Decision Report

Application for Works Approval

Part V Division 3 of the *Environmental Protection Act 1986*

Works Approval Number	W6908/2024/1
Applicant	Roo Brew Pty Ltd
ACN	654 500 017
File number	DER2024/000055
Premises	Lucky Bay Brewing 63 Bandy Creek Road BANDY CREEK WA 6450 Legal description Lot 64 on Diagram 80539 As defined by the premises maps attached to the issued works approval
Date of report	13/06/2024
Decision	Works approval granted

Table of Contents

1. Decision summary

Roo Brew Pty Ltd (the applicant, Roo Brew) submitted an application for a works approval under Division 3 Part V, of the *Environmental Protection Act 1986* (EP Act). To establish a facility to produce malt under category 18 (food processing) in Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations).

This decision report documents the assessment of potential risks to the environment and public health from emissions and discharges during the construction and operation of the premises. As a result of this assessment, works approval W6908/2024/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this decision report, the Department of Water and Environmental Regulation (the department; DWER) has considered and given due regard to its regulatory framework and relevant policy documents which are available at https://dwer.wa.gov.au/regulatory-documents.

2.2 Application summary and overview of premises

On 12 February 2024, the applicant submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act). The application is to undertake construction works for a malt processing plant, wastewater treatment plant and irrigating treated wastewater to a land application area (LAA), for an established brewery (Lucky Bay Brewing), at 63 Bandy Creek, Bandy Creek 6450, on Lot 64 on Diagram 80539 (premises) approximately 6 km north northeast of Esperance town centre.

The premises has a maximum theoretical design capacity of 260 kL of beer per annum based on the fermentation capacity producing beer every two weeks, and processing 520 tonnes/year of grain based on 10 tonnes of grain being processed each week.

The brewery operations at the premises have been operating since 2019 and was not constructed under an EP Act works approval due to being below the prescribed threshold

The applicant has applied for an assessed production throughput of 200 kL/year of beer and 370 tonnes of malt/year. The owners of the premises Nutysia Floribunda Pty Ltd have a lease agreement with the applicant for the premises.

2.3 Existing and proposed infrastructure

The following outlines the key existing and proposed infrastructure relating to the prescribed premises brewery, malt, WWTP, LAA and solids management. This information has been sourced from the applicant.

Construction works involve minor earthworks to create hardstands and assemble tanks and

pipework's onsite.

Existing brewery infrastructure

- 3x 1 kL vessel brew plant
- 9 x fermentation vessels (3x 1.2kL, 2x 2.5 kL and 2x 6 kL)
- 2x 1.5 kL serving tanks
- 4 bright beer tanks (1.2 kL, 2.5 kL 3.5 kL and 6 kL)
- 4 head canning machine
- 300 L vacuum evaporator

Proposed malt infrastructure

- 4x grain storage silos
- Grain cleaning vessel
- Steep vessel
- Germination vessel
- Kiln vessel
- 5x malt storage vessels
- Packing and storage shed
- Existing storage shed
- 2x 50 kL pre steep holding poly tank

Proposed WWTP infrastructure

- 5 kL solids interceptor / clarifier vessel
- 50 kL raw wastewater poly tank with blower
- 3x 5 kL reactor poly tanks (moving bed biofilm reactor (MBBR))
- 3 kL phosphate tie up poly tank (biochar medium)
- Microprocessor with sensors for pH, dissolved oxygen, temperature, water level and flow.
- 2x 50 kL treated wastewater storage
- Flow meter

2.4 Operation (from applicant)

Brewery

The applicant has indicated that they will expand brewery production to produce 200 kL of beer per year with a beer-to-wastewater ratio of 1 litre beer : 4 litres of wastewater, producing 800 kL wastewater per year. Existing wastewater from brewery production is discharged into a 1.5 kL pre-treatment tank for temperature and pH management before disposal to septic tanks and leach drains underground.

The current 1.5 kL brewery pretreatment, 4.18 kL primary and 2.1 kL secondary tanks will remain in place and receive brewery wastewater. A submersible pump in the 2.1 kL secondary tank will transfer wastewater to the proposed 50 kL raw water tank in the wastewater treatment plant (WWTP) for processing before disposal via irrigation to land. The existing leach drains will be decommissioned by disconnecting the pipe. The leach drains will remain in situ to prevent the

destruction of the kikuyu lawn.

Malt facility

Cereal grain will be trucked onto the premises and transferred via an enclosed chute into grain storage silos. Grain transfer from the grain storage silos to the malt steeping tank, between vessels, and to the storage silos and packing shed will be via an enclosed drag chain conveyor.

Malt manufacturing facility will process 10 tonnes of cereal grain per batch through three repurposed fermentation vessels that will act as steep, germination, and kiln vessels in the malting process. The kiln fan system will be contained and baffled within the recirculation ducting system. Water supply for malt production is from rainfall collected from roof runoff and is the limiting factor in the production. The applicant is proposing a two-steep malting process taking between 7 – 15 days and producing 37 batches per year. A two-steep process including cleaning of vessels, will produce 18,250 litres of water per batch, totaling 675.25 kL/annum (37 batches).

The bagging of the malt will be undertaken within an enclosed packing shed. An automated bagging line will seal and bag malt and place the product onto a pallet.

Water requirements

All water required to produce beer, malt, and for restaurant use is from rainwater collected from roof runoff. No grey water is used within the washing/cleaning process and groundwater is used to service toilet and floor washing. The applicant has calculated that approximately 1,035.4 kL of rainwater is available annually. Rainwater is stored within four 27 kL tanks (108kL), the two 50 kL pre-steep accumulator holding tanks (100 kL), and a 500 kL storage tank. Approximately, 675.25 kL is required for malting operations, 1,000 kL for beer production and unknown quantity for restaurant and toilet operations.

The applicant has insufficient water for its proposed operations and insufficient storage for capturing rainfall for later use.

The applicant indicated full scale capacity of the malt facility requires additional water. This may include trucking in water, recycling water on site, or blending rainwater with salty groundwater.

Wastewater treatment plant

The WWTP is designed as a moving bed biofilm reactor (MBBR) using passive aeration simultaneous nitrification and denitrification process (PASND), with a phosphate tie up reactor which is designed to remove phosphorus from the wastewater. The WWTP is designed to process 5 kL every 4 hours, theoretically processing up to 30,000 L wastewater within 24 hours. WWTP is proposed to follow the following process (see Figure 1 for flow pathway).

- Solids separator and clarifier intercepts solid waste from the malt processing which is removed from the vessel and removed from the premises. Wastewater then gravity feeds into the raw water holding tank.
- The raw water holding tank combines the malt and brewery wastewater and is aerated with a blower to break down biological oxygen demand.
- Reactors 1, 2 and 3 comprise of the MBBR. The tanks are dosed every four hours with wastewater from the raw water tank via a pump. The vessel operates on a 2-hour immersion and 2-hour empty cycle flowing from reactor 1 through to reactor 3. The final reactor (reactor 3) discharges into the phosphate tie up module.
- Phosphate tie up tank contains replaceable biochar medium to bind phosphate. The medium is replaced and removed from the premises as required and used as slow-release organic fertilizer.
- Irrigation holding tanks are to hold wastewater when irrigation is not possible during winter, overflow level on the tanks will discharge back to the raw water treatment tank if required.

- The hardstand areas that contain spills have been calculated to contribute up to 6.5 kL in winter nonirrigation months.
- Flow meters installed on the brewery wastewater input into the WWTP, on the malting wastewater input, and irrigation water output.

The applicant has indicated that the MBBR tanks will be located on a concrete hardstand with spills draining to a sump with a submersible pump to feed wastewater into the raw water holding tank. All other tanks will be on a gravel hardstand.

The sump tank will have a high-level alarm, all above-ground WWTP tanks will have level gauges and all tanks will be enclosed with lids.

Land application area (irrigation) (from applicant)

Five land application areas (LAA) totaling 0.57 ha will be planted with kikuyu to establish lawn. Sprinklers will be installed within the lawn areas with seven stations. Multiple stations will allow irrigation to be rotated between stations (zones). The seven stations will be controlled by a commercial irrigation controller with a rain sensor attached to suspend irrigation in case of rainfall. The kikuyu lawn will be moved with cuttings collected and removed from the premises as green waste. Ongoing turf management including aeration and vertical mowing to remove thatch will be undertaken as required.

Malt operations will be reduced to 1 batch in June and no batches in July and August, and brewery operations will be reduced to under 11 kL/month of beer produced during June and August and 9 kL for July to reduce wastewater production. The applicant has 100 kL of storage and will produce 98.25 kL of wastewater during the proposed June-July storage period and produce 142.25 kL of wastewater from 1 June to 31 August. Wastewater will be stored with no irrigation in June and July with reduce irrigation volumes in August (96.25 kL/ha, which equates to 54.86 kL over 0.57 ha.).

Solids management

Culms (rootlets) from the malted grain process are removed by a rotary screen cleaner. The enclosed screen uses aspiration to remove rootlets and shoots via agitation on the screen. The culms are blown into a grain silo and stored and used as animal feed. Any spillage of culms will be swept up and removed from site as animal feed or waste disposal.

Sludge from the WWRP clarifier will be removed as required from the premises for compost and broad acre application. The biochar canisters from the WWTP will be removed from the premises and used as organic fertilizer.

Solid waste from the brewery production is removed offsite for animal feed.

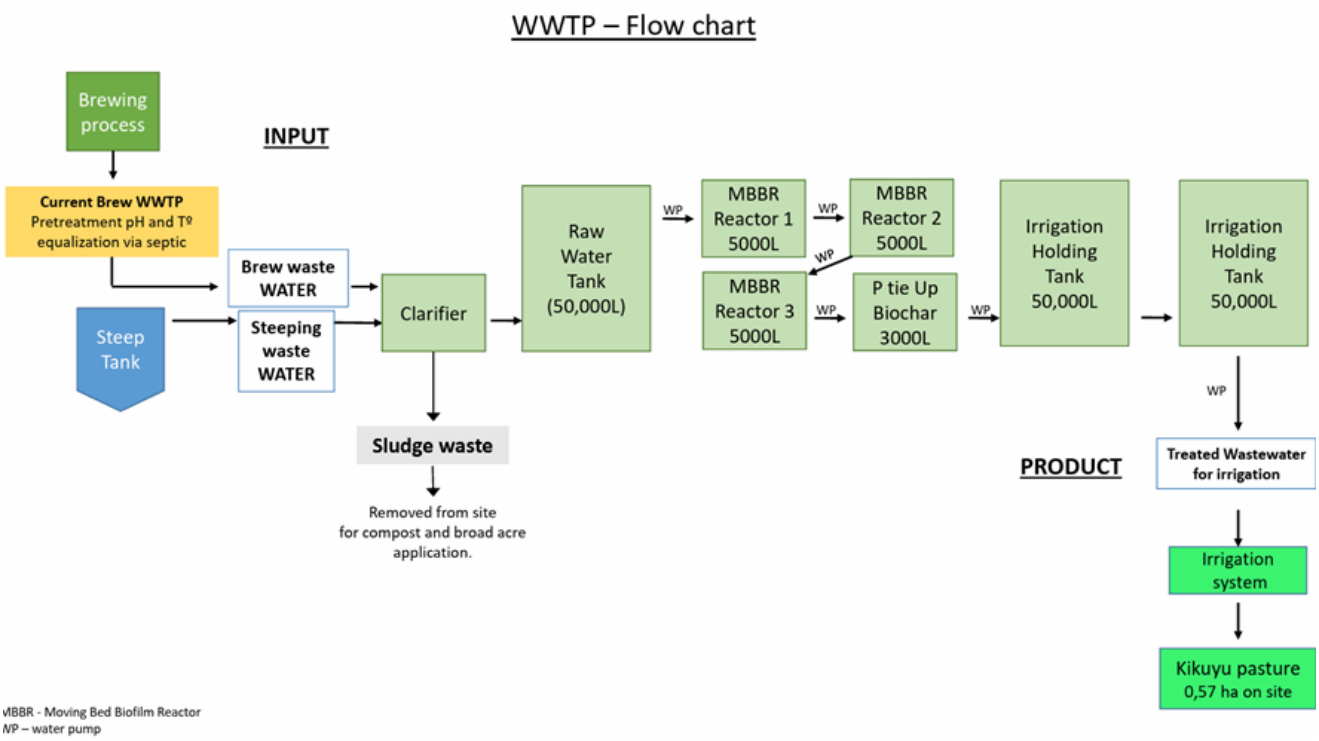

Figure 1: Wastewater treatment plant layout and flow pathway

Environmental commissioning and time limited operations

The applicant has requested environmental commissioning of the WWTP and time limited operations. No details were provided.

The delegated officer determined that environmental commissioning was not required however extended time limited operations will be authorised to ensure the WWTP system is operating and producing wastewater data.

2.5 Other legislative approvals

Local government approvals

The Shire of Esperance issued a development approval for the malting facility on 17 April 2024 under the provisions of the Local Planning Scheme No 24, further information was provided on 26 April 2024 advising the applicant to apply to the Department of Health to construct a wastewater treatment plant.

Department of Health approvals

The Department of Health advised the department on 22 April 2024 that they had not received or assessed an application to construct or install an apparatus for the treatment of sewerage in accordance with the *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations, 1974* for the malting facility

3. Risk assessment

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway, and impact to receptors in accordance with the *Guideline: Risk Assessments* (DWER 2020).

To establish a risk event there must be an emission, a receptor that 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.

3.1 Source-pathways and receptors

Emissions and controls

The key emissions and associated actual or likely pathway during premises construction and operation which have been considered in this decision report are detailed in Table 1 below. Table 1 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 1: Proposed applicant controls

Emission	Sources	Potential pathways	Proposed controls
Construction			
Noise	Installation of malt processing equipment and wastewater treatment systems including earthworks and reverse vehicle beeping.	Air / windborne pathway	NIL
Operation			
Dust	Malt manufacturing and packaging including deliveries and load outs.	Air/windborne pathway	All grain and malt are conveyed via an enclosed belt with drag chain equipment. Post malt rootlets stored in silo via conveyor and taken offsite site. Malt is packaged within an enclosed shed using and bagging equipment
Odour			Waste grain is removed offsite as animal feed and/or temporarily stored in an enclosed silo.
Noise			Fans in malt and kiln vessels have fans enclosed within ducting and vessels. Ducting to reduce fan noise in kiln Loading and unloading undertaken during daylight hours.
Spills and leak of solids and liquids during transfers during processing		Direct discharge to land	Complete containment in process vessels, then pumped to WWTP. The steeping and growing vessel and 3 WWTP reactor vessel with be on bunded concrete hardstand with below ground sump with a transfer pump back to raw water tank.
Odour	Management of wastewater treatment plants	Air/windborne pathway	Processing is within enclosed vessels. Solid waste kept in enclosed vessel.
Noise			No controls
Overtopping of containment, spills, and leaks of wastewater from		Direct discharge to land	Gravity discharge system Treatment storage tank gravity overflow back to the raw water tank

Emission	Sources	Potential pathways	Proposed controls
Containment tanks and pipe works			Waste captured in enclosed container. The steeping and growing vessel and 3 WWTP reactor vessel with be on bunded concrete hardstand with below ground sump with a transfer pump back to raw water tank. All tanks have level gauges, and the sump has high-level alarm.
Nutrient and salt rich wastewater to land Wastewater to land with excessive hydraulic loading	Onsite disposal of wastewater via irrigation	Direct discharge to land	No irrigation June to July with 100 kL storage. Limited irrigation in August to 96.25 kL/ha adjusted to 0.57 ha as 54.86 kL Malt and brewery production to decrease over winter to reduce wastewater. 18 mm maximum irrigation rate. Rain sensor on irrigation controller. Rotation of irrigation stations (7 zones) to allow areas to dry out. Monitoring bore installed in centre of irrigation areas to monitor water level. Irrigation soil testing (no details supplied) Irrigation area mowed and clippings removed offsite. Groundwater monitoring bore placed in the centre of irrigation area. Flow meter on irrigation outlet.

Receptors

In accordance with the *Guideline: Risk Assessment* (DWER 2020), the delegated officer has excluded the applicant's employees, visitors, and contractors from its assessment. Protection of these parties often involves different exposure risks and prevention strategies, and is provided for under other state legislation.

Table 2 below provides a summary of potential human and environmental receptors that may be impacted because of activities upon or emission and discharges from the prescribed premises *(Guideline: Environmental Siting* (DWER 2020)).

Table 2: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
Rural residential premises	850 m west of the boundary of the premises 720 m south of the boundary of the premises 350 m south of the boundary of the premises
Esperance urban residential premises	2 km southwest of the boundary of the premises
Environmental receptors	**Distance from prescribed activity**
Bandy Creek	550 m west and 690 m south-southwest of the irrigation area

Underlying groundwater (non-potable purposes) *Rights to Water and Irrigation Act 1914 (RIWI)* Esperance Groundwater Area, Bremer East-superficial	Assessment in January 2019 by the applicant determined groundwater was at 4 mbgl, and moist at 2.5mbgl. Noting that groundwater peaks in September, groundwater could peak between 2-3 mbgl. Groundwater moves from north- northeast to south-southeast direction. Nearest groundwater well (RIWI) 1.4 km west of premises Nearest wetland (hydrologically linked to Lake Warden system (RAMSAR)) 745 m north of premises boundary and Bandy Creek to the south and west.
Aboriginals Sites and Heritage Place	Lower north half of the site including irrigation areas is within a registered camp, and hunting place.
Soils	Alkaline sands. Soil report submitted by the applicant indicated non-wetting sands through the soil profile to groundwater.

3.2 Wastewater quality

The applicant has not provided wastewater quality details of the brewery wastewater but provided wastewater quality data from Voyager Craft Malt and Joe White Malting facilities and unspecified treated wastewater data. It is noted that typical brewery wastewater is higher than malt processing wastewater for the following attributes total nitrogen, total phosphorus, biological oxygen demand and total dissolved solids (salts). It is expected that the malt processing wastewater will shandy the brewery wastewater in the pre-treatment tank when combined.

Table 3: Wastewater quality (supplied by the applicant)

Source	BOD mg/L	EC µS/cm	TDS mg/L	TN mg/L	TP mg/L	TSS mg/L	pH
Applicant supplied post treatment wastewater quality (unknown source)	300			18.6	6.75		
Voyager Craft Malt 2-steep	1500	1160	1070	59	13.5		5.4
Joe White Malting	2000					350	
Typical range of raw brewery wastewater[1]	1,200 – 3,600			25 - 80	10 – 50		4.5-12
Primary effluent quality following treatment[2]	120-250			30-55	6-14		
Secondary effluent quality following nutrient removal treatment[2]	20-30			10 - 50	6-12		
Nutrient removal effluent quality following nutrient removal treatment[2]	5 - 20			5 - 20	<2		
ANZECC 2000 – Primary Industries[3]	<15		3000	25 – 125[4]	0.8 - 12[4]		6-9

[1]Kebede, T. B. 2018. *Wastewater treatment in brewery industry*, review. International Journal of Engineering Development and Research. Available at: https://www.ijedr.org/papers/IJEDR1801124.pdf

[2] Treatment process category D from Appendix 6 of ARMCANZ and ANZECC 1997. *National Water Quality Management Strategy – Australian Guidelines for Sewerage Systems – Effluent Management*. Commonwealth of Australia.(NWQMS)
[3] National Water Quality Management Strategy Paper No. 4 – Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 3 Primary Industries, 2000, ANZECC and ARMCANZ (ANZECC 2000).
[4] ANZECC 2000, requires site specific assessment to determine actual value
[5] Applicant submitted water quality criteria for the WWTP

The delegated officer has determined to add the following parameters for monthly sampling during time-limited operations to determine the wastewater characteristics and to confirm nutrient loading. They are total nitrogen, nitrate/nitrites (NOx) total phosphorus, phosphate (PO4), pH, electrical conductivity, total dissolved solids, total suspended solids, biological oxygen demand, sodium adsorption ratio (SAR), calcium, magnesium, potassium, sodium, and total organics.

3.3 Irrigation of wastewater

Hydraulic loading impact analysis

Table 4 outlines the rainfall climate statistics for Esperance. Mean monthly rainfall over the year ranges from 20 to 91 mm, with three months June – August where rainfall exceeds evaporation.

Table 4: Rainfall climate statistics for Bureau of Meteorology Esperance site 009789

	January	February	March	April	May	June	July	August	September	October	November	December
Mean number of rain days equal to or greater than 1mm	3.1	3	4.3	6.9	9.5	11.7	13	12.2	10	7.7	5.5	3.3
Mean monthly rainfall (mm)	32.07	22.07	29.56	45.98	63.35	76.21	88.12	91.27	61.29	48.43	34.62	20.09
Mean monthly evaporation (mm)	223.2	187.6	170.5	117	83.7	66	68.2	86.8	111	151.9	180	217
Deficit (mm)						10.21	19.92	4.47				
Average monthly evaporation (mm)	7.2	6.7	5.5	3.9	2.7	2.2	2.2	2.8	3.7	4.9	6	7

Note: Orange shaded areas indicate rainfall exceeds evaporation.

The preliminary assessment of the wastewater hydraulic loading at the premises indicates that the size of the irrigation area (0.57ha) is sufficient to enable moisture to be taken up by vegetation or retained within the soil profile without excessive moisture seepage into groundwater from irrigation.

The preliminary assessment of hydraulic loading is estimated using the Environmental and Health Protection Guidelines 1998. Using:

- design irrigation rate for sandy soils from AS/NZ 1547 (DIR = 5mm)
- runoff coefficient for minimal slope sand (RC=0.13)
- daily irrigation rates of 4,041.78 litres
- Bureau of Meteorology Esperance site 009789 (7.3 km south-southwest of premises)

Using the above values the land area required is approximately 0.1187 ha.

The applicant has proposed to install 100 kL of storage and 0.57 ha of kikuyu grass for irrigation and calculated that they had adequate storage based on reductions in production during the cooler parts of the year to reduce storage and irrigation requirements. The applicant proposed to irrigate over 10 months (August – May) storing wastewater over 2 months (June – July), and reduced irrigation in August, consisting of 96.25 kL/ha (adjusted to 54.86 kL for 0.57 ha). The production reduction proposed by the applicant was to reduce beer production to 11 kL in June and August, to 9 kL in July, one malt batch in June, and no malt batches in July and August.

The delegated officer considered the applicant's production decrease and storage requirements, that the difference between rainfall and evaporation for August is under 5 mm and has an average of 12.2 days of rainfall 1mm or above, considered the winter storage capacity for June and July, and the reduced irrigation in August to be insufficient.

The delegated office considered that rainfall event management was required to reduce the risk of hydraulic overloading and conditioned the following irrigation restrictions:

- **No irrigation during and 24 hours after a rainfall event greater than 3 mm in August or 10 mm from September to May.**

Nutrient loading impact analysis

The lack of verified and appropriately sourced water quality data prevents the delegated officer analysing potential organic, nitrogen, phosphorus, potassium, and salt loadings to the environment with any certainty.

An analysis based on worst case brewery wastewater (see Table 3) using the NSW EPA 1998 nutrient loading impact analysis using the applicants control of 8 weeks storage during winter determines the following.

Nutrient loading impact analysis - nitrogen

A preliminary assessment[1] of nutrient loading rates within the proposed irrigation areas indicates that 0.57 ha is a sufficient land area for pasture to remove all the nitrogen that is applied in the irrigated wastewater.

[1] The land area required to ensure that a particular crop takes up all the nitrogen applied within a disposal area can be estimated using the following equation (NSW EPA, 1998):

$A = (C \times Q) / L_N$

Where:
A = land area (m^2)
C = concentration of N in wastewater (mg/L) – 80 mg/L
Q = treated wastewater flow rate (L/d) – proposed 4041.78 L/day
L_N = critical loading rate (uptake rate) for N for a specific crop ($mg/m^2/day$) – considered to be approximately 36 $mg/m^2/day$ (refer to appendix 6 in NSW EPA, 1998)

Using the above values in the equation gives a required land area of 0.9 ha for a 44-week irrigation period. It is noted that this preliminary assessment is based on Table 3 typical brewery raw wastewater. (If nitrogen concentrations are lowered to 51 mg/L then an irrigation area of 0.57 ha may be sufficient.)

The above calculations are used as an estimate of the land area required for irrigation and may not accurately represent what may occur onsite. The results indicate that if 4,041.78 L/day of wastewater is irrigated over 44 weeks overloading of nitrogen at the premises is unlikely if total nitrogen levels are below 51 mg/L.

Nutrient loading impact analysis - phosphorus

Unlike nitrogen, phosphorus that is applied to crops in irrigation water is not directly taken up by vegetation. It takes between 6 to 12 months for phosphorus to be chemically changed in the soil by microbes to be available in a form for plant uptake. The operational life of a wastewater irrigation scheme is limited by the phosphorus storage capacity of the soil profile between the land surface and the groundwater.

The NSW EPA 1998 land area requirement was used to calculate phosphorous loading rate to land

area, (refer to equation in nitrogen loading impact analysis) using Table 3 typical brewery raw wastewater phosphorus concentration of 50.0 mg/L. A land area of approximately 5.05 ha is required for a 44-week irrigation schedule. (Alternatively, 0.57 ha may be sufficient for the proposed 4,041.78 L/day if the average phosphorus concentration in the wastewater was reduced to 5.6 mg/L.) See nutrient balance for further discussion.

Nutrient loading impact analysis – biological oxygen demand (BOD)

The NSW EPA 1998 land area requirement was used to calculate the BOD loading rate to land area (refer to the equation in nitrogen loading impact analysis) using Table 3 typical brewery raw wastewater BOD concentration of 3,600 mg/L. A land area of approximately 0.49 ha is required for a 44-week irrigation schedule.

Nutrient loading and plant uptake

The applicant initially provided plant nutrient uptake levels for nitrogen (389 kg/ha/yr) and phosphorus (49 kg/ha/yr) based on NSW DPI nutrient removal data for kikuyu. This study was based on kikuyu growth rates on loam soil in a sub-tropical environment within a high aseasonal rainfall area. The nutrient uptake levels provided by the applicant are unrealistic for conditions in Esperance which is a cool Mediterranean environment on sandy soil with an annual rainfall of 650 mm.

Additional information was provided by the applicant for kikuyu pasture growth and nutrient export rates for Esperance Sportsground for nitrogen (567 kg/ha/yr) and phosphorus (47.8 kg/ha/yr) based on harvesting 16.2 tonnes/year.

DWER used the Department of Primary Industries and Regional Development (DPIRD) 1978 kikuyu grass harvesting rates for the southwest region of Western Australia that indicated in an optimum growing environment, 15 tonnes/ha/dry matter could be harvested. According to DPIRD (2018) and Fulkerson (2007) kikuyu typically removes 35 kg/ha of phosphorus (P) and 39 kg of nitrogen (N), (noting that higher rates of nitrogen have been recorded for mixed kikuyu and ryegrass crops).

Kikuyu is a subtropical species, that is dormant in the south of Western Australia in winter, combined with an unknown summer supplementary water regime, and unknown wastewater characteristics, on a low organic sandy soil, kikuyu is unlikely to have optimum growth unless actively managed. The delegated officer determined to use a 50 % maximum productivity level, as no information was provided on supplementary watering and nutrient management to obtain optimum growth. Using 7.5 tonnes/ha/dry matter harvested, this equated to removing 17.5 kg P/ha and 19.5 kg N/ha.

The applicant provided further nutrient export data that was calculated by DPIRD using 7.5 tonnes/yr harvested (50% maximum productivity level) and kikuyu plant analysis rates from Reuter and Robinson (1997), indicating 262.5 N kg/ha and 22.5 P kg/ha removed via harvesting.

Nutrient loading details are listed in Table 5. Details of how the wastewater loading was calculated were not provided by the applicant. The concentration values for total nitrogen and phosphorus are unknown and whether brewery and malt wastewater were considered in the applicant's calculations. Whilst all harvesting calculations are theoretical until data including tissue analysis is provided.

Table 5: Nutrient loading analysis

	Scenario	Total nitrogen	Total phosphorus
Wastewater loading	**Applicant supplied nutrient loading rate applied from WWTP (source unverified)**	48.14 kg/ha	17.47 kg/ha
	DWER calculated nutrient load using the applicant's unverified wastewater quality data (from Table 3)	27.45 kg/yr	9.96 kg/yr
	DWER worst case scenario for treated brewery wastewater (see Table 3).	Using 80 mg/L concentration	Using 50 mg/L concentration

		118 kg/yr	80.7 kg/yr
Hravesting rates (dry matter)	**DWER calculated nutrient removal through harvesting based on DPIRD research in south Western Australia at 50% optimum as 7.5 tonnes /ha**	19.5 kg/ha	17.5 kg/ha
	Applicant calculated nutrient harvesting rates (using 16.2 tonnes/ha harvested (100% optimum) and Esperance Sportsground nutrient dry matter rates)	567 N kg/ha (at 50% 284 kg/ha/yr)	47.8 P kg/ha (at 50% 24 kg/ha/yr)
	DPIRD calculated nutrient harvesting rates (using 7.5 tonnes/ha harvested (50% optimum), 3.5% N and 3 % P content[1])	262.5 N kg/ha	22.5 P kg/ha

Note 1: nutrient content from Reuter and Robinson (1997) Plant Analysis-An interpretation Manual (pastures kikuyu), CSIRO Publishing

Without viable treated wastewater characteristic data, the calculation of loads is theoretical. DWER has calculated that without adequate wastewater treatment, irrigation to land could be unviable (phosphorus impact analysis for worst-case brewery wastewater.) An assessment of salt, potassium, and organic loading was not undertaken due to no representative data being provided for assessment.

The delegated officer considered that monitoring wastewater during time-limited operations is critical to producing viable wastewater characteristic data. A reassessment of the loading levels and viability of the wastewater irrigation should be reconsidered at the licensing stage. Acknowledging that a combination of the following is required at licensing stage to demonstrate the viability of long term irrigation at the site, including wastewater quality data, tissue analysis data from kikuyu harvested, demonstration of adequate supplementary irrigation water, and/or an alternative crop is considered (that can take up more nutrients and/or not require additional supplementary water).

The delegated officer agrees that kikuyu lawn is feasible to remove nutrients from nutrient-rich wastewater. The delegated officer has determined to condition the following nutrient loading rate limits. Limits for nitrogen and phosphorus are based on the applicant's calculations for Esperance Sportsground harvesting rates for kikuyu at 50 % optimum growth (16.2/2 = 8.1 tonnes/ha)). A loading limit for BOD was added based on the NSW EPA guidelines of 1,500 kg/ha/month to prevent soil clogging and odour :

- **284 kg/ha/yr for total nitrogen**
- **24 kg/ha/yr for total phosphorus.**
- **1500 kg/ha/month for biological oxygen demand**

The delegated officer has determined to add the following treated wastewater limits in the works approval in line with ANZECC long term irrigation guidelines and NSW DPI, they are:

- **290 mS/m (2.9 dS/m or 1,856 mg/L) electrical conductivity irrigation limits**
- **5.5-9.0 pH irrigation range limits**
- **<6 SAR irrigation limit.**

Soil assessment

VRT Solutions undertook one soil test, digging 4.2 metres below ground level (mbgl). The soil was assessed at 30 cm increments indicating that the profile was a non-wetting sand. Soil moisture was detected at 2.5 mbgl and the water table 4.3 mbgl. The test was undertaken in January 2022, and groundwater is likely to peak in September. Indicating that peak groundwater is likely to be higher and may peak between 2-3 mbgl.

The applicant provided details of seven soil analyses of the land application area completed by

CSBP labs. No laboratory data sheets, or NATA accreditation of the lab was provided. The results provided that the land application areas have low levels of nitrogen, phosphorus, and organic carbon. PBI levels ranged from 36.1 to 21.0 indicating that the soils in the land application areas have low ability to bind phosphorus and leaching potential of the soil is high. The pH ranged from 7.5 to 8.0 indicating a slight alkaline soil.

The applicant indicated future soil monitoring would be undertaken, but did not provide details. Furthermore, the applicant indicated that a centrally located monitoring bore will be installed to monitor groundwater.

The delegated officer noted that groundwater could be within 2 - 3 metres of the surface, flows north-northeast to south-southwest, the soil type, the unverified wastewater quality and that the soil nutrient levels are low. The wastewater should be treated to a sufficiently high level to prevent the degradation of soil and groundwater quality at the irrigation sites. Therefore, the delegated officer has determined to monitor the soil health every five years by a NATA accredited laboratory for the following parameters, total nitrogen, nitrogen oxides (NOx), total kjeldahl nitrogen, total phosphorus, phosphate, sodium absorption ratio, cation exchange capacity, exchangeable cations, and phosphorus buffering index. Furthermore, two monitoring bores up and down gradient of the premises will be installed and monitored quarterly, for standing water level, pH, electrical conductivity, total nitrogen, total phosphorus, biological oxygen demand and total dissolved solids.

3.4 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for each identified emission source and considers potential source-pathway and receptor linkages as identified in Section 3.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the applicant has proposed mitigation measures/controls (as detailed in Section 3.1), these have been considered when determining the final risk rating. Where the delegated officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

Additional regulatory controls may be imposed where the applicant's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 6.

Works approval W6908/2024/1 that accompanies this decision report authorises construction, environmental commissioning, and time-limited operations. The conditions in the issued works approval, as outlined in Table 6 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

A licence is required following the time-limited operational phase authorised under the works approval to authorise emissions associated with the brewery and malt facilities operations of the premises i.e. brewery and malt operations, treatment of wastewater and discharge of emissions to land. A risk assessment for the operational phase has been included in this decision report, however licence conditions will not be finalised until the department assesses the licence application.

Table 6: Risk assessment of potential emissions and discharges from the premises during construction, commissioning and operation

Risk events					Risk rating [1] C = consequence L = likelihood	Justification for additional regulatory controls	Regulatory controls – conditions of works approval
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**			
Construction							
Placement of WWTP tanks, malt equipment including vehicle movements (reversing beepers). Construction of gravel and concrete hardstands and pipeline trenches.	Noise	Air / windborne pathway causing impacts to health and amenity	Residences 350 m north, 720 m south and 850 m west of the premises boundary.	No controls. Refer to Table 1	Minimal impact to amenity C =Slight The risk event will probably not occur at some time. L = Unlikely **Low Risk**	The delegated officer considered the construction works as minor and intermittent in nature and the distance to residential receptors and considered the risk to be low. The works approval holder will be required to meet *the Environmental Protection (Noise Regulations) 1994*.	N/A
Operation (including time-limited-operations operations)							
Malt manufacturing and bagging and storing	Nutrient laden wastewater generated from processing and cleaning of the malt manufacturing equipment and packaging.	Runoff/direct discharge from brewery/distillery operations and infiltration causing contamination of soils, ground, and surface waters.	Groundwater within 2-3 m of the surface, licenced groundwater user 1.4 km west of premises, Bandy Creek 550 m west and 690 m south southwest of premise, RAMSAR ecosystem 745 m north of premises	Complete containment in process vessels, then pumped to WWTP. The steeping and growing vessel and on bunded concrete hardstand with below ground sump with a transfer pump back to raw water tank. . Refer to Table 1	Low level onsite impacts, minimal offsite impacts to environment C = Minor The risk event will probably not occur at some time. L = Unlikely **Medium Risk**	All malt processing and packaging occurs within either enclosed buildings or enclosed vessels on a concrete bunded hardstand with a sump that will direct spills and contaminated stormwater to the WWTP. The delegated officer considered the enclosed design of the operation, the distance to environmental receptors, and groundwater table and assessed the risk as medium. The applicants' controls were assessed and considered acceptable to mitigate the risk of wastewater impacting on the environment causing contamination. The delegated officer applied the applicant's controls and infrastructure requirements, which are considered critical for maintaining an acceptable level of risk as conditions in the works approval.	Applicant controls
	Dust	Air / windborne pathway causing impacts to health and amenity	Residences 350 m north, 720 m south and 850 m west of the premises boundary.	Malt process occurs in sealed vessel, all grain and malt is conveyed via enclosed belt with drag chain equipment, packaging occurs inside building. Refer to Table 1.	Low level local scale impact to amenity C = Minor The risk event will probably not occur at some time. L = Unlikely **Medium Risk**	All malt processing and packaging occurs within either enclosed buildings or enclosed vessels on a concrete bunded hardstand, malt is transferred via an enclosed conveyor belt with a drag chain and any spills are swept up. The delegated officer considered the enclosed design of the operation, and the distance to residential receptors and assessed the risk as medium. The delegated officer applied the applicant's controls and infrastructure requirements, which are considered critical for maintaining an acceptable level of risk as conditions in the works approval.	Applicant controls
	Noise			Fans in malt and kiln vessels have fans enclosed within ducting and vessels. Ducting to reduce fan noise in kiln. . Refer to Table 1	Low level local scale impact to amenity C = Minor The risk event will probably not occur at some time. L = Unlikely **Medium Risk**	The delegated officer considered the operation of the malt facility and its enclosed fans and ducting to reduce noise emissions and considered the malt operation to be intermittent in nature and the distance to residential receptors and considered the risk to medium. The delegated officer determined that the applicant's controls were deemed to be sufficient to manage noise emissions and that the applicants will be required to meet *the Environmental Protection (Noise Regulations) 1994*.	Applicant controls
Management of malt solid waste	Nutrient laden solids prior to removal offsite	Direct discharge to land causing contamination of soil.	Groundwater within 2-3 m of the surface, licenced	Complete containment in process vessels, then pumped to	Minimal onsite impact to environment C =Slight	Malt culms from operations will be placed and transferred to a sealed vessel before being transported from the premises as animal feed. The delegated officer assessed the risk as low and does not reasonably foresee off-site environmental receptors being impacted by solid waste from the malt operations and solids screen. The delegated officer will regulate the licence holder's controls, to ensure the risk event is maintained at a low level.	Applicant controls

Risk events					Risk rating [1] C = consequence L = likelihood	Justification for additional regulatory controls	Regulatory controls – conditions of works approval
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**			
			groundwater user 1.4 km west of premises, Bandy Creek 550 m west and 690 m south southwest of premise, RAMSAR ecosystem 745 m north of premises	WWTP. The steeping and growing vessel with be on bunded concrete hardstand. Culms transferred to storage vessel. Solids screen located in the entry to raw water tank . Refer to Table 1.	The risk event will probably not occur at some time. L = Unlikely **Low Risk**		
Management of alcohol and malt manufacturing wastewater	Odour from wastewater processing	Air / windborne pathway causing impacts to health and amenity	Residences 350 m north, 720 m south and 850 m west of the premises boundary.	Processing is within tanks (some enclosed) and stored. . Refer to Table 1	Low level impact to amenity at local scale C = Minor The risk event will probably not occur at some time. L = Unlikely **Medium Risk**	With the nature of wastewater, there is an inherent risk of odour causing impacts to offsite receptors, particularly from wastewater stored in tanks for a period. The delegated officer considered the distance to the receptors and determined the risk as medium. The delegated officer will regulate the licence holder's controls, to ensure the risk event is maintained at a medium risk level.	Applicant controls
	Spills, leaks and overtopping of wastewater containments with nutrient laden wastewater and sludge processed through the WWTP	Direct contamination of soils, and groundwater, overland flow to surface water tributaries.	Groundwater within 2-3 m of the surface, licenced groundwater user 1.4 km west of premises, Bandy Creek 550 m west and 690 m south southwest of premise, RAMSAR ecosystem 745 m north of premises	Gravity discharge system. Treatment storage tank gravity overflow back to the raw water tank. Waste captured in enclosed container. The 3 WWTP reactor vessel with be on bunded concrete hardstand with a below ground sump with a transfer pump back to raw water tank on gravel hardstand. . Refer to Table 1	Low level impact to amenity at local scale C = Minor The risk event will probably not occur at some time. L = Unlikely **Medium Risk**	Wastewater from the brewery and malt facilities drains to the raw water tank before being transferred to the three reactor tanks, biochar tank, and irrigation holding tanks. Overflow from the irrigation tanks is gravity-fed to the raw water tank for treatment. The delegated officer considered that no high-level alarms were on tanks only visible level gauges, all tanks enclosed (lids), that only the reactor tanks were within bunded concrete hardstand and that tanks were de-sludge and biochar removed as required from tanks. The delegated officer noted that the groundwater could be within 3 m below ground level, the soil was porous and had a low ability to bind phosphorus, and the distance to environmental receptors and determined the risk as medium. The delegated officer considered that the applicants' controls were not sufficient to manage the risk of spills, leaks, and ruptures and considered it necessary to specify the following: • Raw water tank is fitted with visible sensor levels that visually demonstrate tank levels. • Excess wastewater that exceeds storage and treatment containments and authorised irrigation is removed from the premises. • Raw water tank is de-sludged and biochar replaced at a minimum every two years. • All tanks and sumps and wastewater transfer pipelines are visually inspected for leaks and ruptures once a month and reported in a log book.	Construction requirements • Raw water tank fitted with level sensors with visual display. Operation requirements • Excess wastewater to storage and treatment containment is trucked offsite. • Sensor levels are maintained in working condition. • Wastewater transfer pipeline and containments are visually inspected for leaks and ruptures once a month. • Raw water tank de-sludged at a minimum once every two years.
On site disposal of wastewater via irrigation to land 0.57 ha	Nutrient rich wastewater to land	The discharge of wastewater to land through irrigation potentially contaminating soil, ground and surface waters on the premises and surrounding lands.		No irrigation from June to July with 100 kL storage. Limited irrigation in August. Malt and brewery production to decrease over winter to reduce wastewater. 18 mm maximum irrigation rate. Rain sensor on irrigation controller to prevent irrigation when raining. Rotation of irrigation stations (zones) to allow areas to dry out. Monitoring bore installed. Irrigation soil	Mid-level onsite impacts, low level local scale impacts to environment C = Moderate The risk event could occur at some time. L = Possible **Medium Risk**	The delegated officer considered the proposed treatment of the wastewater before irrigation, including settling, aeration, and storage. That wastewater will be stored from June to July and reduced irrigation in August from production decrease. Kikuyu lawn will be mowed and cuttings removed to green waste, and soil testing and groundwater monitoring (no detail supplied) will be undertaken. Irrigation will be rotated through seven stations and irrigation will stop when raining. The delegated officer considered the applicants' proposed operational controls and management to be insufficient to manage the risk of nutrient loading exceeding the land capacity causing contamination of soil, ground, and surface waters, The delegated officer has assessed the irrigation of nutrient-laden wastewater as medium risk. The applicant supplied wastewater samples from other facilities and unverified concentration data to represent the wastewater quality. The delegated officer determined that the level of detail was insufficient. Due to the lack of certainty of the treated wastewater water quality the delegated officer considered that monthly wastewater monitoring during time-limited operations was required for the following parameters. They are total nitrogen, nitrate/nitrites (NOx), total phosphorus, phosphate (PO_4), pH, electrical conductivity, total dissolved solids, total suspended solids, biological oxygen demand, sodium adsorption ratio (SAR), calcium, magnesium, potassium, sodium, and total organic. The applicant provided soil samples from the irrigation site that indicated that soils were porous with low levels of nutrients and low level to bind phosphorus, and that groundwater levels are likely within 2-3 meters of the surface. The delegated officer has determined to: • Apply wastewater limits on pH, electrical conductivity, and SAR. • Apply five yearly soil monitoring programs consisting of composite samples for total nitrogen, nitrogen oxides (NOx), total kjeldahl nitrogen, total phosphorus, phosphate, sodium absorption ratio, cation exchange capacity, exchangeable cations,	Construction • Sample tap on irrigation outflow. Operational • Irrigated wastewater limits for electrical conductivity 290 mS/m (2.9 dS/M), pH 5.5-9.0 pH, SAR <6 • Five yearly soil monitoring program consisting of composite samples for total nitrogen, nitrogen oxides (NOx), total kjeldahl nitrogen, total phosphorus, phosphate, sodium absorption ratio, cation exchange capacity, exchangeable cations, and phosphorus buffering index • Two monitoring bores to be installed and sampled quarterly for, standing water level pH,

Risk events					Risk rating [1] C = consequence L = likelihood	Justification for additional regulatory controls	Regulatory controls – conditions of works approval
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls			
				testing. The irrigation area mowed and clippings removed offsite. . Refer to Table 1		and phosphorus buffering index, with the first sampling to be undertaken on time limited operations. • Two monitoring bores place up and down gradient sampling quarterly for water level, pH, electrical conductivity, total nitrogen, total phosphorus, biological oxygen demand and total dissolved solids. The applicant has indicated that a rain sensor will be installed connected to the irrigation controller and determined that additional limits to irrigation on rain events greater than 3 mm in August and 10 mm September – May should be applied to limit leaching. The delegated officer assessed the nutrient loading impact for nitrogen, phosphorus, and BOD. BOD levels were determined to be sufficient. Phosphorus loading levels had the potential to be high based on the worst-case scenario, and applicants unspecified wastewater quality data and could be higher than the land area capability, requiring a greater irrigation area or an alternative crop. With the unsubstantiated wastewater quality, the delegated officer calculated the nutrient loading for a kikuyu lawn that was regularly mowed with cuttings removed at 50% optimum management and determined that the following nutrient loadings were applied to ensure wastewater was treated and that excessive nutrient enrichment of the soil is prevented during time-limited operations, they are: • 284 kg/ha/yr for total nitrogen • 24 kg/ha/yr for total phosphorus The delegated officer determined to specify the following conditions: • Sampling tap is located on the outlet to the irrigation areas. • Monthly wastewater sampling during extended time-limited operations to verify the wastewater characteristics including total nitrogen, nitrate/nitrites (NOx) total phosphorus, phosphate (PO4), pH, electrical conductivity, total dissolved solids, total suspended solids, biological oxygen demand, sodium adsorption ratio (SAR), calcium, magnesium, potassium, sodium, and total organic. • Irrigated wastewater limits for electrical conductivity 290 mS/m (2.9 dS/m), pH 5.5-9.0 pH, SAR <6. • Five yearly soil monitoring program consisting of composite samples for total nitrogen, nitrogen oxides (NOx), total kjeldahl nitrogen, total phosphorus, phosphate, sodium absorption ratio, cation exchange capacity, exchangeable cations, and phosphorus buffering index. • Two monitoring bores place up and down gradient sampling quarterly for water level, pH, electrical conductivity, total nitrogen, total phosphorus, biological oxygen demand, and total dissolved solids. The delegated officer will regulate the applicants' controls, as they were deemed essential to manage the risk including the reduction in wastewater production during winter months.	electrical conductivity, total nitrogen, total phosphorus, biological oxygen demand, total dissolved solids. • Maximum loading rates for treated wastewater applications to the irrigated area of 1500 kg/month for BOD, 284 kg/ha/yr for total nitrogen and 24 kg/ha/yr for total phosphorus for a 0.57 ha lawn.
	Wastewater to land with excessive hydraulic loading				Mid-level onsite impacts, low level local scale impacts to the environment C = Moderate The risk event will probably not occur at some time. L = Unlikely **Medium Risk**	The delegated officer considered the proposed treatment of the wastewater before irrigation, including, settling, aeration and storage. That wastewater will be stored from June to July and reduced irrigation in August from production decrease. That irrigation area is divided into 7 stations and rotated, that a rain sensor is connected to the control system, and that the applicant will undertake groundwater level monitoring and soil monitoring (no details supplied). The delegated officer considered the applicants' proposed operational controls and management to be insufficient to manage the risk of excessive hydraulic loading to the land capacity causing contamination of soil, ground, and surface waters. The delegated officer has assessed the irrigation of nutrient-laden wastewater as medium risk. The delegated officer determined that: • Irrigation operational activities will cease, when rainfall exceeds 3 mm during and 24 hours after in August and 10 mm (September-May), to prevent surface water runoff and leaching of nutrients to the environment. • Excess wastewater to storage / irrigation requirements carted offsite. • Five yearly soil monitoring programs consisting of composite samples for total nitrogen, nitrogen oxides (NOx), total kjeldahl nitrogen, total phosphorus, phosphate, sodium absorption ratio, cation exchange capacity, exchangeable cations, and phosphorus buffering index. • Two monitoring bores place up and down gradient sampling quarterly for water level, pH, electrical conductivity, total nitrogen, total phosphorus, biological oxygen demand and total dissolved solids. The delegated officer will regulate the applicants' controls, as they were deemed essential to manage the risk including the reduction in wastewater production during winter months.	Operation • No irrigation during and 24 hours after a 3mm rainfall event in August and 10mm September - May. • Five yearly soil sampling program • Installation of two groundwater monitoring wells. • Monitoring of groundwater monitoring wells. • Excess wastewater to storage needs to be carted offisite

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guideline: Risk Assessments* (DWER 2020).

4. Consultation

Table 7 provides a summary of the consultation undertaken by the department.

Table 7: Consultation

Consultation method	Comments received	Department response
Application was advertised on the department's website on 3 April 2024.	None received	N/A
Local Government Authority advised of proposal on 3 April 2024.	The Shire of Esperance replied on 22/4/2024 confirming that a development approval (AD24/3466) had been issued on 17 April 2024.	The delegated officer notes this information.
Department of Health (DoH) advised of proposal on 3 April 2024.	DoH replied on22 April 2024, advising that an approval to construct or install an apparatus for the treatment of sewerage in accordance with the Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations, 1974 was required, but had not been received.	The delegated officer notes this information. See section 2.5.
Applicant was provided with draft documents on 8 May 2024 and replied on 19 May and 6 June 2024.	Refer to Appendix 1	Refer to Appendix 1

5. Decision

Based on the assessment in this report, the delegated officer has determined the proposal does not pose an unacceptable risk of impacts to environmental receptors. Conditions have been imposed on the works approval based on the applicants' controls (Table 1) as they are considered reasonable and appropriate to maintain an acceptable level of risk.

To address the uncertain quality of the wastewater and potential negative impacts from irrigation several regulatory controls in addition to the applicants' derived controls have been imposed on the works approval (Table 6).

The delegated officer determined to apply time-limited operations to the works approval to allow the malt facility to operate, treat wastewater, and discharge wastewater to land whilst applying for a licence. It is expected during this time that the works approval holder will undertake wastewater sampling to determine wastewater characteristics, harvested material characteristics and investigate alternative crops for irrigation.

References

1. Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 3 Primary Industries.
2. Department of Environment Regulation (DER) 2015, Guidance Statement: Setting Conditions, Perth, Western Australia.
3. Department of Water and Environmental Regulation (DWER) 2020, Guideline: Environmental Siting, Perth, Western Australia.
4. DWER 2020, Guideline: Risk Assessments, Perth, Western Australia.

5. DWER 2022, WQPN 73 – Wineries and distilleries, Perth, Western Australia .
6. Department of Primary Industry and Regional Development (DPIRD) 1978. Kikuyu grass: Establishment, management and utilisation in the south west, Perth, Western Australia.
7. DPIRD, 2018, Improving subtropical grass pastures on the south coast of Western Australia, Perth, Western Australia.
8. DPIRD 2022 Water salinity and plant irrigation (last edited 2019), Water salinity and plant irrigation | Agriculture and Food, 2023, Magill, South Australia
9. Environmental Protection Authority, 2016. EPA Guideline for Wineries and Distilleries, Adelaide, South Australia
10. Fulkerson 2007, Future Dairy Tech Note – Kikuyu grass, Sydney, NSW.
11. Kebede, T. B. 2018. Wastewater treatment in brewery industry, review. International Journal of Engineering Development and Research.
12. NSW Department of Primary Industries 2016, Primefact1344: Interpreting water quality test results, Sydney, New South Wales
13. NSW Environmental Protection Authority (EPA) 1998, Environmental & Health Protection Guidelines: On site sewerage management for single households, NSW EPA Technical Guidelines
14. Reuter and Robinson (1997) *Plant Analysis-An interpretation Manual (pastures kikuyu)*, CSIRO Publishing, Canberra ACT.
15. Roo Brew Pty Ltd, 2024, Application form and supporting documents for Lucky Bay Brewing, Esperance, Western Australia
16. US Environmental Protection Authority (EPA), 2006, Process design manual, land treatment of municipal wastewater effluent, Report EPA/625/R-06/016.

Appendix 1: Summary of applicant's comments on risk assessment and draft conditions

Condition	Summary of applicant's comment	Department's response
Decision report responses		
Section 2.3 Existing and proposed infrastructure	The applicant provided existing brewery infrastructure.	This information has been updated within the report.
Section 2.4 operations	The applicant provided details on the existing brewery infrastructure, decommissioning of the brewery wastewater leach drains, water requirements, and WWTP operations	This information has been updated within the report.
Section 2.4 Operations – Land application area	The applicant requested to include irrigation in winter if seasonally opportunistic.	The delegated officer does not agree, the applicant did not provide details of the winter irrigation request for assessed.
Section 3.3 Irrigation of wastewater	The applicant provided further details of harvesting calculations for annual tonnage and nutrient removal using Esperance Sportsground and calculations undertaken by DPIRD. The applicant requested that the harvesting 50 % reduction be reviewed.	The delegated officer reviewed the additional calculations and the optimum harvesting potential. Revised nutrient loading levels were calculate, however the 50 % reduction in tonnage harvested remain as supporting details were-not demonstrated for increased harvesting potential. Noting the applicant supplied DPIRD calculations that used 50 % harvesting reduction.
Section 3.3 Soil assessment	The applicant stated that seasonal groundwater is stable at 4 mbgl.	The department notes this information and considers the groundwater monitoring for water levels will assist in determining groundwater levels.
Works approval responses		
Condtion1 Table 1 Design and construction	Applicant provided the following information: • The 5 kL clarifier tank has solids removed via an offtake outlet. • The microprocessor measures wastewater from the passive aeration simultaneous nitrification and denitrification process (MBBR tanks).	The delegated officer notes this information and has updated conditions in the works approval.
Condition 10 Table 3 Infrastructure operations	The applicant provide the following information: • that only the steep and grow vessel are wet operations. • the WWTP can process theoretically a maximum of 30,000 litre within a 24 hours. • a map of drainage of the brewery.	The delegated officer notes this information and has updated conditions in the works approval.
Condition 12 Table 4 TLO limits	The applicant requested that nitrogen limits is reviewed as the amount would not support healthy pasture growth, and requested WQPN 22 Risk Category B limits.	The delegated officer reviewed the additional information provided by the applicant for nutrient harvesting rates, and has revised the nutrient loading rates to 284 N kg/ha/yr and 24 P kg/ha/yr. WQPN 22 is not used to set limits as a site specific limit isrequired. Limits can be reviewed in the future licence once additional supporting information is supplied (see section 3.2).