ORC NOTIFICATION RECOMMENDATION REPORT

ID Ref: A1505361
Application No: RM20.164
Prepared for: Staff Consents Panel
Prepared by: Sarah Davidson, Consultant- RDA Consulting
Date: 10 August 2021

Subject: **Notification recommendation for application RM20.164 by Queenstown Lakes District Council to discharge treated wastewater to land for the purpose of disposing of wastewater from Kingston Township.**

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1. Purpose

To report and make recommendations under sections 95A-G of the Resource Management Act 1991 (the Act) on the notification decision for the above application.

2. Background Information

Applicant: Queenstown Lakes District Council

Applicant's Agent: Lowe Environmental Impact

Site address or location: Kingston Station- 87 Kingston-Garston Highway (State Highway 6), Kingston

Legal description(s) of the site: Part Run 323A Kingston Survey District (lease under s83 Land Act 1948)

Record of title number and owner:SL201/158 Leasehold under Craig Kenneth Tayler, Patricia Mary Tayler and Timothy George Tayler

Map reference(s): NZTM 126409E 4969804N- Centre Point Land Treatment Area 1
NZTM 126329E 4970155N- Centre Point Land Treatment Area 2

Consent(s) sought: Discharge permit to discharge treated wastewater to land

Purpose: Disposal of treated wastewater from Kingston Township

Section 124 timeframes:

- This is an application for a new activity and so section 124 does not apply.

3. Description of Activity

The application is for a new consent to discharge treated wastewater to land from the Kingston Township. The applicant seeks consent to discharge up to 1,800m^3 of treated wastewater to land for the disposing of wastewater from the Kingston Township at Kingston.

The Kingston Township does not have a reticulated wastewater supply and relies on individual on site wastewater treatment and disposal systems. The Queenstown Lakes District Council (QLDC) are proposing to develop a community wastewater treatment scheme to service the Kingston Township and are therefore applying for resource consent for the discharge of treated wastewater to land.

A new subdivision is proposed within the Kingston Township that requires new infrastructure, including wastewater treatment. The proposed treatment facilities and discharge are part of the Housing Infrastructure Fund request. It is intended that the new treatment facilities and associated discharge will have the capacity to treat wastewater from the new subdivision and the existing township, plus allow for some future growth.

3.1 Quantity of Discharge

The applicant has applied for a peak wet weather flow rate of 1,800m^3/day (1,800,000L/day) and an average dry weather flow of 900m^3/day (900,000L/day). Flow rates have been estimated on the basis of 1,200 dwellings using the figures below:

- Average Day Dry Weather Flow= 250L/person/day;
- Average Occupancy= 3 people/dwelling;
- Dry Weather diurnal peaking factor= 2.5; and
- Dilution/infiltration factor for wet weather= 2.0

The applicant advises that the estimated flow rate also takes into account a small number of new restaurants, cafes and tourist facilities. The additional sources are not likely to change the character of the wastewater from the strength of typical domestic wastewater. The flow rate has also been estimated utilising the existing District Plan zoning and provisions, which limits the number of housing and commercial activities within the Kingston Township.

It is estimated that 225 of the 270-existing individual onsite wastewater systems could be decommissioned and replaced by the community treatment plant. The subdivision would provide additional housing up to a total of 1200 for the Kingston Township. The subdivision is proposed to be staged into Stage 1 and Stage 2. Stage 1 will have 450 lots. Figure 1 below illustrates the development pattern and subdivision, and identifies the areas of potential additional housing.

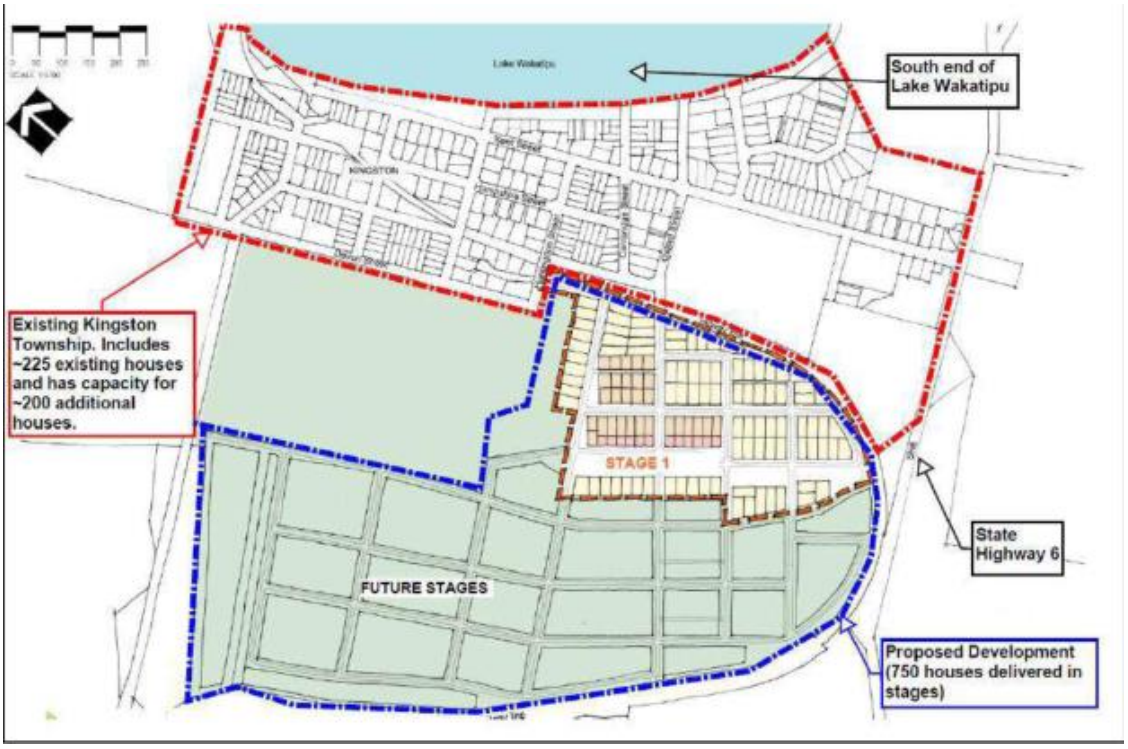

Figure 1. Kingston Township Future Proposed Development (Source: Application)

Pattle Delamore Partners Limited (PDP) on behalf of Council's Resource Science Unit have provided a technical audit of the application and further information and confirm the flow rates are reasonable.

3.2 Quality of Discharge

The applicant has provided a preliminary design of the wastewater treatment system. The preliminary design is discussed below and is separated into two stages. The applicant has applied for both stages.

The applicant proposes to locate the wastewater treatment plant south of Kingston near QLDC's old landfill site near State Highway 6. This location was chosen due to it's separation from the residential areas, reticulation alignments and access for construction, operation and supply of power.

The treatment plant will provide primary, secondary and tertiary treatment in a staged manner to align with the number of properties connected to the scheme. Wastewater influent will comprise of some blackwater from restaurants, cafes and tourist facilities, however the majority of the wastewater flows will be ordinary strength domestic wastewater from individual households. Consent has been sought for a staged approach. Stage 1 of the treatment process will provide treatment of wastewater for up to 450 lots. Figure 1 below demonstrates Stage 1 treatment:

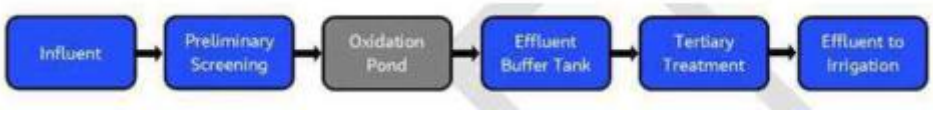

Figure 2. Process Flow Diagram of Stage 1 Treatment (Source: Application).

Once the 450-lot threshold has been reached, Stage 2 of the treatment plant will be implemented. The oxidation pond in Stage 1 will be utilised as a calamity pond and emergency overflow storage to accommodate short periods of treatment system outages. The Stage 2 treatment process is demonstrated in Figure 2 below.

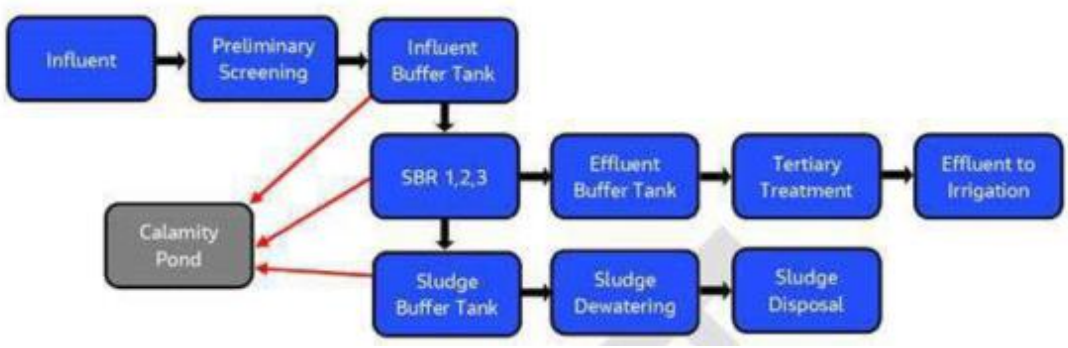

Figure 3. Process Flow Diagram for Stage 2 of the Treatment Plant (Source: Application)

At this stage sequencing batch reactor (SBR) technology is proposed to be used to treat influent that will further be treated by tertiary treatment options. The applicant has proposed the following parameter limits for Stage 1 and Stage 2:

Table 1. Proposed Parameter Limits of Treated Wastewater

Parameter	Stage 1 Limit	Stage 2 Limit
Biological Oxygen Demand (BOD_5)	50mg/L	20mg/L
Total Suspended Solids (TSS)	30mg/L	30mg/L
Total Phosphorus(TP)	10mg/L	10mg/L
Total Nitrogen (TN)	50mg/L	30mg/L
Escherichia coli (E.coli)	10,000cfu/100mL (12 month rolling mean)	10,000cfu/100mL (12 month rolling mean)

A higher BOD_5 limit and Total Nitrogen limit is proposed for Stage 1. The reasoning for this is to accommodate the lighter loading of the plant and the difficulty in operating a large activated sludge treatment system at less than 50% design capacity.

The applicant proposes a total nitrogen loading limit of 450 kg N/ha/year for both Stage 1 and Stage 2 treatment.

3.3 Method of Discharge and Loading Rates

Effluent from the treatment plant will be discharged to a land treatment area (LTA) via subsurface pressure compensating drip irrigation buried at a depth of approximately 200mm and a spacing of 1 m between lines. The applicant advises a dripper depth of 20cm is sufficient to prevent the lines from freezing in winter at this location. The total

command area available for the land treatment area is 25 hectares (Ha), as shown in Figure 4. The amount of land application area required at full development (1200 dwellings) is 15 Ha. The applicant has allowed for 25 Ha for future development and contingency. No less than 5 Ha will be utilised during the initial stage of development.

Figure 4. Proposed Land Treatment Area (Source: Application)

The land treatment area is proposed to be managed by a cut and carry regime and a maximum wet weather application rate of 12mm/day has been proposed based on the hydraulic conductivity of the soils in the proposed LTA area. The expected average loading rate at full development (1200 houses) is approximately 6mm/day. A discussion on soils has been provided further below.

Effluent passing through the soil matrix will be subject to plant and microbial uptake, filtration, adsorption and biological and chemical processes. A pasture and Lucerne cut and carry system is proposed. Cut refers to mowing grass or crops to stimulate growth. Carry refers to removing produced dry matter of site. The applicant advises the nitrogen uptake for pasture is 500-600 kg/ha/year, therefore the minimum sized LTA required for a cut and carry pasture system is 13 Ha to keep the nitrogen loading rate at or below 500 kg/ha/year (plant uptake rate). The applicant proposes a nitrogen loading rate of 450Kg/ha/year based on full development of 1200 houses and a LTA area of 15 Ha for Stage 2.

As discussed above, a higher nitrogen limit is proposed under Stage 1 due to the treatment plant's ability to remove nitrogen. The higher nitrogen concentration in the treated effluent is proposed to be managed by applying wastewater to the LTA over a larger area and meeting the capped nitrogen load of 450 Kg N/ha/year.

Based on a phosphorus (P) concentration of 10 mg/L in the treated effluent and an LTA area of 15 Ha, a P loading of 222 kg P/ha/year is estimated. The plant uptake estimated

using Overseer© is 36 kg P/ha/year. P loading has therefore been estimated as 186 kg P/ha/year across the LTA.

3.4 Description of the Environment

The site is located at Kingston Station on the outskirts of Kingston . Kingston is located at the southern end of Lake Wakatipu, approximately 40 km from Frankton. The township is reliant on individual septic tanks systems. There are not many commercial or retail outlets, with a campground and a café/store. Currently there are an estimated 270 dwellings in the wider Kingston Area that are serviced by individual septic tanks. It is estimated that 225 of the existing properties could connect to the new wastewater reticulation system. The township also relies on groundwater or water collection tanks for water supply. However, consent has been granted for a community water supply north east of the township and a water treatment plant is in conceptual stage. In future the town will be reliant on a reticulated water supply.

The land treatment area is to be located within the rural area. The proposed Queenstown Lakes District Plan zones the existing Kingston Township as Settlement Zone and future development is proposed within the Kingston Valley Special Zone as shown in the Figure below. Subdivision consent has been granted by QLDC to develop this land into 217 residential lots (RM181534).

Figure 5. Proposed Queenstown Lakes District Plan Zoning Kingston (Source: Application)

3.4.1 Climate

The Kingston Climate is characterised by warm dry summers, and cool dry winters. Snow is possible to ground level within Kingston Township in winter. During times of heavy rainfall or rapid snowmelt the shores of Lake Wakatipu can flood. The prevailing weather is directed from the north west or south east and channelled between the mountains and along the valleys.

3.4.1.1 Rainfall and Evapotranspiration

There is limited local weather information available. The closest weather station is 4.5 km from the LTA. Kingston's mean monthly rainfall and soil moisture deficits for the period 1981 to 2010 are shown in Table 2 below. The average annual rainfall for Kingston is 944 mm and the average annual soil moisture deficit is 208mm. GrowOtago data indicates Kingston has an annual average temperature of 10.1-10.5°C. In winter the median air temperature is 5.6-6.0°C and in summer the median air temperature is 14.6-15.0°C.

Table 2. Kingston Monthly Mean Rainfall and Soil Moisture Deficit (mm) (Source: Application)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
Rainfall	88	61	74	75	84	85	70	79	79	87	67	96	944
Soil Moisture Deficit	62	45	20	4	0	0	0	0	0	3	23	46	208

3.4.1.2 Wind

There is limited wind data available for Kingston. Prevailing wind directions are generally from a northerly or southerly direction. GrowOtago suggests an average annual wind speed of 8.1 km/hr to 10.0 km/hr.

3.4.1.3 Soil Temperature

There are no soil temperature monitoring sites within a 30 km radius of Kingston. Cromwell EWs is the nearest site, 50 km northeast of the LTA. Data from this station has been used to estimate the soil temperature at Kingston. The table below illustrates the monthly average 10cm soil depth temperature at Cromwell EWs.

Table 3. Cromwell EWs 10cm Monthly Soil Temperature 2004-2015 (Source:Application)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Average °C	20	19	15	11	6	3	2	3	7	10	15	19

GrowOtago data suggest a winter soil temperature of 3.6-4°C at the proposed LTA, which is comparable to the Cromwell data. It is estimated that the average winter soil temperature is within the range of 2-4°C and it is unlikely that soil temperatures will fall below 0°C.

3.4.2 Geology

Kingston Township lies within a steep sided glaciated valley at the southern end of Lake Wakatipu. Valley deposits comprise of glacial till, alluvial beach deposits and alluvial glacial outwash deposits. Basement rock beneath alluvial soil deposits comprise of schist that extends up into the mountains that lie either side of Kingston. The township comprises more recent alluvial lake deposits and further south are glacial till deposits where the LTA is to be located. The LTA sits approximately 30 m to 60 m higher than the township.

3.4.3 Soils

The soils beneath the LTA are characterised as pallic orthic brown, well drained shallow Maude silty loam. Hadley Consultants Ltd have carried out site soil investigations in 2017 and 19 soil test pits were dug to a depth of 1.5 m to 2.7 m. The location of these test pits are identified on page 10 of the application dated May 2020. Generally silt loam topsoil extends to a depth of 0.2 to 2.5 m below ground level (BGL). Beneath the silt loam glacial till was encountered at depths of 0.9 m to 2.0 m BGL. A full description of the soils across the LTA are provided in Appendix A of the application.

LEI on behalf of the applicant have carried out hydraulic conductivity testing across the site of the LTA to determine the appropriate irrigation rate. Six sites across the LTA were selected for testing. The results are summarised in the Table below and the maximum design irrigation rate based on in the unsaturated K_{-40mm} value is 20 mm/day.

Table 4. Recommended Design Irrigation Rate based on Hydraulic Conductivity of Soils (Source: Application)

Location	Saturated (K_{sat})	Field Unsaturated (K_{-40mm})
Field Measurement (mm/day)	1,996	68
Adjustment (%)	10	30
DIR (mm/day)	199	20.4
Recommended DIR (mm/day)	Maximum of 20	

Phosphorus soil capacity has also been assessed on the site to determine the likely long-term retention of phosphorus. These results are summarised in the Table below.

Table 5. Phosphorus Storage Capacity across LTA (Source: Application)

Sample	Smax	Olsen P	Volume Weight	Olsen P	P Saturation	P Storage Capacity over 1.5 m depth
	(mg/kg)	(mg/L)	(kg/m^3)	(mg/kg)	(%)	(kg P/ha)
K Site 2:	728	9	1,090	8.3	1.13	11907.30
K Site 3:	570	15	1,090	13.8	2.41	9323.76
K Site 5a:	550	10	1,090	9.2	1.67	8987.14

3.4.4 Groundwater

In the original application dated March 2020, information was not provided on the receiving groundwater environment regarding depth, direction and quality of groundwater. A further information request was sent on the 27 July 2020 requesting information on the receiving groundwater environment. A groundwater study has been undertaken and groundwater investigations have been undertaken by the applicant for the past year to obtain relevant data on the groundwater environment.

A total of 7 piezometers have been installed at various locations across the LTA. Bore logs are contained within Attachment 1 of the further information dated 15 March 2021 and a summary of each piezometer is provided on Pages 5-6 of the further information dated 15 March 2021. The location of the monitoring piezometers are identified in the Figure 6 below.

Figure 6. Location of monitoring piezometers (Source: Application)

Water level data loggers have been placed in each of the piezometers and approximately 3 months of recorded data has been processed. The data is presented in Figure 3 of the further information dated 15 March 2021. The study has indicated that the groundwater below the LTA is complex and highly variable. Descriptions for the groundwater environment within each piezometer are provided on Pages 7 and 8 of the further information. In summary water level readings show groundwater is likely to flow towards Lake Wakatipu with depths of groundwater occurring between 15 m to 40 m below ground level beneath the LTA. There is potential for perched groundwater to flow towards the Eyre Mountains. The direction of groundwater has been summarised on Figure 7 below.

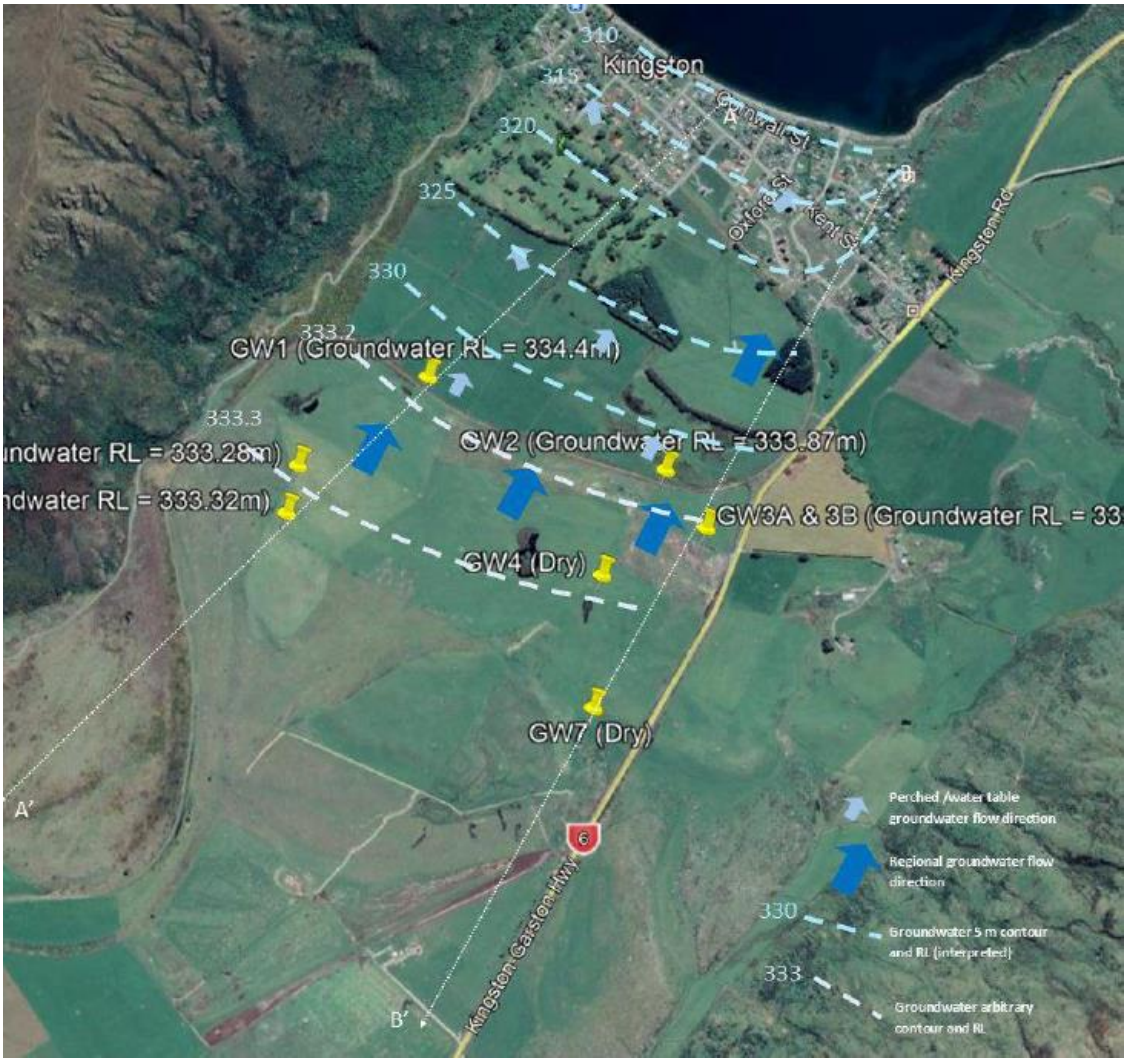

Figure 7. Conceptual hydrogeological flow model of groundwater beneath land treatment area (Source: Application)

Flow gauging has been undertaken by NIWA along an unnamed tributary to the north of the LTA and Kingston Creek to understand loss and gain interactions of surface water and groundwater. The full report has been submitted as part of the further information dated March 2021. The NIWA report shows there is some potential recharging of the unnamed tributary and Kingston Creek.

Groundwater quality monitoring has also been undertaken in the monitoring piezometers. The following parameters were tested:

i. BOD5;
ii. Total phosphorous;
iii. Total nitrogen;
iv. Nitrate-N;
v. NH4-N; and
vi. Field measurements of pH, EC and dissolved oxygen;

The results are identified in the table below based on three sampling rounds.

Table 6. Summary of Water Quality Parameters for Monitoring Piezometers (mg/L) (Source: Application)

Parameter	GW1	GW2	GW3a	GW3b	GW5	GW6
Conductivity	140, 140, 140	69, 66, 66	170, 140, 150	520, 280, 440	-, 190, -	100, 110
DO	11, 10.9, 10.4	9.4, 9.4, 8.8	2.5, 3.5, 9.8	0.6, 0.8, 1.0	-, 10, -	9.4, 8.9, -
pH	5.8, 5.9, 5.7	5.8, 6.0, 5.7	6.3, 6.5, 6.5	7.5, 7.4, 6.9	-, 6.8, -	6.6, 6.6
Ammon. N	<0.01, <0.01, <0.01	<0.01, <0.01, <0.01	<0.01, <0.01, <0.01	<0.01, <0.01, <0.01	<0.01, <0.01, -	<0.01, 0.05, -
$CBOD_5$	<2.0, <2.0, <2.0	<2.0, <2.0, <2.0	<2.0, <2.0, <2.0	4.9, <7.2, <6.0	<2.0, <2.0	<2.0, <2.0
Nitrate-Nitrogen	7.1, 7.1, 7.4	1.3, 1.7, 1.7	4.1, 4.3, 4.7	<0.01, <0.01, 1.2	2.2, 3.4, -	0.29, 0.25, -
T.N.	7.3, 7.5, 6.9	1.9, 1.9, 1.9	4.7, 4.3, 4.8	0.4, 0.63, 1.7	3.7, 3.1, -	0.44, 0.61, -
T.P.	0.07, 0.13, 0.06	0.1, 0.12, 0.05	0.15, 0.47, 0.34	0.39, 0.35, 3.3	<0.01, <0.01, -	<0.01, 0.01, -

GW1 has higher concentrations of Nitrate-Nitrogen indicating a near surface recharge source and reflects current land use practises. GW2 is unlikely to receive overland flow from the above moraine layer and reflects a lower nitrate-nitrogen concentration. GW3a and 3b have significant different chemical signatures and indicate water is sourced from a different water bearing layer separated by low permeability soil. High levels of nitrates have not been observed underneath Kingston Township. The applicant suggests that some attenuation maybe occurring in groundwater beneath Kingston Township. A 2006 report by Otago Regional Council concludes a nitrate level average of 0.44mg/L beneath Kingston Township and highlights high iron content in bore water. The applicant has indicated that high levels of iron can denitrify nitrate-nitrogen within the groundwater and this could be a possible reason for the attenuation beneath the township. In conclusion the groundwater environment beneath the LTA and Kingston is highly complex and possibly recharges nearby surface water bodies. Higher nitrate levels have been observed closer to the LTA reflecting current land uses, whereas less nitrates have been observed in the groundwater beneath Kingston Township indicating some attenuation.

3.4.5 Surface Water

Lake Wakatipu is located to the north of the proposed land treatment area and the LTA is located approximately 1.5 km at its closest point from this water body. The LTA is located approximately 60 m higher in elevation than the lake level. There is an unnamed tributary located to the northwest to north direction of the LTA (identified as SW3, SW2, SW1 and SW7 in Figure 8 below). Kingston Creek is located approximately 500m north of the LTA (identified as SW4 and SW8 of Figure 8 below).

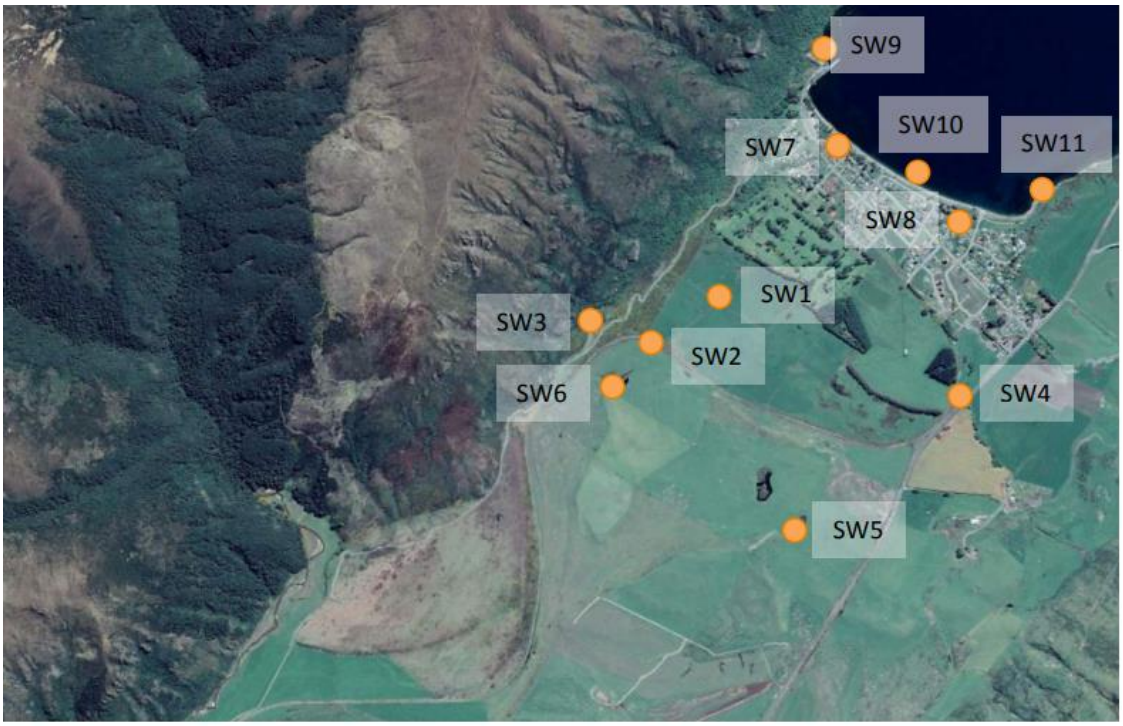

Figure 8. Location of Kingston Surface Water Bodies and Sampling Points (Source: Application)

There are two ponds located within or adjacent to the LTA. These are identified as SW6 and SW5 in the Figure above. SW5 has been drained and does not support any existing aquatic habitat. SW6 is an artificial pond that does not have any direct connection to any surface water body.

An aquatic ecological report by Ryder Environmental Ltd has been submitted in support of the application dated November 2020. A total of 10 surface water samples were undertaken as part of this report that are demonstrated in Figure 8 above. The assessment found that there are no existing surface water connections between the proposed LTA and the identified surface water bodies. As discussed in the groundwater section above, there may be a groundwater connection between Kingston Creek and the unnamed tributary through perched groundwater from the LTA.

The unnamed tributary has a total length of 2 km, flowing from the steep hillside to the west of the LTA, then turning north, entering Lake Wakatipu at Kingston Township. The upstream sites of the unnamed tributary are generally heavily vegetated, and the tributary is poorly defined. SW2 downstream of the tributary is similar to upstream with

a fine soft sediment substrate and heavily vegetated. SW1, downstream of SW2 the channel narrows and is incised and dominated by exotic pasture. The fourth site of the unnamed tributary (SW7) is located within Kingston Township and is located approximately 50m from Lake Wakatipu. The channel here is uniformly open with minimal vegetation and has a mobile, gravel substrate.

Kingston Creek is located approximately 500m north of the LTA. The creek has a total length of 4.5km, flowing from the steep hillside to the east of the LTA. The upstream site (SW4) is located within a grazed paddock, immediately upstream of a culvert on SH6. The channel is open with stock access. Substrate here include soft, fine sediment amongst gravel and cobbles. Patches of vegetation are also present.

The downstream site (SW8) is located within Kingston Township approximately 50m from Lake Wakatipu. The channel here is wide and open with minimal vegetation and mobile, gravel and cobble substrate dominates.

Water quality sampling has also been undertaken, including sampling sites on Lake Wakatipu (identified as SW9, SW10 and SW11 in Figure 8). Full results of the water sampling are available under Table 2 of the ecology assessment by Ryder Environmental Ltd. On the unnamed tributary the downstream site (SW7) had the highest nutrient concentrations. Faecal concentrations were lowest at SW7 but highest at SW3 during sampling. Feral pigs were observed upstream of SW3 during sampling. Total faecal coliforms were highest at SW2 and lowest at SW1.

Nutrient concentrations and turbidity levels were higher at SW8 downstream site on Kingston Creek. Faecal concentrations were higher at the upstream site SW4.

The three Lake Wakatipu sampling sites had similar faecal concentration results and overall, the lowest faecal concentrations out of all surface water bodies within Kingston. Nutrient concentrations varied between the lake sites with dissolved reactive phosphorus highest at the eastern site (SW9) and total nitrogen highest at the mid site (SW10). There is not sufficient data to compare the results against Schedule 15 limits, as five years of data has not been collected.

Macroinvertebrate were also sampled and observed at the sampling sites. A summary of the benthic macroinvertebrate communities is provided on Page 25 of the ecology assessment.

The New Zealand Fish Database (NZFFD) shows records of kōaro and brown trout in Lake Wakatipu. There are also records of brown trout in Kingston Creek on the NZFFD. No records are held for the unnamed tributary.

Kōaro, brown trout and common bully were observed at the downstream site of the unnamed tributary (SW7) during sampling. The report notes that this site is suitable for spawning where gravel substrate dominates. Kōaro was observed in the downstream site at Kingston Creek (SW8) and brown trout was observed in the upstream site. Common bully and longfin eel were observed at SW9 in Lake Wakatipu.

3.4.6 Site Visit

A site visit was not undertaken for this application as there was considered to be sufficient photographic evidence, plans and aerial mapping information of the site to understand the nature of the site.

3.4.7 Recognised values listed in the Regional Plan: Water for Otago

The RPW outlines the natural and human use values of various watercourses throughout the Otago Region. Lake Wakatipu is identified for the following natural and ecosystem values:

- Large water bodies supporting high numbers of particular species, or habitat variety, which can provide for diverse life cycle requirements of a particular species, or a range of species.
- Macrophyte bed composition of importance for resident biota.
- Weedfree
- Presence of riparian vegetation of significance to aquatic habitats
- Presence of significant areas for development of juvenile fish eel, trout, salmon
- Presence of significant indigenous aquatic vegetation
- Presence of indigenous fish species threatened with extinction
- Presence of indigenous invertebrates threatened with extinction

Lake Wakatipu is identified for the following outstanding natural features or landscapes:

Outstanding:

- (a) as a fishery;
- (b) for its scenic characteristics;
- (c) for scientific value, in particular water clarity, and bryophyte community; (d) for recreational purposes, in particular boating;
- (e) for historical purposes;
- (f) for significance in accordance with tikanga Maori, in particular sites at the head of the lake, and the legend of the lake itself.

Scenic values within the wider landscape context of the surrounding mountains, particularly:

• clear blue colour of the water,
• river deltas, and
• beaches, particularly uncommon beach features between Rat Point and White Point.

Lake Wakatipu is identified as a significant habitat for kōaro including many tributaries and has significant vegetation with rare association of aquatic plants.

Kingston Creek is identified for the following natural and ecosystem values:

- Boulder bed composition of importance for resident biota
- presence of riparian vegetation of significance to aquatic habitats
- weedfree
- presence of indigenous fish species threatened with extinction
- presence of significant fish spawning areas.

Schedule 1AA identifies Kōaro as a declining native freshwater fish.

Schedule 3B identifies the location of groundwater takes for the purpose of community water supply. There is no Schedule 3B community water supply takes located in close proximity to the discharge.

Schedule 1D identifies the spiritual or cultural beliefs, values or uses associated with water bodies of significance to Kai Tahu. The following Kai Tahu values are associated with Lake Wakatipu:

- Kaitiakitanga – the exercise of guardianship by Kai Tahu in accordance with tikanga Maori* in relation to Otago's natural and physical resources; and includes the ethic of stewardship.
- Mauri – life force; for example the mauri of a river is most recognisable when there is abundance of water flow and the associated ecosystems are healthy and plentiful; a most important element in the relationship that Kai Tahu have with the water bodies of Otago.
- Waahi tapu and/or Waiwhakaheke – sacred places; sites, areas and values associated with water bodies that hold spiritual values of importance to Kai Tahu.
- Waahi taoka – treasured resource; values, sites and resources that are valued and reinforce the special relationship Kai Tahu have with Otago's water resources. Code Access/Customary Use Interests:
- Mahika kai – places where food is procured or produced. Examples in the case of waterborne mahika kai include eels, whitebait, kanakana (lamprey), kokopu (galaxiid species), koura (fresh water crayfish), fresh water mussels, indigenous waterfowl, watercress and raupo.
- Kohanga – important nursery/spawning areas for native fisheries and/or breeding grounds for birds.
- Trails – sites and water bodies which formed part of traditional routes, including tauraka waka (landing place for canoes).
- Cultural materials – water bodies that are sources of traditional weaving materials (such as raupo and paru) and rongoa (medicines).

4. Status of the Application

Rule 12.A.2.1 of the Regional Plan: Water ("RPW") states:

Except as provided for by Rules 12.A.1.1 to 12.A.1.4, the discharge of human sewage to water, or onto or into land in circumstances where it may enter water, is a ***discretionary*** *activity.*

The provisions of Rules 12.A.1.1 to 12.A.1.4 that are not met are:

- The discharge exceeds 2,000 litre per day

Under Rule 12.A.1.4 the system's disposal field is required to be sited more than 50 metres from any surface water body. There are two ponds located within the vicinity of the LTA that are located within 50m of the discharge. Therefore, the 50m setback provision is also not met.

The discharge of water or any contaminant from an industrial or trade premise to water or to land is a discretionary activity under Rule 12.B.4.1. As the discharge will also include a trade premise component, consent is also required under this rule.

Overall, the application is a ***discretionary*** activity.

4.1 Permitted Activities

The National Environmental Standard for Freshwater 2020 (NES-FW) came into force 3rd August 2020. Part 3 of the regulations deal with activities in relation to natural wetlands, including discharges. There are no natural wetlands within 100 m of the discharge area. No other provisions of the NES-FW applies to human wastewater discharges.

Rule 16.3.7.1 of the Regional Plan: Air for Otago (RPA) confirms the following:

"The discharge of contaminants into air from the storage, transfer, treatment or disposal (including land application of treated effluent and sludge, but excluding the burning of sludge and associated solids) of liquid-borne municipal, industrial or trade waste, where the influent liquid waste does not exceed a BOD5 of 850 kg per day;

is a permitted activity, providing:

a) Ponds constructed after 1 January 2002 are located at least 150 metres from the closest part of the boundary of the property; and
b) Land application does not occur within:
i. 150 metres from any residential dwelling on a neighbouring property or from a building used for employment purposes on a neighbouring property; and
ii. 20 metres from a formed public road; and
iii. 150 metres from any public amenity area or place of public assembly, excluding formed public roads, and
c) Any discharge of odour, particulate matter, droplets or gases is not noxious, dangerous, offensive or objectionable at or beyond the boundary of the property."

The applicant confirms the typical domestic raw wastewater BOD_5 concentration is 200-400 mg/L. The exact location of the ponds has not been confirmed, however it is acknowledged that there is ample space for the treatment plant to comply with the 150 m setback from the boundary. The LTA meets all criteria under Clause b. The activity can comply with Rule 16.3.7.1 of the RPA.

5. Assessment of Adverse Environmental Effects

5.1 Effects on Soils and Plants

5.1.1 Hydraulic Loading Rate and Effects on Soils

The applicant proposes an average dry weather application rate of 6 mm/day and a maximum application rate of 12 mm/day. This is less than the absorption capacity of the top soil layer. The applicant advises based on S-Maps data the available water holding capacity (AWHC) of the soil is 49 mm per 30 cm depth. Adverse effects on soil structure can occur when the application depth exceeds the AWHC and limit treatment of contaminants within the soil profile. In this case the application rate represents less than half the AWHC.

5.1.2 Total Suspended Solids

The applicant has stated that after treatment the wastewater discharged will have low suspended solid concentrations of an average of 30 mg/L following tertiary treatment at the WWTP. A rubber diaphragm in the dripper filters is proposed that will assist in preventing blocking and any residue at the drippers will be flushed out during routine maintenance. Suspended solids entering the soil matrix at any significant volumes will be low and unlikely to cause any soil blockages. Given the low concentration of suspended solids in the wastewater, the nature of the soils at the site, the effects on soil are expected to be no more than minor.

5.1.3 Biological Oxygen Demand (BOD_5)

Excessive BOD_5 concentrations within the wastewater discharged can also clog soil pores. A healthy soil environment can assimilate up to 600 kg BOD_5/ha/day. The land disposal area covers an area of a minimum of 15 ha and up to 9,000 kg BOD_5/day could be applied. With a maximum BOD_5 concentration of 20mg/L and an average flow of 900 m^3/day, the BOD load will be 18 kg BOD_5/day (45 kg BOD_5/day in Stage 1), which is significantly less than this. The effects of BOD from the discharges on the soil are expected to be no than minor.

5.1.4 Drainage and Runoff

PDP have advised that the likelihood of run off is low given the high infiltration rates of the soil testing information provided in the application. Infiltration rates of the soil can reduce overtime and this can be mitigated through on-going conductivity testing. The loading rate is appropriate for the soil type and adverse effects on soils as a result of the loading rate are expected to be no more than minor.

The applicant advises the sodium adsorption ratio (SAR) is likely to be in the order of 4-7. When the SAR is greater than 9, the soil's infiltration rate can be affected due to the dispersion of clay particles. As the SAR ration is less than 9 and through on going conductivity testing, the soil's drainage capacity is not expected to be affected in a more than minor manner.

5.1.5 Heavy Metals

The wastewater will primarily be of domestic nature with some commercial wastewater such as restaurant facilities. The nature of the commercial wastewater will be of similar strength to domestic wastewater. No industrial wastewater is proposed or included in the application. The accumulation of heavy metals within the soil is expected to be no more than minor due to the domestic nature of the discharge.

5.2 Effects on Groundwater

The discharge has the potential to introduce and increase nitrogen and pathogen concentrations within the groundwater. The effects of nutrient concentrations is discussed further below.

5.2.1.1 Nitrogen Leaching

Nitrate-nitrogen is mobile through the soil and has the potential to adversely affect groundwater, including drinking water supplies and decrease groundwater quality.

Groundwater monitoring data shows the areas most concentrated in nitrate-nitrogen present within the groundwater is near the proposed land treatment area. Nitrate-nitrogen concentrations reduce under Kingston Township. The applicant has indicated some attenuation is occurring under Kingston Township due to elevated iron concentrations. PDP have noted that the existing septic tanks within the township provide a source of organic carbon and if septic tank discharges cease, the potential for denitrification under Kingston maybe reduced. Sampling results by Ryder Environmental Limited through a single sampling round shows degraded water quality, including on Lake Wakatipu with respect to total nitrogen and *E.coli.* There is insufficient data to confirm if water quality meets Schedule 15 limits. It is possible that the proposed discharge could degrade water quality further through transport of nitrate-nitrogen through groundwater. A discussion on surface water effects is provided below. It is essential that the discharge is managed in a way to not increase nitrogen within the groundwater environment which ultimately may further degrade groundwater quality and subsequently surface water quality. The applicant proposes a number of mitigation measures to manage the effects of nitrogen leaching. These are discussed further below.

PDP have reviewed the application on behalf of Council's Resource Science Unit and have raised concerns over the increase in nitrogen leaching. The memorandum by PDP dated 14 April 2021 has estimated pre- development leaching from existing septic tanks within the Kingston Township as 5.2 kg/N/year/dwelling, which equates to 1170 kg/N/year for the township. This is a conservative estimate based on a nitrogen concentration of 50mg/L. PDP have raised that it is possible that not all septic tanks that are eligible to connect will connect to the new scheme. Therefore, consideration should be given to the effects of leaching from existing septic tanks in combination with the proposed discharge under different development scenarios. If the township does not fully connect to the reticulation, there could be increases in nitrogen leaching as the size and occupancy of the township increases. The applicant has provided additional information on nitrogen leaching under potential development scenarios and provided the results on Table 1 of the memo dated 11 June 2021, the Table has been reproduced below.

Table 7. Nitrogen leaching modelling under potential scenarios (Source: Application)

	A.1 1.5 person per lot	A.2 3 person per lot	B	C	D	E	F (ORC water plan permitted baseline)
Township septic tanks no	225	225	0	0	225	425	425
Township leaching at 5.2 kg N/tank/yr per 1.5 people	1170	2340	0	0	2340	4420	4420
Total Nitrogen applied to LTA (kg N/y)	0	0	6570	6570	4337	6570	0
Areal loading rate N to LTA (kg N/ha/y)			438	438	356	438	
Total LTA N Leached (kg N/yr)	225	225	2130	2628	1731	2130	225
Areal Nitrogen leaching rate LTA (kg N/ha/yr)	15	15	142	175	115	142	15
LTA area (ha)	15	15	15	15	15	15	15
Subdivision area (ha)	55	55	55	55	55	55	55
N leached from Subdivision land (kg N/ha/yr)	15	15	2	2	2	2	15
N leached from Subdivision (kg N/yr)	825	825	110	110	110	110	825
Total N Leached (LTA, Village and Subdivision) (kg N/yr)	2220	3390	2240	2738	4181	6660	5470
Change from Baseline (Scenario A.1)	0	1170	20	518	1961	4440	3250
Change from Permitted Baseline (Scenario F)	-3250	-2080	-3230	-2732	-1289	1190	0

Notes

[1] Scenario A.2, D, E and F assume 3 people per septic tank leaching 10.4 kg N/y

[2] Scenario E is not valid as the subdivision Plan Change was for up to 744 residential lots only, all other scenarios have been rounded to 1,200 lots (744 new plus 225 existing plus 200 Kingston infill)

[3] Scenario F, ORC permitted is added to show the nitrogen losses currently permitted under ORC water Plan rules with no subdivision and an increased occupancy for 3 person per lot

The baseline for the total nitrogen leached over the whole Kingston village, proposed subdivision area (undeveloped) and 15 ha Land treatment area (LTA) is 2,220 kg N/yr. The worst-case Scenario D (where 225 existing septic tanks in Kingston village remain but with an increased resident population of 3 person per lot and the new subdivision area along with village infill is developed) will leach a total of 4181 kg N/yr. Scenarios B & C also will leach nitrogen at a volume over 2,220kg N/yr. The applicant has volunteered a condition where the total mass of nitrogen leached to groundwater using a nitrogen mass balance calculation must not exceed 1,050kg N/year, where the existing 225 septic tanks are not reticulated to the WWTP. For every property within the Kingston Village that connects to the WWTP, the applicant proposes to increase the mass of nitrogen under the LTA by 5.5 kg N/year, reflecting a single household. Should all 225 septic tanks connect combined with the 975 new lots (Scenario B of Table 7), potential nitrogen leaching under the LTA could be up to 2,220kg N/yr. This is similar to the baseline which is currently leached by the 225 septic tanks in Kingston Village. The condition proposed will ensure nitrogen leaching does not increase from what is occurring within the existing environment. Furthermore, should nitrogen leaching from the discharge be found to be causing adverse effects, further mitigation measures can be implemented. This includes increasing the size of the LTA from 15ha to 25ha and as development stages occur. There is also opportunity to improve treatment at the treatment plant.

Higher concentrations of nitrogen have been found in groundwater monitoring bores near the discharge site, reflective of land use practices. Policy 13 of the National Policy Statement for Freshwater Management 2020 (NPS-FM) requires the condition of water bodies and freshwater ecosystems is systematically monitored over time, and action is taken where freshwater is degraded, and to reverse deteriorating trends. Given there is national direction to improve water quality to reverse deteriorating trends, the nitrogen leaching under potential future scenarios may not achieve this (maintenance of existing baseline nitrogen leaching levels) and as such the effects on the wider groundwater environment within the catchment are considered to be more than minor.

Nitrogen leaching can be a significant issue in winter, where plant uptake is low and it is expected nitrogen leaching values will differ throughout the year. The applicant has provided Overseer© modelling to model the long-term nutrient losses from the proposed LTA. The model assumes that the treatment plant is at full capacity ($900m^3$/day) with all dwellings occupied at 3 persons per household for 365 days of the year. The nitrogen load onto the LTA is proposed to be restricted to 450 kg N/ha/year. Under a worst-case scenario where there is a season variation with high winter nitrogen loading, the months of July and August could see 55.7kg N/ha being applied and N loss from this scenario will equate to a N loss of 178kg/ha/year for a 15ha LTA. It is more likely however that seasonal loadings will occur in Summer, given historical visitor patterns, where plant uptake is higher. Based on an annual average discharge volume of $900m^3$/day with a monthly average nitrogen concentration of 20mg/L over 15Ha, 142 kg N/ha/year from the 15Ha LTA is likely to be leached. This is the most likely scenario given historical visitor patterns in Kingston.

The applicant has demonstrated that plant uptake increases between October to April is low from May to September. The amount of nitrogen that plants are removing from the system ranges from 2.2 kg N/ha in winter to 104.1 kg N/ha/month in summer. In the Overseer© modelling from the application using Lucerne as a crop, a total yield of 12 t with the wastewater application has been predicted. The model is based on a total

annual growth of 12 t dry matter (DM)/ha and being harvested three times a year in January, April and November, with 4t/ha being removed at each harvest. Based on Dairy NZ data, under irrigation, Lucerne can grow up to 21 t DM/ha/year. If bigger yields of Lucerne are achieved through wastewater irrigation, more N will be removed from the system in plant uptake and N leaching will be lower. Lucerne is a suitable crop for the wastewater system and suits the soils and climate of Kingston. Selection of a suitable crop and management of the cut and carry system will assist in mitigating adverse effects of nitrogen leaching.

The applicant has also used Overseer© modelling to model pre and post scenarios to calculate mass nitrogen leaching within the catchment. The nitrogen leaching baseline the applicant has used for the existing farming activities within the LTA is 16kg N/ha/year and this is expected to increase to 142 kg N/ha/year, as previously highlighted. The scenarios are presented in the Table below. The applicant considers the leaching rate of 142 kg N/ha/year is equivalent to what could be leached during winter from an intensive winter forage crop grazing regime and notes the proposal is moving the concentrations of nutrients from the Kingston Township, near Lake Wakatipu to farmland south of the proposed subdivision.

Through modelling the applicant has demonstrated that the activity can reduce nitrogen leaching from the current land use practises. This however will be dependent on the number of connections to the scheme and leaching potential. Scenario 2 shows an increase over the calculated baseline; however, it is noted that the applicant proposes a leaching limit of 140 kg N/ha/year (Scenario 1). Scenario 6 shows permitted activity potential with existing septic tanks and if all new lots were all serviced by individual on-site septic tank systems, permitted under the RPW. In this case, a permitted activity baseline cannot be applied to the activity as the discharge is not permitted, however Scenario 6 does show the effects of individual on site wastewater systems that are permitted.

Table 8. Pre and post development scenarios for Nitrate-N leaching (Source: Application)

Scenario	Persons per household (at existing Kingston properties)	Pre-development leaching – Existing Township plus LTA and Subdivision Grazing (kg/yr)	Post-development leaching (kg/yr)	Flux (-decrease, +increase over current state) (kg/yr)
1	LTA Leaching modelled at 142 kg N/ha (32% of total load leached) and 15 hectares of LTA			
	1.1	1,900	1,853	-47
	3	3,246	2,120	-1,144
2	LTA Leaching modelled at 178 kg N/ha (40% of total load leached) and 15 hectares of LTA			
	1.1	1,900	2,316	416
	3	3,246	2,628	-618
3	LTA Leaching set at 135 kg N/ha (43% of total load leached) and 21 hectares of LTA			
	1.1	1,996	1,654	-341
	3	3,342	1,877	-1,465
4	No community connection, 370 Lots, 27.5 ha subdivision and 15 ha LTA Leaching 43 kg N/ha/yr (32% of applied N leached)			
	3 per new development	680	648	-32
5	No village connection, 975 Lots, 55 ha subdivision and 21 ha LTA Leaching 88 kg N/ha/y (32% of applied N leached)			
	3 per new development	1,216	1,708	492
6	Status quo: Mass balance for just the Kingston Village and 200 additional new community advanced septic tanks on existing consented sections, no subdivision Lots			
	3 per new development	2,126	3,206	1,080

PDP have raised that the level of treatment at the treatment plant could be improved to 10 mg/L of nitrogen. The applicant advises this would present more operating costs for heating, aeration and potential carbon dosing during denitrification phase of the treatment. The applicant advises in future there is potential for improved treatment at the plant to meet future regulation such as the national three water review and if there are adverse effects occurring from results under the proposed monitoring programme.

There are uncertainties using Overseer© for wastewater discharges. Overseer© is commonly used to identify nutrient loss from farming operations. Overseer© has been used as an assessment tool for nutrient leaching effects for the Foxton wastewater treatment plant and associated discharge in the environment court in the decision Horowhenua District Council vs Manawatu-Wanganui Regional Council 2018 [1]. In the summary of key findings, the Court found there was no way currently available to reliably determine existing or future effects of treated wastewater discharges from the Foxton Wastewater Treatment Plant on the Manawatu River and Estuary or monitor the benefits of the proposal. A similar principle applies to this activity and there is a level of uncertainty of the actual and potential effects of the discharge using Overseer© modelling and the effects on surrounding water bodies. It provides some indication on the likely effects, however the use of Overseer© has recently been reviewed by the

[1] Horowhenua District Council vs Manawatu-Wanganui Regional Council [2018] NZEnvC 163

Ministry for Primary Industries and the Ministry for the Environment[2]. The independent Scientific Advisory Panel appointed to review Overseer© has confirmed in its current form, it would not have confidence that Overseer's estimates of nitrogen lost from farms are suitable for use as a stand-alone measure of total losses. Albeit this review applies to farms, it is noted that the wastewater discharge in this case will occur within a working farm and operated as a cut and carry system, forming part of the farming operation. Given the uncertainty of Overseer© modelling, the effects of nitrogen leaching within the wider environment from the discharge is difficult to conclude.

5.2.1.2 Nitrogen and Drinking Water

Nitrate-nitrogen is mobile through the soil and has the potential to adversely affect human health if present in high concentrations in drinking-water. The Drinking Water Standard for New Zealand 2005 reviews 2012 specifies a Maximum Acceptable Value for nitrate-nitrogen of 11.3mg/L.

The applicant has undertaken groundwater sampling of nitrate-nitrogen in a number of sampling bores as discussed in Section 3.4.4 of this report. Water quality testing results from the area showed current nitrate-N concentrations in the groundwater of up to 7 mg/L closest to the proposed LTA site. This is not unusual given the presence of farming activities. The applicant has used an Overseer© model that provides a concentration of nitrogen in drainage as 6 mg/L from the proposed discharge activities. The concentration is below the Drinking Water Standards.

The nearest bore is F42/0136 which is a monitoring bore for the Kingston Closed Landfill, approximately 130m north and east of the discharge site. This bore is unlikely to be used for drinking water purposes. The next closest bore is at least 600 m away. The discharge will see either similar or slight improvements to groundwater quality beneath the site. given there will only be a similar or slight improvement in groundwater quality beneath the site, the effects are considered more than minor.

5.2.1.3 Phosphorus

Based on a phosphorus concentration of 10 mg/L and an LTA size of 15Ha, a phosphorus (P) loading rate of 222 kg P/ha/year is estimated by the applicant. Using Overseer© plant uptake and export is estimated to be 36 kg P/ha/year, the net P loading to the soil matrix is therefore estimated to be 186 kg P/ha/year. Soil testing undertaken by the applicant shows the soil within the LTA can retain a large amount of P. P is a cation and is not very mobile within the soil profile. P retention undertaken by the applicant estimates that P supplied to the LTA at full loading rates can be retained within the first 1.5 m of the soil profile for 54 years before there would be significant P migration to lower subsoils and consequently groundwater. The storage potential is greater than the consent term proposed by the applicant. Leaching of P from the discharge is expected to be no more than minor given the low application rate, the high storage potential, Lucerne uptake and the distance of groundwater beneath the LTA.

[2] The Government response to the findings of the Overseer peer review report, Ministry for the Environment, (August, 2021)

5.2.1.4 Pathogens

The applicant advises a study by Boher and Converse (2000) conducted in Wisconsin for drip irrigation systems of treated wastewater in coarse sand to clay loam showed beyond 450 mm of soil depth, faecal coliform count was below detection limits. At 150 to 300 mm soil depth faecal coliform count ranged from 2 to 24 MPN per gram of soil. In this case the receiving groundwater depth will ensure treatment and removal of pathogens in the soil matrix prior to pathogens entering groundwater. The rate of application (6 mm/day) will also assist in optimising soil treatment of pathogens. The treatment of pathogens at the treatment plant (10,000 cfu/100mL 12 month rolling mean) will also mitigate potential pathogen contamination in groundwater. PDP have advised the potential effects of pathogens to groundwater is low but ongoing monitoring of surface and groundwater of *e.coli* will be required to ensure adverse effects of pathogens are no more than minor.

Overall, potential adverse effects on groundwater in respect of the wider environment are expected to be no more than minor, however there are expected to be localised effects. A discussion on affected parties has been undertaken further below.

5.3 Effects on Surface Water

Wastewater discharges to land may contaminate surface water via groundwater or from overland flow during disposal system malfunction.

A description of the surface water bodies has been undertaken in Section 3.4.5 above. There are two ponds located within close proximity of the land treatment areas. E3 Scientific have undertaken a technical audit of the surface water and ecological components of this application and have recommended a 10m buffer between the LTA and each of the ponds and riparian planting to be undertaken. The assessment by Ryder Environmental has found these ponds are not connected to surface water.

A small unnamed tributary of Lake Wakatipu is located to the north of the proposed land treatment area. It is possible groundwater is connected to this water body. The applicant has stated macroinvertebrates communities identified in this water body are generally tolerant to degraded habitat and there are no surface contaminant pathways. E3 Scientific accept this, however considers more baseline data is required to ensure the proposed discharge will not increase adverse effects on the surrounding ecology and water quality of the water body. Only one sampling set has been undertaken and presented in the application. E3 Scientific recommend a years' worth of monitoring prior to commencing the activity to ascertain current water quality. The sampling that has been undertaken is showing degraded water quality and E3 Scientific consider more monitoring is required to ensure the discharge does not exacerbate the degraded habitat.

Likewise, sampling results on Kingston Creek also indicates degraded water quality and habitat and E3 Scientific have recommended more sampling be undertaken to fully understand the receiving environment prior to giving effect to the consent.

In respect of Lake Wakatipu, the single sampling event shows that there appears to be existing adverse effects on water quality at the site due to nitrogen and *E.coli* concentrations. Lake Wakatipu is identified in Schedule 15 of the RPW as Receiving Water Group 5. The single sampling event has indicated that some results do not meet the target contaminant concentration in Schedule 15. However more sampling is required to confirm this. E3 Scientific recommend sampling be undertaken prior to

giving effect to the consent to provide information on the quality of the receiving Lake Wakatipu. This would assist in providing more accuracy on the quality of the receiving environment and would assist in the identifying the frequency of monitoring required on Lake Wakatipu.

The applicant advises that nitrogen modelling shows nitrogen leaching from the LTA can be maintained at the baseline level of 2,220 kg N/year with 225 existing septic tanks remaining and the staged development of 744 additional lots connected to a reticulated scheme. The application specifies nitrogen levels within the lake are not expected to increase due to the proposed activity, however as discussed previously, there are uncertainties with nitrogen leaching effects. The applicant has specified that if all 225 existing septic tanks from the Kingston Township connect to reticulation, then concentrations of contaminants will shift away from the township area to Kingston Station, further away from Lake Wakatipu and potentially result in an improvement in freshwater quality. This would result in a better environmental outcome, however this scenario is not guaranteed and all potential future development scenarios need to be considered.

The applicant has provided a number of mitigation measures such as nitrogen loading limits, nitrogen mass balance conditions and on-going monitoring to assist with mitigating the adverse effects of nitrogen leaching, however there is some uncertainties with the receiving environment, in particular the quality of the existing surface water environments. The single sampling round undertaken by the applicant shows degraded water quality for Kingston Creek, The Unnamed Tributary and Lake Wakatipu. It is uncertain if these water bodies meet Schedule 15 limits, however some results show exceedances. Policy 13 of the National Policy Statement for Freshwater Management 2020 (NPS-FM) requires the condition of water bodies and freshwater ecosystems is systematically monitored over time, and action is taken where freshwater is degraded, and to reverse deteriorating trends. Policy 3 requires freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.

Given indicative results show degraded water quality, there is a need to improve water quality under the NPS-FM and to consider the activity on a whole-catchment basis. PDP have advised that the catchment from which leached nutrients are likely to flow beneath Kingston to the lake shore is approximately 320 Ha, as shown in the Figure 9 below. Kingston Township and the undeveloped subdivision with the LTA area is likely to contribute a significant portion of nitrogen leaching to the catchment and represent the largest point source nitrogen discharge in the catchment. Given the possibility that not all existing septic tanks in Kingston will connect to the system, and the size of the new subdivision and associated discharge, improvements to water quality of degraded water bodies within the catchment may not occur. As such the potential effects of the discharge on surface water quality is considered to be more than minor at a catchment level.

Figure 9. Estimated area of leaching likely to contribute nutrients to the lakeshore at Kingston (Source: PDP memorandum dated April 2021)

On-going monitoring of water quality contaminant parameters are proposed and will ensure adverse effects of the discharge can be monitored closely. The applicant advises a number of further mitigation measures can be implemented should the discharge be found to causing adverse water quality effects, such as improved treatment at the treatment plant and increasing the size of the LTA. However, given the uncertainty of the actual and potential effects of the discharge, in particular nitrogen leaching effects, the effects of the discharge on the catchment are considered to be more than minor.

5.4 Effects on Air Quality

The greatest potential for odour nuisance from on-site systems arises from system failure and effluent ponding. Neither of these problems should occur if the treatment and disposal system is maintained properly, and if the treatment plant is located appropriately in an area of low sensitivity.

Overall, potential adverse effects on air quality are expected to be less than minor.

5.5 Effects on Neighbouring Properties

Land to the north of the subject site has recently been rezoned to Kingston Village Special Zone and subdivision has been granted to subdivide this land. This proposed development forms part of the existing environment and it would be reasonably foreseeable that residential housing is established on this land in the future. The discharge will occur approximately 30 m at the closest point to this boundary. Amenity

values on neighbouring properties may be impacted in association with discharging treated human wastewater to land. To mitigate this effect, wastewater will be discharged via subsurface drip irrigation that will assisting mitigating adverse visual effects. The discharge will require careful management to ensure surface ponding does not occur that can lead to adverse visual effects and odours. Nevertheless there is a risk to sensitive receptors and the effects on neighbouring land to the north of the discharge site are considered more than minor, given proposed residential development and the proximity of the discharge to this site.

5.6 Effects on Cultural Values

The discharge occurs adjacent to Whakatipu-wai-Māori Statutory Acknowledgement Area. Further information provided by the applicant discuses mana whenua consultation and values discussed with Aukaha. This information identifies the WWTP will assist in reducing adverse effects on the receiving cultural landscape by removing the township of individual septic tank and introducing improved wastewater treatment. It is acknowledged that under future scenarios existing houses may not opt to connect to the treatment plant and nutrients from the discharge may leach into environment resulting in some minor cumulative effects, this is discussed further. For this reason, the effects on cultural values has been assessed as more than minor. Aukaha, Te Ao Marama Inc. and Te Rūnanga o Ngāi Tahu have been assessed as affected parties to the application.

The discharge is also proposed to occur within close proximity to water bodies and may affect mauri of these water bodies. This includes the ponds located within the farmland. As such effects on cultural values are considered to be more than minor. E3 Scientific have recommended a 10 m buffer be applied to the ponds and native plantings be undertaken. This will assist in mitigating adverse effects on cultural values.

5.7 Public Perception

The applicant has not applied for consent under the Regional Plan: Air for Otago for the wastewater treatment plant, therefore odour effects in terms of the wider environment are expected to be no more than minor. Visual amenity values and aesthetic values do need to be taken into consideration. The treatment of wastewater and associated discharge maybe perceived as an undesirable land use to treat and discharge human sewerage in a rural area, which current land use is farming. The site is also adjacent to the Kingston Village Special Zone and is a sensitive receptor. Consideration should be given if special circumstances apply given the location of the discharge in relation to the Kingston Village. In terms of notification, special circumstances have been defined by the courts as circumstances that are unusual or exceptional, but may be less than extraordinary or unique. Special circumstances do not necessarily apply to the size of the proposal or if concerns have been raised on the proposal by persons. Public interest of the proposal outside the normal circumstances can warrant special circumstances. Given the location of the discharge in relation to the Kingston Village and high profile site, it is considered special circumstances apply.

5.8 Consideration of Alternatives

A discussion on alternatives has been undertaken by the applicant on pages 38-40 of the application dated May 2020. The assessment has included alternative locations for land treatment sites that include Kingston Golf Course and Glen Nevis Station. It is

considered that the land treatment site is the best option over other alternative locations due to the location of Kingston Station being further away from Lake Wakatipu and difficulties in integrating the land treatment area into the golf course.

A number of discharge method options have also been considered by the applicant. Table 4.1 on pages 39-40 outline the suitability of alternative land application systems for the site given the site and soil constraints. The applicant concludes subsurface drip irrigation is the best option for the land application of treated effluent and is suitable for the soils at the subject site and will provide the highest level of treatment.

5.9 Cumulative Effects

Adverse effects can arise from many on-site wastewater treatment systems in close proximity, such as ground or surface water contamination. There is risk that existing septic tanks within the Kingston Township will not connect to the new scheme. The cumulative effects of this scenario have been assessed by the applicant and through Overseer© modelling, the applicant has been able to demonstrate that nitrogen levels within the catchment can be maintained to pre-development levels. The groundwater quality beneath Kingston shows to be degrading, potentially as a result of septic tank discharges within Kingston Township and existing land use practises of the discharge location. The single water quality sampling undertaken on Lake Wakatipu also indicates degraded water quality, however more sampling is required to confirm this.

Lake Wakatipu is recognised as having outstanding characteristics, and cumulative effects need to be managed carefully to protect the values associated with Lake Wakatipu and surrounding water bodies. The applicant has proposed some mitigation measures to ensure nitrogen leaching effects do not exceed baseline values. Consideration needs to be given to potential future scenarios, including retainment of existing septic tanks within the Kingston Township. Cumulative effects may arise as a result of the discharge and existing septic tank discharges in the catchment.

5.10 Hazards and Contaminated Land

Kingston Township has historically been prone to surface flooding when water levels in Lake Wakatipu are high. The LTA is located 60m above lake water levels and is not located within a flood hazard zone. There are no other known natural hazards within the area of the LTA. The effects of hazards on the discharge are expected to be no more than minor.

The Kingston Closed Landfill is located to the north-west corner of the subject site. Monitoring information from the Kingston Closed Landfill Closure Plan shows leachate is no longer being discharged from the landfill in any significant quantities. The depth to groundwater beneath the landfill is estimated to be 11.4-15.3 m below ground level. PDP have advised given the depth, it is unlikely that any groundwater mounding as a result of the discharge will impact the landfill. The risk from the landfill is not expected to significantly alter as a result of the discharge. On-going monitoring of the landfill bore is proposed by the applicant. The risks associated with contaminated sites as a result of the proposed discharge is low and effects are no more than minor.

5.11 Conclusion

Overall, the adverse effects of the proposed activity are more than minor on the wider environment.

6. Notification and Written Approvals

6.1 Section 95A Public Notification

Step 1: Is public notification mandatory as per questions (a) – (c) below?

(a) Has the applicant requested that the application be publicly notified? **No**

(b) Is public notification required by Section 95C? **No**
Has further information been requested and not provided within the deadline set by Council? **No**
Has the applicant refused to provide further information? **No**
Has the Council notified the applicant that it wants to commission a report but the applicant does not respond before the deadline to Council's request? **No**
Has the applicant refused to agree to the Council commissioning a report? **No**

(c) Has the application been made jointly with an application to exchange recreation reserve land under section 15AA of the Reserves Act 1977**No**

Step 2: Is public notification precluded as per questions (a) – (b) below?

(a) Is public notification precluded by a rule in the plan or a NES? **No**

(b) Is the application for one or more of the following activities but no other activities**:**

(i) A controlled activity? **No**

(ii) A restricted discretionary, or discretionary activity, but only if the activity is a subdivision of land or a residential activity? **No**

(iia) A restricted discretionary, discretionary or non-complying activity but only if the activity is a boundary activity? **No**

(iii) A prescribed activity (see section 360G(1)(a)(i)? **No**

Step 3: Does the application meet either of the criteria in (a) or (b) below?

(a) Is the application for a resource consent for one or more activities, and any of those activities is subject to a rule or national environmental standard that requires public notification? **No**

(b) Will the activity have or be likely to have adverse effects on the environment that are more than minor in accordance with Section 95D? **Yes**

The adverse environmental effects on the environment from the proposal are discussed above in this report. Based on this review, I consider that there will be more than minor adverse effects on the wider environment (discounting the site and adjacent sites).

Step 4: Do special circumstances exist in relation to the application that warrant the application being publicly notified? Yes

'Special circumstances' are those that are unusual or exceptional, but they may be less than extraordinary or unique. The application involves large volumes of treated wastewater to land from a large-scale development provided for by the underlying zoning. The scale of an activity does not necessarily warrant special circumstances. In this case the application involves the treatment and discharge of human wastewater from a whole township to land adjacent to a sensitive site that is zoned for residential development and the discharge location is considered to be a high profile site. There is likely to be unique public interest in this activity as discussed in Section 5.7 above.

6.2 Section 95B Limited Notification

Step 1

Section 95B(2) Are there any affected groups or persons identified under Section 95B(2):

(a) Protected customary rights groups? **No**

(b) Customary marine title groups? **No**

Section 95B(3)(a) Is the proposed activity on or adjacent to, or may it affect, land that is the subject of a statutory acknowledgement made in accordance with an Act specified in Schedule 11? **Yes**

Section 95B(3)(b) Is a person to whom a statutory acknowledgement is made an affected person under Section 95E? **Yes**.

Te Rūnanga o Ngāi Tahu have been made an affected party to the application due to effects on cultural values associated with Lake Wakatipu.

Step 2

Is Limited Notification precluded under Section 95B(6)?

(a) Is the application for a resource consent for one or more activities, and each activity is subject to a rule or national environmental standard that preclude limited notification? **No**

(b) **(i)** Is the proposal a Controlled Activity that requires consent under the District Plan (other than a subdivision of land)? **No**

(ii) Is it a prescribed activity under Section 360G(1)(a)(ii)? **No**

Step 3

Having regard to Section 95E of the Resource Management Act, identify persons who would be adversely affected by the proposed activity by effects that are minor or more than minor, but not less than minor and give reasons why affected parties were identified.

The following parties have been identified to be affected parties due to effects on them that are minor or more than minor for the reasons stated below.

Affected Party	**How they are affected**
Public Health South	As discussed in Section 5.2.1.2 there is potential for nitrogen to be leached into groundwater that has potential to have more than minor public health effects. As such Public Health South are considered to be an affected party to the application as the statutory organisation responsible for managing drinking water.
Aukaha	As discussed in Section 5.6 of this report effects on cultural values are considered to be more than minor, as such Aukaha are considered an affected party to the application.
Te Ao Marama Incorporated (TAMI)	As discussed in Section 5.6 of this report effects on cultural values are considered to be more than minor, as such TAMI are considered an affected party to the application.

Te Rūnanga o Ngāi Tahu (TRoNT)	The discharge occurs adjacent to Whakatipu-wai-Māori Statutory Acknowledgement Area. The effects on cultural values on Lake Wakatipu have been assessed as more than minor and therefore TRoNT have been assessed as an affected party to the application.
Department of Conservation (DoC)	The discharge occurs adjacent to Kingston Creek and an unnamed tributary of Lake Wakatipu. Macroinvertebrate sampling indicates the presence of some native fish species. Only one set of water quality sampling has been undertaken on these water bodies and Lake Wakatipu. The quality of the receiving surface water environment is uncertain. The effects on native aquatic values has been assessed as more than minor and as such DoC are considered to be an affected party to the application, who have a statutory function to protect and preserve New Zealand's natural and historic resources.
Kingston Village Limited	The legal landowner of Lots 1-2 DP 12725 and Section 18 Block I Kingston Survey District (north of the subject site) is considered to be an affected party to the application due to the proximity of the discharge to this site and the high sensitivity of this receiving environment, being residential zoned land.

Written approvals have been provided from Otago Fish and Game and Land Information New Zealand as the legal landowner of Kingston Station. As approvals have been provided from these parties, effects on them have not been considered and they have not been considered as affected parties.

Have all persons identified as affected under Step 3 provided their written approvals? No

Step 4 Further notification in special circumstances

Do special circumstances exist in relation to the application that warrant notification of the application to any other persons not already determined to be eligible for limited notification under this section (excluding persons assessed under Section 95E as not being affected persons)? **No**

If notification or limited notification is required then has the applicant paid the additional notification fee? Not applicable

NOTIFICATION RECOMMENDATION:

In accordance with the notification steps set out above, it is recommended that the application proceed on a notified basis under Section 95A

Name: Sarah Davidson
Title: Consultant-RDA Consulting
Date: 16 August 2021

DECISION ON NOTIFICATION

Sections 95A to 95G of the Resource Management Act 1991

Date: **20 August 2021**

Application No: **RM20.164**

Subject: ***Decision on notification of resource consent application under delegated authority***

Decision under Delegated Authority

The Otago Regional Council decides that this resource consent application is to be processed on a **publicly notified** basis in accordance with sections 95A to 95G of the Resource Management Act 1991.

The above decision adopts the recommendations and reasons outlined in the Notification Recommendation Report above in relation to this application. I have considered the information provided, reasons and recommendations in the above report. I agree with those reasons and adopt them.

This decision is made under delegated authority by:

Mat Bell
Team Leader Consents
20 August 2021