Technical Memorandum

To:	Hannah Goslin	**From:**	Tim Baker
Company:	Otago Regional Council	**SLR Consulting New Zealand Limited**	
cc:		**Date:**	29 July 2026
		Project No.	860.016625.00037

RE: QLDC Wastewater Discharge – Kawarau Outfall Review of Groundwater Effects

1.0 Background

Queenstown Lakes District Council (QLDC, the applicant) has applied to Otago Regional Council (ORC) for resource consents for construction and operation of a wastewater discharge structure on the Shotover delta and the discharge of treated wastewater to the Kawarau River.

The discharge structure is proposed to comprise a rock outfall structure, which delivers treated wastewater into the Kawarau River, at a location immediately upstream of the confluence of the Kawarau and Kimiākau/Shotover rivers. This will replace the temporary discharge that is currently into the Shotover River.

These consents are intended to replace the consented, but failed, Dose and Drain (DaD) discharge field, and the emergency/temporary discharge (emergency discharge) consents applied for in 2025, but not yet granted.

QLDC has sought consents for:

- The discharge of treated wastewater into water and onto or into land where it may enter water, and the discharge of odour into air.
- Works to install and maintain an outfall structure and/or pipe in the bed of the river.
- The taking of groundwater for dewatering during construction.

For this consent application, the following maximum discharge volume and rates are being sought:

- Maximum daily discharge volume of 60,000 m^3/day.
- Maximum instantaneous discharge rate of 694 L/s.

Unlike the temporary/emergency discharge, where wastewater flows along an unlined discharge channel and has the potential to infiltrate the alluvial gravels of the Shotover delta, the proposed Kawarau River outfall will be piped via a new effluent discharge line directly to the river.

The existing oxidation pond 3 is to be decommissioned, desludged and grassed to enable it to be used a calamity pond. This is essentially an emergency storage pond for treated wastewater. While not lined, because it is within a former oxidation pond there will be a degree of natural sealing of the base, meaning that losses to groundwater when used (infrequently) will likely be minimal.

Dewatering will be required for the installation of the discharge pipeline along the delta. The estimated depth to invert for the pipeline installation ranges from approximately 1.5 m to 3 m below ground level, and dewatering rates have been estimated to be between 5 and 15 L/s.

This review focusses on the actual and potential effects on groundwater quality arising from the discharge of treated wastewater (both via the outfall and incidental discharges from the WWTP) and any effects arising from the abstraction of groundwater for construction phase dewatering.

The documents reviewed for this audit are:

- GHD, 2026. Shotover WWTP Surface Water and Groundwater Assessment.
- Landpro Limited, 2026. Resource Consent Application to Otago Regional Council for Discharge of Treated Wastewater & Associated Activities – Shotover Wastewater Treatment Plant (where it relates to groundwater discharges).

2.0 Description of the Environment

The groundwater environment has been previously described in detail in earlier reviews (SLR review of the emergency discharge) and is summarised here for completeness.

2.1 Physical Setting

The Shotover Wastewater Treatment Plant (WWTP) is located on the Shotover River delta, on the true right bank of the Shotover River, downstream of the State Highway 6 bridge. The river delta sits approximately 40 m below the Frankton terrace (also known as Frankton Flats), and between 1 and 3 m above the active riverbed.

The entire delta forms part of the floodplain of the Shotover River, and the historical imagery presented in the AEE shows that the river has moved back and forth across parts of the delta in recent decades.

Downstream of the delta is the Kawarau River. The Kawarau River flows from Lake Wakatipu downstream through the Kawarau Gorge, discharging into the Clutha River.

2.2 Geology & Hydrogeology

The Shotover Delta is underlain by recent (Holocene) alluvial and fan deposits, comprising unconsolidated gravel sand and silt. The depth of these deposits is unknown, but investigation boreholes at the nearby 5-Mile development proved alluvial deposits at depths of at least 90 m.

GHD has carried out investigations of the shallow delta geology in support of this application (and the previous emergency discharge application). The investigations have been robust, and I consider that they provide a good conceptual understanding of the site. The generalised geology observed during the investigations has been:

- Gravelly fine to coarse sand at surface extending for 1-2 m.
- A layer of sandy gravel, ~1 to 2.5 m thick.
- Gravelly fine to coarse sand extending to at least 20 m depth below ground level (based on the logs of IH2 and IH3).
- A fine silty sand is present near the Kawarau River (BH17 and BH18) extending to at least 9 m depth beneath the sandy gravel. It is not known whether this sand continues deeper or is underlain by more permeable coarse sand or gravel.

As part of the geological investigations, hydraulic testing, comprising rising and falling head tests, of groundwater monitoring wells were carried out to provide an estimate of aquifer saturated hydraulic conductivity. The results indicated:

- A very high hydraulic conductivity for deposits screened in wells BH02, BH03 and BH04 consistent with the sandy gravel lithology.
- In contrast, testing of the fine sand deposits indicates a significantly lower permeability more consistent with a silty sand.
- The difference in permeability between materials is significant and layers or infilled zones of such fine-grained materials may influence groundwater flow direction.

Groundwater flow direction has been determined based on the water level measurements recorded in the investigation wells. The groundwater table ranges from 0.9 to 4.8 m below ground level across the delta area and has a strong (SLR interpret it as a direct) connection to the river.

The direction of groundwater flow across the delta is generally to the southeast, towards the Kawarau River. Localised flow direction is expected to be influenced by changes in aquifer properties (layers of sands, gravels and historic channel features), but overall, groundwater flow is toward and into the Kawarau River.

2.3 ORC Review Questions

The following questions were provided by ORC and form the basis of the review. The answers have been informed by the SLR review of the application, as summarised above.

Q:	Is the technical information provided in support of the application robust, including being clear about uncertainties and any assumptions? Yes, or no. If not, what are the flaws?
R:	Yes. The information provided regarding the existing groundwater environment, and the assessment of effects is robust and clear. Overall, I consider the effects on groundwater (levels and quality) from the proposed discharge, and dewatering to be relatively minor, and manageable. This is for the following reasons: **Historical Discharge Effects**. No further discharges of treated effluent to groundwater from the DaD are proposed, and progressive improvement in groundwater quality downgradient of the DaD is expected over time. Updated monitoring (with the exception of wells immediately downgradient of the emergency discharge) shows improvements in groundwater since the cessation of the DaD ponds. I agree with the applicants' conclusions that effects on groundwater resulting from this proposal are negligible, subject to ongoing monitoring (discussed below). **Effects on groundwater from the Calamity Pond** (and other minor WWTP losses). GHD note that during periods when the pond is used, a small amount of seepage to ground and to underlying groundwater is likely to occur. While the pond base is expected to provide a low permeability barrier for significant soakage to ground, and the volume of water discharging is expected to be less than that occurring when oxidation ponds were in use, some very small discharges may occur. This was not quantified by GHD, but from a first principles perspective I agree with their conclusion. So overall, the effect on

	groundwater quality from calamity pond seepage is expected to be minimal. I agree with this conclusion, subject to ongoing monitoring (discussed below). **Effects as a Result of Dewatering**. Dewatering of groundwater across the delta for the installation of the discharge pipe will be required. While only a high-level assessment was presented in the AEE (and not in the groundwater assessment), I agree with the Applicant's conclusion that effects will be less than minor because: • Groundwater is directly connected to surface water, and the dewatered water would discharge into the river regardless. • Potential effects on river flows are negligible due to the large flows in the Shotover and Kawarau Rivers, compared to the proposed low rates of dewatering. • A Dewatering Management Plan is proposed as part of the Construction Management Plan. I am comfortable this will provide the a framework to manage effects adequately, particularly given it will require future approval from ORC).
Q:	Are there any other matters that appear relevant to you that have not been included? Or is additional information needed? Please specify what additional info you require and why [please explain]
R:	No, I have not identified any other outstanding issues.
Q:	If granted, are there any specific conditions that you recommend should be included in the consent? Beyond those that have been proposed in Appendix O
R:	There does not appear to be any monitoring of groundwater quality proposed as part of this consent (beyond the dewatering). The historic DaD discharges have impacted groundwater on the delta significantly and should be monitored over time until they have all decreased substantially. This monitoring was proposed as part of the temporary discharge consent and would be in place until 2030. If this consent is granted, the proposed groundwater monitoring would be adequate. However, if consent is not granted, then to the best of my knowledge there would be no requirement to monitor the DaD related effects, which is not adequate. Whatever consents are granted and operational, I recommend that monitoring continue until at least 2030. I also recommend that some limited monitoring around the WWTP is required to monitor the long-term operation of the WWTP. I am currently unclear whether monitoring is already included in the existing consents for the WWTP.
Q:	Do you agree with the Applicant's assessment of effects on the discharge component of the application? i.e. stating that the discharge is largely beneficial for aquatic communities/values.

R:	I have not addressed this question at this stage because my understanding is that a review of the effects of the discharge on aquatic communities is outside the scope of this review.
Q:	Have the cumulative effects of the discharge activity been appropriately assessed? Is there any additional information required from the applicant to adequately assess these effects.
R:	Yes – I agree the cumulative effects on groundwater quality are positive (i.e. the proposed activities will result in a reduction of effects from the status quo). Yes – I agree that dewatering related cumulative impacts on groundwater and surface water resources/allocation are negligible based on the temporary nature of the proposed dewatering activities.

3.0 Closure

Thank you for the opportunity to complete this review. Please don't hesitate to contact the undersigned with any further questions.

Regards,

SLR Consulting New Zealand Limited

Regards,

Tim Baker
Practice Manager – Hydrology & Hydrogeology