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RE: RM20.164 Kingston Township Wastewater – Discharge Treated Effluent into Land AEE: Aquatic Ecological and Surface Water Technical Review

1 Introduction

Queenstown Lakes District Council (QLDC) (hereafter the applicant) is applying for resource consent to develop a community wastewater treatment scheme for Kingston Township (Kingston) and discharge treated wastewater effluent to land. Lowe Environmental Impact (LEI) (May 2020) have completed an Assessment of Environmental Effects (AEE) on behalf of the applicant. Kingston currently use individual septic tank systems to treat wastewater, which is believed to adversely affect the groundwater quality in the area and subsequently the receiving water body of Lake Wakatipu (LEI, February 2020).

The wastewater treatment plant (WWTP) and land treatment area (LTA) are proposed to be situated within a parcel of land approximately 1.2 km south of Lake Wakatipu and the Kingston lake margin, known as "Kingston Station". The originally proposed LTA site is adjacent to the Kingston Flyer railway line and an un-named tributary of Lake Wakatipu and was approximately 15 ha (Figure 1). The land treatment area (LTA) is now proposed to cover approximately 17.5 ha within the original location and a further 7.5 ha within a secondary location further to the east (Figure 2). The LTA is proposed to be managed as a "cut and carry" system whereby grass pasture is grown, harvested and removed from site. The WWTP site is not included in the assessment of environmental effects.

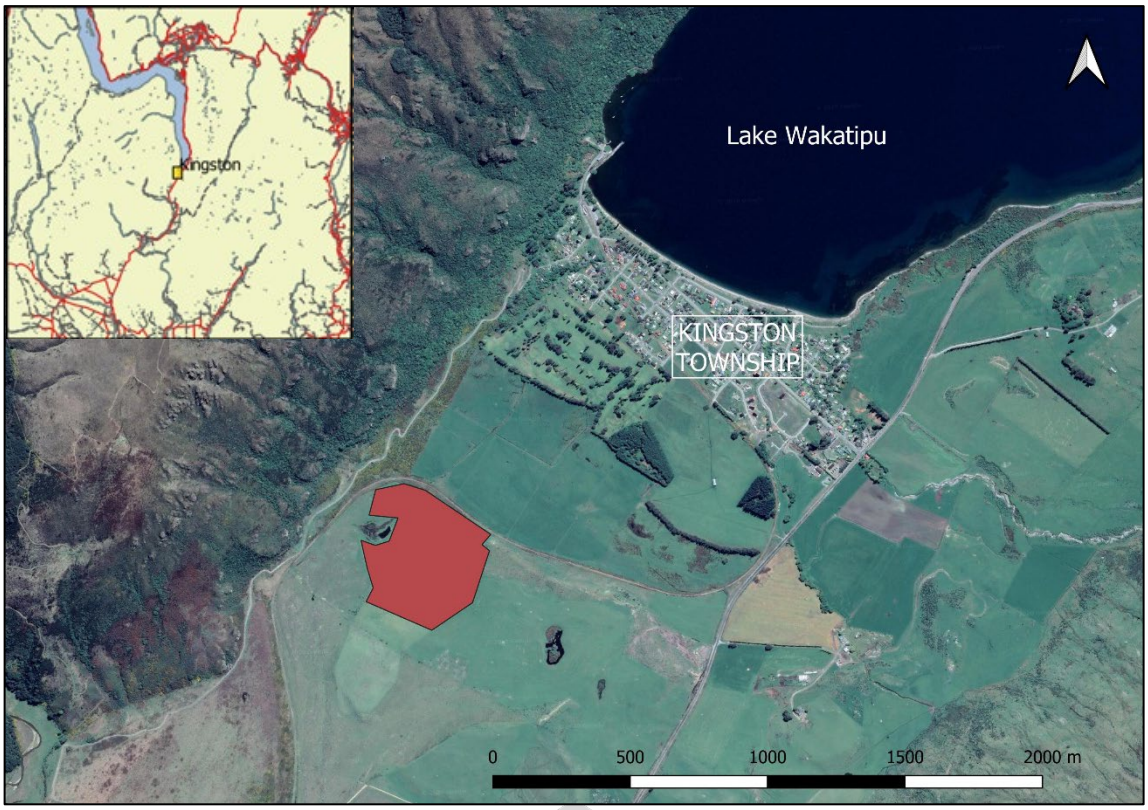

Figure 1: Location of original pre-application proposed land treatment area (LTA) (red) and Kingston township within the Draft AEE (LEI, February 2020).

Figure 2: Location of updated proposed land treatment areas (LTAs) (orange), now titled Land Treatment Command Area within the Final AEE (map sourced from LEI, May 2020).

1.1 Scope of Work

This report provides a technical review of the final AEE (LEI, May 2020) for ORC, with regard to the aquatic ecological and surface water effects on surrounding water bodies/Lake Wakatipu as a result of the proposed treated effluent to land discharge.

2 Surface Water

2.1 Features

The applicant has identified the following possible surface water receptors in proximity to the LTA:

1. Lake Wakatipu (1.5 km north)
2. An unnamed tributary on the western side of Kingston village
3. Kingston Creek (650 m to the north/north-east)
4. Two small ponding areas, one of which "may"[i] be within the LTA.

However, as further discussed in Section 3, there is also a wetland adjacent to and west of LTA2 and an ephemeral pond in a depression within the northern boundary of LTA2.

2.1.1 Lake Wakatipu

LEI (2020) have provided the general description for the lake and provided the results of water quality at the Kawarau outlet. However, there is no local description of the Kingston lakeshore environment or water quality at Kingston.

2.1.2 Unnamed tributary

LEI have described the tributary as ephemeral on Kingston Station and as having more permanent flow within the Kingston village. During their site visit, they did not identify any connection from the LTA to the tributary. The flow characteristics and groundwater connectivity of the creek are unknown. As discussed in Section 3, e3s identified that there may be connectivity between the wetland and the tributary.

[i] LEI (2020) have stated the pond may be within the LTA; the LTA map they provided identifies it partially within the boundary.

2.1.3 Kingston Creek

LEI have stated that they did not identify any connection from the LTA to Kingston Creek during their site visit. The flow characteristics and groundwater connectivity of the creek are unknown.

2.1.4 Ponds on site

The ponds on site do not have inlets or outlets and are believed to be areas of low permeability. The wetland may or may not be connected to the unnamed tributary.

3 Ecological Values

A site visit to the proposed LTA was completed by e3s on the 17th February 2020. A wetland and an unnamed tributary of Lake Wakatipu adjacent to the proposed LTA site was noted, as was an ephemeral pond along the northern boundary of the proposed LTA site. The ecological values of the wetland and un-named tributary were not assessed in the AEE (LEI, February 2020), however e3s provided an overview of ecological and surface water values, potential effects and recommended consent conditions in a pre-application technical review of the draft AEE (LEI, February 2020) on behalf of Otago Regional Council (e3Scientific Ltd, February 2020). The potential surface water flow paths identified within the pre-application technical review by e3s have not been further investigated within the final AEE and the creation of a wetland within the unnamed tributary, which was identified within the pre-application meeting with the applicant (17th February 2020), is not included (LEI, May 2020). This wetland was considered, along with the proposed riparian planting, to mitigate the potential for ecological and surface water adverse effects occurring.

The application now proposes to include two separate land treatment areas (LEI, May 2020). The area that was included in the pre-application draft AEE (LEI, February 2020), referred to as LTA 2, and an additional LTA area (LTA 1). LTA 2 is proposed to increase in size from ~15 ha to ~17.5 ha and includes a steep gully feeding into the ephemeral pond identified by e3s in February 2020. The ephemeral pond and the recommended 10 m riparian buffer should be outside of the proposed LTA boundaries. Please refer to e3s' pre-application review for a full review of ecological and surface water values of LTA 2 (e3Scientific Ltd, February 2020).

LTA 1 covers an area of ~7.5 ha to the east of LTA 2 and looks to also include a section of pond within its' proposed boundary (Figures 2 & 3). It is noted that no hydraulic conductivity tests were completed within the proposed LTA 1 (see Figures 2.7 & 2.8; LEI, May 2020) and no aquatic values are provided for this pond.

Figure 3: Looking south across the pond area within proposed LTA 1. Top photo taken February 2020 (source: B. Miller); Bottom photo taken June 2018 (source: Figure 2.17; LEI, May 2020).

4 Ecological and Surface Water Quality Effects

The application refers to the e3Scientific Ltd report (February 2020) for an assessment of ecological and surface water effects and include the recommended mitigation and monitoring regime within the proposed conditions of consent. It is noted that the application has not completed an assessment of the aquatic values of any of the identified water bodies nor the potential ecological or surface water effects. e3s provided ORC with recommendations to mitigate and monitor ecological and surface water effects for LTA 2 within the pre-application technical review, however, this was not a full assessment of effects and therefore should not be used as such.

4.1 Potential Pathways for Impacts

4.1.1 Surface water runoff

While much of the proposed LTA is delineated on suitable land upon the terrace, there are several areas of steep gullies, and the ephemeral pond and the actual pond that are within the proposed LTA area. The LTA should be delineated to avoid the ponds and areas of steep slopes to reduce the potential for throughflow and to ensure that the calculated areas are reasonable.

LTA 1 has not been assessed within the AEE (LEI, May 2020) for ecological nor surface water effects from the proposed activity. During a site visit in February 2020, e3s noted that there was a steep gully directly to the east of this pond and potentially a culvert under State Highway 6 (SH6) at the base of the gully (Figure 4). This could potentially direct surface water runoff into a tributary of Kingston Creek located on the east side of SH6 (shown in Figure 2.20; LEI, May 2020). This was not confirmed however and may or may not be a legitimate surface flow path.

Figure 4: Looking south within LTA 1 at the gully to the east of pond.

4.1.2 Throughflow

The infiltration tests completed were only within LTA 2 and were completed at a depth of 150 mm. Given that the drip lines are to be installed at 300 mm within the Queenstown Lakes District, and that the test pit logs indicate shallow soils (<300 mm deep) overlying silts, these results may not be indicative of the infiltration conditions of the LTAs. Should infiltration conditions vary from those tested, the potential for throughflow and runoff towards surface water features may be higher than that identified by LEI during winter and wet weather events.

4.1.3 Groundwater connectivity

The connectivity of the unnamed tributary and Kingston Creek with groundwater is unknown.

4.2 Possible Ecological Impacts

The potential ecological effects of the proposed LTA sites on the receiving freshwater environments are unidentified within the AEE, but could include:

1. Freshwater habitat degradation from increased nutrient loading. This includes "flipping" of the wetland/pond system via overland and sub-surface contaminant flow;
2. Contaminant pathways to the nearby tributaries and Lake Wakatipu which would negatively impact trout and koaro spawning habitat; and
3. Surface water contamination.

It is considered that potentially the proposed LTA could improve water quality within the Kingston lake margins due to the removal of the individual septic tank system in Kingston. However, without the applicant quantifying the potential adverse effects and the sensitivity of the receiving freshwater environment this cannot be ascertained.

5 Summary and Recommendations

Given that no further investigation of the potential surface flow paths has been attempted by the applicant, the applicants' proposed man-made wetland has been omitted, and no ecological values within LTA 1 water body provided, an ecological and surface water assessment of the surrounding water bodies is required. This ecological assessment should include, but not be limited to:

1. The wetland area adjacent to LTA 2;
2. The unnamed tributary and any flow path from the wetland identified;
3. The lake margins at Kingston Township; and
4. The pond within LTA 1 and any flow path with Kingston Creek identified.

This assessment will provide a good understanding of the sensitivity of the freshwater receiving environments and identify any further mitigation, if necessary. This also aligns with policy statements in the draft National Policy Statement for Freshwater Management to ensure that the health and wellbeing of waterbodies and freshwater ecosystems is maintained or improved (MfE, 2019).

Overall, it is considered that the applicant does not provide sufficient information regarding the ecological values nor the potential adverse effects on the receiving freshwater bodies. It is recommended that the following assessments and mitigation be undertaken:

1. The pond extent is excluded from LTA 1 and a 10 m buffer of native riparian vegetation should occur around the pond. No irrigation within this 10 m should occur (see Appendix A for recommended species list).
    a. Plants should be spaced at no greater than 1 m intervals.
    b. Riparian planting should occur immediately following agreement from the leaseholder and should be maintained.
2. An ecological and surface water impact assessment of all surface water bodies which could be affected by the discharge. This assessment should include the following areas:
    a. The wetland area adjacent to LTA 2;
    b. The unnamed tributary and any flow path identified from the wetland;
    c. The lake margins at Kingston Township (including Kingston Creek and the unnamed tributary confluences); and
    d. The pond within LTA 1 and any flow path identified to Kingston Creek.
3. The water quality monitoring program within proposed consent condition 15 (p. 83; LEI, May 2020) also includes:
    a. An additional 2 sites at the provided points in Figure 5; one within the LTA 1 pond and one within the LTA 2 wetland.
    b. Sites within the Kingston Township lake margin of Lake Wakatipu which capture the Kingston Creek, unnamed tributary and groundwater inputs.
    c. Analysis for major ions, iron and manganese

Figure 5: Proposed LTA sites with AEE surface and ground water quality monitoring locations (red), and 2 additional surface water sites (yellow) recommended by e3s (Sourced from LEI, May 2020). ***Please note it is assumed that SW 1 to SW 4 are proposed surface water monitoring locations, not groundwater as legend suggests.***

If you have any questions regarding the information provided in this letter, please contact Bryony Miller on 021 883 381 or via email at bryony.miller@e3scientific.co.nz

Yours sincerely,

Bryony Miller
Senior Marine and Freshwater Ecologist

References

e3Scientific Ltd. (February 2020). *Ecological Review of Kingston Township Wastewater Discharge.* Arrowtown: Unpublished e3s technical review for Otago Regional Council.

LEI. (February 2020). *Resource Consent Application: Assessment of Environmental Effects. Discharge of Treated Domestic Effluent into Land, Kingston Township.* Christchurch: Unpublished draft report prepared by Lowe Environmental Impact for Queenstown Lakes District Council.

LEI. (May 2020). *Resource Consent Application: Assessment of Environmental Effects. Discharge of Treated Domestic Effluent into Land, Kingston Township.* Christchurch: Unpublished report prepared by Lowe Environmental Impact for Queenstown Lakes District Council.

MfE. (2019). *Draft National Policy Statement for Freshwater Management.* Wellington: Ministry for the Environment.

MWH. (2010). *Kingston Landfill Closure Plan. Prepared for Queenstown Lakes District Council. November 2010.*

NZWERF. (2002). *New Zealand Municipal Wastewater Monitoring Guidelines (Edited by D.E.Ray).* Wellington, New Zealand: NZ Water Environment Research Foundation.

All maps were created using Google maps basemap and LINZ river environment classification centrelines.

Appendices

Appendix A: Recommended Riparian Species List

Wetland and Pond riparian area	
Common name	**Latin name**
Wineberry	*Aristotelia serrata*
Hen and chick fern	*Asplenium bulbiferum*
Sedges	*Carex spp.*
Red tussock	*Chionochloa rubra*
Mingimingi	*Coprosma propinqua*
Cabbage tree	*Cordyline australis*
Toetoe	*Cortaderia richardii*
Rush	*Juncus edgariae*
Pohuehue	*Muellenbeckia australis*
Mountain flax	*Phormium cookianum*
Flax	*Phormium tenax*
Kowhai	*Sophora microphylla*
Tree Daisy*	*Olearia spp.*
Lemonwood*	*Pittosporum eugenioides*
Manuka*	*Leptospermum scoparium*

***** These species should be planted on raised and drier sites adjacent to the wetland and pond.