Shoalhaven Water Reclamation Annual Report 2023 - 2024

For more information contact
Shoalhaven Water

City Administration Centre
Bridge Road (PO Box 42)
Nowra NSW Australia 2541
P: (02) 4429 3214
F: (02) 4429 3170
water@shoalhaven.nsw.gov.au
www.shoalwater.nsw.gov.au

Document Number
Version: D24/453372
File: 1499E

For more information contact Shoalhaven Water
City Administrative Centre
Bridge Road (PO Box 42), Nowra NSW Australia 2541
P: (02) 4429 3214 F: (02) 4429 3170
water@shoalhaven.nsw.gov.au www.shoalwater.nsw.gov.au

Environmental Project Officer
Wastewater Operations
council@shoalhaven.nsw.gov.au

CONTENTS

TABLES

FIGURES

HIGHLIGHTS & SUMMARY

- Shoalhaven City Council is involved in water reclamation schemes at nine (9) of its thirteen (13) wastewater treatment plants involving re-use on thirty-five (35) properties.
- The largest scheme is the Northern Shoalhaven Reclaimed Water Management Scheme (REMS) involving six (6) wastewater treatment plants and re-use on thirty-one (31) properties with various uses including dairy farms, sports grounds and golf courses.
- During 2023/24 approximately 2,444 ML of reclaimed water was beneficially re-used throughout the Shoalhaven, which is 31% of all reclaimed water produced.
- REMS Stage 1A entered its twenty-third year of operation and provided 1,195 ML of reclaimed water.
- REMS Stage 1B entered its fourth year of operation and provided 755 ML of reclaimed water.
- Kangaroo Valley reclaimed 41ML in the 2023/24, which accounts for 100% of reclaimed effluent used for Agriculture.
- In 2023/34 Council was no longer able to reuse biosolids on local dairy farms due to proposed changes to the NSW EPA Use and Disposal of Biosolids Guidelines. Council commenced disposal of Biosolids on a pine forest plantation to ensure the biosolids produced from our Wastewater Treatment Plants (WwTP's) can be beneficially reused and meet the proposed guidelines.
- Approximately 4,837 wet tonnes (738 dry tonnes) of processed, dewatered biosolids were beneficially reused in agriculture during 2023/24 in accordance with NSW Government environmental guidelines.
- Environmental monitoring of ambient waters undertaken as part of the REMS, Shoalhaven Heads, Ulladulla, Kangaroo Valley, Conjola, Nowra and Bomaderry sewerage schemes found no significant adverse outcomes.
- A Thesis study was conducted at Coonemia Dam to review the strategy for management of Blue-Green Algae outbreaks. The study found our existing chemical dosing procedure to be the best management strategy and made recommendations to improve process monitoring. These recommendations are currently being implemented and will be completed by the end of 2024.
- Each of the water reclamation schemes met its water quality targets with respect to disinfection of reclaimed water, with the exception of St Georges Basin which undergoes further treatment at Vincentia.
- A permanent centrifuge for biosolids management, has been commissioned at Nowra WwTP.

1 SUSTAINABLE WATER RECLAMATION

1.1 Objectives of Water Reclamation Schemes

Shoalhaven City Council is committed to promoting the beneficial use of treated wastewater (reclaimed water) and the solids removed during the treatment process (biosolids). Water reclamation schemes such as the Northern Shoalhaven Reclaimed Water Management Scheme (REMS) can promote sustainable development by:

- protecting the environment;
- reducing demand for potable water supplies;
- promoting local economic development;
- directly involving the community in water conservation.

In the Shoalhaven, water reclamation projects involve a partnership between Council (supplier) and end-users such as farms, golf courses and sports grounds. For each reclamation project, Council has established procedures to ensure the water recycling activity complies with NSW and Commonwealth guidelines. The aims of water reclamation schemes are to:

- ***Safeguard Public Health*** – Reclaimed water is highly treated and disinfected to protect people who may come in contact with it and is regularly tested to ensure it meets relevant standards. In the Shoalhaven, reclaimed water typically receives tertiary treatment. The REMS and Sussex Inlet schemes also provide chlorine disinfection. Additional on-site disinfection can be provided where there is a higher risk of public contact. Irrigation properties manage applications to prevent accidental contact by workers and the public by irrigating at night-time where practicable.
- ***Reduce Impacts on Surface and Groundwater*** – Water reclamation schemes can help reduce the volume of reclaimed water discharged to the environment. Residual compounds in reclaimed water such as nitrogen and phosphorus can be detrimental to waterways but are a valuable resource for plant uptake if recycled onto land.
- ***Protect The Local Environment*** – Water reclamation projects must consider any constraints in the local area such as poor soils and proximity to other residents or sensitive environments. These are generally addressed in the planning phase.
- ***Optimise Resource Use*** – Water reclamation schemes aim to improve resource use by recycling a valuable product. Water reclamation is increasingly being examined as a means of reducing demand on potable water supplies by being used in instances where non-potable water use is appropriate.
- ***Be Affordable*** – Council has limited resources and must look critically at the cost-effectiveness of any proposal for water reclamation projects. This includes consideration of capital and operating costs, environmental benefits and other resources savings.
- ***Be Acceptable to the Community*** - The Shoalhaven community was extensively involved in the developed of the REMS. As Council considers new applications for reclaimed water, it is important to consult the community and stakeholder groups on these new applications.
- ***Potable Water Substitution*** - Reclaimed water is increasingly being seen as one means to reduce demand on potable water supplies. For example, in the REMS, farms are recycling up to 1,000kL of reclaimed water per day for cleaning stock yards and stock drinking water where previously potable water was used.

A Reclaimed Water Policy (refer Appendix A) has been developed to guide the design and operation of Council water reclamation schemes.

2 EXISTING RECLAMATION SCHEMES

2.1 REMS Stage 1A

The REMS is one of the largest and more complex water recycling schemes undertaken by a regional water authority (refer to scheme map in Appendix B). Construction was jointly funded by Shoalhaven City Council, the NSW and Commonwealth Governments and individual irrigators. REMS Stage 1A, costing $34m, was commissioned in January 2002. Twenty-two (22) dairy farms, a golf course and several sporting grounds irrigate with reclaimed water from the scheme on well over 500 hectares of land.

The scheme components are:

Coonemia Bulk Storage – The bulk storage facility has a capacity of 600ML for storage of wet weather flows for subsequent re-use in dry periods. The storage holds the equivalent of 12,000 average family swimming pools or 600 Olympic sized swimming pools.

* (Aerial Image from NearMap 2023)

Figure 2-1 – Photograph and Aerial Image of REMS Bulk Storage

Bulk Storage Return Pump Station – The reclaimed water pumping station and chlorination facility at the Coonemia Bulk Stage draws water from the bulk storage to supply the distribution system when demand exceeds supply from the treatment plants.

Coonemia Distribution Storage Reservoir – The 4ML reservoir balances flows pumped from treatment plants to end-users and maintains a constant water pressure in the distribution system.

Vincentia Wastewater Treatment Plant – As part of the REMS Stage 1A, the plant capacity was increased and treatment processes upgraded to produce tertiary treated reclaimed water for supply into the REMS. Tertiary treatment is achieved through sand filtration, chlorination, and ultraviolet light.

Culburra Beach Wastewater Treatment Plant – As part of the REMS 1A, the plant capacity was increased, and treatment processes upgraded to produce tertiary treated reclaimed water for connection to the REMS. Tertiary treatment is achieved through sand filtration, chlorination, and ultraviolet light.

Callala Wastewater Treatment Plant – The Callala WwTP was commissioned in 1999 and was purpose built to provide tertiary treated reclaimed water into the REMS. Tertiary treatment is achieved through sand filtration, chlorination, and ultraviolet light.

Figure 2-2 – Photograph of Filters Callala WwTP

St Georges Basin Wastewater Treatment Plant – This plant produces secondary treated reclaimed water using extended aeration before being pumped to the Vincentia WwTP for tertiary treatment. The plant provides supply directly to the St Georges Basin Country Club golf course and the Bay and Basin Leisure Centre sports grounds from the reclaimed water transfer main to the Vincentia WwTP.

Vincentia Transfer Main – This 15km pipeline conveys reclaimed water from the Vincentia Wastewater Treatment Plant through to REMS distribution storage at Coonemia. The transfer main also supplies reclaimed water directly to White Sands Park at Huskisson sports ground. Additional ultraviolet disinfection is provided at the sports ground to ensure public health protection.

Figure 2-3 – Photograph of Pumping & Disinfection System - Huskisson Sports Field

Distribution Mains – This 18km pipeline system supplies the agricultural land on the Shoalhaven floodplain east of Nowra from the Coonemia reservoir and bulk storage.

Farm Balance Ponds & Flow Control Works – Each of the properties supplied from the REMS for irrigation is served by a balance pond to store approximately one day's irrigation supply. Supply rates are controlled by automated flow control valves that have the facility to cater for rationing water during periods of low supply.

Figure 2-4 – Photograph of Farm flow control valve

2.2 REMS Stage 1B - Nowra & Bomaderry WwTPs

Major upgrades to the Bomaderry and Nowra WwTPs were completed in late 2019 at a cost of around $110m. The majority of these projects was funded by Shoalhaven City Council with a contribution from the NSW Government. Reclaimed water transfer mains were constructed to connect the treatment plants to the existing REMS network including a 1,400m section of pipeline under the Shoalhaven River (see figure in Appendix B). The inclusion of the Bomaderry and Nowra WwTPs effectively doubled the amount of reclaimed water supply into the REMS. All reclaimed water flows receive tertiary treatment through filtration and ultraviolet disinfection, with reclaimed water transferred to the REMS network also receiving chlorine disinfection. The existing farm and golf course properties supplied from the Nowra WwTP were connected to the expanded REMS distribution system.

2.3 Shoalhaven Heads WwTP

A re-use scheme operates from the Shoalhaven Heads WwTP with a local turf farm irrigating 14 hectares of turf and the Shoalhaven Heads Golf Club irrigating 10 hectares of fairways. Tertiary treatment of reclaimed water is achieved through filtration and chlorine disinfection.

Figure 2-5 – Photograph REMS irrigation – Turf Farm Shoalhaven Heads

2.4 Sussex Inlet WwTP

Reclaimed water from the Sussex WwTP is irrigated on the nearby Thomson Street Sports Ground or Sussex Inlet Golf Course. The Sussex Inlet plant provides tertiary treatment of reclaimed water through sand filtration, chlorine disinfection and additionally with ultraviolet disinfection to ensure public health protection.

Figure 2-6 – Sussex Inlet Golf Course, Sussex Inlet

2.5 Kangaroo Valley WRF

The wastewater reclamation facility (WRF) for Kangaroo Valley was commissioned in 2013. The WRF utilises membrane filtration and ultraviolet disinfection to provides tertiary treated effluent for irrigation. A reclaimed water storage pond was constructed to allow for beneficial irrigation on 16 hectares of adjacent dairy pasture. The storage pond holds 50ML, which equivalent to more than 1 year's output from the treatment plant.

Figure 2-7 – Photograph REMS irrigation – Dairy Farm – Kangaroo Valley

2.6 Biosolids Management

The solids removed during wastewater treatment are recognised as a valuable resource which is high in organic matter and nutrients. Council has a policy to maximise the beneficial re-use of biosolids subject to compliance with NSW environmental guidelines. The treatment of biosolids in the Shoalhaven typically involves stabilisation in lagoons for up to 12 months. The solids are then dewatered using a centrifuge or Geobag and then tested for suitability to land application. At the Kangaroo Vallery WRF solids are stablised in digesters and dewatered on a belt press. Please see Section 3.3 for Council biosolids production details.

Figure 2-8 – Photograph of Council's Permanent centrifuge at Nowra WwTP

3 OPERATIONAL ACHIEVEMENTS 2023-24

3.1 Volumes Reused

The 2023/24 year was characterised by above average rainfall during November 2023 and during April, and June of 2024. Figure 3.1 below shows monthly rainfall, evapotranspiration, and irrigation rates for the REMS during 2023/24. Beneficial re-use for REMS 1A totalled 1,195 ML or 40% of total outflows from the scheme. Farms applied an average of 2.9 ML (291mm) of reclaimed water per allocated hectare for the year.

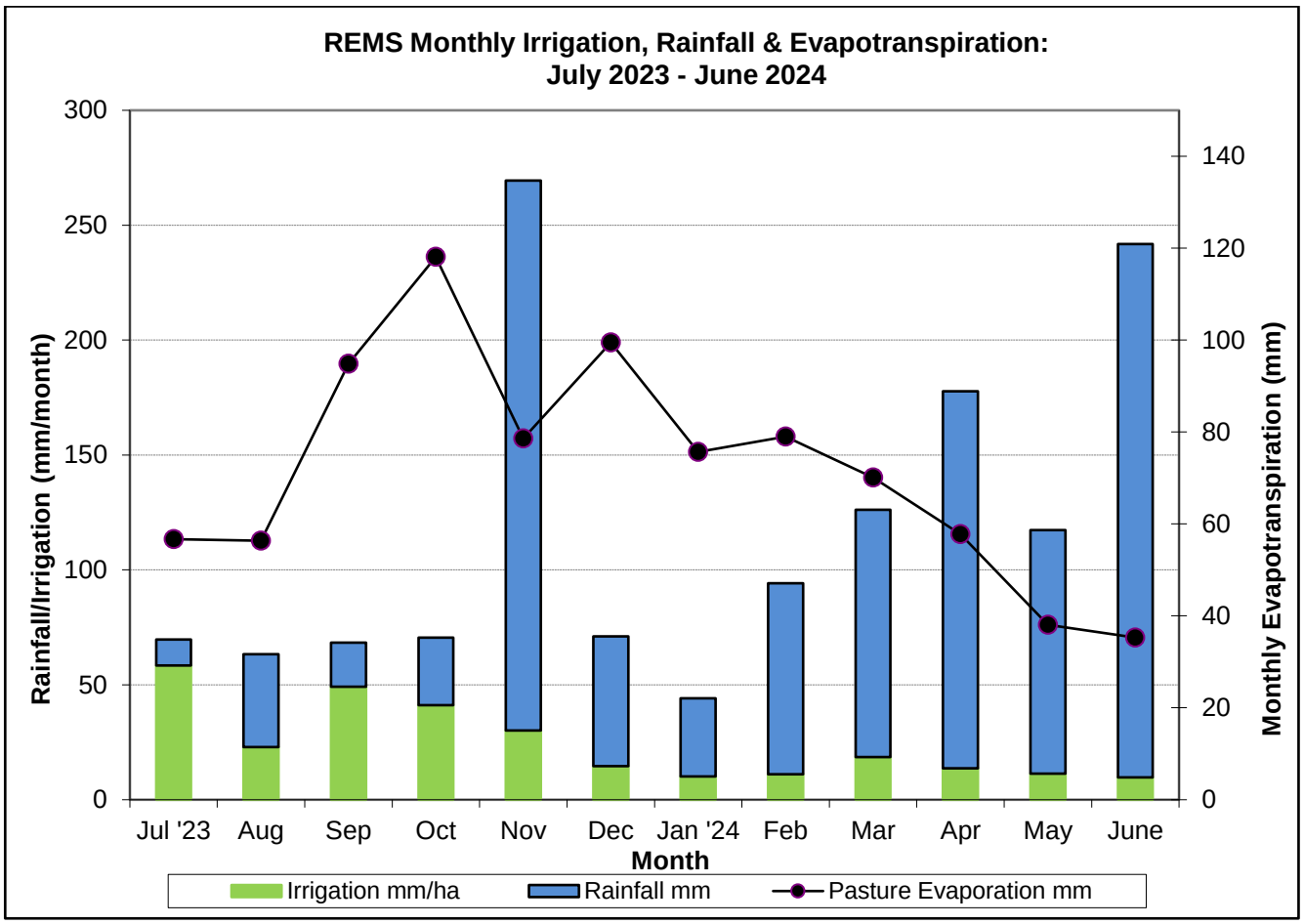


Figure 3-1 – Monthly Water Balance for REMS Irrigation for 2023/24

The cumulative volume of reclaimed water usage in the REMS since operations commenced (i.e. September 2001- June 2024) is in excess of 35,804ML, or approximately 59% of the total flows managed by the scheme (Figure 3.2). The average annual volume released to the Penguin Head outfall has been 1380ML. This annual average represents approximately 30% increase in reclaimed water released to the Penguin Head outfall than when the Culburra scheme operated on a stand-alone basis. However, this increase in volume is more than compensated by a higher level of treatment of reclaimed water in the REMS.

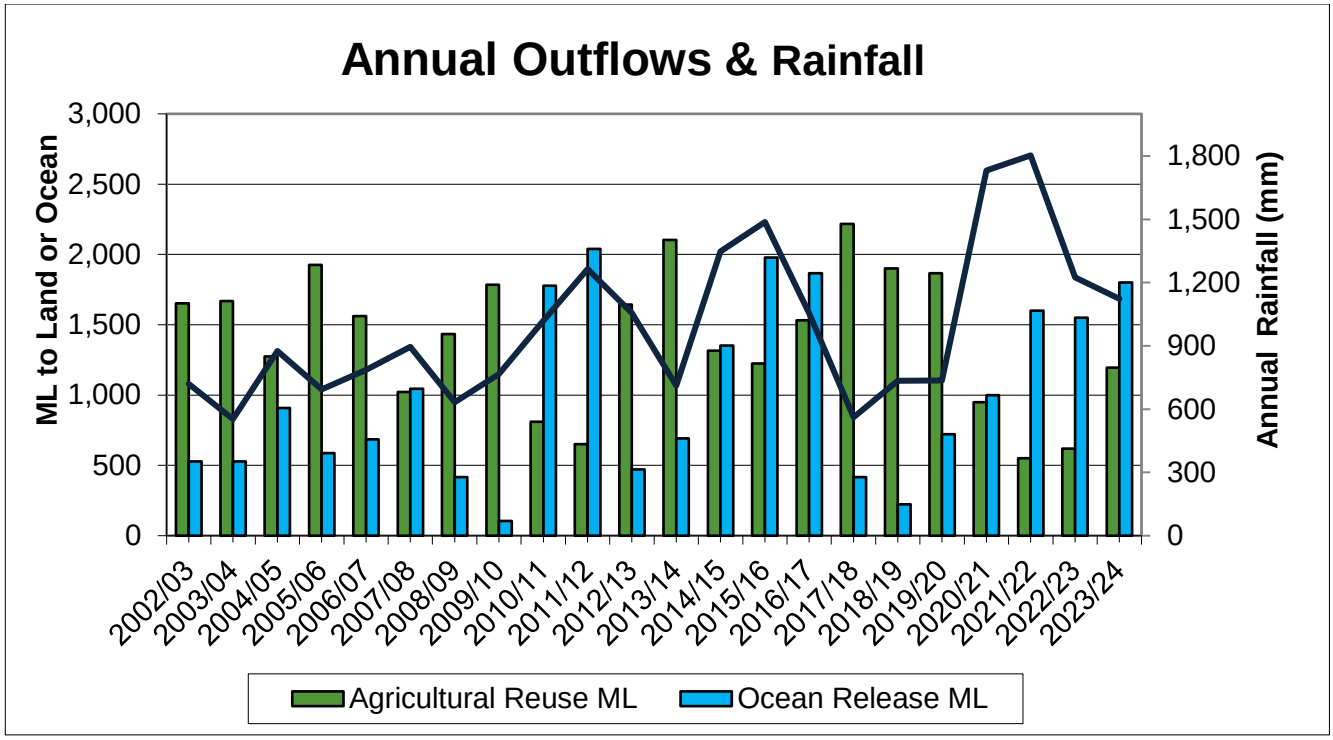


Figure 3-2 – Annual Summaries –REMS 1A – Rainfall from Callala WwTP

Table 3.1 below shows reclaimed water volumes produced and reused for all of Council's wastewaters schemes. Of Council's wastewater treatment plants that produce reclaimed water, a total of 2,444 ML was beneficially reused in 2023/24 (or 31% of the total output from these treatment plants).

Table 3-1 – Shoalhaven Reclaimed Water Production, Re-use, and Surplus Releases 2023/24

Scheme	Total Output (ML)	Total Reclaimed (ML) [a]	Percent of Reclaimed (%)	Surplus Released to Environment (ML)
Shoalhaven Heads	335	89	27%	246
Kangaroo Valley [1]	41	41	100%	0
Bomaderry	754	122	16%	632
Nowra	3,100	633	20%	2,467
REMS [2]	3,017	1,195	40%	1,822
Sussex Inlet	549	364	66%	185
Scheme Totals	**7,796**	**2,444**	**31%**	**5,352**

Notes:
(a) WwTP site reuse not included in total.
(1) Surplus reclaimed water from the Kangaroo Valley WRF held in 50ML reclaimed storage or released to swale drain.
(2) Includes reclaimed water from St Georges Basin, Vincentia, Culburra Beach and Callala WwTPs and the Coonemia Bulk Storage.

3.2 Compliance with Water Recycling Guidelines

There are complementary State and Commonwealth government guidelines that provide a framework for the design and management of water re-use schemes.

These are:

- Environment Protection & Heritage Council (2006). *Australian Guidelines for Water Recycling: Managing Health & Environmental Risks (Phase 1).*
- NSW Department of Environment and Conservation (2004). *Use of Effluent by Irrigation.*
- NSW Department of Primary Industries: Office of Water (2015). *NSW Guidelines for Recycled Water Management Systems*

Key factors common to these guidelines are the need to select suitable sites and control measures for reclaimed water irrigation and to ensure reclaimed water has had adequate disinfection for the intended end use. Table 3.2 provides performance summary of each re-use scheme against the disinfection targets. As shown in the table, all schemes have met these targets and achieved a high level of treatment as evidenced by the removal of organic material and other solids.

The quality of reclaimed water supplied to the REMS irrigation properties during 2023/24 is given in Appendix E: Table A.3. For the REMS, the average value of reclaimed water conductivity was 744µS/cm in 2023/24, below the scheme target of 1,000 µS/cm.

Table 3-2 – Compliance of Shoalhaven Schemes with Disinfection Guidelines

Scheme	Type of Irrigation	Target Disinfection Level (1) (Thermotolerant Coliforms)	2023/24 Plant Performance (1) (Thermotolerant Coliforms)	2023/24 B.O.D. & Suspended Solids Performance (2)
Berry	Pasture + withholding	<1,000 CFU/100mL (3)	No Reclaimed use (4)	No Reclaimed use
Shoalhaven Heads	Turf Municipal: Restricted access	<10,000 CFU/100mL <100 CFU/100mL	51 CFU/100mL	BOD: 1.3 mg/ L (5) TSS: 2.2 mg/ L (6)
Kangaroo Valley	Pasture/ no withholding	<100 CFU/100mL	0.1 CFU/100mL	BOD: 0.2 mg/L TSS: 0.3 mg/L
REMS 1B Nowra / Bomaderry	Pasture + withholding Municipal Open access	<1,000 CFU/100mL <100 CFU/100mL	15 CFU/100mL	BOD: 1.0 mg/L TSS: 1.9 mg/L
REMS 1A	Pasture/ no withholding Municipal Open access	<100 CFU/100mL <10 CFU/100mL	11 CFU/100mL	BOD: 5.8mg/L TSS: 1.2 mg/L
St Georges Basin	Municipal Restricted access	<1,000 CFU/100mL	3566 (7) CFU/100mL	BOD: 1.0 mg/L TSS: 2.3 mg/L
Sussex Inlet	Open access areas	<10 CFU/100mL	4.9 CFU/100mL	BOD: 0.2 mg/L TSS: 2.7 mg/L
Milton/ Ulladulla (6)	Municipal: restricted access	<100 CFU/100mL	No Reclaimed use (4)	No Reclaimed use

Notes:

(1) Average values of full year.
(2) Average (mean) values of full year.
(3) CFU: Colony Forming Units.
(4) No reuse in 2023/24
(5) BOD: Biological Oxygen Demand.
(6) TSS: Total Suspended Solids.
(7) Samples taken at St Georges Basin treatment plant. Further treatment at Vincentia WwTP

3.3 Management of Biosolids

Shoalhaven City Council manages the biosolids reclaimed from wastewater in accordance with NSW Government environmental guidelines 'Use and Disposal of Biosolids Products'.

This process involves:

- Stabilisation in lagoons;
- Dewatering;
- Testing for contaminants by an accredited laboratory;
- Grading of biosolids in accordance with the NSW guidelines;
- Transportation and land application (or disposal if required).

In 2023/24 approximately 4,837 wet tonnes (738 dry tonnes) of biosolids were dewatered and tested at Council's WwTP (Table 3.3). All material was found to be suitable for land application (Grade C or better), with the majority of biosolids applied to a pine forest plantation.

Table 3-3 – Shoalhaven Biosolids Reclamation 2023/24

WwTP	Biosolids Reused (Wet Tonnes)	Biosolids Reused (Dry Tonnes)	Suitability for Land Application (Grade)	Where Applied
Berry	137	20	Suitable (Grade C)	Pine Forest Plantation
Shoalhaven	160	22	Suitable (Grade C)	Pine Forest Plantation
Bomaderry	517	73	Suitable (Grade C)	Pine Forest Plantation
Kangaroo Valley	15	2	Suitable (Grade C)	Pine Forest Plantation
Nowra	1278	250	Suitable (Grade C)	Pine Forest Plantation
Culburra	365	9	Suitable (Grade C)	Pine Forest Plantation
Callala	183	26	Suitable (Grade C)	Pine Forest Plantation
Vincentia	410	53	Suitable (Grade C)	Pine Forest Plantation
St Georges	684	110	Suitable (Grade C)	Pine Forest Plantation
Sussex Inlet	274	36	Suitable (Grade C)	Pine Forest Plantation
Bendalong	46	6	Suitable (Grade C)	Pine Forest Plantation
Conjola	61	11	Suitable (Grade C)	Pine Forest Plantation
Ulladulla	707	120	Suitable (Grade C)	Pine Forest Plantation
Scheme Totals	**4837**	**738**	**Tonnes Recycled**	

The EPA, who regulates Biosolids through the *Environmental Guidelines: Use and Disposal of Biosolids Products* have recently undertaken a review of these guidelines. With indications that there will be considerable change to the current guidelines in relation to PFAS and the ability to dispose of Wastewater Treatment Plant biosolids on dairy farmland.

Sampling of our biosolids was undertaken, detecting low levels of various PFAS chemicals. Council has subsequently undertaken risk assessments and decided to minimise the risk of contamination by disposing of Biosolids at a pine forest plantation at Oberon.

3.4 Compliance with the REMS Usage Targets

The REMS use/supply agreement sets a (moving) target that each property should irrigate a minimum of 75% of the groups' average, expressed on a mm/allocated hectare basis. For the years 2002-2024, ten (10) of fourteen (14) participating farms have met this 75% target. Additionally, two (2) of five (5) golf courses / sports grounds have met this 75% target, however they also utilise stormwater in their irrigation systems. This was hampered by high rainfall in November 2023, with consistent follow up rains during the summer, as shown in Figures 3-1 and 3-2.

3.5 Environmental Monitoring

3.5.1 REMS

As part of the Scheme approvals for the REMS, an Environmental Monitoring Program was developed to ensure beneficial outcomes. Key environmental issues included protection of groundwater and soils in the irrigation areas, monitoring for blue-green algae at the Coonemia and Kangaroo Valley bulk storage dams, and minimising any impacts from surplus releases to the ocean at Penguin Head.

3.5.1.1 Groundwater Monitoring

A network of nine (9) groundwater monitoring bores was established in early 2001 within the farm irrigation area. A baseline ground water height and quality sampling program was undertaken between March 2001 and December 2001. Since then, semi-annual monitoring has been undertaken to examine trends in local water tables. Table 3.4 shows the average depth before and after scheme implementation. The results indicate that average depth to water table has not changed significantly as a result of the scheme. The groundwater quality monitoring undertaken to date also does not show any significant adverse impact from implementation of the scheme.

Table 3-4 – Average Groundwater Depth - REMS Irrigation Area

	Before REMS	During REMS
Average Depth to Water (1)	1.93m	1.84m
Standard Deviation	0.23	0.37

Notes:
(1) Average depth across eight (8) boreholes.

3.5.1.2 Farm Soils

As part of the REMS Environmental Monitoring Program periodic soil samples are taken from irrigated and non-irrigated farming areas to gauge any adverse impacts from reclaimed water irrigation, such as a build-up of soil salinity. Figure 3-3 shows trends in soil conductivity (salinity) levels on three (3) irrigated farms. For the duration of the REMS soil salinity levels have remained well within the safe irrigation range of <2 dS/m.

Due to extreme wet weather events farm soil sampling wasn't completed in 2021 and 2022.

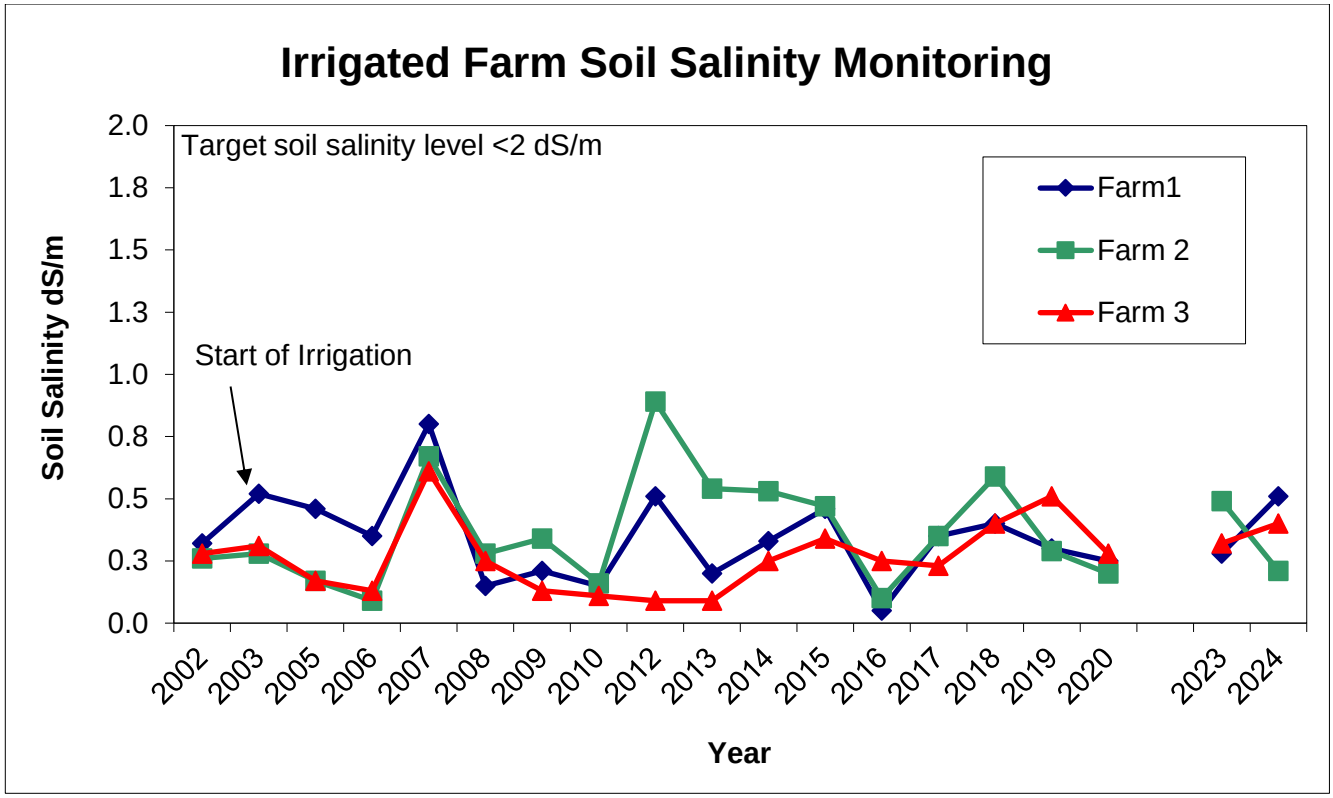


Figure 3-3 – REMS Farm Soil Test Results - Soil Salinity

3.5.1.3 Blue-green Algae

Blue-green algae is monitored by weekly visual inspections at the Coonemia and Kangaroo Valley bulk storage dams. Certain types of blue-green algae are toxin forming which makes monitoring important. Shoalhaven Water has a procedure in place for frequency of monitoring and trigger levels that determine algaecide treatment, and in worst case scenario bulk storage dam isolation.

If blue-green algae is observed during visual inspections, an extreme example is shown in Figure 3-4, laboratory testing is undertaken to confirm the type of blue-green algae present and the cell count per millilitre. If triggered, an algaecide (e.g. Coptrol) is sprayed by either spot spraying or via a boat spray determined by the spread. Frequent monitoring is undertaken to review cell counts.

Figure 3-4 – Example appearance of Blue-green Algae

A Thesis study was conducted at Coonemia Dam to review the management of Blue-Green Algae outbreaks. The study found our existing chemical dosing procedure to be the best management strategy and implemented some recommendations for monitoring pH as a supplementary monitoring tool. Works are underway to establish a permanent probe and connection to the existing SCADA system.

REMS Irrigators should frequently inspect their balance tanks for the presence of blue-green algae. If present, it should be dealt with as soon as possible to reduce the toxin forming potential which can harm living organisms including stock.

3.5.1.4 Nutrient Balance

An annual nutrient budget is calculated for the major nutrients applied through reclaimed water irrigation. The results to date suggest that far more nitrogen and phosphorus is removed through grazing than is applied via reclaimed water. The results of these nutrient budgets for 2023/24 are summarised in Table 3.5 below.

Table 3-5 – Farm Nutrient Budgets 2023/24 - Total Nitrogen & Total Phosphorus

Nutrient	Average Quantity Applied by Irrigation (kg/Ha/yr)	Quantity Removed by Grazing (kg/Ha/yr)	Net Nutrient Balance (kg/Ha/yr)
Nitrogen	23	126	-106
Phosphorous	10	32	-24

3.5.1.5 Environment Protection Licence

Testing of reclaimed water quality released to Penguin Head had three (3) exceedances of the REMS Environment Protection Licence requirements during 2023/24. One exceedance occurred for Total Nitrogen, one exceedance for Ammonia Nitrogen in January 2024 and one exceedance occurred for Faecal coliforms in May 2024.

3.5.1.6 Environmental Benefits

REMS 1A has removed the need for wastewater releases into Jervis Bay. In the twelve (12) months to June 2024 a total of 2,727 ML of reclaimed water was not released into Jervis Bay. This avoided the following nutrients and organic materials from being released to Jervis Bay up to approximately:

- 15,159 kg of nitrogen;
- 12,194 kg of phosphorous;
- 0 kg of oil and grease;
- 9,837 kg of biochemical oxygen demand (BOD); and
- 11,504 kg of total suspended solids.

These compounds were reclaimed by farmland, golf courses and sporting grounds instead of discharged to the ocean outfall at Penguin Head.

4 RE-USE DEVELOPMENT

Shoalhaven City Council is committed to increase the amount of beneficial re-use schemes over time. A range of factors need to be considered in examining the feasibility of new schemes including:

- Type of scheme and volume utilised;
- Proximity to existing reclaimed water facilities;
- Cost-effectiveness of scheme;
- Environmental impacts/benefits of specific schemes; and
- Ability to substitute/replace existing uses of potable water.

Council funding of new re-use schemes needs to be prioritised against other projects such as developing centralised sewerage systems for un-sewered towns and villages as well as increasing maintenance requirements for existing schemes. An ongoing issue is conservation of drinking water resources, thus recycling projects replacing potable water supply are likely to receive a high priority.

Council has developed a reclaimed water policy to guide the development and operation of reclaimed water management schemes (Appendix A).

4.1 REMS Stage 1B

Stage 1B of the REMS was completed in 2019 and supplies reclaimed water from the upgraded Nowra and Bomaderry WwTPs to the REMS distribution system, significantly increasing the daily reclaimed water supply available to the Scheme. The allocated REMS irrigation area has also increased to over 600 hectares.

4.2 Other Projects

Recycled water quality management plans are being updated for the REMS 1A and REMS 1B schemes.

Figure 4-1 – Photograph of Bomaderry Sewage Treatment Plant

Figure 4-2 – Photograph of Nowra Sewage Treatment Plant

5 APPENDICES

Appendix A: Shoalhaven City Council Reclaimed Water Policy

RECLAIMED WATER POLICY

Policy Number: POL22/134 • Adopted: 24/07/2007• Amended: 25/06/2009, 3/09/2013, 18/04/2017 • Reaffirmed: 28/11/2022 • Minute Number: MIN07.1087, MIN09.774, MIN13.858, MIN17.312, MIN22.911 • File: 12039E • Produced By: Shoalhaven Water Group • Review Date: 1/12/2026

PURPOSE

To provide a commitment to the safe and sustainable management of reclaimed water. This policy provides a basis for the development and operation of reclaimed water management schemes involving Shoalhaven City Council's wastewater treatment facilities.

STATEMENT

Reclaimed water is recognised as a valuable resource in the urban water cycle management. Up to 35% of the treated wastewater produced in the Shoalhaven is currently recycled onto land.

A range of State and Federal Government guidelines have been developed to assist water authorities in the development and management of reclaimed water schemes. The current guidelines (EPHC, 2006) place increased emphasis on health risk management similar to the Australian Drinking Water Guidelines (2011). The 2006 reclaimed water guidelines encourage water authorities to develop a robust management framework including clear statement of goals/values, scheme development processes and having appropriate operating and management practices in place. A well-defined policy, development and management framework will be essential in gaining NSW Government and community approval/support for new schemes.

PROVISIONS

Shoalhaven City Council will *responsibly and sustainably* manage reclaimed water by:

- Ensuring that protection of public health, environment and water resources are of prime importance and that reclaimed water is 'fit for purpose' (for the intended end-use).
- Working with our employees, the Shoalhaven community, health and environmental regulators and other stakeholders to ensure reclaimed water schemes are planned, constructed and operated consistent with industry best practices.
- Adopting a risk management approach to ensure that potential risks are made explicit, are understood, managed and accepted by customers and other stakeholders.
- Regular monitoring and reporting of control measures and reclaimed water quality.
- Assessing all proposed schemes and initiatives consistent with long term economic, social and environmental sustainability criteria. A cost-benefit framework has been adopted by Council as a guide for evaluating water recycling projects (Annexure 1).
- Aiming to recognise and capture the economic value of reclaimed water over the long term by applying appropriate cost recovery principles in line with Government policies.

- Agreeing to the level of service to be provided with users of a reclaimed water scheme as part of the process of formulating use/supply agreements.
- Continuing to substitute potable water supplies with reclaimed water where appropriate.

IMPLEMENTATION

Shoalhaven City Council will *support* this Policy by:

- Implementing appropriate operation and maintenance procedures for all reclaimed water schemes.
- Reporting on outcomes of its reclaimed water management schemes.
- Having regular contact and meetings with stakeholders and end-users.
- Preparing Reclaimed Water Quality Management Plans.
- Conducting regular NSW Health Liaison Meetings.

RELATED DOCUMENTATION

This is a policy document only and is supported by the following guidelines that pertain to the design and management of reclaimed water schemes:

- Australian Guidelines for Water Recycling: Managing Health & Environmental Risk (EPHC, 2006).
- Recycled Water Management Systems: Guidance document (DPI Water 2015).
- NSW Environmental Protection Licences 1734, 1735, 1736, 2419, 3936, and 4128.

REVIEW

The Reclaimed Water Policy and associated development guidelines will be reviewed on a periodic basis and particularly where new guidelines and/or management information dictates.

APPLICATION OF ESD PRINCIPLES

Ecological Sustainable Development (ESD) principles have been applied. This policy will permit the conservation of the City's water resource allowing more surface waters to remain in the environment, reduce pumping and transportation costs and greenhouse gas emissions.

Annexure: Framework for Evaluating Cost-Benefits of New Schemes (MIN21.210)

Council's Reclaimed Water Policy (POL22/134) states, for new water recycling projects, the need for *'Assessing all proposed schemes and initiatives consistent with long term economic, social and environmental sustainability criteria.*'

Regarding these aspects:

- Environmental sustainability includes assessment of impacts (and benefits) on surface waters, groundwater and soils. These assessments would normally be done via a Review of Environmental Factors appropriate to the size/scale of the activity.
- Social sustainability includes aspects such as improved recreation amenity (such as turf quality at sporting grounds & golf courses), conservation of potable water supplies and reductions in environmental discharge of treated effluent (widespread Shoalhaven community preference).
- Economic sustainability includes the construction and operating costs of water recycling schemes as well of the financial and employment benefits that result from increased production/utilisation of irrigated lands (whether public or private).

An evaluation framework has been developed by Shoalhaven Water to quantify and compare costs and benefits of water recycling projects (refer to attached Assessment Methodology).

The costs of developing water recycling projects can vary based on complexity, size and associated new infrastructure required. To provide a common basis for comparison, a cost-effectiveness analysis has been used. This allows comparison across a range of project circumstances. In this instance, costs are only those incurred by Council in providing infrastructure to facilitate the water recycling projects, such as pipelines and any additional treatment/sterilisation equipment required to comply with NSW/Australian Water Recycling Guidelines. Costs are expressed as annualised capital costs (total costs spread over 20 years) per megalitre of water recycled ($/ML). A range of existing projects were assessed using this methodology as shown in the table below. The annualised council capital costs (in 2021-22 dollars) ranged from $228 to $3,950 per ML (refer to attached Assessment Methodology).

Quantifying the benefits of a water recycling project is more problematic as many of the benefits (such as improved social amenity, enhanced environmental protection) do not have an easily defined 'market value'. A qualitative scoring system is therefore proposed to rank project benefits in terms of a range of outcomes including:

- Enhanced environment protection.
- Business sustainability.
- Amenity of public access spaces.
- Potable water conservation.

Each benefit category is rated from one (1) to three (3) with a maximum point score of twelve (12) across all four (4) categories. As shown in Table 1 and Attachment 1, the benefit scores from various water recycling projects ranged from four (4) to twelve (12).

Table 1. Current Water Recycling Project Cost-Effectiveness and Benefit Scores (2021)

Water Recycling Project	Council Capital Cost / ML - Annualised**	Qualitative Benefits Score (Out of Possible 12)
REMS Stage 1A	$300	12
REMS Stage 1B	$2,380	12
Shoalhaven Heads Golf Club	$228	7
St Georges Basin Golf Club	$525	5
Sussex Inlet Golf Club	$1,270	6
Sussex Inlet - Thomson Street*	$950	6
White Sands Park*	$3,950	5
Huskisson Soccer Fields*	$1,088	6
Ulladulla Sports Ground*	$413	4
Vincentia Golf Club (est.)	$1,875	7

Notes:
* Council sites.
** Capital costs spread evenly over 20 years (2021/22 $s).

Financial Implications

Future water recycling projects can be assessed using the methodology outlined in this report. This will help determine which projects will provide value for money in terms of any Council expenditures.

As a guide, projects involving commercial businesses (such as farms or golf courses) should have a cost-effectiveness of $700/ML or lower and a benefit score of six (6) or greater.

For sporting grounds, with higher public usage and amenity values, the cost-effectiveness threshold should be $1,200/ML or less and a benefit score of five (5) or greater.

Projects above these $/ML benchmarks would need to have significant public interest benefits.

The use of private funds or grant monies towards future water recycling projects could reduce Council expenditures and improve overall cost-effectiveness of the project from a community standpoint.

Attachment 1 – Details of Framework for Estimating Cost-Effectiveness & Benefit Scores for Water Recycling Projects

1) Cost- Effectiveness Calculations – Current Shoalhaven Schemes

Project	2021/22 Equivalent Council Capital Cost	Average Volume Reused ML / year	Current Council Capital Cost / ML - Annualised***
REMS Stage 1A*	$9,000,000	1,500	$300
REMS Stage 1B	$139,000,000	2,920	$2,380
Shoalhaven Heads Golf Club	$228,000	50	$228
St Georges Basin Golf Club	$315,000	30	$525
Sussex Inlet Golf Club	$762,000	30	$1,270
Sussex Inlet - Thomson Street**	$114,000	6	$950
White Sands Park**	$79,000	1	$3,950
Huskisson Soccer Fields**	$87,000	4	$1,088
Ulladulla Sports Ground**	$33,000	4	$413
Vincentia Golf Club (est.)	$750,000	20	$1,875

Notes:

* REMS 1A - 50% NSW government subsidy deducted from 2021/22 capital cost.
** Council sites.
*** Capital costs spread evenly over 20 years.

2) Qualitative Benefit Scores of Current Shoalhaven Reclaimed Water Projects (0 [-] to 3 [XXX] Points Per Category)

Project	Environment Protection	Business Sustainability	Amenity of Public Access Spaces	Potable Water Conservation	Score Out of Possible 12
REMS Stage 1A**	XXX	XXX	XXX	XXX	**12**
REMS Stage 1B**	XXX	XXX	XXX	XXX	**12**
Shoalhaven Heads Golf Club	XXX	XXX	X	-	**7**
St Georges Basin Golf Club	XXX	XX	X	-	**5**
Sussex Inlet Golf Club	XXX	XX	X	-	**6**
Sussex Inlet - Thomson Street	X	-	XXX	XX	**6**
White Sands Park	X	-	XXX	X	**5**
Huskisson Soccer Fields	X	-	XXX	XX	**6**
Ulladulla Sports Ground	X	-	XX	X	**4**
Vincentia Golf Club (est.)	X	XX	XX	XX	**7**

Notes:

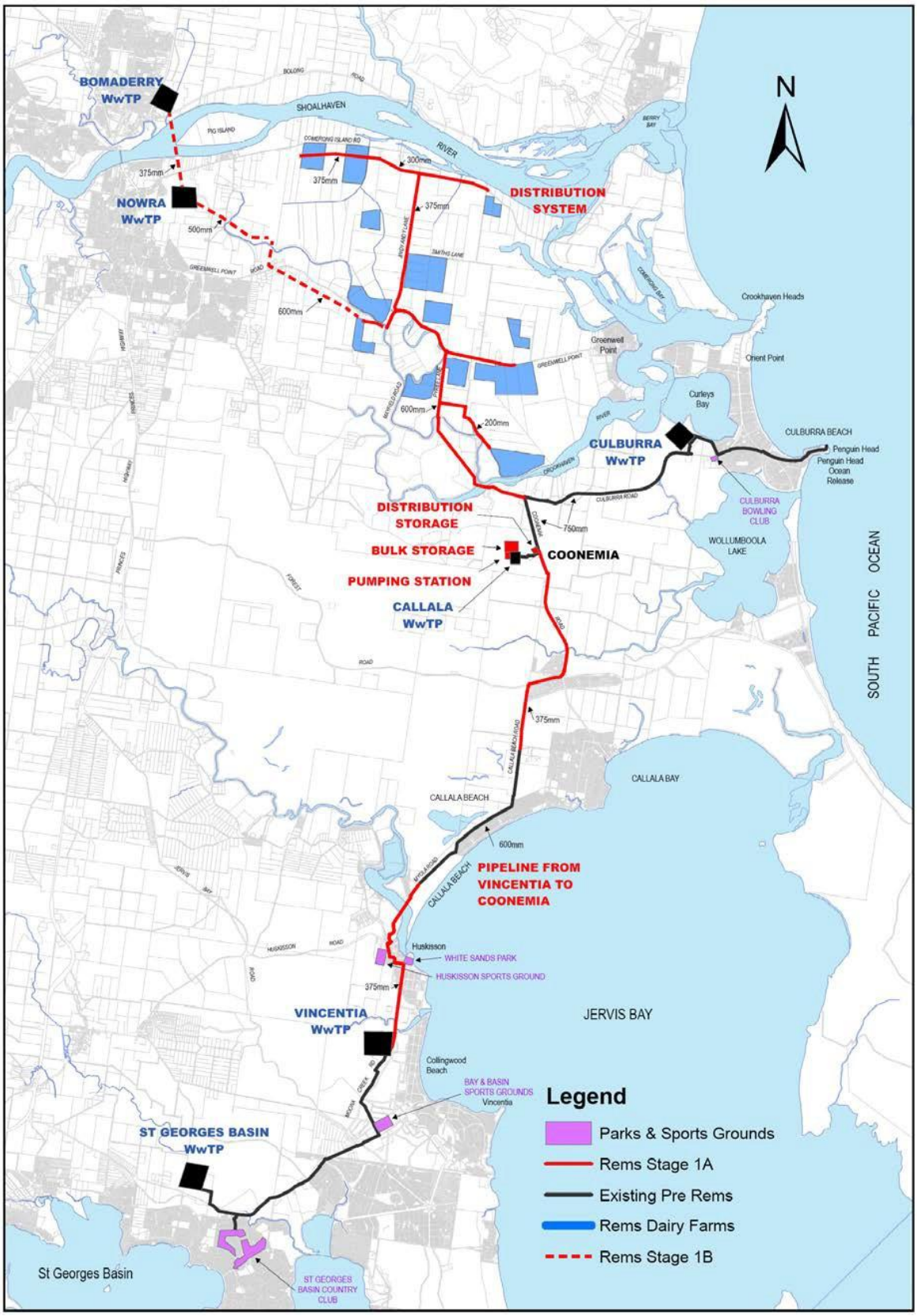
- Not Applicable

Benefits scoring criteria is shown below:

Benefits Scoring Criteria

Environment	Commercial	Public Amenity	Water Conservation
XXX - significant (>20%) reduction in environmental discharge.	**XXX** - significant drought proofing of business (high reliance on reclaimed water).	**XXX** - significant public use of area.	**XXX** - significant potable savings >20ML/yr.
XX - moderate reduction >10% & <20%.	**XX** - moderate drought benefit (partly reliant on other water sources).	**XX** - some public usage.	**XX** - modest potable savings >5ML/year & <20ML/year.
X - small reduction (<10%).	**X** - modest benefit.	**X** - minimum public use.	**X** - minor savings >1ML/year.

Appendix B: Northern Shoalhaven REMS Map



Appendix C: REMS Reclaimed Water Test Results June 2023 - May 2024

Table A.3 - REMS Reclaimed Water Test Results June 2023-May 2024

Overall Scheme Targets				
Analyte	**Range**	**Average**	**Target ***	**# of Samples**
B.O.D. (mg/L)	<2.0 – 31.0	5.8	<10	12
Total Suspended Solids (mg/L)	<1.0 – 5.0	1.2	<15	23
Total Nitrogen (mg/L)	3.0 - 24.1	7.9	<15	12
Total Phosphorus (mg/L)	0.1 – 5.2	3.3	<10	12
Oil & Grease (mg/L)	<1 – <1	<1	<2	12
pH	7.2 – 7.8	7.5	6.0 - 9.0	23
Faecal Coliforms (cfu/100mL)	<1 – 47	10.7	<200	23
** Source: REMS EIS (1997)*				
Analyte	**Range**	**Average**	**Target**	**# of Samples**
Chlorophyll 'a' (mg/m3)	<0.1 – 14	1.9	<20	12
Turbidity (ntu)	0.5 – 3.3	1.6	<2	12
Other Chemistry & Nutrients				
Analyte	**Range**	**Average**	**Target ****	**# of Samples**
Conductivity (uS/cm)	559 – 1040	762	<1000	12
Total Dissolved Solids (mg/L)	446 – 612	366	<700	23
Potassium (mg/L)	14 - 17	13.5	-	2
Calcium (mg/L)	25 - 27	26	-	2
Magnesium (mg/L)	9 - 12	10.5	-	2
Sulfates (mg/L)	64 - 71	66	-	2
Sodium (mg/L)	84 -115	99.5	<250	2

*** Source: NWQMS Irrigation Guidelines (2001)*

Table A.3 - REMS Reclaimed Water Test Results June 2023-May 2024 continued

Overall Scheme Targets				
Analyte	**Range (mg/L)**	**Average (mg/L)**	**Target * (mg/L)**	**# of Samples**
Aluminium	0.02 – 0.06	0.04	<5.0	2
Arsenic	<0.001	-	<0.1	2
Beryllium	<0.001	-	<0.1	2
Boron	<0.05 - 0.07	0.045	<0.5	2
Cadmium	<0.0001	-	<0.01	2
Chromium	<0.001	-	<0.1	2
Cobalt	<0.001	-	<0.05	2
Copper	0.008 – 0.013	0.0105	<0.2	2
Fluoride	0.5 – 0.7	0.6	<1.0	2
Iron	<0.05 – 0.15	0.08	<1.0	2
Lead	<0.001	-	<2.0	2
Lithium	0.003–0.006	0.005	<2.5	2
Manganese	0.009 - 0.011	0.010	<2.0	2
Molybdenum	<0.001	-	<0.002	2
Nickel	<0.001–0.001	0.0005	<0.2	2
Selenium	<0.01	-	<0.02	2
Silver	<0.001	-	<0.02	2
Zinc	0.013 – 0.212	0.1125	<2.0	2
**** Source: NWQMS Irrigation & Stock Drinking Water Guidelines (2001)*				
Toxicants				
Analyte	**Range (mg/L)**	**Average (mg/L)**	**Target (mg/L)**	**# of Samples**
Total Trihalomethanes (THM)	0.023 – 0.065	0.044	<0.1	2
Organo-chlorine Pesticides (OCP)	Not detected	-	-	2
Organo-phosphate Pesticides (OPP)	Not detected	-	-	2
Poly-aromatic Hydrocarbons (PAH)	Not detected	-	-	2
Poly-chlorinated Biphenyls (PCB)	Not detected	-	-	2

6 ATTACHMENTS

Attachment A: REMS Expression of Interest Form