RMCG

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Recycled Water Health & Environmental Management Plan

Draft Report

Lakeshore Caravan Park

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1 Introduction

1.1 ACKNOWLEDGEMENT OF COUNTRY

We acknowledge the Dja Dja Wurrung and Taungurung peoples as the Traditional Owners of the Country on which this site is located. We recognise their continuing connection to land, waters and culture and pay our respects to their Elders past, present and emerging.

Moreover, we express gratitude for the knowledge and insight that Traditional Owners and other Aboriginal and Torres Strait Islander people contribute to our shared work.

1.2 BACKGROUND

The Lakeshore Caravan Park is to be redeveloped and shall include a variety of accommodation types and associated guest facilities. Due to the distance from reticulated services, the development will be responsible for the management of all wastewater produced on the site.

The accommodation and dining facilities will all contribute to wastewater production. Seasonal variations to visitor numbers will result in variable flows on a monthly basis. Wastewater will be collected from all site facilities via an onsite reticulated sewer system. There will be a centralised wastewater treatment plant which will treat the wastewater to sufficient quality for irrigation of grassed areas.

1.3 LOCATION

The proposed redevelopment of Lakeshore Caravan Park is located at 655 Spillway Rd, Lake Eppalock.

The Caravan Park has been in operation for approximately 50 years in this location and was originally developed under the direction of the (then) State Rivers and Water Supply Commission Victoria. The land is owned by the Goulburn-Murray Rural Water Corporation (GMW) and operated by Adventures Victoria Pty Ltd under a lease agreement.

The site is subject to two zone controls: Rural Conservation Zone (RCZ) and Public Conservation and Recreation Zone (PCRZ).

A map for the site is provided in Figure 1-1.

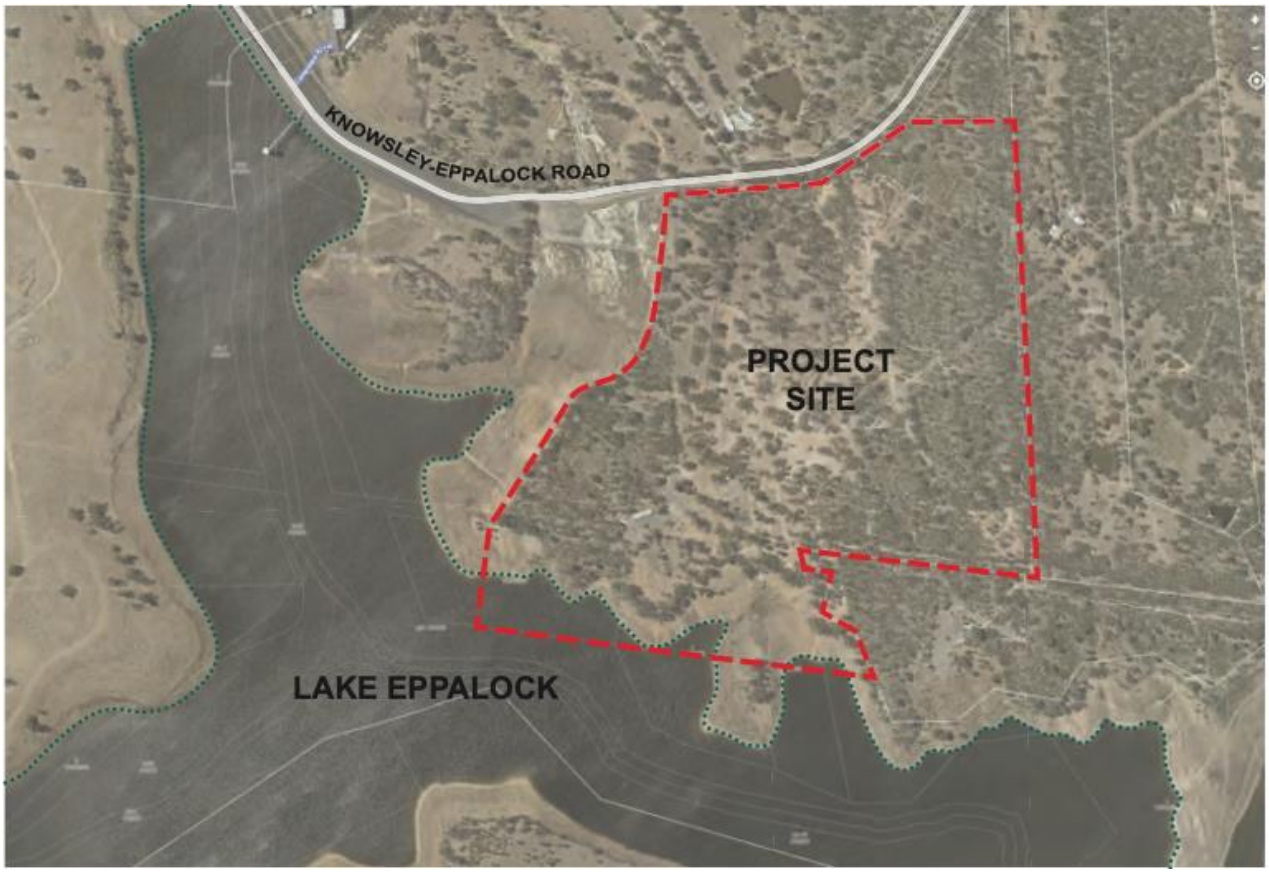

Figure 1-1: Lakeshore Caravan Park site

2 Authorisation

2.1 RESPONSIBILITIES

The roles and responsibilities of staff and operators managing the use of recycled water at the Lakeshore Caravan Park (LCP) are provided in Table 2-1.

Table 2-1: Recycled water roles and responsibilities

ROLE	RESPONSIBILITIES
Wastewater Treatment Plant Operator/Manager	▪ Complete recycled water quality testing as outlined in this HEMP. ▪ Maintain recycled water distribution and storage infrastructure. ▪ Ensure that wastewater treatment plant operates effectively to supply recycled water of appropriate quality for reuse.
LCP General Manager	▪ Ensure that recycled water is used at LCP according to this HEMP. ▪ Ensure staff that operate systems using recycled water are trained in the risks and mitigation measures of using recycled water. ▪ Undertake monitoring, sampling, testing and record keeping as detailed in this HEMP. ▪ Notify EPA when a reportable event occurs and provide documentation as requested by EPA.
LCP operational staff and contractors	▪ Undertake operations and training according to this HEMP.

2.2 ENDORSEMENT

This HEMP is endorsed by Adventures Victoria Pty Ltd.

Lakeshore Caravan Park General Manager:

Name: _____

Organisation: _____

Signature: _____

Date: _____

2.3 KEY CONTACTS

Key contacts relating to the supply of recycled water and for incident response are provided in Table 2-2.

Table 2-2: Recycled water key contacts

NAME	CONTACT DETAILS
Lakeshore Caravan Park General Manager	TBC
Onsite Wastewater Treatment Plant Operator/Contractor	TBC
EPA Victoria	1300 372 842 (1800 EPA VIC) www.epa.vic.gov.au

3 User checklist

The following table provides a summary of the day-to-day operational tasks for recycled water users to understand and undertake. Further details of these tasks and their rationale are contained within the subsequent sections of this HEMP.

Table 3-1: Recycled water user checklist

TASK	DETAILS
Recycled water quality	Confirm recycled water quality from wastewater treatment plant data. Visual inspection of recycled water dam for algae growth.
Storage dam levels	Visual inspection of storage levels and management of inflow/outflow to prevent over-topping.
Irrigation infrastructure	Check for leaks and confirm working order. Check to ensure no cross connections with potable (drinking) water supply.
Site infrastructure	Check condition of fencing on boundaries and around wastewater treatment plant and storage dam. Check recycled water signage is in place.
Irrigation scheduling	Irrigation to occur at night. Do not use recycled water if: ▪ Rainfall of >15 mm is forecast within the next 24 hours ▪ Ground is “soggy” due to recent rainfall
Landscape maintenance	Recycled water contains nutrients that will reduce the need for fertilisers. Check nutrient balance and soil condition before using fertilisers on areas that have been irrigated with recycled water.
Monitoring	Undertake monitoring and record keeping as outlined in this HEMP.

4 Land capability assessment

4.1 SITE LAYOUT

Figure 4-1 shows the layout of the site, including the wastewater treatment area (which includes the storage dam), and the area to be irrigated with recycled water, which includes sections of the recreation park and the amenity buffer.

Figure 4-1: Site layout (Sentient Design 2021)

4.2 TOPOGRAPHY

There is a ridge running through the site as shown in Figure 4-2. Areas to the north of this ridgeline drain away from the lake. A significant portion of the recycled water irrigation will be targeted to areas north of the ridgeline as it is outside the catchment area of Lake Eppalock.

Slopes are gentle on the ridge areas (approximately 0-10%) with steeper areas towards the water edge and along the northern gully (approximately 10-15%). Former site uses have caused alterations to the natural land surface, also altering surface hydrology.

Figure 4-2: Ridgeline denoting catchment boundary for Lake Eppalock

The sites topography will not restrict the use of recycled water. Irrigation will be confined to areas which drain away from Lake Eppalock. Recycled water will be applied below the soil surface reducing any runoff.

4.3 SOILS

The site is mapped within the Glen Cooee land system[1] and site inspection suggests that Component 2 of this land system applies - gentle slope and low crest. This component has yellow sodic duplex soils, with a loamy topsoil of moderate permeability over mottled yellow clay subsoils of low permeability. There is usually a bleached A2 horizon above the clay subsoils. Sheet erosion is a risk.

Soils are classified as yellow sodosols under the Australian Soil Classification[2].

The proposed recreation park area is currently degraded with minimal ground cover and topsoils have been lost through erosion. The area will be rehabilitated as part of the site development.

Topsoil will be imported to the site to ensure the recycled water irrigation functions effectively. Appropriate site preparation and amelioration (e.g. addition of gypsum) will be undertaken during site establishment.

Establishment and ongoing preservation of vegetative cover in this area and use of sub-surface irrigation will minimise further soil erosion.

Irrigation should be applied in smaller amounts, more frequently, to minimise the risk of waterlogging at the interface between the topsoils and heavier clay subsoils.

4.4 SURFACE WATER AND STORMWATER MANAGEMENT

The Lakeshore Caravan Park is located adjacent to sections of the north-eastern boundary of Lake Eppalock. Lake Eppalock was constructed in 1963, capturing the waters of the Coliban and Campaspe Rivers and the Wild Duck Creek. Lake Eppalock is the major water storage for the region supplying drinking water to Bendigo and other urban centres[3].

Given the functional and downstream uses of the lake water, maintaining quality is critical. Within the context of the proposed redevelopment of the Lakeshore Caravan Park, major risks to water quality arising from the landscape include sediments in storm water, and nutrient-rich wastewater.

The overarching objective for storm water management on the site is to slow water flow across the site and to use natural processes to cleanse it prior to reaching the lake (or prior to leaving the site for areas outside the lake catchment). A three-step approach is proposed to slow and cleanse stormwater before it reaches Lake Eppalock. These are outlined in Table 4-1.

[1] A Study of Land in the Campaspe River Catchment http://vro.agriculture.vic.gov.au/dpi/vro/nthcenregn.nsf/pages/nthcen_landform_campaspe_river

[2] vro.agriculture.vic.gov.au/dpi/vro/nthcenregn.nsf/pages/NC_Soils_Sodosols

[3] Murray-Darling Basin Authority, Australian Government https://www. mdba.gov.au/water-management/catchments/campaspe accessed November 2021

Table 4-1: Three step approach for stormwater management

POINT OF IMPACT	STORMWATER MANAGEMENT
First impact	The maximising of permeable surfaces will allow infiltration of water at the first point of contact, reducing the volume of subsequent water moving across the site.
Second point of impact	Where water is shed from impervious surfaces such as asphalt roads, it will be directed to landscape areas to achieve a preliminary level of treatment and infiltration to the soil. The slow movement of storm water across landscaped areas will allow sediments to drop out of the water.
Third point of impact	Devices such as grassed swales, vegetated bioretention swales, and rain gardens utilise natural microbial activity within the soil to clean stormwater. Vegetation interfaces can also treat water and facilitate infiltration to the soil. Some of these devices will allow for temporary detention of water, further reducing the impact of the peak flow of rain events.

4.5 GROUNDWATER

The site is within the Campaspe Groundwater Catchment. Depth to water table is 10 to 20m below ground surface. The salinity of available groundwater ranges from 7001 to 13000 (mg/L) which is quite high and therefore can't be used for potable water or irrigation[4].

Depth to the watertable and the presence of clay subsoils will minimise interaction with groundwater and risk of harm to groundwater environmental values.

4.6 FLORA AND FAUNA

Assessment and mapping of site vegetation and habitat value has been undertaken by Biosis. A map identifying the areas of native vegetation on the site is provided in Appendix 1.

Most of the project site would be described as having an open tree cover. The most numerous species present include *Eucalyptus microcarpa* Grey Box (indigenous), *E. cladocalyx* Sugar Gum (native non-indigenous), and *E. camaldulensis* River Red Gum (indigenous). In addition to the mapped trees, there are areas of strong recent regrowth, both of *Eucalyptus* species and common colonising plants such as *Cassinia arcuata*.

No threatened flora or fauna species have been recorded at the site.

Areas of high-quality habitat have been identified by Biosis and cover the eastern and western areas of the site where there has been limited historic development and use. Within these areas there are three zones of environmental sensitivity.

Areas of the site which contain high quality habitat will not be irrigated with recycled water. Recycled water will only be applied via sub-surface irrigation to grassed areas within the recreation park and amenity buffer area as shown in Figure 4-1.

The treatment of all indigenous and non-indigenous native vegetation will be in accordance with the three-step approach proposed by DELWP[5]. Removal of vegetation will be avoided wherever possible and adverse effects

[4] www.water.vic.gov.au/groundwater/groundwater-resource-reports

[5] DELWP, Guidelines for the Removal, Destruction and Lopping of Native Vegetation, December 2017

to remaining vegetation will be minimised. Where approved removal of vegetation cannot be avoided, biodiversity will be compensated through offsets.

Some herbaceous weed species are present mostly in areas within the former cabin and caravan site areas[6]. These will be managed using minimally destructive control methods.

4.7 CULTURAL HERITAGE

ABORIGINAL CULTURAL HERITAGE

The site is located on land of the Dja Dja Wurrung and Taungurung peoples. The specific boundary between the jurisdiction of the two respective Registered Aboriginal Parties (RAPs) is not yet clarified[7]. While the physical landscape has been heavily modified by the creation of the water storage facility and European land clearing, the site would once have been a known place for the indigenous people as a cultural landscape interconnected with themselves, their cultural traditions and spiritual ancestors.

All aboriginal cultural heritage places and objects are significant, whether they have been found or not, and are protected by State and Commonwealth legislation. Part of this site is located within an Area of Cultural Heritage Sensitivity.

The Lake Eppalock Management Plan states that there are no records of Aboriginal archaeological sites or objects relating to the Lake Eppalock area, but this should be confirmed directly with the Aboriginal Cultural Heritage Register[8].

No specific artefacts relating to Aboriginal cultural history have been identified by Biosis in their review of the site[9].

Development of a cultural heritage management plan is required when major works are planned. Activities that do not cause significant ground disturbance, such as fencing, maintenance of existing tracks, and recycled water irrigation, are exempt.

RECENT SETTLEMENT CULTURAL HERITAGE

Prior to the creation of the lake, much of the surrounding land was used for livestock grazing as a part of the Campaspe Plains pastoral run. In the local area there are sites of cultural significance including homestead ruins, gold mining infrastructure, stone fences and bridge ruins. No specific artefacts relating to recent settlement history have been identified by Biosis in their review of this site.

6 Schematic Landscape Plan for Lakeshore Caravan Park Redevelopment (2021) Sentient Design
7 Goulburn-Murray Water, Lake Eppalock Management Plan 2013
8 Goulburn-Murray Water, Lake Eppalock Management Plan 2013
9 Schematic Landscape Plan for Lakeshore Caravan Park Redevelopment (2021) Sentient Design

5 Recycled water production

5.1 VOLUME

Wastewater is generated from the onsite accommodation and associated guest facilities.

The EPA Victoria Code of Practice for Onsite Wastewater Management (Publication 891.4, 2016) has been used to estimate wastewater volumes, and comparison has been made to water use at a similar style of caravan park in Nagambie.

Based on the expected monthly occupancy rates, the expected variation in wastewater production is provided in Table 5-1.

Table 5-1: Daily wastewater production based on occupancy rates

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Occupancy rate	80%	70%	65%	65%	35%	35%	35%	50%	70%	70%	75%	80%
Daily wastewater production, kL/day	109	96	89	89	48	48	48	68	96	96	103	109
Total annual production, ML/year												**30.93**

5.2 WASTEWATER TREATMENT

Wastewater will be collected from all site facilities via an onsite reticulated sewer system. There will be a centralised treatment plant which will treat the wastewater to sufficient quality for sub-surface irrigation onsite.

Onsite wastewater treatment is expected to be provided by a package-type aerobic wastewater treatment system. This will typically include screening, primary sedimentation and biological treatment for the reduction of carbonaceous material and nitrogen. Phosphorus can be removed by precipitation with alum. After biological treatment, the wastewater is allowed to settle, separating most of the solids from the liquid.

5.3 RECYCLED WATER QUALITY

The recycled water generated is expected to meet Class B quality requirements, along with targets for phosphorus and nitrogen concentrations as outlined in Table 5-2.

The recycled water is suitable for the intended use of irrigating grass, provided the controls detailed in this HEMP are followed.

Table 5-2: Recycled water quality parameters

RECYCLED WATER QUALITY PARAMETERS	
< 20 mg/L BOD	<100 orgs/100 mL *E. coli*
< 30 mg/L suspended solids	< 3 mg/L total phosphorus
pH between 6.5 and 8.5	< 10 mg/L total nitrogen
Salinity <1000 µS/cm EC	

6 Recycled water irrigation

6.1 END USE

The recycled water produced by the onsite WWTP will be used for irrigation of grass in the recreation park and parts of the amenity buffer.

Recycled water irrigation will assist in rehabilitation of degraded parts of the site (the former motorbike track) and provide grassed areas for recreational use by caravan park guests and to green the site.

The irrigation reuse area will be grassed with high water and nutrient use lawn species. Biomass will be harvested (cut and removed). The grass will be a species that is tough enough to cope with significant foot traffic and preferably it should have self-heal capability.

6.2 WATER BALANCE

Modelling has been undertaken to determine an appropriate balance between irrigation area and wet weather storage to ensure the system has capacity for containment of wastewater in the 90th percentile wet year.

Modelling is based on the wastewater production estimates outlined in Section 5. Inflows will vary through the year, peaking in the summer tourist season. This aligns with the peak plant demand for irrigation and minimises the volume of storage required.

The approach used for water balance modelling combines the methods outlined in the *Victorian Land Capability Assessment Framework* (2nd Edition, MAV, DEPI & EPA, 2014) and the *Guidelines for Wastewater Irrigation* (EPA Publication 168, 1991).

Key input data and assumptions used in the water balance modelling are:

- Local climate data – rainfall and evaporation - has been obtained from https://www.longpaddock.qld.gov.au/silo/. Modelling considers a 20-year period from 1998 – 2018 to test the impact of wet and dry years.
- A crop factor allows conversion of pan evaporation into evapotranspiration, thereby allowing the calculation of irrigation demand. The recycled water irrigation areas will be grassed or lawn areas that will be regularly cut with clippings removed from site. A crop factor of 0.8 has been applied.
- Percolation through the soil is dependent on soil texture and permeability. The design percolation rate is limited by the subsoil texture which is clay (refer to Section 4.3). The Design Irrigation Rate (DIR) for medium to heavy clay soils as specified by EPA Publication 891.4 *Code of practice – onsite wastewater management* is 2 mm/day.

Modelling has identified that a combination of 3.1 ha of irrigation with 1.6 ML of storage will achieve containment in a 90th percentile wet year. Note this will also provide sufficient irrigation area to maintain a nutrient balance as detailed in Section 7.2.

6.3 IRRIGATION DESIGN AND MANAGEMENT

Subsurface irrigation is to be installed. This delivers recycled water direct to plant roots to maximise uptake of water and nutrients. It also minimises the potential for human contact, ensures visual amenity is not impacted and enables flexible garden designs to work around other infrastructure on the site.

Key design requirements for the irrigation system are:

- Drip systems shall be installed at 100– 50 mm depth into 150–250 mm of topsoil
- Use of subsurface drip line designed specifically for effluent irrigation
- Adequate filtration will be incorporated into the system prior to drip irrigation
- Pressure compensation/regulation will be provided to ensure even distribution and low application rates across the variety of gradients and elevations
- Use of soil moisture monitoring to control application times and rates
- Cut-off drains to be provided upslope of irrigation areas to minimise stormwater run-on
- Irrigation areas will be graded to ensure rainfall runoff is not temporarily detailed.

To achieve the topsoil depth outlined above, topsoil will need to be imported to the site. Site inspection indicates that the topsoils have been eroded from large portions of the site due to previous land disturbance.

A copy of the irrigation layout is provided in Appendix 2.

6.4 WINTER STORAGE

The existing detention basins will be refurbished for use as winter storage. 1.6 ML of storage capacity will be provided.

Storage design requirements include:

- Storage to be lined (e.g. with compacted clay) to achieve a permeability of less than 1×10^{-9} metres per second to minimise seepage and protect groundwater.
- Perimeter to be fenced to prevent access.
- Embankment design to prevent stormwater ingress.

7 Environmental management plan

7.1 ENVIRONMENTAL RISKS

A detailed risk assessment has been completed and is provided in Appendix 3. Appropriate wastewater treatment, sufficient irrigation area and storage, and irrigation of high water and nutrient use plants will reduce the risk for environmental hazards to **low**.

Further discussion of key risk elements and preventative measures in place to maintain this low risk is provided in the following sections.

7.2 NUTRIENT BALANCE

Nutrients are required for healthy plant growth. However, if not managed appropriately, the nutrients in recycled water can cause environmental harm.

A nutrient balance has been calculated for nitrogen and phosphorus based on irrigation of grass/lawn areas. The nutrient balance identifies that 3.1 ha of irrigation will be required to ensure sustainable management of nutrients.

Table 7-1: Nutrient balance for recycled water irrigation

PARAMETER	NITROGEN	PHOSPHORUS
Wastewater volume	30.93 ML/yr	
Wastewater nutrient content (max) (refer to Table 5-2)	10 mg/L	3 mg/L
Total nutrient applied	309.3 kg/yr	92.8 kg/yr
Nutrient loss to atmosphere[10]	20%	-
Nutrient uptake in plants[11]	120 kg/ha	30 kg/ha
Minimum area required for reuse	2.06 ha	3.09 ha

Grass will be cut and removed from site to enhance nutrient uptake and removal.

Maintenance of a nutrient balance within the recycled water irrigation areas will prevent migration of nutrients to native vegetation areas or to downstream surface waters.

[10] 20% of total nitrogen applied will be lost through mineralisation, volatilisation and denitrification in the soil (MAV, 2014).

[11] Plant uptake figures based on the low end of the range for home lawn application of 120 - 200 kg/ha for nitrogen and 25 – 105 kg/ha for phosphorus (from *Irrigation of Amenity Horticulture with Recycled Water*, Stevens, Smolenaars and Kelly, 2008)

7.3 SALINITY

The recycled water is expected to have relatively low salinity of <1000 µS/cm EC and is suitable for irrigation of most plant species. The grass species to be used in the irrigated areas are expected to be moderately tolerant to salt.

Salinity is not expected to build up in the soil. Soil monitoring will be used to check on soil salinity and sodicity, as outlined in Section 10.1.

7.4 IRRIGATION RUNOFF PREVENTION

Subsurface drip irrigation can be managed to prevent irrigation runoff. This is achieved by applying water so that the soil is not filled to saturation point.

Irrigation will be applied in small amounts relatively frequently to prevent waterlogging of the clay subsoils (which can lead to lateral water movement in the soils and runoff).

Recycled water will not be used for irrigation if:

- Rainfall of >15 mm is forecast within the next 24 hours
- Ground is “soggy” due to recent rainfall.

8 Health management plan

8.1 HEALTH RISKS

A detailed risk assessment has been completed and is provided in Appendix 1. The irrigation of the recycled water below the soil surface, combined with the preventative measures in place, reduce the risk for identified health hazards to **low**.

Key preventative measures in place to maintain this low risk are described in detail in the following sections.

8.2 OPERATING HOURS

The irrigation system will be operated during the night when the recreation park is not in use.

8.3 BUFFER DISTANCES

To ensure there is no contamination of the water in Lake Eppalock, which is for potable (drinking) use, irrigation will occur in areas that are outside the catchment area of the lake (refer to Section 4.2).

Setbacks in line with EPA Publication 891.4 are also required from buildings and service infrastructure to ensure protection of human health and the surrounding environment. These include:

- 3 m to buildings or allotment boundary upslope
- 1.5 m to buildings or allotment boundary downslope
- 1.5 m to water supply pipelines
- 3 m to children's playground or in-ground swimming pool.

8.4 SIGNAGE

Signs (similar to the example in Figure 8-1) will be in place to alert staff and caravan park guests to the use of recycled water. They will be located at site entrances and on the storage dam fence. They will be checked periodically to ensure they are visible and in good condition.

Irrigation infrastructure that is above ground and in areas of public/guest access will be distinctively colour-coded (deep purple) and/or marked with the words: WARNING: RECYCLED WATER - DO NOT DRINK.

Figure 8-1: Example of recycled water warning signage

8.5 TRAINING

All staff responsible for the use of recycled water will be provided with training on correct use and management. The key information that will be covered is:

- The different water sources available at the site and their intended uses.
- Recycled water is not to be used for drinking purposes
- Staff are to maintain good hygiene practices, including appropriate hand washing, especially prior to eating, drinking or smoking
- Irrigation will occur at night when the recreation park is not in use.
- An automated irrigation system is in place, to minimise need for workers to be onsite during irrigation.

A Recycled Water Induction will also be provided for any contractors visiting the site.

9 Incident response

9.1 INCIDENT RESPONSE PLAN

Responses to recycled water incidents are detailed in Table 9-1.

Table 9-1: Incident responses

INDICENT	RESPONSE
Recycled water does not meet quality requirements	Review risk for irrigation with recycled water.
Run-off, spill or leak of recycled water (outside of permitted use areas)	Investigate the cause and undertake works to prevent run-off/leak/spill.
Discharge of recycled water to the environment	Notify EPA within 24 hours of discharge occurring. Investigate the cause and undertake works to prevent discharge.
Any human illness suspected to be caused by contact with or ingestion of recycled water	Seek medical advice. Contact local doctor for assessment of illness and treatment. If doctor would like to speak with someone in the Department of Health (DoH), they can contact the Environmental Health Unit on 1300 761 874.
Community complaint	Investigate complaint and undertake rectification works if necessary.

9.2 BLUE-GREEN ALGAE RESPONSE PLAN

In case of a blue-green algae (BGA) outbreak in the winter storage, the following will be undertaken:

- Obtain a sample of the water and have the species of algae identified and enumerated by an experienced algologist
- If the BGA cell count is less than 15,000 cells/mL the water is considered suitable for use in irrigation following management practices as outlined in this document
- Above 15,000 cells/mL irrigation can occur, but irrigation operators should ensure no direct contact with the recycled water and care is taken when cleaning irrigation filters.

10 Monitoring and record keeping

10.1 SUMMARY

A summary of required monitoring activities is provided in Table 10-1. Appropriate records must be kept either in hard copy operation manuals or online quality management systems.

Table 10-1: Summary of monitoring and record keeping activities

PARAMETER	FREQUENCY	RESPONSIBILITY
Water Balance		
Recycled water inflow and irrigation usage	Monthly	WWTP Operator
Storage levels	On-going	WWTP Operator
Recycled water quality		
Recycled water quality	Monthly	WWTP Operator
Visual appraisal of storage dam for algae growth	On-going	WWTP Operator
Irrigation management		
Site appraisal for waterlogging and offsite runoff	During/following irrigation	LCP Lessee
General maintenance on irrigation infrastructure	Annually	LCP Lessee
Soils		
Chemical analysis of soils	Every three years	LCP Lessee
Site condition		
Condition of fences and warning signs	On-going	LCP Lessee
Feedback		
Negative feedback and response	When required	LCP Lessee
Training		
OH&S training for all involved in recycled water irrigation management	Initially, then as required	LCP Lessee
Scheme review		
HEMP review	Every five years	LCP Lessee
Audit of the recycled water treatment and irrigation scheme	Every five years	LCP Lessee

10.2 RECYCLED WATER

The recycled water is to be tested on at least a monthly basis to confirm that it meets recycled water quality limits as outlined in Table 5-2.

Table 10-2: Quality parameters to be analysed

MONTHLY (WWTP OPERATOR)
pH
Biochemical oxygen demand (BOD)
Suspended Solids
Total nitrogen
Total phosphorus
Ammonia
Salinity
E. coli

10.3 SOILS

Soil monitoring is required to assess that the recycled water is not having deteriorating effects on soil health. The following process should be used for soil sampling:

- Take two composite topsoil samples comprising at least 20 sub-samples (the more the better)
- Sub-samples should be collected at a depth between 0–100 mm
- The sub-samples should be collected by transects. Transects should be selected to create minimal damage to landscaped areas. GPS coordinates should be taken for each transect to ensure repeatability
- The sub-samples should be combined and thoroughly mixed and then a representative composite sample selected from this. A sample of approximately 500 grams is sufficient for laboratory analysis
- The sampler should ensure that the sample collected is not saturated (i.e. sloppy) as this can skew analytical results.

A small auger or corer can be used to ensure minimal damage.

Parameters measured include pH, salinity, organic matter, nutrients (phosphorus, potassium), cations (sodium, calcium, magnesium) and trace elements (zinc, aluminium).

Fertiliser use and action/s taken to rectify any soil health problems (e.g. use of soil amendments such as gypsum/lime) will be documented.

11 Audit and review requirements

11.1 REPORTING TO EPA

LCP shall maintain monitoring records as described in Section 10 and make them available to EPA if requested. There is no requirement for the LCP to report annually to EPA.

11.2 HEMP REVIEW

The HEMP will be reviewed annually by LCP and updated every five years in consultation with industry professionals. The purpose of a review is to reflect any regulatory changes and other changes which will impact the operation of the recycled water scheme.

11.3 AUDITING

An audit of the recycled water scheme should be conducted every five years by an appropriately qualified industry professional. The purpose of this audit is to check the reuse scheme:

- Meets the requirements of the regulations and guidelines,
- Is achieving compliance through the HEMP, and
- Any inadequately managed risks are identified and appropriate actions are determined for rectification.

Appendix 1: Native vegetation map

Yet to be provided

Appendix 2: Irrigation layout

To be provided once detailed design is complete

Appendix 3: Detailed risk assessment

Risks have been assessed according to EPA Publication 1911.2, Table 21.

Table 21 – Qualitative risk matrix for estimating human health and environmental risks based on the likelihood of exposure or an event and the impact

		Impact descriptors				
Health		No negative impact	Minor impact for small population	Minor impact for large population	Major impact for small population	Major impact for large population
Environment [A]		No negative impact	Harmful to local ecosystem with local impacts contained to site	Harmful to regional ecosystem with local impacts primarily contained to on-site	Lethal to local ecosystem; pre-dominantly local, but potential for off-site impacts	Lethal to regional ecosystem or threatened species; wide-spread on-site and off-site impacts
Likelihood		Impact level				
Descriptor	**Level**	**1 Insignificant**	**2 Minor**	**3 Moderate**	**4 Major**	**5 Catastrophic**
1:100 years	A Rare	Low	Low	Low	Moderate	High
1:20 years	B Unlikely	Low	Low	Moderate	High	High
1:5 to 10 years	C Possible	Low	Moderate	High	High	Very high
1:1 to 4 years	D Likely	Low	Moderate	High	Very high	Very high
>1:1 year	E Almost certain	Low	Moderate	High	Very high	Very high

Figure A1-1: Qualitive risk matrix

Table A1-1: Qualitive risk matrix

ELEMENT	HAZARD	CONTROL MEASURES	RESIDUAL RISK ASSESSMENT		
			LIKELIHOOD	CONSEQUENCE	RISK LEVEL
Recycled water quality	Quality exceeds limits outlined in Table 5-2	▪ Monthly recycled water quality testing. ▪ Cease supply of recycled water if parameters above limits.	Unlikely	Minor	Low
	Nutrients (phosphorus and nitrogen) applied in excess of crop demand, leading to migration to native vegetation areas, surface water or groundwater	▪ Cut irrigated grass and remove clippings regularly to enhance nutrient uptake. ▪ Undertake soil testing. ▪ No fertiliser use unless soil testing shows it is needed.	Unlikely	Minor	Low
	Odours from recycled water	▪ Treatment system will be enclosed or other appropriate odour attenuation measures applied. ▪ Treatment will reduce potential for odour from recycled water dam. ▪ Irrigation will be applied sub-surface. ▪ Respond to any complaints as needed.	Unlikely	Minor	Low
	Blue green algae in storages	▪ Regular monitoring of storage during summer. ▪ Implement BGA response plan.	Unlikely	Minor	Low
Turf health	Excess salt application	▪ Monthly recycled water salinity testing. ▪ Undertake soil testing.	Unlikely	Minor	Low
Soil health	Waterlogging	▪ Irrigation according to turf needs. ▪ Irrigate smaller volumes, more frequently.	Unlikely	Minor	Low
	Salinity/sodicity	▪ Monthly recycled water salinity testing. ▪ Undertake soil testing. ▪ Use soil amendments if required to reduce sodicity	Unlikely	Minor	Low
	Alkalinity/acidity	▪ Annual soil testing ▪ Use soil amendments if required to adjust soil pH	Unlikely	Minor	Low
Groundwater quality	Recycled water contaminates groundwater	▪ Irrigation according to turf needs. ▪ Clay subsoils and depth to watertable minimise likelihood of accessions to groundwater ▪ Recycled water dam is clay lined.	Unlikely	Insignificant	Low
Surface water quality	Recycled water contaminates surface waters	▪ Recycled water irrigation will not occur within the catchment area of Lake Eppalock. ▪ Irrigation according to turf needs. ▪ Sub-surface drip irrigation allows for precise irrigation application to prevent runoff. ▪ Storage levels managed to prevent overflow. ▪ Stormwater managed as per Table 4-1. ▪ Table 4-1.	Unlikely	Minor	Low
Human health	Staff contact with recycled water causes illness	▪ Automated irrigation system so can be operated remotely. ▪ Staff trained on risks of using recycled water and appropriate management practices.	Unlikely	Minor	Low
	Public contact with recycled water causes illness	▪ Irrigation occurs at night and below ground surface. ▪ Fencing in place on boundaries and around storage dam. ▪ Warning signs in place.	Unlikely	Minor	Low
	Cross-connection with potable water	▪ There is no connection to potable network. ▪ Use trained staff and contractors for work on recycled water system. ▪ Check for cross connections.	Unlikely	Minor	Low

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