Decision Report

Application for Works Approval

Division 3, Part V *Environmental Protection Act 1986*

Works Approval Number	W6228/2019/1
Applicant	Project Sea Dragon Pty Ltd
ACN	604 936 192
File Number	DER2019/000201-1
Premises	Project Sea Dragon Durack Drive KUNUNURRA WA 6743 Part of Lot 203 on Deposited Plan 27929 Part of Lot 343 on Deposited Plan 44329 Part of Lot 521 on Deposited Plan 210702 Part of Lot 897 on Deposited Plan 28476 Crown Reserve 22609 As defined by the coordinates in Schedule 1 of the Works Approval
Date of Report	17 June 2019
Status of Report	Final

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1. Definitions of terms and acronyms

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

Table 1: Definitions

Term	Definition
AACR	Annual Audit Compliance Report
ACN	Australian Company Number
AER	Annual Environment Report
ANZECC 2000	Australian and New Zealand Guidelines for Fresh and Marine Quality. Paper No. 4, Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australian and New Zealand (ARMCANZ) 2000
Category/ Categories/ Cat.	Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
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 *Public Sector Management Act 1994* 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	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
Works Approval Holder	Project Sea Dragon Pty Ltd
m^3	cubic metres
Noise Regulations	*Environmental Protection (Noise) Regulations 1997* (WA)
Occupier	has the same meaning given to that term under the EP Act.
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
Primary Activities	as defined in Schedule 2 of the Revised Licence

Risk Event	As described in *Guidance Statement: Risk Assessment*
UDR	*Environmental Protection (Unauthorised Discharges) Regulations 2004* (WA)

2. Purpose and scope of assessment

An Application (PSD 2019) was received on 13 March 2019 from Project Sea Dragon Pty Ltd (the Applicant) for a works approval to construct a prawn processing facility in Kununurra, Western Australia (WA). The prawn processing facility will support the Legune grow-out Facility located on Legune Station in the Northern Territory (NT).

Seafood processing is a Prescribed Premises category in accordance with Schedule 1, Part 1 of the *Environmental Protection Regulations 1987 (EP Regulations)*, and as such, requires a works approval to construct, and a licence to operate, in accordance with Part V Division 3 of the *Environmental Protection Act 1986* (WA) (EP Act). As well as seafood processing, the Applicant is also proposing to carry out solar salt manufacturing, which is also a Prescribed Premises in accordance with the EP Regulations. Table 2 lists the prescribed premises categories that have been applied for.

The approved production and design throughput is based on the production processing based on 20 hours a day; not 24 hours, as a mandatory 4 hours a day is required for cleaning. It is also noted that production is not constant and will fluctuate during the 12 month annual period; refer to section 4.1 below. Thus the approved production and design capacity for the Premises is to support the operation of Stage 1 Legune Grow-out Facility.

Table 2: Prescribed Premises Categories in the Existing Licence

Classification of Premises	Description	*Approved Premises production or design capacity or throughput*
Category 22	Seafood processing: premises (other than a fish wholesaler) on which fish or other seafood is processed and from which liquid waste is or is to be discharged onto land or into waters	16,000 tonnes per year
Category 14	Solar salt manufacturing: premises on which salt is produced by solar evaporation	1,854 tonnes per year

This Decision Report documents the Delegated Officer's risk assessment of emissions and discharges from the Premises consistent with *Guidance Statement: Risk Assessment* (DER 2017a) and *Guidance Statement: Decision Making* (DER 2017b).

2.1 Application details

Table 3 lists the documents submitted during the assessment process.

Table 3: Documents and information submitted during the assessment process

Document/information description	Date received
Application Form: Project Sea Dragon Processing Plant Category 22 and 14 Works Approval including: • Attachment 1: Applicant Details, including Proof of Occupier and ASIC Company Extract; • Attachment 2: Premises Maps; • Attachment 3A: Project Description; • Attachment 5: Stakeholder Engagement; • Attachment 6A: Emissions and Discharges; • Attachment 6B: Waste Acceptance; • Attachment 7: Siting and Location; • Attachment 8: Other Relevant Information, including Noise Assessment, Stormwater Management Plan, Groundwater Licence Operating Strategy, Hydrogeological Assessment, Odour Screening Analysis, Contingency	13 March 2019

Response Plan, Environmental Impact Assessment and Water Quality Assessment Processing Plant.	
Additional Supporting Documentation (Electronic Mail) Subject: *Works Approval Application (Part V) – Project Sea Dragon Processing Plant - Kununurra.* Authored by: Kate McBean (CO_2 Australia). Details (including attachments): Further information regarding design of the Salt Evaporation Ponds, the Wastewater Treatment Plant, Stormwater Treatment Plan and requirement to Commission under the Works Approval	27 March 2019

3. Background

The Applicant is developing Project Sea Dragon, which is designed to produce high-quality, year-round reliable volumes for export markets for Black Tiger prawns (*Penaeus monodon*).

Project Sea Dragon comprises a large-scale land-based prawn aquaculture project comprising several key components across Northern Australia, including:

- Up to 10,000 hectares (ha) of prawn production ponds at Legune Station in the NT;
- a processing plant located in Kununurra, WA;
- a founder stock centre and back up breeding centre in Exmouth, WA;
- core breeding centre and Broodstock maturation centre in Bynoe Harbour, NT;
- a commercial hatchery at Gunn Point, NT; and
- export facility (location to be determined).

The construction and operation of the prawn processing plant located in Kununurra (the Premises) is the subject of this Decision Report. The Kununurra prawn processing plant has been classified as a Major Project of Strategic Importance in WA.

4. Overview of Premises

The area forming the Prescribed Premises is a 44 hectare (ha) parcel of Crown Land on a portion of Lot 203 on Deposited Plan 27929, reserved for the purpose of 'Agricultural Research Station' and vested in Department of Primary Industries and Regional Development (DPIRD). The proposed area for the infrastructure on Lot 203 is approximately 10ha, with a 10m buffer around all infrastructure.

The maximum throughput of the category 22 operations is approximately 16,000 tonnes per year. Theoretical design capacity of the processing equipment is estimated to be much higher than this rate, however, production limitations such as the capacity of the Stage 1 Legune grow out ponds in the NT, the requirement for a minimum of 4 hours cleaning per day, and practicalities with market demand and processing times, this assessment will review the emissions and discharges associated with the above given throughput. Any subsequent upgrades required to the processing plant to cater for increased processing resultant from increased production at the Legune grow-out ponds over time may be subject to additional works approvals (and licenses) in due course and if required will be additional subsequent Applications which will undergo a full Risk Assessment.

The Premises is located approximately 12km north of Kununurra within Stage 1 of the Ord River Irrigation Area (ORIA). Figure 1 shows the location of the Premises within Kununurra.

Figure 1: Location of the Project Sea Dragon prawn processing plant.

4.1 Operational aspects

The Premises is designed to operate 24 hours per day, 365 days per year. Whilst the processing plant is designed to operate 24 hours a day, for 365 days a year the Applicant requires the ability to operate the processing plant on any day of the year, subject to harvesting of prawns at the Legune Grow-out Facility. The months of operation will vary from year to year given the harvest is not based on 12 monthly cycles. Daily operations at the Premises will comprise 20 hours of processing time with a mandatory 4 hours of cleaning per day. The plant will be operated by 2 x 12 hour shifts each day. There will be three products lines at the processing plant with the cooked prawn line expected to operate for around 106 days a year as required based on the proposed 2000 tonnes per year throughput. This is complemented with the processing of 13,984 tonnes of uncooked prawns per year. Table 4 provides an overview of the production capacity of each product line at the processing plant.

Table 4 Production capacity of the processing plant (from Application)

Product line	Production and Design Capacity (Tonnes/hour)	Throughput Design Capacity (Tonnes/hour)
Uncooked (raw)	3.75	3
Cooked	3.2	2.5
Soft and broken	-	1

Prawns will be harvested at the Legune Grow-out Facility in the NT and will be trucked to the Premises in tubs containing saline ice slurry to maintain low temperatures as far as practical for processing. Around 2.5 tonnes per hour of prawns will be received at the Premises. The transport tubs will be unloaded via forklift at the unloading bay in an on-grade covered area (graded to ensure any waste water is directed to the WWTP), the bins will be stored at the receival hall, quality checked and then drained. Bins will then be loaded onto one of two bin tippers, lids removed and the prawns tipped for processing.

Empty bins and lids will transferred to a tub and lid washer and stored three high. Prawn receival trucks will be washed prior to collecting the empty cleaned bins to be returned to the Grow-out Facility in the NT. The truck wash facility will have one bay wash to allow for 20 minutes wash per truck. The wastewater from the wash bay will be captured within a bunded hardstand area and directed to the WWTP.

After bin tipping the raw prawns will be inspected and 'soft and broken' prawns removed to a chiller for later processing. Waste, such as barnacles, fish, foreign objects etc., will be transferred to bins for storage in a chilled waste room. Prawns will then be processed, which involves cleaning, grading, and packing, freezing and loading onto pallets for transport in refrigerated containers for export. The 'soft and broken' line will also be processed, which is assumed to be approximately 5% - 15% of total uncooked production. The 'soft and broken' line is a second-grade product consisting of under-sized or physically damaged prawns.

The Premises will also include a prawn cooking line for up to 2,000 tonnes per year of cooked prawns. The cooked prawn line is deemed 'high' care. High care products, such as ready to eat cooked prawns, require higher hygiene and sanitation levels and therefore the cooked prawn line will be separated from the raw prawn line and will have a separate hygiene entry. Prawns to be cooked will be conveyed from the raw prawn line (after grading). The prawns will then be cooked and brine chilled and stored in tubs with ice slurry. The tubs will be stored in a chiller room for 24 hours prior to boxing and freezing. The boxed prawns will be manually carton packed, then frozen and packed onto pallets in a similar way to the raw prawns.

A central ice system is included in the facility to supply all icing points throughout the process.

4.1.1 Wastewater Treatment

The processing of prawns at the Premises will generate wastewater from three sources:

1. Saline ice slurry – from tubs used to transport prawns from the Legune Grow- out facility to the Premises;
2. Water from washing prawns, and from cleaning and washing equipment;
3. Brine water from the prawn cooling and cooking process.

Two streams of wastewater will be generated and treated separately. Chiller brine (NaCl) will be sent to one of two evaporation ponds for storage and evaporation.

Wastewater from remaining sources will be treated via a custom built fully enclosed wastewater treatment plant (WWTP) that will include primary screening to remove shells and flesh, dissolved air flotation (DAF) to remove suspended solids and phosphorus, digestion via an aerobic bioreactor with an integrated ultrafiltration membrane (membrane bioreactor or MBR) and reverse osmosis (RO) to remove dissolved salts, dissolved nitrogen and phosphorus. Treated water from the WWTP will be discharged to the existing Ord Irrigation Cooperative (OIC) D6 drain as shown in Figure 2. The D6 drain runs to the northwest for approximately 8km, and then drains into the Lower Ord River via a 3km natural drainage channel.

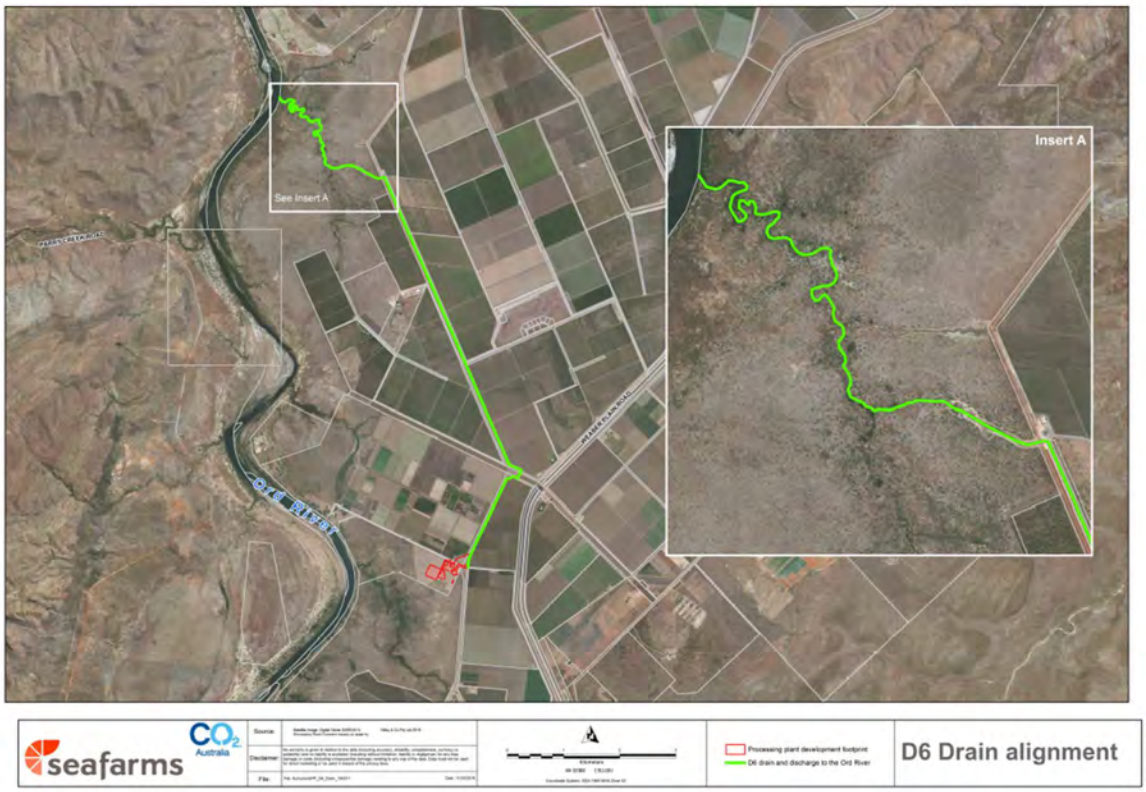

Figure 2: D6 drain alignment

The OIC undertake regular inspections and maintenance of the irrigation channels and drains within the ORIA, including weed management, repairs and de-silting as required.

Expected volumes of treated water produced by the RO system is 204.4 kl/day annualised daily flow and 256.3 kL/day peak flow. The expected quality of the untreated and treated water following MBR and RO treatment is provided in Table 16 below (refer to section 9.5.2 of the Decision Report).

Brine reject water from the RO plant will be sent to the evaporation ponds along with the chiller brine water.

4.1.2 Evaporation Ponds

Liquid brine waste generated from salt use integral to processing and transporting prawns is produced by the processing plant via two streams:

1. Chiller brine (around 2.25kL per day); and
2. RO brine (around 36.1kL per day).

Due to the high concentrations of nutrients and salts in the brine, the wastewater will be directed to one of two evaporation ponds on the Premises for storage and evaporation. Once the liquids have evaporated, the salt crystals will be harvested for sale.

The evaporation ponds will be lined with a High Density Poly-Ethylene (HDPE) liner and will each have a storage capacity of 22,608kL and will be operated with a 500mm design freeboard.

During the wet season months, a cover will be placed over one of the brine ponds and all brine wastes will be directed to the covered pond. This will maintain storage capacity for at least 12 months of discharge at the combined discharge rate of 38.35kL per day.

The uncovered evaporation pond will be dried out and dried salt crystals removed prior to commencement of the next wet season.

Expected volumes and quality of liquid brine produced by the RO system and chiller brine is provided in Table 17 below (refer to section 9.7.2 of the Decision Report).

Approximately 1,854 tonnes of dry salt per year will be collected and bagged onsite for export.

4.1.3 Stormwater Management

A Stormwater Management Plan has been designed for the Premises to prevent and minimize any impacts from stormwater falling on the Premises. Stormwater runoff flows southwest across the Premises towards an existing 900mm diameter pipe and headwall prior to discharging to an open channel in the adjoining lot to the south.

The Applicant has considered stormwater management during the construction and operational phases. During the construction period (expected to be around 12 months) the Applicant will implement an erosion and sediment control plan including control measures to prevent sediment, oils, paints and concrete materials becoming entrained in stormwater and being discharged to the environment.

During operations stormwater from roofs and hardstand areas will be collected via swale drains and will flow to a detention basin located in the south of the processing buildings and WWTP and directly east of the evaporation ponds (see Figure 3). The retention basin will allow for settlement of any sediment, and will have screens on the outlets to capture of any debris prior to discharging to another swale drain that flows to the existing headwall located at the southern boundary of the Premises.

4.1.4 Waste Management

It is anticipated that around 41.5m^3 of solid waste will be generated by the Premises operations each week. Solid waste will comprise organic matter from the primary screen of the WWTP, sediment from the WWTP and other solid waste from the processing facilities, offices and stores. Organic matter from the primary screen will be will be stored in a chiller room and collected regularly by a licensed waste contractor for disposal to the Kununurra Landfill. Sediment from the WWTP will be stored in skip bins adjacent to the WWTP and collected daily by a licensed waste contractor for disposal to the Kununurra Landfill. General waste will be stored in skip bins prior to being collected weekly by a licensed waste contractor for disposal to the Kununurra Landfill.

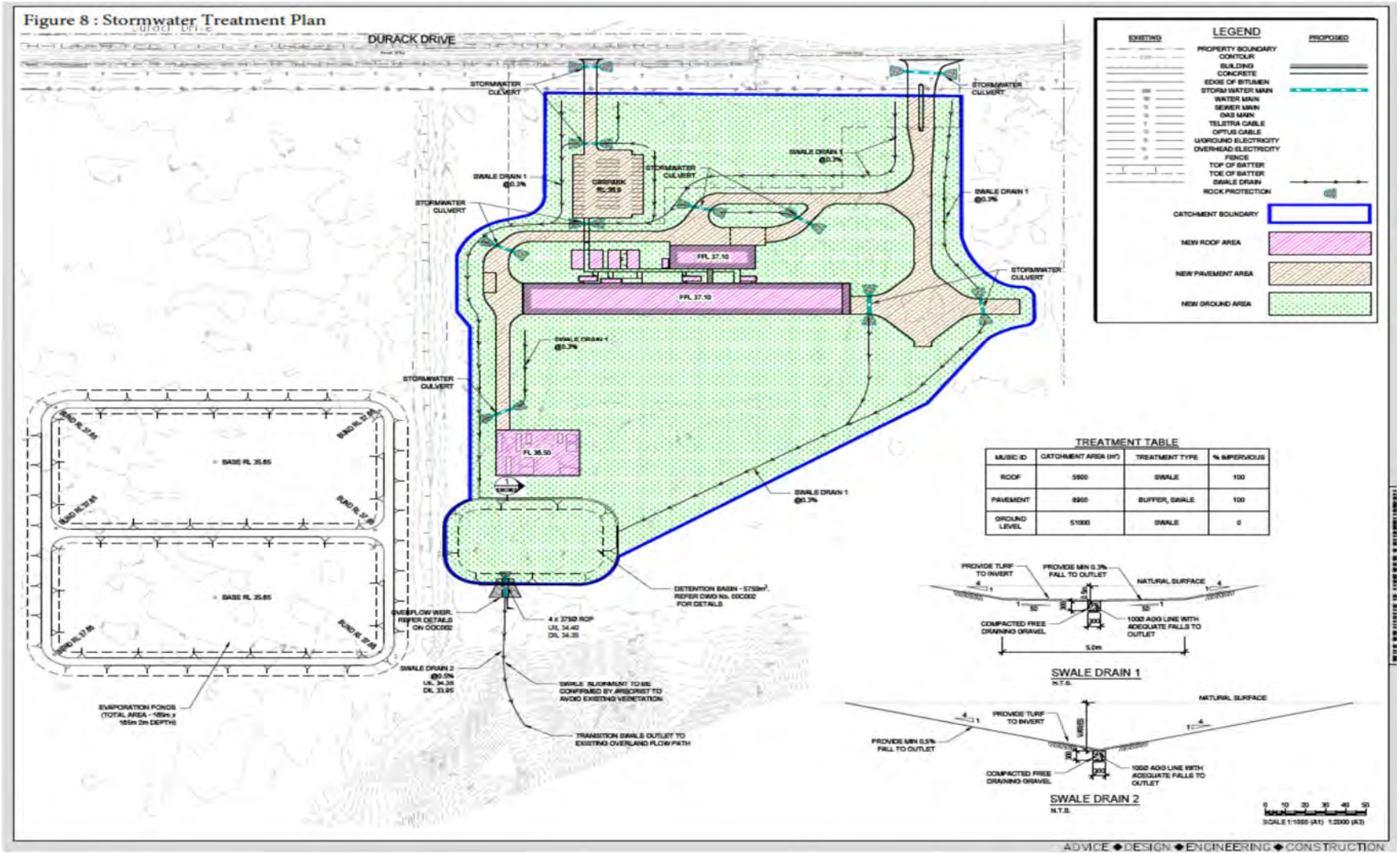

Figure 3 Stormwater treatment

4.2 Infrastructure

The Premises infrastructure, as it relates to Category 22 and 14 activities, is detailed in Table 5 and with reference to the Site Plan (Figure 4).

Table 5 lists infrastructure associated with each prescribed premises category.

Table 5: Project Sea Dragon prawn processing plant Category 22 and 14 infrastructure (From Application)

	Infrastructure	Site Plan Reference
	Prescribed Activity Category 22	
Prawn processing facility where prawns will be received to be cleaned, graded, packed, frozen and packaged for transport to export facility. Some cooking of prawns will also occur; cooked prawns will be		
1	Processing building including chillers, freezers, processing areas, inspection area, laboratory, boiler, loading and storage areas	Figure 4
2	Wastewater treatment plant (WWTP), including reverse osmosis (RO) plant	
3	WWTP discharge pipeline and discharge point	
4	Organic sediment (sludge) storage area	
5	Organic matter storage area	
	Prescribed Activity Category 14	
Salt water evaporation ponds where brine from the RO plant and transport activities will be evaporated to produce dry salt		
1	2 x HDPE-lined evaporation ponds, each with a storage capacity of 22,608kL and managed with 500mm freeboard	Figure 4
2	Brine water discharge pipeline	
	Directly related activities	
1	Stormwater system including detention basin with a storage capacity of 5,750m^3	Figure 3 and 4
2	Infrastructure for the supply, use and discharge of water (bores, pumps and pipes)	
	Other activities	
1	Access roads, carparks	N/A This infrastructure in not regulated under Part V of the EP Act, and as such is not considered further in this report; refer to section 4.3 of this Decision Report for further details
2	Administration, dining and amenities buildings	
3	Septic system	
4	Treated water discharge pipeline – to D6 drain	
5	Workshop	

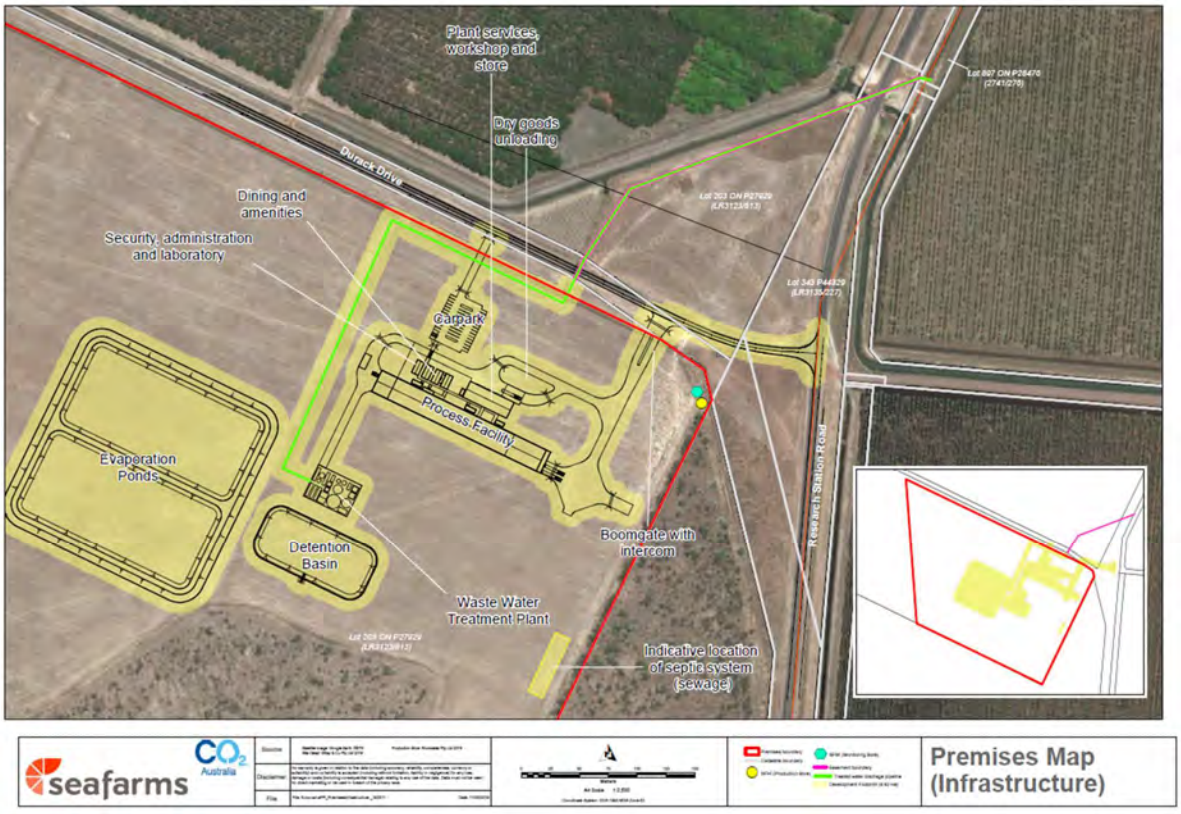

Figure 4: Premises Site Plan

4.3 Exclusions to the Premises

Sewage will be treated onsite via a standard septic tank system with associated leach drains. The capacity of the septic system will be for a full scale workforce of 102 persons. Septic systems are not regulated under the EP Act as septic systems do not meet the definition of category 54 from Schedule 1 of the EP Regulations and therefore the Premises does not require Category 54 on the Works approval or Licence. Likewise the operation of the WWTP for treatment of process water does not meet the definition of Category 54 under the EP Regulations and thus does not require a Category 54 Works Approval or Licence. Under the UDR it is an offense to discharge sewage to the environment so if there is any discharge of sewage to the environment from the septic tanks prior to treatment then this can be regulated under the UDR. As per Table 6 approval is required for the septic system(s) at the Premises.

The treated wastewater will be discharged to the D6 drain and thus Lower Ord River. To achieve this a dedicated treated water pipeline will be constructed and will span from the Premises to the D6 drain and this pipeline will not form part of the Premises boundary.

The Premise will contain roads and other infrastructure such as Administration buildings and workshops and these activities are not regulated under the EP Regulations as Prescribed activities consistent with Schedule 1 of the EP Regulations. Power will be supplied via existing Horizon Power infrastructure, however a backup diesel generator will be on site at the plant. The backup generator does not meet the definition of Category 52 or 84 under schedule 1 of the EP Regulations and therefore does not require a prescribed activity Category 52 or 84 on the Works Approval or Licence.

Key Finding: The Delegated Officer has reviewed the information regarding Exclusions and has found;

1. *Although not a prescribed activity, WWTP and Brine discharges to the environment (D6 drain and Lower Ord River) and evaporation ponds and resultant environmental impacts respectively, will be risk assessed as part of the Decision Report.*
2. *As above, containment infrastructure such as the treated water pipeline will be risk assessed as part of the Decision Report.*

5. Legislative context

Table 6 summarises approvals relevant to the assessment.

Table 6: Relevant approvals and tenure

Legislation	Number	Subsidiary	Approval
Shire of Wyndham East Kimberley (SWEK) Planning Scheme No. 9 administered in accordance with the provisions of the *Planning and Development Act 2005.*	Development Application Pending	Project Sea Dragon Pty Ltd	A Development Application for a Prawn Processing Facility to be constructed on Durack Drive was conditionally approved by SWEK on 11 June 2019.
Building Act 2011	Building permit application to be submitted to SWEK in Q2 2019		Approvals and permits for the construction of built infrastructure.
Aboriginal Heritage Act 1972	N/A		Heritage Clearance from Traditional Owners (Section 18 application not required) Heritage Clearance was obtained in November 2016.
Fish Resources Management Act 1994	Application to be submitted to Department of Primary Industries and Regional Development (DPIRD) in Q2 2019		Construction / operation a place for commercial fish processing
Land Administration Act 1997	Option to Lease was executed in June 2017	Project Sea Dragon Pty Ltd	Granting of Crown Lease in accordance with the Option to Lease between the Minister for Lands and Project Sea Dragon Pty Ltd. Five year lease for up to 44 hectares and lease agreement allows an option for a 49 year lease thereafter.
Rights in Water and Irrigation Act 1914	GWL is still pending		Section 5c Licence to take water Application submitted and approval is still pending.

Legislation	Number	Subsidiary	Approval
Heath (Miscellaneous Provisions) Act 1911	Application to be submitted in Q2 2019		Operation of an 'offensive trade'
	Application will be submitted in late 2019		Application to Construct or Install an Apparatus for the Treatment of Sewage
Part V of the EP Act (WA)	W6228/2019/1		Works approval application: Construction of a category 22 and 14 Prescribed Premises

5.1 Contaminated sites

The Premises was reported under the *Contaminated Sites Act 2003* (CS Act) as possibly contaminated in May 2007 as a result of previous land uses, including the storage and application chemicals including pesticides, herbicides, bulk fuel and oil storage associated with farming research trials.

DWER Contaminated Sites Branch has reviewed the information submitted in regard to the proposed processing plant development and considers the proposal to develop a prawn processing facility to be an interim step in the planning process and as such does not recommend that any contamination conditions be imposed at this stage. However, historical information suggests that the site has existed as a research station, which may have included bulk fuel storage. Fuel storage is a land use that has the potential to cause contamination, as specified in the guideline 'Assessment and Management of Contaminated Sites' (DER, 2014).

Given the site is not anticipated to change to a more sensitive land use, DWER is unlikely to recommend that contamination conditions be placed on any future WAPC and/or Local Government Authority subdivision/development applications providing there is no change to a more sensitive land use.

5.2 Other relevant approvals

5.2.1 Planning approvals

SWEK has provide approval 11 June 2019; refer to Table 8 above.

5.2.2 Department of Primary Industries and Regional Development

Project Sea Dragon has been declared a Major Project of Strategic Importance in Western Australia.

5.3 Part V of the EP Act

5.3.1 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 listed in Appendix 1.

5.3.2 Clearing

Clearing of native vegetation is not assessed or authorised under this assessment.

6. Modelling and monitoring data

6.1 Monitoring of local ecosystem

The Applicant conducted sampling and analysis of surface water from the D6 drain and the Lower Ord River. The sampling was performed in order to obtain water quality baseline data for the purposes of modelling and future monitoring of the Ord River to ensure future discharges from the WWTP (via D6 drain) do not have any adverse impacts to the receiving ecosystem.

The D6 drain discharges into the Lower Ord River between the Diversion Dam and Carlton Crossing. The construction of the Kununurra Diversion Dam have greatly altered the flow regime of the Lower Ord River. Post construction and based on date from 1974 – 2004 the average wet season flows in the Lower Ord River reduced by 67% and the average dry season flow has increased by 430%. Flow data has been measured by DWER for 20 years (1999-2019) at Tarrara Bar located just downstream from the D6 drain confluence. The average peak flow is in the order of 2,000m^3/s. Flow drops after the end of the wet season and during June/July the average daily flow is about 60-100m^3/s.

D6 drain water quality is provided in Table 7 below. Sampling of D6 drain occurred in January 2019.

Table 7 D6 drain Water Quality

Parameter	Discharge into D6	Downstream end of D6	Channel connecting D6 to the lower Ord River
Total Nitrogen (mg/L)	0.41	0.35	0.33
Total Phosphorus (mg/L)	0.027	0.056	0.032
Salinity (as E@25deg mS/m)	27.3	28.3	32.3
Total Suspended Solids (mg/L)	17	72	25

Water quality data was collected in the Lower Ord River in January 2019 and March 2016. Table 8 provides the results of this sampling. The water quality levels measured in the Lower Ord River in January 2019 are close to and above the locally derived and ANZECC trigger levels presented in Table 9, however they are well below the OIC Stage 1 Licence to Take Water SWL156287(3) (SWL) issued under *Rights and Water and Irrigation Act 1914* trigger levels.

Table 8 Lower Ord River Water Quality data

Parameter	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Salinity (as E@25deg mS/m)	Total Suspended Sediment (mg/L)
January 2019				
Upstream of D6	0.27	0.023	28.5	5
D6 Discharge	0.33	0.032	32.3	25

Downstream of D6	0.32	0.025	29.2	15
March 2016				
Upstream of D4	<0.2	<0.05	n/a	7.4
D4 Discharge	<0.2	<0.05	n/a	10
Downstream of D4	<0.2	<0.05	n/a	13

Lower Ord River Trigger Levels are derived from a number of potentially applicable locally derived trigger levels:

- The Lower Ord River environmental water provisions monitoring program and management framework (Department of Water 2011) (DoW 2011). The data was collected at four sites on the lower Ord River.
- Default trigger levels from the ANZECC 2000 Guidelines for 'slightly to moderately disturbed lowland tropical systems'. For some of the parameters the locally derived trigger levels are higher than the ANZECC 2000 trigger levels. DoW 2011 recommends the use of the locally derived trigger levels as they take into account the long term impact on water quality from pastoral and irrigation activities along the Ord River.
- Trigger levels from table 5 in the Annexure to the OIC Stage 1 Licence to Take Water SWL issued under *Rights and Water and Irrigation Act 1914*.

The 80th percentile of data collected is from the DoW 1998-2003 data, the *Lower Ord River Aquatic Fauna Monitoring Synthesis of Baseline Surveys 2009-2011* (WRM 2013) as well as Applicant data collected in 2019 and 2016.

Table 9 Lower Ord River Trigger Levels

Parameter	**ANZECC 2000**	**Locally derived values (DoW 2011)**	**SWL156287(3)**	**80th percentile of DoW data (DoW data, WRM 2013 and Applicant data)**
Total Nitrogen (mg/L)	0.30	0.29	0.85	0.48
Total Phosphorus (mg/L)	0.01	0.018	0.11	0.06
Salinity (mg/L	1,000	1,000	-	-
Total Suspended Solids (mg/L)	2 (baseflow)	7	58	30

6.2 Modelling of discharges to surface water

The Applicant has submitted a Water Quality Assessment (WQA) report as part of the supporting documents to the Application. The WQA reviewed background conditions of the (proposed) WWTP discharge receiving environment (the Lower Ord River), reviewed the D6 drain's capacity to transport flow to the Lower Ord River, compared flow volumes and quality of the WWTP discharge to that of the Lower Ord River, and summarized potential impacts from the proposed discharges of treated wastewater to the Lower Ord River.

The WQA report employed and numerical model to review impacts of the discharge from the processing plant on the Lower Ord River. The model bathymetry was developed using the Geoscience Australia 1 second DEM of the area, with the upstream and downstream boundaries set to the low flow level (considered to be worst case discharge from the processing plant) of 50m^3/s. it should be noted that the DEM and model are course and have not been calibrated and thus the results are indicative of the impact only. Table 10 outlines the discharge load from the processing plant into the Lower Ord River.

Table 10 Discharge loads in the Lower Ord River.

Parameter	Processing plant water quality load (kg/day)	Lower Ord River water quality load (kg/day)	Proportion of processing plant load added to Lower Ord River (%)
Total Nitrogen	1.28	1,166	0.1%
Total Phosphorus	0.13	99	0.1%
Total Suspended Solids	0.51	21,600	0.0%
Total Dissolved Solids	205	691,200	0.02%

The WQA report summarised that:

- The discharge volume from the processing plant is minimal in comparison to flow in the D6 drain and inconsequential when compared to that in the Lower Ord River.
- Whilst concentrations of nutrients from the processing plant are above locally derived, SWL and ANZECC 2000 trigger levels the total volume of nutrient and solids to be added to the system is low and would be expected to be assimilated rapidly into both the D6 drain and Lower Ord River system.
- Preliminary modeling and using conservative estimates indicate that base flows and volume of water in the Lower Ord River are significant enough to rapidly disperse discharge from the D6 drain into the water body and very low to negligible concentrations from the processing plant would be observed within the Lower Ord River. Corresponding discharge of Total Nitrogen and Total Phosphorus would be extremely unlikely to cause these parameters to exceed SWL trigger levels and even then the impact would be limited to a very small area around the D6 drain interface with the Lower Ord River.
- The impacts of the processing plant discharges are considered to be insignificant and additional analysis or assessment of migration are not considered necessary given the order of magnitude differences between the processing plant and lower Ord River flow and volumes.

DWER Water Services Northwest Region (WSNR) has reviewed the Application and provided comments. A summary of the wastewater quality and management targets is provided below:

- The D6 irrigation drain into which the Applicant proposes to discharge treated waste water forms part of the Ord Stage One - Ivanhoe Irrigation Area built in the late 60's/early 70's This flood irrigation/drainage system design is no longer considered best practice and the new farmland of the Ord Irrigation Stage 2 Area (namely Goomig) has been built as 'closed systems', where excess water is recycled and re-used rather than discharged to the environment. Consistent with this, the water quality trigger levels set for the Ord Irrigation Cooperative SWL156297 (4) (table 4 of Applicants water quality report) are not appropriate to guide this proposed discharge water.

- The downstream Ord River floodplain and wetlands are Ramsar-listed and as such are a specified ecosystem. The ANZECC 2000 provides default trigger values for TN (0.3 mg/L) and TP (0.01 mg/L) for tropical Australia for lowland rivers in slightly disturbed ecosystems. However, the preference is to use the locally derived reference values for the Lower Ord River. The 2013 *Ord surface water allocation plan* and the *Lower Ord River environmental water provisions monitoring program and management framework* (DoW 2011), provides locally derived reference values of TN (0.29 mg/L) and TP (0.018 mg/L) for the Lower Ord River (DoW, 2013). In recent years, the plan's locally derived reference values have been breached in the Lower Ord River. DWER is currently undertaking a review of the water quality data collected and potential causes for exceedances to ensure water quality in the lower Ord is retained and the reference values in the plan remain appropriate.

- The Applicant states that the volume they will discharge into the Lower Ord River at peak times would constitute 0.0004% of the total flow in the Wet Season and 0.0071% in the Dry Season. This is considered a small amount however nutrient loading (regardless of dilution) must be taken in to account.

- In January 2019 and March 2016, the Applicant sampled water quality parameters from sites upstream and downstream of the D6 drain. The results show that discharge from the D6 drain is impacting the Lower Ord River, as the samples taken downstream of the D6 drain confluence have greater concentrations than the upstream samples. The TN concentrations are not too different to the local trigger values however, the Lower Ord River has TP concentration greatly in excess of the trigger value: 0.025 mg/L compared with 0.01 mg/L (ANZECC) and 0.018 mg/L (DoW 2011) and any additional phosphorus load will further degrade the system. The additional phosphorus load from the plant is estimated to be 0.13 kg/day

- It is recognized that horticulture contributes excessive TP concentrations to waterways and to achieve TP concentration targets the management practices of the adjacent horticulture properties should be improved. The impact of the processing plant is likely small in comparison due to the relatively small flows and loads and is therefore not considered a significant risk to the environment.

- Total organic loading to D6 drain and the Ord River is also a concern. The BOD concentrations in the MBR- and RO-treated water of 10 mg/L and 5 mg/L respectively should be monitored closely and not exceeded.

- The proposed processing plant water quality parameters of TN 5mg/L and TP 0.5mg/L meet the ANZECC 2000 short-term trigger values (STV) for TN (25 mg/L) and TP (0.8

mg/L) in irrigation water and could be suitable to be re-used on farmland for irrigation in the Dry Season to reduce loads going straight to the Ord River.

The WSNR provided the following Recommendations from the review of the WQA:

- Similar to advice provided to the Applicant from the Northwest Region in an initial meeting held on 8 November 2017 (DWERDT25110), the best case option would be that wastewater would not be required to be discharged or wastewater quality would not be substantially different from the Lower Ord River.

- Consideration is given to alternative options for disposing of treated waste water, particularly in the Dry Season when irrigation of horticulture would be possible.

- Consideration is given to options for the further treatment of the waste water to reduce TP loads, such as constructed wetlands or reed beds between the D6 drain and the Lower Ord River. This would give the additional benefit of improve the overall water quality in the Ord River.

- Adequate monitoring of the treated waste water before it enters the D6 drain and continued monitoring in the Lower Ord River both upstream and downstream of the D6 drain confluence. Water quality monitoring of D6 drainage water upstream of the processing plant is also recommended.

- An Interference with Bed and Banks permit (RIWI Act 1914) should be submitted to the Northwest Region for the construction of the entrance point for treated waste water to enter into the D6 drain as the drainage network is considered part of the Ord waterway network.

7. Consultation

A request for comment on the Applicants' proposal was sent to the following stakeholders on 28 March 2019.

- Shire of Wyndham East Kimberley
- Department of Primary Industries and Regional Development;
- Department of Biodiversity and Conservation Attractions; and
- Ord Irrigation Cooperative.

No comments were received.

8. Location and siting

8.1 Siting context

The Premises is situated approximately 12km north of the town of Kununurra in WA. Kununurra is the commercial and administrative centre for the Ord River Irrigation Area (ORIA). The ORIA consists of the irrigated areas of the Ivanhoe, Packsaddle and Weaber Plains. The lots upon which the prawn processing facility and wastewater discharge pipeline will be constructed are within Stage 1 of the ORIA in an area zoned 'rural agriculture' on land previously used for agricultural trials. Lot 203 forms part of the DPIRD Agricultural Research Station. The Premises fronts' vacant land neighbouring Research Station Road to the east,

Durack Drive to the north and vacant land to the west and south.

8.2 Residential and sensitive Premises

The distances to residential and sensitive receptors are detailed in Table 11.

Table 11: Receptors and distance from activity boundary

Sensitive Land Uses	Distance from Prescribed Activity
Residential Premises	• Residences located at the Frank Wise Institute approximately 1.5km west-northwest of the premises boundary; • Agricultural residence located approximately 1.7km south of the premises boundary; and • Agricultural residence located approximately 1.8km northeast of the premises boundary.

8.3 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 12. Table 12 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 12: Environmental values

Specified ecosystems	Distance from the Premises
Ramsar Sites in Western Australia:	Lake Kununurra is located 14.5km to the south of the Premises boundary (upstream). Lake Kununurra is part of the Lake Argyle and Lake Kununurra wetlands system that is listed under the Ramsar Convention on Wetlands.
Important wetlands – Western Australia	Lake Kununurra wetland is located 1.1km west of the Premises boundary. There are numerous endemic plants and a rich fauna assemblage that inhabit Lake Kununurra.
Parks and Wildlife Managed Lands and Waters	Ngamoowalem Conservation Park is located around 5km west of the Premises boundary
Threatened Ecological Communities (TEC's) and Priority Ecological Communities (PEC's)	Ivanhoe Land System: Priority 3 TEC buffer located approximately 8.6km west of Premises boundary
Biological component	**Distance from the Premises**
Threatened/Priority Fauna	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 Lake Kununurra Wetlands system as habitat and / or breeding areas. These fauna are listed as endangered and vulnerable, and include migratory birds protected under international agreements. Species recorded within a 5km radius to the Premises include:

	• *Rhinonicteris aurantia* (orange leaf-nosed bat) Priority 4 (vulnerable) mammal recorded around 1.5km west of Premises boundary; • *Crocodylus johnstoni* (Australian freshwater crocodile) Other Specially protected fauna recorded 2.3km west-northwest of the Premises boundary; and • *Erythrura gouldiae* (Gouldian finch) Priority 4 (endangered) bird recorded around 2.3km west-northwest of the Premises boundary; • *Gallinago megala* (Swinhoe's snipe) migratory bird protected under an International Agreement recorded 4.6km southwest of the Premises boundary; • *Pleagadis falcinellus* (Glossy Ibis) migratory bird protected under an International Agreement recorded 1.6km and 1.8km southeast of the Premises boundary; • *Calidris acuminate* (Sharp-tailed sandpiper) migratory bird protected under an International Agreement recorded 2km southeast of the Premises boundary; and • *Tringa glareola* (Wood sandpiper) migratory bird protected under an International Agreement recorded 2.6km northeast of the Premises boundary.
Threatened/Priority Flora	• *Typhonium sp. Kununurra*; threatened flora listed as Endangered under the (WC Act?) located 90m east and 2.4km west-southwest of the Premises boundary. • *Goodenia durackiana;* Priority 1 flora located 1.2km northwest of the Premises boundary • *Desmodium flagllare; Priority 1 flora located 1 1.7km west-northwest of the Premises boundary*
Other relevant ecosystem values	**Distance from the Premises**
Ord River	1.1km west of the Premises boundary. The 650km long Ord River is one of WA's major river systems. The construction of the Diversion Dam over the Ord River in 1963 created the freshwater body of Lake Kununurra designed to supply water for Stage 1 of the ORIA. Water from the Ord River is used to irrigate 15,000 hectares of horticulture, timber and other crops. This industry, along with tourism, mining and pastoralism, supports the town of Kununurra. Since the Ord River was dammed, new ecosystems have evolved due to the changes in channel form, water balance and resultant vegetation. The Ord River has been recognised as a nationally important wetland due to its significance as a habitat for more than 75 bird species, including significant breeding and migrant populations. The lower reaches of the river support an important wetland area known as the Ord River Floodplain, approximately 70km downstream of the Premises boundary. The Ord River Floodplain is a Ramsar protected area which contains numerous mangrove forests, lagoons, creeks, flats and extensive floodplains provide important habitats from a biodiversity perspective, supporting high levels of species diversity and endemism for many taxonomic groups such as aquatic plants, fishes and aquatic invertebrates.

8.4 Groundwater and water sources

The distances to groundwater and water sources are shown in Table 13.

Table 13: Groundwater and water sources

Groundwater and water sources	Distance from Premises	Environmental value
Public drinking water source areas (PDWSA) and wellhead protection zone	13 km to the south of the Premises boundary	Priority 1 PDWSA: Kununurra water reserve (groundwater) proclaimed under *the Country Areas Water Supply Act 1947* (WA) in 1970 to ensure protection of the water source.
Groundwater	A production bore and a monitoring bore were drilled at the Premises in June 2016. Depth to groundwater was encountered at approximately 3.5 – 4.2 m below ground level (bgl) (based on information within the Application).	The Premises is located within the Canning-Kimberley Groundwater Proclamation area (RIWI Act). Groundwater in the area is used for agricultural and private purposes. Current water level data suggests that groundwater discharge is towards the Ord River. Groundwater is sodium chloride type and has a salinity of around 960mg/L Total Dissolved Solids (TDS) and is neutral to slightly alkaline.

8.5 Soil type

Table 14 details soil types and characteristics relevant to the assessment.

Table 14: Soil and sub-soil characteristics

Groundwater and water sources	Distance from Premises	Environmental Value
Soil type classification	The Applicant has advised the majority of the site is classified as Vertosol soils, which are clay soils with shrink-swell properties that exhibit strong cracking when dry and at depth have slickensides and/or lenticular structural aggregates. Vertosols have a clay field texture or ≥35% clay throughout the surface and sub-surface except for thin, surface crusty horizons 0.03 m or less thick and; when dry, open cracks occur at some time in most years.	The Premises is already cleared of native vegetation and has previously been used for agricultural research purposes. The rich soils and clays of the ORIA are well suited to agriculture, producing a variety of agricultural crops including mango, citrus, watermelon, rockmelons, pumpkin, chickpeas, sandalwood and chia.
Acid sulphate soil risk	There is a 300m wide “high probability” acid sulphate soil (ASS) region along the Ord River, located around 750m west of Premises boundary.	The high probability band of ASS occur outside of the Premises and will therefore not be disturbed during construction and operation of the Premises.

8.6 Meteorology

The closest Bureau of Meteorology (BoM) weather station to the Premises with recorded statistics for wind (9am and 3pm), rainfall and temperature is located at Kununurra Aero (Station No. 002056), located 12km south of the Premises.

8.6.1 Regional climatic aspects

Kununurra experiences a tropical monsoonal climate defined by two distinct seasons; a wet season and a dry season. The dry season runs from May to October and is characterised by clear blue skies, easterly winds and warm days with cool nights. The wet season runs from November to April and is usually hot and humid, featuring low pressure systems that can cause intensive and erratic rainfall patterns. Rainfall is variable with daily rainfall high during the wet season. The annual evaporation rate for Kununurra is

8.6.2 Rainfall and temperature

The average annual rainfall (1971-2019) experienced in Kununurra is 841mm, of which, 92% occurs during the wet season.

The wet season experiences high mean maximum temperatures ranging from 35.1 – 39°C, while dry season maximum mean temperatures range from 30.4 -38.8°C.

The mean minimum temperatures range from 25.5 – 24.3°C in the wet season and 15 – 23.4°C in the dry season.

Figure 5 shows the average rainfall and maximum temperature statistics for Kununurra Aero.

8.6.3 Wind direction and strength

Winds in the mornings predominantly blow from the southeast at speeds ranging from 10 - 30km/hour (up to 35% of the year) and also from the east between 10 and 20km/hr (around 10% of the year).

In the afternoons winds also tend southeast mostly between 10 – 20 km/hour (around 30% of the year) and to a lesser extent blow from the north (18% of the year) and the east (15% of the year) at between 10 - 30km/hr (BOM, 2019).

Figure 6 shows 9am and 3pm Rose of Wind charts for Kununurra Aero.

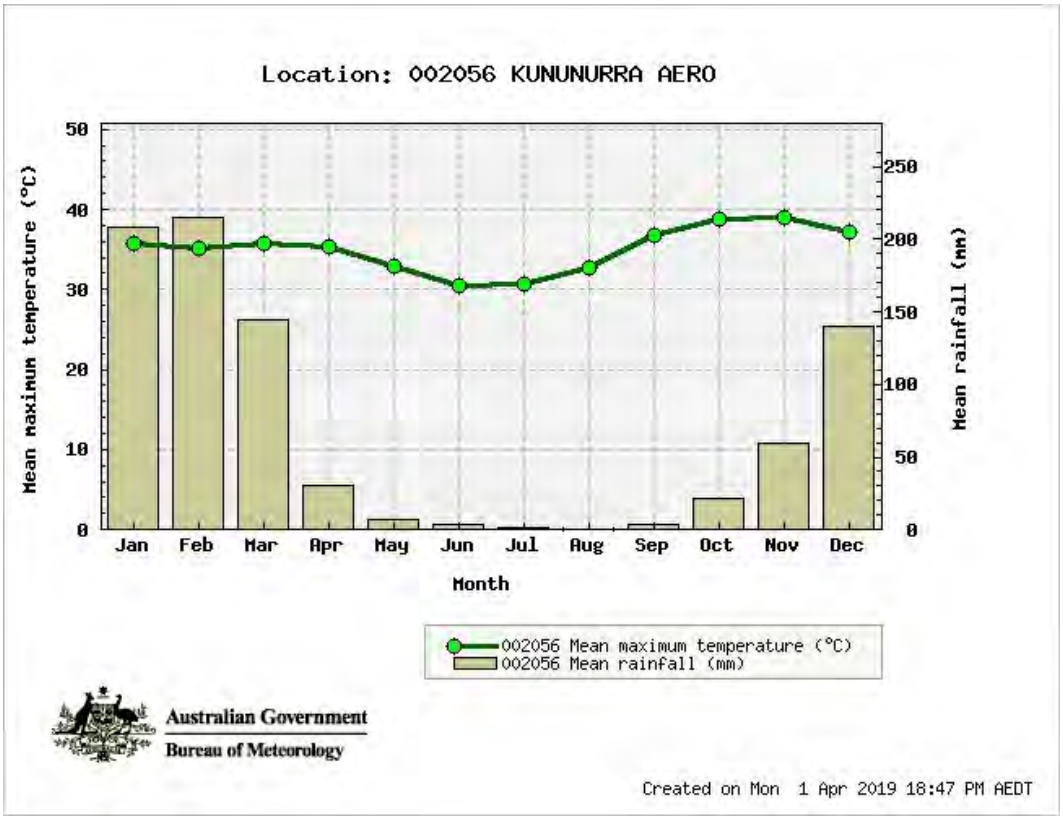

Figure 5: Kununurra Aero – mean rainfall and temperature (BOM 2019)

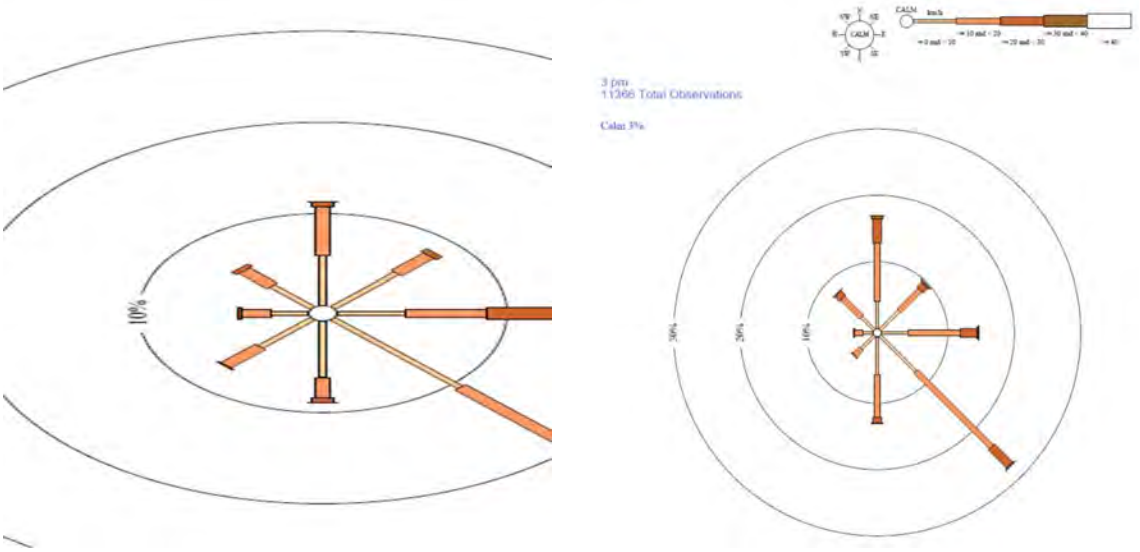

Figure 6: Annual average 9am and 3pm rose of wind charts – Kununurra Aero (BOM 2019)

9. Risk assessment

9.1 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 15.

The identification of the sources, pathways and receptors to determine Risk Events are set out in Tables 15 and 16 below.

Table 15: Identification of emissions, pathway and receptors during construction and commissioning

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
Construction of category 22 seafood processing infrastructure	Construction of new buildings, plant and infrastructure, including vehicle and machinery movements on unsealed areas	Noise	Residential premises located 1.5km west-northwest of the Premises boundary.	Air / wind dispersion	Amenity impacts	No	Noise emissions from vehicles and machinery will be minimal during the construction period, which is expected to last for around 12 months. Construction activities will not occur at night. Noise during construction will be regulated under the provisions of the *Environmental Protection (Noise) Regulations 1997* (the Noise Regulations). The Delegated Officer considers that 1.5km is a sufficient separation distance to have minimum to no impact from noise associated with construction activities.

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
		Dust				No	Dust will be minimised during construction as required by the application of water via a water cart. The Delegated Officer considers that 1.5km is a sufficient separation distance to have minimum to no impact from dust associated with construction activities. No flora of conservation significance is located in vicinity (3km radius) of proposed crushing / screening plant
Construction of category 14 infrastructure	Excavation and earthworks, installation of HDPE liner	Noise	Residential premises located 1.5km west-northwest of the Premises boundary.	Air / wind dispersion	Amenity impacts	No	Noise emissions from vehicles and machinery will be minimal during the construction period, which is expected to last for around 12 months. Construction activities will not occur at night. Noise during construction will be regulated under the provisions of the *Environmental Protection (Noise) Regulations 1997* (the Noise Regulations) The Delegated Officer considers that 1.5km is a sufficient separation distance to have minimum to no impact from noise associated with construction activities.
		Dust				No	Dust will be minimised during construction as required by the application of water via a water cart. The Delegated Officer considers that 1.5km is a sufficient separation distance to have minimum to no impact from dust associated with construction activities. No flora of conservation significance is located in vicinity (3km radius) of proposed crushing / screening plant

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
General Premises Construction	Stormwater management	Discharge of potentially contaminated stormwater to land, groundwater or surface waterbodies	Adjacent soils and groundwater (depth to groundwater is ~3.5 – 4.2mbgl); Ord River is 1.1km west	Direct discharge; infiltration to groundwater; or overland flow to waterbodies	Contamination of soils, groundwater and surface water with nutrients, suspended solids, salts, chemicals etc. Impacts to soil biota and groundwater / surface water dependent ecosystems	No	The Applicant has prepared, in parallel to the Shire of Wyndham East Kimberley Stormwater Management Policy Directive, a Stormwater Management Plan (SMP) to ensure acceptable treatment and disposal of stormwater during the construction period as well as during operations. The DRAINS computer model was used to calculate the stormwater runoff quantity for the pre-developed site and proposed development. Runoff flows for the 5 year and 100 year Average Recurrence Interval storm events with durations of 5 minutes to 4.5 hours were calculated to ensure that peak runoff flows from the proposed site would not exceed peak runoff flows from the existing site. During construction, an Erosion and Sediment Control Plan will be implemented to prevent sediment laden stormwater and other potential pollutants (eg. paint, oil, concrete) from being discharged offsite. Control measures will include the use sediment traps, fences, sandbags, diversion drains and containment bunds as required to manage stormwater. Regular inspections of control measures will occur to ensure their integrity is maintained. The water quality objectives of the receiving waters have been obtained from the Western Australian Planning Commission Better Urban Water Management Guideline. The land is relatively flat, covered in grass has a gentle slope to the southwest across the Premises. Stormwater runoff ultimately discharges across the Southern boundary to a constructed and natural overland flow paths located within the adjoining lot.

Commissioning of category 22 and category 14 prescribed premises	Commissioning of WWTP and Processing Plant	Discharge of wastewater and or / hypersaline water to land, groundwater or surface waterbodies	Adjacent soils and groundwater (depth to groundwater is ~3.5 – 4.2mbgl); Ord River is 1.1km west	Direct discharge; infiltration to groundwater; or overland flow to waterbodies	Contamination of soils, groundwater and surface water with nutrients, suspended solids, salts, chemicals etc. Impacts to soil biota and groundwater / surface water dependent ecosystems	Yes	The WWTP will be commissioned for three months to allow testing, calibration and inspection of all equipment. This process will ensure the WWTP is effectively treating the wastewater and that no discharges from any component is likely to occur. A commissioning report will be submitted to DWER within six weeks of completion of commissioning. See section 9.5 for Discharges to Surface water during Commissioning Dry and Wet commissioning of the processing plant will involve two key phases over two months (January and March 2021 respectively), the product validation and performance testing phase and a discharge validation and performance testing phase. The product validation and performance testing phase involves processing product through the plant (raw and cooked lines) to ensure that all equipment is operating correctly and that product is not compromised or damaged through the process. Testing will also be undertaken to ensure that the product satisfies all applicable Food Safety standards and requirements. Product validation testing and performance will include discharging to the evaporation ponds, and testing of the evaporation pond cover retractor. The discharge validation testing and performance phase ensures that water treatment through the WWTP satisfies the discharge criteria specified under the proposed licence conditions. This will involve a water quality testing regime to assess the quality of treated water. The water quality testing regime during wet commissioning will include monitoring for pH, turbidity, conductivity and nutrients in accordance with the requirements of the proposed licence. In the event any of these parameters are not acceptable for discharge, water will be diverted back to the balance tank (which has a 1-day minimum storage capacity) for reprocessing. Discharge water that does not

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
							satisfy the discharge criteria will not be discharged to the environment. See section 9.4 for pipeline / containment failures during Commissioning.
		Odour	Residential premises located 1.5km west-northwest of the Premises boundary	Air / wind dispersion	Amenity impacts	No	Dry and Wet commissioning of the processing plant will involve two key phases over two months (January and March 2021 respectively), the product validation and performance testing phase and a discharge validation and performance testing phase. The product validation and performance testing phase involves processing product through the plant (raw and cooked lines) to ensure that all equipment is operating correctly and that product is not compromised or damaged through the process. Testing will also be undertaken to ensure that the product satisfies all applicable Food Safety standards and requirements. Product validation testing and performance will include discharging to the evaporation ponds, and testing of the evaporation pond cover retractor. The Delegated Officer considers that 1.5km is a sufficient separation distance to have minimum to no impact from odour associated with limited Commissioning activities.
		Discharge of treated wastewater to surface water (Ord River via D6 Drain) ~204.4kL/;day	Ord River (discharges after flowing 11km downstream via D6 Drain)	Direct discharge	Disruption of normal ecosystem function in the Ord River	Yes	See section 9.5

Table 16: 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**		
Operation of category 22 infrastructure (seafood processing)	Abstraction of groundwater for processing resulting in drawdown of groundwater levels	None	Groundwater dependent ecosystems	Abstraction of groundwater	Reduction in groundwater availability for dependent vegetation	No	Not within scope of Part V of the EP Act. Regulated under the RiWI Act
	Vehicle (truck movements), operation of prawn processing infrastructure, WWTP, pumps, refrigeration equipment etc	Noise	Residential premises located 1.5km west-northwest of the Premises boundary.	Air / wind dispersion	Amenity impacts	No	The Applicant conducted a predictive assessment of noise emissions from operation of the processing plant, which estimated the noise level of 30 dBA from the processing plant at the closest sensitive receptor complies with the most stringent noise level criteria for noise sensitive receptors (i.e. 35 dBA) as specified in the Noise Regulations. No regulatory controls for noise emissions are required on the licence. The provisions of the Noise Regulations apply during operations.
	Operation of Premises WWTP	Discharge of untreated or partially treated wastewater from overflows / breach of tanks or pipework	Adjacent soils and groundwater (depth to groundwater is ~3.5 – 4.2mbgl)	Direct discharge; infiltration to groundwater	Contamination of soils and groundwater with nutrients, suspended solids affecting soil biota and groundwater dependent ecosystems	Yes	See section 9.4
		Odour from operation of the WWTP,	Residential premises located 1.5km west-northwest of the Premises boundary.	Air / wind dispersion	Amenity impacts	Yes	See section 9.8

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
		collection of organic matter in WWTP primary screen; and WWTP sludge					
	Treated wastewater discharge to D6 drain within the Ord Irrigation Cooperative drainage network	Discharge of treated wastewater to surface water (Ord River via D6 Drain) ~204.4kL/;day	Groundwater (via seepage through the D6 drain); Ord River (discharges after flowing 11km downstream via D6 Drain)	Direct discharge	Disruption of normal ecosystem function in the Ord River	Yes	See section 9.5
		Spills / leaks from discharge pipeline Rupture of pipes / overtopping of holding tanks resulting in sewage discharge to land	Adjacent soils and groundwater (depth to groundwater is ~3.5 – 4.2mbgl)	Direct discharge; seepage / infiltration to groundwater	Contamination of soils and groundwater with nutrient rich wastewater affecting soil biota and groundwater dependent ecosystems	Yes	See section 9.4
	Cooking of Prawns and Waste management (storage of solid organic waste)	Odour	Residential premises located 1.5km west-northwest of the Premises boundary	Air / wind dispersion	Amenity impacts	Yes	See section 9.8

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**		
Operation of category 14 infrastructure (solar salt manufacturing)	Storage of brine salts in evaporation dam	Embankment breach / overflow of brine salts	Adjacent soils; Ord River	Overland flow	Contamination of soils; Reduction in groundwater quality impacting upon dependent vegetation; disruption of normal ecosystem function in the Ord River	Yes	See section 9.6
		Seepage of brine salts through pond liner	Soils (subterranean fauna); groundwater	Seepage / infiltration	Contamination of soils and groundwater with hypersaline wastewater affecting soil biota and groundwater dependent ecosystems	Yes	See section 9.7
	Brine discharge pipeline	Rupture of pipeline causing brine salts discharge to land	Vegetation / soils adjacent to pipeline	Direct discharge	Soil contamination inhibiting vegetation growth and survival	Yes	See section 9.4
General Premises Operations	Storage of environmentally hazardous materials (brine salts, cleaning chemicals, minor fuel storage for backup generators)	Breach of containment causing chemical discharge to land	Ecosystems adjacent to storage area	Direct discharge	Soil contamination inhibiting vegetation growth and survival and health impacts to fauna	No	Chemical storage will be in accordance with AS1940 'The storage and handling of flammable and combustible liquids, and the National Standard for the Storage and Handling of Workplace Dangerous Goods. A hazardous materials register will be maintained on the Premises. Fuel, oil, chemical and liquid wastes will be stored in bunded contained areas. Hazardous and non-compatible chemicals will be stored in their own dedicated bunding system, to prevent dangerous chemical reactions taking place in the event of minor

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
							spills.
	Stormwater management	Discharge of potentially contaminated stormwater to land	Adjacent soils and groundwater (depth to groundwater is ~3.5 – 4.2mbgl)	Direct discharge; infiltration to groundwater	Contamination of soils and groundwater with nutrients, suspended solids affecting soil biota and groundwater dependent ecosystems	No	During operations, stormwater from roofs and hardstands will be directed via swale drains to a 5,750m^3 detention basin located to the southwest of the Premises. The outlets of the detention basin will be screened to capture any solid waste. The swale drain will have an overflow weir that will discharge to a new swale drain that flows to the existing headwall located on the southern boundary of the site. Stormwater in the evaporation ponds will be reduced by covering one pond each wet season. The evaporation ponds are sufficiently sized to ensure no overtopping or stormwater during wet season. Swale drains are designed to effect natural treatment by slowing the flow of runoff and capturing sediment and hydrocarbons in vegetation in the drain. Soil microbes the earthen swale drains assist in digesting any hydrocarbons. Washing of trucks and vehicles will occur on a bunded hardstand where detergents and hydrocarbons can be captured and treated prior to discharge. Effective housekeeping measures such as adequate rubbish bins and regular cleaning and sweeping of hardstands and carpark will minimise generation of stormwater contamination.

9.2 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 17 below.

Table 17: 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 18 below.

Table 18: 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	• **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	• 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	• **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	• **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	• **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	• **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	• **onsite impacts**: low level • **offsite impacts local scale**: minimal • **offsite impacts wider scale**: not detectable • Specific Consequence Criteria (for environment) likely to be met	• 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	• **onsite impact**: minimal • Specific Consequence Criteria (for environment) met	• **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.

9.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment Table 19 below:

Table 19: 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.

9.4 Risk Assessment – Discharge of untreated or partially treated wastewater and Brine from pipeline and containment infrastructure

9.4.1 Description of Discharge

During Commissioning and Operation pipelines feeding brine to the evaporation ponds, untreated wastewater to the WWTP or transferring treated effluent from the WWTP to the D6 drain discharge pipeline may fail due to a mechanical problem with the pipeline or due to damage incurred from mobile mechanical plant. Partially treated and treated wastewater will be stored within tanks as the wastewater is treated/processed in the WWTP.

Process control errors or faults, or blocked screens due to poor maintenance may result in overtopping of tanks comprising the WWTP. These uncontrolled discharges have the potential to flow overland and contaminate soils, impacting subterranean fauna and contaminate groundwater.

Commissioning is only planned for two months in January and March 2021 so the majority of risk will occur during operations.

9.4.2 Identification and general characterisation of emission

Untreated wastewater from the processing plant will typically be high in Total Dissolved Solids (TDS) (~16,932mg/L) high in Total Suspended Solids (TSS) (~119.1mg/L), high in Total Nitrogen (TN) (~227.7mg/L) have moderate levels of phosphorus (P) (~16mg/L) and high levels of Biochemical Oxygen Demand (BOD) (~1,310mg/L); refer to Table 16 below. Brine will have TDS (108,286mg/L), TSS (22mg/L), TN (305mg/L) and BOD (38mg/L) concentrations respectively; refer to Table 19 below.

9.4.3 Description of potential adverse impact from the emission

Partially or completely untreated wastewater that may be released from overtopping of the WWTP tanks may cause localised soil contamination.

Pipeline failures may also release untreated or treated wastewater to land, inundating the soil.

9.4.4 Criteria for assessment

Relevant land, surface water and groundwater quality criteria include:

- Australian Water Quality Guidelines (ANZECC & ARMCANZ 2000) provides fresh and marine water criteria; and
- Assessment and Management of Contaminated Sites (DER 2014) provides ecological and human health assessment levels for soil.

9.4.5 Applicant controls

This assessment has reviewed the controls set out in Table 20 below.

Table 20: Applicant's controls for rupture of pipes, overflows from wastewater treatment tanks

Site infrastructure	Description
WWTP design	The WWTP is completely enclosed and has secondary containment (bunding) to capture any leaks / spills / overflows. The WWTP also has segregated chemical bunds to prevent wastewater chemicals entering the treatment plant or coming into contact with other chemicals. In the event of a spill, water is collected in the plant sump and pumped to the balance tank. From there it is treated through the WWTP before being discharged to the environment
	The membrane bioreactor includes a large anoxic stage for nitrogen removal through nitrification/denitrification. Reverse osmosis provides a final barrier to remove nitrogen
	Online analysers will be present throughout the system, including on the outlet to the D6 drain to prevent uncontrolled discharge of untreated water through the plant
	Online monitoring and alarm system will be installed to alert operators of any issues throughout the plant which need attention
	The WWTP includes an automatic PLC control to prevent issues related to "human error".
	There is a minimum 1-day storage capacity in the buffer tank to provide sufficient time to address maintenance issues.
WWTP management controls	Treated water quality will be monitored for pH, turbidity, conductivity and nutrients. In the event any of these parameters are not acceptable for discharge, water is diverted back to the balance tank for reprocessing. In addition, routine sampling for other parameters will be undertaken.
	The WWTP will be commissioned for three months to allow testing, calibration and inspection of all equipment. This process will ensure the WWTP is effectively treating the wastewater and that no discharges from any component is likely to occur. A commissioning report will be submitted to DWER within six weeks of completion of commissioning.
	In-depth training will be provided on operating procedures and preventative maintenance to keep plant operating as designed

Site infrastructure	Description
Brine management controls	Brine will be transported to the evaporation ponds in dedicated closed HDPE pipelines.
	Brine will be treated at the RO to quality provided in Table 24 below.

9.4.6 Consequence

If release of brine or partially or untreated effluent to land occurs, soil contamination may occur, native vegetation may be impacted with possible impacts to birds or other fauna if they come into contact with the effluent. The Delegated Officer has determined that the impact of the discharge will be **minor**.

9.4.7 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of discharge of untreated, partially treated or treated effluent to land occurring will be **unlikely**.

9.4.8 Overall rating of discharge of untreated, partially treated or treated effluent to land

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 12) and determined that the overall rating for the risk posed by failure of sewage pipelines and overtopping from the WWTP is **medium risk**.

9.5 Risk Assessment –Discharge of treated wastewater to surface water (D6 drain and the Lower Ord River)

9.5.1 Description of Discharge

The WWTP will initially undergo Commissioning for three (3) months prior to Operating for an additional six (6) months under the Works Approval prior to Operating under the Category 22 and 14 Licence. Discharges will occur during the Works Approval period but it is expected volumes will be small. As such the majority of discharges will occur during Operations under the Licence.

Up to 256.3kL/day (peak flow) (or 0.0030m^3/s or 3 litres /second) of treated wastewater from the processing plant will be discharged via a pipeline to the OIC D6 drain and eventually, after 11km of flow, will discharge to the Lower Ord River.

The discharge will be constant during normal operations. Table 21 provides the comparison of processing plant discharge to the D6 drain and Lower Ord River.

Table 21 Proportion of processing plant discharge on the Lower Ord River Flow

Plant discharge	Additional discharge into D6 (m^3/s)	Condition / Lower Ord River flow	Proportion of Lower Ord River flow
204 kL/day annualised daily flow	0.0024	Wet season / 1000m^3/s	0.0003%
	0.0024	Dry season / 50m^3/s	0.0056%
256kL/day peak flow	0.0030	Wet season / 1000m^3/s	0.0004%
	0.0030	Dry season / 50m^3/s	0.0071%

9.5.2 Identification and general characterisation of emission

Wastewater from the Premises WWTP will be treated to a tertiary level. The discharge concentrations will meet the following specifications: TDS ≤800mg/L, TSS ≤2mg/L, TN ≤5mg/L, TP ≤0.5mg/L and BOD ≤5mg/L.

Wastewater will be treated by the WWTP. The WWTP will be designed to treat wastewater to the specifications listed in Table 22.

Table 22: WWTP treatment specifications

Parameter	WWTP untreated wastewater	MBR treated water	RO treated water
Peak flow (kL/day)	306	301.5	256.3
Total Dissolved Solids (mg/L)	16,932	16,923	800
Total Suspended Solids (mg/L)	119.1	5	2
Total Nitrogen (mg/L)	227.7	50	5
Total Phosphorus (mg/L)	16	1.2	0.5
Biological Oxygen Demand (mg/L)	1,310	10	5

Previous Table 10 provides discharge loads the Applicant modelled for discharges from the processing Plant to the Lower Ord River.

9.5.3 Description of potential adverse impact from the emission

Should the treated wastewater not meet the proposed specifications there may be downstream impacts to the Lower Ord River, from excessive nutrients at the discharge point. Additionally, excessive nutrient and BOD levels in the irrigation drain may affect the beneficial use of the irrigation water, rendering it unsuitable for farming uses downstream. Water may also become odorous if there are high levels of BOD, affecting the amenity of residents downstream of the D6 drain.

9.5.4 Criteria for assessment

Relevant land, surface water and groundwater quality criteria include:

- Australian Water Quality Guidelines (ANZECC & ARMCANZ 2000) provides fresh and marine water criteria; and
- Assessment and Management of Contaminated Sites (DER 2014) provides ecological and human health assessment levels for soil.

9.5.5 Applicant controls

The Applicant will manage the risk of discharges of wastewater to the D6 drain and thus Lower Ord River primarily by designing a custom built WWTP for removal of solids, nutrients, salts and associated monitoring of these discharges to surface water. This assessment has reviewed the controls set out in Table 23 below. The treatment process will include screening, dissolved air flotation, biological process, membrane filtration (MBR) and reverse osmosis and sampling of treated wastewater.

Table 23: Applicant's controls for discharge of treated wastewater to surface water

Site infrastructure	Description
WWTP design	The membrane bioreactor includes a large anoxic stage for nitrogen removal through nitrification/denitrification. Reverse osmosis provides a final barrier to remove nitrogen
	Online analysers will be present throughout the system, including on the outlet to the D6 drain to prevent uncontrolled discharge of untreated water through the plant
	Online monitoring and alarm system will be installed to alert operators of any issues throughout the plant which need attention
	The WWTP includes an automatic PLC control to prevent issues related to "human error".
	There is a minimum 1-day storage capacity in the buffer tank to provide sufficient time to address maintenance issues.
WWTP management controls	Wastewater from the Premises WWTP will be treated to a tertiary level. The discharge concentrations will meet the following specifications: TDS ≤800mg/L, TSS ≤2mg/L, TN ≤5mg/L, TP ≤0.5mg/L and BOD ≤5mg/L (Table 22).
	Treated water quality will be monitored for pH, turbidity, conductivity and nutrients. In the event any of these parameters are not acceptable for discharge, water is diverted back to the balance tank for reprocessing. In addition, routine sampling for other parameters will be undertaken.
	The WWTP will be Commissioned for three months under the Works Approval to allow testing, calibration and inspection of all equipment. This process will ensure the WWTP is effectively treating the wastewater and that no discharges from any component is likely to occur. A commissioning report will be submitted to DWER within six weeks of completion of commissioning.
	The WWTP will be Operated for six months under the Works Approval to allow operation, testing and inspection of all equipment. This process will ensure the WWTP is effectively treating the wastewater and that no discharges from any component is likely to occur. Samples are required monthly and the sample results must be submitted monthly.
	In-depth training will be provided on operating procedures and preventative maintenance to keep plant operating as designed
	TN, TP, TSS and TDS percentage portion of processing plant added to the Lower Ord River is 0.1%, 0.1%, 0% and 0.02% respectively (Table 10 data).
	Proposed flow rate into D6 drain represents 0.02% of the flow in the D6 drain. Peak flow of 256kL/day represents 0.0004% and 0.0071% of the Ord River flow rate in the Wet and Dry season respectively (Table 21 data).
Environmental Management	The Applicant has advised in the Application that it plans monitor water quality in the D6 drain and the Lower Ord River.

9.5.6 Consequence

If treated wastewater to surface water occurs, the receiving water body (D6 drain and Lower Ord River) may be impacted minimally with possible impacts to aquatic and terrestrial flora and fauna if they come into contact with the wastewater. The Delegated Officer has determined that the impact of the discharge will be **minor**.

9.5.7 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of discharge of treated wastewater to surface water occurring will be **unlikely**.

9.5.8 Overall rating of discharge of treated wastewater to surface water

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 12) and determined that the overall rating for the risk posed by discharge of treated wastewater to surface water is **medium risk**.

9.6 Risk Assessment – Embankment breach / overflow of brine salts from Evaporation ponds

9.6.1 Description of Discharge

Liquid brine is produced from two sources – chiller brine and RO brine. Two evaporation ponds will be constructed and the evaporation ponds will receive around 2.25kL/day annualised daily flow from the chiller brine and 36.1kL/day annualised daily flow from the RO brine, which equates to around 1,854 tonnes of salt produced each year.

9.6.2 Identification and general characterisation of emission

Should higher volumes of RO reject water or chiller brine be discharged to the ponds, then the storage capacity may be compromised and hypersaline brine water may overflow from the embankment of the ponds. If there was significant input from rainfall (monsoon troughs) and runoff (due to poor design) then an embankment breach may also occur resulting in discharge of saline or hypersaline water to the adjacent environment. Overflow may also occur from not maintaining sufficient freeboard in the ponds during the wet season.

9.6.3 Description of potential adverse impact from the emission

Saline / hypersaline water discharge as a result of embankment breach / overflow of brine salts may cause localised soil contamination. Soils contaminated with salts may also leach salts to groundwater systems in the wet season.

Hypersaline water may also travel via overland flow, in runoff or drainage in gullies and erosion channels, and could end up discharging to the Ord River located 1km to the west, impacting ecosystem values.

9.6.4 Criteria for assessment

The Applicant has designed the evaporation ponds in accordance with *Water Quality Protection Note 26: Liners for containing pollutants, using synthetic materials* (Department of Water, August 2013).

9.6.5 Applicant controls

Two evaporation ponds will be constructed, as indicated on the attached stormwater treatment plan.

The embankment walls for the ponds will be above-ground earthen structures constructed using existing in-situ soils and lined with an impermeable HDPE liner. Construction of ponds will be via a cut-to-fill operation to the designed levels as outlined below:

- Remove 100 mm of top soil and stock pile for later use on external embankment walls to encourage regeneration.
- Excavate approximately 1 m of in-situ soil to an RL of 35.65 at the pond base.

- Excavated soil will be placed around the pond's perimeter and compacted to form embankments with 1:2 batter slopes.
- Pond floors and walls will be compacted to engineered specifications and ensuring that no rocks or angular soil material is present prior to installing liners.

This assessment has reviewed the controls set out in Table 24 below.

Table 24: Applicant's controls for embankment breach / overflow of brine salts

Site infrastructure	Description
Evaporation pond design	Each evaporation pond will be constructed to the following specifications: • Top - 165 m x 80 m • Bottom - 157 m x 72 m • Depth - 2 m • Batter - 1:2
	Each evaporation pond will be 2m deep, with an operating level of 1.5m and a freeboard of 500 mm.
	Storage capacity of each pond is 22,608kL, allowing for over 12 months storage capacity.
	Evaporation ponds completely enclosed by a bund with sumps and pipework to allow pond to be completely drained.
	There will be no breaks through the bund – all pipes will go over the bund wall.
Management	Groundwater monitoring will be undertaken in accordance with Groundwater Operating Strategy.

9.6.6 Consequence

If embankment breach / overflow of brine salts occurs, native vegetation may be impacted with possible impacts to birds or other fauna if they come into contact with the effluent. The Delegated Officer has determined that the impact of the discharge will be **moderate**.

9.6.7 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of embankment breach / overflow of brine salts occurring will be **unlikely**.

9.6.8 Overall rating of embankment breach / overflow of brine salts

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 12) and determined that the overall rating for the risk posed by embankment breach / overflow of brine salts is **medium risk**.

9.7 Risk Assessment – Seepage of brine salts through pond liner

9.7.1 Description of Discharge

The Applicant is constructing two evaporation ponds and both ponds will be lined with a HDPE

liner. Any damage to the liner, such as rips, tears or seam damage, may result in seepage of hypersaline water through the pond liner to soils and groundwater below. The total capacity of each evaporation pond is 22,608kL.

9.7.2 Identification and general characterisation of emission

Discharge of hypersaline water can contaminate soils below the ponds, and via seepage can discharge to groundwater contaminating the water source below. Groundwater below the premises indicates a sodium-chloride groundwater type and salinity of 950-970 mg/L TDS.

There are two streams of brine and both will be sent directly to the evaporation ponds for treatment. Both streams of brine will be discharged to the two lined evaporation ponds. The RO will be designed to treat brine to the specifications listed in Table 25 and the corresponding chiller brine concentrations are also presented in Table 25.

Table 25: Brine water quality and volumes

Parameter	Chiller brine	RO brine
Peak flow (kL/day)	5.14	45.2
Annualised daily flow (kL/day)	2.25	36.1
Total Dissolved Solids (TDS) (mg/L)	290,000	108,286
Total Suspended Solids (TSS) (mg/L)	195	22
Total Nitrogen (TN) (mg/L)	404	305
Total Phosphorus (TP) (mg/L)	45	5.17
Biological Oxygen Demand (BOD) mg/L	2,500	38

Any leaks or seepage of brine salts from the evaporation pond liner may go undetected for some time if covered by salts and / or brine water for extended periods of time. Advice within WQPN 26 indicates that a liner with a coefficient of permeability of less than 2 x 10^{-10} m/s will discharge 6mm of liquid per year.

9.7.3 Description of potential adverse impact from the emission

Brine may be released from seepage through the liner and may cause localised soil contamination and groundwater contamination.

9.7.4 Criteria for assessment

Relevant land, surface water and groundwater quality criteria include:

- Australian Water Quality Guidelines (ANZECC & ARMCANZ 2000) provides fresh and marine water criteria; and
- Assessment and Management of Contaminated Sites (DER 2014) provides ecological and human health assessment levels for soil.

9.7.5 Applicant controls

This assessment has reviewed the controls set out in Table 26 below.

Table 26: Applicant's controls for seepage of brine through pond liner

Site infrastructure	Description
Evaporation pond design	Pond liners will be constructed in accordance with WQPN 26, that is they will have: • coefficient of permeability of less than 2 x 10^{-10} m/s; • gradient of less than 1 in 3; • liners of 1.5 mm thickness are recommended for long-term containment facilities with heat welded joints; • Liner should be fabricated to form the shape of the excavation. All seems and joins made on site are continuous. Panels of the liner overlap by a minimum of 100mm, prior to heat-welding or mechanical joining. • Any membrane welding materials should be supplied by the liner manufacturer and should be identical with the liner membrane; • All seems and joins should be constructed and tested as watertight over their full length using a vacuum test unit, air pressure testing or other approved method used in the industry; • HDPE liners should not be used on soils subject to differential movement (settling) as they have low resistance to shearing and stress cracking; and • HDPE liner shear resistance should be tested in accordance with ASTM D5321-02
	There will be no breaks through the bund and liner system, all pipes will go over the bund wall, trafficable sections will go over the height of any bund.
	Groundwater monitoring will be undertaken to monitor water levels and water quality. One monitoring bore will be located up hydraulic groundwater gradient of the Premises and one monitoring bore located down hydraulic gradient of the Premises (between the processing plant and the Ord River).
	The total capacity of each evaporation pond is 22,608kL.
	During the Wet season a cover will be placed over one of the ponds and all brine will be directed to this pond. Covering the pond reduces excess rainfall hydraulic pressure entering the pond. Only one evaporation pond will be used at a time which will reduce hydraulic loading on the other pond.

9.7.6 Consequence

If seepage of brine through pond liner occurs, native vegetation may be impacted with possible impacts to birds or other fauna if they come into contact with the effluent. The Delegated Officer has determined that the impact of the discharge will be **moderate**.

9.7.7 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of discharge of seepage of brine through pond liner occurring will be **unlikely**.

9.7.8 Overall rating of seepage of brine through pond liner

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 seepage of brine through pond liner is **medium risk**.

9.8 Risk Assessment – Odour

9.8.1 Description of Discharge

The processing plant will operate during commissioning for two months so the majority of odour emissions will prevail during Operations. Odour emissions may be generated on the Premises during normal operations, including from the daily operation of the WWTP and from cooking prawns on the Premises (for approximately 106 days per year. Prawns will be cooked within an insulated cooking room within the processing plant facility. Steam from the cooking room will be extracted via ventilation points located on the roof of the processing plant.

Organic waste collected from the WWTP screen will be will be stored in a chiller and disposed of to landfill as required.

Sediment from the WWTP will be stored in skip bins are removed daily for disposal to landfill.

9.8.2 Identification and general characterisation of emission

Odour from the operation of the WWTP may be generated during the various stages of treatment as reactions occur. Odour will also be generated via the cooked prawn process and odour may be generated from intermittent solid waste storage.

Figures 6 provides the respective wind plots; the prevailing wind is from the south east and thus any sensitive receptors located to the north-west may be impacted. Residences located at the Frank Wise Institute are approximately 1.5km west-northwest of the premises boundary.

An Odour Screening Analysis (OSA) was performed by the Applicant to assess the risk of odour emissions from the Premises during operations. The OSA determined the risk of odour emissions to be low.

DWER Air Quality Branch has assessed the OSA and provided advice that odour emissions present a low risk. The low risk is determined by:

- *Distance to sensitive receptors;*
- *Despite having limited information about the flux of steam from the point source emission from the cooking operation, it is not expected that it may reach sensitive receptor locations. It can be raised that, under very stable conditions and low winds which may occur in such inland location, it is still a possibility at night time. However, cooking will occur for 102 days per year and the probability to get stable conditions and low wind speed towards sensitive receptors out this number of days should be low. However, a recommended action if you wish to guarantee the minimum risk for this is to include a condition in the licence that will stipulate that if odour complaints start occurring and the likelihood of the emissions from prawn cooking operation is demonstrated, then a condensation system will have to be installed and only emissions from incondensable phase will be allowed. The note about limited odour detected by employee at the Cardwell facility from the cooking area cannot be accepted as a reliable proof of limited emissions (lack of objectivity and possible lack of odour sensitivity due to their roles at the facility).*
- *Organic matter (6m^3/week) is collected and stored in chill room before being disposed off-site. No problem with odour*
- *Organic sediments (32 m^3/week) are stored in bins and removed off-site daily. It appears to be sufficient to limit emissions and the source footprint remains small. However, the levels of emissions of this organic matter is unknown and a daily storage*

and removal but in open air conditions may be sufficient to breakdown the organic matter into very odorous compounds (especially under hot conditions). A contingency condition in the licence may indicate that, should odour complaints start occurring and the bins of organic matter is a likely source of emissions, management should be modified with a cover and/or a low temperature storage or any other technique that would limit emissions.

- *The WWTP: the proposed treatments at the WWTP are state of the art in regards to water quality expected at the outlet. The expected quality of the treated water suggests very low levels of odour emissions. However, it is unclear whether the brine that will be sent to the evaporation ponds may be odorous. This is not discussed in the supporting documents. The assumption would suggest a low level of odours as the volume of brine per tonne of prawn is high which means that any odours from prawns in contact with the brine (storage ad post-cooking) would be diluted. However, during wet season when the brine is stored under a cover over the evaporation pond, conditions will be with limited oxygen and it is unclear whether anaerobic conditions may start developing in the pond which would create odorous compounds which may be emitted once the cover is removed. Confirmation may be requested to the applicant whether this condition has been investigated and guarantee can be provided to DWER that brine once sent to the evaporation pond may not go through chemical and biological alterations that would create odorous compounds. This may be a critical consideration for the applicant and the department as the evaporation pond will possibly represent a very large surface area source for which emissions could impact the closest sensitive receptors*
- *Finally, the facility will start with low volumes of prawns to process (uncooked and cooked) due to initial limited production at the Legune Grow-out facility. Therefore, it is possible for them to monitor what the levels of emissions from the above-mentioned main sources of odour are during the increased throughput and implement corrective actions.*

9.8.3 Description of potential adverse impact from the emission

Odour from cooking of prawns, WWTP processes and solid waste storage may be offensive to some people, affecting their comfort, health, welfare and amenity.

9.8.4 Criteria for assessment

No specific consequence criteria are applicable. The health, welfare, convenience, comfort and amenity of receptors are relevant in determining the consequence of odour. The closest residential receptors located at the Frank Wise Institute approximately 1.5km west-northwest of the premises boundary.

General provisions of Sections 49(4) and 49(5) of the EP Act regulate odour.

9.8.5 Applicant controls

This assessment has reviewed the controls set out in Table 27 below.

Table 27: Applicant's controls for management of odour

Site infrastructure	Description
WWTP	The WWTP will process up to 306kL/day of wastewater, and will be completely enclosed in a self-contained, bunded system.
	The membrane bioreactor includes a large anoxic stage to remove nitrogen

Site infrastructure	Description
	via nitrification / denitrification Reverse Osmosis provides a final barrier to remove nitrogen
	Sludge will be dewatered to produce a sediment “cake” that will be stored in enclosed skip bind adjacent to the WWTP.
	In the event of a spill water will drain to a sump and pumped to the balance tank to be treated through the WWTP.
	The WWTP has segregated chemical buds to prevent chemicals entering the treatment plant or to come into contact with other chemicals. Hazardous and incompatible chemicals are stored in their own dedicated bunding system to prevent the risk of reactions
Processing building	Separation distance to nearest receptor is 1.5km from premises boundary
	Prawns will be cooked in within an insulated cooking room Steam will be extracted via ventilation points located on the roof of the processing plant
Management controls	**Description**
Solid waste	A total of ~6m^3/week of organic matter (rejected prawns, shells, vegetative matter etc.) will be generated during operations. Odour will be minimised by storing collected organic matter in a chiller prior to lawful disposal.
WWTP	Around 31.5m^3/week of sediment will be produced from the WWTP. Sludge sediment from the WWTP be disposed of daily to a licenced waste facility (eg. the Kununurra Landfill) via a licensed waste contractor.

9.8.6 Consequence

If release of odour from the WWTP and processing / cooking of prawns occurs, then this will cause mid-level impact to amenity on a local scale. The Delegated Officer has determined that the impact of the discharge will be **minor**.

9.8.7 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of odour emissions from the WWTP and cooking of prawns impacting the nearest receptor at 1.5km northwest will be **unlikely**.

9.8.8 Overall rating of Odour

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 odour from the WWTP and cooking of prawns is **medium risk**.

9.9 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 28 below. Controls are described further in section 11.

Table 28: Risk assessment summary

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)
	Emission	**Source**	**Pathway/ Receptor (Impact)**			
1.	Discharge of untreated or partially treated wastewater and Brine from pipeline and containment infrastructure	Wastewater pipeline to D6 drain and evaporation ponds Overflow from wastewater treatment tanks	Direct discharge to land - Vegetation and fauna adjacent to discharge area. Direct discharge to surface water D6 drain / Lower Ord River Seepage through soil into groundwater	Wastewater treatment fully enclosed and bunded Evaporation pond capacity	Minor consequence Unlikely likelihood **Medium Risk**	Acceptable subject to proponent controls conditioned / outcomes based controls
2.	Discharge to surface water	Direct discharge to surface water D6 drain and Lower Ord River from wastewater Treatment Plant	Discharge to D6 drain and Lower Ord River Contamination of surface water	Infrastructure and management controls. Monitoring	Minor consequence Unlikely **Medium risk**	Acceptable subject to proponent controls conditioned / outcomes based controls
3.	Embankment breaches	Brine from Evaporation ponds	Direct discharge to land - Vegetation and fauna adjacent to discharge area. Direct discharge to surface water D6 drain / Lower Ord River Seepage through soil into groundwater	Infrastructure and management controls.	Minor consequence Unlikely likelihood **Medium Risk**	Acceptable subject to proponent controls conditioned / outcomes based controls
4.	Seepage from lined		Seepage: lateral and vertical	Infrastructure and management	Minor	Acceptable subject to

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)
	Emission	**Source**	**Pathway/ Receptor (Impact)**			
	ponds	Seepage from the two Evaporation Ponds	subsurface migration of leachate to groundwater Groundwater contamination (nutrient loading). Native vegetation and fauna impacts	controls	consequence Unlikely likelihood **Medium Risk**	proponent controls conditioned / outcomes based controls
5.	Odour	Cooking of prawns / wastewater treatment plant / solid waste storage	Air / wind dispersion Amenity impacts causing nuisance	Sitting and Infrastructure Controls	Minor consequence Unlikely likelihood **Medium Risk**	Acceptable subject to proponent controls conditioned / outcomes based controls

10. Regulatory controls

A summary of regulatory controls determined to be appropriate for the Risk Event is set out in Table 29. The risks are set out in the assessment in section 9 and the controls are detailed in this section. DWER will determine controls having regard to the adequacy of controls proposed by the Applicant. The conditions of the Works Approval will be set to give effect to the determined regulatory controls.

Table 29: Summary of regulatory controls to be applied

		Controls (references are to sections below, setting out details of controls)				
		Infrastructure and equipment	**Emissions limits**	**Specified action**	**Monitoring**	**Reports**
Risk Items (see risk analysis in section 9)	**1.** Discharge of untreated or partially treated wastewater and Brine from pipeline and containment infrastructure	●		●	●	●
	2. Discharge to surface water –D6 and Lower Ord River	●	●		●	●
	3. Embankment breaches – evaporation ponds	●				
	4. Seepage from lined Evaporation ponds	●			●	●
	5. Odour	●				●

10.1 Works Approval (Construction, Commissioning and Operation) controls

The Delegated Officer notes that the construction and operation of the category 22 and category 14 Prescribed Premises proposed by the Applicant have the potential to generate the emissions outlined in Tables 10 and 11, and risk assessed in section 9.

The Applicant is proposing to Commission the WWTP for three (3) months and the Processing Plant for two (2) months which will be split into a month of 'dry commissioning' and a month of 'wet commissioning'. Dry and Wet commissioning of the processing plant will involve two key phases over two months (January and March 2021 respectively), the product validation and performance testing phase and a discharge validation and performance testing phase. The product validation and performance testing phase involves processing product through the plant (raw and cooked lines) to ensure that all equipment is operating correctly and that product is not compromised or damaged through the process. Testing will also be undertaken

to ensure that the product satisfies all applicable Food Safety standards and requirements. Product validation testing and performance will include discharging to the evaporation ponds, and testing of the evaporation pond cover retractor. The discharge validation testing and performance phase ensures that water treatment through the WWTP satisfies the discharge criteria specified under the proposed licence conditions. This will involve a water quality testing regime to assess the quality of treated water. The water quality testing regime during wet commissioning will include monitoring for pH, turbidity, conductivity and nutrients in accordance with the requirements of the proposed licence. In the event any of these parameters are not acceptable for discharge, water will be diverted back to the balance tank (which has a 1-day minimum storage capacity) for reprocessing. Discharge water that does not satisfy the discharge criteria will not be discharged to the environment.

The Applicant will be authorised to Operate the Premises infrastructure for a period not exceeding six (6) months. This period of operation under the Works Approval allows the Applicant to operate the premises prior to the Licence being finalised and granted.

Conditions have been included in the Works Approval to include:

- Condition 1 of the Works approval is to allow the Works Approval Holder to construct Premises infrastructure according to the specification outlined in Table 2.
- Condition 2 allows for minor departures if required.
- Condition 3 requires the Works Approval Holder undertake an audit with the requirements of Table 2 and prepare and submit to the CEO a respective audit report of that compliance.
- Condition 4 requires the report submitted under condition 3 be certified by a suitable qualified engineer for each item of infrastructure or component specified in Table 2 has been constructed with no material defects and where a departure from the requirements of Table occurs and is of a type allowed by condition 2, the Works Approval Holder must provide to the CEO a description of and explanation for the departure along with the report required by condition 3.
- Condition 5 requires the Works Approval Holder must not cause any emissions through the Works Approval except for those specified emissions and general emissions described in table 3
- Condition 6 allows upon completion of the works specified in Table 2 the Works Approval holder shall commission the infrastructure referred to in Table 2 for a period not exceeding 3 months.
- Condition 7 allows upon completion of the works specified in Table 2 the Works Approval holder shall operate the infrastructure referred to in Table 2 for a period not exceeding 3 months.
- Condition 8 requires the Works Approval Holder to ensure that the site infrastructure and equipment listed in Table 3 are located at the corresponding location is maintained in good working order and operated in accordance with the corresponding operational requirements set out in Table 4.
- Condition 9 allows emissions specified in Table 5 to only be discharged from the corresponding discharge points identified within Table 5.
- Condition 10 ensures that during commissioning and operation of the WWTP that the discharge emissions must not exceed the parameter limits stipulated in Table 6 when monitored in accordance with condition 11.
- Condition 11 stipulates the discharges to surface water for parameters listed in Table 7 from the WWTP to D6 drain monitoring programme to be employed during

commissioning and operation.

- Condition 12 stipulates the groundwater monitoring programme for groundwater parameters listed in table 8 to be employed during commissioning and operation.
- Condition 13 stipulates the D6 drain water monitoring programme for the parameters listed in Table 9 to be employed prior to and during commissioning and operation.
- Condition 14 requires all samples required under conditions 11, 12 and 13 to be submitted to a laboratory with NATA accreditation for analysis of the parameters specified in those Tables.
- Condition 15 outlines the monitoring requirement frequencies.
- Condition 16 stipulates that within four (4) weeks after Commissioning of the Works the Works Approval Holder must submit to the CEO a Commissioning Report with the information required as identified in condition 16. This includes all monitoring results and a summary of treated wastewater quality as required in Table 6. It also includes information on where design specification are not meet the measures proposed to meet those specifications with corresponding timeframes.
- Condition 17 outlines specified actions for Visual inspections of the infrastructure outlined in Table 10.
- Condition 18 requires accurate record keeping.
- Condition 19 requires the Works Approval Holder must comply with a Department request within 14 days from the date of the request.
- Condition 20 outlines the information required in relation to complaints.
- Condition 21 requires the Works Approval Holder must submit to the CEO reports for Operations monitoring the conditions listed in Table 11.

The Applicant will be required apply for a Category 22 and 14 operating licence once the Premises has been constructed and all compliance requirements under the works approval have been satisfied.

10.2 Licence (Operations) controls

It is expected that the Applicant will apply for a licence towards the completion of Commissioning/Operations. Operation of the Premises will continue under the Works Approval until a licence has been issued. The determined controls for a licence will be generally consistent with the operation based conditions outlined in Section 10 and included on the works approval as follows:

1. Operation infrastructure and equipment;
2. Emission limits (WWTP);
3. Monitoring requirements;
   (a) WWTP discharges into D6 drain;
   (b) Surface water quality in the D6 drain and Lower Ord River (upstream and downstream); and
   (c) Ambient groundwater monitoring;
4. Specified actions; and
5. Annual reporting including submission of an annual water monitoring and complaints register.

Final determination of licence controls will consider information submitted by the Applicant in its licence application, submissions from relevant Stakeholders, advice from WSNR and in response to Works Approval requirements.

11. Determination of Works Approval conditions

The conditions in the issued Works Approval have been determined in accordance with the *Guidance Statement: Setting Conditions*.

The *Guidance Statement: Licence Duration* has been applied and the issued works approval expires in 3 years from date of issue.

Table 30 provides a summary of the conditions to be applied to this works approval.

Table 30: Summary of conditions to be applied

Condition Ref	Grounds
Infrastructure and Equipment 1, 2, 3 and 4	These conditions are valid, risk-based and contain appropriate controls and necessary reporting requirements to ensure compliance.
Emissions 5	This condition is valid, risk-based and consistent with the EP Act.
Emissions 6 and 7	These conditions are valid and are necessary administration and reporting requirements to ensure compliance.
Infrastructure and Equipment 8, 9 and 10	These conditions are valid, risk-based and contain appropriate controls and necessary reporting requirements to ensure compliance.
Monitoring 11, 12, 13, 14, 15 and 16	These conditions are valid, risk-based and consistent with the EP Act.
Specified action 17	These conditions are valid, risk-based and consistent with the EP Act.
Record Keeping 18, 19, 20 and 21	These conditions are valid and are necessary administration and reporting requirements to ensure compliance.

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.

12. Applicant's comments

The Applicant was provided with the draft Decision Report and draft Works Approval on 30 May 2019. The Applicant provided comments on 12 June 2019. The Applicants comments are provided in Appendix 2.

13. 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 works approval will be granted subject to conditions commensurate with the determined controls and necessary for

administration and reporting requirements.

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.	Application for Works Approval (and associated supporting documents) Project Sea Dragon Pty Ltd, 12 March 2019	Application (PSD 2019)	DWER records (A1771924 and A1771928)
2.	Additional Supporting Documentation (Electronic Mail) Subject: *Works Approval Application (Part V) – Project Sea Dragon Processing Plant - Kununurra.* Authored by: Kate McBean (CO_2 Australia).	N/A	DWER records (A1776346)
3.	Department of Water, 2009. *Water Quality Protection Note 26: Liners for containing pollutants, using synthetic membranes*, Department of Water, Western Australia	DoW 2009	Accessed as www.water.wa.gov.au
4.	DER, July 2015. *Guidance Statement: Regulatory principles.* Department of Environment Regulation, Perth.	accessed at www.dwer.wa.gov.au	
5.	DER, October 2015. *Guidance Statement: Setting conditions.* Department of Environment Regulation, Perth.		
6.	DER, August 2016. *Guidance Statement: Licence duration.* Department of Environment Regulation, Perth.		
7.	DER, November 2016. *Guidance Statement: Environmental Siting.* Department of Environment Regulation, Perth.		
8.	DER, February 2017. *Guidance Statement: Land Use Planning*. Department of Environment Regulation, Perth.		
9.	DER, February 2017. *Guidance Statement: Risk Assessments*. Department of Environment Regulation, Perth.		
10.	DER, February 2017. *Guidance Statement: Decision Making*. Department of Environment Regulation, Perth.		

11.	DER, 2014. *Assessment and Management of Contaminated Sites.* Department of Environment Regulation, Perth.	

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

Condition	Summary of Applicant comment	DWER response
Works Approval		
Definition Table 1	Chiller Brine – remove 'Chiller'	Change accepted in Works Approval
Definition Table 1	'Works Approval Holders' address within definition	Change accepted in Works Approval
4	Suggest deleting 'civil' engineer; the qualified professional engineer should be appropriate to the infrastructure being assed.	Change accepted in Works Approval
12 (c)	At no less that the corresponding frequency; replace 'that' with 'than'	Change accepted in Works Approval
12 Table 8	Monitoring Frequency; Applicant proposes only nutrients and metals sampling occurs monthly during Commissioning, rather than weekly due to low risk	Change accepted in Works Approval
Table 10	Typo's missing '8'	Change accepted in Works Approval
Table 14	1.854 – typo; should be 1,854	Change accepted in Works Approval
Schedule 1 Maps	Applicant to provide Groundwater (Table 8) and Surface water (Table 9) monitoring locations.	Provided and incorporated into Works Approval
Decision Document		

Table 2	Applicant confirms Approved production and design capacity of 16,000 tonnes per year	Changed accepted in Decision Report
Section 4.1	Applicant to confirm 'covered area'; confirmation provided.	Decision Reported updated
Section 4.1	Applicant to confirm truck wash wastewater treatment and discharge; confirmation provided.	Decision Reported updated
Table 6	Applicant to confirm SWEK Development Application; confirmation provided	Decision Reported updated to confirm Approval
Table 6	Applicant to provide Groundwater Licence number; still pending	Decision Reported updated to indicate Licence pending.
Table 16	Applicant to confirm vehicle wash bay bunded hardstand area; confirmed as bunded hardstand area.	Decision Reported updated
Table 20	Applicant to confirm brine pipelines type; confirmation HDPE pipes.	Decision Reported updated
Section 9.7.2	Applicant to confirm groundwater quality; confirmed and response provided.	Decision Reported updated

Attachment 1: Issued Works Approval W6228/2019/1