



Application for Licence

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

Licence Number	L5989/1991/12
Applicant	Water Corporation
File number	2010/003537-1
Premises	Northam Water Resource Recovery Facility Crown Reserve 25729 Legal description Lot 29316 on Deposited Plan 221054 Lot 500 and Lot 501 on Deposited Plan 76392 NORTHAM WA 6401 As defined by the premises map attached to the issued licence
Date of report	3 December 2024
Decision	Licence granted

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an officer delegated under Section 20 of the *Environmental Protection Act 1986* (WA)

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1. Decision summary

This decision report documents the assessment of potential risks to the environment and public health from emissions and discharges during the operation of the premises. As a result of this assessment, licence L5989/1991/12 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 7 September 2023 the Water Corporation (the applicant) submitted an application for a licence renewal to the department under Section 57 of the *Environmental Protection Act 1986* (EP Act) for the continued operation of a Category 54 sewage facility at the Northam Waste Resource Recovery Facility. There are no requests for an alteration to the previously approved infrastructure or design capacity. The applicant requested a 5 year licence duration to support the operational continuation of the plant while infrastructure upgrades are developed, an alteration to the premises name to Northam Water Resource Recovery Facility (WRRF) and altering the method for calculating the operating throughput of the plant from a monthly average to an annual average (see Section 4).

The premises is located about 1 km north-west of Northam and consists of two sites to the south of the Avon River, separated by the Great Eastern Highway and the railway line. The primary treatment plant originally built in 1938 is located on Lot 500 and Lot 501 on Deposited Plan 76392 and consists of a grit channel, two primary sedimentation tanks, three sludge digesters, four sludge drying beds and a hardstand with three biosolids storage bays (Figure 1). The sludge generated from the clarifiers is dried on the sludge drying beds which drain leachate back into the main line to the clarifiers. The hardstand is for storage of spadeable Imhoff waste.

The partially treated wastewater from the primary plant is transferred by pipe, 800 m north-west to the secondary treatment plant on Lot 29316 on Deposited Plan 221054. Here, three secondary treatment ponds operate in parallel to treat the wastewater (Figure 2). The treated wastewater (TWW) is dosed with alum before being stored in the polishing pond to flocculate out phosphorus, turbidity and total suspended solids. Upon exiting the polishing pond TWW is disinfected by an ultraviolet (UV) disinfection unit to reduce *E. coli* levels, prior to discharging to both the Shire pond and the flume outflow.

TWW is stored in the Shire pond to supply the Shire of Northam reuse scheme and is further chlorinated upon exiting the pond prior to irrigation of public open spaces.

TWW in excess of the Shire's reuse is discharged via a flume outflow to land on the western side of the premises, prior to any excess water exiting the premises boundary through a culvert and discharging to the banks of the Avon River.

The premises relates to the category and assessed design capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in licence L5989/1991/12 and in Table 1 below. The infrastructure and equipment relating to the premises category and any associated activities which the department has considered in line with *Guideline: Risk Assessments* (DWER 2020) are outlined in licence L5989/1991/12.

Table 1: Prescribed premises category description

Prescribed Premises category description (Schedule 1, <i>Environmental Protection Regulations 1987</i>)	Assessed design capacity
Category 54 sewage facility: premises – <ul style="list-style-type: none"> a) on which sewage is treated (excluding septic tanks); or b) from which treated sewage is discharged onto land or into waters. 	1,500 m ³ per day

2.3 Imhoff tank waste acceptance

During the assessment process the department was made aware of an additional process that was occurring on the premises, being the collection, consolidation and drying of Imhoff tank waste. Cunderdin, Wundowie, Meckering, Narembeen, and Kellerberrin wastewater treatment plants operate with Imhoff tank systems. Imhoff tanks are cleaned out on a 13-week schedule, however if there is not a sufficient volume of Imhoff sludge then the clean out will not take place until 26 weeks. Therefore, each plant undergoes Imhoff tank cleaning approximately 2-3 times per year, generating approximately 100 m³ per year. The waste is dried in the Imhoff drying beds at the source plants. Once it is adequately dry and spadable it is transported to the Northam WRRF for collated storage within the hardstand biosolids storage bays at the primary plant. These bays contain the waste, collect any contaminated stormwater runoff and direct it back into the clarifiers. Once adequate volumes of Imhoff waste are collated at Northam WRRF it is transported to the Northam landfill, being the most appropriately licensed landfill facility to accept this waste.

The quantity of Imhoff waste to be received at Northam WRRF falls below the production capacity for both Category 61A solid waste facility and Category 62 solid waste depot, so neither of these categories are required to be added to the Northam licence. Imhoff waste will, however, be added as a waste type approved for acceptance at the premises, with associated conditions as necessary in the licence for management of this waste.



Figure 1: Map of the infrastructure layout at the primary premises



Figure 2: Map of the infrastructure layout at the secondary premises

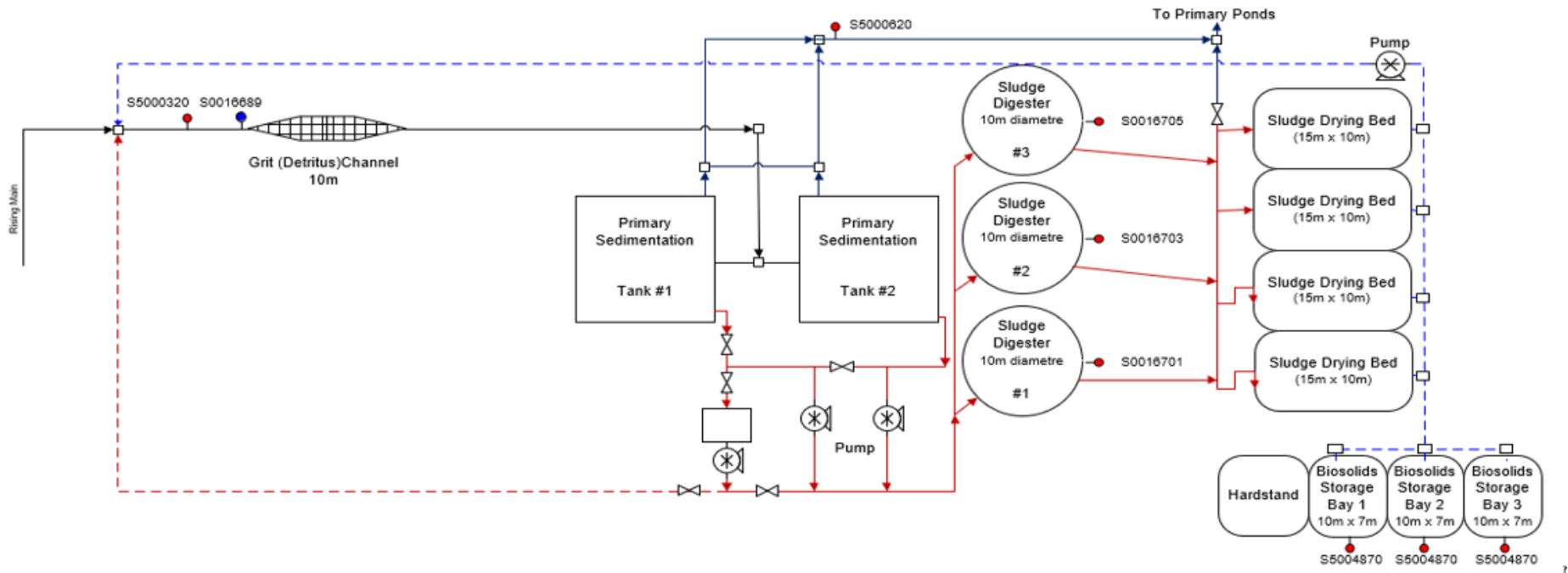


Figure 3: Schematic for the primary premises

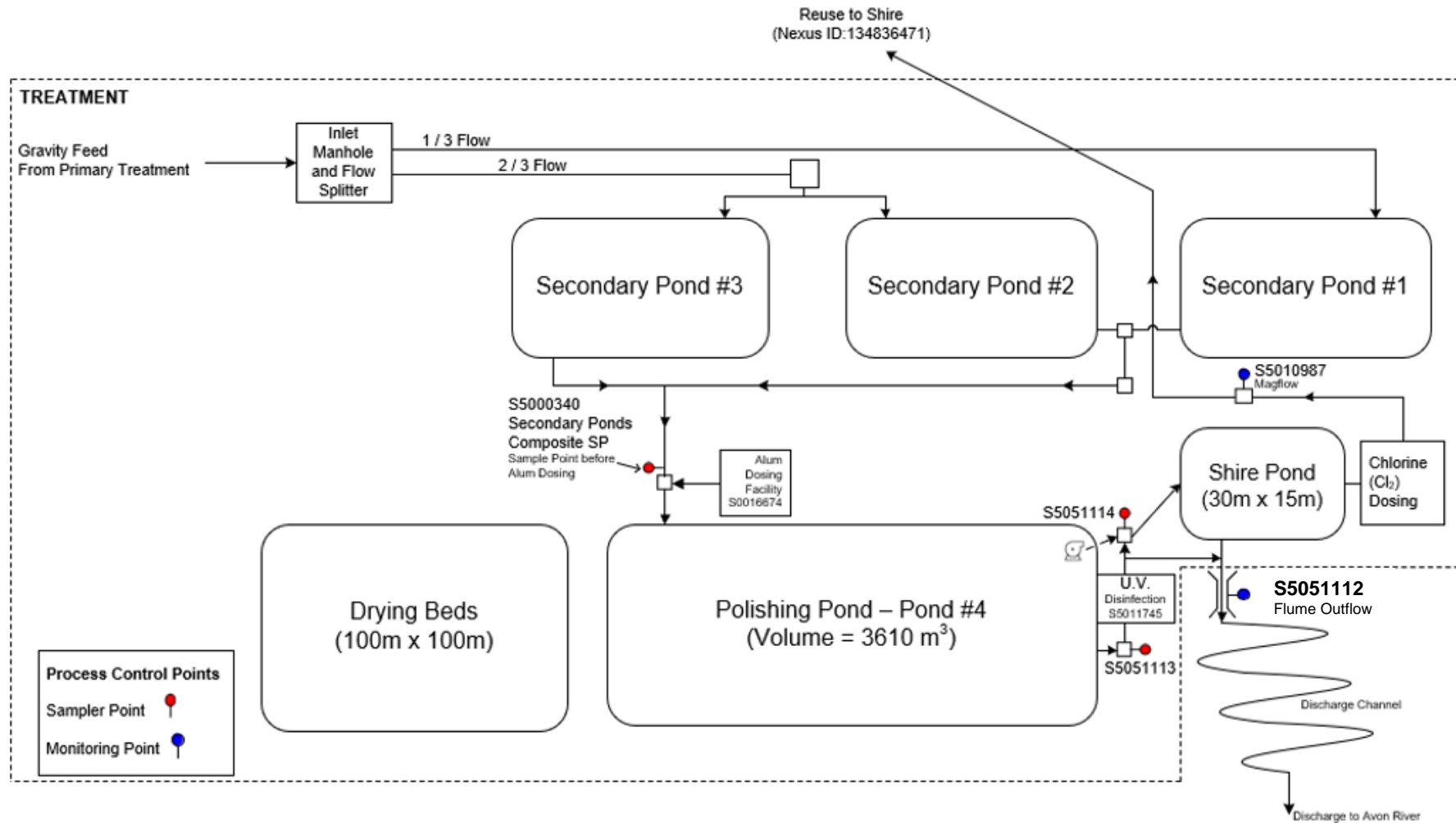


Figure 4: Schematic for the secondary premises

2.4 Part V of the EP Act

With the aim of improving TWW quality and to foster utilisation of TWW reuse off-site, in 2012 the former Department of Environment Regulation (DER) imposed conditions on the Licence (L5989/1991/10) which required Water Corporation to prepare, submit and implement an Environmental Improvement Plan (EIP). The EIP was required to incorporate actions and associated completion dates to achieve the ANZECC water quality guidelines for surface water in the Avon River by 31 December 2017. The timeframe was set to allow Water Corporation sufficient transitional time to either upgrade treatment infrastructure or determine alternative reuse or disposal options for TWW.

On 3 July 2013 the Water Corporation submitted an EIP and committed to the cessation of TWW discharges to the Avon River by winter 2015; thus, the need to meet ANZECC water quality criteria was considered redundant. Water Corporation would retain the discharge point to the Avon River for excess TWW during emergency overflow events.

On 30 March 2015 Water Corporation advised DER that based on the current inflow to the plant they would be unable to cease discharge to the Avon River by winter 2015.

Water Corporation then submitted a revised the EIP to DER on 16 June 2015 citing that the majority of TWW will either be used by the Shire to irrigate parks and gardens or pumped to the Northam Racecourse for irrigation; and Water Corporation would retain the discharge point to the Avon River for excess TWW that is surplus to reuse requirements.

The former Department of Water (DoW) provided advice to DER on 27 June 2016 recommending that routine discharge of TWW to the Avon River be phased-out in favour of alternative disposal options such as reuse for irrigation and that further discussion should be held with all agencies involved in order to establish current environmental goals and objectives and to discuss further management options.

On 4 July 2016 DER wrote to Water Corporation advising that DoW had recommended the ecosystem condition (disturbance status) of the Avon River was considered to be 'slightly to moderately disturbed', as defined in the ANZECC (2000) guidelines. DER communicated to Water Corporation that this criterion be considered as part of assessing surface water quality in the Avon River with regards to the related TWW discharges. DER also outlined concerns relating to the sole-use of dilution and mixing zones to mitigate potential impacts to the Avon River from TWW discharges. In light of the above advice DER requested Water Corporation to revise the EIP for the site and submit this by 30 September 2016.

On 4 October 2016 Water Corporation submitted an amendment application to DER. The application related to a proposal to undertake an Environmental Impact Assessment (Hydrobiology, 2018) to assess discharges of TWW to the Avon River against the ANZECC classification of the surface water system, to determine future upgrade options and potential amendment of the EIP. Water Corporation subsequently withdrew this application on 22 March 2017, however proceeded to conduct the EIA and a Detailed Site Investigation (Cardno, 2018).

The Water Corporation lodged an application for a Works Approval W6224/2019/1 on 31 July 2018 to upgrade the treatment capacity of the Northam WRRF from 1,500 m³/day to 2,000 m³/day, line the ponds, reconfigure and upgrade the pond system to improve the quality of TWW discharged to the environment. The throughput of 2,000 m³/day was not anticipated to be reached until 2048. It was intended that once the upgrades were complete and operational, the primary treatment plant would be decommissioned. The proposed works aimed to reduce the quantity of discharge to the Avon River and improve treated water quality. An EIP was also provided to meet Conditions 1, 2 and 3 of the current Licence. The Works Approval was granted on 23 December 2019. The Water Corporation advised on 22 January 2020 it no longer intended on proceeding with the Smart Pond System as approved under Works Approval W6224/2019/1.

The Water Corporation subsequently lodged an application for a Works Approval W6910/2024/1 on 22 February 2024 to upgrade the treatment capacity of the plant from 1,500 m³/day to 2,000 m³/day and construct an Oxidation Ditch system. The Works Approval will be assessed separately to the licence renewal assessed within this Decision Report.

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2.5 Aquatic ecological classification of the Avon River

ANZG Classification of the Avon River

The ANZG Water Quality Guidelines (2018) provide important information on ecosystem condition, stating that:

‘the level of protection is selected to maintain the existing ecosystem condition or enhance a modified ecosystem by targeting the most appropriate level of condition’.

As such, the Avon River should be managed as a high conservation or ecological value system given the high ecological values associated with the river, such as the existence of Rakali (also known as the Australian Otter or water rat) and the near threatened snake-necked turtle.

Efforts have been underway for many years to restore the Avon River and improve its water quality. Also, significant government investments have been made in oxygenating the Swan River, which the Avon River is a tributary of, to protect its ecology from eutrophication symptoms such as deoxygenation, algal blooms and loss of biodiversity.

Determining if effluent is appropriate for discharge to the Avon River

The following process is the recommended approach to determine if effluent from the Northam WRRF is suitable for discharge to the Avon River. This is a contemporary approach that will provide an additional line and weight of evidence to inform licensing decisions moving forward. Further information can be found in ANZG (2023) guideline *Guidance on the use of ecosystem receptor indicators for the assessment of water and sediment quality* for further information.

1) Undertake a review of all available toxicant data associated with the premises to first characterise the treated wastewater discharges, which helps determine the analytes required for future testing. This includes Contaminated Sites data, EIA data, and treated wastewater discharges data. Because the level of wastewater treatment affects contaminant removal, it should be considered when selecting analytes for future testing.

2) If there is inadequate data to characterise effluent from the WRRF, then Direct Toxicity Assessment (DTA, also known as Whole Effluent Toxicity (WET)) testing should be undertaken on a suite of environmentally relevant freshwater species across a range of trophic levels, consistent with the guidelines. For more information about DTA, see page 19 of the ANZG (2023) guideline. As an example the following tests might be used:

- 72-hour microalgal growth inhibition test e.g., *Selenastrum capricornutum*
- 7-day macrophyte test e.g., *Lemna disperma*
- 7-day cladoceran partial life-cycle test e.g. *Ceriodaphnia dubia*
- 10-day rainbowfish embryo-larval development test e.g., *Melanotaenia splendida*

The objective of this sampling is to first determine if there is any associated toxicity with effluent from the Northam WRRF. Depending on the magnitude of toxicity experienced, Toxicity Identification and Evaluation (TIE) may be required (see step 3).. Secondly, the level of dilution required to mitigate toxic effects needs to be determined. This level of dilution is an output (result) of Direct Toxicity Assessment tests.

Sampling should be undertaken quarterly for one year, with the timing of sample collection being reflective of when a majority of the treated wastewater is exiting the UV disinfection unit each day. Justification for the timing of sampling should be given as well as plots that are representative of the daily outflow of WRRF effluent over the previous year.

3) If toxicity is experienced from the DTA in step 2 then a TIE analysis should be undertaken to determine the components of the effluent that cause toxicity. For more information about TIE, see page 23 of the ANZG (2023) guideline. Thus, the TIE analysis refines the list of components required for ongoing monitoring and indicates the requirements for further treatment or management (e.g., regulating industrial sewer discharge).

Note that a specialist NATA-accredited ecotoxicology laboratory should be used for all testing described above.

Maximum acceptable nutrient concentrations of effluent for discharge to the Avon River

Based on the 2021/22 Annual Environmental Report (AER), WWRF effluent had total nitrogen (TN) concentrations of 36 mg/L (25-42 mg/L) and total phosphorus (TP) concentrations of 0.63 mg/L (0.34–1.1 mg/L). About 78% of the nitrogen was in the form of ammonium and <1% as nitrate, indicating a high proportion of nitrogen is bioavailable. Modelling of nutrient losses from land uses in the Avon Basin, which included the Northam WWRF, found that on average for the period of 2001–10 the WWRF contributed approximately 2.5% of the nitrogen load (5.4 t/yr) and 1.1% of the phosphorus load (0.06 t/yr) each year. However, recently phosphorus loads from the WWRF have doubled (currently 0.15 t/yr) and nitrogen loads have also increased slightly (currently 5.7 t/yr).

Because phosphorus can accumulate in rivers and estuaries, its discharge should be prevented at concentrations above what is typical for a slightly to moderately disturbed upland rivers in south-west Australia being 0.02 mg/L (see Table 3.3.6 in ANZECC & ARMCANZ (2000)).

Although nitrogen can be removed from rivers and estuaries through biological processes, it is not a harmful toxicant that requires dilution. However, the discharge of treated effluent when stream flow is very low during summer months will increase the risk of algal blooms. Additionally, mean total nitrogen concentrations in the Avon River upstream of the discharge are 2.4 mg/L. For context, guideline total nitrogen concentrations for upland rivers are 0.45 mg/L. This demonstrates that the river is above its capacity to assimilate nitrogen and that discharges of high concentrations (and loads) of nitrogen should be prevented.

Criteria for nutrient discharge can be determined based on the outcomes of the ecotoxicity assessment.

Key findings

1. The Delegated Officer notes that the Avon River area should be managed as a 'high conservation or ecological value system'.
2. The Delegated Officer notes the recommended approach to determine if effluent is appropriate for discharge to the Avon River, and that this should be conducted prior to determining proposed upgrade works for the WRRF.
3. The Delegated Officer notes criteria for nutrient discharge can be determined based on the outcomes of the ecotoxicity assessment.

2.6 Contaminated Sites Act 2003

Crown Reserve 25729, along with other land parcels comprising the WRRF operations, was reported as a known or suspected contaminated site under the *Contaminated Sites Act 2003* (CS Act) in 2007, due to suspected soil and groundwater contamination associated with sewerage sludge, septage waste, oil, asbestos and uncontrolled waste disposal.

The applicant commenced investigations during 2017, lodging the findings in the report 'Detailed Site Investigation - Northam Wastewater Treatment Plant (ponds) Northam WA' (Cardno 2018). The report concluded additional investigations were required to inform the development of an appropriate remedial action plan and to inform the classification of the premises under the CS Act. As of July 2019, the premises remains 'awaiting classification'.

Key findings of the investigation that are relevant to this assessment are summarised below:

- The investigation identified a number of areas of potential contamination sources, including the current TWW storage ponds and the former septage disposal pits located south east of Maturation Pond 3.
- The contaminants of potential interest identified within soils at concentrations that exceeded ecological criteria included metals (copper, nickel and zinc), total recoverable hydrocarbons, and per- and poly-fluoroalkyl substances (PFAS).
- The contaminants of potential interest identified within groundwater at concentrations exceeding freshwater ecological criteria included metals (cadmium, copper, manganese and nickel), nutrients, faecal coliforms and PFAS.
- Elevated TDS, relative to other locations, was identified in groundwater in MW16 located down-hydraulic gradient of Pond 1, potentially suggesting that the Pond 1 liner integrity may be compromised.
- Surface water investigations at various locations within the Avon River indicated that the WRRF (current or historical practices) may be having an adverse impact on water quality (nutrients).
- Further investigations have been recommended to assess temporal effects and potential secondary exposure pathways (recreational contact and irrigation use) for contaminants contained in wastewater that is discharged to the Avon River, including PFAS.
- A remediation action plan for the former waste disposal pits was prepared by Cardno in 2019, however Water Corporation elected for further risk assessment to be undertaken to confirm that remediation was aligned with the guideline 'Assessment and management of contaminated sites' (DWER, 2021).

Based on the concentrations of contaminants in soil and groundwater, activities at the premises have resulted in exceedances of relevant specific consequence criteria for soil (ecological) and water (freshwater ecosystems).

The areas of potential environmental concern where data gaps were identified primarily related to the overflow discharge area, former liquid waste disposal pits, the sludge drying area and the treatment ponds. A Data Gap Evaluation and Sampling Analysis and Quality Plan (AECOM, 2022) (SAQP) were recently completed, and several data gaps were identified at the site. Additional groundwater well installation, and surface water and sediment sampling were undertaken as part of the SAQP.

The following conclusions were drawn following the investigation:

- Soil - There were no exceedances of adopted ecological or human health assessment criteria from soil samples collected from the overflow discharge area. Soil data did however, indicate leaching of Per- and polyfluoroalkyl substances (PFAS) compounds to groundwater within the overflow discharge area suggesting that TWW was likely contributing to increased groundwater concentrations of PFAS in this area;
- Surface Water (Overflow) - Reported TWW concentrations were above the 99% protection assessment criteria within the surface water samples from the overflow discharge area, but below the adopted human health and 95% protection assessment criteria for PFAS compounds in all samples. Nutrient concentrations, particularly Total Nitrogen, ammonia as

N and reactive phosphorus were reported above the respective 90% protection assessment criteria, ANZECC lowland rivers and SRT healthy rivers criteria in all samples suggesting that discharged surface water is contributing to the already degraded quality of the catchment.

- Sediment (Avon River) - PFAS concentrations in sediment within the Avon River remained below the adopted human health and ecological assessment criteria in locations at and down-gradient of the plant. Therefore, while impacted groundwater and surface water was discharging from the premises, these discharges did not appear to have impacted sediment within the Avon River. Elevated nutrient concentrations were observed at all monitoring locations within the Avon River. Total Nitrogen concentrations within sediments were observed to increase at locations at and down-stream of the premises suggesting that the nutrients are being discharged to the Avon River from the plant.
- Surface Water (Avon River) - Surface water samples recorded PFAS concentrations above the 99% protection assessment criteria but below the adopted 95% protection criteria, in addition to being below the adopted recreational waters, livestock and drinking water criteria. Surface water monitoring data collected from the Avon River suggested the river system was degraded and impacted by elevated regional concentrations of nutrients, pathogens and heavy metals throughout the year. However, based on the data obtained during the additional surface water investigations it was evident that nutrients are being discharged to the Avon River from the WRRF and are contributing to the already degraded quality of the catchment; and
- Groundwater - Nutrient concentrations reported in groundwater samples suggested the premises is impacting groundwater with elevated concentrations discharging from the premises boundary, however, it is considered that the nutrient discharges from WRRF operations are presenting a low and acceptable risk to the Avon River for the purposes of assessing site contamination. Nutrient plumes were evident immediately downgradient of the liquid waste disposal pits and northwest of the treatment ponds; with the former suggesting that the treatment ponds are leaking TWW. Seasonal monitoring indicated that the WRRF operations is acting as a source of PFAS to groundwater and subsequently, the Avon River. It was considered that the risk to the Avon River ecosystem from PFAS beneath and down-gradient of the liquid waste disposal pits to be low and acceptable. It was however, recognised that there was still an ongoing on-site source of PFAS with the former liquid waste disposal pits area, which is continuing to impact groundwater quality beneath the premises. It was considered that remediation of this source area would be best environmental practice.

Ongoing monitoring of soil and groundwater is being conducted as part of investigations required under the CS Act.

Key findings

4. The Delegated Officer notes the soil, surface water and groundwater sampling regime currently being conducted for the purposes of the CS Act serves a dual purpose of satisfying licensing requirements under the EP Act.
5. The Delegated Officer notes that contaminants of potential interest identified by the detailed site investigation include PFAS. The regulation of PFAS in wastewater is considered to be informed by the National Environmental Management Plan for PFAS (PFAS NEMP) which provides a risk-based framework for the environmental regulation of PFAS contaminated materials and sites, including TWW. DWER is currently progressing implementation of the PFAS NEMP in a manner that is intended to apply regulation in a nationally consistent manner. While PFAS will be considered within the assessment of risk, the application of controls in relation to PFAS associated with current and proposed operations at the WRRF may be deferred until DWER's regulatory approach is finalised.

2.7 Department of Health

The Department of Health (DoH) was invited to comment on the application on 29 September 2023. The DoH provided the following comments on wastewater recycling and environmental discharge.

Wastewater recycling

Treated wastewater from the Northam WRRF is provided to the Shire of Northam at a nominated handover point within the boundary of the WRRF in accordance with Recycled Water Scheme Approval No. D49/NT000 issued to the Shire of Northam.

As per Recycled Water Scheme Approval No. D49/NT000, the recycled water scheme is required to comply with water quality objectives associated with a 'medium risk' exposure level end use. The recycled water scheme does not consistently meet the requirements of a medium risk exposure level end use. DoH understands that the Shire of Northam and Water Corporation have been in discussions about improving compliance with the required water quality objectives and/or removing medium risk sites (Bernard Park and Riverbank) from the recycled water scheme. The Shire of Northam have provided an updated Recycled Water Quality Management Plan for the scheme which is currently under review by DoH.

Environmental discharge

Regarding the current licence conditions for the monthly treated wastewater UV Wet Well sampling point, DoH suggested that DWER consider discharge quality trigger/exceedance requirements for *E. coli* and other parameters appropriate for discharge into the Avon River.

In addition, it was suggested that contingency action requirements be considered in the event that the water quality trigger/exceedance requirements are not met. For the period July 2020 to date, DoH is aware of a number of wastewater/treated wastewater overflow events, particularly in relation to heavy rainfall events, that may directly, or indirectly impact on the WRRF operation/capacity.

The DoH is also aware of a previous cyanobacterial/algal bloom event downstream (~ 10km) from the Northam WRRF which occurred 27/02/2014 – Katrine Pool (Avon River). DWER Phytoplankton Ecology Unit reported cyanobacteria levels which exceeded the NHMRC Guidelines for recreational waters (2008).

The DoH further advised on 30 September 2024 that operational discharges to the Avon River, beyond discharges for emergency purposes, are considered a recycled water scheme and require DoH approval.

Recycled water scheme approval

The DoH approved the Northam Town Recycled Water Scheme (D49/NT000) in the early 1970's for the Water Corporation to supply the Shire of Northam with recycled water for irrigation of ovals. The approval conditions the quality of recycled water used, which must comply with the limits in Table 2 below. These ovals are outlined in Table 3 below and depicted in Figure 2.

Table 2: Discharge limits for recycled water quality

Parameter	Compliance value	Monitoring frequency
E. coli	< 10 cfu or MPN/100 mL	Monthly
pH	6.5 – 8.5	Continuous online
Turbidity	< 5 NTU (95 %ile)	Continuous online
Disinfection	Total chlorine: 0.2 – 2 mg/L ¹	Continuous online

Note 1: Total chlorine residual after a minimum contact time of 30 minutes.

Table 3: Name and location of recycled water sites in Shire of Northam

Oval	Location	Proximity to rivers
Bert Hawke Oval Complex	Suburban Road	Avon River ~70 m north
Burwood Park & Trotting Club	Clarke Street	Avon River ~50 m east
Northam Senior High School Oval	Clarke Street	Avon River ~120 m southeast
Jubilee Oval	Peel Terrace	Avon River ~240 m northwest
Henry Street Oval	Henry Street	Avon River ~400 m northwest
Apex Park ¹	Newcastle Road	Avon River ~30 m south
Bernard Park	Cnr Peel Terrace & Minson Avenue	Avon River ~10 m along western boundary
Riverbank Broome Terrace	Broome Terrace	Adjacent to Avon River ~70 m along southern boundary
Skate Park (Skateboard track reserve)	Clarke Street	Avon River ~40 m north
Racecourse	Yilgarn Avenue	Mortlock River ~500 m west

Note 1: Decommissioned March 2022 (supplied by scheme water)

Key findings

6. The Delegated Officer notes the request from DoH to implement trigger/exceedance requirements for discharges to the Avon River, and contingency action requirements in the event the triggers are exceeded.
7. The Delegated Officer notes that operational discharges to the Avon River, beyond discharges for emergency purposes, are considered a recycled water scheme and DoH approval is required.

2.8 Operational activities

The applicant reported that although the premises is licensed for an inflow capacity of 1,500 m³ per day, multiple exceedances on an annualised average have occurred since 2017 (Table 4). The applicant considers this increase in average daily inflow is from higher than average rainfall events combined with stormwater ingress into the sewer network system, which is being investigated and remedied. This also resulted in overtopping events, however the spills were contained within the premises and partially recovered back into the plant for treatment.

Table 4: Daily inflow exceedances 2017 – 2023 (monthly average, annualized)

	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Approved inflow	1,500 m ³ /day	1,500 m ³ /day	1,500 m ³ /day	1,500 m ³ /day	1,500 m ³ /day	1,500 m ³ /day
Actual inflow	1,595 m ³ /day	1,504 m ³ /day	1,486 m ³ /day	1,566 m ³ /day	1,772 m ³ /day	1,602 m ³ /day
Overtopping events	-	-	-	-	5,000 L Pond 3	1,599 L Pond 3

In the 2022-23 reporting period there were seven exceedances of monthly average inflows (Table 5). Rainfall events and stormwater ingress is not sufficient to explain the exceedances that occurred from February to May 2023.

During routine desludging works in November 2019 it was observed that the floor of Pond 2 was undulating with evidence of hard material, possibly cemented lateritic gravel, exposed in several locations and damp areas were observed in the north-western portion of the pond floor. A geotechnical engineering assessment was completed on 18 March 2020 which concluded that the clay liner had been compromised where the affected damp areas have been observed. A targeted soil assessment for the northern portion of secondary treatment pond 2 was conducted where concentrations of copper in two samples were found to be 95 mg/kg and 85 mg/kg, which exceeded the specific Ecological Investigation level criteria of 70 mg/kg. The affected portion of pond 2 was relined with a geosynthetic clay liner, completed in April 2020.

Table 5: Licensed inflow vs actual outflow, with daily exceedances (monthly average)

Date	Licensed monthly average inflow to WRRF (m ³)	Actual monthly average inflow to WRRF (m ³)	Outflow to Reuse (m ³)	Outflow to Overflow Discharge Area (m ³)
July 2022	46,500	45,783.02	22,268.06	9,606.66
August 2022	46,500	78,197.14	2,169.23	64,490.19
September 2022	45,000	51,759.42	1,715.14	47,136.62
October 2022	46,500	43,065.82	16,847.31	14,174.22
November 2022	45,000	41,499.96	24,385.00	3,217.62
December 2022	46,500	46,125.91	21,063.07	852.61
January 2023	46,500	45,348.69	18,203.61	153.30
February 2023	42,000	42,918.03	21,039.30	366.29
March 2023	46,500	48,499.33	27,804.52	1,776.54
April 2023	45,000	45,759.41	27,612.12	2,879.09
May 2023	46,500	48,143.49	29,363.67	2,545.04
June 2023	45,000	47,604.39	26,229.71	6,915.90

Key findings

8. The Delegated Officer notes ingress of stormwater into the sewer network system and overtopping events have occurred at the premises, indicating the plant is overloaded for its current system holding capacity, which could also be negatively impacting the ability of the WRRF to adequately treat wastewater.
9. The Delegated Officer notes the significant reduction, but not cessation, of discharges to the Avon River between December and February, during summer months.

2.9 Water balance modelling

The applicant conducted an operational water balance model for the current WRRF process to identify suitable parameters for estimating projected wastewater flows to the plant. The model assumed that there was no change in the pond storage volume (53,034 m³ at highest water level). The results of this modelling are shown in Table 6 below.

Table 6: Summary of inflows and outflows for period 1 July 2017 to 30 June 2018

	Inflow	Rainfall	Evaporation	Reuse	Discharge	Deficit
	kL/day	mm/day	mm/day	kL/day	kL/day	kL/day
Mean	1,595	33	172	629	369	420
Min: Max	1,325: 2,123	1: 78	59: 299	64: 1,104	60: 1,299	166: 837
Standard Deviation (SD)	250.1	29.4	86.9	327.4	433.2	204.4

Based upon the available flow and climatic data a mean water balance deficit of ~420 kL/day was calculated for the period 1 July 2017 to 30 June 2018. This deficit was attributed to various potential occurrences, including losses from either the conveyance and/or the treatment systems, seepage from ponds, or due to wastewater flow monitoring and instrument errors. The exact source of the losses was not determined. Given that seepage from a pond treatment system should be a relatively constant rate, the reasonably large variability within the deficit loss rate value (mean: 420, SD: 204.4) is considered inconsistent with seepage being the sole source of losses.

More recently reported water balance modelling found a daily seepage between 166 m³/day and 837 m³/day. The water balance was unable to determine if the seepage was occurring from just one pond or all four ponds.

Key findings

- | |
|--|
| 10. The Delegated Officer notes the occurrence of losses, likely from seepage, from the treatment ponds. |
|--|

2.10 Monitoring of discharges to land

The applicant lodged the Northam Nutrient Irrigation Management Plan (AECOM 2014) (the report) to the department in 2014, however the report was not assessed by DWER to determine the risks posed by discharges to land. Once the TWW exits the WRRF it is stored in the Shire pond within the premises before being utilised to irrigate nine ovals via the reuse scheme managed by the Shire of Northam. The TWW is blended with stormwater at the Clarke Street Dam prior to irrigating the ovals, at the Burwood Park storage tank or at the Racetrack dam and storage tank. The vegetation at the ovals consists of mixed grass species of couch and kikuyu.

The report was based on a predicted average water usage of 135 ML across 14.5 hectares of ovals, plus between 53.4 ML and 89 ML of water usage across the 8 hectares at the Racetrack. Irrigation of the ovals does not occur during winter months, therefore irrigation water sent to the reuse scheme in winter is stored in dams at some ovals in readiness for summer.

Sampling of TWW is currently undertaken post-chlorination and aluminium sulphate dosing in accordance with the requirements of Licence L5989/1991/11, but prior to discharge to the reuse scheme. The blending of TWW with stormwater prior to irrigating the ovals is utilised in combination with the requirement that the water is to be applied at a rate that allows for leaching of any accumulated salts, with limited fertiliser use only at Henry Street Oval to combat salt inputs.

Licence: [L5989/1991/12](#)

Several of the ovals are in close proximity to the Avon River and the Mortlock River, as shown in Figure 5 and Table 3. The soils present at the ovals are consistently sandy with a low probability of occurrence of acid sulfate soils, except for the northwestern edge of Bernard Park immediately adjacent to the Avon River which has a high probability of acid sulfate soils occurring. Given no earthworks are required for the irrigation project and the majority of the irrigable areas are low risk, no acid sulfate soils management measures have been implemented.

Table 7: 2006-2008 Quality of local water resources compared to 2012-2014 TWW

Location	Date	pH	Total Dissolved Solids (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)
WRRF outflow (Annual average)	Jan 2012 – Mar 2014	7.6	1113.53	34.18	1.14
Avon River upstream of WRRF outflow	2006	8.7	11810	1.1	0.027
	2007	8.5	8565	1.7	0.044
	2008	8.4	10130	1.1	0.036
Avon River downstream of WRRF outflow	2006	-	-	-	-
	2007	8.5	8452	1.9	0.041
	2008	8.3	10250	1.9	0.045
Avon River at Northam Weir	2006	8.8	10320	1.0	0.023
	2007	8.3	7407	1.4	0.033
	2008	8.4	8799	1.1	0.025
Mortlock River at Taylor Street Weir	2006	8.6	21880	1.4	0.043
	2007	8.5	18710	2.0	0.110
	2008	8.4	17670	1.7	0.093

Nutrient loading of soils in excess of the requirement of the vegetation being irrigated can lead to excess nutrients in soils and groundwater, which poses a risk of lateral transportation and discharge of impacted groundwater to the Avon and Mortlock rivers.

The report included water analysis conducted in 2012-13 of the TWW and compared that to the water quality of the Avon and Mortlock Rivers (Table 7). The TWW has been recorded as slightly more acidic than the data from the Avon and Mortlock rivers, but is essentially neutral. The nutrients present within the TWW are significantly higher than those recorded within the Avon River with Total Nitrogen and Total Phosphorus being more than ten times higher. Conversely, sampling from the Avon and Mortlock Rivers showed nitrogen results were below the level of detection and phosphorus concentration was also low. Salts, potassium and sulphate were all high where the water was potentially unsuitable for irrigation, however it is suitable for sandy soils where water infiltrates adequately.

The Phosphorus Buffering Index results from the soil sampling conducted in March 2014 ranged from 3.6 to 64.5 (Table 8). The low PBI (<100) combined with a significant risk of eutrophication to waters within 500 m of the parks, places the soils in eutrophication risk category A. Therefore, the maximum application rates to the park soils for inorganic nitrogen is 140 kg/ha/yr and reactive phosphorus is 10 kg/ha/yr. Fertiliser is rarely used on the parks and ovals apart from Henry Street Oval for salinity management and occasionally the Racecourse turf.

Table 8: Phosphorus Retention Index and Phosphorus Buffering Index for ovals

Oval	Phosphorus Retention Index (mg/L)	Phosphorus Buffering Index
Bert Hawke Oval Complex	11.0	45.9
Burwood Park & Trotting Club	2.0	13.5
Northam Senior High School Oval	-0.5	17.4
Jubilee Oval	1.9	27.5
Henry Street Oval sample 1	1.4	3.6
Henry Street Oval sample 2	13.0	55.1
Bernard Park	7.7	23.7
Riverbank Broome Terrace	2.3	15.1
Skate Park (Skateboard track reserve)	2.2	64.5
Racecourse	- 0.5	10.0

Nutrient inputs from TWW are approximated to be, based on a total volume of 135 m³ per day:

- Total nitrogen average is 34.18 mg/L which equates to 256.77 kg/ha/yr; and
- Total phosphorus average is 1.14 mg/L which equates to 8.86 kg/ha/yr (Table 7).

The total nitrogen of 256.77 kg/ha/yr is well above the recommended 140 kg/ha/yr, but the total phosphorus of 8.86 kg/ha/yr is lower than the recommended 10 kg/ha/yr.

Mowing of the turf at the ovals can be attributed to a loss of 240 kg/ha of nitrogen, assuming no additional fertiliser is utilised.

Monitoring of discharges of wastewater post-treatment during 2022 and 2023 shows elevated concentrations of parameters in the discharge water. The levels of total nitrogen, total phosphorus, total dissolved and suspended solids and biochemical oxygen demand are significantly elevated (Table 9) compared to the 2013 data that were used to calculate the soil nutrient loading rates (Table 7).

Table 9: Average contaminant loads per month in discharges of TWW 2022-23

Date	Total Nitrogen (kg)	Total Phosphorus (kg)	E. coli (per 100 mL)	Biochemical Oxygen Demand (kg)	Suspended Solids (kg)	Total Dissolved Solids (kg)
July 2022	890.72	6.68	650.00	55.67	111.34	21,154.66
August 2022	71.58	1.24	410.00	5.42	5.42	1,930.61
September 2022	49.74	0.99	160.00	4.29	4.29	1,629.38
October 2022	640.20	6.91	20.00	168.47	252.71	21,901.51
November 2022	999.79	7.32	110.00	243.85	243.85	37,309.05
December 2022	947.84	15.80	640.00	421.26	947.84	33,279.65
January 2023	764.55	4.19	63.00	45.51	455.09	31,674.28

Date	Total Nitrogen (kg)	Total Phosphorus (kg)	E. coli (per 100 mL)	Biochemical Oxygen Demand (kg)	Suspended Solids (kg)	Total Dissolved Solids (kg)
February 2023	841.57	14.94	20.00	420.79	1,472.75	36,187.60
March 2023	1,000.96	23.36	460.00	834.14	973.16	42,262.87
April 2023	994.04	33.13	98.00	1,104.48	828.36	32,858.42
May 2023	1,380.09	3.52	240.00	146.82	146.82	35,823.68
June 2023	1,101.65	3.41	31.00	524.59	65.57	28,852.69

The current licence applies a limit upon the WRRF to ensure that when the Shire cannot fully utilise all TWW discharges, that prior to discharge to the Avon River the final pond discharge concentration of total phosphorus is less than an arithmetical mean of 1.0 mg/L, when measured over three out of four consecutive sampling periods. Exceedances of this licence limit were reported to have occurred between September 2020 and March 2021 (Table 10). Aluminium sulphate dosing was increased in response to the exceedance, with the average arithmetical mean returning to less than 1.0 mg/L by April 2021.

Table 10: Exceedances of 1.0 mg/L (arithmetical mean) Total Phosphorus limit

Sample point post UV	Flow (m ³) through discharge flume	Total Phosphorus (mg/L)
September 2020	26,149	0.32
October 2020	8,369	1.10
		0.73
November 2020	5,972	1.10
December 2020	1,085	1.30
January 2021	1,434	2.20
February 2021	999	2.40
March 2021	12,055	1.08
April 2021	1,619	0.85
May 2021	17,462	0.80



Figure 5: Discharges to ovals in proximity to the Avon and Mortlock Rivers

Key findings

11. The Delegated Officer notes the data for total nitrogen and total phosphorus sampled in TWW during 2022/2023 are significantly elevated compared to the samples of TWW taken during 2012/2014 and utilised to calculate the soil nutrient loading rates as detailed in the Nutrient Irrigation Management Plan.

2.11 Monitoring of discharges to surface water

Treated wastewater in excess of that used by the Shire's reuse scheme is discharged to the Avon River. Sampling of the Avon River is currently undertaken at two upstream and three downstream locations in accordance with the requirements of Licence L5989/1991/11 (Figure 6). The upstream locations are at 1 km and 3.7 km and the downstream locations are at 0.7 km, 1.5 km and 2.7 km.

The current licence required the applicant to submit an Environmental Improvement Plan (EIP) by 30 June 2013. The EIP was to incorporate actions and associated completion dates to achieve the objective of meeting the ANZECC water quality guidelines for surface water for the discharge into the Avon River by the 31 December 2017. The applicant was to complete the action in the approved EIP by the dates specified by the plan. The applicant lodged a 'Detailed Site Investigation - Northam Wastewater Treatment Plant (ponds) Northam WA' (Cardno 2018), however has not addressed the objective of meeting the ANZECC water quality guidelines.

DWER considers that the Avon River should be managed as a high conservation or ecological value system under the ANZG Water Quality Guidelines (2018) (see Section 2.5).

The applicant has previously reported that high and dangerous river conditions over a period of weeks in the month of July 2021 prevented upstream and downstream sampling. The applicant has recently reported that access to the river at the 1.5 km and 2.7 km downstream locations can only be performed safely when accessed through private property, however the landowner

has denied this access. Therefore, samples were not taken for August, September and October 2022, and April, May and June 2023. Investigations into alternative access routes to safely sample surface water downstream of the premises is ongoing.

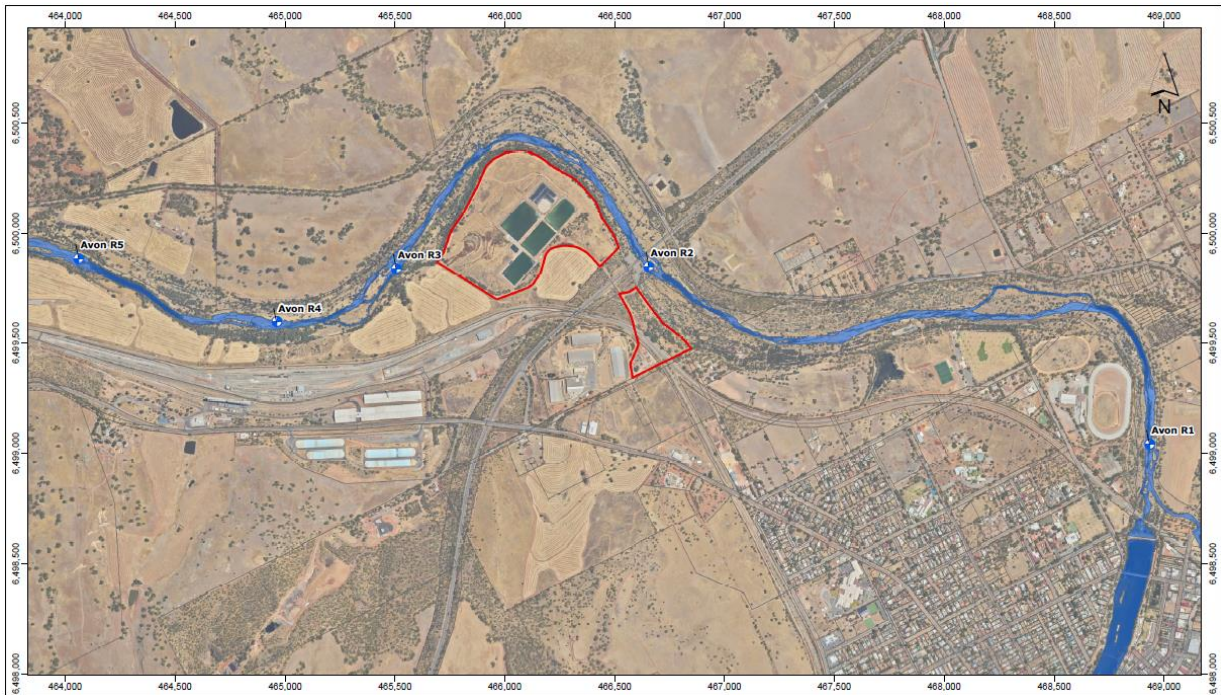


Figure 6: Surface water monitoring locations within the Avon River

Monitoring of discharges to the Avon River shows elevated concentrations of parameters in the discharge water that can contribute detrimental impacts to surface water quality. While alum dosing for phosphorus removal is effective, the levels of *E. coli*, total nitrogen, total dissolved and suspended solids and biochemical oxygen demand are significantly elevated (Table 11).

Table 11: Average contaminant loading per month in discharges to the Avon River

Date	<i>E. coli</i> (per 100mL)	Biochemical Oxygen Demand (kg)	Suspended Solids (kg)	Total Dissolved Solids (kg)	Total Nitrogen (kg)	Total Phosphorus (kg)
July 2022	650.00	24.02	48.03	9,126.33	384.27	2.88
August 2022	410.00	161.23	161.23	57,396.27	2,128.18	36.76
September 2022	160.00	117.84	117.84	44,779.79	1,366.96	27.34
October 2022	20.00	141.74	212.61	18,426.49	538.62	5.81
November 2022	110.00	32.18	32.18	4,922.96	131.92	0.97
December 2022	640.00	17.05	38.37	1,347.13	38.37	0.64
January 2023	63.00	0.38	3.83	266.75	6.44	0.04
February 2023	20.00	7.33	25.64	630.03	14.65	0.26
March 2023	460.00	53.30	62.18	2,700.34	63.96	1.49
April 2023	98.00	115.16	86.37	3,426.12	103.65	3.45
May 2023	240.00	12.73	12.73	3,104.95	119.62	0.31
June 2023	31.00	138.32	17.29	7,607.49	290.47	0.90

Key findings

12. The Delegated Officer notes the Avon River should be managed as a high conservation or ecological value system under the ANZG Water Quality Guidelines (2018).

2.12 Ambient monitoring of groundwater

The applicant has installed four groundwater monitoring bores at the primary treatment plant located on Lot 500 and Lot 501 on Deposited Plan 76392, and 23 groundwater monitoring bores at the secondary treatment plant on Lot 29316 on Deposited Plan 221054, for the 'Detailed Site Investigation - Northam Wastewater Treatment Plant (ponds) Northam WA' (Cardno 2018). The applicant considers ten of the bores at the secondary premises are suitable for ongoing monitoring of groundwater quality down-hydraulic gradient of all infrastructure and discharge areas (Figure 7). The current Licence L5989/1991/10 does not have a requirement to monitor groundwater.

Nutrient concentrations reported in groundwater samples suggested the premises is impacting groundwater with elevated concentrations discharging from the boundary. Nutrient plumes were evident immediately downgradient of the former liquid waste disposal pits and northwest of the plant, with the former suggesting that the plant is leaking treated wastewater (Cardno, 2021). Ongoing groundwater monitoring is being conducted through the contaminated sites investigation to assess the potential impact on the Avon River.

Key findings

13. The Delegated Officer notes the occurrence of losses from overtopping and likely seepage events from the treatment ponds have the potential to increase loading of soils and groundwater with nutrients and transport these contaminants laterally to discharge this impacted groundwater to the Avon River.



Figure 7: Groundwater monitoring bore locations

2.13 Modelling of odour emissions – operational

Odour modelling was carried out for the plant by SKM in July 2009 using the local wind file and the Ausplume dispersion model, with a resulting total odour emission of 43,500 OU/s. The applicant has used statewide community complaints data to determine the 5 OU level of odour is the level at which odour can be perceived as annoying by the local community, when calculated using the Ausplume model at 99.9 percentile frequency over a 1-hour averaging period.

The predicted odour contours are mapped in Figure 8, including the 5 OU (99.9%) odour in red. The Wastewater Treatment Plant Buffer Special Control Area is the black semielliptical line as depicted in the Shire of Northam Local Planning Scheme No. 6 (2013), which extends to a 600 m separation distance around the existing treatment facilities. The red 5 OU contour extends beyond the Special Control Area, thereby odour emissions extend over several residential properties south-east of the premises.

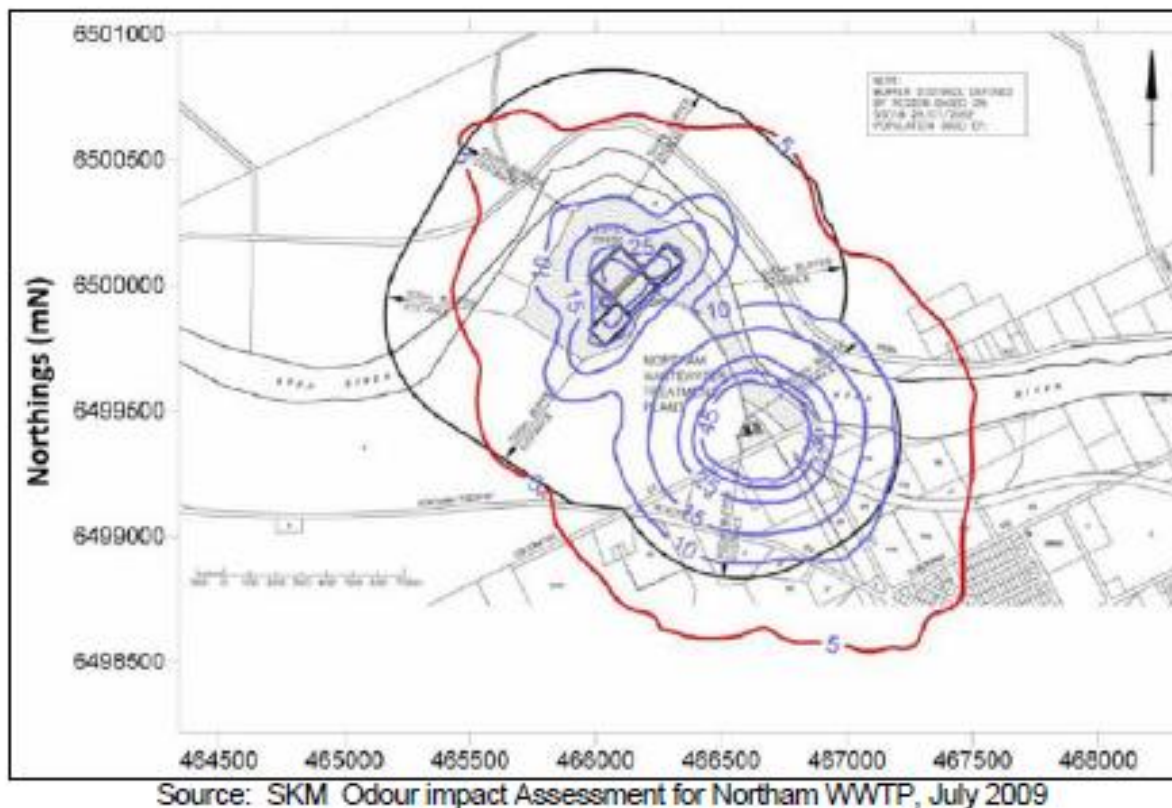


Figure 8: Odour contour modelling for the Northam WRF

Key findings

- The Delegated Officer notes that modelled odour emissions extend over several residential properties south-east of the premises.

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 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.

3.1 Source-pathways and receptors

3.1.1 Emission sources and applicant controls

The key emissions and associated actual or likely pathway during premises operation which have been considered in this decision report are detailed in Table 12 below. Table 12 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 12: Proposed applicant controls

Sources	Emission	Potential pathways	Proposed controls
Operation			
Treatment of sewage	Odour	Air / wind dispersion	No new controls proposed, operating under licence L5989/1991/11.
	Noise	Air / wind dispersion	No new controls proposed, operating under licence L5989/1991/11.
	Seepage of untreated and treated wastewater from ponds	Subsurface seepage and subsequent discharge to Avon River	No new controls proposed, operating under licence L5989/1991/11.
	Overtopping of containment ponds with treated and untreated wastewater	Overland flow and subsequent discharge to Avon River	No new controls proposed, operating under licence L5989/1991/11.
	Contamination of stormwater	Overland flow and subsurface seepage	No new controls proposed, operating under licence L5989/1991/11.
	Spills of chemicals such as alum and hypochlorite	Direct discharge to land and surface waters	No new controls proposed, operating under licence L5989/1991/11.
Discharges of TWW for irrigation of public open space	Treated wastewater containing pathogens at concentrations not fit for purpose	Direct discharge to land	No new controls proposed, operating under licence L5989/1991/11.
	Treated wastewater containing nutrients and contaminants at concentrations not fit for purpose	Direct contact with pooling water or ingestion of irrigation mist, direct discharge to land	No new controls proposed, operating under licence L5989/1991/11.
Discharges of TWW to the Avon River	Treated wastewater containing nutrients and contaminants at concentrations not fit for purpose	Direct discharge to surface waters	No new controls proposed, operating under licence L5989/1991/11.
	Treated wastewater containing pathogens at concentrations not fit for purpose	Direct discharge to surface waters	No new controls proposed, operating under licence L5989/1991/11.

3.1.2 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 13 and Figure 9 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises (*Guideline: Environmental Siting* (DWER 2020)).

Table 13: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
Residential Premises	<ul style="list-style-type: none"> • 490 m south of premises boundary • 680 m south east of premises boundary • 1,500 m east of premises boundary
Environmental receptors	Distance from prescribed activity
Threatened Fauna	<p>The following species are located within a 1 km radius of the premises boundary, within remnant riparian vegetation along the Avon River and remnant roadside vegetation.</p> <ul style="list-style-type: none"> • Protected under an International Agreement - <i>Actitis hypoleucos</i> (Common Sandpiper), <i>Ardea modesta</i> (Great Egret, White Egret), <i>Calidris ruficollis</i> (red-necked stint), <i>Merops ornatus</i> (Rainbow Bee-eater) and <i>Tringa glarela</i> (Wood Sandpiper) • Endangered - <i>Calyptorhynchus latirostris</i> (Carnaby's cockatoo) • Threatened – <i>Dasyurus geoffroii</i> (Chuditch, Western Quoll) • P4 Priority Fauna - <i>Oxyura australis</i> (blue-billed duck).
Threatened Ecological Communities	<ul style="list-style-type: none"> • Wheatbelt Woodlands – Eucalypt woodlands of the wheatbelt, located adjacent to the Premises on the east, north and north western sides and extends along the Avon River riparian zone, plus various remnant roadside vegetation. • York Gum Woodlands – York Gum woodlands of the wheatbelt, located 570 m south of the Premises, beyond the railway yards.
Avon River	<ul style="list-style-type: none"> • Major, non-perennial watercourse located immediately adjacent to the Premises boundary, to the east, north and west. Flow is predominantly seasonal, following rainfall. The river supports saline and eutrophic aquatic communities (flora and fauna). • The river channel is located approx. 120 m from the proposed ponds at its closest point. • The Premises is located within the Avon River Waterways Management area, which is proclaimed under the <i>Waterways Conservation Act 1976</i>.
Groundwater	<ul style="list-style-type: none"> • Located within the Avon River Catchment Area. • Depth to groundwater is generally 3 to 6 metres below ground level. • Groundwater directional flow is from the north east, flowing radially to the north west and west and towards the Avon River. • Groundwater salinity is marginal to saline ranging from 657 mg/L to 7,700 mg/L.

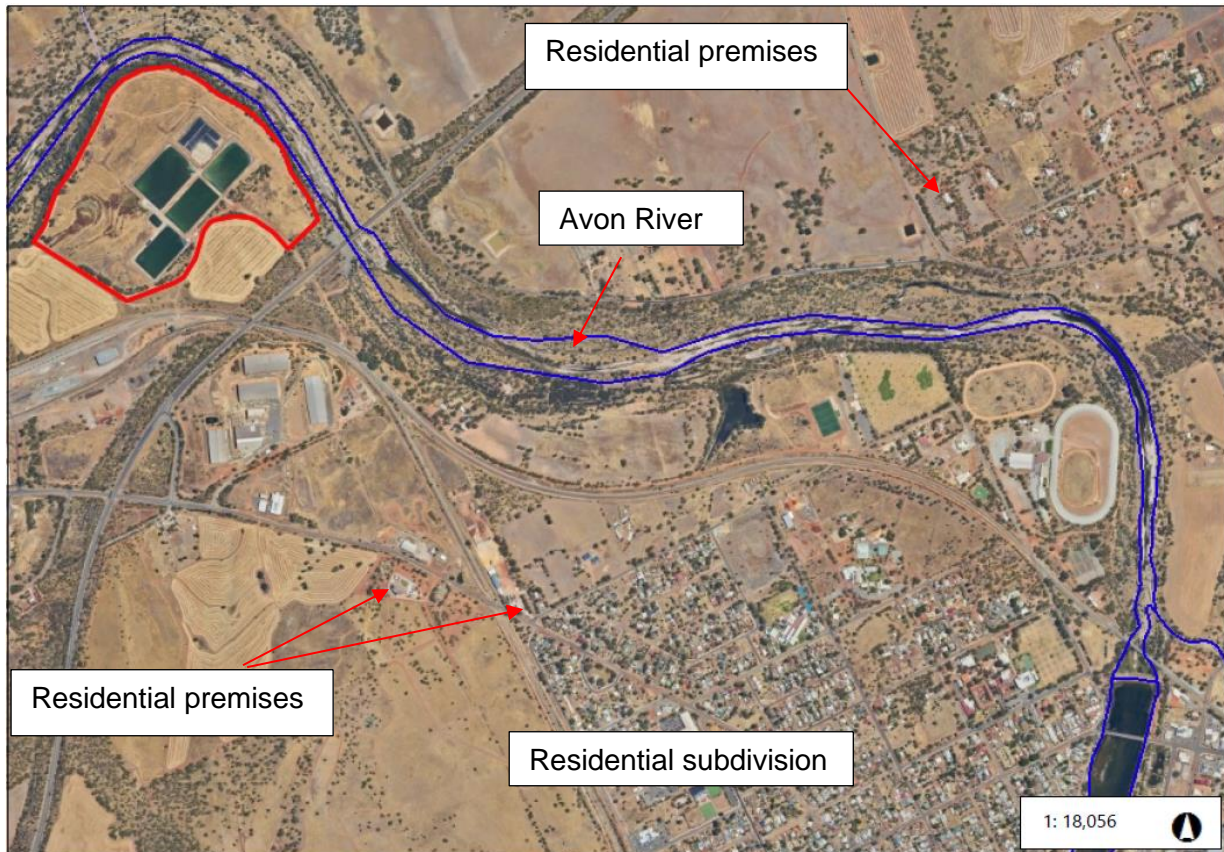


Figure 9: Distance to sensitive receptors

3.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for each identified emission source and takes into account 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 licence 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 14.

Licence L5989/1991/12 that accompanies this decision report authorises emissions associated with the operation of the premises.

The conditions in the issued licence, as outlined in Table 14 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

Table 14: Risk assessment of potential emissions and discharges from the premises during operation

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
Operation								
Treatment of sewage	Odour	Air / wind dispersion Impacts to amenity	Residential premises	Refer to Section 3.1	C = Minor L = Possible Medium Risk	No	N/A	The Delegated Officer notes the 5 OU modelled odour emissions extend over a number of residential properties south-east of the premises. Any unreasonable emissions of odour may be subject to the provisions of Section 49 of the EP Act, therefore no further conditions have been added to the licence. The applicant has requested a 5 year licence duration to support the operational continuation of the WRRF while upgrades to the premises are developed. The Delegated Officer will require the medium risk of odour emissions to be mitigated by upgrades to the premises.
	Noise	Air / wind dispersion Impacts to amenity	Residential premises	Refer to Section 3.1	C = Minor L = Rare Low Risk	Yes	N/A	General provisions of the <i>Environmental Protection (Noise) Regulations 1997</i> apply.
	Seepage of untreated and treated wastewater from ponds	Subsurface seepage and subsequent discharge to Avon River Impacts to aquatic ecosystems, Soil contamination inhibiting native vegetation survival and growth and impacting fauna habitat Degradation of surface water and groundwater quality Public health impacts for recreational users of the Avon River including gastroenteritis and other diseases	Surface water and riparian habitat – Avon River Beneficial uses of groundwater	Refer to Section 3.1	C = Moderate L = Almost Certain High Risk	No	Conditions 8 and 21 <u>Conditions 1, 2, 3 to 5, 9 to 11, 12, 13, 14 and 23 to 27</u>	The Delegated Officer notes the know occurrence of seepage from, and overtopping of, the treatment ponds and the high risk this poses for the environment and human health. The suite of parameters to be sampled from treated wastewater in condition 13 has been expanded to provide more accurate data for comparison to surface water and groundwater quality, to determine potential impacts from seepage and overtopping. Condition 14 has been added to the licence to require monitoring of groundwater from 10 bores currently installed at the secondary premises, to determine if overtopping events and potential seepage events are contributing to discharges to groundwater and in turn to the Avon River.
	Overtopping of containment ponds with treated and untreated wastewater	Overland flow and subsequent discharge to Avon River Impacts to aquatic ecosystems, Soil contamination inhibiting native vegetation survival and growth and impacting fauna habitat Degradation of surface water and groundwater quality Public health impacts for recreational users of the Avon River including gastroenteritis and other diseases	Surface water and riparian habitat – Avon River Beneficial uses of groundwater	Refer to Section 3.1	C = Moderate L = Likely High Risk	No	Conditions 1 and 20 <u>Conditions 2, 3 to 5, 8, 9 to 11, 12, 13, 14 and 23 to 27</u>	Associated conditions 1 for infrastructure maintenance and 8 for sampling have been applied to the licence. The applicant has requested a 5 year licence duration to support the operational continuation of the WRRF while upgrades to the premises are developed. The Delegated Officer will require the high risks of seepage and overtopping to be further mitigated by upgrades to the premises. Any discharges may be subject to the provisions of the <i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i> .

Risk events					Risk rating ¹	Applicant controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls	C = consequence L = likelihood			
Treatment of sewage	Contamination of stormwater	Overland flow and subsurface seepage Soil contamination inhibiting vegetation survival and growth and impacting fauna habitat Degradation of surface water and groundwater quality Public health impacts for recreational users of the Avon River including gastroenteritis and other diseases	Surface water and riparian habitat – Avon River Beneficial uses of groundwater	Refer to Section 3.1	C = Moderate L = Possible Medium Risk	No	Condition 1	The Delegated Officer notes contamination of stormwater poses a medium risk for the environment and human health. The applicant has requested a 5 year licence duration to support the operational continuation of the WRRF while upgrades to the premises are developed. The Delegated Officer will require the medium risk of contamination of stormwater to be mitigated by upgrades to the premises. Any discharges may be subject to the provisions of the <i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i> .
Treatment of sewage	Spills of chemicals such as alum and hypochlorite	Direct discharge to land and surface waters Soil contamination inhibiting vegetation survival and growth and impacting fauna habitat Degradation of surface water and groundwater quality	Surface water and riparian habitat - Avon River Beneficial uses of groundwater	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	No	Condition 2	The Delegated Officer notes spills of chemicals poses a medium risk to the environment. As such the Delegated Officer will implement a licence condition to ensure the recovery of spills of chemicals. Storage of chemicals is subject to the provisions of the <i>Dangerous Goods Safety Act 2004</i> . Any discharges may be subject to the provisions of the <i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i> .
Discharges of treated wastewater for irrigation of public open spaces	Treated wastewater containing nutrients and contaminants at concentrations not fit for purpose	Direct discharge to land. Impacts causing contamination of soil, vegetation health and degradation of groundwater quality	Beneficial uses of groundwater Surface water and riparian habitat – Avon River	Refer to Section 3.1	C = Moderate L = Likely High Risk	No	Conditions 1, 6, 8 and 20 Conditions 3 to 5, 9 to 11, 12, 13, 17, 19, 22 and 23 to 27	Refer to Section 3.4 The Delegated Officer will require the high risk of discharges of elevated concentrations of nutrients and contaminants to the irrigation scheme to be mitigated by future upgrades at the premises.
	Treated wastewater containing pathogens at concentrations not fit for purpose	Direct contact with pooling water or ingestion of irrigation mist, direct discharge to land. Impacts to health of recreational users of public open spaces, impacts causing contamination of soil, vegetation health and degradation of groundwater quality.	Recreational users of public open space	Refer to Section 3.1	C = Major L = Unlikely Medium Risk	Yes	Conditions 1, 8 to 13 and 20 Conditions 3 to 5, 9 to 11, 12, 13, 22 and 23 to 27	The Delegated Officer considers the Department of Health approval is appropriate for the regulation of public health impacts associated with the Shire of Northam reuse scheme, which includes the chlorination of TWW prior to irrigation. While the Delegated Officer will not duplicate the regulatory controls DoH imposes upon TWW sent to the reuse scheme, licence conditions applied as primary controls for a variety of other emissions also provide complementary regulatory controls for mitigating emissions of pathogens. The Delegated Officer has added a condition to ensure the chlorination unit is maintained free of leaks and defects, and in good working order.
Discharges of treated wastewater to the Avon River	Treated wastewater containing nutrients and contaminants at concentrations not fit for purpose	Direct discharge to surface waters. Impacts causing contamination of surface waters and aquatic environments of the Avon River.	Surface water and riparian habitat – Avon River	Refer to Section 3.1	C = Major L = Likely High Risk	No	Conditions 1, 6, 7, 8 and 20 Conditions 3 to 5, 9 to 11, 12, 13, 15, 16, 18, 22 and 23 to 27	Refer to Section 3.5 The Delegated Officer will require the high risk of discharges of elevated concentrations of nutrients and contaminants to the Avon River to be mitigated by the premises infrastructure upgrades.

Risk events					Risk rating ¹	Applicant controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls	C = consequence L = likelihood			
Discharges of treated wastewater to the Avon River	Treated wastewater containing pathogens at concentrations not fit for purpose	Direct discharge to surface waters. Impacts to health of recreational users of the Avon River, impacts causing contamination of surface waters and aquatic environments of the Avon River.	Recreational users of the Avon River Surface water and riparian habitat – Avon River	Refer to Section 3.1	C = Major L = Unlikely Medium Risk	No	Conditions 1, 6, 8 and 20 <u>Conditions 1, 3 to 5, 7, 9 to 11, 12, 13, 15, 22 and 23 to 27</u>	<p>The Northam WWTP was originally designed for discharging to the Avon River only in emergency events. Over time, discharges to the Avon River have increased to become a regular disposal method. The Department of Health has advised approval is necessary for operational discharges to the Avon River, however the applicant does not hold this approval. As no regulatory controls exist, the Delegated Officer considers it necessary to mitigate the risks of emissions of pathogens to the Avon River.</p> <p>The Delegated Officer considers that, since the plant is currently designed to disinfect TWW during emergency discharge events, an <i>E. coli</i> concentration limit of < 1,000 cfu/100 mL for TWW is satisfactory to mitigate the likelihood of impacts arising from discharges to the Avon River for the immediate management of the premises, consistent with limits provided within primary recreational water bodies within the Wastewater Overflow Notification and Response Procedures 2021 (Department of Health, 2022).</p> <p>The Delegated Officer will require the medium risk of discharges of treated wastewater containing pathogens to the Avon River to be further mitigated by the premises infrastructure upgrades.</p> <p>The Delegated Officer has added conditions relating to infrastructure maintenance, a concentration limit for <i>E. coli</i> for discharges to the Avon River and monitoring controls.</p>

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

Note 2: Proposed applicant controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls imposed by department.

3.3 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 15 below.

Table 15: 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 16 below.

Table 16: Risk criteria table

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

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

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

"onsite" means within the Prescribed Premises boundary.

3.4 Detailed risk assessment – Discharges of TWW to public open spaces containing nutrients and contaminants at concentrations not fit for purpose

Description of the risk event for discharges of TWW to public open spaces

The untreated sewage from the town of Northam is received at the WRRF for treatment, following which TWW may be piped to the Shire's reuse pond in Clarke Street for subsequent irrigation via the registered reuse scheme to Northam town ovals and public open space areas.

Wastewater, if treated sufficiently, should contain nutrients and contaminants at levels adequate for the receiving environment to buffer appropriately, in this instance being adequately utilised by the grassed public open spaces as a fertiliser substitute, thereby preventing or minimising adverse impacts to the environment.

Untreated or incorrectly treated wastewater may contain elevated concentrations of nitrogen and phosphorus as well as metals, metalloids and persistent organic pollutants. During irrigation and discharges of TWW to land (source) the release of contaminants in concentrations elevated beyond what the grassed public open spaces can adequately utilise as a fertiliser substitute (emission) by overland flow, runoff and subsurface seepage (pathway) may cause contamination of soils and groundwater (adverse impact).

Additionally, once soil concentrations of nutrients and contaminants reach the threshold of what the grassed public open space can utilise, any additional TWW that is applied will instead be laterally transported by overland flow, runoff and subsurface seepage (pathway) leading to contamination of surface waters of the Avon River, impacting the aquatic and riparian ecosystem (adverse impact). This risk is discussed in detail in Section 3.5.

Criteria for assessment

Relevant land and surface water quality criteria include:

- AECOM (2014) Northam Nutrient Irrigation Management Plan; and
- Department of Health (2011) – Guidelines for the non-potable use of recycled water in Western Australia.

Applicant controls

The applicant has not proposed any new controls for discharges of TWW for irrigation from the premises.

The applicant has requested a 5 year licence duration to support the operational continuation of the WRRF while upgrades to the premises are developed.

Key findings

The Delegated Officer has reviewed the information regarding discharges of TWW for irrigation containing contaminants at concentrations not fit for purpose and has found:

15. Ingress of stormwater into the sewer network system, overtopping events and the occurrence of losses likely from seepage have occurred at the premises, which could be negatively impacting the ability of the WRRF to adequately treat wastewater prior to discharge for irrigation.
16. Sampling of wastewater post-treatment conducted in 2022-23 (Table 9) shows concentrations of nitrogen and phosphorus being elevated compared to the 2012-14 data (Table 7) was used to calculate soil nutrient loading rates in the Nutrient Irrigation Management Plan, which indicates when this water is irrigated at the Northam ovals it will overload soils with nutrients in excess of what the turf can utilise for growth.
17. The Delegated Officer notes the applicant has requested a 5 year licence duration to support the operational continuation of the WRRF while upgrades to the premises are developed.

Consequence

If TWW containing nutrients and contaminants at concentrations not fit for purpose is released during irrigation of Northam ovals, the Delegated Officer has determined that impacts from nutrients and contaminants could result in mid-level onsite impacts, low-level offsite impacts on a local scale and minimal offsite impacts on a wider scale where specific consequence criteria for the environment are at risk of not being met. Therefore, the Delegated Officer considers the consequence of the release of TWW containing nutrients and contaminants at concentrations not fit for purpose during irrigation to be **Moderate**.

Likelihood

The Delegated Officer has determined that, given the high concentrations of parameters of nitrogen, phosphorus and other contaminants sampled in the Shire pond in 2022-23 (Table 9), the likelihood of nutrients and contaminants being discharged in TWW will probably occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of the release of TWW containing contaminants at concentrations not fit for purpose during irrigation to be **Likely**.

Overall risk rating for discharges of TWW for irrigation containing nutrients and contaminants at concentrations not fit for purpose

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 15) and determined that the overall rating for the risk of the release of TWW containing nutrients and contaminants at concentrations not fit for purpose during irrigation of the Northam reuse scheme is **High**.

Justification for additional regulatory controls

The requirement for an update Nutrient Irrigation Management Plan (NIMP) has been added to the licence (condition 17). The NIMP requires review to determine the current soil nutrient loading capacity, the current input levels of nutrients from TWW and the ongoing ability of the oval turf to adequately utilise this level of nutrients. If the soils of the ovals become, or are already, overloaded with nutrients they pose a risk of lateral transportation of nutrients to the nearby Avon River, and the Mortlock River, thereby contributing to eutrophication of the Avon River as discussed in Section 3.5.

The NIMP will also require review to determine if the irrigation requirements of the ovals are still current, including the removal of Apex Park from the irrigation schedule, and any improvements to quality and increase in quantity of the reuse water as a result of the proposed future infrastructure upgrades at the premises.

The Shire of Northam indicated a desire to expand the number of reuse areas in recent correspondence to DWER. The applicant should consider including future additional areas to the Shire's reuse scheme within the NIMP, to facilitate increased reuse of TWW proposed by future upgrades at the premises.

The Delegated Officer will require the high risk of discharges of elevated concentrations of nutrients and contaminants to the irrigation scheme to be mitigated by future upgrades at the premises.

3.5 Detailed risk assessment – Discharges of TWW to the Avon River containing nutrients and contaminants at concentrations not fit for purpose

Description of the risk event for discharges of TWW to the Avon River

The untreated sewage from the town of Northam is received at the WRRF for treatment, following which TWW may be piped to the Shire's reuse pond in Clarke Street for irrigation via the reuse scheme to Northam town ovals. TWW volumes in excess of the Shire's reuse needs is discharged to land within the premises boundary at the WRRF and eventually discharges to the Avon River.

Wastewater, if treated sufficiently, should contain nutrients and contaminants at levels adequate for the receiving environment to buffer appropriately, thereby preventing or minimising adverse impacts to the environment.

Untreated or incorrectly treated wastewater may contain elevated concentrations of nitrogen and phosphorus as well as metals, metalloids and persistent organic pollutants. During discharges of TWW to the Avon River (source) the release of contaminants in elevated concentrations (emission) by runoff and subsurface seepage (pathway) may cause adverse impacts to aquatic and riparian ecosystem health, surface water of the Avon River, contamination of soil, impacts to riparian vegetation health and degradation of groundwater quality (adverse impact).

Criteria for assessment

Relevant land and surface water quality criteria include:

- ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality;
- Cardno (2021) Groundwater and Surface Water Monitoring Event Northam Wastewater Treatment Plant.
- Department of Health (2011) – Guidelines for the non-potable use of recycled water in Western Australia; and
- Department of Environment Regulation (2014) Assessment and management of contaminated sites: Contaminated sites guidelines.

Applicant controls

The applicant has not proposed any new controls for discharges of TWW to the Avon River from the premises.

The applicant has requested a 5 year licence duration to support the operational continuation of the WRRF while upgrades to the premises are developed.

Key findings

The Delegated Officer has reviewed the information regarding discharges of TWW to the Avon River containing nutrients and contaminants at concentrations not fit for purpose and has found:

18. Water testing in 2012-13 showed that Total Nitrogen and Total Phosphorus were more than ten times higher in TWW compared to background levels of the Avon River (Table 7). While the Delegated Officer is aware background levels will have also increased in the last ten years, these nutrients significantly increased in the 2022-23 sampling of TWW (Table 11). Contaminants are not currently sampled.
19. Treatment at the WRRF resulted in six exceedances of the 1.0 mg/L Total Phosphorus limit (Table 10), one as high as 2.40 mg/L, in 2020-21.
20. Ingress of stormwater into the sewer network system, overtopping events and the

occurrence of losses likely from seepage have occurred at the premises, which could be negatively impacting the ability of the WRRF to adequately treat wastewater prior to discharge to the Avon River.

21. The applicant has requested a 5 year licence duration to support the operational continuation of the WRRF while upgrades to the premises are developed.

Consequence

If TWW containing nutrients and contaminants at concentrations not fit for purpose is discharged to the Avon River, the Delegated Officer has determined that impacts could result in high level onsite impacts, mid-level offsite impacts on a local scale and short-term impacts to an area of high conservation value or special significance, where specific consequence criteria for the environment are exceeded. Therefore, the Delegated Officer considers the consequence of discharges of TWW containing nutrients and contaminants at concentrations not fit for purpose to the Avon River to be **Major**.

Likelihood

The Delegated Officer has determined that, given the high concentrations of parameters of nitrogen, phosphorus and other contaminants sampled in discharges to the Avon River in 2022-23 (Table 11), the Total Phosphorus limit exceedances (Table 10) and 2012-13 water testing having already shown nutrients in TWW exceeding background concentrations of the Avon River (Table 7), the likelihood of discharges of TWW to the Avon River containing nutrients and contaminants at concentrations not fit for purpose will probably occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of discharges of TWW containing nutrients and contaminants at concentrations not fit for purpose to the Avon River to be **Likely**.

Overall risk rating for discharges of TWW to the Avon River containing contaminants at concentrations not fit for purpose

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 15) and determined that the overall rating for the risk of discharges of TWW containing nutrients and contaminants at concentrations not fit for purpose to the Avon River is **High**.

Justification for additional regulatory controls

The applicant intends on conducting infrastructure upgrades at the premises in the near future and the Delegated Officer will require that wastewater treatment achieves the level of protection commensurate with the ANZ Guideline classification for a 'high conservation or ecological value system'. In turn this will mitigate the risk of impacts from discharges of elevated concentrations of nutrients and contaminants to the Avon River.

The recommended approach to determine if effluent is appropriate for discharge to the Avon River (Section 2.5) shall be conducted as an outcomes-based approach. To complement this study, the suite of parameters to be sampled from treated wastewater in condition 13 has been expanded.

While the Delegated Officer is aware that the ANZECC default trigger value of ≤ 0.02 mg/L total phosphorous is applicable for discharges to slightly to moderately disturbed ecosystems, the licence includes an emission limit of < 1.0 mg/L for total phosphorus for TWW discharged from the premises commensurate with previous licence requirements and treatment methods achievable by the current plant design. The aforementioned determination of trigger/exceedance requirements for effluent discharges to the Avon River (Section 2.5) will provide qualitative data to indicate a more appropriate emission limit for total phosphorus, and other contaminants, whereby the applicant can then determine necessary treatment modifications to achieve these limits via the premises infrastructure upgrades.

The five surface water sampling locations on the current licence are considered sufficient,

however the suite of parameters to be sampled has been expanded to provide more accurate data on surface water quality, until such time as the protection criteria under the ANZG Water Quality Guidelines (2018) have been defined for the Avon River and both the sampling locations and suite of parameters are reviewed for suitability to meet the protection criteria.

The Delegated Officer will require the high risk of discharges of elevated concentrations of nutrients and contaminants to the Avon River to be mitigated by the premises infrastructure upgrades.

4. Assessment of applicant's request to amend conditions

The applicant has requested an alteration to the method for calculating the operating throughput of the plant where the "Assessed design capacity" of 1,500 m³ per day is to be measured and recorded as Annual Average Daily Flow, rather than the currently practiced Monthly Average Daily Flow. The applicant prefers the use of Annual Average Daily Flow to define either agreed "treatment capacity", or actual status for a reporting period.

The applicant proposes to use several calculated datasets to model flow conditions which the WRRF will be required to manage, including:

- Average Dry Weather Flow - average flow of incoming used water (domestic, commercial and industrial) measured in the three driest (non-rainfall) months of the year.
- Peak Dry Weather Flow - the highest measured hourly flow that occurs during dry weather, which in turn defines the diurnal peak contaminant load.
- Maximum Month Flow (MMF) - largest volume of flow measured during a continuous period of 30 days, expressed as a daily average, which may also represent the peak daily load.
- Peak Wet Weather Flow - highest measured hourly flow that occurs during wet weather.
- Peak (instantaneous) Flow - highest possible inflow to a treatment facility.

These datasets are represented in combination by an Annual Average Daily Flow, which is defined as the average flow of incoming used water measured over the whole year, calculated by dividing the total annual inflow volume by 365 days. It includes the influence of all domestic, commercial and industrial used water flows, as well as rainfall and groundwater infiltration, and the impact that these inputs have on the variable load which a treatment facility must manage to a specified standard. The applicant considers it an appropriate measure to calculate inflows at the WRRF.

The Delegated Officer notes the ongoing exceedances of monthly average inflow to the WRRF (Section 2.8, Table 4), and that the request to alter the method for calculating the operating throughput of the plant would enable these exceedances above the currently approved 1,500 m³ per day, to be averaged out in combination with months of lower inflow thereby mitigating accurate recording of treatment capacity of the WRRF. As such, the request to alter the method for calculating the operating throughput of the plant as an Annual Average Daily Flow has not been supported.

The Delegated Officer notes this Decision Report is assessing the maximum design capacity of the plant of 1,500 m³ per day and the emissions and discharges this rate of treatment creates. The modification to an annual average daily flow indicates that the plant capacity can exceed this throughput, which would require reassessment of the risks posed by the fluctuating inflows upon plant treatment capability, pond capacity and nutrient loading of discharges to the Avon River and the reuse scheme.

5. Consultation

Table 17 provides a summary of the consultation undertaken by the department.

Table 17: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website (28/09/2023) and in the West Australian (02/10/2023)	None	N/A
Local Government Authority advised of proposal (29/09/2023)	None	N/A
Department of Health advised of proposal (29/09/2023)	Comments received on 16/10/2023 and 30/09/2024 and summarised in Section 2.7.	Department response summarised in Section 2.7 (Key findings).
Applicant provided with draft documents (20/12/2023)	Comments received on 23/02/2024 and summarised in Appendix 1.	Department response summarised in Appendix 1.
Applicant provided with draft documents (25/10/2024)	Comments received on 15/11/2024 and summarised in Appendix 2.	Department response summarised in Appendix 2.

6. Conclusion

Based on the assessment in this decision report, the delegated officer has determined that the application to renew licence L5989/1991/12 will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

References

1. AECOM 2014, *Northam Nutrient Irrigation Management Plan*.
2. ANZECC & ARMCANZ 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra.
3. ANZG, *Search for toxicant default guideline values for the protection of aquatic ecosystems*: <https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/water-quality-toxicants/search>
4. ANZG, *Toxicant default guideline values for protecting aquatic ecosystems*: <https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/water-quality-toxicants/search/master-table>
5. ANZG 2018, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.
6. ANZG 2023, *Guidance on the use of ecosystem receptor indicators for the assessment of water and sediment quality*. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.
7. Cardno 2018, *Detailed Site Investigation - Northam Wastewater Treatment Plant (ponds) Northam WA*.
8. Cardno 2021, *Groundwater and Surface Water Monitoring Event Northam Wastewater Treatment Plant*.
9. Department of Health 2022, *Wastewater Overflow Notification and Response Procedures 2021*.
10. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
11. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
12. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.

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

Condition	Summary of applicant's comment	Department's response
Comments on Licence		
Condition 1 Table 1 (Draft condition 1, Table 1)	Add to Row 1: Include primary treatment plant infrastructure in the table: a) Grit Channel b) Primary sedimentation tanks (Tank #1 & Tank #2) c) Sludge Digesters x 3 d) Sludge drying beds x 4 e) Hardstand with Biosolids storage bays x3	Condition wording amended. The description in Section 2.2 of the Decision Report of the infrastructure present at the primary premises will be amended for consistency.
	Amend Row 1: Treatment ponds 1-3 are all technically secondary ponds operating in parallel.	Condition wording amended.
	Amend Row 1: The flow meter is located after the Shire pond and chlorination. It records the volume of treated wastewater that leaves the premises for reuse via irrigation.	Condition wording amended.
	Delete Row 2: Shire pond. The Shire pond is not a Water Corporation asset. As the occupier of this part of the premises on which this infrastructure is located, the Shire is responsible for the operation and maintenance of this asset.	Condition wording retained. The Shire pond and the chlorination unit are located within the premises boundary, therefore DWER considers the applicant is responsible for maintenance of this infrastructure. As such, these items of infrastructure are to remain listed in condition 1.
	Delete Row 5: Chlorination unit. The chlorination unit is not a Water Corporation asset. As the occupier of this part of the premises on which this infrastructure is located, the Shire is responsible for the operation and maintenance of this asset.	If the applicant considers they do not hold this responsibility, the infrastructure should be excised from the premises boundary via a licence amendment.

Condition	Summary of applicant's comment	Department's response
<p>Condition 1 Table 1 (Draft condition 1, Table 1)</p>	<p>Amend Row 1 (c)(iii) 'There is no seepage loss from the wastewater treatment ponds'.</p> <p>These treatment ponds are not plastic lined and as such are designed to have a minimal volume of infiltration due to the nature of the compact clay lining. The industry standard is an infiltration rate of 1×10^{-9} m/sec. Requesting to specify that the condition only refers to additional seepage beyond design standard.</p>	<p>Condition wording amended to ensure the rate of seepage loss is less than or equal to 1×10^{-9} m/sec.</p>
	<p>Amend Row 7: Deletion of groundwater monitoring bores MW3, MW4, MW5, MW6, MW7, MW17A, GWQC12, GWQC21, GWQC22, GWQC31, and GWQC32 as they are not suitable for monitoring purposes. Addition of groundwater monitoring bore MW13.</p> <p>These 10 bores allow for ongoing monitoring of groundwater quality down-hydraulic gradient of all infrastructure and discharge areas.</p>	<p>Condition wording amended.</p> <p>Bore GWQC11 also deleted, to ensure consistency with the applicant's comments provided against condition 14, Table 8 (Draft condition 17, Table 9).</p>
<p>N/A (Draft condition 3)</p>	<p>Delete condition: 'The licence holder must take all reasonable and practicable measures to prevent stormwater run-off becoming contaminated by the activities and operations undertaken at the premises'.</p> <p>The operational requirements listed in Table 1 already condition Water Corporation to meet the desired outcome. Thus, this condition is redundant. Further, it is unclear how compliance is met with this condition and how to audit this condition.</p>	<p>Condition deleted, noting that it is a duplication of condition 1.</p>
<p>Condition 3 Table 2 (Draft condition 4, Table 2)</p>	<p>Amend Table 2 to add '(as a monthly average)' to the rate at which waste is received, for consistency with condition 6, Table 3.</p>	<p>Condition wording amended.</p>
	<p>Amend Row 2, providing the wording as requested by DWER 'tankered into the premises and discharged into the primary treatment plant or treatment ponds'.</p>	<p>Condition wording amended to primary treatment plant.</p> <p>Sewage waste from the reticulated sewage network that is tankered into the premises is considered liquid waste in accordance with Category 61. As the rate at which this waste is received falls below the threshold for Category 61, the rate in Table 2 has been specified as 'less than 100 tonnes per annual period'.</p>

Condition	Summary of applicant's comment	Department's response
<p>Condition 3 Table 2</p> <p>(Draft condition 4, Table 2)</p>	<p>Add Row 3: Imhoff tank waste. No rate limit applicable. Spadeable waste which is disposed to sludge drying beds.</p> <p>Water Corporation transports dried spadeable Imhoff tank sludge from other regional wastewater treatment facilities into Northam WRRF. This waste is placed into the sludge drying beds where it is removed with the Northam WRRF dried sludge.</p> <p>The Water Corporation provided further information on 06/05/2024 advising:</p> <p>Imhoff waste comes from Cunderdin, Wundowie, Meckering, Narembeen, and Kellerberrin WWTPs. 13-weekly clean outs of Imhoff tanks are scheduled, however, if there is not a sufficient volume of Imhoff sludge then the clean out will not take place until 26 weeks. Therefore, each plant undergoes Imhoff tank cleaning approximately 2-3 times per year. Each load of Imhoff waste is approximately 5 m³, totaling approximately 100 m³ per year received at Northam WRRF.</p> <p>The waste is dried in the Imhoff drying beds at the source plants. The Imhoff waste is diluted with sand as the Imhoff beds are layered with sand. Once it is adequately dry and spadable it is collected and transported to the hardstand biosolids storage bays at Northam WRRF. These bays adequately contain the waste and prevent any unplanned discharges due to stormwater runoff. The waste is then transported to a licensed facility by an appropriately licensed carrier for disposal.</p>	<p>The quantity of Imhoff waste to be received at Northam WRRF falls below the production capacity for both Category 61A solid waste facility and Category 62 solid waste depot, so neither of these categories will be added to the Northam licence.</p> <p>Imhoff waste will be added as a waste type approved for acceptance at the premises, with associated conditions as necessary in the licence for management of this waste. To ensure the rate at which Imhoff waste is received remains below the threshold for Category 62, the rate in Table 2 has been specified as 'less than 500 tonnes per annual period'.</p> <p>Row 3 added to Table 2 to allow the acceptance of Imhoff tank waste into the premises, plus additional acceptance specifications included for clarity.</p> <p>For consistency with this request, condition 5, Table 3 (draft condition 6, Table 3) has been amended. Imhoff tank waste type has been added, with the limits or specifications being equivalent to that of sewage sludge. The process has been amended, for Imhoff waste and sewage sludge, to remove the words 'and processing' as these wastes will not be processed, only stored prior to off-site disposal.</p> <p>For consistency with this request, condition 12, Table 6 (draft condition 15, Table 7) has been amended to ensure loads of Imhoff tank waste received at the premises are adequately monitored, by adding the Imhoff tank waste as an Input. The monitoring parameter and frequency are equivalent to that of sewage sludge, on a volumetric per load basis.</p>
<p>Condition 5 Table 3</p> <p>(Draft condition 6, Table 3)</p>	<p>Amend Row 2: Delete 'leachate to be returned to the start of the treatment process' and replace with 'leachate to be returned to the treatment ponds'.</p> <p>Sludge leachate is not always returned to the start of the treatment process. Sometimes it is returned to pond 4 when pond 4 is being desludged as a minimum depth is required to undertake online pond desludging.</p>	<p>Condition wording amended.</p>

Condition	Summary of applicant's comment	Department's response
Condition 5 Table 3 (Draft condition 6, Table 3)	Amend Row 2: Delete 'and to be transported by a licensed carrier'. Dried sludge produced within the premises is spadeable. As such, it does not trigger a controlled waste permit during transportation	Condition wording amended.
N/A (Draft condition 7)	Delete condition: 'The licence holder must manage and operate the premises such that odours emanating from the premises do not unreasonably interfere with the health, welfare, convenience, comfort or amenity of any person.' This condition is already a legislative requirement under s. 49 of the EP Act. According to DER's Guidance Statement Setting Conditions (2015), conditions will not unnecessarily duplicate requirements imposed on licensees directly by the EP Act or another written law.	This condition is included for transparency to demonstrate DWER has risk assessed odour emissions and determined regulatory control is necessary. However, it is agreed in this instance the application of this condition is a duplication of the regulatory control provided under s. 49 of the EP Act, therefore the Delegated Officer has agreed to delete condition 7. For consistency with this request, condition 27, Table 10 (draft condition 31, Table 11) relating to reporting of complaints will be modified to remove the bracketed text 'cross referenced with prevailing wind directions'. The risk assessment in Table 14 of this Decision Report will be modified to reflect this outcome.
Condition 6 Table 4 (Draft condition 8, Table 4)	Amend Row 1: 'Inlet to Shire Pond'. Water Corporation does not own or operate the Shire Pond. The discharge point is the final effluent entering the Shire Pond post the UV Wet Well. Requesting to amend to make this clearer.	Upon review of the process control schematic of the WWTP, the Delegated Officer considers the discharge point post-treatment is up to and including the exit from the UV disinfection unit. As this pipeline then branches for discharge to the Shire Pond and to the Flume outflow, these are considered two discharge points which both need to be authorised by DWER. The names of the discharge points in condition 6, Table 4 (draft condition 8, Table 4) have been amended to 'Exit from UV disinfection unit directed to the Shire Pond' and 'Exit from UV disinfection unit directed to the Flume outflow to Avon River' to differentiate the two discharge points and associated emissions.

Condition	Summary of applicant's comment	Department's response
Condition 7 Table 5 (Draft condition 9, Table 5)	Amend Row 1: 'Inlet to Shire Pond', as above.	<p>DoH manages limits of <i>E. coli</i>, turbidity, pH and total residual chlorine in the emissions of treated wastewater that are sent to the reuse scheme via the Recycled Water Scheme Approval No. D49/NT000 issued to the Shire of Northam. The Delegated Officer shall not duplicate this legislative requirement in the licence. As such, the discharge point 'Exit from the Chlorine dosing unit' and the parameters <i>E. coli</i>, turbidity, pH and total residual chlorine shall be deleted from condition 7, Table 5 (draft condition 9, Table 5).</p> <p>The discharge point 'Exit from UV disinfection unit directed to the Flume outflow to Avon River' shall be retained in condition 7, Table 5 (draft condition 9, Table 5) and will specify concentration limits for total phosphorus and <i>E. coli</i>.</p> <p>The Northam WWTP was originally designed for discharging to the Avon River only in emergency events, therefore the plant can only provide limited treatment for <i>E. coli</i> as it is currently constructed. The Wastewater Overflow Notification and Response Procedures 2021 (Department of Health, 2022) provides <i>E. coli</i> concentration limits for recreational water bodies, during times of emergency wastewater overflow events. This provides a limit when measured within the water body and differs depending on the level of risk of exposure to humans. The <i>E. coli</i> concentration limit within primary recreational water bodies, where higher risk swimming or white-water canoeing occurs, is 100 – 700 cfu/100 mL. Alternatively, the limit within</p>
	Combine the two discharge points to be one. The quality of final effluent treated wastewater does not change between the two discharge points. As such, the quality parameters can be combined as the discharge quality for both discharge points is sampled at the Post UV Wet Well sample point.	
	Delete parameters and concentration limits: pH, turbidity and total chlorine. The chlorinator is located after the Shire Pond in the treatment train which is after the Water Corporation discharge point and hence the quality of treated effluent delivered by Water Corporation is not chlorinated. As such, we request to delete residual chlorine as a monitoring requirement. Request to delete turbidity as it is not a contaminant of potential concern and is not listed within the <i>Guideline, Assessment and Management of Contaminated Sites</i> (DWER 2021) Appendix B pp 149. Additionally, analysis of this parameter does not reduce the interpretive value of the monitoring data set or increase risk to the environment.	
	Amend concentration limits: <i>E. coli</i> from '< 10 cfu' to '< 1000 cfu (arithmetic mean, measured over 3 out of 4 consecutive sampling periods)'. An <i>E. coli</i> concentration of 1,000 cfu/100 mL is applicable for the discharge of treated wastewater to minimise the potential health risks associated with contact within the Avon River.	

Condition	Summary of applicant's comment	Department's response
<p>Condition 7 Table 5</p> <p>(Draft condition 9, Table 5)</p>		<p>secondary recreational water bodies, where lower risk boating, fishing and wading occurs, is 1,000 – 7000 cfu/100 mL.</p> <p>The Delegated Officer notes the requested <i>E. coli</i> concentration limit of < 1,000 cfu/100 mL to be tested within treated wastewater will, once the treated wastewater is discharged into the Avon River water body, result in a concentration limit that meets the DoH concentration limit for higher risk primary recreational activities. This condition will be amended.</p> <p>Over time, discharges to the Avon River have increased to become an operational disposal method. The Department of Health has advised that discharges beyond emergency discharges to the Avon River are considered recycled water and require approval. Given the applicant intends on refurbishing the plant in the near future, if operational discharges to the Avon River are to continue with the proposed plant upgrades the Delegated Officer will consider the DoH approval during assessment of the upgrades.</p> <p>The Delegated Officer considers the request to have the <i>E. coli</i> limit averaged as an arithmetical mean measured over 3 out of 4 consecutive sampling periods is inappropriate for that contaminant. Although the limit is appropriate in emergency discharge events, the discharge event is not restricted to emergency situations but rather it is an ongoing operational disposal method. As such, management responses to any exceedances of this limit must be timely and effective to mitigate impacts to human health. This request has not been supported.</p>
<p>N/A</p> <p>(Draft condition 10, Table 6)</p>	<p>Delete condition and table: 'The licence holder must ensure that treated wastewater is only discharged via irrigation to the specified discharge points in accordance with the loading limits and specifications in Table 6.'</p> <p>Water Corporation does not own or operate the Northam Irrigation system. This is managed entirely by the Shire and Water Corporation has no authority over this activity.</p>	<p>As the applicant does not operate the irrigation system, they are unable to implement the specifications at the irrigation locations. As such, the specifications column of draft condition 10, Table 6 will be deleted.</p> <p>The applicant provides TWW to the irrigation network, which is unable to be further treated by the Shire of Northam. Thereby, the applicant must provide TWW to the Shire of Northam that has achieved the necessary loading limits, to ensure the receiving soils within the reuse network are not overloaded. As such, the discharge</p>

Condition	Summary of applicant's comment	Department's response
		<p>points and loading limits of draft condition 10, Table 6 will be moved to become discharge specifications within condition 6, Table 4 (draft condition 8, Table 4) for TWW discharged to the reuse network.</p> <p>In effect, condition deleted.</p> <p>Condition 27, Table 10 (draft condition 31, Table 11) has been amended to include reporting of the calculated contaminant loads for Total Nitrogen and Total Phosphorus in kg/ha/year for discharges to the Shire of Northam reuse network, and a comparison of this load to the discharge rate specified in condition 6, Table 4.</p>
<p>Condition 12 Table 6 (Draft condition 15, Table 7)</p>	<p>Amend Row 2, providing the wording as requested by DWER: 'Sewage (Tankered), no monitoring point applicable, parameter is volume per load, unit is m³, averaging period is not applicable, frequency to be altered to per load.'</p>	<p>Condition wording amended. Parameter listed as volume, with frequency as per load.</p>
	<p>Amend Row 3: treated wastewater monitoring points to be amended to 'Outflow to Shire Reuse' and 'Flume Outflow (Discharge channel)'. Flow to reuse is measured via a Water Corporation magflow meter which is positioned post the Shire Pond and chlorinator which captures the volume of treated effluent that leaves the prescribed premises to the reuse sites. A separate flow monitoring device captures the volume of treated wastewater that goes to the start of the discharge channel.</p>	<p>Condition wording amended.</p>
<p>Condition 13 Table 7 (Draft condition 16, Table 8)</p>	<p>Amend Column 1: Delete monitoring point reference 'outlet post-chlorination unit'. The Water Corporation does not have a sampling point beyond the chlorination unit.</p>	<p>Upon review of the process control schematic of the WWTP, the Delegated Officer notes there is currently no capability to sample post-chlorination. As such, the monitoring point 'outlet post-chlorination unit' will be deleted.</p>
	<p>Amend Column 3: Delete parameter 'cumulative flow volume'. Cumulative flow volume is already monitored under Condition 15. Request to delete duplication.</p>	<p>Parameter and unit deleted from condition 13, Table 7 (draft condition 16, Table 8).</p>

Condition	Summary of applicant's comment	Department's response
Condition 13 Table 7 (Draft condition 16, Table 8)	Amend Column 3: Delete parameter 'residual chlorine' and associated unit.	DoH manages limits of total residual chlorine and turbidity in the emissions of treated wastewater that are sent to the reuse scheme via the Recycled Water Scheme Approval No. D49/NT000 issued to the Shire of Northam. The Delegated Officer shall not duplicate this legislative requirement in this licence. As such, the parameters total residual chlorine and turbidity shall be deleted from condition 13, Table 7 (draft condition 16, Table 8).
	Amend Column 3: Delete parameter 'turbidity' and associated unit.	
Condition 13 Table 7 (Draft condition 16, Table 8)	Amend Column 3: Delete parameter 'total coliforms' and associated unit. Measurement of <i>E. coli</i> is sufficient.	Parameter and unit deleted from condition 13, Table 7 (draft condition 16, Table 8).
	Amend Column 3: Amend frequency of monitoring parameters 'Electrical conductivity' and 'Redox potential' to be quarterly.	Condition wording amended.
	Amend Column 3: Amend frequency of monitoring parameter 'pH' to be monthly. The pH is unable to be measured continuously, request to amend to monthly frequency in line with other parameters.	Condition wording amended. If operational discharges to the Avon River are to continue with the proposed plant upgrades, the Delegated Officer expects pH to be monitored continuously when the upgrades are implemented at the plant.
	Amend Column 3: Amend parameter 'Ammonia (NH ₃) as N' and replace with parameter 'Ammonium (NH ₄) as N'.	Condition wording amended.
	Amend Column 3: Delete parameters 'surfactants', 'molybdenum' and 'vanadium'. Request to delete these parameters as they are not contaminants of potential concern and are not listed within the <i>Guideline: Assessment and Management of Contaminated Sites</i> (DWER 2021) Appendix B pp 149. Additionally analysis of these parameters does not reduce the interpretive value of the monitoring data set or increase risk to the environment.	Condition wording retained. Schedule 4, Part 3 of the EP Regulations specify the kinds of wastes present in discharges onto land or into waters. Surfactants are a liquid waste that physically alter the characteristics of naturally occurring waters. Molybdenum and vanadium are wastes that can potentially accumulate in the environment or living tissues. It is important to monitor the presence and concentration of these wastes in TWW, in order to compare it to concentrations of these parameters in surface water samples taken from the Avon River.

Condition	Summary of applicant's comment	Department's response
<p>Condition 13 Table 7 (Draft condition 16, Table 8)</p>	<p>Delete Note 3: 'In field, non-NATA accredited analysis and NATA accredited analysis required' and substitute with Note 1 'In field, non-NATA accredited analysis permitted' for electrical conductivity.</p> <p>Requirement for in field, non-NATA analysis and NATA analysis doesn't provide any beneficial environmental outcome.</p>	<p>Note 3 deleted from condition 13, Table 7 (draft condition 16, Table 8) for electrical conductivity and replaced with Note 1.</p>
	<p>Amend Column 5: Frequency for electrical conductivity, redox potential, major cations, major anions and metals and metalloids to be amended from Monthly to Quarterly.</p> <p>This requested amendment does not reduce the interpretive value of the monitoring data set or increase risk to the environment. This requested amendment is consistent with other monitoring effort for condition 17 and condition 18.</p>	<p>Condition wording amended.</p>
<p>Condition 14 Table 8 (Draft condition 17, Table 9)</p>	<p>Amend Column 1: Deletion of groundwater monitoring bores MW3, MW4, MW5, MW6, MW7, MW17A, GWQC11, GWQC12, GWQC21, GWQC22, GWQC31, and GWQC32 as they are not suitable for monitoring purposes. Addition of groundwater monitoring bore MW13.</p> <p>These 10 bores allow for ongoing monitoring of groundwater quality down-hydraulic gradient of all infrastructure and discharge areas.</p> <p>Updated map provided depicting the groundwater monitoring bore locations.</p>	<p>Condition wording amended.</p> <p>For consistency with this request, Figure 4 of the Licence and Section 2.12 and Figure 4 of the Decision Report have been updated with an accurate map of the 10 groundwater monitoring bores.</p>
	<p>Amend Column 2: Delete parameters '5 day Biochemical Oxygen Demand', 'total suspended solids', 'surfactants', 'molybdenum' and 'vanadium'.</p> <p>Request to delete these parameters as they are not contaminants of potential concern and are not listed within the <i>Guideline: Assessment and Management of Contaminated Sites</i> (DWER 2021) Appendix B pp 149. Additionally analysis of these</p>	<p>5-day BOD is a key early indicator of organic related contamination in groundwater. As organic matter increases, more oxygen is required to be used to break it down. Changes in groundwater due to wastewater intrusion presents as changes in geochemical parameters (oxygen, pH, redox etc) earlier than contaminants of potential concern (nitrogen, phosphorus) as nutrients are consumed or bound up in the process. Therefore, the nutrient load in treated wastewater entering groundwater needs to reach a high load before it</p>

Condition	Summary of applicant's comment	Department's response
	<p>parameters does not reduce the interpretive value of the monitoring data set or increase risk to the environment.</p>	<p>identifies in samples. Further, the premises is in proximity to suitable laboratories to meet the required 48 hour holding time for BOD analysis. As this parameter provides relevant data for groundwater sampling, BOD will be retained in the licence condition.</p> <p>Given the treated wastewater filters through the soil medium before reaching groundwater, any suspended solids would likely have filtered out beforehand. As this parameter does not provide relevant data for groundwater sampling, Total Suspended Solids will be deleted from condition 14, Table 8 (draft condition 17, Table 9).</p> <p>Surfactants, molybdenum and vanadium are contaminants of interest when sampling surface waters. As these parameters do not provide relevant data for groundwater sampling, they will be deleted from the licence condition.</p>
<p>Condition 14 Table 8 (Draft condition 17, Table 9)</p>	<p>Delete Note 3: 'In field, non-NATA accredited analysis and NATA accredited analysis required' and substitute with Note 1 'In field, non-NATA accredited analysis permitted' for electrical conductivity.</p> <p>Requirement for in field, non-NATA analysis and NATA analysis doesn't provide any beneficial environmental outcome.</p>	<p>Note 3 deleted from condition 14, Table 8 (draft condition 17, Table 9) for electrical conductivity and replaced with Note 1.</p>
	<p>Amend Column 4: frequency to have '(if groundwater is present and access to bores is safe)' added to Quarterly.</p>	<p>Condition wording amended to "(if groundwater is present)" only. The applicant has a responsibility to maintain the premises to ensure year-round access to all infrastructure.</p> <p>To facilitate sampling, condition 9(b) (draft condition 12(b)) which stipulates the required number of days between successive quarterly sampling has been amended from 45 days to 30 days, to provide an additional 15 days within the monitoring time period for sampling to occur during a safe weather event.</p>
<p>Condition 15 Table 9 (Draft condition 18, Table 10)</p>	<p>Updated map provided, as requested by DWER, depicting the surface water monitoring point locations.</p>	<p>Figure 4 of the Licence and Figure 3 of the Decision Report updated with the map of the 5 surface water monitoring locations.</p> <p>For consistency, column 1 of Table 9 (draft Table 10) is amended to depict the correct monitoring point location names, as shown in the provided map.</p>

Condition	Summary of applicant's comment	Department's response
<p>Condition 15 Table 9 (Draft condition 18, Table 10)</p>	<p>Amend Column 1: Delete parameters '5-day Biochemical Oxygen Demand', 'total suspended solids', 'phenols', 'surfactants', 'molybdenum' and 'vanadium'.</p> <p>Request to delete these parameters as they are not contaminants of potential concern and are not listed within the <i>Guideline: Assessment and Management of Contaminated Sites</i> (DWER 2021) Appendix B pp 149. Additionally, analysis of these parameters does not reduce the interpretive value of the monitoring data set or increase risk to the environment.</p>	<p>5-day BOD is a key early indicator of organic related contamination in surface water. As organic matter increases, more oxygen is required to be used to break it down. Changes in surface water due to contaminated groundwater intrusion presents as changes in geochemical parameters (oxygen, pH, redox etc) earlier than contaminants of potential concern (nitrogen, phosphorus) as nutrients are consumed or bound up in the process. Therefore, the nutrient load in treated wastewater entering groundwater needs to reach a high load before it identifies in samples. Further, the premises is in proximity to suitable laboratories to meet the required 48 hour holding time for 5-day BOD analysis. As this parameter provides relevant data for surface water sampling, 5-day BOD will be retained in the licence condition.</p> <p>Discharges of TWW to the Avon River have the potential to contain suspended solids. As total suspended solids provide relevant data for surface water sampling, this parameter will be retained in the licence condition.</p> <p>Schedule 4, Part 3 of the EP Regulations specify the kinds of wastes present in discharges onto land or into waters. Surfactants are a liquid waste that physically alter the characteristics of naturally occurring waters. Molybdenum and vanadium are wastes that can potentially accumulate in the environment or living tissues. It is important to monitor presence and concentration of these wastes in surface water samples taken from the Avon River to determine contributions from TWW discharges, therefore they will be retained in the licence condition.</p>
	<p>Amend Column 4: frequency to have '(if surface water is present and flowing, and access to sample location is safe)' added to Quarterly.</p> <p>To allow for seasonal fluctuation in surface water flow where it may be dry, or if the banks are flooded and dangerous.</p>	<p>Condition wording amended to "(if surface water is present)".</p> <p>Surface water data is relevant during low and no-flow times, as the intention is to determine changes in surface water due to wastewater-contaminated groundwater intrusion and discharges direct-to-surface water.</p> <p>To facilitate sampling, condition 9(b) (draft condition 12(b)) which stipulates the required number of days between successive quarterly sampling has been amended from 45 days to 30 days, to provide an additional 15 days within the monitoring time period for sampling to occur during a safe weather event.</p>

Condition	Summary of applicant's comment	Department's response
Condition 15 Table 9 (Draft condition 18, Table 10)	Delete Note 3: 'In field, non-NATA accredited analysis and NATA accredited analysis required' and substitute with Note 1 'In field, non-NATA accredited analysis permitted' for electrical conductivity. Requirement for in field, non-NATA analysis and NATA analysis doesn't provide any beneficial environmental outcome.	Note 3 deleted from Table 9 (draft Table 10) for electrical conductivity and replaced with Note 1.
Condition 16 (Draft condition 19)	Amend condition from 'maximum acceptable parameter concentrations for discharges to the Avon River to meet the ANZ Guidelines for a 'high conservation or ecological value system' to 'maximum acceptable parameter concentrations for discharges to the Avon River following ANZG (2018) deriving guideline values for water quality'. As per ANZG (2018) deriving guideline values for water quality, guideline values for aquatic ecosystems can be derived using reference-site data, laboratory effects data, field-effects data or multiple lines of evidence. Default guideline values provide a generic starting point for assessing water quality and are only recommended in the absence of more relevant guideline values (jurisdictional, site specific). The use of guideline values with measurements from other lines of evidence in a weight-of-evidence process to determine if water quality represents a risk to a particular community value is recommended by the ANZG (2018).	The Delegated Officer considers discharges of TWW from the WRRF presents a high risk to the Avon River, therefore the application of the 'maximum acceptable parameter concentrations for discharges to the Avon River to meet the ANZG (2018) guidelines for a 'high conservation or ecological value system' remains applicable to the investigative monitoring of the Avon River. The aim of condition 16 is to determine the toxicity of effluent and if it is suitable for discharge into the Avon River. To ensure clarity on this approach, condition 16 (draft condition 19) has been amended to provide specific detail on the monitoring requirements.
Condition 17 (Draft condition 20)	Amend condition to remove items (a) to (i) inclusive, and replace with 'that complies with WQPN33'. The condition is not required to be listed in detail if the NIMP complies with WQPN33.	Condition wording retained. The Delegated Officer considers it appropriate to detail the requirements the NIMP must encompass within the licence condition to ensure compliance with that condition, rather than defer compliance to a guideline that does not fall under the jurisdiction of the EP Act. The Delegated Officer has amended the condition wording to clarify that the NIMP is applicable only for the Northam reuse area.

Condition	Summary of applicant's comment	Department's response
N/A (Draft condition 21)	Delete condition: 'The licence holder must submit the Recycled Water Quality Management Plan (as submitted to the Department of Health) to the CEO: (a) on or before [3 months from grant]; or (b) with an application for proposed infrastructure upgrades.' Water Corporation does not have authority to provide this as this is an agreement between the Shire and DoH. Please contact DoH for this information.	Noted. Condition deleted. For consistency, Key Finding 5 within Section 2.7 and Key Finding 18 within Section 3.4 will also be deleted.
Condition 27 Table 10 (Draft condition 31, Table 11)	Amend condition: 'The licence holder must: (a) prepare an environmental report that provides information in accordance with Table 11 for the preceding two annual periods, and (b) submit the environmental report to the CEO by 1 October 2022 and biennially thereafter. Water Corporation cannot meet the requirements of Table 11 for the past two annual periods as monitoring in accordance with this Licence will not start until the Licence is issued. Amend submission date to be 1 October 2024.	Condition 27(a) (draft condition 31(a)) to be modified to require reporting on the preceding single annual period. Condition 27(b) (draft condition 31(b)) submission date to be amended to 1 October 2025 to align with reporting dates for the applicant's concurrent licenses. The previous licence L5989/1991/11 remains in force until the commencement of this licence L5989/1991/12, therefore the monitoring requirements of version 11 must be complied with until licence version 12 commences. Further, the monitoring and reporting conditions of licence version 11 are expanded in version 12, not deleted. It is the Delegated Officer's expectation that data collected in accordance with licence version 11 is included in the first environmental report submitted under licence version 12 to provide seamless reporting.
	Amend the requirements for reporting from 'an assessment against the ANZ Water Quality Guidelines for a 'high conservation or ecological value system' to 'an assessment against the ANZ Water Quality Guidelines for relevant assessment levels, with rationale provided to justify why assessment levels have been assigned'.	Condition wording retained. The Delegated Officer considers discharges of TWW from the WRRF presents a high risk to the Avon River, therefore the application of the 'maximum acceptable parameter concentrations for discharges to the Avon River to meet the ANZ Guidelines for a 'high conservation or ecological value system'' remains applicable to the investigative monitoring of the Avon River. If operational discharges to the Avon River are to continue with the proposed plant upgrades, the Delegated Officer considers the maximum acceptable parameter concentrations for discharges to the Avon River must meet the ANZ Guidelines for a 'high conservation or ecological value system'.

Condition	Summary of applicant's comment	Department's response
Comments on Decision Report		
Section 2.5 (was Section 2.4) & Key Findings 1	<p>ANZG Classification of the Avon River:</p> <p>As per ANZG (2018) deriving guideline values for water quality, guideline values for aquatic ecosystems can be derived using reference-site data, laboratory effects data, field effects data or multiple lines of evidence.</p> <p>Default guideline values provide a generic starting point for assessing water quality, and are only recommended in the absence of more relevant guideline values (jurisdictional, site specific). The use of guideline values with measurements from other lines of evidence in a weight- of-evidence process to determine if water quality represents a risk to a particular community value is recommended by the ANZG (2018).</p>	<p>As discussed in Section 2.5 (was Section 2.4), DWER has recommended default guideline values are used for specific toxicants only in the absence of site-specific guideline values.</p>
Section 2.5 (was Section 2.4) Section 3.5	<p>Determining if effluent is appropriate for discharge to the Avon River.</p> <p>Maximum acceptable nutrient concentrations of effluent for discharge to the Avon River.</p> <p>Water Corporation has engaged an aquatic science specialist consultant to determine the appropriateness of effluent discharge to the Avon River. The proposed approach is attached (Hydrobiology, 2024).</p>	<p>The approach proposed by Hydrobiology (2024) is not aligned with the specified actions detailed in Section 2.5 (was Section 2.4).</p> <p>To ensure clarity on this approach, condition 16 (draft condition 19) has been amended to provide specific detail on the monitoring requirements.</p>
Section 2.8 (was Section 2.7) Table 5	<p>Amend Table 5 heading 'Outflow to Avon River' to 'Outflow to Overflow Discharge Area'.</p> <p>The TWW flow volume is monitored from the flume discharging from the Shire Pond to the overflow discharge area. The exact amount of TWW that flows from the overflow discharge area into the Avon River is not known.</p>	<p>Table 5 heading amended.</p>

Condition	Summary of applicant's comment	Department's response
<p>Section 3.2 Table 14 Section 3.4 Section 3.5</p>	<p>Request the risk ratings in Table 14 for discharges of treated wastewater for irrigation of the reuse scheme and for discharges of treated wastewater to the Avon River, be amended from High to Medium, and also reflected in the detailed risk assessments within Sections 3.4 and 3.5.</p> <p>DoH regulates the reuse irrigation schemes as per "Guidelines for the Non-potable Uses of Recycled Water in Western Australia". The Northam Scheme is regulated as 'enhanced restricted access and application'. This reduces the viability of the potential pathway for gastroenteritis and other diseases.</p> <p>The controls are not applied as a condition of this licence but of the DoH approval. Water Corporation proposes that this reduces the likelihood from Possible to Unlikely.</p>	<p>The Delegated Officer has reconsidered the emissions present in discharges to the reuse scheme and to the Avon River and determined that there are two emissions of concern: pathogens and contaminants.</p> <p>As such, the risk assessment has been modified to identify these two emissions for each of the receiving environments.</p> <p>The Delegated Officer considers the Department of Health sufficiently regulates emissions of pathogens to the reuse scheme. Reassessment of this risk presents a major consequence and an unlikely likelihood, resulting in a medium risk, as detailed in Section 3.2.</p> <p>The Delegated Officer will still assess the risk of pathogens present in discharges to the Avon River, as detailed in Section 3.2.</p>

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

Condition	Summary of applicant's comment	Department's response
Comments on Licence		
Condition 6 Table 4	<p>It is noted while the individual reuse network discharge locations are listed in the condition, the application of reuse water is managed and operated by the Shire of Northam.</p> <p>Nutrient loading rates should be removed from Condition 6 Table 4 as they are based on out-dated figures that are no longer applicable to the scheme, hence the need to produce an updated NIMP per Condition 17. Following its completion, the updated NIMP can inform loading limits to be included in the discharge specifications in a future licence amendment.</p>	<p>Agreed. Condition amended.</p> <p>The Delegated Officer is aware the WRRF cannot currently meet these discharge rates. The updated NIMP will inform the irrigation discharge specifications for the upgraded WRRF and in time the requirements of the licence. Therefore, the Delegated Officer has removed nutrient loading rates and specific discharge locations from the licence.</p>
Condition 13 Table 7	<p>Water Corporation request parameters 'surfactants', 'molybdenum' and 'vanadium' be deleted from parameter list. Schedule 4, Part 4 of the EP Regulations are not specific to the type of waste being discharged so it is not clear what the justification for these parameters being selected is? Water Corporation's justification on parameters is from reference the Guideline: Assessment and Management of Contaminated Sites (DWER 2021) Appendix B pp 149 is based on DWER guidance on potential contaminants associated with wastewater.</p>	<p>Condition wording retained.</p> <p>Appendix B of the Guideline: Assessment and Management of Contaminated Sites (DWER 2021) provides an indicative list of common contaminant types and is focussed on the rectification of the contaminated land within a premises. It does not focus on the environmental impacts</p> <p>The applicant wishes to discharge TWW beyond the boundary of the premises, therefore the intention of sampling under condition 13 is to determine the full suite of contaminants present in TWW. Monitoring under the previous licence L5989/1991/11 was limited to nutrients and pathogens only; major cations, major anions, metals and metalloids were not specified. The applicant therefore has limited data on what contaminants are present in the TWW and being discharged to the Overflow Discharge Area and eventually the Avon River.</p> <p>Schedule 4, Part 3 of the EP Regulations specify the kinds of wastes present in discharges onto land or into waters. Surfactants are listed</p>

Licence: [L5989/1991/12](#)

Condition	Summary of applicant's comment	Department's response
		<p>as a liquid waste that physically alters the characteristics of naturally occurring waters; these are a known common contaminant in TWW. Molybdenum and vanadium are listed as wastes that can potentially accumulate in the environment or living tissues.</p> <p>It is important to monitor the presence and concentration of these wastes in TWW, then compare it to concentrations of these parameters in surface water samples taken from the Avon River. The results sampled in condition 13 will directly relate to the investigative review required under condition 16 to determine the environmental impacts of discharging TWW to the Avon River. This will inform the Delegated Officer's future assessment under Works Approval W6910/2024/1 for continuation of these discharges.</p> <p>If surfactants, molybdenum and vanadium are consistently not found in sampling, the applicant may request to remove these parameters from the licence during the renewal assessment in five years time.</p>
<p>Condition 14 Table 8</p>	<p>Water Corporation requests 5-day BOD be deleted from the parameter list for groundwater. Water Corporation agrees that changes in groundwater due to wastewater intrusion will present as changes in geochemical parameters and requests that 5-day BOD be replaced with: In-field non-NATA accredited analysis for Field Measurements (pH, electrical conductivity, redox, temperature and dissolved oxygen).</p>	<p>Dissolved oxygen is not an adequate substitute for 5-day BOD. Dissolved oxygen provides an immediate snapshot of water quality in groundwater and can indicate the current oxygen availability, which is crucial for the survival of aerobic microorganisms that help in natural attenuation of contaminants.</p> <p>5-day BOD reflects the oxygen demand over five days, so provides a more comprehensive picture of the organic load and its potential impact on groundwater quality over time. 5-day BOD is used as a stand-alone parameter across the suite of monitoring conditions in the licence, to provide an indication of the effectiveness of the WRRF treatment process, changes in groundwater and subsequently changes in surface water, from direct discharges of TWW and/or groundwater intrusion to the Avon River.</p> <p>5-day BOD is unable to be conducted in the field, as it is a test performed over 5 consecutive days. Northam is not a remote location and is in proximity to suitable laboratories to meet the required 48 hour holding time for BOD analysis. As such, 5-day BOD will be retained in the licence condition.</p>

Condition	Summary of applicant's comment	Department's response
		<p>Condition amended to change redox as an in-field, non-NATA accredited measurement. For consistency, condition 13, Table 7 and condition 15, Table 9 have been amended to include redox as an in-field, non-NATA accredited measurement.</p> <p>Temperature is not listed in condition 14. The Delegated Officer will consider the addition of temperature to the licence during assessment of the plant upgrades.</p>
Condition 16	<p>Access to bores can be impeded by flooding during periods of high streamflow and high intensity rainfall events. Attachment 1 shows the flooding associated with a 100-year ARI rainfall event, highlighting how several of the outer bores have the potential to become inundated with water which limits accessibility and compromises the sample quality. The following wording is proposed to reflect these scenarios: "if groundwater present and representative sample able to be taken"</p>	<p>The Delegated Officer has decreased the necessary number of days between quarterly sampling periods from 45 days down to 30 days. This will provide 15 additional days within the quarter to conduct the sampling, which is considered sufficient time to select an appropriate sampling day that meets the safety and access requirements.</p> <p>If, on the off chance a rainfall event does impede a sampling occasion, this would be a justified reason which can be advised in the AACR or annual reporting process.</p>
Condition 16	<p>The decision report states that sampling should be undertaken quarterly for one year to characterise the ecological toxicity of treated wastewater discharges. Request the time to engage a qualified aquatic scientist be amended to 'on or before 18 months from grant' as opposed to 12 months, as to achieve this WC will be required to allocate funding to the project and engage a suitable consultant to complete the year of sampling.</p>	<p>Agreed. Condition amended to 18 months, being 4 June 2026.</p>
Condition 16	<p>Amendment:</p> <p>undertake a review of all available data associated with the premises, including data obtained from monitoring in accordance with condition 13, to characterise the ecological toxicity of treated wastewater.</p> <p>Treated wastewater sampled at the Post-UV Wet Well sampling point as required by condition 13 goes through further polishing in the Overflow Discharge Area prior to discharging to the Avon River.</p>	<p>The results obtained under condition 13 are crucial to characterise the ecological toxicity of treated wastewater discharges from the plant. As discussed above, monitoring under the previous licence L5989/1991/11 was limited, therefore the applicant has limited data on what contaminants are present in the TWW, being discharged to the Overflow Discharge Area and eventually the Avon River. As this data is not currently available but will be collected over time in accordance with condition 13, this condition will remain as specified.</p> <p>The applicant has, in previous discussions, advised DWER that treatment concludes in the Polishing Pond and the WRRF schematic</p>

Condition	Summary of applicant's comment	Department's response
	<p>The requirement to review all available data associated with the premises already includes these sampling results. Specifically referencing condition 13 misrepresents operation of the facility and quality of the effluent as it enters the Avon River, which is the focus of the study.</p>	<p>diagram depicts the locations where sampling occurs. There is no sampling location at the exit of the Overflow Discharge Area, so sampling locations from the schematic diagram were used to determine the sampling location specified in condition 13. Further, the applicant lodges sampling data obtained from the Post-UV Wet Well sampling location in support of the contaminant loading rates for discharges to water in their annual fee submission documentation, hence has pre-determined this is a discharge to water.</p> <p>The applicant has not provided any qualitative or quantitative information that the Overflow Discharge Area provides any substantial polishing treatment to the discharged TWW. While the Delegated Officer considers some attenuation of TWW could possibly occur when it is discharged across the land of the Overflow Discharge Area, it is also possible that the soils in this area are already laden with contaminants, have reached their holding threshold and therefore provide no further attenuation benefits.</p> <p>If the applicant considers the Overflow Discharge Area contributes to the treatment process, the applicant can choose to expand the requirements of condition 16 to incorporate data on discharges from this zone and compare it to data on discharges of TWW from the Post-UV Wet Well sampling location. This would provide qualitative and quantitative data on the full operation of the WRRF for inclusion in the assessment of Works Approval W6910/2024/1. This should include, but not be limited to, a site specific soil analysis to determine soil type, concentrations of contaminants present in the discharged TWW and accumulated in the soils of the Overflow Discharge Area and the potential for the soil type and vegetation cover to facilitate attenuation of these contaminants prior to discharging TWW into the Avon River.</p>
Condition 18	<p>Amend condition to extend submission of investigative monitoring outcomes to 'on or before 24 months from grant' to align with the 6 month extension to condition 16 above.</p>	<p>Agreed. Condition amended to 24 months, being 6 December 2026.</p>

Condition	Summary of applicant's comment	Department's response
<p>Condition 27 Table 10 Row 'Condition 13 Table 7'</p>	<p>Remove items (c) and (e):</p> <p>(c) a diagram with aerial image overlay showing all monitoring locations and depicting groundwater level contours, flow direction and hydraulic gradient, relevant site features including discharge points and other potential sources of contamination;</p> <p>(e) for monitoring at the Post-UV Wet Well Sampling Point, an assessment against the ANZG (2018) guidelines for a 'high conservation or ecological value system';</p> <p>Justification:</p> <p>(c) requirements relating to groundwater elevation contours, flow direction, hydraulic gradient are not relevant to sampling of treated wastewater.</p> <p>(e) Post-UV Wet Well Sampling Point discharges to the ODA not Avon River, therefore the ANZG guidelines are not appropriate. ANZG guidelines should only be applied at the receiving environment and do not apply to treated wastewater emissions.</p>	<p>Agreed. Condition amended.</p> <p>Item (c) deleted.</p> <p>It is considered item (e) will be captured under the investigation required in condition 16, therefore deleted from reporting requirements.</p>
<p>Condition 27 Table 10 Row 'Condition 15 Table 9'</p>	<p>Remove item (c):</p> <p>(c) a diagram with aerial image overlay showing all monitoring locations and depicting groundwater level contours, flow direction and hydraulic gradient, relevant site features including discharge points and other potential sources of contamination.</p> <p>Requirements relating to groundwater elevation contours, flow direction, hydraulic gradient are not relevant to sampling of surface water.</p>	<p>Agreed. Condition amended.</p> <p>Item (c) deleted.</p> <p>It is considered item (e) 'an assessment against the ANZG (2018) guidelines for a 'high conservation or ecological value system' will be captured under the investigation required in condition 16, therefore for consistency this will be deleted from reporting requirements.</p>
<p>Comments on Decision Report</p>		
<p>Section 2.5</p>	<p>Amendment: Sampling should be undertaken quarterly for one year, with the timing of sample collection being reflective of when a majority of the treated wastewater is exiting the UV disinfection unit entering the receiving environment each day.</p>	<p>Wording retained.</p> <p>The applicant has not provided any qualitative or quantitative information that the Overflow Discharge Area provides any substantial polishing treatment to the discharged TWW. While the</p>

Condition	Summary of applicant's comment	Department's response
	<p>Justification: TWW discharged from the UV unit goes through further polishing in the Overflow Discharge Area prior to TWW discharging to the Avon River. Sampling should be taken at the location where TWW discharges into the receiving environment in order to determine potential toxic effects and dilution levels.</p>	<p>Delegated Officer considers some attenuation of TWW could possibly occur when it is discharged across the land of the Overflow Discharge Area, it is also possible that the soils in this area are already laden with contaminants, have reached their holding threshold and therefore provide no further attenuation benefits.</p> <p>The results obtained under condition 13 are crucial to characterise the ecological toxicity of treated wastewater discharges from the plant and subsequently determine how the upgraded WRRF will achieve the level of treatment required to meet the ANZG (2018) guidelines for a 'high conservation or ecological value system'.</p> <p>If the applicant considers the Overflow Discharge Area contributes to the treatment process, the applicant can choose to expand the requirements of condition 16 to incorporate data on discharges from this zone and compare it to data on discharges of TWW from the Post-UV Wet Well sampling location. This would provide qualitative and quantitative data on the full operation of the WRRF for inclusion in the assessment of Works Approval W6910/2024/1. This should include, but not be limited to, concentrations of contaminants present in the discharged TWW, accumulated in the soils of the Overflow Discharge Area and the potential for the soil type to facilitate offsite migration of these contaminants into the Avon River.</p>