



Cobbitty Consulting
Engineering and Advisory Services

WICA Audit Report to IPART

Licence Plan Audit
(Recycled Water Treatment Plant)

Flow Systems Operations (Box Hill North scheme)

Independent Pricing and Regulatory Tribunal
Water Industry Competition Act 2006

Network Operator's Licence Audit Report

Licence No. 16_037: Flow Systems Operations Pty Ltd
(for the Box Hill North scheme)

Licence Holder: Flow Systems Operations Pty Ltd (ACN 603 106 305)

Document Version 2 (Draft Report for IPART Review), prepared 23 November 2018

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1. Executive Summary

This report presents the findings of an audit undertaken for the Independent Pricing and Regulatory Tribunal (IPART) under the *Water Industry Competition Act 2006*.

The subject matter of this audit was the infrastructure to be operated under Network Operator's Licence No. 16_037 for the supply of non-potable (recycled) water to the Box Hill North development. The Licensee is Flow Systems Operations Pty Ltd (ACN 603 106 305).

The scope of the audit was a 'Licence Plan Audit' of the management plans required under the Licence as they relate to the non-potable (recycled) water infrastructure. The audit was specifically focussed on the recycled water treatment plant and associated components of the scheme; the distribution/reticulation components of the recycled water scheme, and the drinking water and sewerage infrastructure, were the subject of previous audits.

The Licence Plans subjected to audit were as follows:

- *Infrastructure Operating Plan (IOP)*;
- *Water Quality Plan (non-potable water) (WQP (npw))*; and
- *Sewage Management Plan (SMP)*.

A 'New Infrastructure audit', which is reported separately, was also conducted in respect of the recycled water treatment plant and associated infrastructure.

The auditors were provided with sufficient and appropriate evidence, as described in *IPART Audit Guideline Water Industry Competition Act 2006 (September 2018)* (the Audit Guideline), on which to base the conclusions reached during the audit. The auditors have observed the requirements of the Audit Guideline and the audit deed in conducting the audit, determining audit findings and preparing the report.

The audit report findings accurately reflect the professional opinion of the auditors. The findings have not been unduly influenced by the Licensee or any of its associates and express the auditors' opinions as to whether the Licensee has met the licence conditions and regulatory requirements as specified in the scope. A summary of the audit findings is given in the following chapters and a detailed breakdown of the full audit findings against the audited criteria is given in the appendices.

The Licensee (Flow Systems Operations Pty Ltd) was found to have documented the arrangements in relation to the design, construction, operation and maintenance of the proposed recycled water scheme in full compliance with the assessed audit criteria.

In the opinion of the auditors, Flow Systems Operations Pty Ltd's management plans (*Infrastructure Operating Plan, Water Quality Plan (non-potable water) and Sewage Management Plan*, in conjunction with the *Box Hill Scheme Management Plan*) adequately document the arrangements in relation to the design, construction, operation and maintenance of the proposed recycled water treatment plant and associated infrastructure that is to be operated under Network Operator's Licence No: 16_037. The documented arrangements are adequately compliant with the relevant guidelines, standards and legislative requirements.

2. Introduction

2.1 Objective

This report presents the findings of an audit undertaken for the Independent Pricing and Regulatory Tribunal (IPART) under the *Water Industry Competition Act 2006*.

The subject matter of this audit was the infrastructure to be operated under Network Operator's Licence No. 16_037 for the supply of non-potable (recycled) water to the Box Hill North development. The Licensee is Flow Systems Operations Pty Ltd (ACN 603 106 305).

The scope of the audit was a Licence Plan Audit of the management plans required under the Licence as they relate to the non-potable (recycled) water infrastructure. The audit was specifically focussed on the recycled water treatment plant and associated components of the scheme; the distribution/reticulation components of the recycled water scheme and the sewerage infrastructure were the subject of previous audits.¹

A 'New Infrastructure Audit', which is reported separately,² was also conducted in respect of the recycled water treatment plant and associated infrastructure.

2.2 Licensee's infrastructure, systems and procedures

The infrastructure, systems and procedures audited were those related to the recycled water treatment plant and associated infrastructure that form part of the Box Hill North recycled water and sewerage schemes (the Schemes) (refer <https://boxhillwater.com.au>). More specifically, the infrastructure comprises:

- the treatment plant (including the sewage flow balance tanks);
- the recycled (treated) water storage tanks; and
- the recycled water distribution pumping station.

Flow Systems Operations Pty Ltd is the Licensee, holding Network Operator's Licence No. 16_037. As Licensee, Flow Systems Operations will own and be responsible for the operation and maintenance of the recycled water treatment plant and associated infrastructure in accordance with its Licence Plans, including:

- Scheme Management Plan – Box Hill, *Box Hill Management Plan (Scheme MP) (Revision 8)*, 14 November 2018;

which must be read in conjunction with:

- Infrastructure Operating Plan – Flow, *Infrastructure Operating Plan (IOP) (Revision 11)*, 10 September 2018;
- Recycled Water Quality Plan – Flow, *Recycled Water Quality Plan (RWQP) (Revision 11)*, 10 September 2018;
- Sewage Management Plan – Flow, *Sewage Management Plan (Sewage MP) (Revision 6)*, 31 July 2018; and
- other relevant supporting documentation.

Flow Systems Pty Ltd (Flow) (ACN 136 272 298) is named as 'Authorised Persons' under this Licence.

¹ Cobbitty Consulting/Water Futures, *WICA Audit Report to IPART; Licence Plan Audit (Sewerage and Recycled Water Reticulation); Flow Systems Operations (Flow Systems Operations Pty Ltd); (Version 2.0)*, October 2017.

² Water Futures/Cobbitty Consulting, *WICA Audit Report to IPART; New Infrastructure Audit (Recycled Water Treatment Plant); Flow Systems Operations (Box Hill North scheme); (Version 2 – Draft Report)*, 23 November 2018.

2.3 Audit method

Audit scope

This compliance audit covers design, construction, operation, repair and maintenance of the Scheme and addresses the scope of the Licence Plan Audit for the following plans:

- *Infrastructure Operating Plan (IOP)*;
- *Water Quality Plan (non-potable water) (WQP (npw))*; and
- *Sewage Management Plan (SMP)*.

Audit standard

The audit broadly followed the generic principles of auditing given in *ISO 19011:2011 - Guidelines for auditing management systems*. The principal document used to guide the audit was the *IPART Audit Guideline Water Industry Competition Act 2006 (September 2018)* (the Audit Guideline).

Audits are by necessity limited to sampling processes. It is not practicable, nor necessary, to inspect 100 percent of items within an audit scope. Auditing forms part of the broader risk management process, providing an independent check on the veracity of the processes and procedures in place to manage risk. Finding a balance between audit effort and practicality requires the exercise of experienced professional judgement. The amount of effort allocated to this audit has been kept to a reasonable minimum level.

The audit was reported in accordance with the WICA Audit Guideline and its associated Appendices. The audit templates given in the Guideline provided the reporting format for the audit as well as providing the detailed audit criteria.

Audit steps

An Audit Plan was submitted to both IPART and the Licensee prior to the audit being undertaken. The Licensee supplied documentation to both the auditor and IPART prior and subsequent to the audit.

The audit, which comprised of a site inspection and office based desktop audit, took place on Monday, 24 September 2018 and Friday and 16 November 2018. Further desktop auditing took place following the site audit, with additional evidence and/or clarifications being requested and subsequently provided.

The audit process involved seeking objective evidence that the Licensee met the audit criteria set by IPART. The auditors collected evidence through interview, document review, site inspections and review of photographs taken at the site. The auditors randomly sampled examples sufficient to verify claims made by the Licensee.

Quality was assured using a professional review process; each auditor's work was reviewed and approved by the other auditor.

Audit team

For efficiency, the various components of the audit were addressed in an integrated manner. This document sets out the detailed audit agenda and audit criteria that were applied. The two-member team that conducted the audits included:

- Audit initiation and contribution to reporting of the audit, particularly aspects relating to the *Water Quality Plan (non-potable water) (WQP (npw))*: Dr Dan Deere.
- The bulk of the detailed reporting of the audit, including in particular aspects relating to the *Infrastructure Operating Plan (IOP)*: Mr Jim Sly.

Acknowledgements

The audit team notes, and greatly appreciates:

- the work and effort put in by those audited, including all Flow staff, particularly Darren Wharton, Garth Hugo, Kirsten Evans, Ben, Mark Spilger and Robert Hill; and
- the presence of IPART representatives, Serge Detoffi, Christine Allen and Jessica Hanna, as observers and commentators during the audit.

Audit grades

Audit grades have been awarded as recommended in the WICA Audit Guideline.

2.4 Regulatory regime

When auditing, relevant aspects of the following standards and regulations were considered:

- *Water Industry Competition Act 2006* (WICA).
- *Water Industry Competition (General) Regulation 2008*.
- Network Operator's Licence No. 16_037 issued under the above framework (dated 12 May 2016).
- *IPART Audit Guideline Water Industry Competition Act 2006 (September 2018)* (the Audit Guideline) provided as part of the above framework.
- *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1), 2006*.
- Relevant NSW and National water industry and environmental codes of practice and regulations, as applicable.

2.5 Audit findings

Audit findings are summarised in section 1 (Executive Summary), in more detail in sections 3, 4 and 5, and in full detail in the following Appendices:

- Appendix A for the *Infrastructure Operating Plan* (IOP);
- Appendix B for the *Water Quality Plan (non-potable water)* (WQP (npw)); and
- Appendix C for the *Sewage Management Plan* (SMP).

It should be noted that Flow (parent company of Flow Systems Operations Pty Ltd) has adopted a business management documentation system comprising generic management plans which must be read in conjunction with a scheme specific *Scheme Management Plan*. Requirements that must, under the provisions of the *Water Industry Competition Act 2006* and/or the *Water Industry Competition (General) Regulation 2008*, be addressed by one of the management plans are now jointly addressed by the *Scheme Management Plan* and the respective management plan.

3. Infrastructure Operating Plan

3.1 Summary of findings

There were no identified non-compliances in respect of the audited clauses of the *Water Industry Competition (General) Regulation 2008* related to the *Infrastructure Operating Plan*. Detailed assessment in respect of these clauses is presented in **Appendix A**.

3.2 Review of actions

The Licence Holder has not made any suggestions for corrections or clarifications following the issue of a draft report prior to the report being issued to IPART.

3.3 Opportunities for improvement

No opportunities for improvement have been identified in respect of the *Infrastructure Operating Plan* as a result of this audit.

4. Water Quality Plan – Non-Potable Water

4.1 Summary of findings

There were no identified non-compliances in respect of the audited clauses of the *Water Industry Competition (General) Regulation 2008* related to the *Water Quality Plan (Non-potable Water)*. Detailed assessment in respect of these clauses is presented in **Appendix B**.

4.2 Review of actions

The Licence Holder has not made any suggestions for corrections or clarifications following the issue of a draft report prior to the report being issued to IPART.

4.3 Opportunities for improvement

No opportunities for improvement have been identified in respect of the *Water Quality Plan (non-potable water)* as a result of this audit.

5. Sewage Management Plan

5.1 Summary of findings

There were no identified non-compliances in respect of the audited clauses of the *Water Industry Competition (General) Regulation 2008* related to the *Sewage Management Plan*. Detailed assessment in respect of these clauses is presented in **Appendix C**.

5.2 Review of actions

The Licence Holder has not made any suggestions for corrections or clarifications following the issue of a draft report prior to the report being issued to IPART.

5.3 Opportunities for improvement

No opportunities for improvement have been identified in respect of the *Sewage Management Plan* as a result of this audit.

Appendix A Detailed Audit Findings – Infrastructure Operating Plan (IOP)

Table A.1 IOP Audit Table – WIC Reg Sched 1 cl.6(1)(a)

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.6(1)(a)	The IOP indicates the arrangements in relation to the design, construction, operation and maintenance of the infrastructure, including particulars as to the life-span of the infrastructure, the system redundancy built into the infrastructure and the arrangements for renewal of the infrastructure.	Compliant

Risk

This presents a high operational risk. Knowledge of the capacity and constraints associated with the infrastructure is essential to the effective management of the infrastructure assets in delivering agreed levels of service.

Target for Full Compliance

Full development of the Infrastructure Operating Plan, including development of an Asset Management Plan and demonstrated implementation of the infrastructure management practices documented therein.

Evidence sighted

- Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.
- Site inspections of infrastructure on 24 September and 16 November 2018.
- Flow Systems Operations, *Box Hill Scheme Management Plan (Scheme MP) (Revision 8)*, 14 November 2018.
- Flow, *Infrastructure Operating Plan (IOP) (Revision 11)*, 10 September 2018.
- Flow, *Asset Management Plan (AMP) (Revision 3)*, 22 January 2018.
- Flow, *Box Hill North Local Water Centre Drawings* (Drawing Nos: 9274-200-654-1 to 9274-200-654-7, Rev C, 21 December 2017; 9274-200-732-1 to 9274-200-732-3, Rev B, 29 November 2017; 150242-A104-C1 and 150242-A103-C1, 26 July 2017; and 150242-A010-C1, 22 August 2017).
- Flow, *Box Hill Water Concept Design Report – Process & Electrical: Local Water Centre (Revision 0)*, 16 November 2016.
- Flow, *Box Hill Water Validation Report: Local Water Centre (Version 2)*, 22 August 2017.
- Flow, *Box Hill Water Functional Description: Local Water Centre (Version 2)*, 20 May 2018.
- Flow, *Water Recycling Plant – Plant Block Flow Diagram (Revision 0)*, 16 November 2016.
- Flow Systems Operations, *Process and Instrumentation Diagrams* (Drawings 9274-3000 to 9274-3011; Revision A), 16 November 2016.
- RPS Australia East, *Box Hill Local Water Centre; Construction Environmental Management Plan (Version 3)*, 24 November 2016.
- Flow, *Box Hill Local Water Centre: Stage 1; Commissioning Plan (Version 0)*, 5 May 2018.
- Flow Systems Operations, *Verification Plan; Local Water Centre (Version 1)*, 23 October 2018.
- Flow, *Box Hill LWC Operation and Maintenance Manual (Version 1)*, August 2018.
- Flow, *Responsibilities and Authorities Matrix (Reference: FS-WAT-AUS-FM-GOV-1316)*, 11 July 2018.
- Email dated 24 July 2018 from Flow to Cobbitty Consulting (re: *Box Hill Recycled Water Treatment Plant - Licence Plan and New Infrastructure Audits*).

Summary of reasons for grade

The *Infrastructure Operating Plan*, in conjunction with the *Scheme Management Plan* and other supporting documentation, indicates (at a high level) the arrangements adopted in relation to the design, construction, operation, maintenance and renewal (life cycle management) of the infrastructure. Furthermore, review of the evidence provided (and reference to other Flow schemes as examples) indicates that these arrangements are capable of being effectively implemented.

Accordingly, Flow Systems Operations is considered to have demonstrated full compliance with this obligation.

Discussion and notes

Overview:

Sewerage and recycled water infrastructure that is to be owned and/or operated and maintained by Flow Systems Operations will comprise:

- a pressure sewer collection system, including on-lot infrastructure and the reticulation network;
- a sewage/recycled water treatment plant (Local Water Centre/LWC) and associated infrastructure; and
- a recycled water distribution/reticulation system.

The sewage collection and recycled water distribution/reticulation infrastructure, which has been operating under interim arrangements, have been assessed as part of a previous Licence Plan Audit.³ This audit is primarily focussed on the recycled water treatment plant and associated infrastructure; more specifically:

- the treatment plant (including the sewage flow balance tanks);
- the recycled (treated) water storage tanks; and
- the recycled water distribution pumping station.

Design:

The *Infrastructure Operating Plan*⁴ identifies the standards to which the infrastructure is to be designed and constructed. Listed standards relevant to the proposed recycled water infrastructure include:

- Water Services Association of Australia (WSAA), *Water Supply Code of Australia (WSA 03)*;
- *Plumbing Code of Australia* (Volume 3 of the *National Construction Code*);
- AS 3735 *Concrete structure for retaining liquids*; and
- Flow Systems' Design Standards.

The *Scheme Management Plan* details the proposed arrangements in respect of both the treatment plant (LWC) and associated facilities, including:

- an overview describing the arrangement of the facility, including details of its key components, architectural design and landscape design;⁵
- details of the treatment process, which will incorporate inlet screening, a membrane bioreactor, ultra-violet (UV) disinfection and chlorination processes;⁶ and
- the proposed staging of development of the facility.⁷

The design capacity of the recycled water infrastructure, including the treatment plant (Local Water Centre), are set out generically in the *Infrastructure Operating Plan*⁸ and more specifically in the *Scheme Management Plan*.⁹

³ Water Futures/Cobbitty Consulting, *WICA Audit Report to IPART; Licence Plan Audit (Sewerage and Recycled Water Reticulation); Flow Systems Operations (Flow Systems Operations Pty Ltd) (Version 2)*, October 2017.

⁴ *Infrastructure Operating Plan*, section 2.3.

⁵ *Scheme Management Plan*, section 3.3.1.

⁶ *Scheme Management Plan*, section 4.1.3.

⁷ *Scheme Management Plan*, section 4.2.

The overall arrangement of the proposed infrastructure is shown on a set of *Local Water Centre Schematic Drawings*¹⁰ More specific details are presented in the *Concept Design Report*,¹¹ *Validation Report* (which details the treatment process)¹² and *Functional Description*,¹³ together with the *Block Flow Diagram*¹⁴ and *Process and Instrumentation Diagrams (P&IDs)*.¹⁵

In summary, the *Infrastructure Operating Plan* (in conjunction with the *Scheme Management Plan* and other supporting documentation) appropriately describes the arrangements in relation to the design of the infrastructure. Based on observations made during the audit site inspections, there is evidence that the documented requirements have been effectively implemented.

Construction:

The *Scheme Management Plan* outlines the arrangements (albeit at a high level) for construction of the treatment plant and associated infrastructure.¹⁶ It also references the *Construction Environmental Management Plan*¹⁷ in relation to the management of environmental impacts during construction.

Although not specifically documented in either the *Infrastructure Operating Plan* or the *Scheme Management Plan*, treatment plant and associated infrastructure has clearly been designed by and constructed under the direct supervision of Flow Systems Operations, which has retained overall responsibility for the construction activities.

As evidence of the arrangements in place to ensure that the treatment plant and associated infrastructure will be constructed in accordance with the design and appropriate standards, Flow Systems Operations provided copies of:

- the *Commissioning Plan*,¹⁸ which sets out the arrangements (methodology) for pre-commissioning and commissioning of the various infrastructure and systems required for operation of the scheme; and
- a *Verification Plan*,¹⁹ which includes details of the verification process requirements for the scheme.

During the audit site inspections undertaken on 24 September 2018 and 16 November 2018, and from photographs subsequently provided by Flow Systems Operations, visible components of the completed works were observed to be compliant with relevant standards.

In summary, the *Infrastructure Operating Plan* (in conjunction with the *Scheme Management Plan* and other supporting documentation) appropriately describes the arrangements in relation to the construction of the infrastructure. Furthermore, there is evidence that the documented requirements in respect of the treatment plant and associated infrastructure have been effectively implemented.

Operation and Maintenance:

The *Infrastructure Operating Plan*²⁰ indicates that an Operation and Maintenance Manual will be developed for the scheme. At the time of reporting, the *Operation and Maintenance Manual*²¹ had been prepared as a draft document. It is noted that an Operation and Maintenance Manual is typically not finalised until completion of the commissioning and verification processes, which enables the inclusion of all relevant operating parameters.

⁸ *Infrastructure Operating Plan*, section 2.3.1.3.

⁹ *Scheme Management Plan*, section 4.3.

¹⁰ Flow, *Box Hill North Local Water Centre Drawings* (Drawing Nos: 9274-200-654-1 to 9274-200-654-7, Rev C, 21 December 2017; 9274-200-732-1 to 9274-200-732-3, Rev B, 29 November 2017; 150242-A104-C1 and 150242-A103-C1, 26 July 2017; and 150242-A010-C1, 22 August 2017).

¹¹ Flow, *Box Hill Water Concept Design Report – Process & Electrical: Local Water Centre (Revision 0)*, 16 November 2016.

¹² Flow, *Box Hill Water Validation Report: Local Water Centre (Version 2)*, 22 August 2017.

¹³ Flow, *Box Hill Water Functional Description: Local Water Centre (Version 2)*, 20 May 2018.

¹⁴ Flow, *Water Recycling Plant – Plant Block Flow Diagram (Revision 0)*, 16 November 2016.

¹⁵ Flow Systems Operations, *Process and Instrumentation Diagrams* (Drawings 9274-3000 to 9274-3011; Revision A), 16 November 2016.

¹⁶ *Scheme Management Plan*, section 3.3.2.

¹⁷ RPS Australia East, *Box Hill Local Water Centre; Construction Environmental Management Plan (Version 3)*, 24 November 2016.

¹⁸ Flow, *Box Hill Local Water Centre: Stage 1; Commissioning Plan (Version 0)*, 5 May 2018.

¹⁹ Flow Systems Operations, *Verification Plan; Local Water Centre (Version 1)*, 23 October 2018.

²⁰ *Infrastructure Operating Plan*, section 2.5.

²¹ Flow, *Box Hill LWC Operation and Maintenance Manual (Version 1)*, August 2018.

Review of the *Operation and Maintenance Manual* reveals that it addresses all relevant aspects, including: Introduction/Purposes of Document; Contact Details; General Description of Installation; SCADA Screens and Controls; Operating Procedures; Maintenance Schedule; Troubleshooting; Emergency Responses; Equipment Schedules; Manufacturer's Literature – Equipment; Manufacturer's Literature – Instruments; Manufacturer's Literature – Valves; Manufacturer's Literature – MEMCOR; and As-Built Documentation. Furthermore, information presented in the *Operation and Maintenance Manual* reflects and should be read in conjunction with the *Functional Description*,²² which also provides a description of the system components and the detailed arrangements for system control.

The *Responsibilities and Authorities Matrix*, which is referenced in the *Scheme Management Plan*,²³ the *Infrastructure Operating Plan*²⁴ and other Business Management System documentation, indicates that operation and maintenance activities required to meet the requirements of the Licence are principally the responsibility of Flow's (Flow Systems Operations Pty Ltd's parent company) Executive Manager Operations.²⁵ The *Responsibilities and Authorities Matrix* identifies a range of relevant "Operational" activities and activities related to the "Recycled Water Quality Management System" for which the Executive Manager Operations is responsible. These include (for example) but are not limited to:

- Develop and implement operational procedures, process control and verification of recycled water quality;
- Operate and maintain the Local Water Centre;
- Implement the maintenance management system; and
- Manage incidents and emergencies.

The Executive Manager Operations is supported in this role by the Manager Network Operations, Scheme Operations Manager, Scheme Operator, other Flow Systems staff and external service providers.

In summary, the *Infrastructure Operating Plan* (in conjunction with the *Scheme Management Plan* and other supporting documentation) describes (at a high level) the arrangements in relation to the operation and maintenance of the infrastructure. Detailed arrangements are set out in the *Operation and Maintenance Manual* and the *Functional Description*.

Lifecycle Asset Management:

The *Infrastructure Operating Plan*²⁶ provides an overview of Flow's/Flow Systems Operations Pty Ltd's approach to the management of its assets. It also references the *Asset Management Plan* in which more detailed information about the adopted asset management processes is presented.

The *Infrastructure Operating Plan*:

- At an overview level, describes the key steps to be implemented in managing the asset portfolio; these steps are considered to be consistent with contemporary asset management practice.
- Indicates that an asset register will be maintained for each scheme; such a register is to include a list of assets, physical details, relative location, capacities and sources.
- Indicates that Flow will undertake an operational analysis of the present and future needs of the assets, the outputs from which will include the identification of capital investment requirements in respect of asset renewal, replacement and development.
- Indicates that Flow will conduct regular scheduled inspections of critical assets and record the results and any required corrective action in its enterprise Asset Management System (refer observations below).

The *Asset Management Plan* sets out a tactical plan for the management of the asset portfolio as a whole. It addresses key issues including:

- Strategic approach to Asset Management;

²² Flow, *Box Hill Water Functional Description: Local Water Centre (Version 2)*, 20 May 2018.

²³ *Scheme Management Plan*, section 2.4.

²⁴ *Infrastructure Operating Plan*, section 1.5.

²⁵ Flow, *Responsibilities and Authorities Matrix (Reference: FS-WAT-AUS-FM-GOV-1316)*, 11 July 2018.

²⁶ *Infrastructure Operating Plan*, section 7.

-
- Asset Management Organisation, including roles and responsibilities;
 - A reference to the Flow Business Management System, and the elements thereof (including policies and procedures);
 - Maintenance Planning and Execution;
 - Asset Condition and Risk Assessment;
 - Asset Creation, Renewal and Disposal;
 - Reporting and Planning; and
 - Capital Investment.

It is noted that several opportunities for improvement in respect of the asset management system have been identified during other recent audits of Flow schemes.^{27,28} Those opportunities for improvement are not repeated in this report; Flow has advised²⁹ that they have been included on an issues/action list to be addressed.

In summary, the *Infrastructure Operating Plan* and *Asset Management Plan* together appropriately describe the arrangements in relation to the life cycle management of the infrastructure assets.

Summary:

The *Infrastructure Operating Plan*, in conjunction with the *Scheme Management Plan* and other supporting documentation, indicates (at a high level) the arrangements adopted in relation to the design, construction, operation, maintenance and renewal (life cycle management) of the infrastructure. Furthermore, review of the evidence provided (and reference to other Flow schemes as examples) indicates that these arrangements being effectively implemented.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

²⁷ Cobbitty Consulting/Water Futures, *Flow Systems Operations (Shepherds Bay); Licence Plan Audit (Version 2.0)*, 24 October 2017, section 3.3 and table A.1.

²⁸ Cobbitty Consulting/Water Futures, *Discovery Point Water; Operational Audit (Version 2.1)*, 13 July 2017, section 4.3 and table B.1 (for example).

²⁹ Email dated 24 July 2018 from Flow to Cobbitty Consulting (re: *Box Hill Recycled Water Treatment Plant - Licence Plan and New Infrastructure Audits*).

Table A.2 IOP Audit Table – WIC Reg Sched 1 cl.6(1)(b)

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.6(1)(b)	The IOP indicates the arrangements in relation to the continued safe and reliable performance of the infrastructure.	Compliant
Risk	Target for Full Compliance	
This presents a high operational risk. The risk is generally managed by the implementation of an asset management system/framework that is outlines the basis for the ongoing management of the infrastructure assets.	Preparation of an Asset Management Plan and supporting procedural documentation and demonstrated implementation of appropriate infrastructure management practices.	
Evidence sighted		
<ul style="list-style-type: none">▪ Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.▪ Site inspections of infrastructure on 24 September and 16 November 2018.▪ Flow Systems Operations, <i>Box Hill Scheme Management Plan (Scheme MP) (Revision 8)</i>, 14 November 2018.▪ Flow, <i>Infrastructure Operating Plan (IOP) (Revision 11)</i>, 10 September 2018.▪ Flow, <i>Asset Management Plan (AMP) (Revision 3)</i>, 22 January 2018.▪ Flow, <i>Recycled Water Quality Plan (RWQP) (Revision 11)</i>, 15 December 2017.▪ Flow, <i>Monitoring and Sampling Plan (MSP) (Revision 8)</i>, 8 June 2018.▪ Flow, <i>Sewage Management Plan (Sewage MP) (Revision 6)</i>, 31 July 2018.▪ Flow, <i>Box Hill LWC Operation and Maintenance Manual (Version 1)</i>, August 2018.▪ <i>Agreement for supply of services</i> (between Flow Systems Operations and Permeate Partners Pty Ltd), 1 October 2018.▪ Flow, <i>Box Hill Water Functional Description: Local Water Centre (Version 2)</i>, 20 May 2018.▪ Flow, <i>Responsibilities and Authorities Matrix (Reference: FS-WAT-AUS-FM-GOV-1316)</i>, 11 July 2018.▪ Network Operator’s Licence No: 16_037 issued to Flow System Operations, 12 May 2016.▪ Flow, <i>Box Hill Scheme Risk Register</i>, 16 July 2018.		
Summary of reasons for grade		
<p>The <i>Infrastructure Operating Plan</i>, in conjunction with the <i>Scheme Management Plan</i> and other supporting documentation, indicates (at a high level) the arrangements in relation to the continued safe and reliable performance of the infrastructure. Detailed arrangements are set out in the <i>Operation and Maintenance Manual</i> and <i>Functional Description</i>.</p> <p>Accordingly, Flow Systems Operations is deemed to have demonstrated compliance with this obligation.</p>		
Discussion and notes		
<p>The continued safe and reliable performance of the infrastructure is dependent upon the implementation of effective operational, maintenance, condition monitoring and refurbishment/replacement practices. These practices are described at a tactical level in the <i>Asset Management Plan</i>; more detailed operation and maintenance procedures are typically documented in an Operation and Maintenance (O&M) Manual developed specifically for each scheme.³⁰</p>		

³⁰ *Infrastructure Operating Plan*, section 2.5.

As noted in Table A.1, the *Operation and Maintenance Manual*³¹ has been prepared as a draft document and, consistent with typical practice, will be finalised following completion of the commissioning and verification processes. As also noted, review of the *Manual* confirms that it addresses all relevant aspects.

Information presented in the *Operation and Maintenance Manual* reflects and should be read in conjunction with the *Functional Description*,³² which also provides a description of the system components and the arrangements for system control (i.e. key information in respect of operation of the schemes).

In addition to the *Operation and Maintenance Manual*, operational procedures (including ongoing monitoring) aimed at ensuring the quality of the water supplied are documented in the *Recycled Water Quality Plan*³³ and *Monitoring and Sampling Plan*.³⁴ Monitoring of sewage characteristics, which is referenced in the *Sewage Management Plan*³⁵ and *Monitoring and Sampling Plan*,³⁶ is also focussed on ensuring recycled water quality (understanding source water quality) as well as environment protection.

Arrangements in respect of condition monitoring and planning for refurbishment/replacement of infrastructure are addressed in the *Asset Management Plan*.³⁷ Once fully populated and implemented, the Asset (Maintenance) Management System will provide an effective support tool for use in managing the ongoing maintenance and life-cycle management of the infrastructure.

As also discussed in Table A.1, responsibility for operation and maintenance is identified in the *Responsibilities and Authorities Matrix*, which is referenced in the *Scheme Management Plan*,³⁸ the *Infrastructure Operating Plan*³⁹ and other Business Management System documentation. The *Responsibilities and Authorities Matrix* indicates that operation and maintenance activities required to meet the requirements of the Licence are principally the responsibility of Flow's (Flow Systems Operations Pty Ltd's parent company) Executive Manager Operations.⁴⁰

Effective performance of infrastructure is in part dependent upon the resources engaged for operation and maintenance. Review of curricula vitae for Flow's operational staff (Executive Manager Operations, Manager Network Operations, Scheme Operations Manager and Scheme Operator) indicates that they are appropriately qualified and experienced for the purposes of operating the infrastructure. This assessment has been further validated by discussions with the Executive Manager Operations and Manager Network Operations during various previous audits of Flow schemes.

Flow (and its subsidiaries) has arrangements in place with Permeate Partners, which will continue to provide a primary operational support in respect of the Flow Systems Operations schemes. Previous review of curricula vitae for Permeate Partners personnel confirms that they are appropriately qualified and experienced to provide the necessary support.

The continued safe and reliable performance of the infrastructure is also dependent upon having a clear understanding of the associated risks. The *Infrastructure Operating Plan*⁴¹ identifies "Asset condition and risk assessment" as part of the overall approach to asset management. The *Box Hill Scheme Risk Register*⁴² identifies hazards associated with the various components of the system, including the treatment plant, and outlines appropriate control strategies.

On the basis of the evidence provided, it is apparent that *Infrastructure Operating Plan*, in conjunction with the *Scheme Management Plan* and other supporting documentation, indicates (at a high level) the arrangements in relation to the continued safe and reliable performance of the infrastructure.

Recommendations

³¹ Flow, *Box Hill LWC Operation and Maintenance Manual (Version 1)*, August 2018.

³² Flow, *Box Hill Water Functional Description: Local Water Centre (Version 2)*, 20 May 2018.

³³ *Recycled Water Quality Plan*, section 6.

³⁴ *Monitoring and Sampling Plan*, section 6.

³⁵ *Sewage Management Plan*, section 7.

³⁶ *Monitoring and Sampling Plan*, section 5.

³⁷ *Asset Management Plan*, sections 6 and 7.

³⁸ *Scheme Management Plan*, section 2.3.

³⁹ *Infrastructure Operating Plan*, section 1.5.

⁴⁰ Flow, *Responsibilities and Authorities Matrix (Reference: FS-WAT-AUS-FM-GOV-1316)*, 11 July 2018.

⁴¹ *Infrastructure Operating Plan*, section 7.1 (table 2).

⁴² Flow, *Box Hill Scheme Risk Register*, 16 July 2018.

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this requirement.

Table A.3 IOP Audit Table – WIC Reg Sched 1 cl.6(1)(c)

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.6(1)(c)	The IOP indicates the arrangements in relation to the continuity of the water supply and sewerage services.	Compliant
Risk	Target for Full Compliance	
This presents a high operational risk. The risk is generally managed by operating in accordance with agreed protocols for both planned and unplanned service interruptions.	Development and implementation of appropriate protocols for both unplanned and planned service interruptions.	
Evidence sighted		
<ul style="list-style-type: none">▪ Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.▪ Site inspections of infrastructure on 24 September and 16 November 2018.▪ Flow Systems Operations, <i>Box Hill Scheme Management Plan (Scheme MP) (Revision 8)</i>, 14 November 2018.▪ Flow, <i>Infrastructure Operating Plan (IOP) (Revision 11)</i>, 10 September 2018.▪ Flow Systems, <i>Customer Contract</i>, 30 October 2015, available at: http://flowsystems.com.au/governance/CustomerContract.pdf.		
Summary of reasons for grade		
Flow Systems Operations has arrangements in place for ensuring (as far as practical) the continuity of both recycled water supply and sewerage services; these arrangements are documented in the <i>Infrastructure Operating Plan</i> and <i>Scheme Management Plan</i> .		
Furthermore, it has developed protocols (commitments), documented in its <i>Customer Contract</i> , in respect of unplanned and planned service interruptions. These protocols are consistent with industry standards.		
Accordingly, it is assessed that Flow Systems Operations is compliant with this obligation.		
Discussion and notes		
Overview:		
The continuity of the recycled water supply and sewerage services may be subject to either planned or unplanned interruptions. This is consistent with the servicing provisions provided to both similar 'land and housing' developments and the broader community.		
Arrangements in relation to the continuity of each of the services that may be impacted by the treatment plant and associated infrastructure that are the subject of this audit are discussed in the following.		
Recycled Water:		
Scenarios that may impact the continuity of recycled water services and arrangements for addressing any discontinuity are identified in the "Continuity of Services" provisions of the <i>Infrastructure Operating Plan</i> ⁴³ and the "System Redundancy" provisions of the <i>Scheme Management Plan</i> . ⁴⁴		
Continuity of recycled water supply is to be achieved through:		
<ul style="list-style-type: none">▪ "The developer's development of bulk water supply connections in line with the Box Hill Water Servicing Strategy and a commercial agreement between Flow and Sydney Water that will include drinking water availability as top up for recycled water, if required.		

⁴³ *Infrastructure Operating Plan*, section 6.2.

⁴⁴ *Scheme Management Plan*, section 5.4.

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- *Significant redundancy is provided by the recycled water storage tanks, which will provide up to 72 hours supply at peak demand.*
 - *Recycled water distribution pumps being installed in a duty/standby arrangement.*
 - *Operational scenarios modelling that identifies storage needs within the development to ensure continuity of supply.”*

Measures to be implemented in the event of a failure include:⁴⁵

- *“Minimisation of demand through customer notifications.*
- *Rapid response to infrastructure failure.”*

Sewerage Services:

Scenarios that may impact the continuity of sewerage services and arrangements for addressing any discontinuity are identified in the “Continuity of Services” provisions of the *Infrastructure Operating Plan*⁴⁶ and the “System Redundancy” provisions of the *Scheme Management Plan*.⁴⁷

- *“Up to 48 hours storage at each lot in the pressure sewer pumping system.*
- *Flexibility in the operation of the pressure sewer network with monitoring and control via the telemetry system.*
- *Remote monitoring of failure alarms in the pressure sewer pumping system at each lot.*
- *Buffer storage in the flow balance tank at each LWC.*
- *Critical equipment at each LWC being installed in duty/standby configuration to ensure adequate redundancy.*
- *Back-up generator onsite at each LWC.*
- *Control panel design that enables simple connection to a mobile generator.*
- *Remote monitoring of failure alarms on critical infrastructure at each LWC.”*

The *Infrastructure Operating Plan*⁴⁸ further indicates that:

- Reticulation networks (including the pressure sewer system) are also designed with isolation valves strategically placed to enable isolation of discreet sections of the network in the event of failure, thereby minimising the number of customers affected. This is consistent with good industry practice.
- Sewage can be extracted directly from property storage tanks using tanker trucks during an extended period of maintenance or from the flow balance tank if the recycled water treatment plant is not operating.
- A mobile generator can be used to operate sewage pumps at customer properties in the event of an extended power outage.

Huntlee Water will monitor pressure and flow within the sewerage reticulation network for both system performance and the early identification of any failures.⁴⁹

Measures to be implemented in the event of a failure include:⁵⁰

- *“Minimisation of sewage production through customer notifications.*
- *Rapid response to infrastructure failure*
- *Trucking of sewage off-site via an approved waste management contractor.”*

Whilst some of the arrangements outlined above are more applicable to the sewage collection system than the treatment plant and associated infrastructure that is the subject of this audit, it is clearly demonstrated

⁴⁵ *Scheme Management Plan*, section 5.4.

⁴⁶ *Infrastructure Operating Plan*, section 6.3.

⁴⁷ *Scheme Management Plan*, section 4.4.

⁴⁸ *Infrastructure Operating Plan*, section 6.2.2.

⁴⁹ *Scheme Management Plan*, section 11.1.

⁵⁰ *Scheme Management Plan*, section 4.4.

that there are system wide arrangements to ensure (as far as possible) the continuity of sewerage services.

Customer Contract Obligations:

The *Customer Contract* sets out Flow Systems Operations Pty Ltd's commitment to its customers in the event of either unplanned or planned interruptions.⁵¹

The *Customer Contract* also sets out Flow Systems Operations Pty Ltd's commitment to its customers in the event of water restrictions resulting from drought or a major operational difficulty.⁵²

Summary:

In summary, Flow Systems Operations has arrangements in place for ensuring (as far as practicable) the continuity of the recycled water supply and sewerage services. Furthermore, it has developed protocols in respect of unplanned and planned service interruptions; these are generally consistent with industry standards.

Recommendations

There are no recommendations in respect of this requirement.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this requirement.

⁵¹ *Customer Contract*, sections 3.3.1 and 3.3.2.

⁵² *Customer Contract*, sections 3.3.3 and 3.3.4.

Table A.4 IOP Audit Table – WIC Reg Sched 1 cl.6(1)(d)

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.6(1)(d)	The IOP indicates the arrangements in relation to alternative water supplies and sewerage services when the infrastructure is inoperable.	Compliant
Risk	Target for Full Compliance	
This presents a high operational risk. The risk is generally managed by operating in accordance with agreed protocols for both planned and unplanned service interruptions.	Development and implementation of appropriate protocols for both unplanned and planned service interruptions.	
Evidence sighted		
<ul style="list-style-type: none">Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.Site inspections of infrastructure on 24 September and 16 November 2018.Flow Systems Operations, <i>Box Hill Scheme Management Plan (Scheme MP) (Revision 8)</i>, 14 November 2018.Flow, <i>Infrastructure Operating Plan (IOP) (Revision 11)</i>, 10 September 2018.Flow Systems, <i>Incident Management Plan (Revision 7)</i>, 10 January 2018.Flow Systems, <i>Customer Contract</i>, 30 October 2015, available at: http://flowsystems.com.au/governance/CustomerContract.pdf.		
Summary of reasons for grade		
Flow Systems Operations has documented its arrangements for the provision of alternative recycled water supplies (through the use of potable water top-up) and/or the sewerage services (through the eduction of sewage) when the infrastructure is inoperable in the <i>Infrastructure Operating Plan</i> and <i>Incident Management Plan</i> .		
Furthermore, circumstances in which Flow Systems Operations may be unable to maintain the provision of services are documented in its <i>Customer Contract</i> . These circumstances are consistent with industry standards.		
Accordingly, it is assessed that Flow Systems Operations is compliant with this requirement.		
Discussion and notes		
The <i>Infrastructure Operating Plan</i> ^{53,54} refers to the <i>Incident Management Plan</i> and “ <i>Specific Incident Response Procedures ...</i> ” as guidance for responding to an interruption to the supply of recycled water.		
Whilst the <i>Incident Management Plan</i> does not include specific response procedure for a recycled water supply or sewerage service interruption, it does provide a framework for responding to any incident. Furthermore, it identifies requirements in respect of customer notification, as well as indicating that: ⁵⁵		
“ <i>For a significant outage the Executive Manager Operations is responsible for arranging alternative supply.</i> ”		
Flow Systems Operations Pty Ltd’s <i>Customer Contract</i> identifies circumstances in which Flow Systems Operations may be unable to maintain the supply of recycled water. These circumstances include: ⁵⁶		

⁵³ *Infrastructure Operating Plan*, section 6.2.4.

⁵⁴ *Infrastructure Operating Plan*, section 6.3.4.

⁵⁵ *Incident Management Plan*, section 5.4.

⁵⁶ *Customer Contract*, section 3.1.2.

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- planned or unplanned interruptions;
 - major operational difficulties;
 - circumstances in which it (Flow Systems Operations) is entitled to restrict supply; and
 - events beyond the reasonable control of Flow Systems Operations Pty Ltd.

Similarly, the *Customer Contract* identifies circumstances in which Flow Systems Operations may be unable to maintain the provision of sewerage (wastewater) services. These circumstances include:⁵⁷

- circumstances in which it (Flow Systems Operations) is entitled to restrict supply;
- planned or unplanned interruptions; and
- events beyond the reasonable control of Flow Systems Operations.

As discussed in Table A.3, arrangements are in place for the use of drinking water as both the initial source of supply for the recycled water scheme and as top up (an alternative supply) for recycled water once the treatment plant is operational.

As also discussed in Table A.3, sewage can be extracted using tanker trucks:

- directly from property storage (more specifically if the reticulation system is inoperable, but also if the treatment plant is inoperable); or
- from the flow balance tank at the recycled water treatment plant if the plant (once brought into service) is not operating.

In summary, Flow Systems Operations has identified the arrangements in relation to alternative recycled water supplies when the infrastructure is inoperable.

Recommendations

There are no recommendations in respect of this requirement.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this requirement.

⁵⁷ *Customer Contract*, section 3.2.1.

Table A.5 IOP Audit Table – WIC Reg Sched 1 cl.6(1)(e)

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.6(1)(e)	The IOP indicates the arrangements in relation to the maintenance, monitoring and reporting of standards of service.	Compliant
Risk	Target for Full Compliance	
This presents a medium operational risk in that the Licensee may be unaware that standards of service are not being met in the absence of performance monitoring.	Implementation of appropriate systems to monitor the service delivery performance of the infrastructure.	

Evidence sighted

- Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.
- Site inspections of infrastructure on 24 September and 16 November 2018.
- Flow Systems Operations, *Box Hill Scheme Management Plan (Scheme MP) (Revision 8)*, 14 November 2018.
- Flow, *Infrastructure Operating Plan (IOP) (Revision 11)*, 10 September 2018.
- Flow, *Recycled Water Quality Plan (RWQP) (Revision 11)*, 15 December 2017.
- Flow, *Sewage Management Plan (Sewage MP) (Revision 6)*, 31 July 2018.
- Flow, *Monitoring and Sampling Plan (MSP) (Revision 8)*, 8 June 2018.
- Flow, *Records Management Policy (Revision 1)*, 17 July 2015.
- Flow Systems, *Customer Contract*, 30 October 2015, available at: <http://flowsystems.com.au/governance/CustomerContract.pdf>.

Summary of reasons for grade

The *Infrastructure Operating Plan* indicates the arrangements in relation to the maintenance, monitoring and reporting of standards of service, which are documented in the *Customer Contract*. Reference is made to additional detail documented in the *Recycled Water Quality Plan*, *Sewage Management Plan* and *Monitoring and Sampling Plan*.

Maintenance of standards of service is also reliant on customer complaints to identify any failure to meet the specified standards; this is consistent with practices adopted by other water utilities.

Accordingly, Flow Systems Operations is assessed as being compliant with this requirement.

Discussion and notes

Overview:

The *Infrastructure Operating Plan*⁵⁸ provides an overview of the arrangements for monitoring and reporting; the monitoring and reporting systems provide information on a number of characteristics including, but not limited to, internal and regulatory performance indicators. Information is to be recorded and reported in accordance with relevant policies and procedures, including the *Flow Systems Records Management Policy*.⁵⁹

⁵⁸ *Infrastructure Operating Plan*, section 8.1.

⁵⁹ Flow, *Records Management Policy (Revision 1)*, 17 July 2015.

Recycled Water:

The *Recycled Water Quality Plan* provides further detail in respect of both monitoring⁶⁰ (including reference to the *Monitoring and Sampling Plan*) and reporting of results.⁶¹ It also identifies various reports to be prepared, their purpose, frequency, responsibility for preparation and distribution.

The *Monitoring and Sampling Plan*⁶² outlines requirements in respect of desktop validation, operational monitoring and verification monitoring of recycled water quality. Verification monitoring requirements include both monitoring frequency and guideline values for verification parameters.

Under the provisions of the *Customer Contract*, Flow Systems Operations is obligated to supply recycled water compliant with:⁶³

“... the Australian Guidelines for Water Recycling 2006 (Phase 1 Managing Health & Environmental Risks) National Water Quality Management Strategy or as approved by the relevant Federal and/or State health authorities.”

It is also required to:⁶⁴

“... use our best endeavours to ensure that the recycled water we supply to your Property is at the minimum pressure of 10 metres head.”

Accordingly, it is appropriate that the arrangements for the monitoring and reporting of standards of service include both recycled water quality and pressure, as identified in the *Recycled Water Quality Plan*⁶⁵ and *Scheme Management Plan*⁶⁶ respectively.

Sewerage Services:

The *Sewage Management Plan*⁶⁷ provides an overview of the requirements in respect of sampling and monitoring of sewage. It also refers to more specific detail in the *Monitoring and Sampling Plan*,⁶⁸ which identifies requirements in respect of operational monitoring of the sewerage collection system.

Under the provisions of the *Customer Contract*, Flow Systems Operations will:⁶⁹

“... make every reasonable effort to minimise the incidence of wastewater overflows on your Property due to a failure of our wastewater system, and which is within our control”.

Accordingly, it is appropriate that the arrangements for monitoring and reporting monitoring of standards of service include pressures within the reticulation network (although this service parameter is not directly applicable to the treatment plant and associated infrastructure).

Customer Complaints:

It is noted that, in addition to the identified monitoring, Flow Systems Operations is also reliant upon customer complaints to identify any failure to meet performance standards. This is consistent with practices adopted by other water utilities.

Recommendations

There are no recommendations in respect of this requirement.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this requirement.

⁶⁰ *Recycled Water Quality Plan*, sections 5.2 and 6.1.

⁶¹ *Recycled Water Quality Plan*, section 11.2.

⁶² *Monitoring and Sampling Plan*, section 6.

⁶³ *Customer Contract*, section 3.1.2.

⁶⁴ *Customer Contract*, section 3.1.2.

⁶⁵ *Recycled Water Quality Plan*, sections 5.2 and 6.1.

⁶⁶ *Scheme Management Plan*, sections 11.1 and 11.2.

⁶⁷ *Sewage Management Plan*, section 7.

⁶⁸ *Monitoring and Sampling Plan*, section 5.

⁶⁹ *Customer Contract*, section 3.2.2.

Appendix B Detailed Audit Findings – Water Quality Plan (non-potable water) (WQP (npw))

Table B.1 WQP (npw) element one

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element one The WQP (npw) shows a commitment to responsible use and management of recycled water quality.	Compliant
Risk	Target for Full Compliance	
The lack of a water quality policy, up to date and accurate details for regulatory and formal requirements and contact details for stakeholders presents a small operational risk for this scheme.	A water quality policy, an up to date list of regulatory and formal requirements and an up to date list of stakeholders and their contact details.	
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018. ▪ Site inspections of infrastructure on 24 September and 16 November 2018. ▪ Flow Systems Operations, <i>Box Hill Scheme Management Plan (Scheme MP) (Revision 8)</i>, 14 November 2018. ▪ Flow, <i>Recycled Water Quality Plan (RWQP) (Revision 11)</i>, 15 December 2017. ▪ Flow Systems, <i>Recycled Water Policy</i>, 23 October 2014. ▪ Flow, <i>Water Compliance Register</i>, intranet-based register, printed for audit purposes 13 November 2018. ▪ Flow Systems, <i>Customer Contract</i>, 30 October 2015, available at: http://flowsystems.com.au/governance/CustomerContract.pdf. ▪ Flow, <i>Box Hill Stakeholder & Emergency Contact List</i>, intranet-based register, printed for audit purposes 13 November 2018. ▪ Flow, <i>Responsibilities and Authorities Matrix (Reference: FS-WAT-AUS-FM-GOV-1316)</i>, 11 July 2018. 		
Summary of reasons for grade		
<p>Flow Systems Operations demonstrated that it has measures in place for ensuring the responsible use of recycled water, an up-to-date list of regulatory and formal requirements, an up-to-date list of stakeholders and their contact details, and a <i>Recycled Water Policy</i>. It also demonstrated that it had engaged its principal stakeholders (NSW Health and IPART) in conducting a risk assessment workshop to the extent that those stakeholders wanted to be engaged.</p> <p>Accordingly, Flow Systems Operations is assessed to have demonstrated compliance with this obligation.</p>		
Discussion and notes		
Overview:		
<p>Flow Systems Operations' commitment to recycled water quality management is outlined in the <i>Recycled Water Quality Plan</i>,⁷⁰ which should be read in conjunction with the further detail provided in the <i>Scheme Management Plan</i>.⁷¹ Specific arrangements are discussed in the following.</p>		
Responsible use of recycled water:		

⁷⁰ *Recycled Water Quality Plan*, section 2.

⁷¹ *Scheme Management Plan*, section 6 (table 7).

The *Recycled Water Quality Plan*⁷² outlines arrangements for ensuring the responsible use of recycled water, which include:

- Engaging with agencies with responsibilities and expertise in protection of public and environmental health, including the local Public Health Authority, the Environment Protection Authority and IPART.
- Ensuring that design of the schemes is undertaken by reputable and experienced companies in accordance with the relevant codes and standards.
- Employing experienced personnel to manage the recycled water scheme.
- Complying with the regulatory requirements of IPART, NSW Health, NSW Planning and Environment and the NSW Office of Water.

Regulatory of formal requirements:

There is a list of regulatory and formal requirements within the *Recycled Water Quality Plan*⁷³ and *Scheme Management Plan*.⁷⁴ The lists are not exhaustive, but cover the main requirements relevant to recycled water quality management.

Flow Systems Operations uses a *Compliance Register*⁷⁵ in order to fully comply with this requirement. Another key document (which is not identified in the *Compliance Register*) is the *Customer Contract*.⁷⁶

Partnerships and engagement of stakeholders:

The *Recycled Water Quality Plan*⁷⁷ identifies stakeholders that have an interest in management of the recycled water scheme. Flow also has an *Emergency Contact List*⁷⁸ that includes a listing of key stakeholders and up-to-date contact details for all those stakeholders across each of its operating schemes.

There was evidence of Flow Systems Operations engagement with key stakeholders. In particular, in relation to NSW Health, the Western Sydney Local Health District (Helen Noonan, Manager Environmental Health & Disaster Preparedness and colleague Trent Auld) met with the Flow representatives to review the risk assessment and provide feedback and Flow modified the risk assessment based on their feedback to the satisfaction of NSW Health.⁷⁹ IPART no longer takes part in the scheme risk assessments but they were invited as a courtesy.⁸⁰

Mechanisms used by Flow Systems Operations to engage with users of recycled water to ensure that responsibilities are identified and understood are also outlined in the *Recycled Water Quality Plan*.⁸¹ These include (for example) the *Customer Contract*, *Homeowner's Guide* and the scheme specific websites (as discussed in more detail in Table B.8).

Recycled water policy:

Flow Systems Operations has a *Recycled Water Policy*⁸² in place. The policy appropriately addresses the guideline requirements. The extent to which the *Policy* has been communicated has not been assessed in detail; however, it is noted that:

- As Flow is relatively small, the number of personnel directly engaged in recycled water quality management is minimal; consequently, communication of policy isn't a major issue as it can be in larger companies.
 - Based on discussions with relevant Flow personnel during this and previous audits, it is clear that they
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⁷² *Recycled Water Quality Plan*, section 2.1.

⁷³ *Recycled Water Quality Plan*, Section 2.2.

⁷⁴ *Scheme Management Plan*, section 2.2.

⁷⁵ Flow, *Water Compliance Register*, intranet-based register, printed for audit purposes 13 November 2018.

⁷⁶ Flow Systems, *Customer Contract*, 30 October 2015, available at:

<http://flowsystems.com.au/governance/CustomerContract.pdf>

⁷⁷ *Recycled Water Quality Plan*, section 2.3.

⁷⁸ Flow, *Box Hill Stakeholder & Emergency Contact List*, intranet-based register, printed for audit purposes 13 November 2018.

⁷⁹ Email thread extending over September 2018 between Helen Noonan of NSW Health and Kirsten Evans of Flow.

⁸⁰ Email thread extending over September 2018 between Jessica Hanna of IPART and Kirsten Evans of Flow.

⁸¹ *Recycled Water Quality Plan*, section 2.3 (table 4).

⁸² Flow Systems, *Recycled Water Policy*, 23 October 2014.

are aware of the policy and the associated obligations.

Furthermore, responsibilities in respect of the communication, awareness and implementation of both the *Recycled Water Quality Plan* and the *Recycled Water Policy* are clearly identified in the *Responsibilities and Authorities Matrix*.⁸³

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

⁸³ Flow, *Responsibilities and Authorities Matrix* (Reference: FS-WAT-AUS-FM-GOV-1316), 11 July 2018.

Table B.2 WQP (npw) element two

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element two The WQP (npw) includes an analysis of the recycled water system.	Compliant
Risk	Target for Full Compliance	
Failure to adequately describe the system and assess risks could lead to risks being overlooked.	Adequate system description and risk assessment.	

Evidence sighted

- Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.
- Site inspections of infrastructure on 24 September and 16 November 2018.
- Flow Systems Operations, *Box Hill Scheme Management Plan (Scheme MP) (Revision 8)*, 14 November 2018.
- Flow, *Recycled Water Quality Plan (RWQP) (Revision 11)*, 15 December 2017.
- Network Operator's Licence No: 16_037 issued to Flow System Operations, 12 May 2016.
- Flow, *Box Hill North Local Water Centre Drawings* (Drawing Nos: 9274-200-654-1 to 9274-200-654-7, Rev C, 21 December 2017; 9274-200-732-1 to 9274-200-732-3, Rev B, 29 November 2017; 150242-A104-C1 and 150242-A103-C1, 26 July 2017; and 150242-A010-C1, 22 August 2017).
- Flow, *Box Hill Water Concept Design Report – Process & Electrical: Local Water Centre (Revision 0)*, 16 November 2016.
- Flow, *Box Hill Water Functional Description: Local Water Centre (Version 2)*, 20 May 2018.
- Flow, *Water Recycling Plant – Plant Block Flow Diagram (Revision 0)*, 16 November 2016.
- Flow Systems Operations, *Process and Instrumentation Diagrams* (Drawings 9274-3000 to 9274-3011; Revision A), 16 November 2016.
- Flow Systems, *Flow Systems Operations Risk Assessment; Risk Workshop Sign-on Sheet*, 30 September 2015.
- Flow, *Box Hill Scheme Risk Register*, 16 July 2018.

Summary of reasons for grade

Flow Systems Operations demonstrated that the *Recycled Water Quality Plan*, in conjunction with the *Scheme Management Plan* and other referenced documentation, includes an assessment of the recycled water supply system. The system arrangement is clearly documented and a risk assessment has been undertaken by an appropriately experienced team in accordance with the guidance presented in the *Australian Guidelines for Water Recycling*.

Accordingly, Flow Systems Operations is assessed to have demonstrated compliance with this obligation.

Discussion and notes

Overview:

An assessment of the recycled water supply system is outlined in the *Recycled Water Quality Plan*,⁸⁴ which should be read in conjunction with the detail provided in the *Scheme Management Plan*.⁸⁵ Specific arrangements are discussed in the following.

⁸⁴ *Recycled Water Quality Plan*, section 3.

⁸⁵ *Scheme Management Plan*, sections 5 and 6 (table 7 and section 6.1).

It is noted that this audit is specifically focussed on the recycled water treatment plant and associated components of the scheme; the distribution/reticulation components of the scheme have been assessed as part of a previous Licence Plan Audit.⁸⁶

Source of recycled water, intended uses, receiving environments and routs of exposure:

The *Scheme Management Plan*⁸⁷ indicates that the source water will comprise sewage collected from the Box Hill development area, including sewage from both residential and commercial/retail premises. Discharge of trade waste from commercial premises will be subject to the terms of Trade Waste Agreements with Flow Systems Operations, which may require pre-treatment to ensure that it is of acceptable quality. Stormwater may also be harvested from the development area if required to supplement source water in periods of high demand. Further discussion in respect of the quality of the source water is presented below.

The *Scheme Management Plan*⁸⁸ also identifies the intended uses of recycled water as: toilet flushing; washing machines; general purpose wash-down; carwash use; irrigation (private properties and common areas, and Designated Irrigation Zones (DIZs)); treatment plant service water; and dust suppression. These proposed uses are generally consistent with those permitted by the Licence.⁸⁹

Both the *Recycled Water Quality Plan*⁹⁰ and the *Scheme Management Plan*⁹¹ indicate that people can be exposed to recycled water “...via direct ingestion, aspiration of aerosols, aspiration of spray or ingestion via contact with skin or clothing.” Those people potentially exposed to recycled water include: Communities in the vicinity of application sites; Household occupants; Commercial customers; Visitors to site; Local Water Centre (treatment plant) operators; and Local plumbers.

The *Scheme Management Plan*⁹² indicates that potential receiving environments at Box Hill include humans, plants and soils.

Recycled water systems analysis:

The Box Hill recycled water scheme will comprise:

- a recycled water treatment plant (Local Water Centre) that will treat sewage from the Box Hill development; and
- a recycled water distribution/reticulation system.

Of these components, the treatment plant and associated infrastructure are the subject of this audit. As noted above, the distribution/reticulation system has been the subject of a previous audit.

The overall arrangement of the scheme is described in the *Scheme Management Plan*⁹³ and is shown on a set of *Local Water Centre Schematic Drawings*⁹⁴ More specific details are presented in the *Concept Design Report*⁹⁵ and *Functional Description*,⁹⁶ together with the *Block Flow Diagram*⁹⁷ and *Process and Instrumentation Diagrams (P&IDs)*.⁹⁸

Both the *Recycled Water Quality Plan*⁹⁹ and *Scheme Management Plan*¹⁰⁰ identify the in-house personnel and external stakeholder organisations that are typically invited to assist in the system analysis, which is

⁸⁶ Water Futures/Cobbitty Consulting, *WICA Audit Report to IPART; Licence Plan Audit (Sewerage and Recycled Water Reticulation); Flow Systems Operations (Flow Systems Operations Pty Ltd) (Version 2)*, October 2017.

⁸⁷ *Scheme Management Plan*, section 6.1.1.1.

⁸⁸ *Scheme Management Plan*, section 6.1.1.3.

⁸⁹ Network Operator’s Licence No: 16_037 issued to Flow System Operations, 12 May 2016, table 1.3.

⁹⁰ *Recycled Water Quality Plan*, section 3.1.3.

⁹¹ *Scheme Management Plan*, section 6.1.1.4.

⁹² *Scheme Management Plan*, section 6.1.1.5.

⁹³ *Scheme Management Plan*, sections 4.1 and 5.1.

⁹⁴ Flow, *Box Hill North Local Water Centre Drawings* (Drawing Nos: 9274-200-654-1 to 9274-200-654-7, Rev C, 21 December 2017; 9274-200-732-1 to 9274-200-732-3, Rev B, 29 November 2017; 150242-A104-C1 and 150242-A103-C1, 26 July 2017; and 150242-A010-C1, 22 August 2017).

⁹⁵ Flow, *Box Hill Water Concept Design Report – Process & Electrical: Local Water Centre (Revision 0)*, 16 November 2016.

⁹⁶ Flow, *Box Hill Water Functional Description: Local Water Centre (Version 2)*, 20 May 2018.

⁹⁷ Flow, *Water Recycling Plant – Plant Block Flow Diagram (Revision 0)*, 16 November 2016.

⁹⁸ Flow Systems Operations, *Process and Instrumentation Diagrams* (Drawings 9274-3000 to 9274-3011; Revision A), 16 November 2016.

⁹⁹ *Recycled Water Quality Plan*, section 3.2.2

¹⁰⁰ *Scheme Management Plan*, section 6.1.2.2.

undertaken as part of the risk assessment process. Evidence of participation in the process, including details of people involved and the organisations/functions they represent is provided by the *Risk Workshop Sign-on Sheet*.¹⁰¹

Periodic review of the system analysis is undertaken as part of the annual review of the risk assessment. This annual review is managed through Flow's document management system, which issues a reminder when review of the *Risk Register* is required.

Assessment of water quality data:

As noted above, source water for the recycled water system will comprise mainly sewage from residential, commercial and retail connections. Flow Systems Operations has assumed that the source water quality will be typical of general domestic sewage, and the treatment plant has been designed on that basis.¹⁰²

As the sewage will be sourced from a development which had not yet been occupied at the time that the treatment plant was being designed, no historical data was available. Further analysis will be undertaken during commissioning and the subsequent operating period to validate and (if necessary) update the design basis of the treatment plant.

Hazard identification and risk assessment:

A *Hazard Identification and Risk Assessment Workshop* was undertaken. The NSW Health Western Sydney Local Health District (Helen Noonan, Manager Environmental Health & Disaster Preparedness and colleague Trent Auld) met with the Flow representatives to review the risk assessment and provide feedback and Flow modified the risk assessment based on their feedback to the satisfaction of NSW Health.¹⁰³ IPART no longer takes part in the scheme risk assessments but they were invited as a courtesy.¹⁰⁴

The workshop, which addressed the full extent of the proposed recycled water scheme at Box Hill was undertaken using a methodology that was generally compliant with the approach outlined in the *Australian Guidelines for Water Recycling (AGWR)*. The outcomes are documented in the *Box Hill Scheme Risk Register* (which has subsequently been updated).¹⁰⁵

An extensive range of hazardous events have been identified in respect of the recycled water system and controls/mitigation measures identified.

In summary, review of the *Box Hill Scheme Register* leads to the assessment that the hazard identification and risk assessment process has appropriately addressed the treatment plant component of the Box Hill recycled water system.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

¹⁰¹ Flow Systems, *Flow Systems Operations Risk Assessment; Risk Workshop Sign-on Sheet*, 30 September 2015.

¹⁰² *Scheme Management Plan*, section 6.1.3.

¹⁰³ Email thread extending over September 2018 between Helen Noonan of NSW Health and Kirsten Evans of Flow.

¹⁰⁴ Email thread extending over September 2018 between Jessica Hanna of IPART and Kirsten Evans of Flow.

¹⁰⁵ Flow, *Box Hill Scheme Risk Register*, 16 July 2018.

Table B.3 WQP (npw) element three

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element three The WQP (npw) outlines the preventive measures for water quality management.	Compliant

Risk

Target for Full Compliance

Failure to adequately define preventive measures and assess residual risks could lead to risks being overlooked.

Adequate definition of preventive measures and residual risk assessment.

Evidence sighted

- Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.
- Site inspections of infrastructure on 24 September and 16 November 2018.
- Flow Systems Operations, *Box Hill Scheme Management Plan (Scheme MP) (Revision 8)*, 14 November 2018.
- Flow, *Recycled Water Quality Plan (RWQP) (Revision 11)*, 15 December 2017.
- Flow, *Box Hill Scheme Risk Register*, 16 July 2018.
- Flow, *Box Hill Water Validation Report: Local Water Centre (Version 2)*, 22 August 2017.
- Flow Systems Operations, *Verification Plan; Local Water Centre (Version 1)*, 23 October 2018.
- Flow, *Water Recycling Plant – Plant Block Flow Diagram (Revision 0)*, 16 November 2016.

Summary of reasons for grade

Flow Systems Operations has provided details in relation to the risk management measures (controls) that it will implement in respect of recycled water quality. It has also identified the critical control points (CCPs) that will be used to monitor performance of the multiple barrier treatment process that is to be implemented to achieve the pathogen log removal values required to ensure that the water is compliant with the requirements of the *Australian Guidelines for Water Recycling (AGWR)*.

Accordingly, Flow Systems Operations is assessed to have demonstrated compliance with this obligation.

Discussion and notes

Overview:

Details of preventive measures and critical control points adopted in respect of the recycled water supply system are outlined in the *Recycled Water Quality Plan*,¹⁰⁶ which should be read in conjunction with the further detail provided in the *Scheme Management Plan*.¹⁰⁷ Specific arrangements are discussed in the following.

Preventive measures and multiple barriers:

The *Recycled Water Quality Plan*¹⁰⁸ indicates that:

“Management of the recycled water system is by a professional operations manager (Flow), which includes audits as required by Table 7.2 (high level of human contact) of the NSW Guidelines for Management of Private Recycled Water Schemes (2008). This provides a foundation for effective control.”

The *Recycled Water Quality Plan* further indicates that the Local Water Centre (recycled water treatment

¹⁰⁶ *Recycled Water Quality Plan*, section 4.

¹⁰⁷ *Scheme Management Plan*, section 6.2.

¹⁰⁸ *Recycled Water Quality Plan*, section 4.1.

plant) incorporates multiple barriers in accordance with industry best practice for the production of recycled water. The target log removal of pathogens from the proposed treatment train, which are identified in the *Plan*, exceeds that required under the *Australian Guidelines for Water Recycling (AGWR)*.

Both the *Recycled Water Quality Plan*¹⁰⁹ and the *Scheme Management Plan*¹¹⁰ reference the *Scheme Risk Register*¹¹¹ in respect of this obligation. As noted in Table B.2, review of the *Box Hill Scheme Risk Register* reveals that an extensive range of hazardous events have been identified in respect of the recycled water system and an extensive range of controls/mitigation measures identified in respect of those events.

Critical control points:

The *Recycled Water Quality Plan* indicates that:¹¹²

“Each treatment process unit, activity or procedure relied upon to provide pathogen removal is considered a CCP. The controls, yet to be fully developed, are focused around the LWC processes for pathogen control. CCPs have been identified on the following processes and parameters:

- *Ultrafiltration (turbidity on combined effluent of membranes; and instantaneous flow rate at the permeate pumps)*
- *UV disinfection (instantaneous flow rate upstream of the UV reactor; UVT downstream of the UV reactor; and UVI within the UV reactor)*
- *Chlorine disinfection (free chlorine concentration downstream of the CCT, pH measures post MgOH dosing, but prior to the CCT; and instantaneous flow rate).”*

Critical control points (CCPs) for the Box Hill scheme, which are identified and detailed in the *Validation Report*¹¹³ and *Verification Plan*¹¹⁴ and shown on the *Block Flow Diagram*,¹¹⁵ are consistent with this arrangement. Critical limits response actions for each CCP are also identified in the *Verification Plan*.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

¹⁰⁹ *Recycled Water Quality Plan*, section 4.1.

¹¹⁰ *Scheme Management Plan*, section 6.2.1.

¹¹¹ Flow, *Box Hill Scheme Risk Register*, 16 July 2018.

¹¹² *Recycled Water Quality Plan*, section 4.2.

¹¹³ Flow, *Box Hill Water Validation Report: Local Water Centre (Version 2)*, 22 August 2017, section 13/table 13.1.

¹¹⁴ Flow Systems Operations, *Verification Plan; Local Water Centre (Version 1)*, 23 October 2018, section 5.5.4/table 5-4.

¹¹⁵ Flow, *Water Recycling Plant – Plant Block Flow Diagram (Revision 0)*, 16 November 2016.

Table B.4 WQP (npw) element four

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element four The WQP (npw) outlines the operational procedures and process control for the scheme.	Compliant

Risk

Target for Full Compliance

Failure to adequately formalise procedures could lead to inconsistent operation and exposes customers to risk of poor quality water being supplied.

Adequate detail on operational procedures to protect water quality.

Evidence sighted

- Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.
- Site inspections of infrastructure on 24 September and 16 November 2018.
- Flow Systems Operations, *Box Hill Scheme Management Plan (Scheme MP) (Revision 8)*, 14 November 2018.
- Flow, *Recycled Water Quality Plan (RWQP) (Revision 11)*, 15 December 2017.
- Flow, *Infrastructure Operating Plan (IOP) (Revision 11)*, 10 September 2018.
- Flow, *Asset Management Plan (AMP) (Revision 3)*, 22 January 2018.
- Flow, *Box Hill LWC Operation and Maintenance Manual (Version 1)*, August 2018.
- Flow, *Water Recycling Plant – Plant Block Flow Diagram (Revision 0)*, 16 November 2016.
- Flow, *Monitoring and Sampling Plan (MSP) (Revision 8)*, 8 June 2018.
- Flow, *Box Hill Water Concept Design Report – Process & Electrical: Local Water Centre (Revision 0)*, 16 November 2016.
- Flow, *Box Hill Water Functional Description: Local Water Centre (Version 2)*, 20 May 2018.

Summary of reasons for grade

Flow Systems Operations has outlined its arrangements in relation to operational procedures, operational monitoring and process control in the *Recycled Water Quality Plan*, with additional detail presented in the *Infrastructure Operating Plan/Asset Management Plan* and the *Monitoring and Sampling Plan*. The *Operation and Maintenance Manual* provides specific operational guidance, which is considered appropriate for the scheme. Details of the assessment process in respect of chemical supply have also been documented.

Accordingly, Flow Systems Operations is assessed to have demonstrated compliance with this obligation.

Discussion and notes

Overview:

The arrangements in respect of operational procedures and process control of the recycled water supply system are outlined in the *Recycled Water Quality Plan*,¹¹⁶ which are also referenced in the *Scheme Management Plan*.¹¹⁷ Specific arrangements are discussed in the following.

Operational procedures:

The *Recycled Water Quality Plan*¹¹⁸ indicates that Flow Systems Operations will develop an Operation and Maintenance Manual for each scheme prior to commencing commercial operation. This is consistent with

¹¹⁶ *Recycled Water Quality Plan*, section 5.

¹¹⁷ *Scheme Management Plan*, section 6 (table 7).

information presented in the *Infrastructure Operating Plan*.¹¹⁹ The *Recycled Water Quality Plan* also identifies the information that is to be incorporated into the Operation and Maintenance Manual, which includes:

- *“Overall process and site description*
- *Process description for each process step*
- *Process, mechanical and electrical drawings*
- *Equipment operation and process control, including set points and alarming*
- *Equipment maintenance schedule and guides, including daily, monthly, quarterly, half-yearly and yearly routine checklists*
- *Instrument calibration procedures and plan*
- *Troubleshooting procedures to identify process and/or equipment faults*
- *Safety information, including e-stops*
- *Supplier manuals and contact details*
- *Spare part requirements*
- *Material Safety Data Sheets (MSDSs).”*

This content, which is considered appropriate for the recycled water scheme, is consistent with information presented in the draft *Operation and Maintenance Manual*.¹²⁰ As reported in Table A.1 and Table A.2, the *Manual* provides appropriate guidance in respect of all aspects of operation and maintenance of the treatment plant and associated infrastructure.

The *Recycled Water Quality Plan*¹²¹ references the Flow Business Management System (BMS) in respect of operational procedures. The BMS includes/provides linkages to “... wide range of operational procedures covering operations, maintenance, asset management, sampling and analysis ...” which are used to “...support operations, control risks and ensure a high level of performance and compliance with legislative requirements.”

Operational monitoring:

The *Recycled Water Quality Plan*¹²² indicates that:

“Operational monitoring is designed to be continuous to detect faults before the use of recycled water to assess whether preventive measures are effective as well as to evaluate usage trends. Operational monitoring consists of the following aspects:

- *Continuous online monitoring of key performance parameters, including ongoing review and interpretation of the results.*
- *Evaluation, comparison of the results as part of the verification process (refer to section 7 [of the RWQP]). This creates an overlap between verification and operational monitoring to ensure the results are correlated and any discrepancies identified and adjustments made in the continuous monitoring where required.”*

Operational monitoring is undertaken principally in relation to critical control points (CCPs), but also includes appropriate quality control points (QCPs). Both CCPs and QCPs are identified on the *Block Flow Diagram*.¹²³

The *Monitoring and Sampling Plan* outlines arrangements in respect of:¹²⁴

- **Observational monitoring – which includes inspections and maintenance of drinking water**
-

¹¹⁸ *Recycled Water Quality Plan*, section 5.1.

¹¹⁹ *Infrastructure Operating Plan*, section 2.5.

¹²⁰ *Flow, Box Hill LWC Operation and Maintenance Manual (Version 1)*, August 2018.

¹²¹ *Recycled Water Quality Plan*, section 5.1.

¹²² *Recycled Water Quality Plan*, section 5.2.

¹²³ *Flow, Water Recycling Plant – Plant Block Flow Diagram (Revision 0)*, 16 November 2016.

¹²⁴ *Monitoring and Sampling Plan*, section 6.2.

infrastructure as outlined in the *Infrastructure Operating Plan*.

- Online monitoring – which includes monitoring of control parameters (CCPs and QCPs) throughout the treatment process.

Operational corrections:

The *Recycled Water Quality Plan*¹²⁵ indicates that non-compliance with critical limits at critical control points (CCPs) will result in plant shutdown and cessation of recycled water production/supply to the recycled water treatment plant, this process being automatically controlled by the treatment plant PLC. Action is then taken by operators to identify and correct the cause of the non-compliance. This procedure is consistent with that observed during previous audits of other Flow recycled water schemes.

Arrangements for plant shutdown and the diversion of out-of-specification water to the flow balance tank are shown on the *Block Flow Diagram*¹²⁶ and are documented in both the *Concept Design Report*.¹²⁷ In the event of plant shutdown, treated water from the storage facilities is used until a trigger level is reached, following which potable water is supplied into the storage tank(s) via a potable top-up mechanism (which includes an air gap).

Flow Systems Operations has incident response procedures in place that are to be implemented in the event that normal corrective actions cannot re-establish operational performance quickly enough to prevent recycled water of unacceptable quality from reaching consumers. These incident response procedures are discussed in further detail in Table B.6.

Equipment capability and maintenance:

The *Recycled Water Quality Plan*¹²⁸ notes the importance of the recycled water system equipment and infrastructure being adequately designed and sufficiently accurate and sensitive to perform in accordance with the specified requirements. It further notes that Local Water Centres (recycled water treatment plants) are designed by suitably qualified design consultants and that a technology assessment is undertaken for each plant to verify the treatment process and its ability to achieve the required pathogen log reduction values (refer to Table B.9 for further discussion).

Measures taken to ensure the ongoing capability of the equipment include (for example):

- Operation and performance of the treatment plant is controlled by PLC and a centralised SCADA system.
- Alternative power supplies are provided to the treatment plant, and provision is made for connection of an emergency generator.
- Key equipment is installed in a duty/standby configuration, with automatic changeover initiated via the control system in the event of component failure.
- Routine checking/calibration of key process monitoring instrumentation by both operators (using hand-held instruments) and external service providers.

Arrangements in relation to maintenance of the infrastructure are detailed in the *Infrastructure Operating Plan* and more specifically the *Asset Management Plan*. The *Asset Management Plan* outlines the arrangements in relation to Preventive Maintenance¹²⁹ and Breakdown/Defect Maintenance.¹³⁰ Maintenance activities are managed through a Computerised Maintenance Management System (CMMS), through which Work Orders for all maintenance activities are to be issued.

The *Asset Management Plan* also outlines arrangements in relation to asset condition and risk assessment, which provides the basis for ensuring the capability of the infrastructure.

Materials and chemicals:

Flow Systems Operations relies on guidance documents provided by external parties in relation to material

¹²⁵ *Recycled Water Quality Plan*, section 5.3.

¹²⁶ Flow, *Water Recycling Plant – Plant Block Flow Diagram (Revision 0)*, 16 November 2016.

¹²⁷ Flow, *Box Hill Water Concept Design Report – Process & Electrical: Local Water Centre (Revision 0)*, 16 November 2016.

¹²⁸ *Recycled Water Quality Plan*, section 5.4.

¹²⁹ *Asset Management Plan*, section 5.4.

¹³⁰ *Asset Management Plan*, section 5.5.

quality, including:

- *Plumbing Code of Australia (Volume 3 of the National Construction Code)*;
- *WSAA Water Supply Code of Australia (WSA 03)*; and
- *AS/NZS 3500 Plumbing and Drainage Set*.

This guidance is considered appropriate.

The *Recycled Water Quality Plan*¹³¹ identifies chemicals used in the recycled water treatment process. It also indicates that chemicals are sourced from reputable suppliers and outlines key aspects considered when evaluating potential chemical suppliers. These assessment criteria are considered appropriate.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

¹³¹ *Recycled Water Quality Plan*, section 5.5.

Table B.5 WQP (npw) element five

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element five The WQP (npw) outlines the process for verification of the water quality.	Compliant

Risk	Target for Full Compliance
Inadequate verification presents a risk of ongoing supply of unfit recycled water over the longer term.	A suitable verification program is required to ensure that ongoing monitoring and assurance takes place.

Evidence sighted

- Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.
- Site inspections of infrastructure on 24 September and 16 November 2018.
- Flow Systems Operations, *Box Hill Scheme Management Plan (Scheme MP) (Revision 8)*, 14 November 2018.
- Flow, *Recycled Water Quality Plan (RWQP) (Revision 11)*, 15 December 2017.
- Flow, *Monitoring and Sampling Plan (MSP) (Revision 8)*, 8 June 2018.
- Flow Systems, *Incident Management Plan (Revision 7)*, 10 January 2018.
- Flow Systems Operations, *Verification Plan; Local Water Centre (Version 1)*, 23 October 2018.
- Flow, *Incident Notification and Response Protocol (IN&RP) with NSW Health for Supply of Sewerage, Recycled Water and Drinking Water Services (Revision 3)*, 8 November 2018.
- Flow, *Recycled Water Irrigation Management Plan (Revision 3)*, 18 June 2018.
- Flow, *Complaints and Dispute Resolution Policy*, 14 March 2018, available at: <https://flowsystems.com.au/governance/CustomComplaints.pdf>.
- Flow, *Customer Complaint Process (Flow Charts)*, undated.
- Flow website contact page at: <https://flowsystems.com.au/contact/>.

Summary of reasons for grade

Flow Systems Operations has appropriately detailed its recycled water quality verification processes. These processes involve the monitoring of water quality data and customer complaints; appropriate corrective actions have also been identified.

Accordingly, Flow Systems Operations is assessed to have demonstrated compliance with this obligation.

Discussion and notes

Overview:

The process for verification of recycled water quality is outlined in the *Recycled Water Quality Plan*,¹³² which is also referenced in the *Scheme Management Plan*.¹³³ Specific arrangements are discussed in the following.

Recycled water quality monitoring:

Arrangements in respect of verification monitoring of recycled water quality are detailed in the *Monitoring and Sampling Plan*.¹³⁴ This outlines an Intensive Verification Monitoring Plan to be implemented during the first four weeks of operation and an Ongoing Verification Monitoring Plan to be implemented thereafter.

¹³² *Recycled Water Quality Plan*, section 6.

¹³³ *Scheme Management Plan*, section 6 (table 7).

¹³⁴ *Monitoring and Sampling Plan*, section 6.3.

Verification monitoring as implemented by Flow comprises a combination of online and grab sample monitoring.

More specific details of the monitoring required for verification purposes are documented in the *Verification Plan*.¹³⁵ The scope of ongoing monitoring is also detailed in the *Box Hill Monitoring and Sampling Plan*.¹³⁶

The *Monitoring and Sampling Plan*¹³⁷ notes that customer complaints will be recorded as part of the verification monitoring plan, thereby enabling the long-term analysis of system performance.

Corrective actions or emergency responses are implemented in the event of any deviations identified due to verification monitoring. Such action is taken in accordance with the *Incident Management Plan* and *Incident Notification Protocol*,¹³⁸ where applicable (refer Table B.6 for further discussion).

Application site and receiving environment monitoring:

The *Recycled Water Quality Plan*¹³⁹ outlines the parameters that will be monitored in relation to any receiving environments. It indicates that monitoring locations and frequencies are documented in a Water Quality Verification and Monitoring Plan.

The *Scheme Management Plan*¹⁴⁰ indicates that potential receiving environments at Box Hill include humans, plants and soils. It also details the arrangements in respect of the use of recycled water irrigation, which provides the greatest potential for impact on the receiving environment.

The arrangements for monitoring of irrigation receiving environments are further detailed in the *Recycled Water Irrigation Management Plan*,¹⁴¹ which in turn references the *Monitoring and Sampling Plan* and the (scheme specific) *Verification Plan*.

Documentation and reliability:

The *Recycled Water Quality Plan*¹⁴² refers to a Water Quality Verification and Monitoring Plan, which documents a sampling plan for each characteristic, including the location and frequency of sampling, ensuring that monitoring data is representative and reliable. For the purposes of this scheme, requirements for the initial Intensive Verification Monitoring are detailed in the *Verification Plan*,¹⁴³ whilst the requirements for Ongoing Verification Monitoring are detailed in the *Box Hill Monitoring and Sampling Plan*.

A work instruction *How to take a Recycled Water Sample* (also referenced in the *Monitoring and Sampling Plan*)¹⁴⁴ forms part of the Flow Business Management System.

Satisfaction of users of recycled water:

Flow, which is the licensed Retail Supplier for the Box Hill scheme, enters details of its customers into the Customer Relationship Management System (CRMS) as they are set up, i.e. when they purchase properties within the development. The CRMS is then used to manage records of customer complaints (should they arise) and responses in accordance with *Customer Complaint Policy*¹⁴⁵ and *Customer Compliant Process Flow Charts*¹⁴⁶ (which has been discussed in detail during previous audits of Flow schemes).

Customer complaints can be made via telephone, email or online, with details available on the Flow¹⁴⁷ and its subsidiary websites. Flow has set itself internal targets for ensuring that customer complaint resolution is

¹³⁵ Flow Systems Operations, *Verification Plan; Local Water Centre (Version 1)*, 23 October 2018, section 5.

¹³⁶ Flow Systems Operations, *Box Hill Monitoring and Sampling Programme (Revision 2)*, 13 November 2018.

¹³⁷ *Monitoring and Sampling Plan*, section 6.3.2.1.

¹³⁸ Flow, *Incident Notification and Response Protocol (IN&RP) with NSW Health for Supply of Sewerage, Recycled Water and Drinking Water Services* (Revision 3), 8 November 2018.

¹³⁹ *Recycled Water Quality Plan*, section 6.2.

¹⁴⁰ *Scheme Management Plan*, section 6.1.1.5.

¹⁴¹ *Recycled Water Irrigation Management Plan*, section 7.

¹⁴² *Recycled Water Quality Plan*, section 6.3.

¹⁴³ Flow Systems Operations, *Verification Plan; Local Water Centre (Version 1)*, 23 October 2018, section 5.

¹⁴⁴ *Monitoring and Sampling Plan*, section 9.

¹⁴⁵ Flow, *Complaints and Dispute Resolution Policy*, 14 March 2018, available at: <https://flowsystems.com.au/governance/CustomerComplaints.pdf>.

¹⁴⁶ Flow, *Customer Complaint Process* (Flow Charts), undated.

¹⁴⁷ Flow website contact page at: <https://flowsystems.com.au/contact/>.

both prompt and appropriate; these targets, which are considered appropriate, are documented in the *Recycled Water Quality Plan*¹⁴⁸ (in part) and *Customer Complaint Policy*.

The *Customer Complaint Policy* clearly documents the process adopted by Flow in relation to the management of customer complaints.

Short-term evaluation of results:

The *Recycled Water Quality Plan*¹⁴⁹ refers to section 12 of the *Plan* (Documentation and Reporting) for details in respect of the short-term evaluation of results (refer Table B.11 for discussion). It further indicates that performance reporting in respect of water quality targets is available on the Flow website.

It is noted that, although not specifically identified in the relevant section of the *Recycled Water Quality Plan*, short-term monitoring and evaluation of results is undertaken continuously via the SCADA system, which is in turn monitored by operational staff at least daily or in response to alert/alarm conditions.

Corrective responses:

The *Recycled Water Quality Plan*¹⁵⁰ indicates that:

“In the event that any deviations are identified in the verification results, immediate corrective actions or emergency response procedures are implemented.”

Arrangements in respect of incident and emergency response are discussed in Table B.6.

The *Recycled Water Quality Plan* further notes that:

“As a minimum, the plant records and trends are evaluated to confirm normal operation and identify any possible deviations. All the findings are clearly reported and if required, the RWQP and/or Scheme Management Plan updated to include the findings.”

This indicates that, where appropriate, corrective actions having longer term or wider ranging implications are captured in the management system documentation, thereby supporting a process of continual improvement.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

¹⁴⁸ *Recycled Water Quality Plan*, section 6.4.

¹⁴⁹ *Recycled Water Quality Plan*, section 6.5.

¹⁵⁰ *Recycled Water Quality Plan*, section 6.6.

Table B.6 WQP (npw) element six

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element six The WQP (npw) includes details on the management of incidents and emergencies.	Compliant

Risk

The absence of an approach for handling incidents and emergencies presents a risk of poor response to incidents arising related to the recycled water supply scheme.

Target for Full Compliance

An adequate management plan for incidents and emergencies.

Evidence sighted

- Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.
- Site inspections of infrastructure on 24 September and 16 November 2018.
- Flow Systems Operations, *Box Hill Scheme Management Plan (Scheme MP) (Revision 8)*, 14 November 2018.
- Flow, *Recycled Water Quality Plan (RWQP) (Revision 11)*, 15 December 2017.
- Flow Systems, *Incident Management Plan (Revision 7)*, 10 January 2018.
- Flow, *Incident Notification and Response Protocol (IN&RP) with NSW Health for Supply of Sewerage, Recycled Water and Drinking Water Services (Revision 3)*, 8 November 2018.
- Flow Systems Operations, *Incident Notification Forms A and B (Reference: BH-WAT-AUS-FM-INC-1972)*.
- Flow, *Emergency Contact List (Revision 2)*, 24 July 2018.
- Flow, *Complaints and Dispute Resolution Policy*, 14 March 2018, available at: <https://flowsystems.com.au/governance/CustomerComplaints.pdf>.

Summary of reasons for grade

Flow Systems Operations has developed an approach to the management of incidents and emergencies, which is documented in the *Recycled Water Quality Plan* and the *Incident Management Plan*. It also has communication protocols in place with NSW Health. Accordingly, Flow Systems Operations is assessed to have demonstrated compliance with this obligation.

Discussion and notes

Overview:

Details of the arrangements for the management of incidents and emergencies are outlined in the *Recycled Water Quality Plan*,¹⁵¹ which is also referenced in the *Scheme Management Plan*.¹⁵² The response to incidents and emergencies is managed in accordance with the *Incident Management Plan*, which provides guidance in relation to risk management; incident response; incident classification and management; incident notification; incident management responsibilities; incident termination and investigation; incident recovery; and incident preparedness.

¹⁵¹ *Recycled Water Quality Plan*, section 7.

¹⁵² *Scheme Management Plan*, section 6 (table 7).

The *Recycled Water Quality Plan*¹⁵³ indicates that Flow has defined potential incidents and emergencies and has documented response plans to respond to certain events. These include both matters related to recycled water quality and broader matters, such as:

- failure/breakage of the pressure main resulting in contamination;
- equipment failure;
- fire, disrupting operation of the drinking water infrastructure;
- power failure, disrupting operation of the drinking water infrastructure;
- vandalism/sabotage, disrupting operation of the recycled water infrastructure;
- flood, disrupting the operation of the drinking water infrastructure;
- cross connection of recycled water into the drinking water network; and
- customer complaint.

Specific arrangements are discussed in the following.

Communication:

Flow Systems Operations has in place an *Incident Notification Protocol*,¹⁵⁴ which details the protocol for notifying and communicating with NSW Health and other stakeholders in the event of incident or emergency. The *Protocol* includes Forms A (Incident Initial Notification) and B (Incident Written Notification),¹⁵⁵ which are to be used for notification purposes. Flow Systems Operations provided evidence¹⁵⁶ that a generic version of the *Protocol* had been submitted to NSW Health and that this was being finalised with NSW Health.¹⁵⁷

Flow Systems Operations has also developed an *Emergency Contact List*,¹⁵⁸ which provides an up-to-date listing of contacts relevant to all of Flow's schemes.

Incident and emergency response protocols:

As noted above, protocols in place in relation to incident and emergency response include the *Incident Management Plan* and the *Incident Notification Protocol* with NSW Health. These protocols provide appropriate guidance in relation to response management and communication.

Flow Systems Operations also demonstrated that, in responding to problems identified by customers, it will implement response processes outlined in its *Customer Complaint Policy*;¹⁵⁹ these appeared to be adequate to raise an issue to incident status where required.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

¹⁵³ *Recycled Water Quality Plan*, section 7.2.

¹⁵⁴ Flow, *Incident Notification and Response Protocol (IN&RP) with NSW Health for Supply of Sewerage, Recycled Water and Drinking Water Services* (Revision 3), 8 November 2018.

¹⁵⁵ Flow Systems Operations, *Incident Notification Forms A and B* (Reference: BH-WAT-AUS-FM-INC-1972).

¹⁵⁶ For example: Email dated 7 October 2014 (and follow-up emails dated 20 October 2014 and 14 November 2014) from Flow to NSW Health (re: *DRAFT Incident Notification Protocol with NSW Health and Public Health Units*).

¹⁵⁷ Email thread extending over November 2018 between multiple NSW Health staff and Kirsten Evans of Flow.

¹⁵⁸ Flow, *Emergency Contact List (Revision 2)*, 24 July 2018.

¹⁵⁹ Flow, *Complaints and Dispute Resolution Policy*, 14 March 2018, available at: <https://flowsystems.com.au/governance/CustomerComplaints.pdf>.

Table B.7 WQP (npw) element seven

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element seven The WQP (npw) outlines operator, contractor and end user awareness and training requirements.	Compliant

Risk	Target for Full Compliance
Inadequate training and awareness of employees presents a risk of poor management of the recycled water supply scheme.	Adequate training and awareness of employees.

Evidence sighted

- Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.
- Site inspections of infrastructure on 24 September and 16 November 2018.
- Flow Systems Operations, *Box Hill Scheme Management Plan (Scheme MP) (Revision 8)*, 14 November 2018.
- Flow, *Recycled Water Quality Plan (RWQP) (Revision 11)*, 15 December 2017.

Summary of reasons for grade

The *Recycled Water Quality Plan* outlines the arrangements in respect of operator, contractor and end user training and awareness. Observations made during this and previous audits of Flow schemes indicate that those arrangements are effectively implemented.

On that basis, Flow Systems Operations is assessed to have demonstrated compliance with this obligation.

Discussion and notes

Overview:

Details of the arrangements in respect of employee training and awareness are outlined in the *Recycled Water Quality Plan*,¹⁶⁰ which is also referenced in the *Scheme Management Plan*.¹⁶¹

As reported in Table A.1 and Table A.2, the Executive Manager Operations will be principally responsible for management (operation and maintenance) of the infrastructure, and will be supported in this role by the Manager Network Operations, Scheme Operations Manager, Scheme Operator, other Flow staff and external service providers. As also reported, these key staff and supporting staff have appropriate skills and ample experience to undertake their roles.

More specific arrangements in relation to training and awareness are discussed in the following.

Operator, contractor and end user awareness and involvement:

The *Recycled Water Quality Plan*¹⁶² indicates that key stakeholders in relation to awareness and training fall into four main groups including management of the scheme; operators; contractors who provide support services; and customers (end users of the treated water). It also outlines the specific awareness and training arrangements that are applicable to each group.

Review of the training and awareness program as outlined in the *Recycled Water Quality Plan*¹⁶³ reveals that it is both comprehensive and appropriate for the purposes of recycled water quality management.

Operator, contractor and end user training:

¹⁶⁰ *Recycled Water Quality Plan*, section 8.

¹⁶¹ *Scheme Management Plan*, section 6 (table 7).

¹⁶² *Recycled Water Quality Plan*, section 8.1.

¹⁶³ *Recycled Water Quality Plan*, section 8.1 (table 10).

As noted above, the *Recycled Water Quality Plan*¹⁶⁴ outlines the specific awareness and training arrangements that are applicable to each stakeholder group.

It is the responsibility of the Executive Manager Operations to ensure that employees are appropriately skilled and trained in the management and operation of the recycled water supply system, including the treatment plant. This is achieved through a regular review process, which aims to ensure that individual employees and contractors maintain the appropriate qualifications and experience.

Review of training documentation and records during previous audits of Flow schemes has revealed that relevant training is implemented and recorded.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

¹⁶⁴ *Recycled Water Quality Plan*, section 8.2.

Table B.8 WQP (npw) element eight

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element eight The WQP (npw) outlines the process for community awareness and involvement.	Compliant

Risk

Target for Full Compliance

Inadequate community consultation, awareness and involvement present a risk of poor management of the recycled water supply scheme.

Adequate community consultation, awareness and involvement.

Evidence sighted

- Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.
- Site inspections of infrastructure on 24 September and 16 November 2018.
- Flow Systems Operations, *Box Hill Scheme Management Plan (Scheme MP) (Revision 8)*, 14 November 2018.
- Flow, *Recycled Water Quality Plan (RWQP) (Revision 11)*, 15 December 2017.
- Flow Systems Operations website at: <https://boxhillwater.com.au>.
- Flow website at: <https://flowsystems.com.au/>.
- Flow Systems, *Customer Contract*, 30 October 2015, available at <http://flowsystems.com.au/governance/CustomerContract.pdf>.
- Flow, *Homeowner's Guide*, December 2016, available at: https://flowsystems.com.au/askus/Land_Housing/Home_Owners_Guide.pdf.
- Flow, *Complaints and Dispute Resolution Policy*, 14 March 2018, available at: <https://flowsystems.com.au/governance/CustomerComplaints.pdf>.
- Flow, *Plumber's Guide*, May 2016, available at: https://flowsystems.com.au/askus/Land_Housing/Plumbers_Guide.pdf.
- Flow, *Builder's Guide*, November 2017, available at: https://flowsystems.com.au/askus/Land_Housing/Builders_Guide.pdf.

Summary of reasons for grade

Flow Systems Operations has sufficiently documented its process for community awareness and involvement in the *Recycled Water Quality Plan*. These processes, which are principally reliant on web-based mechanisms for both communication and feedback, are considered appropriate.

Accordingly, Flow Systems Operations is assessed to have demonstrated compliance with this obligation.

Discussion and notes

Overview:

Details of the process for community consultation, awareness and involvement are outlined in the *Recycled Water Quality Plan*,¹⁶⁵ which is also referenced in the *Scheme Management Plan*.¹⁶⁶ More specific arrangements are discussed in the following.

Consultation with users of recycled water and the community:

The *Recycled Water Quality Plan*¹⁶⁷ indicates that Flow Systems Operations employs the following key

¹⁶⁵ *Recycled Water Quality Plan*, section 9.

¹⁶⁶ *Scheme Management Plan*, section 6 (table 7).

strategies to ensure the continued effective involvement of the community and end-users (customers):

- Web-based updates;
- Various options for customers to provide feedback or to record complaints, encouraging feedback;
- ‘Town’ meetings as an opportunity to give feedback and openly discuss any concerns/issues; and
- Community based education and training sessions, including controlled site visits of the Local Water Centre (recycled water treatment plant).

Flow Systems Operations has a specific website specific to the Box Hill scheme.¹⁶⁸ In addition, general information and feedback mechanisms are available via the Flow website.¹⁶⁹ These include extensive information in respect of recycled water and its management as well as documents such as the *Customer Contract*,¹⁷⁰ *Homeowner’s Guide*¹⁷¹ and *Customer Complaint Policy*.¹⁷²

These arrangements are considered appropriate.

Communication and education:

The *Recycled Water Quality Plan*¹⁷³ references the scheme specific website and customer communications via email updates as mechanism for communicating with the community and its customers. As noted above, Flow Systems Operations has posted a website specific to the Box Hill scheme. General information in relation to Flow schemes is available on the Flow website, which also indicates that:

- information packages, which identify authorised uses, restrictions and user responsibilities, are provided to all customers; and
- information is available to tradespersons in the *Plumber’s Guide*¹⁷⁴ and *Builder’s Guide*.¹⁷⁵

These arrangements are again considered appropriate.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

¹⁶⁷ *Recycled Water Quality Plan*, section 9.1.

¹⁶⁸ Flow Systems Operations website at: <http://Box.Hillwater.com.au/>.

¹⁶⁹ Flow website at: <https://flowsystems.com.au/>.

¹⁷⁰ Flow Systems, *Customer Contract*, 30 October 2015, available at <http://flowsystems.com.au/governance/CustomerContract.pdf>.

¹⁷¹ Flow, *Homeowner’s Guide*, December 2016, available at: https://flowsystems.com.au/askus/Land_Housing/Home_Owners_Guide.pdf.

¹⁷² Flow, *Complaints and Dispute Resolution Policy*, 14 March 2018, available at: <https://flowsystems.com.au/governance/CustomerComplaints.pdf>.

¹⁷³ *Recycled Water Quality Plan*, section 9.2.

¹⁷⁴ Flow, *Plumber’s Guide*, May 2016, available at: https://flowsystems.com.au/askus/Land_Housing/Plumbers_Guide.pdf.

¹⁷⁵ Flow, *Builder’s Guide*, November 2017, available at: https://flowsystems.com.au/askus/Land_Housing/Builders_Guide.pdf.

Table B.9 WQP (npw) element nine

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element nine The WQP (npw) outlines the validation, research and development processes for the scheme.	Compliant

Risk

Target for Full Compliance

Inadequate validation of processes and procedures presents a risk of poor management of the recycled water supply scheme.

Adequate methodology for validating processes and procedures to ensure that the system is effective at controlling hazards.

Evidence sighted

- Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.
- Site inspections of infrastructure on 24 September and 16 November 2018.
- Flow Systems Operations, *Box Hill Scheme Management Plan (Scheme MP) (Revision 8)*, 14 November 2018.
- Flow, *Recycled Water Quality Plan (RWQP) (Revision 11)*, 15 December 2017.
- Flow, *Monitoring and Sampling Plan (MSP) (Revision 8)*, 8 June 2018.
- Flow, *Box Hill Water Validation Report: Local Water Centre (Version 2)*, 22 August 2017.
- Flow, *Box Hill Water Concept Design Report – Process & Electrical: Local Water Centre (Revision 0)*, 16 November 2016.
- Flow Systems Operations, *Verification Plan; Local Water Centre (Version 1)*, 23 October 2018.
- Water Futures, *WICA Technology Assessment Report – Box Hill, Cooranbong and Huntlee recycling schemes process trains*, 15 May 2017.

Summary of reasons for grade

Flow Systems Operations has outlined its approach in relation to its validation of processes in the *Recycled Water Quality Plan*. These processes include both desktop (technology assessment) and practical (onsite monitoring) validation processes, which are appropriate for the scheme. More specific detail is presented in a Validation and Verification Report.

Design of infrastructure by appropriately qualified personnel in accordance with industry standards provides the basis for continuing reliability.

Accordingly, Flow Systems Operations is assessed to have demonstrated compliance with this obligation.

Discussion and notes

Overview:

Details of the validation processes for the scheme are outlined in the *Recycled Water Quality Plan*,¹⁷⁶ which is also referenced in the *Scheme Management Plan*.¹⁷⁷ Specific arrangements were considered in detail in the *Technology Assessment*¹⁷⁸ which identified only that the only omission was that the final critical limits and control philosophy of the CCPs was yet to be stated for all processes and full and explicit reference to the validation reports to justify the log reduction credits was yet to be made. The updates to those details are discussed in the following.

¹⁷⁶ *Recycled Water Quality Plan*, section 10.

¹⁷⁷ *Scheme Management Plan*, section 6 (table 7).

¹⁷⁸ Water Futures, *WICA Technology Assessment Report – Box Hill, Cooranbong and Huntlee recycling scheme process trains*, 15 May 2017.

Validation of processes:

The *Recycled Water Quality Plan*¹⁷⁹ outlines Flow Systems Operations' approach to validation of its treatment processes, which includes:

- Offsite validation – which involves assessment of the effectiveness of proposed MBR and UV disinfection processes and chlorine disinfection CT calculations. A technology assessment based on supplier provided validation information is undertaken (in accordance with WIC Act Audit Guidelines) to assess the appropriateness and adequacy of selected the technology.
- Onsite validation – undertaken during the start-up of the scheme, this involves four weeks of focused online sampling to verify the validation information used in the selection of the technologies (effectively more regular verification monitoring, which is used for validation purposes.)

The *Monitoring and Sampling Plan*¹⁸⁰ further details the arrangements in respect of both desktop (offsite) and practical (onsite) validation. It details the multiple barrier approach adopted to achieve the required pathogen log removal values and the basis for validation of the MBR, UV disinfection and Chlorine disinfection processes.

The *Validation Report*¹⁸¹ outlines in detail the validation of the suitability of the adopted treatment processes for the Box Hill scheme (also discussed in the *Concept Design Report*).¹⁸² The *Verification Plan*¹⁸³ outlines a verification process for confirming that the treatment plant functions in accordance with its design intent.

Flow typically engages an auditor to undertake a technology assessment in respect of each of its schemes. The technology assessment for the Box Hill recycled water process train is documented in the *Technology Assessment Report*,¹⁸⁴ which confirmed that the proposed process arrangements are appropriate for the scheme; however, it was noted that it was still necessary to finalise settings and fully justify the adopted critical limits. Critical limits have subsequently been identified in the *Validation Report*¹⁸⁵ and the *Verification Plan*.¹⁸⁶

Design of equipment:

As reported in Table B.4, Local Water Centres (recycled water treatment plants) are designed by suitably qualified design consultants. Distribution/reticulation pipework is designed in accordance with relevant industry standards including:

- *Plumbing Code of Australia* (Volume 3 of the *National Construction Code*);
- *WSAA Water Supply Code of Australia* (WSA 03); and
- *AS/NZS 3500 Plumbing and Drainage Set*.

Investigative studies and research monitoring:

The *Recycled Water Quality Plan*¹⁸⁷ indicates that Flow Systems Operations will review the data obtained as a result of validation and verification monitoring of system performance to continually increase its understanding of the system and as the basis of any improvement initiatives.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

¹⁷⁹ *Recycled Water Quality Plan*, section 10.1.

¹⁸⁰ *Monitoring and Sampling Plan*, section 6.1.

¹⁸¹ Flow, *Box Hill Water Validation Report: Local Water Centre (Version 2)*, 22 August 2017.

¹⁸² Flow, *Box Hill Water Concept Design Report – Process & Electrical: Local Water Centre (Revision 0)*, 16 November 2016.

¹⁸³ Flow Systems Operations, *Verification Plan; Local Water Centre (Version 1)*, 23 October 2018.

¹⁸⁴ Water Futures, *WICA Technology Assessment Report – Box Hill, Cooranbong and Huntlee recycling schemes process trains*, 15 May 2017.

¹⁸⁵ Flow, *Box Hill Water Validation Report: Local Water Centre (Version 2)*, 22 August 2017, section 13/table 13.1.

¹⁸⁶ Flow Systems Operations, *Verification Plan; Local Water Centre (Version 1)*, 23 October 2018, section 5.5.4/table 5.4.

¹⁸⁷ *Recycled Water Quality Plan*, section 10.3.

Table B.10 WQP (npw) element ten

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element ten The WQP (npw) outlines the process for management of documentation and records as well as the reporting requirements.	Compliant

Risk

Target for Full Compliance

Inadequate documentation, records and reporting presents a risk of poor management of the recycled water supply scheme.

Adequate documentation, records and reporting.

Evidence sighted

- Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.
- Site inspections of infrastructure on 24 September and 16 November 2018.
- Flow Systems Operations, *Box Hill Scheme Management Plan (Scheme MP) (Revision 8)*, 14 November 2018.
- Flow, *Recycled Water Quality Plan (RWQP) (Revision 11)*, 15 December 2017.
- Flow, *Records Management Policy (Revision 1)*, 17 July 2015.
- Flow, *Document Control Procedure (Revision 3)*, 3 February 2016.
- Flow, *Compliance Management Policy and Procedure (Revision 3)*, 29 August 2017.
- Flow, *Water Compliance Register*, intranet-based register, printed for audit purposes 13 November 2018.

Summary of reasons for grade

Flow Systems Operations has detailed its processes for the management of documentation and records and complying with reporting requirements in the *Recycled Water Quality Plan*. These processes are managed by Flow at a corporate level through implementation of policies and procedures that form part of its Business Management System.

Accordingly, Flow Systems Operations is assessed to have demonstrated compliance with this obligation.

Discussion and notes

Overview:

Details of processes for the management of documentation and records and complying with reporting requirements are outlined in the *Recycled Water Quality Plan*,¹⁸⁸ which is also referenced in the *Scheme Management Plan*.¹⁸⁹ Specific arrangements are discussed in the following.

Management of documentation and records:

Flow has documented and implements the *Records Management Policy*¹⁹⁰ as part of its Business Management System. It also has in place a corporate *Document Control Procedure*,¹⁹¹ which also forms part of the Business Management System. Current documents are retained on the intranet, through which document control mechanisms are also implemented.

Flow's approach to document and records management has been reviewed during previous audits of Flow

¹⁸⁸ *Recycled Water Quality Plan*, section 11.

¹⁸⁹ *Scheme Management Plan*, section 6 (table 7).

¹⁹⁰ Flow, *Records Management Policy (Revision 1)*, 17 July 2015.

¹⁹¹ Flow, *Document Control Procedure (Revision 3)*, 3 February 2016.

schemes and found to be both adequate and effective.

The *Recycled Water Quality Plan*¹⁹² also details the arrangements for management of operational data. All key critical control point (CCP) data is stored and is available for access via the SCADA system. Collation of key data on a summary page enables ready review of system performance at any time. Data is trended against design/expected performance, thereby enabling the ready identification of any deviations and a proactive response in the case that deviations are observed.

The SCADA system can be accessed remotely, thereby increasing accessibility and enabling rapid response to alert or alarm conditions.

Reporting:

Reporting requirements are identified in the *Recycled Water Quality Plan*.¹⁹³ These include:

- Internal reporting for operational purposes;
- Internal reporting for management purposes; and
- External reporting to customers, local government authorities, health authorities and IPART.

Reporting requirements are managed in part through implementation of the *Compliance Management Policy and Procedure*,¹⁹⁴ with compliance requirements identified (at a high level) in the *Compliance Register*.¹⁹⁵ A useful summary table identifies the key monthly, annual and event-related reporting requirements and summarises those correctly.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

¹⁹² *Recycled Water Quality Plan*, section 11.1.

¹⁹³ *Recycled Water Quality Plan*, section 11.2.

¹⁹⁴ Flow, *Compliance Management Policy and Procedure (Revision 3)*, 29 August 2017.

¹⁹⁵ Flow, *Water Compliance Register*, intranet-based register, printed for audit purposes 13 November 2018.

Table B.11 WQP (npw) element eleven

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element eleven The WQP (npw) outlines the process for long-term evaluation of results and the audit of the documentation.	Compliant
Risk	Target for Full Compliance	
Inadequate long-term evaluation and audit presents a risk of poor management of the recycled water supply scheme.	Adequate long-term evaluation and audit.	
Evidence sighted		
<ul style="list-style-type: none">▪ Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.▪ Site inspections of infrastructure on 24 September and 16 November 2018.▪ Flow Systems Operations, <i>Box Hill Scheme Management Plan (Scheme MP) (Revision 8)</i>, 14 November 2018.▪ Flow, <i>Recycled Water Quality Plan (RWQP) (Revision 11)</i>, 15 December 2017.▪ Flow, <i>Audit Procedure (Revision 3)</i>, 31 July 2018.		
Summary of reasons for grade		
<p>The <i>Recycled Water Quality Plan</i> outlines the process for the long-term evaluation of results and audit of the <i>Plan</i>. An <i>Audit Procedure</i> provides more specific detail of the audit process, addressing both internal and external audits.</p> <p>Accordingly, Flow Systems Operations is assessed to have demonstrated compliance with this obligation.</p>		
Discussion and notes		
Overview:		
<p>Details of processes for the long-term evaluation of results and the audit of the <i>Recycled Water Quality Plan</i> are outlined in the <i>Recycled Water Quality Plan</i>,¹⁹⁶ which is also referenced in the <i>Scheme Management Plan</i>.¹⁹⁷ Specific arrangements are discussed in the following.</p>		
Long-term evaluation of results:		
<p>The <i>Recycled Water Quality Plan</i>¹⁹⁸ indicates that systematic review of monitoring results over an extended period, typically 12 months or longer, is undertaken to assess overall performance against water quality objectives, identify any emerging problems and plan maintenance and/or identify process improvements. It further indicates that Flow Systems Operations will:</p>		
<ul style="list-style-type: none">▪ monitor the treatment plant to proactively identify problems, thereby ensuring the long-term performance of the treatment system; and▪ once per year, review operational details including:<ul style="list-style-type: none">○ key performance data trends;○ a summary of incidents, causes and remediation actions; and○ any changes to the plant which may require update of the <i>Recycled Water Quality Plan</i>.		

¹⁹⁶ *Recycled Water Quality Plan*, section 12.

¹⁹⁷ *Scheme Management Plan*, section 6 (table 7).

¹⁹⁸ *Recycled Water Quality Plan*, section 12.1.

Audit of recycled water quality management:

The *Recycled Water Quality Plan*¹⁹⁹ indicates that Flow Systems Operations will conduct internal audits, and will document and communicate audit results in accordance with the *Audit Procedure*²⁰⁰ that forms part of the Flow Business Management System. The *Audit Procedure* also outlines external audits undertaken in respect of Flow and its subsidiaries, which include:

- WICA audits, which provide a key review opportunity; and
- annual audit of Flow's management systems, which are certified to ISO 9001, ISO 14001, OSHAS 18001 and AS 4801, by an independent accredited certifying body.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

¹⁹⁹ *Recycled Water Quality Plan*, section 12.2.

²⁰⁰ Flow, *Audit Procedure (Revision 3)*, 31 July 2018.

Table B.12 WQP (npw) element twelve

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element twelve The WQP (npw) outlines a process for review and continual improvement.	Compliant

Risk

Target for Full Compliance

An inadequate process for review and continual improvement a risk of poor management of the recycled water supply scheme.

Adequate processes for review and continual improvement.

Evidence sighted

- Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.
- Site inspections of infrastructure on 24 September and 16 November 2018.
- Flow Systems Operations, *Box Hill Scheme Management Plan (Scheme MP) (Revision 8)*, 14 November 2018.
- Flow, *Recycled Water Quality Plan (RWQP) (Revision 11)*, 15 December 2017.
- Flow, *Management Review Procedure (Revision 1)*, 17 July 2015.
- Flow, *Continual Improvement Procedure (Revision 2)*, 2 December 2015.

Summary of reasons for grade

The *Recycled Water Quality Plan* outlines the process for review and continual improvement of its recycled water quality management system. The arrangements for conducting management reviews and the process for identifying and implementing improvements are considered to be appropriate.

Accordingly, Flow Systems Operations is assessed to have demonstrated compliance with this obligation.

Discussion and notes

Overview:

Details of processes for review and continual improvement are outlined in the *Recycled Water Quality Plan*,²⁰¹ which is also referenced in the *Scheme Management Plan*.²⁰² Specific arrangements are discussed in the following.

Review by senior managers:

The *Recycled Water Quality Plan*²⁰³ indicates that the Flow Executive Management Team will maintain oversight of the effectiveness of the recycled water quality management system and evaluate needs for change in accordance with the requirements of the *Management Review Procedure*,²⁰⁴ which forms part of the Flow Business Management System. Management reviews are to be conducted annually as a minimum, and will include a review of audit reports; recycled water quality performance; environmental performance; previous management reviews; and concerns identified by users of recycled water, regulators and other stakeholders.

²⁰¹ *Recycled Water Quality Plan*, section 13.

²⁰² *Scheme Management Plan*, section 6 (table 7).

²⁰³ *Recycled Water Quality Plan*, section 13.1.

²⁰⁴ Flow, *Management Review Procedure (Revision 1)*, 17 July 2015.

Recycled water quality management improvement plan:

The *Recycled Water Quality Plan*²⁰⁵ indicates that recycled water quality improvements will be managed in accordance with the *Continual Improvement Procedure*,²⁰⁶ which also forms part of the Business Management System and its Implementation Plan.

The *Recycled Water Quality Plan* also indicates the types of improvements that could potentially be implemented; these include (for example) capital works; enhanced operational procedures; and training. It further notes that corrective actions identified as a result of audit (internal or external) will be addressed as part of its improvement plan.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

²⁰⁵ *Recycled Water Quality Plan*, section 13.2.

²⁰⁶ Flow, *Continual Improvement Procedure (Revision 2)*, 2 December 2015.

Appendix C Detailed Audit Findings – Sewage Management Plan (SMP)

Table C.1 SMP Audit Table – WIC Sched 1 cl.14(1)(a)

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.14(1)(a)	The Sewage Management Plan indicates the manner in which the health and ecological assessments will be undertaken and any concerns arising from any such assessment addressed.	Compliant

Risk	Target for Full Compliance
Failure to adequately describe the system and assess risks could lead to risks being overlooked.	Adequate system description and risk assessment.

Evidence sighted

- Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.
- Site inspections of infrastructure on 24 September and 16 November 2018.
- Flow Systems Operations, *Box Hill Scheme Management Plan (Scheme MP) (Revision 8)*, 14 November 2018.
- Flow, *Sewage Management Plan (Sewage MP) (Revision 6)*, 31 July 2018.
- Flow, *Recycled Water Quality Plan (RWQP) (Revision 11)*, 15 December 2017.
- Flow, *Monitoring and Sampling Plan (MSP) (Revision 8)*, 8 June 2018.
- Flow, *Box Hill North Local Water Centre Drawings* (Drawing Nos: 9274-200-654-1 to 9274-200-654-7, Rev C, 21 December 2017; 9274-200-732-1 to 9274-200-732-3, Rev B, 29 November 2017; 150242-A104-C1 and 150242-A103-C1, 26 July 2017; and 150242-A010-C1, 22 August 2017).
- Flow, *Box Hill Water Concept Design Report – Process & Electrical: Local Water Centre (Revision 0)*, 16 November 2016.
- Flow, *Box Hill Water Validation Report: Local Water Centre (Version 2)*, 22 August 2017.
- Flow, *Water Recycling Plant – Plant Block Flow Diagram (Revision 0)*, 16 November 2016.
- Flow Systems Operations, *Process and Instrumentation Diagrams* (Drawings 9274-3000 to 9274-3011; Revision A), 16 November 2016.
- Flow Systems, *Flow Systems Operations Risk Assessment; Risk Workshop Sign-on Sheet*, 30 September 2015.
- Flow, *Box Hill Scheme Risk Register*, 16 July 2018.

Summary of reasons for grade

The *Sewage Management Plan* (in conjunction with the *Scheme Management Plan*) indicates that hazard identification and risk assessment in relation to potential health and ecological impacts will be undertaken in accordance with guidance provided in the *Australian Guidelines for Water Recycling*. Furthermore, Flow Systems Operations demonstrated that a risk assessment had been undertaken consistent with that guidance, with input from both NSW Health and IPART.

Site inspection and assessment of documentation by the audit team provided evidence that the documented requirements and controls have been effectively implemented. Accordingly, it was assessed that Flow Systems Operations had demonstrated compliance with this requirement.

Discussion and notes

Overview:

The system is described in detail in the *Scheme Management Plan*.²⁰⁷ The Box Hill scheme is not intended to discharge sewage via an outfall to a receiving environment; it is intended to recycle all sewage as far as possible. In the period prior to the recycled water treatment plant and associated infrastructure (that are the subject of this audit) being brought into operation, and during any periods that the treatment plant is inoperable, sewage is being/will be transported and disposed of off-site (at an appropriate receiving point) using tanker trucks.

Discussion of the arrangements in relation to the conveyance, treatment and disposal of sewage by means of infrastructure is in part addressed in the assessment of the *Infrastructure Operating Plan* (refer Appendix A) and the *Recycled Water Quality Plan* (refer Appendix B), with a specific focus on the treatment plant and associated infrastructure; the sewerage and recycled water distribution/reticulation infrastructure and interim sewage management arrangements at Box Hill were the subject of a previous Licence Plan Audit.²⁰⁸

This section reports on additional information that specifically relates to sewage management as applicable to the treatment plant.

Scheme Description:

As noted above, the system is described in detail in the *Scheme Management Plan*. The overall arrangement of the proposed infrastructure is shown on a set of *Local Water Centre Schematic Drawings*²⁰⁹ More specific details are presented in the *Concept Design Report*,²¹⁰ *Validation Report* (which details the treatment process)²¹¹ and *Functional Description*,²¹² together with the *Block Flow Diagram*²¹³ and *Process and Instrumentation Diagrams* (P&IDs).²¹⁴ Collectively these documents clearly describe the nature and arrangement of the infrastructure.

Of specific relevance is the fact that the design of the treatment plant and associated facilities incorporates measures to ensure that there is no impact on the environment. These measures include (for example):

- The whole of the treatment plant has been (effectively) constructed within a bunded area. Arrangements are in place for the capture of any spills (all stormwater is captured by default); and
- An odour scrubbing facility has been incorporated as part of the plant.

Hazard Identification and Risk and Uncertainty Assessment:

The *Sewage Management Plan*²¹⁵ indicates that Flow (and its subsidiaries) adopts an approach consistent with the *Australian Guidelines for Water Recycling* (AGWR) for sewage hazard identification and risk assessment; this approach is described in detail in the *Recycled Water Quality Plan*.²¹⁶

Flow Systems Operations conducted a risk assessment with the outcomes documented in the *Box Hill Scheme Risk Register*, which was updated in November 2015, March 2016, November 2016 and July 2018.²¹⁷

Review of the risk assessment confirmed that the methodology implemented was generally compliant with the approach outlined in the AGWR. Sewerage system hazardous events/hazards associated with the treatment plant and associated infrastructure relate mainly to the flow balance tank, including:

²⁰⁷ *Scheme Management Plan*, section 3.

²⁰⁸ Water Futures/Cobbitty Consulting, *WICA Audit Report to IPART; Licence Plan Audit (Sewerage and Recycled Water Reticulation); Flow Systems Operations (Flow Systems Operations Pty Ltd) (Version 2)*, October 2017, table A2.2.

²⁰⁹ Flow, *Box Hill North Local Water Centre Drawings* (Drawing Nos: 9274-200-654-1 to 9274-200-654-7, Rev C, 21 December 2017; 9274-200-732-1 to 9274-200-732-3, Rev B, 29 November 2017; 150242-A104-C1 and 150242-A103-C1, 26 July 2017; and 150242-A010-C1, 22 August 2017).

²¹⁰ Flow, *Box Hill Water Concept Design Report – Process & Electrical: Local Water Centre (Revision 0)*, 16 November 2016.

²¹¹ Flow, *Box Hill Water Validation Report: Local Water Centre (Version 2)*, 22 August 2017.

²¹² Flow, *Box Hill Water Functional Description: Local Water Centre (Version 2)*, 20 May 2018.

²¹³ Flow, *Water Recycling Plant – Plant Block Flow Diagram (Revision 0)*, 16 November 2016.

²¹⁴ Flow Systems Operations, *Process and Instrumentation Diagrams* (Drawings 9274-3000 to 9274-3011; Revision A), 16 November 2016.

²¹⁵ *Sewage Management Plan*, section 4.

²¹⁶ *Recycled Water Quality Plan*, section 3.4.

²¹⁷ Flow, *Box Hill Scheme Risk Register*, 16 July 2018.

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- Tank/well structural failure leading to uncontrolled overflow in publicly accessible areas, which may have both environmental and public health impacts;
 - Raw sewage flow balance tank mixer fails, which may result in odour generation and emission;
 - Gross solids block inlet screen preventing inflow into the plant, which may result in contamination of the immediate local environment;
 - Excess inflow results in tank overflow; and
 - Interruption to treatment capacity, which may result in an inability to service customers.

These identified hazards/hazardous events are considered appropriate for the infrastructure being assessed.

Mitigation Measures:

An extensive list of risk mitigation measures/controls are identified in the *Box Hill Scheme Risk Register*.²¹⁸ It is apparent that appropriate risk mitigation measures/controls have been identified and, based on observations made during the audit site inspections, implemented.

Sewage Quality Monitoring:

The *Sewage Management Plan*²¹⁹ refers to the *Monitoring and Sampling Plan* for:

“...a procedure for determining the characteristics to be monitored in the sewerage system and the receiving environment (as required)”.

The *Recycled Water Quality Plan*²²⁰ also indicates that:

“Source water quality is assumed to be typical of general sewage effluent and the design of Flow schemes is based on this assumption. Further analysis is done during the commissioning and operating period to evaluate and if necessary update the design basis.”

The basis upon which characteristics of the treatment plant source water (sewage) is determined is also outlined.

As noted above, once the treatment plant is operational, it is proposed to recycle all sewage as far as possible. In the event of an infrastructure failure, sewage may be discharged off-site using tanker trucks by an approved waste management contractor. Whilst the receiving agency may require details of the quality of sewage being discharged, given that it would be predominantly domestic sewage, this is considered unlikely. Nonetheless, the above referenced arrangements would ensure that such detail is available if required.

It is therefore apparent that arrangements in relation to sewage quality monitoring have been appropriately documented.

Review of Historical Data and Exceedances:

The *Sewage Management Plan* again refers to the *Monitoring and Sampling Plan* for:

*“... a procedure for the collection and retention of historical data about influent sewage as well as data from effluent disposed of from the LWCs and the receiving environment over time and following specific events”;*²²¹ and

*“...a documented process for identifying, listing and examining exceedances”.*²²²

The *Monitoring and Sampling Plan* outlines the requirement for the analysis of data, as follows:²²³

“Results must be reviewed frequently to confirm that records are complete and accurate, and to identify any deviations from critical limits or target criteria. Those responsible for interpreting and recording

²¹⁸ Flow, *Box Hill Scheme Risk Register*, 16 July 2018.

²¹⁹ *Sewage Management Plan*, section 7.2.

²²⁰ *Recycled Water Quality Plan*, section 3.3.1.

²²¹ *Sewage Management Plan*, section 7.3.

²²² *Sewage Management Plan*, section 7.4.

²²³ *Monitoring and Sampling Plan*, section 2.5.

operational results should understand how the results should be assessed.”

The *Monitoring and Sampling Plan* also indicates the action to be taken in the event that exceedances are identified, as follows:²²⁴

“In the event that any deviations are identified in the verification results, immediate corrective actions or emergency response procedures will be implemented as per the corrective actions for each of the critical control points (CCPs) and the actions outlined in the Incident Management Plan (IMP).”

It is therefore apparent that arrangements in relation to data analysis and the response to identified exceedances have been appropriately documented.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

²²⁴ *Monitoring and Sampling Plan*, section 12.

Table C.2 SMP Audit Table – WIC Sched 1 cl.14(1)(b)

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.14(1)(b)	The Sewage Management Plan indicates the arrangements for the disposal of waste from the infrastructure.	Compliant
Risk	Target for Full Compliance	
Failure to adequately make arrangements for the disposal of waste from the infrastructure presents a risk to public health and the environment.	Adequate arrangements for the disposal of waste from the infrastructure.	

Evidence sighted

- Interviews with Flow Systems Operations personnel on 24 September and 16 November 2018.
- Site inspections of infrastructure on 24 September and 16 November 2018.
- Flow Systems Operations, *Box Hill Scheme Management Plan (Scheme MP) (Revision 8)*, 14 November 2018.
- Flow, *Sewage Management Plan (Sewage MP) (Revision 6)*, 31 July 2018.
- Flow Systems, *Incident Management Plan (Revision 7)*, 10 January 2018.

Summary of reasons for grade

The *Sewage Management Plan* (in conjunction with the *Scheme Management Plan*) and other supporting documentation effectively detail the arrangements in relation to the management of waste streams arising as a result of the conveyance, treatment and disposal of sewage. These waste streams will include the disposal of treatment plant process waste (screenings and dewatered waste activated sludge) and odour, and may include domestic sewage in the event that the treatment plant is inoperable.

Accordingly, Flow Systems Operations is assessed to have demonstrated compliance with this obligation.

Discussion and notes

As reported in Table C.1, the sewerage system is described in detail in the *Scheme Management Plan*²²⁵ and other supporting documentation. As also noted:

- Under interim arrangements (i.e. until the treatment plant is commissioned and commences commercial operation), sewage is being transported and disposed of off-site (at an appropriate receiving point) using tanker trucks.
- Once the treatment plant is operating, all sewage will be treated to produce recycled water. In the event of infrastructure failure or excess sewage being produced, sewage will again be transported and disposed of off-site (at an appropriate receiving point) using tanker trucks.

The *Sewage Management Plan*²²⁶ outlines the arrangements in relation to waste disposal, including the identification of waste types and the manner in which waste is to be managed. Once the treatment plant is operational, there will be a need to dispose of waste products including screenings, grit and waste activated sludge. Flow Systems Operations has indicated that it will dispose of waste products:²²⁷

- “in a manner which ensures that environmental and public health risks are managed appropriately;
- if applicable, in accordance with the POEO Act;
- if applicable, at a Waste Facility lawfully authorised to dispose of the waste.”

²²⁵ *Scheme Management Plan*, section 3.

²²⁶ *Sewage Management Plan*, section 8.

²²⁷ *Sewage Management Plan*, section 8.2.

The *Scheme Management Plan* provides further detail in respect of waste management, indicating (for example) that:

*“Any waste water screenings will be collected and disposed by way of an authorised waste disposal contractor.”*²²⁸

*“The Waste Activated Sludge (WAS) from the membrane zone will be dewatered from 0.6% w/w solids to ~12% w/w solids using a belt filter press. The filter cake will be collected and disposed off-site via an approved waste management contractor.”*²²⁹

*“Foul air from the inlet screens and flow balance tank will be collected and processed via an odour scrubbing unit. The primary treatment process for odour will be biological followed by activated carbon.”*²³⁰

and:

*“It is understood that the Box Hill scheme does not require an environmental protection licence (EPL) as the LWCs will not produce a waste or by-product that will be applied to land or water.”*²³¹

Flow Systems Operations has engaged a specialist contractor (Staples) to provide waste collection services for the Box Hill scheme; these services require the use of authorised sewage collection tankers and disposal at an appropriately licensed facility. Under the interim arrangements, sewage is being collected from the interim sewerage serving tanks (ISSTs); however, the current arrangement is open-ended with services being provided on an “as-required” basis. A copy of an invoice was provided as evidence.²³² It should be noted that it remains incumbent upon the cartage contractor to make specific arrangements for disposal of the sewage.

Matters relating to incident response in general are discussed in Table B.6 (which relates to compliance of the *Recycled Water Quality Plan* under Element 6 of the AGWR). As identified in the risk assessment process, some hazards/hazardous events may result in a sewage spill. It is noted that the *Incident Management Plan*²³³ correctly identifies the duty to notify “relevant authorities” as specified in section 148(8) of the *POEO Act* (i.e. the EPA, local authority, Ministry of Health, WorkCover Authority and Fire and Rescue NSW) of pollution incidents where material harm to the environment is caused or threatened.

In summary, arrangements in respect of the management of waste streams arising as a result of the conveyance, treatment and disposal of sewage, are effectively documented in the *Sewage Management Plan* (in conjunction with the *Scheme Management Plan*) and other supporting documentation.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

²²⁸ *Scheme Management Plan*, section 3.3.3.

²²⁹ *Scheme Management Plan*, section 4.1.3.

²³⁰ *Scheme Management Plan*, section 4.1.3.

²³¹ *Sewage Management Plan*, section 12.2.2.2

²³² The support of Staples is not under contract but a Staples sewer truck was sighted during the field audit and an example of a recent tax invoice from Staples was provided for the Box Hill scheme (dated 5 September 2019).

²³³ *Incident Management Plan*, section 5.1.
