



Application for Works Approval

Division 3, Part V *Environmental Protection Act 1986*

Works Approval Number W6266/2019/1

Applicant Santos WA Energy Limited

ACN 009 301 964

File Number DER2019/000215

Premises Varanus Island and East Spar Facilities
CALM Act Leases 1902/100 and 2064/100
Part Reserve 33902 (Part Lot 500 on Plan 240033)
VARANUS ISLAND WA 6872

Date of Report 19 August 2019

Status of Report Final

Table of Contents

1. Definitions of terms and acronyms	3
2. Purpose and scope of assessment	4
2.1 Application details	4
3. Background	4
4. Overview of Premises.....	5
4.1 Operational aspects	5
4.1.1 Sewage treatment process.....	7
4.2 Infrastructure	8
5. Legislative context.....	9
5.1 Part V of the EP Act	9
5.1.1 Applicable regulations, standards and guidelines	9
6. Consultation	10
7. Location and siting	10
7.1 Siting context.....	10
7.2 Residential and sensitive Premises	10
7.3 Specified ecosystems.....	10
7.4 Groundwater and water sources.....	11
8. Risk assessment.....	12
8.1 Determination of emission, pathway and receptor	12
8.2 Consequence and likelihood of risk events.....	14
8.3 Acceptability and treatment of Risk Event.....	15
8.4 Risk Assessment – Containment failure resulting in the discharge of sewage (treated and untreated) to land.....	15
8.4.1 Description of the risk event	15
8.4.2 Identification and general characterisation of emission.....	15
8.4.3 Description of potential adverse impact from the emission	16
8.4.4 Criteria for assessment.....	16
8.4.5 Applicant controls	16
8.4.6 Consequence	16
8.4.7 Likelihood of consequence	17
8.4.8 Overall rating.....	17
8.6 Summary of acceptability and treatment of Risk Events	20
8.7 Works Approval controls.....	21
8.7.1 Commissioning under Works Approval.....	21
8.7.2 Time limited operation under works approval	21

8.8	Licence controls	21
8.8.1	Monitoring requirements.....	22
8.8.2	Monitoring reports	22
8.8.3	Licence Amendment.....	22
9.	Applicant's comments.....	22
10.	Conclusion	22
	Appendix 1: Key documents	24
	Appendix 2: Summary of Applicant's comments on risk assessment and draft conditions	25

List of Tables

Table 1: Definitions	3
Table 2: Documents and information submitted during the assessment process.....	4
Table 3: Prescribed Premises Categories applicable to this application.....	5
Table 4: Varanus Island and East Spar Facility Category 85 infrastructure	8
Table 5: Relevant approvals and tenure.....	9
Table 6: Receptors and distance from activity boundary	10
Table 7: Environmental values.....	11
Table 8: Groundwater and water sources	11
Table 9. Identification of emissions, pathway and receptors during construction	12
Table 10: Identification of emissions, pathway and receptors during operation	13
Table 11: Risk rating matrix	14
Table 12: Risk criteria table.....	14
Table 13: Risk treatment table	15
Table 14: Applicant's proposed controls for containment failure and spills.....	16
Table 15: Sewage facility influent and treated effluent specifications (from Application)	17
Table 16: comparison of treated effluent from new sewage facility against relevant guidelines	18
Table 17: Applicant's proposed controls for disposal of treated sewage to marine environment	19
Table 18: Risk assessment summary	20

List of Figures

Figure 1: location of new (and existing) sewage facility	6
Figure 2: Process flow diagram of new sewage facility	8

1. Definitions of terms and acronyms

In this Decision Report, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
ACN	Australian Company Number
Category/ Categories/ Cat.	Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CALM Act	means the <i>Conservation and Land Management Act 1984 (WA)</i>
Decision Report	refers to this document.
Delegated Officer	an officer under section 20 of the EP Act.
Department	means the department established under section 35 of the <i>Public Sector Management Act 1994</i> and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
EP Regulations	<i>Environmental Protection Regulations 1987 (WA)</i>
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of, and during this Assessment
m ³	cubic metres
Prescribed Premises	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report
Works Approval Holder	Santos WA Energy Limited

2. Purpose and scope of assessment

This Decision Report assesses an application for Works Approval from Santos WA Energy Limited (Applicant) for construction of a new sewage facility which is being built to replace the existing sewage facility at the Varanus Island and East Spar Facilities oil and gas production facility (the Premises).

2.1 Application details

Table 2 lists the documents submitted during the assessment process.

Table 2: Documents and information submitted during the assessment process

Document/information description	DWER record	Date received
Category 85 Works Approval Application Form, signed 22 March 2019.	A1775243	25 March 2019
Varanus Island Waste Water Treatment Plant Upgrade Works Approval Application (Supporting Document)		
Letter from Santos WA Energy Limited to DWER dated 29 May 2019 including: <ul style="list-style-type: none">• Attachment 1 titled 'Response to DWER Queries';• Attachment 2 titled 'General Arrangement Drawing Plan View'; and• Attachment 3 titled 'Process Flow Diagram'.	A1802314	29 May 2019

3. Background

The Premises is located around 70km off the Pilbara coast in Western Australia. The Premises processes gas, oil and condensate received from production wells located in both State and Commonwealth waters. Processed oil and condensate is stored on the Premises and transferred to tankers for direct export, while natural gas is transported via the Sales Gas Pipeline into the Dampier to Bunbury Natural Gas Pipeline and the Goldfields Gas Transmission pipeline. Oil and gas processing operations are licensed under the EP Act via Existing Licence L6284/1992/10 (authorising prescribed categories 10, 34 and 85).

The Premises has two workforce accommodation villages (Top Village and Bottom Village) that supports up to 200 workers on the Island, and has an existing sewage facility that consists of two package treatment plants (also licenced under Existing Licence L6284/1992/10). The existing sewage facility is nearing the end of its useful life and the Applicant now proposes to replace it with a new plant to be located to the south west of the Bottom Village (see Figure 1).

Table 3 lists the prescribed premises category that has been applied for.

Table 3: Prescribed Premises Categories applicable to this application

Classification of Premises	Description	Current throughput capacity	Proposed throughput capacity
Category 85	Sewage facility: premises — (a) on which sewage is treated (excluding septic tanks); or (b) from which treated sewage is discharged onto land or into waters	54m ³ per day	Not more than 72m ³ per day

4. Overview of Premises

4.1 Operational aspects

Treated sewage will be discharged to the ocean via the existing ocean discharge pipeline. The proposed new sewage facility will have a maximum design capacity of 72m³ per day. The system will be an Activated Sludge Bioreactor (ASBR) type wastewater treatment plant which is designed to treat sewage using aeration and a biological flocculent (composed of bacteria and protozoa) to achieve 'Class A' treated effluent, suitable for discharge to the marine environment.

The footprint of the proposed new sewage facility is anticipated to be 12m wide by 25m long and covers an area of approximately 400m². Figure 1 shows the location of the proposed new sewage facility (labelled "New WWTP") and the existing discharge pipeline.

Once the new sewage facility has been commissioned and has reached steady state operations, the old sewage facility will be decommissioned and disconnected from all active sewer mains.

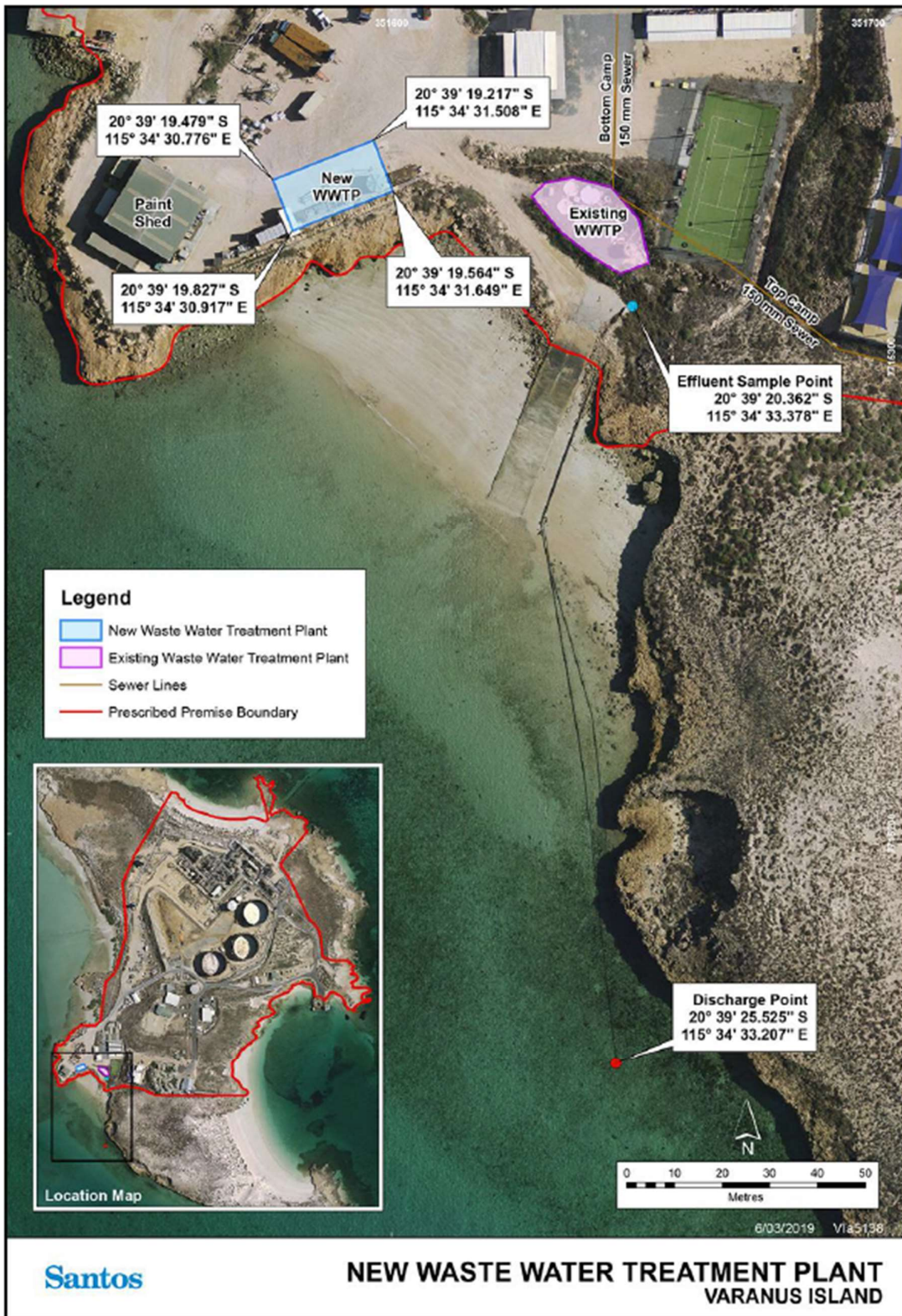


Figure 1: location of new (and existing) sewage facility

4.1.1 Sewage treatment process

Raw sewage is pumped to an influent screen for removal of inorganic material before passing through a bar screen into the two balance tanks (combined capacity of 100m³). The inorganic material is disposed of into a waste bin for bagging and disposal to a licenced facility on the mainland.

An influent feed pump supplies screened, mixed wastewater and mixed liquor from the balance tanks into the bioreactor. The level of wastewater inside the bioreactor drives the influent feed pump to top up the bioreactor when levels are low. The balance tanks will also receive mixed liquor return (MLR), which is a combination of pre-settled wastewater and return activated sludge (RAS), from the bioreactor for re-use through the system.

The bioreactor removes organic content (nitrogen) and Biochemical Oxygen Demand (BOD) as a result of biological processes performed by bacteria (95%) and other microorganisms (5%) utilising aerobic and anaerobic digestion. The microorganisms clump together during this process (flocculation) causing particles to settle out which allows for removal during clarification.

The bioreactor includes an aerobic zone 1, which allows bacteria and other microorganisms to multiply and digest suspended organic matter, also causing it to flocculate. Dissolved Oxygen (DO) concentrations are maintained at greater than 2mg/L via a DO Analyser inside the aerobic tank. This ensures the nitrification process (biological conversion of ammonia to nitrate) occurs effectively. Dosing of sodium hydroxide also occurs in this zone to maintain optimum pH levels.

An anoxic zone is present in the bioreactor to facilitate phosphorus removal. Mixed liquor is recycled from the aerobic zone to the anoxic zones for enhanced denitrification and phosphorus release. Dosing of sucrose occurs in this zone. Mixed liquor from the anoxic zone then overflows by gravity to the second aerobic zone for enhanced nitrification.

In the aerobic zone 2, the conversion of any residual ammonium to nitrate occurs, and flocculated particles settle out for removal during clarification. Dosing of coagulant occurs in this zone. MLR is continuously recirculated from the bioreactor back to the balance tanks via the MLR pump.

From the bioreactor, liquor is sent to the clarification tank to allow settling and separation of flocculated particles. The settled material (activated sludge) is either returned to the start of the treatment process as RAS or removed from the process as waste activated sludge (WAS). Removal of WAS is important to keep the ratio of biomass to food supplied to the bioreactor in balance. Clarified wastewater low in suspended solids is then decanted and filtered (for further removal of suspended solids) into the treated effluent tank.

In the treated effluent tank chlorination occurs by way of hypochlorite dosing to disinfect the microbial pathogens before discharging treated effluent via the ocean outfall.

A 'Class A' upgrade to the sewage facility will be installed to improve the treated effluent quality through:

- an auto-backwashing 25 micron filter;
- recirculation pump which continuously circulates the contents of the treated effluent tank;
- online monitoring of chlorine, pH and turbidity; and
- residual trim hypochlorite dosing.

The chlorine analyser monitors the free residual chlorine and a dosing system controls additional hypochlorite as required to ensure correct free chlorine levels are maintained in the tank at all times for effective disinfection.

A new pipe will be installed from the treated effluent tank to tie into the existing treated effluent

discharge pipe. The treated sewage is then pumped to the ocean discharge point. A flow meter will measure the volume of treated sewage discharged. A sample point is also located at the flow meter to allow treated water samples to be taken.

A process flow diagram for the new sewage facility is shown in Figure 2.

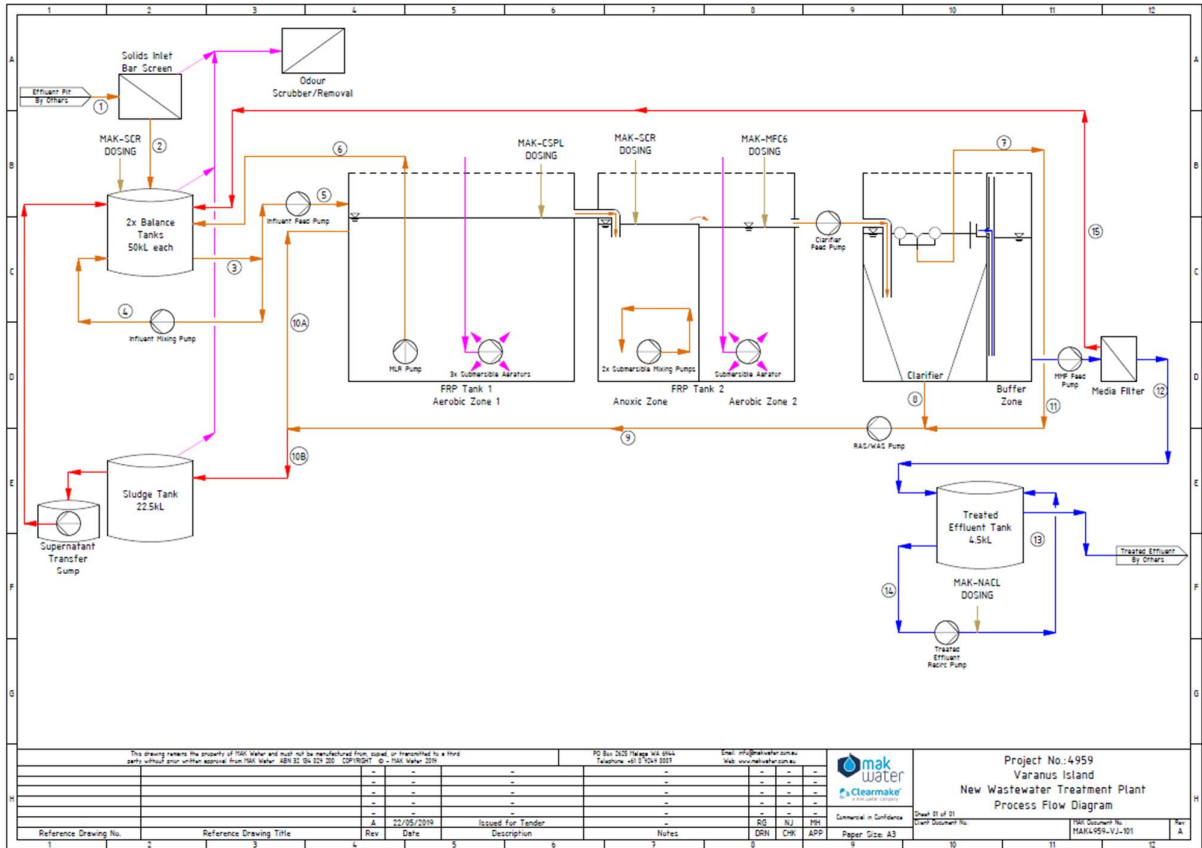


Figure 2: Process flow diagram of new sewage facility

4.2 Infrastructure

The Premises infrastructure, as it relates to Category 85 activities, is detailed in Table 4 and with reference to the Site Plan (attached in the issued Works Approval).

Table 4 lists infrastructure associated with each prescribed premises category.

Table 4: Varanus Island and East Spar Facility Category 85 infrastructure

Infrastructure	Site Plan Reference
Prescribed Activity Category 85	
Raw sewage is collected from the various amenity facilities on the Premises and treated via the premises sewage facility, prior to being discharged to the marine environment by ocean outfall.	
1 Activated Sludge Bioreactor sewage facility consisting of: <ul style="list-style-type: none"> influent screen 2 x balance tanks (combined capacity of 100m³) bioreactor (aerobic and anoxic treatment) clarification tank treated effluent tank effluent chlorination 	'Site layout' shown in Schedule 2 of the Issued Works Approval

	Infrastructure	Site Plan Reference
	<ul style="list-style-type: none"> treated sewage distribution system (including flowmeter and sample point) 	
2	Sub-sea pipeline and discharge point to marine waters	'Premises map - sewage facility location and discharge point' shown in Schedule 1 of the Issued Works Approval

This Decision Report assesses the construction and operation of the proposed new sewage facility on the Premises only. The category 10 (oil or gas production from wells) and category 34 (oil or gas refining) operations have been assessed under licence L6284/1992/10 as part of a Licence Review conducted in March 2019 and are not considered further in this Decision Report.

5. Legislative context

Table 5 summarises approvals relevant to the assessment.

Table 5: Relevant approvals and tenure

Legislation	Number	Subsidiary	Approval
<i>Petroleum and Geothermal Energy Resources Act 1967</i>	Petroleum Lease	Santos WA Energy Limited	Titles for petroleum exploration and production in WA (onshore or internal waters) issued under this Act. A bridging document or written notification will be submitted to DMIRS for approval for the activity to be conducted on VI under the Varanus Island Hub Operations Environment Plan (Rev. 6) dated 5/9/2014.
Part V of the EP Act (WA)	L6284/1992/10	Santos WA Energy Limited	Licence for category 10 (oil and gas production from wells), category 34 (oil or gas refining) and category 85 (sewage facility) prescribed premises.
	W6266/2019/1		Works approval to allow construction of (new) category 85 (sewage facility)
<i>Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974</i>	Under assessment	Santos WA Energy Limited	An application for approval for sewage treatment apparatus is currently being processed by the Shire of Ashburton / Department of Health WA. Application submitted 31/7/2019

5.1 Part V of the EP Act

5.1.1 Applicable regulations, standards and guidelines

The overarching legislative framework of this assessment is the EP Act and EP Regulations.

The guidance statements which inform this assessment are outlined in Appendix 1.

6. Consultation

DWER sought comment from relevant stakeholders associated with the Premises, including the Shire of Ashburton, DBCA and DMIRS on 18 July 2019. The following comments were received:

- DMIRS responded on 6 March 2018 advising that due to the new sewage facility resulting in improved environmental outcomes (improved discharge water quality), DMIRS does not have any issues with the Application;
- DBCA responded on 2 August 2019 noting the increase in sewage throughputs associated with the proposed new facility and the capacity for DWER to apply appropriate regulatory measures for management of the facility under Part V of the EP Act;
- No comments were received from the Shire of Ashburton.

A copy of the draft Works Approval and Decision Report were provided to the Applicant for comment on 7 August 2019. Appendix 2 provides a summary of the Applicant's comments.

7. Location and siting

7.1 Siting context

Varanus Island (VI) is located in the North West Shelf of Western Australia approximately 117km west of Dampier and 12km east of Barrow Island. VI is 2.5km long, 600m wide at its widest point and reaches a height of 30m above sea level.

VI is a 'C' Class nature reserve (Reserve 33902) for the purpose of flora and fauna conservation. Areas of ecological significance, (including marine turtle nesting beaches, shearwater rookeries and mangrove protection areas) are present adjacent to the oil and gas processing facilities.

7.2 Residential and sensitive Premises

The distances to residential and sensitive receptors are detailed in Table 6.

Table 6: Receptors and distance from activity boundary

Sensitive Land Uses	Distance from Prescribed Activity
Worker Accommodation Village on Barrow Island Oil and Gas Facility (Industrial Premises)	12km west
Mardie Station homestead (on mainland WA)	70km southeast

7.3 Specified ecosystems

Specified ecosystems are areas of high conservation value and special significance that may be impacted as a result of activities at or Emissions and Discharges from the Premises. The distances to specified ecosystems are shown in Table 7. Table 7 also identifies the distances to other relevant ecosystem values which do not fit the definition of a specified ecosystem.

The table has also been modified to align with the *Guidance Statement: Environmental Siting*.

Table 7: Environmental values

Specified ecosystems	Distance from the Premises
DBCAs Managed Lands and Waters	The Premises is located on Varanus Island which is part of the Lowendal Islands Nature Reserve gazetted for the conservation of flora and fauna.
Biological component	Distance from the Premises
Threatened/Priority Fauna	<p>There are multiple reptile, bird and mammal species declared as Threatened/Priority Fauna under the Environment Protection and Biodiversity Conservation Act 1999 (Cwth) (EPBC Act) and Wildlife Conservation Act 1950 (WA) (WC Act) that are known to use the Lowendal Islands, including VI, as habitat and / or breeding areas. These fauna are listed as critically endangered, endangered and vulnerable, and include migratory birds protected under international agreements.</p> <p>VI beaches are an important nesting and breeding habitat for Hawksbill, Flatback and Green turtles which are all classified as vulnerable under the EPBC Act and the WC Act.</p> <p>Migratory birds known to nest on VI include Wedgetailed Shearwaters, Bridled Terns, Crested Terns and Osprey. The Great Knot is listed on Schedule 1 (Fauna that is rare or is likely to become extinct) of the WC Act.</p>
Other relevant ecosystem values	Distance from the Premises
Mangrove community (high value ecosystem providing habitat and shelter for birds, fish and other marine species and breeding sites for a number of fish and crustaceans).	A white mangrove (<i>Avicennia marina</i>) community occurs along the southern portion of a sandy beach on the west coast of VI.
Barrow Island Marine Management Area (high value ecosystem)	The boundary of the Marine Management Area is located to the north, west and south of VI. At its closest point, the Marine Management Area is around 1.6km west of the VI lease area boundary.

7.4 Groundwater and water sources

The distances to groundwater and water sources are shown in Table 8.

Table 8: Groundwater and water sources

Groundwater and water sources	Distance from Premises	Environmental value
Groundwater	The uppermost aquifer on VI is located within the Pleistocene aged sands and is unconfined. Depth to groundwater around the Bulk Storage Tanks have been recorded at approximately 11.5 – 12.2m below ground level at the Bulk Storage Tanks. Depth to groundwater and groundwater flows are subject to tidal influence. Groundwater quality is saline.	<p>Groundwater is abstracted from bores located in the southern portion of the site, 350 metres from the processing facilities.</p> <p>A reverse osmosis plant treats groundwater for potable use such as for drinking and showering.</p>

8. Risk assessment

8.1 Determination of emission, pathway and receptor

In undertaking its risk assessment, DWER will identify all potential emissions pathways and potential receptors to establish whether there is a Risk Event which requires detailed risk assessment.

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission. Where there is no actual or likely pathway and/or no receptor, the emission will be screened out and will not be considered as a Risk Event. In addition, where an emission has an actual or likely pathway and a receptor which may be adversely impacted, but that emission is regulated through other mechanisms such as Part IV of the EP Act, that emission will not be risk assessed further and will be screened out through Table 10.

The identification of the sources, pathways and receptors to determine Risk Events are set out in Tables 9 and 10 below.

Table 9. Identification of emissions, pathway and receptors during construction

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
Construction of new sewage facility	Construction, positioning and commissioning of sewage facility infrastructure	Noise	No residences or other sensitive receptors in proximity.	Air / wind dispersion	Amenity impacts	No	No receptor present
		Dust	Closest residence is 12km west and 70km southeast.				
Commissioning of new sewage facility	During the commissioning period treated or partially treated sewage will be discharged to the ocean via the existing outfall	Discharges to water: During commissioning seeding and establishment of biological processes will need to occur and effluent may not meet specified discharge water quality criteria targets.	Marine species inhabiting area surrounding outfall discharge pipe	Direct discharge to marine surface waters	Adverse impacts on marine water quality (and fauna and flora) in the vicinity of the outfall.	Yes	See section 8.5

Table 10: Identification of emissions, pathway and receptors during operation

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
Category 85: Sewage facility	Treatment of sewage	Odour	No residences or other sensitive receptors in proximity. Closest residence is 12km west and 70km southeast	Air / wind dispersion	None	No	No receptor present An odour control system (using carbon filters to remove odours) is to be installed at the inlet screen and balance tanks of the sewage facility.
	Sewage pipes and holding tanks	Rupture of pipes / overtopping of holding tanks resulting in sewage discharge to land and / or the adjacent marine environment	Vegetation and soils adjacent to discharge area. Marine environment (high water tide mark ~ 20m south of sewage facility)	Direct discharge	Soil contamination inhibiting vegetation growth and survival. Impacts to intertidal areas and / or marine species inhabiting the area	Yes	See section 8.4
	Disposal of treated effluent to marine environment via outfall	Treated effluent discharged to the ocean via the existing outfall	Marine species inhabiting the area surrounding outfall discharge pipe	Direct discharge to marine waters	Adverse impacts on marine water quality (and fauna and flora) in the vicinity of the outfall.	Yes	See section 8.5

8.2 Consequence and likelihood of risk events

A risk rating will be determined for risk events in accordance with the risk rating matrix set out in Table 11 below.

Table 11: Risk rating matrix

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

DWER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 12 below.

Table 12: Risk criteria table

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the Risk Event occurring.		The following criteria has been used to determine the consequences of a Risk Event occurring:		
			Environment	Public health* and amenity (such as air and water quality, noise, and odour)
Almost Certain	The risk event is expected to occur in most circumstances	Severe	<ul style="list-style-type: none"> onsite impacts: catastrophic offsite impacts local scale: high level or above offsite impacts wider scale: mid-level or above Mid to long-term or permanent impact to an area of high conservation value or special significance[^] Specific Consequence Criteria (for environment) are significantly exceeded 	<ul style="list-style-type: none"> Loss of life Adverse health effects: high level or ongoing medical treatment Specific Consequence Criteria (for public health) are significantly exceeded Local scale impacts: permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	<ul style="list-style-type: none"> onsite impacts: high level offsite impacts local scale: mid-level offsite impacts wider scale: low level Short-term impact to an area of high conservation value or special significance[^] Specific Consequence Criteria (for environment) are exceeded 	<ul style="list-style-type: none"> Adverse health effects: mid-level or frequent medical treatment Specific Consequence Criteria (for public health) are exceeded Local scale impacts: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	<ul style="list-style-type: none"> onsite impacts: mid-level offsite impacts local scale: low level offsite impacts wider scale: minimal Specific Consequence Criteria (for environment) are at risk of not being met 	<ul style="list-style-type: none"> Adverse health effects: low level or occasional medical treatment Specific Consequence Criteria (for public health) are at risk of not being met Local scale impacts: mid-level impact to amenity
Unlikely	The risk event will probably not occur in most circumstances	Minor	<ul style="list-style-type: none"> onsite impacts: low level offsite impacts local scale: minimal offsite impacts wider scale: not detectable Specific Consequence Criteria (for environment) likely to be met 	<ul style="list-style-type: none"> Specific Consequence Criteria (for public health) are likely to be met Local scale impacts: low level impact to amenity
Rare	The risk event may only occur in exceptional circumstances	Slight	<ul style="list-style-type: none"> onsite impact: minimal Specific Consequence Criteria (for environment) met 	<ul style="list-style-type: none"> Local scale: minimal to amenity Specific Consequence Criteria (for public health) met

[^] Determination of areas of high conservation value or special significance should be informed by the *Guidance Statement: Environmental Siting*.

* In applying public health criteria, DWER may have regard to the Department of Health's *Health Risk Assessment (Scoping) Guidelines*.

“onsite” means within the Prescribed Premises boundary.

8.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment table 13 below:

Table 13: Risk treatment table

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk Event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls.	Risk Event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls.	Risk Event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled.	Risk Event is acceptable and will generally not be subject to regulatory controls.

8.4 Risk Assessment – Containment failure resulting in the discharge of sewage (treated and untreated) to land

8.4.1 Description of the risk event

Unintentional release of nutrient rich wastewater to land (or groundwater) and to the marine environment due to containment failure, ruptured pipes or overtopping. These uncontrolled discharges have the potential to flow overland and contaminate soils, groundwater and impact marine water quality and marine species.

Sewage pipelines reporting to the sewage facility or transferring treated effluent from the sewage facility to the ocean outfall may fail due to a mechanical problem with the pipeline or due to damage incurred from mobile mechanical plant.

Process control errors or faults, or blocked screens due to poor maintenance may result in overtopping of individual tanks within the sewage facility.

8.4.2 Identification and general characterisation of emission

Sewage generated from the accommodation camp facilities will be piped and treated in the sewage facility. The raw sewage meets the typical composition of domestic sewage, it is generally high in suspended solids, nutrients and pathogens, such as E. Coli. The raw sewage contains Total Nitrogen (TN) concentrations at around 120mg/L, Total Phosphorus (TP) concentrations at around 20mg/L, Biochemical Oxygen Demand (BOD) at around 450mg/L and Total Suspended Solids (TSS) at around 450mg/L. The sewage facility can treat up to 72m³ per day. An undetected leak from pipelines could potentially discharge minor volumes (from several litres to several cubic metres) or an overflow from tanks could discharge larger volumes (average daily throughputs are around 50m³) of treated or untreated sewage, particularly during peak flow times.

8.4.3 Description of potential adverse impact from the emission

Partially or completely untreated sewage that may be released from overtopping of the sewage facility tanks may cause localised soil contamination. The proximity of the sewage facility to the marine environment (less than 20m away from the high water tide mark) may also result in an unplanned discharge to the marine environment.

Pipeline failures may also release untreated or treated sewage to land, inundating the soil. As native vegetation has adapted to thrive in low nutrient environments, the impact of a discharge to vegetation would likely be adverse as a result of high nutrient levels in the sewage.

8.4.4 Criteria for assessment

Regulation 3(1) of the *Environmental Protection (Unauthorised Discharges) Regulations* stipulate that it is an offence to discharge sewage to the environment.

8.4.5 Applicant controls

This assessment has reviewed the controls set out in Table 14 below.

Table 14: Applicant’s proposed controls for containment failure and spills

Site infrastructure	Description
New ASBR sewage facility	All tanks have secondary containment to capture any leaks / spills / overflows. Tanks are either located within a concrete bund, or those that form part of the ASBR process are located within a sea container providing some internal secondary containment.
	The sewage facility has 2 x balance tanks with combined storage capacity of 100m ³ to provide buffering capacity.
	The sewage facility will have a fault alarm connected to the Central Control Room.
	The plant will be checked daily by the operator to ensure the plant is operating as intended and operating data will be logged.
	Around 8m ³ per month of sewage sludge will be removed from the sewage facility and for disposal to an approved facility on the mainland. Sludge will either be dewatered onsite and temporarily stored on the Premises in leak proof containers or will be removed by vacuum truck.
	The sewage facility will be commissioned for 3 months to allow testing, calibration and inspection of all equipment. This process will ensure the sewage facility is effectively treating the wastewater and that no malfunction or discharges from any component is likely to occur.

8.4.6 Consequence

Based on the volumes of sewage contained, distance to surface water receptors (less than 20m away) and Applicant controls proposed, If release of partially or untreated effluent to land occurs, native vegetation and / or the marine environment may be impacted with possible impacts to fauna (including marine biota) if they come into contact with the sewage. The Delegated Officer has determined that the impact of the discharge will be low level on-site

impacts and minimal off-site impacts. Therefore the Delegated Officer considers the consequence to be **minor**.

8.4.7 Likelihood of consequence

Based upon the design controls of the new sewage facility (outlined in Table 14), the Delegated Officer has determined that the likelihood of off-site impacts on a minimal scale will probably only occur in exceptional circumstances. Therefore the Delegated Officer considers the likelihood to be **rare**.

8.4.8 Overall rating

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 11) and determined that the overall rating for the risk posed by failure of sewage pipelines and overtopping from the sewage facility is **low risk**.

8.5 Risk Assessment – Disposal of treated sewage to marine environment (normal operations)

8.5.1 Description of the Risk Event

The new sewage facility will treat up to 72m³ per day of sewage generated from accommodation and office facilities on the Premises for discharge to the marine environment via an ocean discharge pipeline. The discharge point is located approximately 200m south of the new sewage facility and approximately 20m west (offshore) of the Varanus Island coast (shown in Figure 1).

8.5.2 Identification and general characterisation of emission

Under normal operating conditions, treated wastewater is expected to meet effluent water quality criteria outlined in Table 15.

Table 15: Sewage facility influent and treated effluent specifications (from Application)

Parameter	Influent	Effluent
Biochemical Oxygen Demand (mg/L)	150 – 450	< 20
Total suspended solids (mg/L)	150 – 450	< 30
pH (pH value)	6.0 – 8.5	8 – 8.4
Total nitrogen (mg/L)	120	< 50
Total phosphorus (mg/L)	20	< 12
Free Chlorine	-	0.2 – 2
E.Coli (CFU/100mL)	-	< 10
Turbidity (NTU)	-	< 5

8.5.3 Description of potential adverse impact from the emission

The discharge of treated wastewater to the marine environment has the potential to cause adverse impacts on marine water quality, impacting fauna and flora in the vicinity of the outfall. Poor water quality in the area of the outfall may impact ecosystem values of Varanus Island, a Class C Nature Reserve. There are multiple threatened and priority fauna, important turtle

nesting beaches, rookeries and mangrove areas protected under State and Commonwealth legislation.

8.5.4 Criteria for assessment

Under normal operating conditions, treated wastewater is expected to meet discharge quality specifications cited in *Australian Guidelines for Sewage Systems – Effluent Management* (AARMCANZ/ANZECC 1997). The new sewage facility will be capable of treating sewage to a 'Class A' treatment standard (tertiary treatment including pathogen reduction) which is suitable for discharge to coastal waters. Table 16 gives a comparison of the expected water quality of the treated sewage against the *Australian Guidelines for Sewage Systems – Effluent Management* which are considered to be appropriate assessment criteria.

Table 16: comparison of treated effluent from new sewage facility against relevant guidelines

Parameter	New sewage facility treatment targets ¹	Guideline value ²
Biochemical Oxygen Demand (mg/L)	< 20	20 - 30
Total Suspended Solids (mg/L)	< 30	25 - 40
pH (pH units)	8.0 – 8.4	Not available
Total Nitrogen (mg/L)	< 50	20 - 50
Total Phosphorus (mg/L)	< 12	6 - 12
Free Chlorine (mg/L)	0.2 – 2.0	Not available
E Coli (CFU/100mL)	< 10	10 ⁵ - 10 ⁶
Turbidity (NTU)	< 5	Not available

1. Based on design treatment targets specified in Application
2. Australian Guidelines for Sewage Systems – Effluent Management (AARMCANZ/ANZECC 1997) Treatment Process Category C (Secondary Treatment)

The Delegated Officer notes that the sewage facility to be constructed on the Premises will include a "Class A Upgrade" to improve the quality of treated wastewater discharged from the plant. The Class A upgrade includes an auto-backwashing 25 micron filter, a recirculation pump which continuously circulates the contents of the treated effluent tank, online monitoring of chlorine, pH and turbidity and residual trim hypochlorite dosing. The residual trim hypochlorite dosing ensures pathogen levels (E Coli) are reduced to a tertiary treatment standard which are well above the requirements of the guideline value for Category C secondary treatment.

8.5.5 Applicant controls

Commissioning: after the sewage facility has been constructed the Applicant will commission the system for a period of three months to allow testing and calibration of the infrastructure and development of the biological treatment processes.

During the commissioning phase the Applicant will sample treated wastewater from the sewage facility on a monthly basis for analysis by a NATA accredited laboratory.

During this time it is possible that the treated sewage may not meet the treatment targets specified in Table 16, however any exceedances are expected to be for short duration only (if

at all).

A commissioning report will be submitted to DWER six weeks post commissioning. The commissioning report will include the effluent sampling results during commissioning summarised against the design treatment targets and if the design specifications are not met, measures proposed (including timeframes) for meeting the design specifications.

Operation: once the sewage facility has been commissioned and the treatment process has reached steady state, it is expected treated wastewater quality will meet or exceed treatment levels suitable for discharge to the marine environment (Category C secondary treatment) as specified in *Australian Guidelines for Sewage Systems – Effluent Management* (AARMCANZ/ANZECC 1997).

This assessment has reviewed the Applicant’s controls set out in Table 17 below.

Table 17: Applicant’s proposed controls for disposal of treated sewage to marine environment

Site infrastructure	Description
New ASBR sewage facility	ASBR process can cope with variable untreated effluent flow conditions and maintain effective treatment processes
	Discharge point to marine environment submersed at all times for adequate dispersion of treated wastewater
	The plant will be checked daily by the operator to ensure the plant is operating as intended and operating data will be logged. The plant will also have a fault alarm connected to the Central Control Room.
	Sewage sludge will be regularly and automatically transferred to sludge storage tank to maintain optimal levels for treatment to occur. Sludge will be taken to the mainland for disposal to a licensed facility.
	A three month commissioning period will occur to enable testing and calibration of the sewage facility components and to allow time for steady state operations to be reached. Contingency plans will be implemented (including frequent checks, testing and adjustments) to ensure the new sewage facility reaches equilibrium quickly. If design criteria cannot be met, the existing sewage facility can be used until the new sewage facility can demonstrate compliance with treatment design criteria,
	Quarterly testing of treated effluent (by NATA accredited laboratory) for typical wastewater suite including pH, TSS, BOD, TN, TP, Free Chlorine, E. Coli, anionic surfactants and oil and grease. Any exceedances of design parameters will trigger an investigation, subsequent analysis of effluent discharge and (if required) adjustments to chemical dosing rates and / or timing of retention within various stages of the bioreactor.

8.5.6 Consequence

Based on the design treatment levels outlined in Table 16 and the applicant controls outlined in Table 17, the Delegated Officer has determined that the impact of disposal of treated sewage to the marine environment will be low level offsite impacts at the local scale. Therefore, the Delegated Officer considers the consequence of the Risk Event to be **Moderate**.

8.5.7 Likelihood of Risk Event

Based on the Applicants proposed controls, the Delegated Officer has determined that the likelihood of the discharge causing an adverse impact to the marine environment will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of the Risk Event to be **Unlikely**.

8.5.8 Overall rating of treated sewage discharged to the marine environment

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 11) and determined that the overall rating for the risk posed by the disposal of treated sewage to marine environment is **Medium**.

8.6 Summary of acceptability and treatment of Risk Events

A summary of the risk assessment and the acceptability or unacceptability of the risk events set out above, with the appropriate treatment and control, are set out in Table 17 below. Controls are described further in section 11.

Table 18: Risk assessment summary

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)
	Emission	Source	Pathway/ Receptor (Impact)			
1.	Untreated / partially treated sewage (nutrient rich)	Rupture of pipes, overflows from sewage treatment tanks	Direct discharge to soils and marine environment, impacts to vegetation and marine biota health from high nutrients,	Concrete hardstands, bunded areas, containerised ASBR system, commissioning process, regular inspections	Minor consequence Rare Low risk	Acceptable, generally not controlled
2.	Discharge of treated sewage to the environment (low levels of TN, TP, BOD, E Coli, TSS and Chlorine)	New sewage facility	Direct discharge to marine environment causing impacts to marine species inhabiting the area	Daily inspections, regular sludge removal, design controls, quarterly treated effluent monitoring	Moderate consequence Unlikely Medium risk	Acceptable subject to proponent controls conditioned

8.7 Works Approval controls

The conditions in the Issued Works Approval have been determined in accordance with the *Guidance Statement: Setting Conditions*. Conditions have been included to include infrastructure and compliance requirements and outline authorised emissions as well as record keeping requirements

The approved infrastructure and equipment will suitably minimise the risk of nutrient rich sewage causing contamination of soil and groundwater, or marine environment impacts. The conditions are fundamental to ensure that the works, as proposed, are installed to the specific requirements. The design and construction requirements of the works are necessary to protect the soil, groundwater and marine environment against potential contamination.

DWER notes that it may review the appropriateness and adequacy of controls at any time and that, following a review, DWER may initiate amendments to the works approval under the EP Act.

Grounds: Works, specified infrastructure requirements and expected standards are derived from the Application.

8.7.1 Commissioning under Works Approval

Standard conditions have been added to the Works Approval detailing requirements and duration of commissioning.

Grounds: The risk assessment in section 8.5 outlined that the potential emissions and discharges during commissioning present an acceptable risk to the environment and public amenity. The Applicant is permitted to commission the sewage facility for a period of up to 3 months to bring the plant into steady state conditions. The Applicant will be required to submit construction compliance documentation and also a commissioning report to DWER to enable an assessment of the environmental performance of the sewage facility once operational. The discharge water quality will be required to be monitored monthly during commissioning and discharge flow rates will need to be recorded continuously.

8.7.2 Time limited operation under works approval

Standard conditions have been added to the Works Approval detailing requirements during time limited operations.

Grounds: The risk assessment in section 8.5 outlined that the potential emissions and discharges during operation present an acceptable risk to the environment and public amenity. Post commissioning, the Applicant is permitted to operate the sewage facility for a period of up to 3 months to allow adequate time for an amendment to Existing Licence L6284/1992/10 to be processed (see section 8.8.3).

Quarterly monitoring of discharge water quality is required during operations for typical wastewater parameters. Discharge water quality limits (based on design treatment levels) have not been set during the three months operational phase under the works approval. The Delegated Officer will review the results from the monitoring during Commissioning and if considered necessary, will apply water quality discharge limits as part of the amendment to the Existing Licence to incorporate the ongoing operation of the new sewage facility.

8.8 Licence controls

The Existing Licence L6284/1992/10 has conditions relating to the operation of the existing sewage facility, including:

- the sewage facility shall be operated and maintained such that overtopping of tanks does

not occur and the integrity of containment infrastructure is maintained;

- discharge of treated effluent to the marine environment shall only occur through the approved discharge point; and
- a volumetric discharge limit of $\leq 54\text{m}^3$ / day applies.

8.8.1 Monitoring requirements

The following monitoring of the sewage facility is already required under the Existing Licence:

- treated effluent discharged from the sewage facility is required to be sampled quarterly and analysed at a NATA registered laboratory for pH, TSS, BOD, TN, TP, Free Chlorine, E. Coli, anionic surfactants and oil and grease; and
- monthly monitoring of volumes discharged.

8.8.2 Monitoring reports

The following reporting to DWER is required via an Annual Environmental Report:

- sewage facility discharge outputs (volumetric); and
- treated effluent quality - Tabulated surface water monitoring data results and an interpretation of monitoring data results including comparison of historical data to determine trends.

Reporting of the results of monitoring is required to inform future risk assessments.

8.8.3 Licence Amendment

Following completion of the works, submission of specified certifications for the installed infrastructure and time limited commissioning / operations, the Applicant will need to submit an application for an amendment to the Existing Licence L6284/1992/10. The amendment will be required to change the approved volumetric throughput limit of category 85 discharges from 54m^3 per day to 72m^3 per day. The Applicant should ensure that the application is lodged as soon as certification is submitted to DWER and all necessary information is provided to allow timely processing, assessment and determination of the licence amendment application.

Licence conditions will be determined in accordance with the *Guidance Statement: Setting Conditions* following compliance with this Works Approval

9. Applicant's comments

The Applicant was provided with the draft Decision Report and draft issued Works Approval on 7 August 2019. The Applicant provided comments which are summarised, along with DWER's response, in Appendix 2.

10. Conclusion

This assessment of the risks of activities on the Premises has been undertaken with due consideration of a number of factors, including the documents and policies specified in this Decision Report (summarised in Appendix 1).

Based on this assessment, it has been determined that the Issued Works Approval will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

The *Guidance Statement: Licence Duration* has been applied and the issued works approval expires in 5 years from date of issue.

Caron Goodbourn
MANAGER, PROCESS INDUSTRIES

Delegated Officer
under section 20 of the *Environmental Protection Act 1986*

Appendix 1: Key documents

	Document title	In text ref	Availability
1.	Category 85 Works Approval Application Form, signed 22 March 2019. Supporting documentation: Varanus Island Waste Water Treatment Plant Upgrade Works Approval Application		DWER record (A1775243)
2.	Letter from Santos WA Energy Limited to DWER dated 29 May 2019 including: <ul style="list-style-type: none"> Attachment 1 titled 'Response to DWER Queries'; Attachment 2 titled 'General Arrangement Drawing Plan View'; and Attachment 3 titled 'Process Flow Diagram'. 	Application	DWER record (A1802314)
3.	Licence L6284/1992/10 – Varanus Island and East Spar Facilities	L6284/1992/10	accessed at www.der.wa.gov.au
4.	DER, July 2015. <i>Guidance Statement: Regulatory principles</i> . Department of Environment Regulation, Perth.	DER 2015a	accessed at www.dwer.wa.gov.au
5.	DER, October 2015. <i>Guidance Statement: Setting conditions</i> . Department of Environment Regulation, Perth.	DER 2015b	
6.	DER, November 2016. <i>Guidance Statement: Environmental Siting</i> . Department of Environment Regulation, Perth.	DER 2016a	
7.	DER, August 2016. <i>Guidance Statement: Licence duration</i> . Department of Environment Regulation, Perth.	DER 2016b	
8.	DER, February 2017. <i>Guidance Statement: Risk Assessments</i> . Department of Environment Regulation, Perth.	DER 2017a	
9.	DER, February 2017. <i>Guidance Statement: Decision Making</i> . Department of Environment Regulation, Perth.	DER 2017b	
10.	Agriculture and Resource Management Council of Australia and New Zealand and Australian and New Zealand Environment and Conservation Council, <i>Australian Guidelines for Sewerage Systems – Effluent Management</i> (ARMCANZ/ANZECC 1997).	ANZECC ARMCANZ 1997	

Appendix 2: Summary of Applicant's comments on risk assessment and draft conditions

Condition	Summary of Applicant's comment	DWER response
Explanatory Notes (page 2 of works approval)	Typographical error requires correcting (<i>Environmental Protection Regulations 1987</i>).	Accepted and updated.
Definitions (page 6 of works approval)	Santos queried inclusion of "Reportable Event" in Definitions section.	Definition deleted as not required.
Condition 4 Table 2	<p>Santos requested Site Plan Reference in Table 2 refer to Schedule 1 Premises Map (as opposed to Schedule 2 Layout Plan) as this defines the location of the sewage facility as referred to in condition 1(c). Layout is indicative only, and is not georeferenced.</p> <p>Schedule 1 Map has been amended to allow for a slight increase in total area for the WWTP (increase being ~100m²). The increase in area relates to the optimised engineering and to accommodate bunding requirements.</p> <p>Santos is currently optimising the engineering design and is reviewing treated effluent tank size. As such, Santos requests capacity of treated effluent tank be amended to cater for an increased size of up to 9 kL.</p>	<p>Accepted and updated.</p> <p>Accepted and updated.</p> <p>Accepted and updated.</p>
Condition 9(a)	Santos advises it is not practicable to monitor at the 'ocean' discharge point and requests 9(a) be removed.	Not accepted. Condition 9(a) is requiring a sample of what is being discharged, not from the actual discharge point but from the monitoring location for that discharge point. Condition 9(a) defines (and approves) the discharge point that the required monitoring relates to, so has been retained.
Schedule 1: Premises Map	<p>Santos has amended the Premises map in Schedule 1 to make it clearer that the ocean discharge point is not part of the Prescribed Premises, but is an Approved Discharge Location.</p> <p>Discharge sample point and flow meter location has also been indicated.</p> <p>Premises map has also been amended to remove reference to the</p>	Accepted. Amended Premises map has been included on final works approval.

Condition	Summary of Applicant's comment	DWER response
	existing WWTP, and included the influent/effluent lines, which run between the existing WWPT and the new WWTP. For completeness only.	
Schedule 2: Site Layout	This is a General Arrangement Drawing and subject to change for engineering optimisation reasons. Including the wording "Indicative Site Layout" would make the intent of the drawing clearer.	Accepted and updated.