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Signed D James

Sheet No 4 of 11

Selwyn Snow Resort

Recycled Water Management Plan

10 February 2023, Version 3

Document history

Version	Status	Author	Drafting date	Reviewer	Review date
1	Working draft	Daniel Deere (Water Futures)	22 January 2023	Megan Priestley (Advisian) Josh Elliott (Blyton Group) Lex Seabrook (De.mem)	29-30 January 2023
2	Briefing paper for human health and environmental risk assessment workshop	Daniel Deere (Water Futures)	30 January 2023	Josh Elliott (Blyton Group)	31 January 2023
3	Post workshop draft, incorporating findings from human health and environmental risk assessment workshop	Daniel Deere (Water Futures)	9 February 2023	Josh Elliott (Blyton Group)	10 February 2023

Contents

1 Commitment to responsible use and management of recycled water quality

1.1 Overview

This document is a Recycled Water Management Plan (RWMP) for Selwyn Snow Resort Pty Ltd's (SSR) Recycled Water Scheme (RWS). The document has been prepared following a human health and environmental risk assessment workshop held 2 February 2023. The 12 document sections align with the 12 elements of the Australian Guidelines for Water Recycling 2006 (AGWR) 'Framework for management of recycled water quality and use' (the AGWR Framework).

As part of its commitment to minimally impacting the environment, wastewater from the snow resort rebuilt in the Kosciusko National Park following major bushfires is being treated at the Sewage Treatment Plant (STP), stored in the former Quarry Dam, and beneficially recycled. Recycling reduces the draw on water resources in the area and disperses the treated wastewater in a more environmentally sustainable manner than conventional methods of direct discharge. Specifically, the SSR RWS uses treated sewage effluent from the SSR to supply recycled water for snowmaking and flush toilets as the two *intended* uses. Potential *inadvertent* uses of the recycled water are the potential for accidental ingestion due to cross-connections or misconnections of the SSR plumbing systems to the potable system, consumption of snow, consumption of water in the creek for drinking downstream, or environmental effects of snowmelt in the aquatic and terrestrial ecosystem of the site and region.

1.2 Regulatory/formal requirements and stakeholders

Key stakeholder	Contact	Roles and responsibilities	Key regulatory/formal requirement
Selwyn Snow Resort	Lucy Blyton, General Manager	• Sewerage system and recycled water scheme provider, manager, operator, supplier and user. • Developing and implementing RWMP. • Supply of recycled water that is fit for purpose. • Assessing and managing risks to public health and the environment in accordance with the AGWR & environmental protection legislation. • Ensuring worker health and safety. • Ensuring compliance with the Plumbing Code of Australia (PCA).	*Work Health and Safety Act 2011 (NSW)* *Plumbing and Drainage Act 2011 (NSW)*

Key stakeholder	Contact	Roles and responsibilities	Key regulatory/formal requirement
Department of Planning & Environment (DPE)	Daniel James, Team Leader - Alpine Resorts Team	• Development Application (DA) approval • Advice on environmental impacts	State Environmental Planning Policy (Precincts – Regional) 2021
NSW Environment Protection Authority (EPA)	Carlie Armstrong 6229 7002	• Environment Protection Licence (EPL) for miscellaneous discharge to waters arising from the snow making part of the scheme • Advice on environmental impacts	*Protection of the Environment Operations Act 1997 (NSW)*
NSW National Parks and Wildlife Service (NPWS)	Kelsey Boreham - Principal Project Officer	• Advice on environmental impacts	
NSW Health – Murrumbidgee Local Health District (LHD)	Tony Burns	• Review of human health risk assessment for recycled water use in publicly accessible areas. • Advice on health impacts.	*Public Health Act 2010 (NSW)*
NSW Health – Water Unit	Leslie Jarvis		

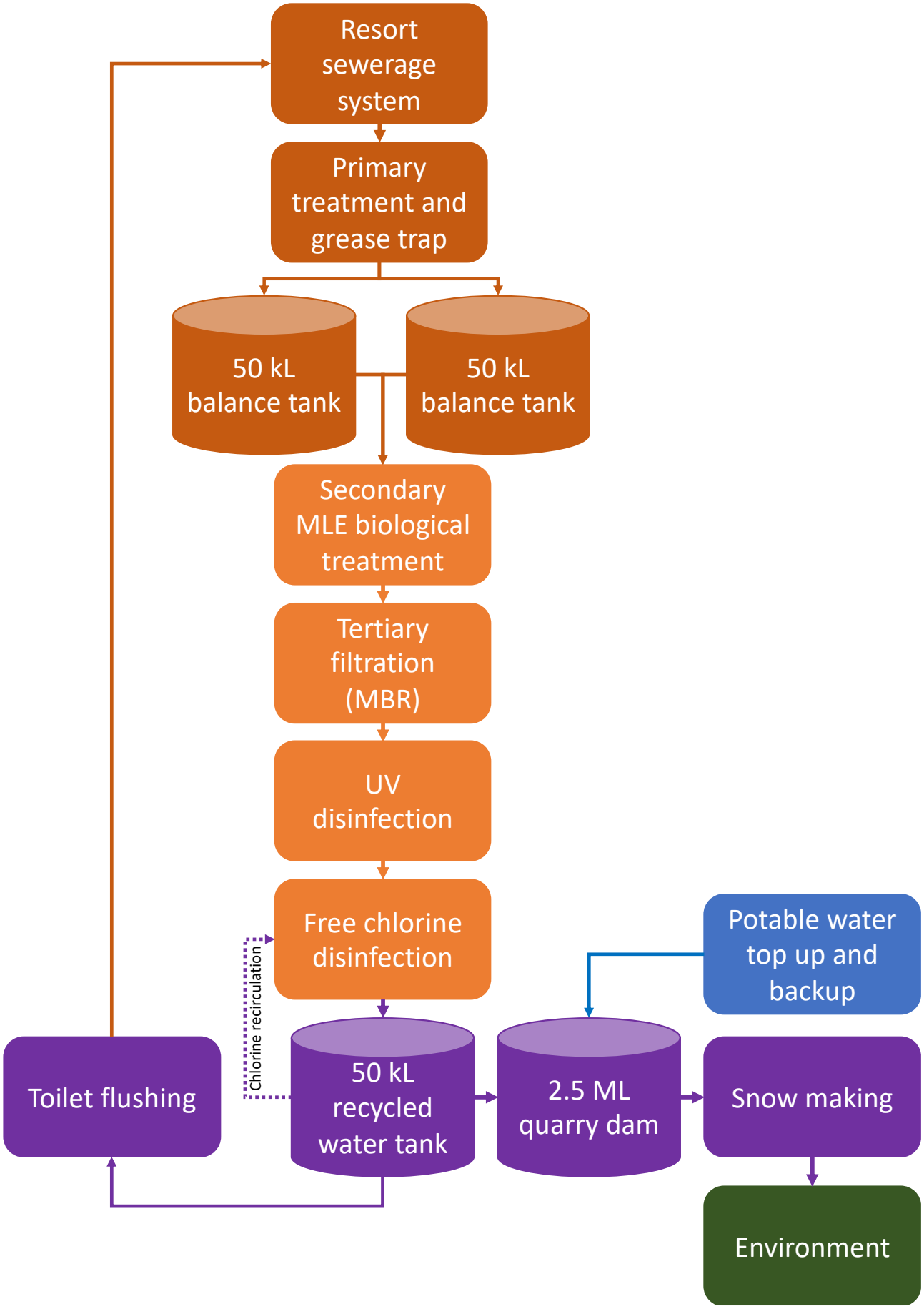
2 Assessment of the recycled water system

2.1 Scheme description

2.1.1 Tabular process summary

Process step	Description
Previous system	• Not present. Previously pit toilets were used (prior to the loss of the resort in the January 2020 bushfires). This is a green field site.
Source water	• Day resort only (up to 2,000 persons). • Overnight accommodation limited to staff (up to 50 persons). • Only open between June and October long weekends. • No trade waste – just domestic and catering facility discharge. • Estimated up to 2,000 equivalent population (EP) per day. • Up to a maximum 50 kL/d raw sewage inflow.
Primary treatment	• Inlet screen and grease trap
Balance tanks	• Two x 50 kL balance tanks to help balance flows before treatment.
Secondary treatment	• Modified Ludzack Ettinger (MLE) activated sludge process. • Heating elements within anoxic tank to support biological activity.
Tertiary treatment	• Membrane filtration (in membrane bioreactor configuration). • Hydranautics HSMM200-ES 0.05 µm nominal pore size ultrafiltration.
Disinfection	• UV dose to achieve sufficient protozoan pathogen reduction. • Free chlorination using sodium hypochlorite to achieve sufficient viral pathogen reduction, with recirculation to maintain residual.
Treated water storage	• Treated water storage tank (all uses). • Open storage in 2.5 ML Quarry Dam (for snow making water only).
Dilution	• Controlled and monitored dilution of the recycled water in Quarry Dam with fresh water from Clear Creek prior to its use for snow making. • Further uncontrolled dilution of recycled water after its application for snow making with natural rainfall and runoff.
Recycled water uses	• Toilet flushing (using dual pipe system with backflow devices to protect the potable water supply). • Snow production (with snow guns used outside operational hours). • Potable water abstraction can occur at SSR and downstream.
Health-related water quality objectives	• Recycled water may be accidentally ingested via cross-connections or misconnections within the toilet block or during its use in snow making. • Pathogen $\log_{10}$ reduction for 'dual reticulation' outdoor and indoor use (6.5, 5.0, 5.0 for viruses, protozoa and bacteria, respectively). • Helminth reduction not applicable (not an agricultural scheme). • Useful benchmark: Alpine Resorts Victoria snow making schemes. • Health Guidelines: AGWR (2006).
Environmental water quality objectives	• No change in water quality beyond natural variability is predicted for physical chemical stressors in Clear Creek and its tributaries through direct deposition and as snow melt (Advisian 2023) • 99% species protection level for toxicants. • Useful benchmark: Other NSW resort STPs. • Water Quality Guidelines: ANZG (2018).

2.1.2 High level summary process flow diagram (refer to P&ID for full details)



2.2 Hazard identification and risk assessment

2.2.1 Methodology

The health and environmental risk assessment was undertaken using the AGWR terminology and methodology (Table 2-1 to Table 2-4) using the following iterative process:

- A draft risk assessment was tabulated.
- A workshop was held 10:00 to 14:00 on 2 February 2023 with the Risk Assessment Team (Table 2-5) to review the draft risk assessment and contribute additional risks.
- The risk assessment was finalised following the workshop to encapsulate and respond to feedback from the Risk Assessment Team.
- A follow-up more detailed environmental assessment was conducted post-workshop to address additional questions that arose at the workshop.

Table 2-1. Jargon terms and definitions used in the risk assessment (AGWR 2006)

Term	Description
Hazard	A **biological, chemical, physical or radiological agent** that has the potential to cause harm to people, animals, crops or plants, other terrestrial biota, aquatic biota, soils or the general environment.
Hazardous Event	An incident or situation that can lead to the presence of a hazard — that is, **what can happen and how**.
Risk	The likelihood of identified hazards causing harm in exposed populations or receiving environments in a specified timeframe, including the severity of the consequence (**risk = likelihood × impact**)
Maximum Risk	The risk in the **absence of preventive measures**. Assessment of maximum risk is useful for identifying high-priority risks, determining where attention should be focused and preparing for emergencies
Residual risk	The risk **after consideration of existing and proposed preventive measures**. Assessment of residual risk provides an indication of the safety and sustainability of the recycled water scheme or the need for additional preventive measures
Preventive measures	Are actions, activities and processes used to prevent significant hazards from being present in recycled water or to reduce the hazards to acceptable levels. Preventive measures are sometimes referred to as **controls**.

Table 2-2. Likelihood measures used in the risk assessment (AGWR 2006)

Level	Descriptor	Description
A	Rare	May occur only in exceptional circumstances. May occur once in **100 years**
B	Unlikely	Could occur within **20 years** or in unusual circumstances
C	Possible	Might occur or should be expected to occur within a **5- to 10-year** period
D	Likely	Will probably occur within a **1- to 5-year** period
E	Almost certain	Is expected to occur with a probability of **multiple occurrences within a year**

Table 2-3. Consequence measures used in the risk assessment (AGWR 2006)

Level	Descriptor	Description
1	Insignificant	Insignificant impact or not detectable
2	Minor	Health — **Minor** impact for **small population** Environment — Potentially **harmful** to **local** ecosystem with local impacts contained to site
3	Moderate	Health — **Minor** impact for **large population** Environment — Potentially **harmful** to **regional** ecosystem with local impacts primarily contained to on-site
4	Major	Health — **Major** impact for **small population** Environment — Potentially **lethal** to **local** ecosystem; predominantly local, but potential for off-site impacts
5	Catastrophic	Health — **Major** impact for **large population** Environment — Potentially **lethal** to **regional** ecosystem or threatened species; widespread on-site and off-site impacts

Table 2-4. Risk matrix used in the risk assessment (AGWR 2006)

Likelihood	Consequence				
	1 Insignificant	**2 Minor**	**3 Moderate**	**4 Major**	**5 Catastrophic**
A Rare	Low	Low	Low	High	High
B Unlikely	Low	Low	Moderate	High	Very High
C Possible	Low	Moderate	High	Very High	Very High
D Likely	Low	Moderate	High	Very High	Very High
E Almost certain	Low	Moderate	High	Very High	Very High

Table 2-5. Risk assessment team participating in workshops

Name	Organisation and title	Role or area of expertise and experience	Workshop attendance
Josh Elliott	Chief Operating Officer, Blyton Group	Scheme operator	2/2/23
Lucy Blyton	General Manager, Selwyn Snow Resort	Scheme operator	2/2/23
Keiran Thomas	Keiran Thomas, Director Regional Assessments, DPE	Planning and approvals	2/2/23
Daniel James	Team Leader, Alpine Resorts Team, Regional Assessments. Regions, Industry and Key Sites, DPE	Planning and approvals	2/2/23
Kelsey Boreham	Principal Project Officer – Park Operations Projects / REST Southern Ranges Branch NPWS	Environment	2/2/23
Aaron Clifford	Environmental Health Officer NPWS	Environmental Health	2/2/23
Ryan Petrov	Sewage treatment Plant Manager NPWS	Sewage treatment expertise	2/2/23
Bryce Williams	A/Team Leader (REST) Southern Ranges Branch, NPWS	Environment	2/2/23
Carlie Armstrong	Senior Operations Officer, Regulatory Operations, EPA	Environment and licensing	2/2/23
Christina McInally	EPA	Environment and licensing	2/2/23
Tony Burns	Senior Environmental Health Officer, Public Health Unit| Murrumbidgee & Southern NSW Local Health Districts	Public health	2/2/23
Leslie Jarvis	NSW Health, Water Unit	Public health	2/2/23
Sarah Collum	Quality Compliance Officer Water and Wastewater Snowy Monaro Regional Council	Sewage treatment expertise	2/2/23
Jeffrey Bulfin	Principal Planning, Precise Planning	Planning	2/2/23
Megan Priestley	Senior Environmental Consultant, Advisian	Environment	2/2/23
Dan Deere	Water, sanitation and hygiene consultant, Water Futures	Public health	2/2/23

3 Preventive measures for recycled water management

3.1 Preventive measures

The preventive measures are summarised in the risk assessment worksheet. These include the STP controls as well as controls in place at the point where recycled water is stored and used. Briefly, the preventive measures identified are given in Table 3-1. These were defined either as:

- Passive – inherent in the nature of the scheme. No special monitoring or management required.
- Active – needs formalised monitoring and control.

Table 3-1. Summary of preventive measures considered in the risk assessment.

Process	Preventive measures	Nature of control
Sewerage system	Sewer catchment domestic and food waste only	Passive
STP as a whole	STP capacity matched to maximum usage	Passive
	Absence of bypass valves so treatment bypasses don't occur	Passive
	Training and awareness and education of personnel on site	Active
	Pollution Incident Response Management Plan	Active
	Contingency plan at the STP: recirculate within the STP and if that fails, move to pump out contingency	Active
Secondary treatment (MLE)	Heating for operation during cold weather	Active
	Proper operation to achieve required nutrient reduction (including feeding during low utilisation and for start-up)	Active
Tertiary treatment (MBR)	Proper operation of membrane modules to achieve required pathogen reduction	Active
UV disinfection	Proper operation of UV disinfection to achieve dose required for pathogen reduction	Active
Chlorine disinfection	Proper operation of chlorine disinfection to achieve dose required for pathogen reduction	Active
	Online process monitoring with automated controls including free chlorine residual	Active
Toilet flushing	Signage 'recycled water – do not drink' at points of use	Active
	Induction for workers coming to site	Active
Quarry Dam	Monitoring and management of cyanobacteria	Active
	Prevention of overflow of recycled water to environment	Active
	Prevention of leaching of recycled water to environment	Passive

Process	Preventive measures	Nature of control
	Low temperatures limiting risks from cyanobacteria	Passive
	Dilution is achieved within the former Quarry Dam	Active
Snow making	Signage 'recycled water – do not drink or eat snow' at points of potential exposure	Active
	Timing of snow making to avoid visitors getting excessively covered in or inhaling snow	Active
	Control of application rates, locations and timing to avoid excessive environmental discharge and runoff	Active
	Operating Guide for snow making team	Active
	Training in the Operating Guide and required controls	Active
Clear Creek (discharge, extraction, or runoff)	Water Quality Monitoring Program	Active
	OEMP	Active
	Recycled water is treated to a high grade	Active
	Water extraction from Clear Creek under existing license and no increases/changes are proposed	Active

3.2 Critical control points

Some of the preventive measures were singled out and defined as 'critical control points' (CCPs). For this scheme, the CCPs were defined in accordance with the AGWR. Briefly, CCPs are the sub-set of preventive measures that meet both of the following criteria:

- they are essential for the control of hazards that present significant risks; and
- for which performance efficacy can be monitored and controlled in a timely manner.

In this case, CCPs included any preventive measure on which reliance is placed for reducing pathogens to levels that ensure recycled water is fit for purpose. In addition, CCPs included preventive measures on which reliance is placed for controlling hazards that are acutely hazardous to the environment. Therefore, four CCPs were identified, as follows:

- CCP1 Secondary treatment MLE (to control both environmental toxicants and pathogens).
- CCP2 Tertiary filtration MBR (to control pathogens).
- CCP3 UV disinfection (to control pathogens).
- CCP4 Chlorination (to control pathogens).

4 Operational procedures and process control

4.1 Target criteria, operational monitoring and corrective actions

For the preventive measures that have been singled out, some objectives, defined as 'target criteria', have been identified, along with a means for monitoring performance against those objectives ('operational monitoring'). Corrective actions have been defined for the response to deviations from the target criteria. These have been summarised in Table 4-1.

4.2 Critical limits

For the preventive measures that were highlighted as CCPs, a 'critical limit' was determined. These have been summarised in Table 4-1.

A critical limit defines the measurable upper and/or lower performance limits of the CCP within which there is confidence that recycled water produced is fit for purpose. Operation within critical limits indicates the process is functioning effectively to remove the relevant hazards and produce water of acceptable quality.

If a critical limit is exceeded a corrective action is undertaken to ensure that recycled water is not supplied for a use for which it is not fit for purpose. This includes options, recirculating the wastewater for re-treatment, or tankering the wastewater offsite. If the corrective action fails to be applied in a timely manner and recycled water is supplied for a use for which it is not fit for purpose, then an incident or emergency response is triggered as discussed in section 6.

4.3 Reliability of processes and monitoring systems

Asset management and operational controls are in place at SSR to ensure scheduled inspection, preventive and reactive maintenance, and instrument cleaning, cross-checking and calibration. These are captured in SSR's maintenance management system.

Table 4-1. Process Control Summary Table.

Process step	Preventive measure	Operational monitoring parameter(s)	Location	Responsible party	Target criteria	Critical limit	Corrective actions
Secondary treatment (MLE) (CCP1)	Heating	Temperature	In anoxic zone	Blyton Group site operator	15-20˚C	< 10˚C	Stop supply of recycled water until problem resolved
	Proper operation	Ammonia	Prior to chlorination		7.5 mgL	> 10 mg/L	
Tertiary treatment (MBR) (CCP 2)	Operation for achievement of required pathogen reduction	Turbidity	Turbidity after the MBR stage	Blyton Group site operator	≤0.2 NTU 95%ile in any 24-hour period	>0.5 NTU	Stop supply of recycled water until problem resolved
		MLSS	Mixed liquor sample point in MBR tank	Blyton Group site operator	6,000-12,000 mg/L MLSS	> 15,000 MLSS	
UV Disinfection (CCP 3)	Operation for achievement of required pathogen reduction	ONORM validated reduction equivalent dose (online)	UV units online	Blyton Group site operator	≥ 40 mJ/cm^2	< 40 mJ/cm^2	Stop supply of recycled water
		UVT			> 77%	≤ 77%	
Chlorine disinfection (CCP 4)	Operation for achievement of required pathogen reduction	pH (online)	Outlet from the chlorine contact tank online	Blyton Group site operator	6.5-8.5 pH units	> 9.0 pH units	Stop supply of recycled water
		Free chlorine residual (online)			≥ 0.5 mg/L	< 0.5 mg/L	Stop supply of recycled water
Quarry Dam	Management of cyanobacteria	Cyanobacteria (monthly)	Quarry Dam sampling point	Blyton Group site operator	To be determined	N/A	Stop supply of recycled water
	Management of leaching and overflow	Levels (monthly)	Quarry Dam sampling point		To be determined	N/A	To be determined
Toilet flushing	Signage and plumbing controls	Compliance with PCA (after completion of any plumbing works on site)	On site	Licensed plumber Overseen by Blyton Group site operator	Certified compliance with PCA from licensed plumber for all plumbing works	N/A	Report and rectify any non-compliance with PCA
Snow making	Signage, timing and volume controls	Timing and flow rates of snow guns	At water meter	Blyton Group site operator	Compliance with agreed application timing and rates given in OEMP	N/A	Report any non-compliance with OEMP (or similar) document

5 Verification of recycled water quality and environmental performance

5.1 Recycled water quality verification monitoring

The recycled water quality verification monitoring program is used as a final and independent check to demonstrate that recycled water is fit for purpose, and to provide evidence for compliance assessment. An independent National Association of Testing Authorities (NATA) accredited laboratory will conduct the laboratory tests and provide results, certified by a NATA signatory, for the testing of the final recycled water quality in the Recycled Water Tank and Quarry Dam. The results will be compared to the water quality criteria for the scheme (Table 5-1).

The laboratory will provide an SMS and email alert to the Blyton Group SSR representative within an agreed timeframe if an exceedance is reported (within one hour for exceedances related to microbial risk and process control (*E. coli*, free and total chlorine, pH and turbidity) and within 24 hour for other exceedances).

Following preliminary investigation by SSR, if warranted, the follow up to an exceedance may trigger an incident and emergency response, as summarised in section 6. The incident and emergency response may in turn lead to cessation of recycled water supply until any underlying causes of the exceedance have been identified and resolved, and follow-up testing has returned compliant results.

All results of verification monitoring will be reported in an annual water scheme performance report, tabulated as number of samples, mean, 95%ile and maximum.

5.2 Monitoring of recycled water users

There is no formal monitoring of recycled water users since in this case SSR is both the producer and user of recycled water.

There is only a single recycled water pipe supplying flushing water only to the toilets in the Visitor Centre, and nowhere else. As such, the plumbing system is as simple as it could be. Nonetheless, a formal notification and response process in the Drinking Water Quality Assurance Program triggers an investigation of taste or odour questions, enquiries or complaints raised by staff or visitors to the SSR. The response considers whether there may have been a cross-connection due to an illegal tapping into the recycled water line.

Table 5-1. Verification Monitoring Summary Table. [draft pending licence and DA approval]

Sample location	Frequency	Test location	Parameter	Lab notification value
Recycled water tank	Weekly (during scheme operation)	Laboratory (by NATA certified analyst)	*Escherichia coli*	≥ 1 per 100 mL
			Total coliforms	≥ 20 per 100 mL
			Turbidity	≥ 0.5 NTU
		At sample point (by sampler)	Free chlorine	≥ 5 mg/L ≤ 0.5 mg/L
			Total chlorine	≥ 5 mg/L ≤ 0.5 mg/L
			pH	≥ 8.5 pH units ≤ 6.5 pH units
	Monthly (during scheme operation) possibly dropping to annually after first two years of operation	Laboratory (by NATA certified analyst)	Ammonia	TBD
			Total nitrogen	TBD
			Total phosphorus	TBD
			Biological oxygen demand	TBD
			Total suspended solids	TBD
			Metals suite by ICP-MS	TBD (focus on plumbing leachate, particularly copper)
Quarry Dam	Monthly (during scheme operation)	At sample point (by sampler)	Free chlorine	≤ 0.1 mg/L
		Laboratory	Cyanobacteria	TBD

6 Management of incidents and emergencies

SSR has an incident an incident and emergency management system for the site. Recycled water management is covered within that system. Exceedances of the critical limits will ordinarily be contained by corrective actions and recycled water will not be supplied if not fit for purpose. However, if there is evidence that recycled water that is not fit for purpose has been supplied then this will lead to the declaration of an incident and notification of relevant regulators and public health and environmental agencies. If necessary, visitors to the site will be notified, in consultation with those agencies.

Evidence triggering such an incident would include:

- A cross-connection or misconnection was identified that may have resulted in consumption of recycled water by persons visiting or working at the SSR. Note that this overlaps with the Drinking Water Quality Assurance Program obligations for the site.
- Recycled water was not fit for purpose but had been supplied (i.e. critical limit exceedances (refer to Table 4-1) had occurred and recycled water had continued to be supplied).
- Water quality verification test results were not compliant with water quality specifications (Table 5-1) and recycled water was supplied.

7 Operator, contractor and end user awareness and training

Part of the onsite induction for staff and visitors includes raising awareness of the use of the recycled water at the site. Signs at the entrance to the resort, in the snow making areas, and in the toilets, highlight the presence of recycled water. Only licensed plumbers are permitted to undertake plumbing works on the site.

8 Community involvement and awareness

The beneficial use of wastewater through the production of high-quality recycled water is promoted at the site and in brochures and websites.

9 Research and development

9.1 Validation of processes and design of equipment

Validation evidence was assembled to demonstrate that the recycled water system is capable of consistently achieving the process performance objectives and meeting water quality criteria. For pathogens, the validation for the scheme is summarised in Table 9-1.

Table 9-1. Treatment barriers and validated performance.

Process step	Pathogen log_{10} reduction value (LRV) credited			Basis for validation
	Viruses	Protozoa	Bacteria	
Secondary treatment (MLE) (CCP1)	0.5	0.5	0.5	AGWR and WaterVal conservative default values for operation within the critical limits
Tertiary treatment (MBR) (CCP 2)	2.5	3.0	3.0	Given in the vendor design report and the third-party validation report for operation within the critical limits. Specifically, the Hydranautics HYDRAsub®/MRE's Sterapore SADF® HSE25 0.4 micron microfiltration polyvinylidene fluoride (PVDF) reinforced hollowfibre membrane bioreactor (MBR) technology was certified by the California Department of Public Health as complying with the California Water Recycling Criteria (Title 22) on 23 September 2009. The operating criteria were ≤ 0.2 NTU 95%ile in any 24-hour period and ≤ 0.5 as a critical limit at any time. The virus LRV demonstrated was 2.4 to 4.1, with a 50%ile > 3.0 and 5%ile (interpolated) > 2.5. The unit at SSR is an updated model, the HYDRAsub®Max ultrafiltration PVDF MBR with a pore size of 0.05 µm. Therefore, this LRV claim is considered conservative. Regular monitoring of mixed liquor suspended solids and online monitoring of transmembrane pressure and flow rate will be used to ensure operation within the validated dynamic range of those parameters.

Process step	Pathogen log_{10} reduction value (LRV) credited			Basis for validation
	Viruses	Protozoa	Bacteria	
UV Disinfection (CCP 3)	0.5	4.0	4.0	Given in the vendor design report and the third-party validation report for operation within the critical limits. Specifically, the Xylem Water Solutions Spektron 50e reactor is validated to ÖNORM M5873-1:2001 for 40 mJ/cm^2 reduction equivalent dose within the UVT/cm dynamic range 77% to 100% as displayed on the Wedeco controller.
Chlorine disinfection (CCP 4)	4.0	0.0	4.0	Based on WaterVal guidance for operation within the critical limits (free chlorine concentration and contact time, noting the temperature, turbidity and pH range indicated in the vendor design report). The contact tank has been designed for 30 minutes minimum contact time. With a critical limit of 0.5 mg/L this provides 15 mg•min/L CT. Note that chlorine is recirculated so that during periods of low turnover the chlorine residual will be maintained within the contact tank.
Sum of validated performance	7.5	7.5	11.5	Sum of above
Objectives	6.5	5.0	5.0	AGWR for 'dual reticulation' outdoor and indoor use
Safety margin	1.0	2.5	6.5	Validated less objectives

9.2 Receiving Environment Monitoring

For environmental aspects, the validation for the scheme is summarised separately and is based on the design report from the vendor compared to the objectives set out in the prior environmental assessments (Advisian 2023, K2 Consulting 2022).

As a new scheme, monitoring of environmental water quality is proposed during the recycled water operation to assess potential changes in water quality in receiving Clear Creek. The proposed environmental monitoring program sampling locations are shown in Figure 9-1 and Figure 9-2 and the program in Table 9-2 and Table 9-3.

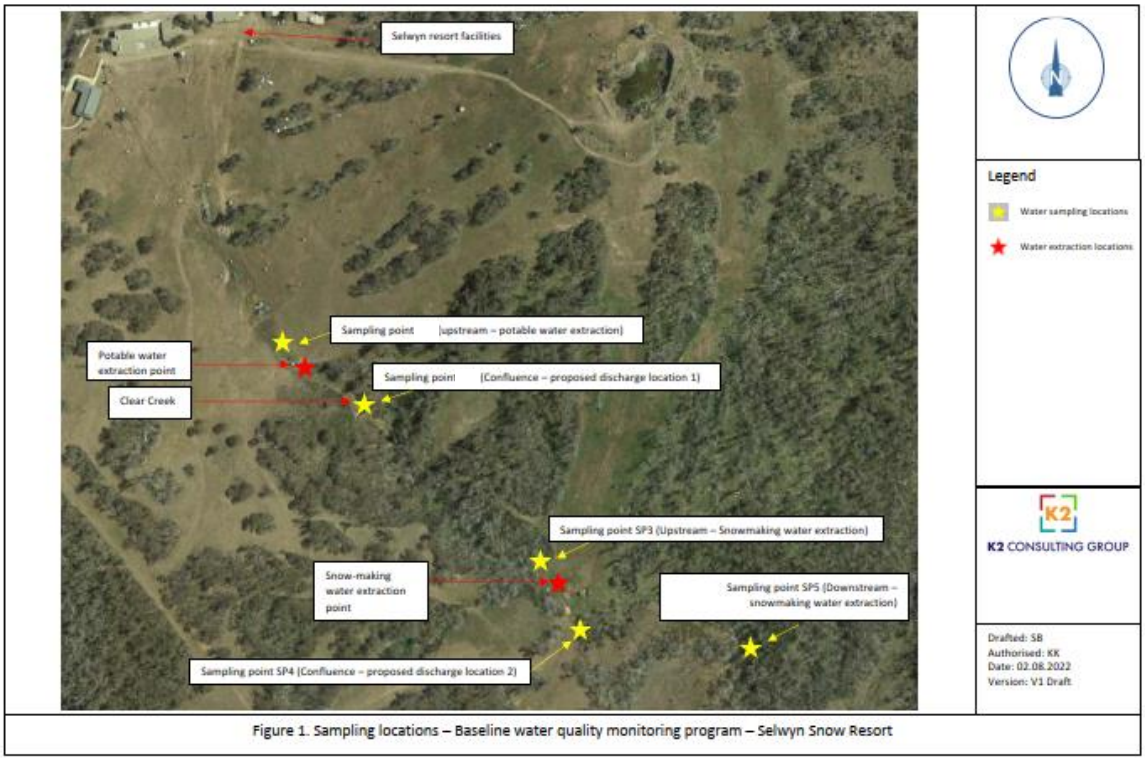


Figure 9-1 Baseline water sampling locations for Selwyn Snow Resort (K2 Consulting 2022)

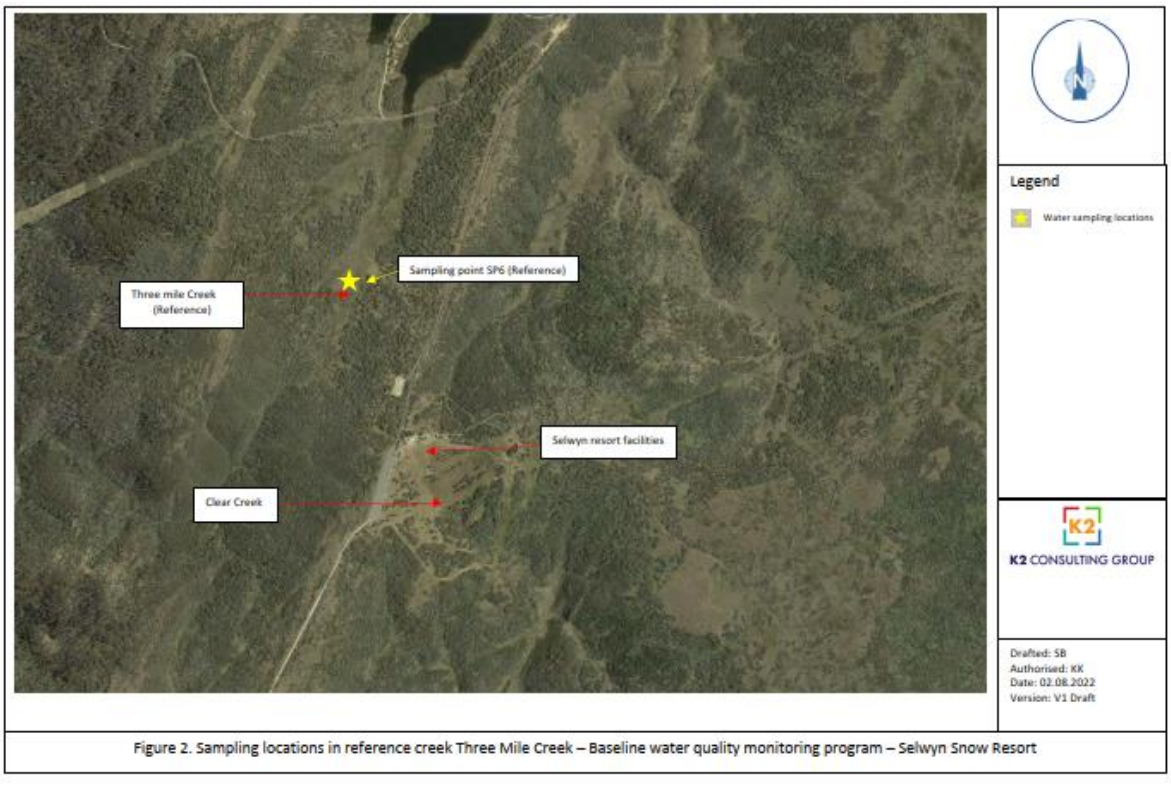


Figure 9-2 Baseline reference location for Selwyn Snow Resort (K2 Consulting 2022)

Table 9-2. Receiving Environment Monitoring Locations and Frequency

Sample locations	Frequency	Test method	Group
Soils			
S1 S2 S4 Reference (All at two depth profiles: 0-10cm; 30-50cm)	Annual	Laboratory (by NATA certified analyst)	pH, salinity indicators, cadmium, boron, nitrogen and phosphorous
Soil description and classification	Annual	Visual assessment	
Freshwater			
Quarry Dam Q1 (Licensed discharge point) **Clear Creek**: SP1 SP2 SP3 SP5 **3-Mile Creek**: SP6 (Reference)	Monthly during recycled water operation (3 events per year)	At sample point (by sampler using handheld water quality meter) (average of 3 measurements)	Physiochemistry and creek flow rate
		Laboratory (by NATA certified analyst)	Physical quality, nutrients, metals and metalloids, pathogen indicators, chlorophyll – *a*, and chlorine

Table 9-3 Clear Creek Receiving Environment Monitoring Program

Group	Parameter	Unit	Guideline Value	Reference
Soils				
Physicochemistry	pH		7-9	
	Salinity (EC)			
	Sodium absorption ratio (SAR)		<2	AGWR
Metals	Cadmium	mg/kg	3	NEPC
	Boron	mg/kg	-	
Nutrients	Total nitrogen	mg/kg		
	Total phosphorous	mg/kg	Assessment as per Table A5.23 of AGWR	AGWR
Waters				
Physicochemistry	Temperature	°C	No change from ambient conditions	EPA requirements[3] & ANZECC (2000)[1]
	pH	-		
	Dissolved oxygen	% Sat		
	Conductivity	µS/cm		
	Turbidity	NTU		
	Sodium absorption ratio (SAR)		Assessment as per Table A5.22 of AGWR	AGWR

Physical quality	Biological Oxygen Demand (BOD)	mg/L	-	-
	Oil and grease	mg/L	-	-
	Total dissolved solids (TDS)	mg/L	-	-
	Total suspended solids (TSS)	mg/L	-	-
Nutrients	Ammonia as N (NH)	mg/L	0.32	ANZG (2018)[2]
	Total nitrogen as N (TN)	mg/L	0.25	ANZECC (2000)[1]
	Total phosphorus as P (TP)	mg/L	0.02	
Dissolved Metals and metalloids	Total Mercury (Hg)	mg/L	-	-
	Aluminium (Al)	µg/L	27	-
	Arsenic (As)	µg/L	1 (AS III)	ANZG (2018)[2]
	Cadmium (Cd)	µg/L	0.06	ANZG (2018)[2]
	Chromium (Cr)	µg/L	-	-
	Copper (Cu)	µg/L	1	ANZG (2018)[2]
	Lead (Pb)	µg/L	1	ANZG (2018)[2]
	Iron (Fe)	µg/L	-	-
	Zinc (Zn)	µg/L	2.4	ANZG (2018)[2]
Pathogen indicators	Faecal coliforms	CFU/100ml	200	NHMRC (2008)
	Enterococci	CFU/100ml	40	NHMRC (2008)
Algae indicator	Chlorophyll - *a*	mg/L	-	-
Disinfectants	Total chlorine	µg/L	3	ANZG (2018)[2]

1. ANZECC (2000) Default trigger values for physical and chemical stressors in south-east Australia and 2. ANZG (2018) 99% species protection for toxicants for high value ecosystems, 3. ANZECC (2000) Interim working guideline for iron based on the Canadian guideline level.

10 Documentation and reporting

10.1 Management of documentation and records

This RWMP and associated documents are retained by SSR.

10.2 Document review

This RWMP and associated documents are periodically reviewed by SSR:

- after major changes in infrastructure;
- in the light of major changes in guidelines or regulations;
- following incidents and emergencies; and
- at periodic intervals not exceeding five years.

10.3 Reporting

An annual report on the operation of the scheme is provided to EPA and the NSW Health LHD, that includes the following:

- Volume of recycled water produced.
- Concise summary of preventive measure performance as indicated by operational monitoring.
- Detailed summary of CCP performance as indicated by operational monitoring, including detailed any exceedances and associated responses.
- Water quality monitoring results from verification monitoring, including detailed any exceedances and associated responses.

11 Evaluation and audit

11.1 Long term evaluation of results

The annual report on the operation of the scheme is reviewed by SSR as part of the process of producing that report. Previous annual reports are compared to each annual report to help evaluate scheme performance.

11.2 Audit of the recycled water management system

The scheme is subject to internal first-party audit by SSR at least every five years. The audit assesses the scheme against the RWMP and any agreements with regulators and associated regulatory and formal requirements. SSR may engage a third-party auditor from time-to-time or if so requested by the regulator.

12 Review and continuous improvement

Information from incident responses, annual reviews, audits and long-term evaluations are used to support periodic review and continual improvement.

13 References

Advisian (2023) Selwyn Snow Resort STP Dilution Study – Phase 1. A report prepared for Selwyn Snow Resort. Report number: 311012 – 01613. Rev0.

De.mem Akwa (2022). Selwyn Snow Resort Design Brief for STP. A design report prepared for the Blyton Group in March 2022. Available from: DA 22/5248 Selwyn Snow Resort, Mount Selwyn - installation of sewerage treatment plant | Planning Portal - Department of Planning and Environment
(nsw.gov.au).

K2 Consulting (2022). Draft Baseline Water Quality Monitoring Program – Onsite Treated Effluent Discharge for Selwyn Snow Resort. A report prepared for Selwyn Snow Resort.

Natural Resource Management Ministerial Council, Environment Protection and Heritage Council, and Australian Health Ministers Conference, Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1) (2006). Available from: https://www.waterquality.gov.au/sites/default/files/documents/water-recycling-guidelines-full-21.pdf.

Precise Planning (2022). Statement of Environmental Effects (SEE) Available from: DA 22/5248 Selwyn Snow Resort, Mount Selwyn - installation of sewerage treatment plant | Planning Portal - Department of Planning and Environment (nsw.gov.au).

14 Appendices

14.1 Health and environmental risk assessment worksheets

See separate attachments

14.2 Selwyn Snow Resort STP Dilution Study (Advisian 2023)

See separate attachment