



From Local Knowledge to Operational Framework



Developing a Reusable TARP for
Wastewater Operators

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Abstract

The Kilcoy Resource Recovery Centre (RRC) operates a trickling filter wastewater treatment process that discharges treated effluent to Sheep Station Creek under an Environmental Authority issued by the Queensland Department of Environment, Tourism, Science and Innovation. Due to the limitations of trickling filter technology and the site's reliance on a single recycled water customer, maintaining compliance with environmental obligations required proactive management of ammonia-related risks.

Historically, operational responses relied heavily on operator experience, informal communication pathways and site-specific knowledge. While operators routinely monitored process performance, there were limited documented triggers linking environmental risk indicators to predefined operational actions.

To address this challenge, Urban Utilities developed and implemented a Trigger Action Response Plan (TARP) supported by online monitoring, improved governance and structured escalation pathways. The framework translated operational knowledge into a repeatable system that provides operators with clear direction on what actions are required, when escalation is necessary and how environmental risks should be managed.

Following successful implementation at Kilcoy, the TARP framework has subsequently been adopted at Esk, Toogoolawah and Gatton Resource Recovery Centres, with additional sites currently being assessed for implementation.

This paper outlines the development of the TARP framework, the operational improvements achieved and the benefits of standardising operator decision-making across multiple wastewater treatment plants.

Introduction

Kilcoy RRC is located within the Somerset Region of Southeast Queensland and treats domestic wastewater using primary treatment, biological treatment (Trickling filter), clarification and chlorination prior to discharge or reuse.

A key operational challenge at the site was balancing compliance obligations with the limitations of ageing treatment infrastructure and the availability of recycled water storage. During periods of low irrigation demand or wet weather, the racecourse reuse dam could reach capacity, limiting the site's ability to divert treated effluent away from the receiving environment.

While operators regularly monitored ammonia concentrations and site performance, many operational decisions relied on local knowledge and experience. This created a risk that responses to emerging compliance issues could vary between operators and shifts.

The project objective was therefore not simply to improve compliance outcomes, but to create a repeatable operational framework that provided consistent guidance regardless of who was operating the plant.



Figure 1. Kilcoy Resource Recovery Centre overview.

Converting Knowledge into a Framework

The project team identified that much of the knowledge required to manage compliance risk already existed within the operations team. The challenge was capturing this knowledge and converting it into a documented operational framework that could be consistently applied across operators, shifts and sites.

A Trigger Action Response Plan (TARP) was developed to establish clear links between environmental indicators and operational actions.

The TARP incorporated five primary monitoring parameters:

- Racecourse dam level
- Available storage capacity
- Ammonia concentration at the bridge monitoring point
- Ammonia concentration at the receiving environment monitoring point
- Visual indicators of environmental harm

These parameters were linked to predefined escalation levels ranging from routine operations through to incident management responses.



Kilcoy RRC Discharge to Creek Trigger Action Response Plan (TARP)
Operations and Maintenance - Resource Recovery

Trigger Action Response Plan (TARP) – Kilcoy RRC Discharge to Creek

Key Triggers to Actively Monitor					Action/Response	Responsible Person	Escalation Point
Racecourse Dam Level (mm)	Racecourse Storage Capacity (days)	Bridge ¹ Ammonia (mg/L)	REMP Ammonia Downstream (mg/L)	Visual Harm			
<800	>14	<0.9			1. Test ammonia at bridge (2x week) 2. Check Racecourse dam level (daily) and dam storage capacity (auto calculation) 3. Visual check for environmental harm	1. TPO 2. TPO 3. TPO	Nil
>1000	<10	0.9 to 2.0	>0.4		1. Test ammonia at bridge (3x week) 2. Check Racecourse dam level (daily) and dam storage capacity (auto calculation) 3. Test ammonia at downstream REMP location (1x week) 4. Visual check for environmental harm 5. Contact recycled water customers (TPO to notify RW Officer) 6. Irrigate RRC Site	1. TPO 2. TPO 3. TPO 4. TPO 5. RW Officer 6. TPO	Production Leader Process Engineer
>1200	<7	2.0 to 5.0	>0.6		1. Stand up Friday huddle to review operations ² a. Record screenshot of weather predictions in running huddle Teams chat. 2. Test ammonia at bridge (daily) 3. Check Racecourse dam level (daily) and dam storage capacity (auto calculation) 4. Test ammonia at downstream REMP location (daily) 5. Visual check for environmental harm (daily) 6. Inform Process Engineer and Environmental Management Officer 7. Run un-ionised calculator 8. Consider initiating SAS laboratory testing 9. Consider standing up OMT 10. Consider ceasing tanker waste deliveries 11. Consider tanker options	1. Leadership Team 2. TPO 3. TPO 4. TPO 5. TPO 6. TPO 7. PCE / EMO 8. EMO 9. Plant Manager 10. Plant Manager 11. Engineer	Plant Manager
>1250	<2	≥5.0	>0.9 or ≥80% un-ionised limit		1. Continue actions per Orange trigger above 2. Increased SAS laboratory testing 3. Inform O&M Management 4. Consider standing up IMT	1. As above 2. EMO 3. Plant Manager 4. OMT	General Manager
LICENCE BREACH Yes					1. Notify DETSI 2. Inform Executive of breach	1. EMO 2. Plant Manager	DETSI Executive

REMP = Receiving Environment Monitoring Point
TPO = Treatment Plant Operator
PCE = Process Engineer
RW Officer = Sustainable Water Technical Officer
OMT = Operational Management Team
IMT = Incident Management Team

De-escalation

Red: 1x SAS result <0.8mg/L ammonia at REMP and >7 days storage capacity or nil discharge to creek
Orange: 1x TPO result <0.4mg/L ammonia at REMP and >10 days storage capacity or nil discharge to creek
Yellow: 3x TPO result <0.9mg/L ammonia at REMP and >14 days storage capacity or nil discharge to creek

¹ Kilcoy's outfall location, per Urban Utilities' Environmental Authority, may be inaccessible at times due to environmental conditions. For consistency, safety and accessibility, TPO's sample at the bridge, located 80 meters southwest of Kilcoy RRC's front gate. The bridge is 80 meters downstream of outfall.

² Huddle Invite list: Plant Manager, Production Leader, Operations Specialist, Environmental Management Officer, Process Engineer, On-call TPO and/or TPO

Figure 2. Kilcoy Trigger Action Response Plan framework.

Providing Clear Operator Direction

The most significant benefit of the TARP was the removal of ambiguity from operational decision-making.

Prior to implementation:

- Monitoring was largely reactive.
- Escalation decisions relied on operator judgement.
- Communication pathways were informal.
- Dam capacity information was not readily available.

Following implementation:

- Trigger thresholds were clearly defined.
- Required actions were documented.
- Escalation responsibilities were assigned.
- Environmental and operational teams shared a common framework.

Importantly, the framework ensured that critical compliance decisions were no longer dependent on the experience of a single operator but could be consistently applied by the broader operational team.

Improving Operational Visibility

The TARP was supported by several practical operational improvements including:

- Online monitoring of racecourse dam levels.
- Automated storage capacity calculations.
- Increased ammonia monitoring frequency.
- Weekly cross-functional operational reviews.
- Formal escalation pathways.

The installation of online dam monitoring was particularly valuable, allowing operators to identify emerging storage constraints well before they became critical.

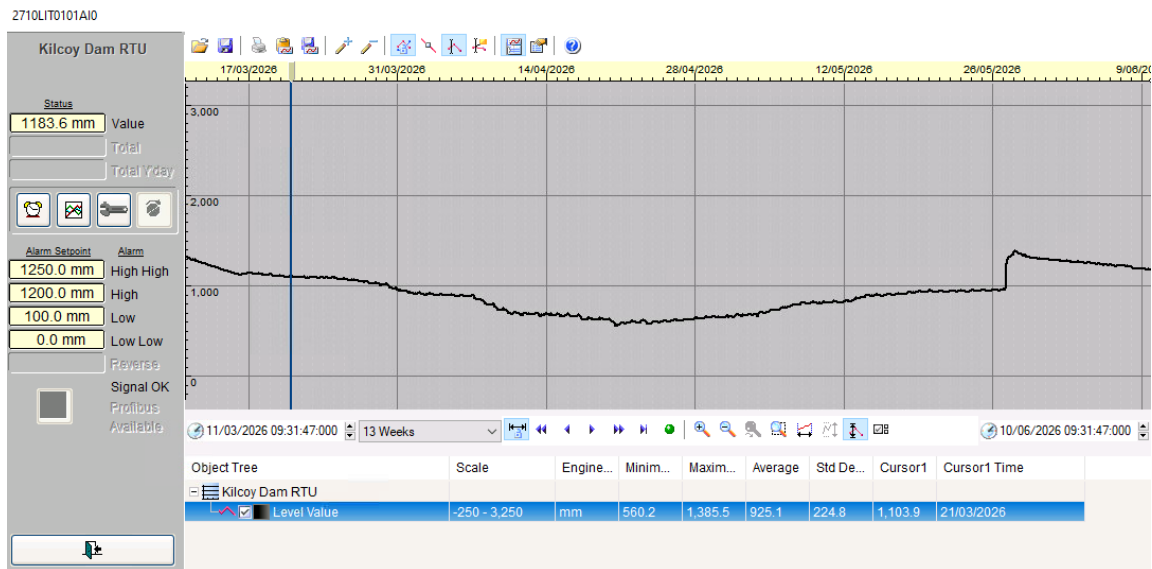


Figure 3. Online monitoring of the recycled water storage dam.

Organisational Adoption

One of the most significant outcomes of the project was the transferability of the framework.

Following the successful implementation at Kilcoy, the framework was adapted and implemented at:

- Esk RRC
- Toogoolawah RRC
- Gatton RRC
- Boonah RRC
- Kalbar RRC
- Aratula RRC

While each site has unique operational requirements, the core principles remained consistent:

- Defined triggers.
- Prescribed actions.
- Clear escalation pathways.
- Shared operational ownership.

Additional sites are currently being assessed for implementation across the Urban Utilities network.

This demonstrated that operational knowledge can be transformed into organisational capability when captured within a structured and repeatable framework.

Conclusion

The Kilcoy Compliance Project demonstrated that significant environmental compliance improvements can be achieved through operational excellence, structured decision-making and improved visibility of risk indicators.

While long-term capital investment may ultimately be required to address the inherent limitations of ageing trickling filter infrastructure, the project highlighted the value of focusing on the operational controls that are available today. Rather than waiting for a future capital solution, the TARP framework provided operators with clear triggers, defined actions and structured escalation pathways that enabled proactive management of compliance risks.

By clearly outlining what actions operators could take within their sphere of control, the framework shifted the focus from infrastructure constraints to operational opportunities. This empowered operators to make timely, consistent and informed decisions, improving confidence in compliance management while reducing reliance on individual experience and local knowledge.

The success of the framework at Kilcoy, and its subsequent implementation at Esk, Toogoolawah and Gatton Resource Recovery Centres, demonstrates that operational knowledge can be transformed into organisational capability when it is captured within a structured and repeatable system.

The project reinforces an important lesson for the water industry: while capital investment remains an important component of long-term asset management, meaningful compliance improvements do not need to wait for the next upgrade project. By providing operators with clear direction, practical tools and defined actions, organisations can improve compliance outcomes today while continuing to plan for future infrastructure improvements.

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