Item 1: Shotover WWTP Long Term Disposal Solution Update

SESSION TYPE: Workshop

PURPOSE/DESIRED OUTCOME:

Following Council's resolution in March 2026, a resource consent application was lodged with the territorial authority for the discharge of treated wastewater to the Kawarau River.

As part of the consent application process, a range of environmental investigations and assessments were undertaken to inform elements of the preliminary design. Through this work, several design modifications and upgrades have been identified necessary to minimise potential water quality effects on the receiving environment and downstream catchments.

The proposed modifications include changes to the proposed outfall structure and treatment plant upgrades that were not contemplated prior to Council's March 2026 decision. The purpose of this workshop is to brief Councillors on these proposed amendments ahead of a decision.

A decision will be sought prior to responding to the territorial authority's requests for further information under section 92 of the Resource Management Act (response due end of September 2026).

DATE/START TIME:

Tuesday, 25 August 2026 at 10:00am

TIME BREAKDOWN:

Presentation: 45mins
Questions: 15mins

PRESENTERS:

Simon Mason - Infrastructure Operation Manager
Tony Avery - General Manager Property & Infrastructure

Prepared by:

Name: Scott Paterson
Title: Project Manager

14 August 2026

Reviewed and Authorised by:

Name: Tony Avery
Title: General Manager, Property & Infrastructure
17 August 2026

ATTACHMENTS:

A	SWWTP Long Term Consent Update Presentation

QLDC Council Workshop

Project: Shotover WWTP Long Term Disposal Solution

Date: 25 August 2026

Presenter: Simon Mason, Infrastructure Operations Manager

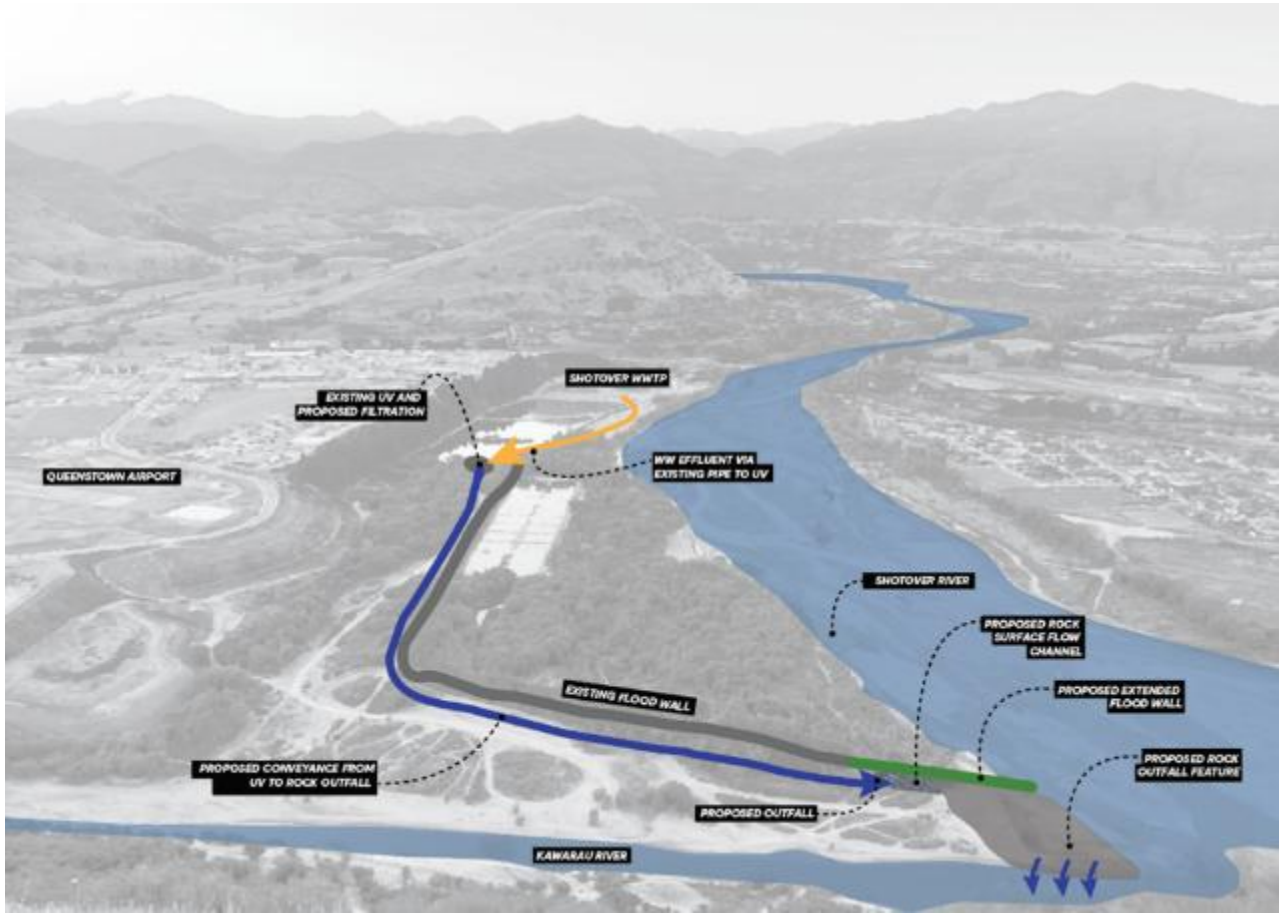
Purpose: Update on the Long Term Discharge Consent Application Post Lodgment

QUEENSTOWN LAKES DISTRICT COUNCIL

Agenda

- March 2026 Council Decision & Key Changes (5 mins)
- Environmental Investigation and Assessments (15 mins)
  - River bathymetry & velocity surveying.
  - Computational fluid dynamics and dispersion modelling.
  - Water quality and public health risk assessment.
- Amendments to the discharge/outfall design (10 mins)
  - Piped conveyance benefits and risks
- Additional Plant upgrades (15 mins)
  - Ultraviolet (UV) disinfection upgrades – E. coli & virus removal
  - Chemical dosing – Phosphorous removal
- General Q&A (15 mins)

March 2026 Council Decision - Revisit



- Approved the recommended option to proceed to resource consent for treated WW discharge to the Kawarau River.
- Proposed a rock outfall structure for final discharge to the Kawarau River.
- Approved the installation of a tertiary filtration system.
- Continuation of the Treated Wastewater Calamity Pond (TWCP) construction.
- Directed further investigations into alternative options for decision on implementation March 2027 (separate engagement workstreams underway – not part of this presentation).

Proposed changes following March 2026 Council decision

- **Proposed changes to the discharge structure to improve mixing:** Piped conveyance directly to the Kawarau River in lieu of rock outfall structure. Submerged pipe or diffuser configuration which enhances near-field mixing performance.

- **Proposed additional UV disinfection capacity:** To deliver higher virus removal performance across the full range of expected future flows and water clarity conditions, with redundancy built in.

- **Proposed addition of a chemical dosing system:** Removing phosphorus given recent monitoring suggests a seasonality to phosphorus load from the SWWTP, ensuring it does not contribute to downstream cumulative nutrient load & adverse effects.

Environmental Investigations

- **River Bathymetry & Velocity Surveying:** Earth Sciences New Zealand (ex. NIWA) undertook a detailed bathymetry survey and 2D water velocity survey of the Kawarau River in March 2026.

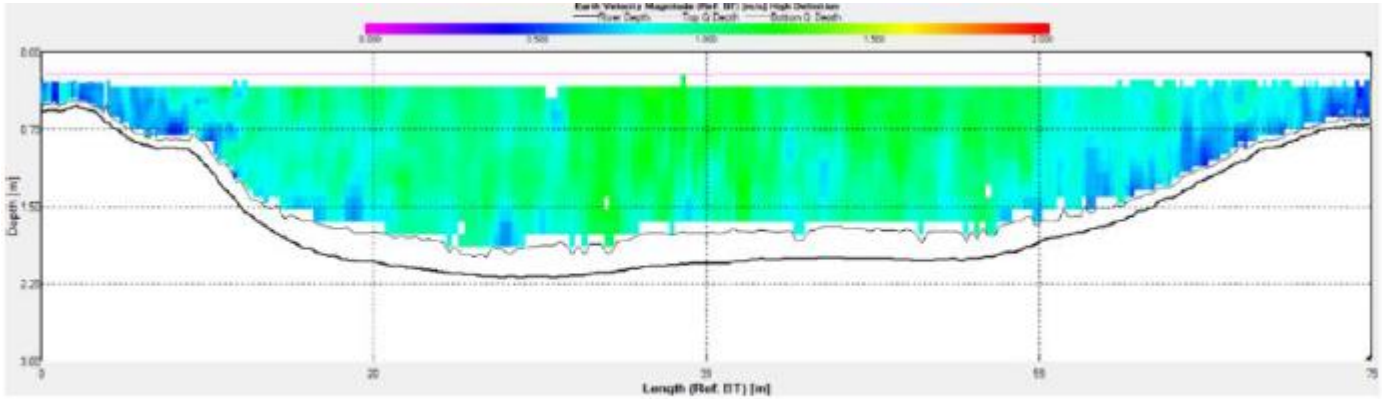


Figure 1 Kawarau River bathymetry and water velocity survey

- ***Bathymetric Survey:*** *Measures underwater depth and maps submerged terrain, creating an underwater equivalent of a topographic map of the Kawarau Riverbed showing contours, slopes, ledges etc.*

- ***Water Velocity Survey:*** *Measures speed and direction of water movement across a specific distance over time, crucial to understanding the dynamic flows within the Kawarau River.*

What did we find?

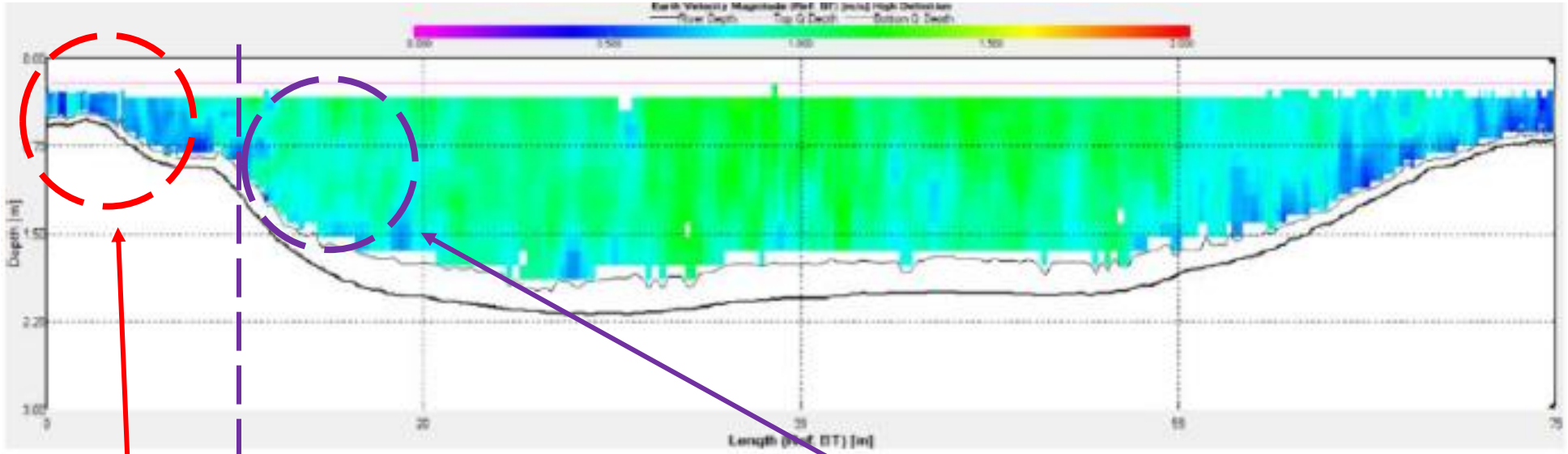


Figure 1 Kawarau River bathymetry and water velocity survey

10m

Zones of Limited Flow

- Water flows along the Kawarau River edge to approximately 10 metres out from the bank (at low river levels is shallow and slow moving). Velocities along the river edge are roughly 1/3 those of the deeper channel.

Zones of Greater Flow

- Water flows beyond 10m during low flow conditions, contribute to greater mixing and faster dispersion. Significant finding - as any treated wastewater discharged at the river edge would stay concentrated along the bank.

Environmental Investigations

- **<u>Dispersion modelling and water quality assessment:</u>** To quantify the mixing behaviour, GHD undertook 3D CFD modelling to simulate the dispersion of treated WW in the immediate discharge area (near-field) and the downstream transport of the treated WW to the confluence of the Kawarau & Shotover.

- **<u>Assumptions:</u>** The scenario that was assessed, modelled the future 2060 PDWF under low flow conditions to reflect a future upper bound for effects to river water quality.

Site Photograph D: Photograph taken at Shotover Delta, approximately 150m northeast of the proposed outfall, looking in a southwesterly direction.

What did we find?

- **<u>Key Findings:</u>** Modelling of the initial Kawarau discharge, predicted that treated WW would be trapped along the riverbank, with minimal dilution occurring.

- In practical terms, concentrations of nutrients and residual pathogens close the riverbank would remain elevated for some distance downstream:

1. High nutrient concentrations present near the riverbank could result in periphyton (algae) growth.

2. Residual pathogens concentration in shallow river water may require bathing restrictions downstream.

3. High phosphorus concentrations, even following complete mixing, may increase potential for periphyton or algal growth in the river and Lake Dunstan.

- Modelling also found that the Shotover River provides considerable additional mixing at the confluence of the Shotover & Kawarau Rivers. This means, we need to convey the treated wastewater point of discharge as close to the confluence of both rivers as possible.

How was this addressed?

- **Conclusions:** predicted dispersion and mixing significantly improves when treated WW is discharged 10m out from the bank of the Kawarau River.

- **Diagram right shows predicted mixing with discharge via rock outfall structure.**

- **Diagram far right shows predicted mixing with discharge via piped discharge 10m into high flows.**

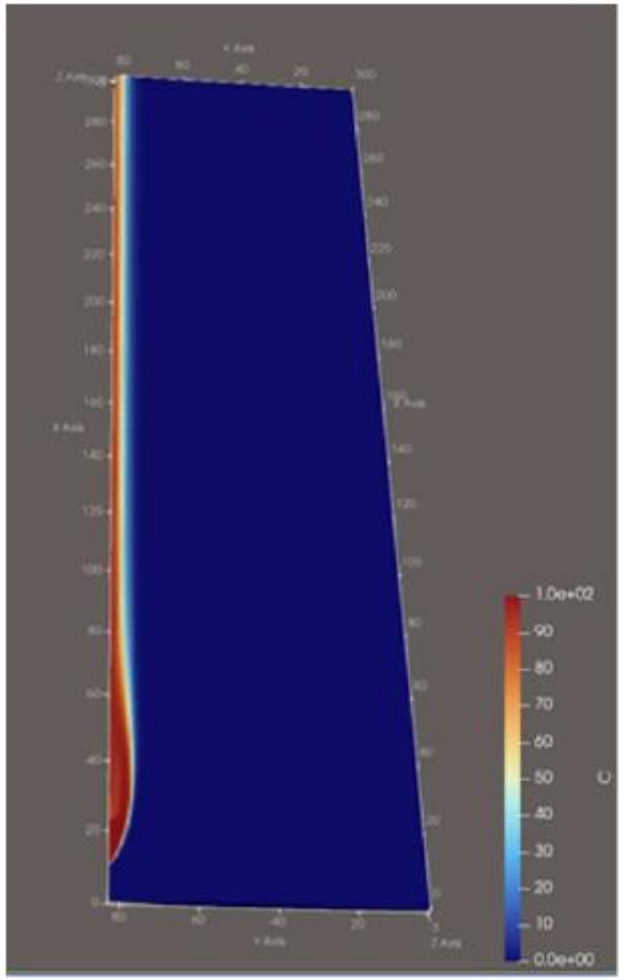


Figure 2 *Predicted dispersions of effluent when discharged at the river edge.*

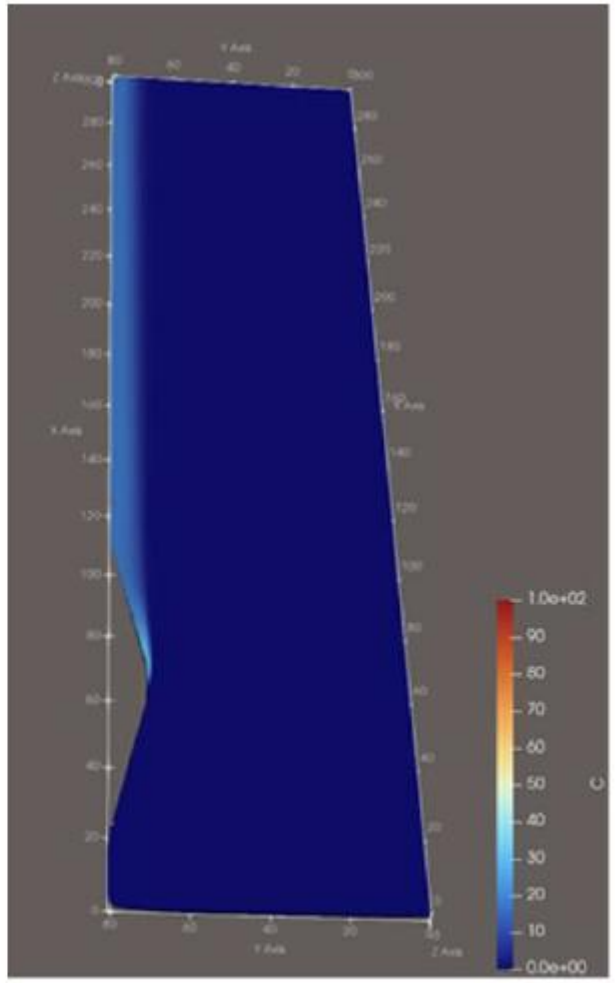
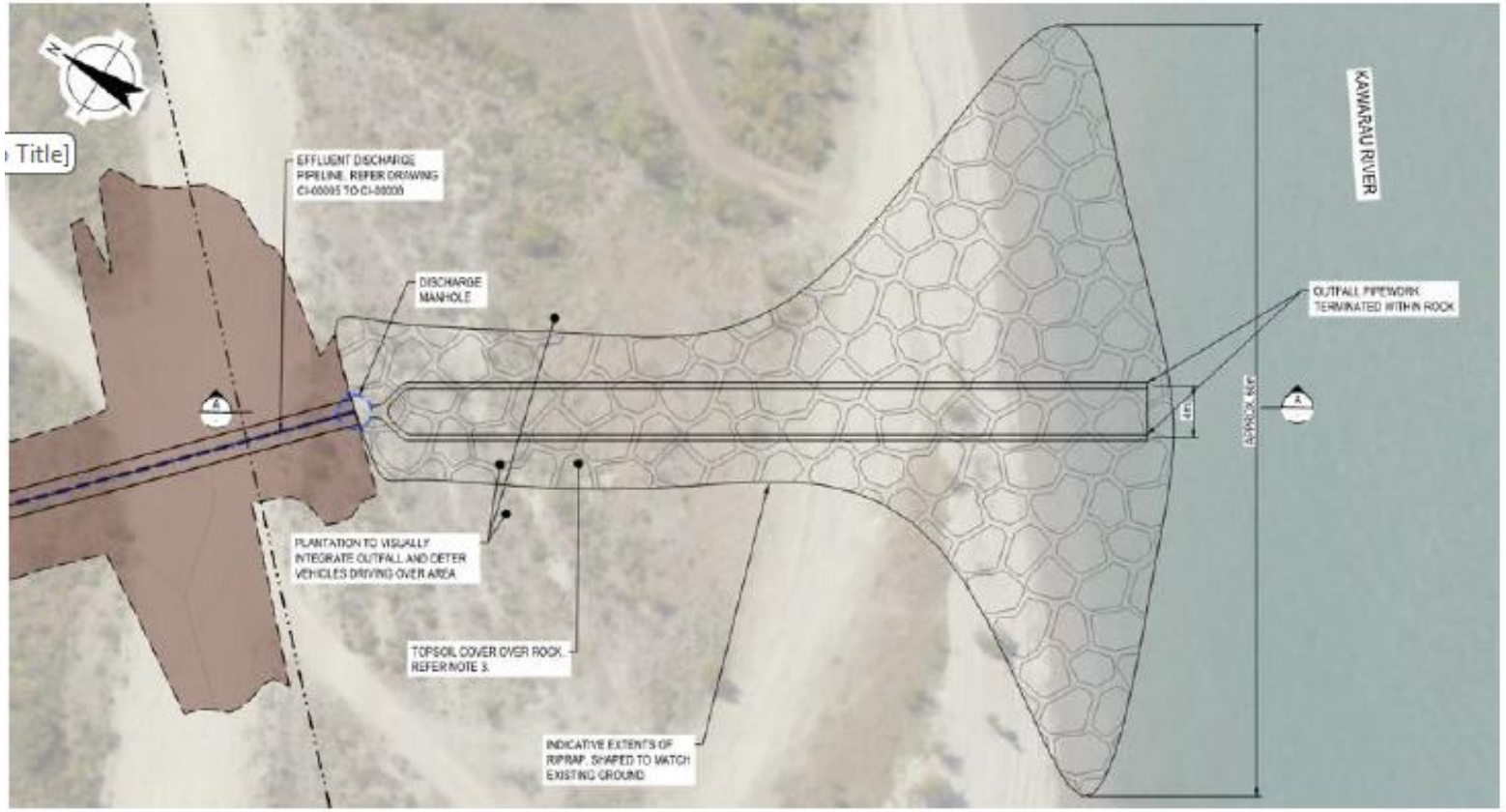
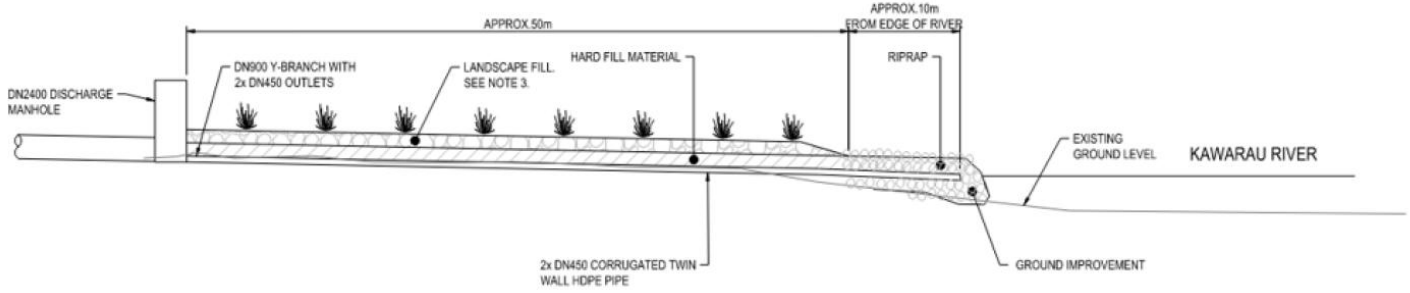


Figure 3 *Predicted dispersions of effluent when discharged 10 m out from the bank.*

Proposed Outfall Design Amendments



Removal of the rock outfall structure and transition to **a submerged pipe discharge** direct to more turbulent flows 10m + from the bank of the Kawarau River.



Option A: Outfall Design Amendments Benefits

Outfall Design Amendments	Benefits
Reduced cross sectional area and potential restriction of river flow during high flow events.	Potential to reduce extent of UV system upgrade, ultimately reducing costs.
Reduced footprint of the structure	Reduces extent of visual and amenity impact along with ongoing maintenance requirements.
Transitioning to submerged pipe and/or diffuser arrangement.	Allows for extending outfall pipeline further into river, accessing higher velocity flows and improved dilution and mixing
Removing rock in front of piped outlet	Provides better mixing and may reduce ongoing maintenance obligations.
Adjustments to configuration of pipe size and numbers, and outlet shape with further extension into the river.	Maximises turbulence and mixing effects. 5 fold dilution within 40m downstream of the structure vs. 3 fold.

Option A: Outfall Design Amendments Risks

Outfall Design Amendments	Risks
Rock channel design represents complexities which add to cost and constructability.	Additional complexities and cost relative to rock outfall particularly the challenges with 'in-river' construction works. Somewhat mitigated if rock structure removed entirely and submerged pipeline constructed although constructability risk remains.
Structure as designed has the potential to influence Kawarau River flows.	Change in river channel area reduces cross sectional area by 3.5% at low flows and 7% at high flows. Further mitigated if submerged pipeline constructed.

Option A: Outfall Design Progression

- Following ORC's S92 request for further information, which requests further detail on the outfall design, the design team are progressing development of the outfall design to:

1. Design a submerged pipeline to preserve visual & recreation amenity along the true left bank of the Kawarau River.

2. Remove as much of the rock channel design as possible, while retaining sufficient structure to secure the submerged pipeline.

3. Extend the submerge pipeline(s) as far as reasonably practicable into the more turbulent flows of the river, to maximise dispersion and near field mixing.

Plant Upgrades – Why Additional UV?

- The SWWTP provides a high level of effective treatment of bacteria, and E Coli concentrations after mixing; predicted to be much lower than criteria for recreational waster use, bathing and the WEPS.

- Other pathogens in treated WW, viruses such as norovirus, are more resilient to treatment and can cause illnesses such as gastroenteritis.

- Viruses are difficult and expensive to measure. As such, estimating risk to water users requires detailed analysis in the form of a QMRA (Quantitative Microbial Risk Assessment). No previous statistical virus testing has been undertaken at the SWWTP.

- In June 2026, virus testing commenced for treated and raw WW. A 12 month statistical sample is needed for the QMRA. First round of testing has confirmed **no live virus found in the treated WW**, which indicates the UV disinfection is doing its job.

Plant Upgrades – Why Additional UV?

Figure 2 *Current UV site at Shotover WWTP, photo taken 2024*

- The existing UV system capacity was assessed for virus removal and found unlikely to provide the required additional disinfection at 2060 flows.
- Upgrading the existing system is impractical, as it requires an extended shutdown which risks noncompliant treated WW discharges during works.
- To understand the full scope and requirements for the new UV system, in context of both the short and long term consents, the QMRA must be completed prior to finalising the new UV system design.

Plant Upgrades – Proposed UV Disinfection System

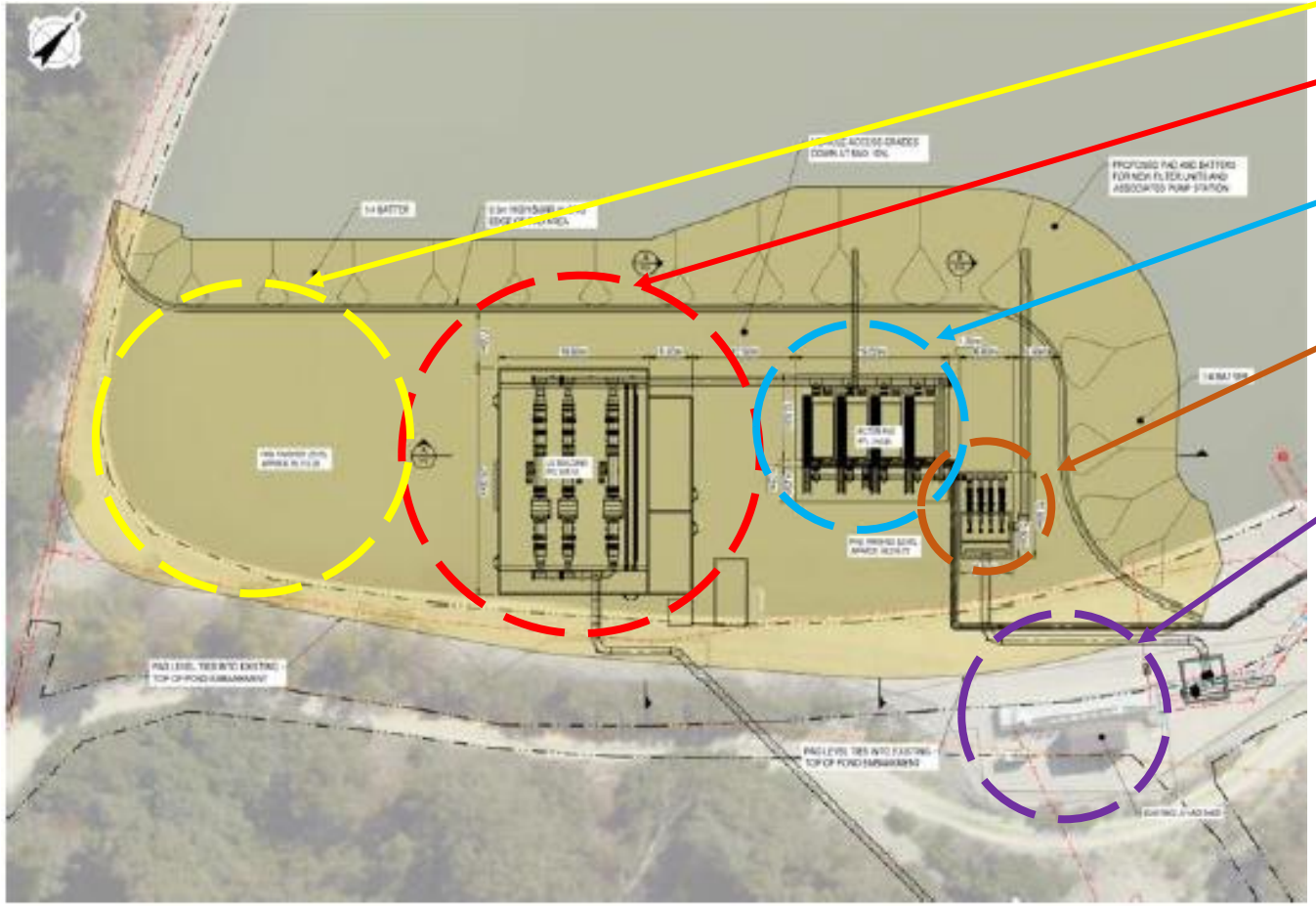


Figure 6 Engineer filled area, located at bottom of Pond 3a, indicated in the yellow fill

Future expansion (Quaternary Treatment)

Proposed enhanced UV reactors

New tertiary filters

New tertiary filters pump station

Existing UV channel

Figure 8 Example UV reactor installation (from Trojan website)

- **Proposed UV system:** Two UVFlex200 reactors each with 144 lamps (existing channel has 84 total) with provision in building for future reactor providing additional redundancy and expansion.

Plant Upgrades – UV System Benefits & Risks

Benefits
Very high level of disinfection, to a standard **generally consistent with that required for recycled water use.** That provides long term opportunities for how treated WW may be beneficially used in future.
Regulator and community are given confidence that the public health risks are consistently and appropriately managed, and the requirements of the water conservation order are met both after reasonable mixing and within the mixing zone.
Minimises any need for restrictions on swimming to only within the immediate proximity of the discharge structure.

Risks
Capital Costs Impact – Additional building, engineered fill platform, UV reactors and process control equipment increases capital costs. Circa $15M additional CAPEX cost for the UV system upgrade.
Operational Costs Impact – Additional power, operation and running costs including UV lamps replacement intervals. Circa $360k P/A 2030 and $480k 2060 additional OPEX costs (no cost escalation).

*There is also a low probability outcome that the additional UV grades are **not required.** This would only eventuate in the unlikely event **no live viruses** were detected in the treated WW over the 12 month period.

Plant Upgrades – Why Chemical Dosing?

QUEENSTOWN LAKES DISTRICT COUNCIL

- The design assumed the existing biological treatment process would be sufficient to manage the potential effects to water quality. Nitrogen removal is very good – phosphorous removal is moderate.
- Phosphorous is the nutrient that most attributed to the increase of periphyton growth in rivers and algal blooms in lakes.
- Chemical dosing of alum or poly aluminium chloride, dosed upstream of the secondary clarifiers, binds and removes phosphorous from the wastewater as a solid, before it reaches the discharge point.
- Chemical dosing is a standard, well-proven technology used in many WWTP's in NZ & internationally.
- While phosphorus testing over the last 6 months has shown a trend towards the proposed short term consent limits, it is suspect this is seasonal and dosing is needed to manage potential water quality effects.

Plant Upgrades – TP & DRP Performance

- Chemical dosing is required to reduce TP and DRP within the median limits, particularly when concentration is expected to increase again later in the year (suspected seasonal behaviour). Chemical dosing would then be a seasonal operation only.

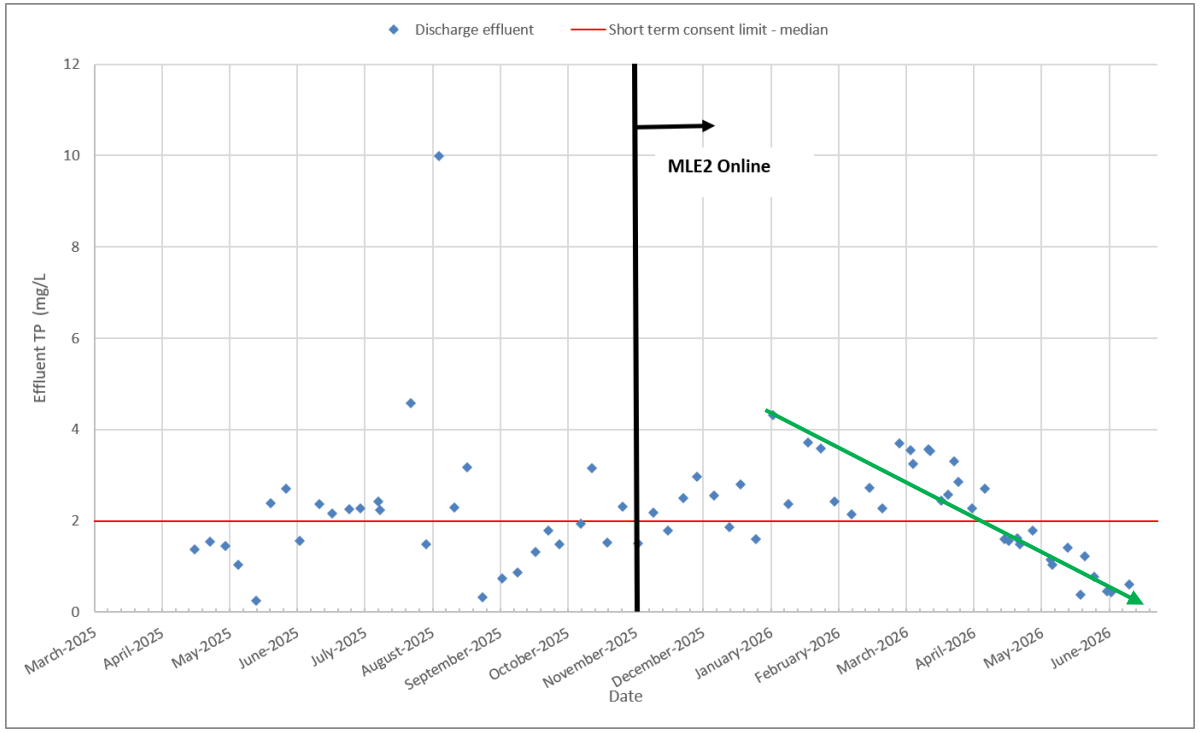


Figure 6 SWWTP treatment performance of TP

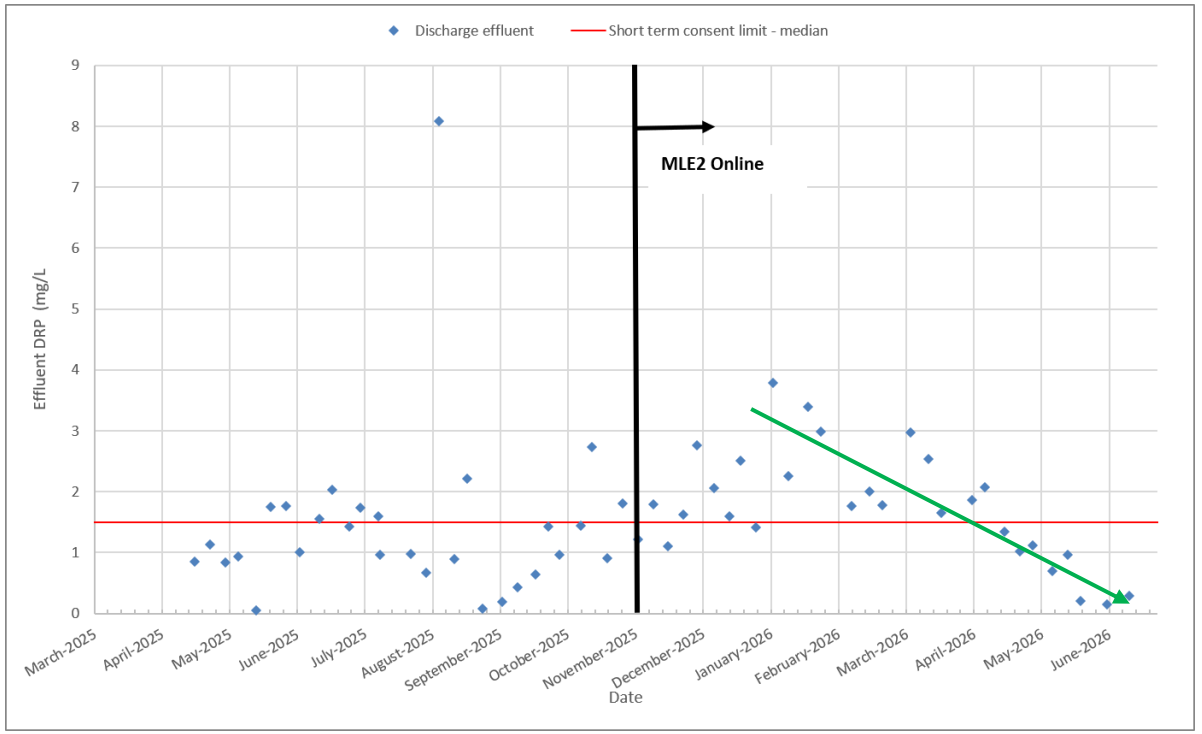


Figure 7 SWWTP treatment performance of DRP

Plant Upgrades – Chemical Dosing Benefits & Risks

QUEENSTOWN LAKES DISTRICT COUNCIL

Benefits
Significantly reduces the phosphorous load to the Kawarau River catchment and risk of periphyton growth.
Process of dosing and solids removal results in overall improved removal of total suspended solids (TSS).
Provides operational flexibility in how the SWWTP responds to changes in influent quality (raw WW) or regulatory expectations.
Can be accommodated within the existing SWWTP site, adjacent to the existing MLE & clarifiers.

Risks
Capital Costs Impact – Includes bulk chemical storage tanks, dosing equipment and a bunded containment area for spill management. Additional CAPEX circa $700k.
Operational Costs Impact – Additional power, operation and running costs including additional sludge removal. Circa $290k P/A 2030 and $610k 2060 additional OPEX costs (no cost escalation).

Plant Upgrades – Current Budget Summary

Item	CAPEX	OPEX
Approved option to seek resource consent to discharge to the Kawarau River (March 2026)	**$39M to $44M** **(P50 to P90)**	$320k to $460k (-10% to +30%)
As above, inclusive of the proposed additional plant upgrades.	**$51.9M to $65.40M** **(P50 to P95)**	$1.1M to $1.6M (2030) $1.5M to $2.2M (2060)

Item	Total
Net Present Value (NPV): Approved option to seek resource consent to discharge to the Kawarau River (March 2026)	**$48M**
Net Present Value (NPV): As above, inclusive of the proposed additional plant upgrades.	**$85.8M**

P95 CAPEX Estimate remains within the total LTP Budget ($77.5M), but with little headroom for any further amendments through the consent process.

Next Steps

- Council decision required to approve proceeding with a direct piped discharge to the Kawarau as part of the consent application currently before the territorial authority.

- Council decision required to approve proceeding with the proposed additional plant upgrades:
  - Tertiary filtration – approved at Council meeting March 2026.
  - Chemical Dosing – to be immediately approved.
  - Additional UV Disinfection – decision for implementation following completion of the QMRA.

- These decisions affect both the short-term discharge consent and the long-term discharge consent (responding to the consenting authority's S92 requests).

- Further investigations (e.g. virus testing) and design will proceed in the meantime, ahead of a future decision on the extent of enhanced UV disinfection required.

Questions?

QUEENSTOWN
LAKES DISTRICT
COUNCIL