



Water Quality Management (and Sewage Management) Plan

**For
Barangaroo South**

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SECTION 0 INTRODUCTION

0.1 Purpose

Lendlease Recycled Water (Barangaroo South) Pty LTD (LLRWBS) is the Water Industry Competition Act 2006 (WICA) licence holder and has appointed Veolia Energy Solutions (Veolia) as the operator of the Barangaroo South Recycled Water Plant (BSRWP).

This Water Quality Management Plan (WQMP) has been developed by Veolia and Lendlease Recycled Water (Barangaroo South) Pty Ltd (LLRWBS) for the Barangaroo South Recycled Water Plant (BSRWP) project in Sydney, which is being delivered under the Water Industry Competition Act 2006 (WICA).

This WQMP is to be read in conjunction with the Barangaroo South Recycled Water Plant's (BSRWP) Operations Management Plan (OMP) [PL-BAR-1-7389](#), which provides overview of the plant's integrated Business Management System (BMS).

This WQMP together with the OMP address the 12 elements of the framework for the management of recycled water quality and use, as detailed in the Australian Guidelines for Water Recycling.

Throughout both of the documents, specific references are provided to relevant procedures, work instructions and other documents that all together form the BSRWP Management System.

0.2 Expertise in producing and maintaining recycled water

Design & Construction

Lendlease has utilised the resources of WJP, to manage the design and construction of the Plant, with Lendlease managing the of the integration of the plant into the overall Barangaroo development as well as the design and construction of the network, trade waste disposal and sewer mining infrastructure

WJP has significant experience in designing and building water-recycling plants to meet customers' site requirements in several market sectors.

Operation

Lendlease has utilised the resources of Veolia, to manage the operation of the Plant.

Across Australia, Veolia has over 20 long-term operations contracts, involving more than 40 water and wastewater treatment plants, recycling over 600 mega litres a day, producing high quality treated water. Including its subsidiary United Water, Veolia has more than 865 employees providing water and wastewater services to up to 4 million people in Australia and New Zealand.

Veolia has extensive experience in creating alternative water resources that will be used for:

- Irrigation for agriculture
- Irrigation of recreational areas, including golf courses and sports fields
- Toilet flushing
- Car washing
- Increasing environmental and river flows
- Industrial reuse: make up water for boilers & cooling towers, process water, cleaning & manufacturing.

Independent Verifier

Lendlease have engaged an independent verifier, Permeate Partners, to ensure that the design and construction of the BBRWP is delivered according to the specifications that form part of the Project Agreement.

0.3 Definitions

| Abbreviation | Definition |
|---------------------------------|---|
| AGWR | Australian Guidelines for Water Recycling |
| BSWQER | Barangaroo South Water quality and Environmental Risk Assessment |
| Consequence | The outcome of an event expressed qualitatively or quantitatively, being a loss, injury, disadvantage or gain. There may be a range of possible outcomes associated with an event |
| Codes | Mandatory industry codes, and voluntary industry codes with which the organisation chooses to comply |
| Compliance | Ensuring that the requirements of laws, regulations, industry codes and organisational standards are met |
| HACCP | Hazard analysis and critical control point |
| Hazard | A source of potential harm or a situation with a potential to cause loss |
| IBMS | Integrated Business Management System |
| Likelihood | A qualitative description of probability or frequency |
| Organisational Standards | Any code of ethics, codes of conduct, good practices and charters that an organisation may deem to be appropriate standards for its day-to-day operations |
| PLC | Programmable logic controller |
| Project | The complete project |
| Risk | The chance of something happening that will have an impact upon objectives. It is measured in terms of consequence and likelihood |
| Risk Assessment | The overall process of risk analysis and risk evaluation |
| Risk Management | The culture, processes and structures that are directed towards the effective management of potential opportunities and adverse effects |
| RO | Reverse osmosis |
| NF | Nano filtration |
| SCADA | Supervisory Control and Data Acquisition system |
| Sydney Water | Sydney Water Corporation |

SECTION 1 ANALYSIS OF THE RECYLED WATER STREAM

1.1 Recycled Water Quality

Source of Water

The BSRWP is fed by two wastewater sources, as described in BSRWP Catchment Assessment Report E-R-201 5017 (2).

Firstly, from the wastewater generated at the Barangaroo South and Central site, and secondly from an adjacent Sydney Water sewer from which sewage is mined as demand requires. The expected Feed Water Quality Specification for the various stages of the plant is defined in Section 8 of the BSRWP Final Design Report (5017-E-R-101(5) - Final Design Report) and Section 5.4 of Schedule 1 of the RWP O&M Agreement (Lendlease Veolia RWP Operation Maintenance Agreement (NSW) 140714).

Those reports can be found in: V:\Energy\Sites\Barangaroo\K. Engineering\K04 - Design\RWP\13.1.R Design

Recycled Water Quality

The Plant treats the wastewater from the Barangaroo sites and Sydney Water sewer to produce high quality recycled water to meet the Recycled Water Specification before it is used on site and export to third-party customers as required

Refer to Recycled Water Specification [SPEC-BAR-20-8394](#) for the parameters that are measured and their targets. The specification also identifies which parameters are monitored on-line and which parameters are tested in the laboratory.

On-line parameters are measured on a continuous basis and monitoring points are listed in Section 10.2.13 of the BSRWP Final Design Report.

Laboratory analysis is also undertaken at various stages of the process. Parameters are measured by the internal and / or external laboratory on a weekly, or monthly based on the Laboratory Analysis Schedule contained in Section 5.3 of Schedule 1 of the RWP O&M agreement and the Barangaroo Laboratory Manual [MN-BAR-24-8968](#).

End Uses

The BSRWP produces water for reuse on site at Barangaroo South and Central as well as for export, as detailed in the BSWQER Assessment Report, Table 2-3. Intended recycled water use summary.

Routes of Exposure

Routes of exposure for the two types of recycled water (on site and export) are through ingestion of water and sprays, and physical contact with water.

Those routes of exposures along with the target pathogen log10 removal targets have been assessed, based on the AGWR recommendations, in the BSWQER Assessment Report, Section 2.1.4.

Receiving Environment

The receiving environments of the BSRWP include:

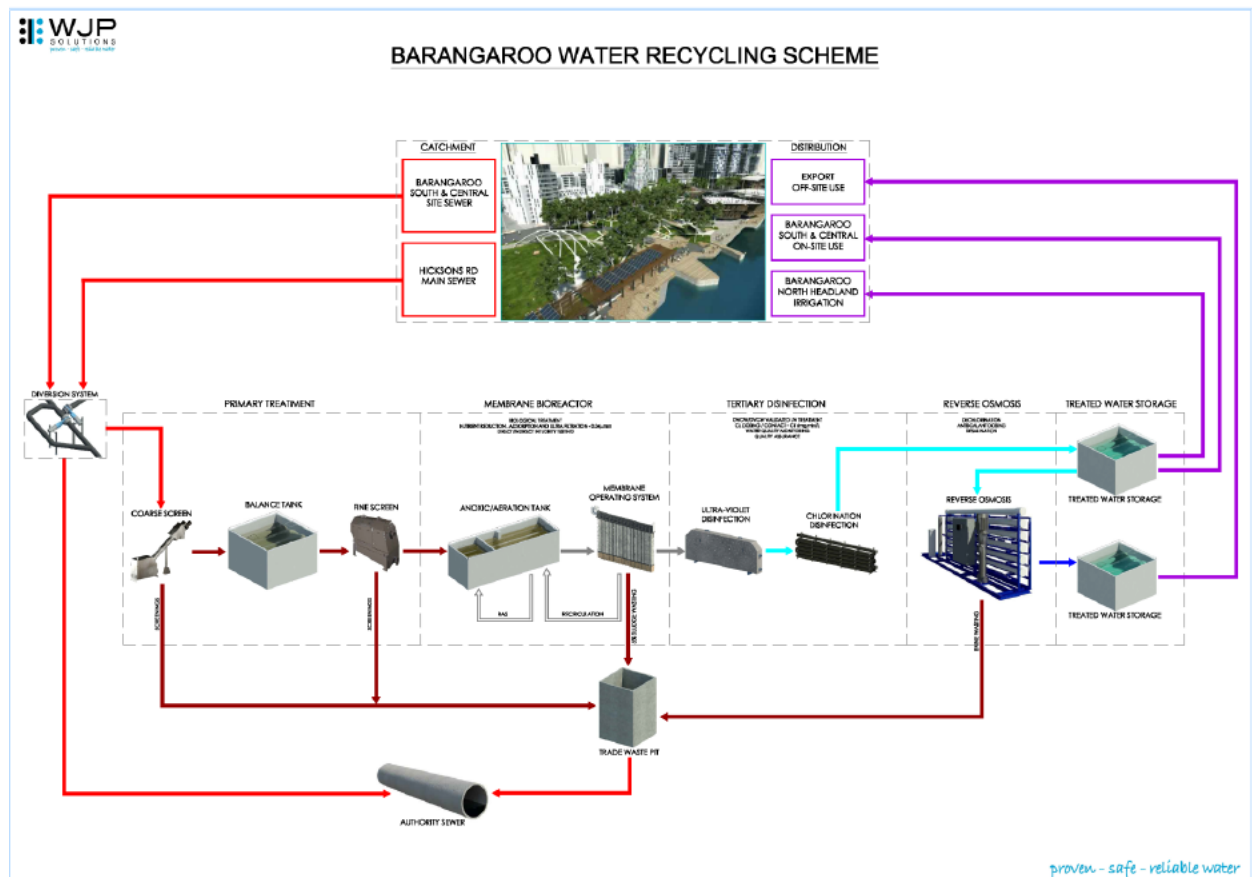
- Barangaroo South and Central on site use
- Export customers use (to be defined)
- The natural environment through irrigation or mains break
- The Sydney Water sewer system through Plant waste stream

1.2 Recycled Water System

Key Characteristics

The BSRWP has the following key components and is depicted in the general diagram below:

- Precinct Gravity Sewer Diversion System
- Plant (including screening, bioreactor, reverse osmosis, ultrafiltration, chlorination and other processes)
- Trade waste pumped to the Sydney Water sewerage system
- Network (consisting of pipes, reservoirs and pumping stations)
- Potable water (top-up) connection points
- End users



A detailed description of the BSRWP is provided in Section 2.2 of the BSWQER Assessment Report.

System Analysis - Screening Level Risk Assessment

(Section extracted from the BSWQER Assessment Report, section 2.4 Hazard Identification and risk assessment)

Prior work

An initial, high-level risk assessment was prepared in liaison with additional consultants from Permeate Partners and Worley Parsons. This information, combined with the experience of the other consultants and contractors working on this project was used to develop a working draft preliminary risk assessment for review and comment during two preliminary risk workshops.

It is possible, and indeed more usual, to assess risks from a blank page start point. There are pros and cons with using a blank or working draft document as the start point. Given the large number of very busy people involved in the assessment, and the prior experience of the parties preparing for the risk assessment, it was decided that, on balance, the preparation of a working draft assessment was the preferred approach. Therefore, the purpose of the workshops was to review and improve the preliminary risk assessment worksheet rather than to develop one from scratch. The risk assessment was found to be approximately 50% complete prior to the first workshop relative to its status following that workshop.

Risk Assessment methodology

A risk assessment workshop was held in September / November 2014. The first step of the risk assessment process was to identify hazards and their existing controls in accordance with procedure detailed in the BSWQER .

The principal purpose of the risk assessment was to identify the required controls and ensure that the proposed design of those controls was adequate. With respect to the methodology chosen for assessing risks, the purpose was to ensure verbatim and readily demonstrably, compliance to the ADWG and AGWR since such an approach is an implied obligation under WICA. Therefore, the risk rating criteria were consistent with those given in AS/NZS ISO 31000:2009. Risk management—Principles and guidelines and the ADWG and AGWR (as shown in tables Table 2-7 to Table 2-10 of the BSWQER Assessment Report. The approach was based on that used in Queensland for compliance with the relevant potable and recycled water regulations – considered the most stringent at the time due to their use in the Western Corridor potable reuse scheme.

Hazardous events were identified, the maximum risks associated with those events were assessed and those risks were then reassessed with relevant preventive measures being considered. Uncertainties were recorded to enable further review and analysis to take place in future.

The risk assessment scoring criteria were provided as an attachment for ease of use during the workshops.

Risk Assessment workshop participants

The participants invited to the workshops included regulators, interested parties, designers, operators and consultants.

Risk Assessment outcome

The workshop risk assessment outcome is set out in a worksheet format: the BSWQER Assessment.

Review of System Analysis

The recycled water system analysis will be reviewed annually in order to identify and incorporate any changes.

The analysis will also be reviewed following any major scheme expansion or change in end user requirements.

1.3 Recycled Water Quality Data

Source Water Characterisation

The source water for the BSRWP scheme comes from the catchments of Barangaroo South and Central and the adjacent Sydney Water sewer.

The design of the plant was based on source water characterisation under taken as part of the document 5017-E-R-201(2) - CATCHMENT ASSESSMENT REPORT. A copy of the report is located in V:\Energy\Sites\Barangaroo\K. Engineering\K04 - Design\RWP\13.1.R Design

Assessment of Data

The database generated using the historical data of the raw water sources will be supplemented by the implementation of an onsite data historian or similar system. This historian, or a similar system, will be linked to the plant SCADA system and will provide long-term storage of plant process data.

SECTION 2 PREVENTATIVE MEASURES FOR WATER QUALITY MANAGEMENT

2.1 Preventative Measures

Multiple Barrier Approach

In accordance with the AGWR, the BSRWP uses a multiple barrier approach to manage hazards in recycled water. Under this approach, a number of sequential processes are used, each of which provides a barrier to one or more hazardous parameters. The multiple barrier approach has a number of advantages:

- Reduced performance of one barrier does not result in a total loss of management
- It may be possible to temporarily increase the performance of the remaining barriers while remedial action is taken to restore function of the faulty barrier
- As a combination, multiple barriers produce less variability in performance than single barriers (AGWR).

There are several barriers in the BSRWP to ensure that recycled water that does not meet the Water Quality Specification is not supplied to customers. They are:

- Barangaroo Precinct residents discharges restrictions
- Process CCP's
- Plant Unit Processes - Unit process barriers within the Plant are such that contaminants are removed in order to meet the Water Quality Specification. Unit process barriers are summarised in Table 4.1 below.

Full details of the pathogen log reduction estimates of those barriers are provided in the Barangaroo Validation and Verification Plan [PL-BAR-31-8932](#).

- Water Quality at Plant Outlet - Recycled water that does not meet the Water Quality Specification at any point in the process is diverted, retreated or not delivered to the product water tank.

A SCADA system is used to monitor the water quality and alarms are triggered when quality parameters are drifting towards the limits. This provides the Plant operators with time to take corrective actions prior to the recycled water falling outside the Water Quality Specification.

Table 2-1 Summary of Unit Process Barriers

| | Ultrafiltration | Ultraviolet | Reverse osmosis | Chlorination |
|-----------|-----------------|-------------|-----------------|--------------|
| Bacteria | ☑ | ☑ | ☑ | ☑ |
| Viruses | ☑ | ☑ | ☑ | ☑ |
| Parasites | ☑ | ☑ | ☑ | |

Additional Preventative Measures

(Section extracted from the BSWQER Assessment Report, section 3.1 Preventive measures and multiple barriers)

Examples of preventive measures that this scheme includes are listed as follows.

Overarching preventive measures include the following:

- Operation and maintenance of the infrastructure by competent personnel in accordance with approved management plans.
- The reticulation system infrastructure is largely constructed in an accessible form, in the basement of the development, with concrete walls on all sides.
- Stakeholder education on the potable water, sewerage and recycled water systems, in particular on the safe use of recycled water.
- Providing high levels of redundancy to maximise reliability.

Recycled water quality preventive measures include the following:

- Using multiple barriers and critical control points in the production of recycled water.
- Production and distribution of recycled water in accordance with the relevant guidelines and industry best practice.
- Using proven technology for the production and distribution of recycled water.
- Regular system auditing to detect unacceptable end uses or cross connections.

Environmental preventive measures include the following:

- Aside from irrigation based on demand, no discharge of liquid or solids wastes to the environment is proposed.
- Reducing potable water consumption (site and off-site) of up to 310 ML/year.
- Recycling of up to 310 ML/year of sewage, which would have otherwise been discharged to ocean via Sydney Water's sewer system.
- Reduced fertiliser consumption on areas irrigated with recycled water.

Sewage management preventive measures include the following:

- Sourcing raw sewage for sewer mining from Sydney Water who complies with the relevant regulation/guidelines during its management.
- Collection and transport of sewage in accordance with the relevant plumbing codes, guidelines and industry best practice.
- The sewerage network will be owned, operated and managed by a Lendlease entity and its sub-contractors.
- Within Barangaroo, use of trade waste agreements and regular inspections of the sewerage system to minimise/eliminate the discharge of any potentially detrimental substances to the sewer system.
- Sydney Water uses trade waste agreements and regular inspections of the sewerage system to minimise/eliminate the discharge of any potentially detrimental substances to the mined sewer system.
- The sewerage system will be designed to minimise/eliminate any inflow or infiltration.
- Using proven technology for the collection and transport of sewage.
- All solid waste (i.e. screenings) will be discharged to sewer under a trade waste agreement with Sydney Water.
- All liquid waste (i.e. brine) will be discharged to sewer under a trade waste agreement with Sydney Water.
- All sources of odour will be treated via an odour scrubber prior to discharge to a high point on an adjacent building. The odour scrubber and discharge point will be designed to comply with impact assessment criteria of urban communities.

- It is important to note that the system will be designed to minimise the generation of odour wherever possible. This will largely be achieved by processing the raw sewage as quickly as possible to avoid anaerobic conditions.
- Providing a bypass to Sydney Water's sewer system where excess sewage can be discharged.
- Providing local buffer storage (i.e. \approx 4 hours) in each of the building sewer pump stations should there be a problem with transfer of sewage.
- Providing significant buffer storage (i.e. 12 to 16 hours) at the recycled water plant should there be a problem with the treatment of sewage.

Consumer preventive measures include the following:

- Supply agreements that detail responsibilities and obligations of all stakeholders.
- Stakeholder education through provision of information (website, brochures, newsletters, etc.) and signage (local at recycled water plant, labelling, etc.).
- All high noise equipment will be provided with acoustic covers and located in a separate room within the RWP facility.

Document Preventative Measures and Strategies

The definition of process limits for the process barriers is defined in document HACCP Register [REG-BAR-31-8392](#). This document details the alarm and alert limits for each barrier and the corrective actions to be taken if these limits are reached.

2.2 Critical Control Points

Identification of Critical Control Points

(Section extracted from the BSWQER Assessment Report, section 3.2 Critical Control Points)

During the workshop held in September / November 2014, after completion of the hazard assessment, each treatment step was assessed for its criticality in controlling a specific health or other hazard; critical limits were defined and draft response plans were developed to respond to possible limits breaches. A follow up workshop was conducted in March 2018 to assess the implementation of the Critical Control Points, and the effectiveness of the preventative actions as per section 4.1 – Validation of the process.

CCPs monitor and identify failures of the barriers that would result in the residual risk of a hazard increasing above the level identified in the risk assessment.

The critical control points (CCPs), identified using the AGWR Decision-Tree questions, for the treatment plant (BSWQER Assessment Report, Table 3-1. AGWR critical control point decision tree and principal barriers.) were as follows:

1. Diversion system (simply stops the flow to the recycled water plant in response to any significant trigger, e.g. a downstream plant failure or a reported contamination event upstream).
2. Activated sludge treatment (controls macro quality parameters such as nitrogen, phosphorus, colour and odour).
3. Membrane filtration (controls pathogens).
4. UV disinfection (controls pathogens).
5. Chlorine disinfection (controls pathogens).
6. Reverse osmosis (RO) (controls both salts and pathogens as well as colour) Note that less than 100% of the flow is required to pass through the RO and in many cases none of the flow need pass through RO. The RO is only a CCP when being

used to control salt or colour under circumstances that either needs to be controlled in order to make the water fit for purpose.

The first two might arguably not be classified as CCPs, but the way that the system is to be operated, these process steps pass the test for CCPs under the AGWR definition.

BSWQER Assessment Report, Table 3-2 summarises the design criteria for these CCPs from an AGWR perspective.

A full description of critical control points for the plant is given in document HACCP Register [REG-BAR-20-8392](#).

For more details refer to Process Operations Plan [PL-BAR-20-9844](#).

Establish Mechanisms for Operational Control

Following the identification of CCPs, alert and alarm levels were developed.

The purpose of an alert level is to advise the plant operator that a critical limit is being approached and that corrective action needs to be undertaken to ensure that the critical limit is not breached. Corrective procedures have been developed for alert levels for each CCP identified.

The purpose of an alarm level is to advise the plant operator that a critical limit has been reached and that corrective actions will immediately be undertaken. Corrective procedures have been developed for alarm levels for each CCP identified. These procedures will typically include automatic shutdown of plant equipment to minimise the impact of the CCP breach. Refer to I&E Manual [MN-BAR-9-4880](#) and CCP Alarm Alert Response procedures.

Summary screens on SCADA allow the plant operator to readily review the status and set points of CCP alert and alarm limits.

Details of the critical controls points along with their alert and alarm limits are given in HACCP Register [REG-BAR-20-8392](#).

2.3 Stakeholder Engagement and Evaluation Procedure

The Operations Manager has overall responsibility for the communications and engagement with stakeholders. The Operations Manager will use communication tools and strategies to enhance the relationship between the plant and all stakeholders and be a good neighbour to minimise the impact of the operation of the plant on the surrounding.

Stakeholders

- Primary Stakeholders:
Individuals or organisations directly affected by the operation and maintenance of the plant or have a vested interest. Activities to keep this stakeholder group informed will be important to developing and maintaining a positive relationship with this group.
- Secondary stakeholders:
Individuals or organisations with a general interest in the project overall, but who will not be directly affected by operations or do not have direct/related interest. Activities to keep this stakeholder group informed will depend on stakeholder requirements.

The information in this table below has been compiled from a desktop review of information obtained from a variety of sources including documents relating to the Environmental Assessment for the project. The table is reviewed on regular basis.

Table 2-2 Summary of Primary and Secondary Stakeholders

| Primary Stakeholders | |
|---|--|
| IPART | IPART is the independent economic regulator for NSW. IPART oversees regulation in the water industry. IPART oversees granting of a WICA licence. Need to be notified by Lendlease if significant changes are planned for the plant operation. |
| Lendlease | Lendlease holds the WICA licence, and the Trade Waste License and is the asset owner. Key personnel need to be notified of any pollution incidents. |
| NSW Health | Responsible for the protection of human health in NSW. Notification of any recycling water quality events that may not meet the desired specifications. |
| Sydney Water | Relevant personnel at Sydney Water Corporation including their communications, environment and other relevant teams. |
| Secondary Stakeholders | |
| JLL / International Towers Sydney (ITS) | JLL / ITS maintains equipment within the Recycled Water Plant and their operation can be impacted by Veolia operation and vice versa. |
| NSW Department of Natural Resources (DNR) | The NSW Department of Natural Resources (DNR) is responsible for the sustainable and equitable management of water, soil and native vegetation resources across the state. DNR are particularly interested in providing water for the environment. |
| Department of Energy Utilities and Sustainability (DEUS) | The Department of Energy, Utilities and Sustainability leads the NSW Government's sustainable energy and urban water agenda. Its aim is for the people of New South Wales to have reliable, affordable and sustainable energy and urban water. As this is a major urban water project of Sydney, DEUS linkage will be strong, but relatively informal. |
| NSW Department of Planning and Infrastructure | The Department of Planning and Infrastructure supports sustainable growth in NSW. Environmental Management Reporting |
| NSW Office of Environment and Heritage | The Office of Environment and Heritage (OEH) is a division of the NSW Department of Premier and Cabinet. OEH regulates industry, protects and conserves the NSW environment, manages national parks and reserves and protects the natural, cultural and built heritage in NSW. |

Approach to Engagement

- Stakeholders and/or community groups shall be engaged during operations in a variety of ways including corporate support or volunteer involvement by Veolia staff, site tours or other activities or opportunities as arise.
- Monitoring and evaluation of the effectiveness of stakeholder communication will occur throughout operations.
- Evaluation is considered essential to achieve best practice communication and consultation. The Operations Manager will evaluate performance in communication and consultation throughout operations. This information will be used to review and refine the communication plan as required and will be facilitated through an ongoing process of:

- Feedback from clients, presentations and site visits.
- Regular reviews of enquiries/complaints received;
- Review of procedures/commitment to minimising disruption to stakeholders.
- Meetings with above mentioned stakeholders and other interested parties

Areas that will be evaluated include:

- Stakeholder satisfaction levels with the project
- Relevance and suitability of communications activities
- Timeliness and effectiveness of addressing complaints and enquiries

Veolia will determine any issues that may arise from the procedures, and identify means for further improving the communication processes.

Reporting Tools

- Routine Reporting shall be done in accordance with the Internal and External Reporting procedure, see section 2.6.

Enquiries and Complaints Handling

- General community enquiries and complaints regarding the Barangaroo Recycled Water Plant may be managed by the client through their communication process or Veolia employees face to face.
- Refer to [PR-ANZ-1-413](#) Handling Complaints Policy for more information.

2.4 Internal and External Reporting

Internal and External Reporting takes place on a regular basis. It is the responsibility of the Operations Manager to ensure that all internal and external reporting requirements are met.

Monthly Reporting

- A monthly report shall be submitted by the Operator to the licence holder by the 10th day of the calendar month summarising the previous month's operations. The report will contain asset management and process data as lined out in the agreement between both parties.

Incident Reporting

- Unplanned plant shutdowns are categorised as incidents and will be classified and reported in accordance with Incident and Emergency Manual [MN-BAR-9-4880](#)
- Incident Notification shall be done in accordance with Incident Notification Process [REF-BAR-9-7392](#)

License Breach Reporting

- Any licence breaches in accordance with the Network Operator's Reporting Manual must be immediately communicated to the licence holder. The classification of a breach is based on the potential impact of a breach of the licence conditions on water quality, continuity of supply, public health, safety, other licensees and Government's policy objectives. Appendix E of the Network Operator's Reporting Manual lists which licence conditions, if breached, should be reported 'immediately' and which should be reported annually.

Annual Report

- An annual report is to be submitted by the licence holder to IPART in accordance with the Network Operator's Reporting Manual detailing compliance with the WICA

licence obligations, during the previous financial year ending 30 June. The report needs to be submitted to IPART by no later than 31 August each year.

Changes in insurance cover

Changes in insurance must be report to IPART as per the table below (see licence condition B3.3. in the Network Operator’s Reporting Manual)

Table 2-3 Summary of Primary and Secondary Stakeholders

| Change in insurance includes | | Period of notification | Information to provide to IPART where applicable |
|--|-----------------------|---|---|
| <ul style="list-style-type: none"> • Insurer • Underwriting panel | | 30 days after the change | <ul style="list-style-type: none"> • Insurer’s name and Australian financial services licence number • Underwriting panel’s name and Australian financial services licence number • New product disclosure statement • Reasons for change • Revised certificate of currency once finalised |
| <ul style="list-style-type: none"> • Type • Scope | Increase in coverage | 30 days after the change | |
| <ul style="list-style-type: none"> • Sum insured/ Limit on the amount/ Limit on indemnity | Reduction in coverage | 14 days prior to change initiated by the insurer 45 days prior to change initiated by the licensee | |

Changes to End Use

A written notice must be provided to IPART at least three months before a proposed change in end-use(s) if Barangaroo RWP proposes to supply water for an end-use which is not set out in the Water Quality provided to IPART.

If the proposed end-uses are consistent with the authorised purposes specified in the licence, the Water Quality Plan would need to be updated. If the changes in authorised purposes are not consistent, a licence variation will be required.

Significant Changes to relevant FRWP Plans

When a significant change to a Plan is made, a copy of the amended Plan must be provided to IPART at the same time that a copy is provided to an approved auditor engaged to prepare a report as to the adequacy of the amended Plan.

This requirement is applicable to the following Plans:

- Water Quality Management Plan (This document)
- Infrastructure Operating Plan [PL-BAR-21-8375](#)

NSW Health

A Recycled Water Quality issue that threatens or could threaten public health and safety is to be reported to NSW Health

Sydney Water Corporation

The trade wastewater discharged must be monitored and reported to Sydney Water in accordance with the consent to discharge industrial trade wastewater including:

- Notifications in relation to non-compliance

SECTION 3 VERIFICATION OF RECYCLED WATER QUALITY

3.1 Recycled Water Quality Monitoring

Characteristics to be monitored

The characteristics to be monitored throughout the BSWRP have been identified and defined by several documents and studies. These include:

- Operation and Maintenance Agreement
- Water Quality Risk Assessment
- HACCP analysis

Operational plan

Based on the requirements of the documents listed in Section 0 an overarching document has been developed [PL-BAR-20-9844 Process Operations Plan](#).

The Laboratory Manual [MN-BAR-24-8968](#) details the location and frequency of sampling to be undertaken on site. The Process Operations Plan also details how analysis results will be managed to ensure that it is representative and reliable.

IPART will be notified in the event of any significant changes being made to this sampling plan.

Documentation and training

A number of procedures and work instructions will be developed to support the implementation of the Process Operations Plan, and to ensure consistency in sampling and reporting.

All Operators will be trained in these procedures.

3.2 Recycled Water Users

Enquiry and Response for Customers

Lendlease will regularly update the BSRWP website to provide customers and other stakeholders with recycled water quality and other information.

Customer enquiries are handled in accordance with Stakeholder Engagement and Evaluation procedure as described in section 3.3.

Customer complaints are jointly managed by Veolia and Lendlease in accordance with the Schedule 1 - Services, clause 1 of the Agreement. This is done in accordance with the Handling Complaints procedure [PR-ANZ-1-413](#).

SECTION 4 VALIDATION, RESEARCH AND DEVELOPMENT

4.1 Validation Processes

Validation of the Barangaroo South Recycled Water Plant was undertaken in accordance with BSWQER Assessment Report as part of the risk assessment workshop (refer to section 2.2 of this document).

The objective of the validation was to ensure that hazards originally identified by the risk assessment workshop team (refer to section 2.2 of this document) were complete and correct and that they were being effectively controlled under the proposed HACCP approach.

The following HACCP principles were validated:

| | |
|---|---|
| Hazard Analysis | Validate that all major risks have been identified Validate that the risks have been correctly rated and ranked Validate the efficiency of the process barriers as control measures |
| Identification of Control Points | Validate that there are CCPs for all significant hazards Validate that the CCPs are at appropriate stages of the process |
| Critical limits | Validate that the critical limits control the hazards |
| Monitoring of Control Points | Validate that the monitoring system will ensure that the control measure at the CCP is efficient |
| Corrective Actions | Validate that the Corrective Action procedures will prevent non-conforming water from reaching the consumer. |

4.2 Change in Conditions and New Equipment

Processes are re-validated when changes to conditions, process equipment or operating protocol occur in accordance with procedure [PR-NSW-20-846](#) Change Management.

In the event of changes, a new process validation plan will need to be developed if it has any effect on the integrity and reliability of the process.

4.3 Design of Equipment

Validation of the Barangaroo South Recycled Water Plant was undertaken in accordance with Validation Plan [PL-BAR-20-8932](#).

Validation of Equipment and Infrastructure

This procedure outlines a 3-step approach to the validation of new equipment and infrastructure:

1. Desktop Validation

The BSRWP process was validated at the desktop level to quantify its ability to achieve the required water quality objectives.

2. Validation of the Process Efficiency from the Literature

Further sources of information available from literature and manufacturers were compiled in order to validate the efficiency of each treatment barrier and CCP at the BSRWP. This information will be submitted to the validation team during the validation workshop for review.

3. Design Review

The BSRWP design was also reviewed by an independent reviewer with experience in water treatment. The consulting company selected for the independent review was VIRDIS.

Validation of Process

The validation of the efficiency of the barriers for the BSRWP was undertaken using a three-part process:

1. Process Proving

The first step of the validation process was undertaken for individual Process Unit Proving, which was conducted during the commissioning phase of the BSRWP in September to November 2015.

2. Performance Trial

Following satisfactory completion of the Process Unit Proving Tests, a 4 week commissioning verification performance trial followed by a 7 weeks ongoing verification of the process was undertaken. For those tests, the plant was operated under normal operating conditions to produce the required recycled water quality. The verification performance tests were successfully completed between November 2016 to January 2017.

3. Validation Workshop

A successful validation workshop was held March 2018 following the successful completion of the performance trial. The purpose of the workshop was to review the HACCP process, and to validate the effectiveness of the HACCP system in place.

The members of the validation team were representatives from:

- Design and Construction Team
- Operations Team
- Control Systems Integration

The objectives of the workshop included:

- All major risks to human health and/or the environment posed by the recycled water have been identified, rated and ranked and that control measures have been put in place to control these.
- A system of critical control points has been put in place to control recycled water quality and ensure that it is of a quality that does not pose a hazard to human health and / or the environment.
- The critical limits selected are appropriate to the hazards and will ensure control of recycled water quality.
- The plant, operating normally, will not breach the critical limits, as demonstrated during the plant performance trial.
- Systems are in place to ensure that if the plant operating conditions approach the critical limits, automated corrective actions will take place to ensure that no water produced with any critical limit breached will reach the recycled water network.

4.4 Investigation studies and research monitoring

Following commissioning of the plant, process data from the SCADA will be recorded to the plant historian database or a similar system.

This data will be regularly analysed to identify any emerging trends, and to develop improved operating protocols to treat the wastewater.

Veolia will provide a process engineering resource to be a member of the plant team. This resource will provide process optimisation support and analysis of process data. The site process engineer is supported by the national engineering team and more broadly by the extensive technical knowledge of recycling available within Veolia in Australia and worldwide.

Veolia implements a variety of knowledge transfer techniques to ensure that the staff at each of its operations can benefit from pertinent knowledge from other sites and from research and development projects. In 2010, for example, a “lessons learned” workshop in water recycling was conducted at the Bundamba Advanced Water Treatment Plant in Brisbane, gathering technical staff from eight reuse and membrane plants to share lessons in water recycling.

Some technical experts from Veolia’s operations worldwide also frequently visit Australia and present technical information from other sites. Technical information sharing is also available through an on-line knowledge transfer network.

Veolia also has an extensive research and development program worldwide, with Australia being a key hub for research in recycling and membrane processes.

SECTION 5 OPERATOR, CONTRACTOR AND USER AWARENESS

5.1 Recycled Water Quality Awareness

Operator and Contractor Awareness

Base level process and operations training provides new operators with a minimum level of training required to understand and operate the Barangaroo plant.

All contractors are required to undertake a site-specific induction providing awareness and outlining the requirements for water quality. The contractors are engaged with the Barangaroo site in accordance of section 12 of the Operations Management Plan [PL-BAR-1-7389](#).

End User Awareness

During the process of finalising the recycled water supply agreements, customers were provided with the following information:

- Recycled water quality specification,
- Approved end uses list and
- RO Water Briefing paper (technical paper on RO recycled water), its uses and precautions needed in relation to materials being used.

5.2 User Consultation Strategy

Lendlease ensures that customers are actively involved in water quality issues through the initial water quality education process that forms part of the recycled water supply agreement negotiation process and through the regular quarterly reporting that forms part of the recycled water supply agreements.

Individual customers have limited ability to influence a change in the Quality Specification, however constructive suggestions are taken on board and all customers will be consulted before any proposed change to the Quality Specification by the BSRWP proponents. Customers confirmed agreement with the Quality Specification and the terms of supply through execution of their recycled water supply agreement.

Ongoing communication with customers is in accordance with Communication Protocol that forms part of the recycled water supply agreements and in accordance with Stakeholder Engagement and Evaluation procedure described in section 2.5.

5.3 Promotion of Benefits of Recycled Water Use

The BSRWP Scheme is an innovative project, which both Lendlease and Veolia are actively marketing in public forums and seminars and through brochures and company websites. Any opportunity to promote the BSRWP Scheme is welcomed by Lendlease and Veolia.

Listing of the benefits of recycled water use forms part of all promotional opportunities.

5.4 Unintended Use

All recycled water equipment in the BSRWP and on export sites is clearly and permanently labelled with safety signs that follow the current version of the [Safety Signs for the Occupational Environment](#) standard AS/NZS 1319.

Recycled water pipe work has colour coding that conforms to the guidelines for recycled water in the NSW Code of Practice for Plumbing and Drainage 2006. Signs advising of the use of recycled water on site and induction training help prevent unauthorised use. These measures ensure that

customer's employees, site visitors and other stakeholders are aware that the recycled water is 'not for drinking'.

5.5 Unauthorised Uses

The recycled water supply agreements clearly state authorised specific end uses for each customer. It is a condition of the agreements that customers take responsibility for ensuring that:

- They restrict recycled water use to these specific uses
- Take the backflow and cross connection precautions as defined by the Water Supply Code of Australia (WSA).
- Unintended and unauthorised end uses are most likely to be as a result of accidental cross connection of the reticulation network or the end users' recycled water systems with the potable water network. This risk is mitigated through measures such as
- Dial Before You Dig (DBYD) providing advice to workers working in the vicinity of the reticulation network
- Export site inductions and signs at the entrance to Export Sites informing visitors (including plumbers) that recycled water is in use
- A requirement in the recycled water supply agreements for installation of recycled water systems by customers to comply with the NSW Plumbing and Drainage code
- Lendlease uses licenced plumbers to make new connections to ensure that cross contamination does not occur in the reticulation network.