Appendix E
NOR – Richmond South Water Supply Reservoir

Ecological Impact Assessment

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ECOLOGICAL ASSESSMENT & REPORTING SERVICES

Richmond South Reservoir

Short-Term Discharges Ecological Impact Assessment

For Tasman District Council

April 2022

REPORT INFORMATION & QUALITY CONTROL

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Executive Summary

Tasman District Council is seeking consent for controlled (operational and maintenance) discharges to upper Borck Creek associated with the proposed Richmond South Reservoir located at 520 Hill Street South. To understand and evaluate the ecological values present within the freshwater receiving environment, Robertson Environmental Limited was engaged to undertake an ecological assessment of the values and potential effects associated with the proposal.

Desktop, database and field surveys indicated that the upper reach of Borck Creek to be directly impacted by the proposed discharges is highly modified and of limited ecological value. This area receives inputs from a semi-urban catchment and has been impacted by historical and current agricultural land use practices. Key conclusions of the assessment were as follows:

- The in-stream and riparian habitat directly affected is highly degraded, small in area, and of relatively low value ecologically.
- No natural inland wetlands, rare plant species or vegetation communities were recorded within the proposed discharge location or wider surveyed reach.
- It is anticipated that the proposed short-term discharges will have a negligible effect on in-stream water and habitat quality and associated organisms (likely before and after reasonable mixing), given that discharge flow rates and contaminant (chlorine) concentrations within discharge will be controlled as necessary to avoid adverse effects on associated freshwater values.
- The overall magnitude of the potential effects, both direct and indirect, are low or very low, and the resultant significance of the potential adverse effect is generally very low.

Generally, the proposal is relatively minor in terms of ecological impacts based on the temporary, infrequent and point source nature of the proposed activity, and the existing values, and therefore the life-supporting capacity of associated freshwater ecosystem will be maintained through the operation of the consent.

In addition to the above discharge controls, precautionary installation of scour protection aprons is recommended as the Borck Creek streambed is clay based and therefore readily erodible in the vicinity of the proposed discharge location.

Monitoring of the freshwater receiving environment is not proposed on the basis that the proposed activity is not expected to adversely effect identified ecological values.

1 Introduction

Tasman District Council (TDC) seeks consent for controlled discharges to upper Borck Creek associated with the operation and maintenance of the proposed Richmond South reservoir located at 520 Hill Street South, Tasman.

An overview of the proposal by WSP and Stantec outlines the proposed designation footprint, including areas of Borck Creek upper reach where stormwater-related modification and rehabilitation works are likely to occur prior to any consented discharge event. The overview also provides an indication of the frequency and nature of discharges. The resource consent application for the proposed discharges requires an assessment of effects, including ecological effects.

The following report is an ecological impact assessment (EcIA) of the proposed short-term discharges on aquatic ecology within upper Borck Creek. The assessment is based on a worst-case, pre-construction scenario (i.e., under existing in-stream conditions without rehabilitation associated with the Richmond South Project). It was commissioned by WSP on behalf of TDC.

1.1 Ecological Assessment Scope

With detailed methodology outlined in Section 2, and limitations in Section 7, the purpose of this report is to:

- Identify and describe the ecological values of the freshwater receiving environment (Section 3);
- Describe the potential effects on local ecology arising from proposed activity (Section 4);
- Discuss and present an overall conclusion of the level of potential effects of the proposal on local ecology (Section 5); and,
- Recommend measures as appropriate to avoid, remedy or mitigate potential effects (including any proposed conditions/management plan required) (Section 6).

1.2 Description of Project

The location of the proposed discharge outfall within the designation footprint and subject survey area is shown in Figure 1.1. The overflow pipes (scour line) will lead to upper Borck Creek with controlled discharges during commissioning of tanks, maintenance and emergency situations. Based on information from WSP, for tank commissioning, the following steps are proposed:

1. *"...The internal surface of each tank will be mechanically cleaned through water blasting and hand tools as required. The water and debris from this process will collect in the bottom of the tanks and be removed by truck to an authorised disposal point. This is likely to be sewer for liquid waste and land fill for any solid debris. This part of the process will not involve discharges to the creek. This cleaning process takes approximately 1 day per tank.*
2. *Once the tanks are internally cleaned, they are filled with water from the Richmond Water Treatment Plant. This is for integrity testing, including to check for leaks. This water will come directly from the treatment plant which is not currently chlorinated. When the tank is emptied after this process it will be drained to Bateup Creek. If the water supply is chlorinated when tank integrity testing occurs sodium thiosulphate (or a similar product) will be used to reduce the chlorine content to an approved level prior to discharge. The discharge rate to the creek will be controlled via valves within the pipework, a discharge chamber at the bottom of the slope, and a rock lined overflow channel for aeration and further chlorine reduction prior to entering the creek. The maximum proposed rate of discharge is 40l/sec.*
3. *A final fill and discharge process is required to disinfect each tank. The tank is again filled with water from the treatment plant. Chlorine is then added at the tank to raise the chlorine level to*

Figure 1.1. Survey reach (or Zone of Influence) and proposed discharge location, upper Borck Creek. Designation boundary and proposed discharge location as per site plans by WSP and Stantec.

expert ecological services.

PROJECT: RICHMOND SOUTH RESERVOIR, TASMAN DISTRICT COUNCIL

Richmond South Reservoir Survey Area

| Date: 17 March 2022 | Revision: A | Aerial: LINZ 18/19
Plan map prepared for WSP by Robertson Environmental Limited

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approximately 20mg/l. This level is required to disinfect the interior of the tank prior to it receiving water for drinking supply purposes. Sodium thiosulphate (or a similar product) will be used to reduce the chlorine content to an approved level prior to discharge. The rate of discharge will again be controlled to 40l/sec...".

The scour line will terminate amongst a section of rocks and plantings prior to entering the creek channel. Discharge flow rates will be maintained to agreed levels protective of in-stream habitat[1], while chlorine concentrations in discharge will be controlled below ANZECC toxicity default guideline levels for freshwater[2].

Overflow (emergency) events are considered unlikely with controls to monitor and respond to water level changes. In any such instance, most issues would be fixed before overflow occurred.

The following report assesses potential discharge effects of Steps 2 & 3 above on in-stream ecology within upper Borck Creek, as well as for discharges during maintenance (expected to be required on a 10-yearly basis and involve smaller volumes as the tanks can be drained / drawn down prior to discharging).

[1] Background flow rate in Borck Creek is estimated to be around 5l/s (pers. comm, Matt McLarin, Hydrologist, TDC). Roelof De Haan (WSP Technical Principal – Water and Waste Water) has calculated that a suitable flow rate within the stream without causing scour/erosion is between 40/s and 90l/s. To be on the cautious side the maximum rate of flow for the purpose of this exercise is therefore assumed to be 70l/s. With the stream base flow estimated to be 5l/s this allows for 65l/s to be added to the flow through tank discharge without scouring the channel. To take further steps to be cautious a maximum flow rate of 40l/s from tank discharge is recommended as this is the rate of discharge that Matt McLarin considers could comfortably be accommodated within the channel and within the lower range of the calculated suitable discharge. This will be controlled by valves and would last for 19 hours while the tank is drained during commissioning.

[2] A freshwater moderate reliability trigger value of 3 µg Cl l^{-1} measured as total residual chlorine was derived using the statistical distribution method with 95% protection - source: https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/water-quality-toxicants/toxicants/chlorine-2000.

2 Assessment Methodology

The aquatic ecological assessment of the site has been undertaken using a combined desktop, database and field survey approach outlined below.

2.1 Desktop Analysis

Existing biological databases and all published information on habitat types and biological values within the study area were researched. This phase also included preparation of site maps and plans to direct the field survey. The extent and differences in vegetation and habitat type within the site were delineated on geographic information systems (GIS) using topographical maps and high resolution aerial photography (LINZ rectified ~0.3 m per pixel resolution flown in 2018/19 - https://data.linz.govt.nz/layer/104165-tasman-03m-rural-aerial-photos-2018-2019/) prior to site visit. Information was derived from known data sets on landforms, soils, climate, and topography of the site. Preliminary biological communities and habitat types were identified and described through a combination of New Zealand Land Cover Database version five (LCDBv5), TDC reports and data, and the use of aerial photographs.

The national threat classification of freshwater species was derived from the appropriate threat classification list for each taxa (Dunn 2018; Burns, et al., 2018; Grainger, et al., 2018; Robertson, et al., 2017; de Lange, et al., 2018; Nelson et al. 2019) and their regional status was derived from the Draft Conservation Management Strategy for the Nelson/Marlborough Conservancy 1996-2006 (Department of Conservation 1996).

2.1.1 Freshwater Fauna

Macroinvertebrate lists obtained from representative sources were examined to identify any rare or uncommon species in which to focus field surveys. A review of fish records from Borck Creek catchment area on the New Zealand Freshwater Fish Database (NZFFD) was undertaken. We also considered monitoring data provided by TDC of fish species observed within the Borck Creek catchment.

2.2 Field Survey

In-stream and riparian habitat (the latter defined as 30 m from the baseflow wetted edge, or 10 times the wetted width, whichever area is larger) adjacent to the proposed discharge location were assessed by field survey. The survey targeted an area based on the proposed plan (Figure 1.1). The survey was undertaken during baseflow conditons on 17th March 2022 when weather conditions were mostly fine.

2.2.1 Habitat Classification

Broad ecological or habitat zones in the study area were identified, and with the aid of a handheld Garmin GPSMAP 64sc WW unit (accuracy approx. ±5 m) broadly delineated. Each habitat was subjectively classified into one of several different qualitative habitat type descriptors according to unique features identified. Qualitative inspection of habitats was then conducted to note key flora and fauna for each zone. Upon completion of field work the broad habitat zones where then imported into a georeferenced aerial photo of the area using Garmin BaseCamp (version 4.8.3) and ArcMap 10.5 GIS software. Using colour aerial photos (LINZ 2018/19) delineated habitat zones were adjusted accordingly, to more accurately reflect the likely tonal gradations of respective habitats, and a map of different habitats was produced.

2.2.2 Habitat Quality Assessment

Synoptic assessment of specific aquatic habitat types and the associated values was completed at the site. All watercourses to be impacted both directly and indirectly were photographed and classified as either permanent, intermittent or ephemeral. The assessment of the waterbodies examined the key physical parameters including, but not limited to hydrological connectivity, thermal regulation, vegetation composition both aquatic and marginal vegetation.

In the present case, a habitat quality assessment was conducted along the approx. 150 m stretch of upper Borck Creek located within the survey area, using the Rapid Habitat Assessment (RHA) methods of Clapcott (2015). The rapid habitat assessment involves assigning 10 habitat parameters with a score from 1 to 10 (refer field sheet in Appendix A). The lowest scores indicate the greatest deviation from the condition expected with no, or minimal, human influence or impact (reference state). These individual parameter scores are then summed to determine an overall Habitat Quality Score: Excellent (>75), Good (51–75), Fair (26–50) or Poor (<26). The habitat parameters include measures of fine sediment cover, habitat diversity and abundance, and riparian width and shade. To bolster this assessment by identifying areas that may be vulnerable to degradation due to habitat modification, we also considered in narrative terms relevant parameters listed in Holmes et al. (2020). Native and exotic vegetation was noted across the site with a focus on the presence of indigenous species (Appendix B).

2.2.3 Freshwater Fauna

No surveys of aquatic invertebrates or fish were undertaken. Rather, we relied on the vegetation community and habitat type descriptions obtained from the field investigations to identify areas of potential habitat for species likely to occur within the area, as well as published and unpublished accounts of freshwater invertebrates and fish present within the wider catchment or similar habitats regionally.

2.3 Assessment of Effects Methodology

The location of the subject site falls within the jurisdictional boundary of TDC and its operative TRMP, and is part of the Motueka Ecological District. The site occupies predominantly Rural 1 land and the proposed activity has a Discretionary Activity status under the TRMP. All statutory planning documents relevant to the consenting and ecological assessment of the proposed activity, and the National Policy Statement for Freshwater Management 2020 (NPSFM) and National Environmental Standards for Freshwater 2020 (Freshwater NES), were considered in the assessment.

The assessment of ecological effects follows Ecological Impact Assessment guidelines (EcIA) produced by the Environment Institute of Australia and New Zealand (EIANZ, 2018). The EcIA approach follows the steps outlined below:

Step 1: Assessment of ecological values

Ecological values are assigned based on the matters to be considered when assigning ecological value outlined in Table 2.1, with corresponding criteria specific to terrestrial and freshwater habitats and species as set out in the EcIA guidelines (Table 2.2).

Table 2.1. Assignment of values to species, vegetation and habitats within the surveyed area (adapted from EIANZ, 2018).

Matter	Assessment matters considered; terrestrial and aquatic ecosystems
Representativeness	Criteria for representative vegetation and habitats: • Typical structure and composition • Indigenous species dominate • Expected species and tiers are present • Thresholds may need to be lowered where all examples of a type are strongly modified Criteria for representative species and species assemblages: • Species assemblages that are typical of the habitat • Indigenous species that occur in most of the guilds expected for the habitat type

Matter	Assessment matters considered; terrestrial and aquatic ecosystems
Rarity/distinctiveness	Criteria for rare/distinctive vegetation and habitats: • Naturally uncommon, or induced scarcity • Amount of habitat or vegetation remaining • Distinctive ecological features • National priority for protection Criteria for rare/distinctive species or species assemblages: • Habitat supporting nationally Threatened or At Risk species, or locally uncommon species • Regional or national distribution limits of species or communities • Unusual species or assemblages • Endemism
Diversity and pattern	• Level of natural diversity, abundance and distribution • Biodiversity reflecting underlying diversity • Biogeographical considerations – pattern, complexity • Temporal considerations, considerations of life cycles, daily or seasonal cycles of habitat availability and utilisation
Ecological context	• Site history, and local environmental conditions which have influenced the development of habitats and communities • The essential characteristics that determine an ecosystem's integrity, form, functioning, and resilience (from "intrinsic value" as defined in RMA) • Size, shape and buffering • Condition and sensitivity to change • Contribution of the site to ecological networks, linkages, pathways and the protection and exchange of genetic material • Species role in ecosystem functioning – high level, key species identification, habitat as proxy

Table 2.2. Criteria for assigning ecological value to terrestrial and freshwater habitats and species (modified from EIANZ 2018)

Value	Species Value requirements	Habitat Value requirements
Very High	Threatened - (Nationally Critical, Nationally Endangered, Nationally Vulnerable)	Area rates High for 3 or all of the four assessment matters listed in Table 1. Likely to be nationally important and recognised as such.
High	Important for Nationally At Risk – species and may provide less suitable habitat for Nationally Threatened species	Area rates High for 2 of the assessment matters, Moderate and Low for the remainder, or Area rates High for 1 of the assessment matters, Moderate for the remainder. Likely to be regionally important and recognised as such.
Moderate	At Risk - (Recovering, Relict, Naturally Uncommon) Locally (Ecological District) uncommon or distinctive species	Area rates High for one matter, Moderate and Low for the remainder, or Area rates Moderate for 2 or more assessment matters Low or Very Low for the remainder. Likely to be important at the level of the Ecological District.
Low	Native - Not Threatened. Nationally and locally common indigenous species	Area rates Low or Very Low for majority of assessment matters and Moderate for one. Limited ecological value other than as local habitat for tolerant native species.

Value	Species Value requirements	Habitat Value requirements
Very Low	Exotic species, including pests, species having recreational value	Area rates Very Low for 3 matters and Moderate, Low or Very Low for remainder.

Step 2: Magnitude of effect assessments

Step 2 of the EcIA guidelines requires an evaluation of the magnitude of effects on ecological values based on the extent of any area which is likely to be affected, intensity and duration of effect. The magnitude of the effect that the Project is expected to have on ecological values is evaluated as being either No effect, Negligible, Low, Moderate, High or Very High, based on the proposed works (footprint size, intensity and duration; see Table 2.3).

Table 2.3. Summary of the criteria for describing the magnitude of effect as outlined in EIANZ, 2018.

Magnitude of effect	Description
Very High	Total loss or major alteration of the existing baseline conditions; and/or Loss of high proportion of the known population or range
High	Major loss or alteration of existing baseline conditions; and/or Loss of high proportion of the known population or range
Moderate	Loss or alteration to existing baseline conditions; and/or Loss of a moderate proportion of the known population or range
Low	Minor shift away from existing baseline conditions; and/or Minor effect on the known population or range
Negligible	Very slight change from the existing baseline conditions; and/or Negligible effect on the known population or range

Step 3: Level of effects assessment in the absence of mitigation

Step 3 of the EcIA guidelines requires the overall level of effect to be determined using a matrix that is based on the ecological values and the magnitude of effects on these values in the absence of any efforts to avoid, remedy or mitigate for potential effects. Level of effect categories include No Effect, Very Low, Low, Moderate, Moderate/High, High and Very High. Table 2.4 shows the EcIA matrix outlining criteria to describe the overall level of ecological effects.

Table 2.4. Summary of the criteria for describing the overall level of ecological effects as outlined in EIANZ, 2018.

Magnitude of effect	Ecological Value				
	Very High	High	Moderate	Low	Very Low
Very High	**Very high**	**Very high**	**High**	**Moderate**	Low
High	**Very high**	**Very high**	**Moderate**	Low	Very low
Moderate	**High**	**High**	**Moderate**	Low	Very low
Low	**Moderate**	Low	Low	Very low	Very low
Negligible	Low	Very low	Very low	Very low	Very low
Positive	Net gain	Net gain	Net gain	Net gain	Net gain

Step 4: Establish if mitigation is required

The overall level of effect is used to determine if mitigation is required. As discussed later in this report, the proposed activity would have only very low ecology effects (in terms of Step 3 of the EcIA guidelines), even without taking into account mitigation measures beyond the controls mentioned in Section 1.2.

3 Ecological Description

3.1 Site Description and Ecological Context

Based on an initial desktop review of available information we have identified the following ecological attributes within the freshwater receiving environment of the project (the study area). Figure 3.1 provides an overview of existing land use, vegetation cover and freshwater attributes at the proposed site.

The survey area encompassing Borck Creek upper reach, a small, narrow, first order (most likely ephemeral) stream, is within low topography[3], gully floor environment situated to the immediate east of the proposed tank reservoir and discharge site at 520 Hill Street South. The area is surrounded by High Producing Exotic Grassland (LCDB5) with a height above sea level of around 58 meters. Predominantly landuse cover across the wider catchment area is one of high producing pasture grasses and urban development, with areas of indigenous (deciduous and broadleaf hardwoods) and plantation forest occupying land on steeper hillslope flanks to the south.

The in-stream environment is highly modified due to historical land clearance and existing landuse. Urban development within the middle of the catchment is relatively close to the survey reach and it is likely that urban stormwater discharges have an intermittent effect on water quality and the flow regime. Further, in-stream structures - in this case several culverts within the survey area that included perched or vertical sections - may act to limit upstream passage for many indigenous fish species. Other existing disturbances include grazing pressure and low-level noise. However, the area may still provide some habitat for indigenous fauna.

The wider terrestrial environment is classified as Category 3 (20-30% indigenous cover left) under the Threatened Environment Classification (TEC) version 2012. Expected natural vegetation cover within the proposal area is likely a lowland podocarp forest type.

Figure 3.1. Borck Creek upper reach contiguous with grazed pasture cover down to the wetted stream edge and exotic shrubs/trees on low relief gully floor within the survey area, at the proposed site, March 2022.

3.2 Existing State of Freshwater Environment

An example, looking north (downstream) across the site, of how habitat margins were delineated is provided in Figure 3.2. A GIS-based habitat map of the study area is provided in Figure 3.3.

3.2.1 In-Stream & Riparian Habitat

The surveyed extent of Borck Creek presented as a highly degraded, narrow stream varying between approximately 1-2 m wide. Flow characteristics included shallow slow-runs lacking riffles, with several small pools (mostly less than 30 cm deep) often associated with culverts. At the time of the survey, the relatively featureless clay-base streambed was dominated by nuisance filamentous (>2 cm long) green algae and to a lesser extent nuisance macrophytes. Baseflow water clarity was generally good but likely becomes more turbid during higher flow events.

Riparian margins consisted of grazed pasture grass with isolated non-native large shrubs and/or trees (mostly weeping willow) confined to an area along the true right bank top. The latter provide some shading of the streambed. The open pasture area provided no protection from stock access to the stream. The lower banks on both sides of this reach were incised and relatively steep with some areas of bare exposed ground. With evidence of bank slumping observed, both banks appear to have a high potential for erosion, especially during higher flow events.

Habitat quality assessment of in-stream values was conducted during a site visit on 17 March 2022 and the results are presented below (Table 3.1), with field sheets provided in Appendix A. The Habitat Quality Score (25) for the full width (i.e., wetted plus riparian area) of Borck Creek was Poor overall. Factors contributing to the Poor habitat score include moderate levels of deposited fine sediment, limited habitat for fish and invertebrates (including sensitive invertebrate taxa), little riparian habitat and shade, and low diversity of hydraulic habitat. The prevalence of filamentous green algae further reduced habitat quality within this reach, although problems associated with such nuisance growths are most prominent during low flows and therefore may only occur at certain times of the year. The overall ecological value of this stream reach has been assessed as Low.

Table 3.1 Rapid habitat assessment results summary based on Clapcott (2015) protocol.

Zone	Habitat Parameter	Score / Category
Wetted area	Deposited sediment	4
	Invertebrate habitat diversity	2
	Invertebrate habitat abundance	1
	Fish cover diversity	1
	Fish cover abundance	1
Riparian area	Hydraulic heterogeneity	2
	Bank erosion	6
	Bank vegetation	3
	Riparian width	1
	Riparian shade	4
Habitat quality score (of 100)		**25 / Poor**

[3] ~65% of survey area is undulating 4-7° with ~30% flat to gently undulating 0-3°; Landcare Research NZ Limited 2009-2022.

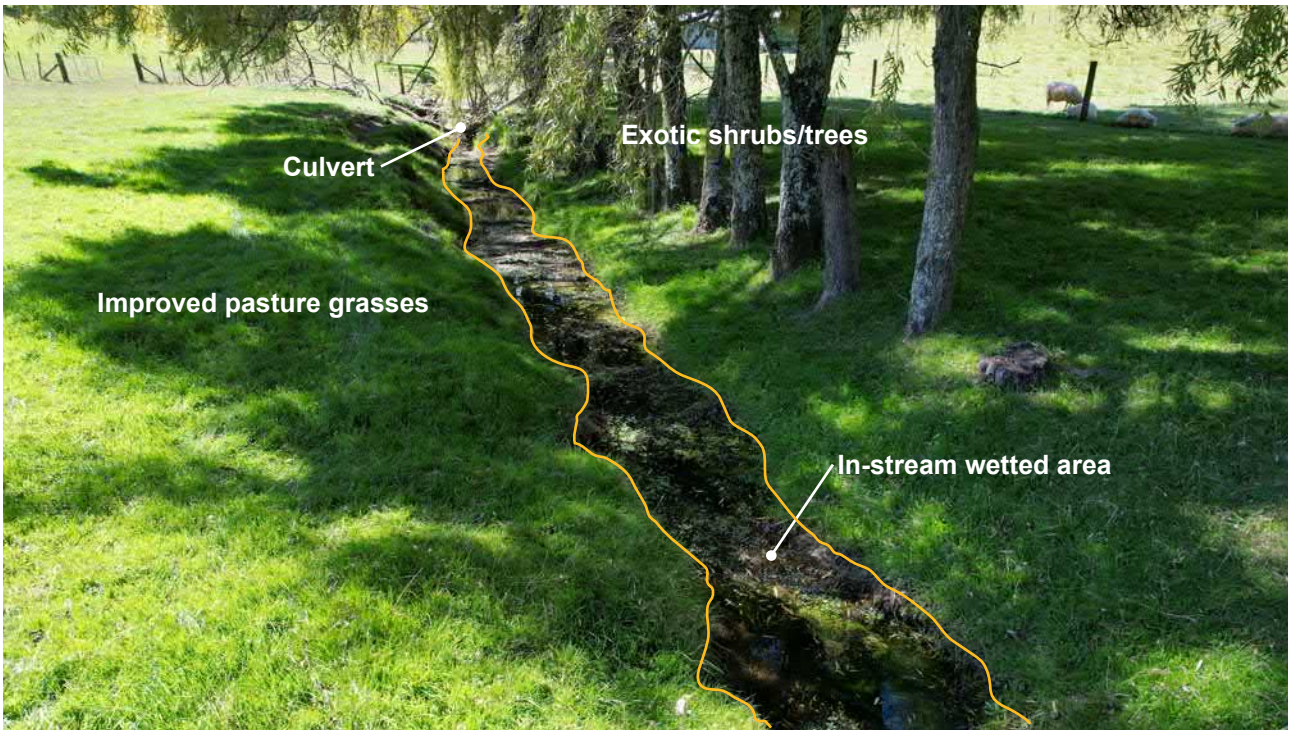

Figure 3.2. Typical example of the different habitats in the surveyed area and mapped during the field survey. Habitat boundaries are indicative only and do not accurately reflect those presented in Figure 3.3.

3.3 Freshwater Fauna

3.3.1 Fish Community

Based on the habitat preference and recorded distributions of fish species (Appendix C), there are several species of fish with the potential to inhabit the surveyed stream reach including:

- Shortfin eel (*Anguilla australis*) — Not Threatened;
- Longfin eel (*Anguilla dieffenbachii*) — At Risk (Declining);
- Inanga (*Galaxias maculatus*) — At Risk (Declining);
- Banded kokopu (*Galaxias fasciatus*) — Not Threatened;
- Common bully (*Gobiomorphus cotidianus*) — Not Threatened;
- Freshwater shrimp (*Paratya curvirostris*) — Not Threatened;
- Common smelt (*Retropinna retropinna*) — Not Threatened;
- Giant bully (*Gobiomorphus gobioides*) — At Risk (Naturally Uncommon); and,
- Redfin bully (*Gobiomorphus huttoni*) — Not Threatened.

Of these species, both shortfin and longfin eel were observed within a pool located at the downstream end of the survey reach. Common bully and banded kokopu (where there is good overhead tree cover) are also expected to occupy or utilise this part of Borck Creek, even if it dries to a series of residual pools during low flow conditions[4].

The ecological value of fish populations in the freshwater receiving environment is Low to Moderate given the overall poor quality of available habitat, in particular the high cover of nuisance filamentous algae (impairing spawning and living habitat) and existing culverts (potentially impeding upstream passage). This area is not likely to support Threatened species. If present, these species are not restricted to these habitats within the subject site and likely utilise available habitat within the broader catchment area (e.g., downstream near Cupola Crescent where rehabilitation efforts have been undertaken to improve in-stream conditions).

[4] Trevor James (Senior Resource Scientist Freshwater & Estuarine Ecology, TDC) pers. comm. via email on 8 Apr 2022.

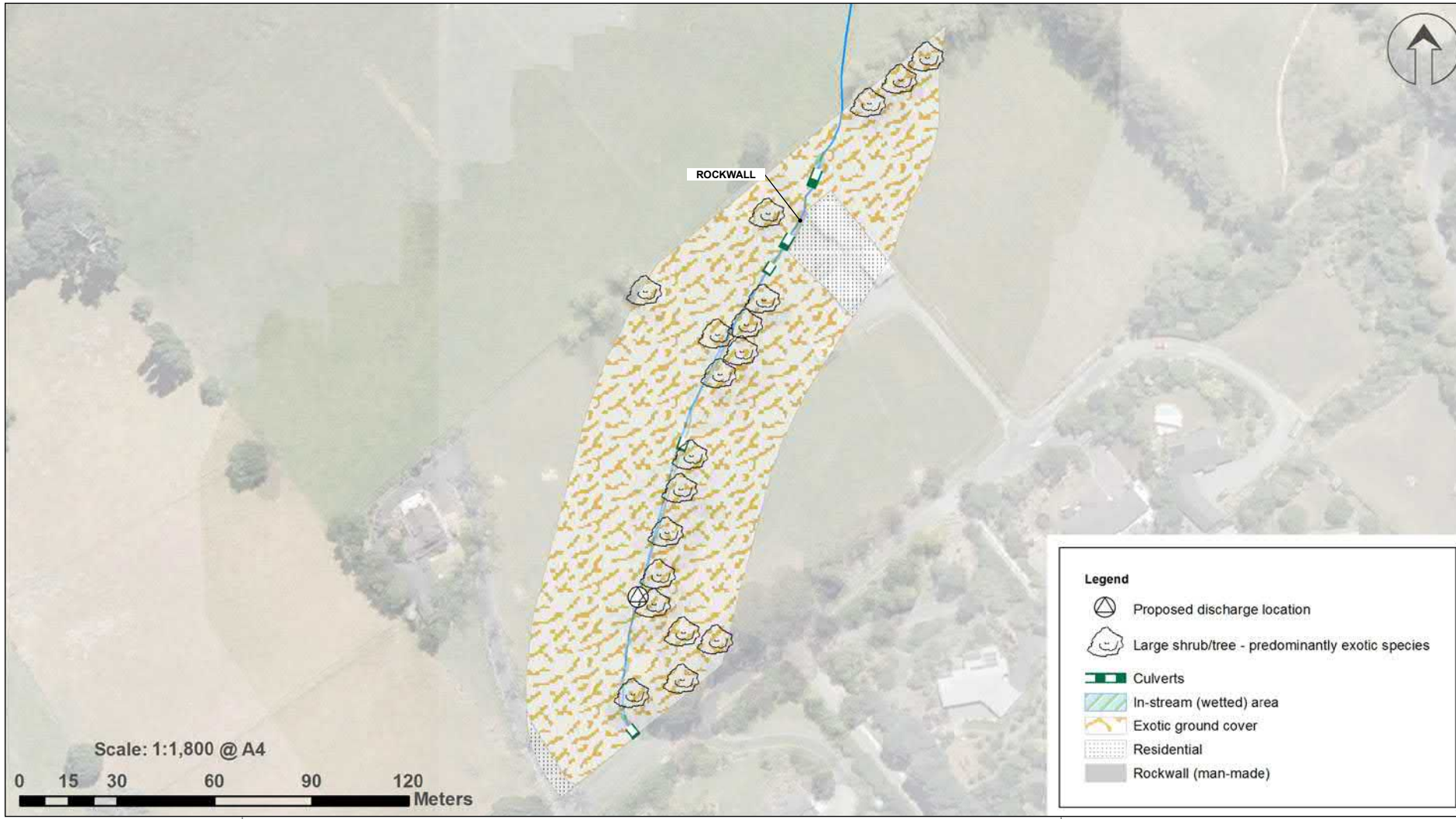

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Figure 3.3. Broad scale (indicative) map of existing habitats, including proposed discharge location within the upper Borck Creek study area.

PROJECT: RICHMOND SOUTH RESERVOIR, TASMAN DISTRICT COUNCIL

Existing Habitat Occupying Survey Area

| Date: 17 March 2022 | Revision: A | Aerial: UAV Mar 22 / LINZ 18/19
Plan map prepared for WSP by Robertson Environmental Limited

Project Manager: Ben.Robertson@robertsonenviro.co.nz

3.3.2 Macroinvertebrates

The overall diversity of freshwater macroinvertebrates is expected to be very low within the existing stream reach.

Such a degraded stream is likely to reflect a macroinvertebrate assemblage characteristic of the pooled and slow-run habitat available and be predominantly composed of mobile taxa known to be tolerant of disturbance (pollution and changes in land use) such as water boatmen, back swimmers, diving beetles and midge. It is considered unlikely that the stream would support significant numbers of sensitive EPT[5] taxa or Threatened species in its present state. Similarly low diversity/ tolerant assemblages are expected to inhabit modified terrestrial/riparian margins.

The overall ecological value of inhabitant freshwater invertebrates is considered to be Very Low given existing in-stream conditions and the likely absence of Threatened/At Risk species.

[5] EPT are macroinvertebrates that are sensitive to water pollution. These are Ephemeroptera (mayfly), Plecoptera (stonefly) and Trichoptera (caddisfly).

4 Assessment of Effects on Ecological Values

In the absence of efforts to avoid, remedy or mitigate adverse ecological effects, the potential effects on associated ecological values come primarily from direct, short-term (temporary) effects within the surveyed stream reach area during planned discharge events.

Potential effects from discharges to freshwater environments relate to water quality effects (and subsequent streambed quality) or water quantity effects. Water quality effects, in the present case, arise as residual chlorine in waters used to clean tanks discharges to the receiving environment, while water quantity effects reflect physical disturbance through scouring and/or erosion. The TRMP requires that water quality standards be met after reasonable mixing. In this case, such effects are not anticipated, given that discharge flow rates and contaminant concentrations within discharge will be controlled as necessary to avoid adverse effects on associated freshwater values.

There are no mapped natural inland wetlands within the subject reach under the TRMP, and none were identified during the present survey, although they may be present within floodplain beyond this area.

The likelihood (or risk) and magnitude of these effects occurring and the potential level of adverse effects on the receiving environment relevant to the proposal are discussed as follows.

4.1 Ecology Values Assessment

Step 1 of the EcIA guidelines requires ecological values to be assessed and ranked. As defined by Table 4.1 below, ecology values within the freshwater receiving environment range from ‘low’ for poor quality in-stream habitat to ‘low to moderate’ for the fish community within the subject reach.

Table 4.1 Assignment of values within the freshwater receiving environment to habitats and species (adapted from EIANZ, 2018).

Habitat/Species	Value	Comments
In-stream & Riparian Habitat	Low	This subject reach receives inputs from a semi-urban catchment and has been highly modified (primarily through reclamation and loss of riparian vegetation) to the extent it is no longer reference quality. At the time of the survey, there was moderate levels of deposited fine sediment, high coverage of nuisance filamentous algae, lack of riparian habitat and shade, little to no suitable habitat for sensitive invertebrate taxa, and low diversity of hydraulic habitat. The Habitat Quality Assessment Score was Poor overall.
Fish	Low to Moderate	Known inhabitants of Borck Creek upper reach include At Risk fish species (longfin eel); however, the importance of this area for other indigenous fish species is considered low given the overall poor quality and quantity of habitat for fish as well as the several artificial structures that may impede upstream passage within the survey reach. Further, these species are not restricted to these habitats within the subject stream reach and likely utilise available habitat within the broader catchment area.
Macroinvertebrates	Low	Macroinvertebrate communities potentially inhabiting this reach are most likely to have low diversity, species richness and abundance, and not include significant numbers of sensitive EPT taxa or species known to be Nationally Threatened, At Risk or locally uncommon or rare.

4.2 Magnitude of Effects Assessment

Having identified the ecological value of the habitat and fauna, Step 2 of the EcIA guidelines requires an evaluation of the magnitude of effects on ecological values based on footprint size, intensity and duration (Table 4.2).

Table 4.2 Magnitude of effects on habitat and fauna potentially impacted (adapted from EIANZ, 2018).

Habitat/Species	Magnitude	Reasons
In-stream & Riparian Habitat	Negligible	Temporary discharge flow rates and contaminant concentrations will be controlled, so adverse effects on water quality and streambed habitat quality are not anticipated. Precautionary installation of scour protection aprons is suggested as the Borck Creek streambed is clay-based and therefore readily erodible in the vicinity of the proposed discharge location. The area where an apron would be placed has low ecological value and provided sedimentation is minimised and fish passage is maintained, there should be no adverse effects on the watercourse.
Fish	Negligible	Effects on fish are typically expressed either directly (e.g., filling-in stream channels and removing vegetation and sediment from streams poses a risk to native freshwater fish of mortality or injury) or indirectly (e.g., contamination from runoff and culvert installation poses a risk to native freshwater fish of limiting migratory fish passage). However, since the proposed activity includes appropriate controls, the magnitude of potential effects on fish are seen as negligible.
Macroinvertebrates	Negligible	Given the relatively depauperate macroinvertebrate community likely to be present at the proposed site coupled with the above controls, any impacts on them are expected to be negligible.

4.3 Summary of Effects Assessment

Table 4.3 below summarises ecological value (Step 1), magnitude of effects (Step 2), and level of effects (Step 3) for each of the freshwater ecological values identified.

Table 4.3 Ecological values, magnitude of effects and overall level of effects for the freshwater receiving environment.

Habitat/Species	Ecological Value	Magnitude of Effect	Level of Effect
In-stream & Riparian Habitat	Low	Negligible	Very Low
Fish	Low to Moderate	Negligible	Very Low
Macroinvertebrates	Low	Negligible	Very Low

Overall, taking into account the control and mitigation measures, the proposed short-term discharge activity is not expected to result in adverse effects (cumulative or otherwise) on identified freshwater

values upstream or downstream of the proposed discharge location (likely before and after reasonable mixing). Recommendations to further ensure this is the case have been outlined below.

5 Recommendations

5.1 Recommendations for avoiding or minimising potential adverse effects

Given the short-term, infrequent and point source nature of the proposed activity coupled with the limited loss of freshwater biodiversity as detailed above, ecological mitigation is not warranted beyond the following:

- Prior to any land-disturbing activities occurring (e.g., to install outfall structures or to undertake earthworks between the creek and the proposed tank platform), install erosion and sediment control (ESC) in accordance with Nelson Tasman Erosion and Sediment Control Guidelines 2019 or any subsequent version. This will effectively minimise sediment discharges to adjacent watercourses, although we note adverse discharge effects on local stream ecology are unlikely given the limited scale of the works and relatively low relief topography between the proposed tank platform/discharge location and those habitats.
- Control discharge flows to a maximum flow rate of 40 l s^{-1}, as agreed between TDC and WSP.
- Precautionary installation of scour protection aprons is suggested given the erodible nature of the clay-based streambed in the vicinity of the discharge location. Aprons should be placed to the design engineer's specification to prevent stream channel scour, potential risk of structural failure and to maintain fish passage.
- Control total residual chlorine concentrations in discharge below 3 µg Cl l^{-1} (protective of 95% of freshwater species)[6].

5.2 Recommendations for addressing adverse residual effects that cannot be avoided or minimised

Monitoring of the freshwater receiving environment is not proposed given that the proposed activity is not expected to adversely effect identified ecological values.

[6] Noting that "...*although this threshold at 95% protection is relatively close to the acute toxicity value for the most sensitive species, this was considered sufficiently protective* [for chlorine]*, due to its short residence time, and the narrow difference between acute and chronic toxicity*..." (ANZECC & ARMCANZ (2000) guidelines).

6 References

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7 Limitations & Applicability

As with all one-off field ecological assessments, seasonal or temporal variation in the presence of mobile fauna means that the presence or absence of such fauna cannot be ascertained with great accuracy. The condition of habitat becomes the surrogate for the presence or absence of fauna rather than observed condition on the day of the survey. The localised and short-term nature of the proposed discharges is expected to preclude effects on freshwater amphibian and avifauna communites that may occupy or utilise the subject site, hence those biota were not considered herein.

This assessment has been carried out in line with the proposal given to the Client by Robertson Environmental Limited on the 11th of January 2022. This is assumed in this assessment to be development footprint/activity being sought by this application. We note that this design may not be final. Depending on the scope of any future development and detailed design changes, further ecological assessments, including further quantitative assessments may be required.

Robertson Environmental's professional opinions are based on its professional judgement, experience, and training. These opinions are also based upon data derived from the field survey and analysis described in this document, with the support of relevant guidelines (EIANZ, 2018). It is possible that additional surveying, testing and analyses might produce different results and/or different opinions. Should additional information become available, this report should be updated accordingly. Robertson Environmental Limited has relied upon information provided by the Client to inform parts of this document, some of which has not been fully verified by Robertson Environmental Limited. This document may be transmitted, reproduced or disseminated only in its entirety.

Appendix A:

Rapid Habitat Quality Assessment Field Sheet

Results of the habitat quality assessment conducted along the approx. 150 m stretch of Borck Creek upper reach located within the survey area, using the rapid habitat assessment methods of Clapcott (2015), during baseflow conditons, 17 March 2022.

Habitat parameter	Condition category										SCORE
1. Deposited sediment	*The percentage of the stream bed covered by fine sediment*										4
	0	*5*	*10*	*15*	*20*	*30*	*40*	*50*	*60*	*≥ 75*	
SCORE	10	9	8	7	6	5	(4)	3	2	1	
2. Invertebrate habitat diversity	*The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher*										2
	≥ 5	*5*	*5*	*4*	*4*	*3*	*3*	*2*	(2)	*1*	
SCORE	10	9	8	7	6	5	4	3	(2)	1	
3. Invertebrate habitat abundance	*The percentage of substrate favourable for EPT colonisation, for example flowing water over gravel-cobbles clear of filamentous algae/macrophytes.*										1
	95	*75*	*70*	*60*	*50*	*40*	*30*	*25*	*15*	(5)	
SCORE	10	9	8	7	6	5	4	3	2	(1)	
4. Fish cover diversity	*The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher*										1
	≥ 5	*5*	*5*	*4*	*4*	*3*	*3*	*2*	*2*	(1)	
SCORE	10	9	8	7	6	5	4	3	2	(1)	
5. Fish cover abundance	*The percentage of fish cover available*										1
	95	*75*	*60*	*50*	*40*	*30*	*20*	*10*	*5*	(0)	
SCORE	10	9	8	7	6	5	4	3	2	(1)	
6. Hydraulic heterogeneity	*The number of of hydraulic components such as pool, riffle, fast run, slow run, rapid, cascade/waterfall, turbulance, backwater. Presence of deep pools score higher*										2
	≥ 5	*5*	*4*	*4*	*3*	*3*	*2*	*2*	(2)	*1*	
SCORE	10	9	8	7	6	5	4	3	(2)	1	
7. Bank erosion	*The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank or stock pugging*										6
Left bank	*0*	*≤ 5*	*5*	*15*	*25*	*35*	(50)	*65*	*75*	*> 75*	
Right bank	*0*	*≤ 5*	(5)	*15*	*25*	*35*	*50*	*65*	*75*	*> 75*	
SCORE	10	9	8	7	(6)	5	4	3	2	1	
8. Bank vegetation	*The maturity, diversity and naturalness of bank vegetation*										3
Left bank AND Right bank	*Mature native trees with diverse and intact understorey*		*Regenerating native or flaxes/sedges/tussock > dense exotic*			*Mature shrubs, sparse tree cover > young exotic, long grass*			*Heavily grazed or mown grass > bare/impervious ground*		
SCORE	10	9	8	7	6	5	4	(3)	2	1	
9. Riparian width	*The width (m) of the riparian buffer constrained by vegetation, fence or other structure(s)*										1
Left bank	*≥ 30*	*15*	*10*	*7*	*5*	*4*	*3*	*2*	*1*	(0)	
Right bank	*≥ 30*	*15*	*10*	*7*	*5*	*4*	*3*	*2*	*1*	(0)	
SCORE	10	9	8	7	6	5	4	3	2	(1)	
10. Riparian shade	*The percentage of shading of the stream bed throughout the day due to vegetation, banks or other structure(s).*										4
	≥ 90	*80*	*70*	*60*	*50*	*40*	(25)	*15*	*10*	*≤ 5*	
SCORE	10	9	8	7	6	5	(4)	3	2	1	
TOTAL	(Sum of parameters 1-10)										25

Noting high cover of filamentous algae/macrophytes

"

"

No stock fence, grazing at stream margin.

Large oaks on true right bank top

Appendix B:

Plant Species List

Species[1]	NVS Code used on field sheets	Common name	Structural Class	Threat Status[2]
Juncus effusus	JUNeff	Soft rush	Rushes and Allied Plants	Exotic
Grevillea robusta	GRErob	Silky oak	Dicotyledonous Trees & Shrubs	Exotic
Salix babylonica	SALbab	Weeping willow	Dicotyledonous Trees & Shrubs	Exotic
Veronica anagallis-aquatica	VERana	Water speedwell	Dicotyledonous Herbs other than Composites	Exotic
Lotus corniculatus	LOTcor	Lotus	Dicotyledonous Herbs other than Composites	Exotic
Ranunculus repens	RANrep	Creeping buttercup	Dicotyledonous Herbs other than Composites	Exotic
Persicaria hydropiper	PERhyd	Water pepper	Dicotyledonous Herbs other than Composites	Exotic
Stenotaphrum secundatum	STEsec	Buffalo grass	Grasses	Exotic
Trifolium repens	TRIrep	White clover	Dicotyledonous Herbs other than Composites	Exotic
Callitriche stagnalis	CALsta	Water starwort	Dicotyledonous Herbs other than Composites	Exotic

[1] List is indicative and not exhaustive.

[2] de Lange et al. (2018).

Appendix C:

Potential Fish Species

Summary the threat classification of fish species recorded within the Borck Creek Catchment (New Zealand Freshwater Fish Database 2022).					
Species	Common name	Threat Classification[1]	Recorded observation		
			NZTM E	NZTM N	Year
Anguilla australis	Shortfin eel	Not Threatened	1614152	5424638	2000
Anguilla dieffenbachii	Longfin eel	At Risk (Declining)	1614152	5424638	2000
Galaxias maculatus	Inanga	At Risk (Declining)	1614152	5424638	2000
Gobiomorphus cotidianus	Common bully	Not Threatened	1614152	5424638	2000
Gobiomorphus gobioides	Giant bully	At Risk (Naturally Uncommon)	1614152	5424638	2000
Gobiomorphus huttoni	Redfin bully	Not Threatened	1614152	5424638	2000
Gambusia affinis	Gambusia	Introduced	1614101	5422217	2000
Paratya curvirostris	Freshwater Shrimp	Not Threatened	1614101	5422217	2000
Retropinna retropinna	Common smelt	Not Threatened	1614423	5424910	2000

[1] Dunn et al. (2018).

Appendix D:

Field Photographs






Photo 1-6: Overview of existing (modified) conditions within the subject reach, upper Borck Creek, where discharges will be received.

6 May 2022

RobEnv_Richmond South_ Discharges EcIA Addm_22020506.pdf

robertson environmental

ECOLOGICAL ASSESSMENT & REPORTING SERVICES

Tasman District Council
C/- WSP
Level 1 Morrison Square
77 Selwyn Place
Nelson, 7010

Attention: Darren Rodd

Dear Darren,

Richmond South Reservoir Short-Term Discharges

Addendum to Ecological Impact Assessment Report

1 Introduction

Tasman District Council engaged Robertson Environmental to undertaken an ecological assessment of the values and potential effects from the controlled (operational and maintenance) discharges to upper Borck Creek associated with the proposed Richmond South Reservoir located at 520 Hill Street South.

This letter addresses a request from TDC for specific data on in-stream macroinvertebrate communities and provides additional assessment information pursuant to the consenting process and forms an addendum to the initial Ecological Impact Assessment Report dated 21 April 2022 (hereafter called the '*EcIA Report*').

2 Macroinvertebrate Sampling Results

Sampling of the macroinvertebrate community in the subject reach was undertaken during base flow conditions on 2 May 2022 following National Environmental Monitoring Standards (Macroinvertebrates 2020) protocol. Taxonomic identification and calculation of relevant biotic indices was carried out by Stark Environmental Limited.

A summary of the macroinvertebrate results is presented in Table 1. Full macroinvertebrate results and field records are provided in **Attachment A**.

- **Ben Robertson** (Principal Consultant, Director) BSc (Hons), PhD, CEnvP
- **Jodie Robertson** (Senior Consultant) BSc, PG Dip, MSc
- **Barry Robertson** (Technical Advisor, Director) BSc, Dip Sci, PhD
- **Julian Goulding** (Technical Officer) BComm, Master 3000 Gross Tonnes

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Table 1 Macroinvertebrate sampling results, Borck Creek upper reach, 2 May 2022.

Metric/index[1]	Number / Score
Percentage Counted	1.00
Number of taxa (including rare taxa)	13
Number of rare taxa	6
Number of animals	219
MCI	69
QMCI	3.85
MCI-sb	58
QMCI-sb	2.16
%EPT taxa (excluding Hydroptilidae)	0.00
%EPT abundance (excluding Hydroptilidae)	0.00
ASPM	0.12

[1] Refer NEMS Macroinvertebrates (2020), page xiii, for further details of listed indices.

On the day of the survey, macroinvertebrate community health was poor, with a low number of taxa present. Generally dominated by Potamopyrgus, the only ETP taxa found at the site were two hydroptilids (which are tolerant taxa and excluded from the EPT indices), hence the EPT indices are zero. The MCI-sb index is also indicative of poor habitat conditions. Likewise, the QMCI-sb score is also indicative of poor habitat conditions (Stark and Maxted 2007).

3 Implications for the EcIA Report

The above results support assumptions made in the EcIA Report regarding the poor state of inhabitant macroinvertebrate communities and the absence of significant numbers of sensitive EPT taxa. They do not alter conclusions made in the EcIA Report regarding the potential ecological effects of the proposed activity.

4 Applicability

Robertson Environmental's professional opinions are based on its professional judgement, experience, and training. These opinions are also based upon data derived from the existing information and analysis described in this document, with the support of relevant national guidelines (EIANZ, 2018). It is possible that additional testing and analyses might produce different results and/or different opinions, particularly given the potentially ephemeral flow characteristics of Borck Creek upper reach.

This letter has been prepared for the exclusive use of TDC, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

We understand and agree that WSP will submit this addendum letter to support a resource

consent application and that TDC as the regulatory authority will use this letter for the purpose of assessing that application.

Robertson Environmental Limited

Addendum Letter Prepared by:

Dr Ben Robertson

Principal Consultant, Director

References

National Environmental Monitoring Standards: Macroinvertebrates. Collection and Processing of Macroinvertebrate Samples from Rivers and Streams Version: 0.0.1 DRAFT Date of issue: November 2020. *Note: The current suite of National Environmental Monitoring Standards (NEMS) documents, Best Practice Guidelines, Glossary and Quality Code Schema can be found at http://www.nems.org.nz.*

Stark, J.D. and Maxted, J.R. 2007. A user guide for the macroinvertebrate community index. Report prepared for the Ministry for the Environment. Nelson, Cawthron Institute. 66p.

Attachment A:

Detailed Macroinvertebrate Results & Field Record Form

Robertson Environmental Ltd			1
Site Name			**Upper Borck Ck Richmond**
Collector			**Ben Robertson**
Processing			**P2 Soft Bottom**
Date sampled			**2-May-22**
	MCI Score	**MCI-sb Score**	
Odonata			
Xanthocnemis	5	1.2	3
True Flies			
Austrosimulium	3	3.9	1
Empididae	3	5.4	1
Caddisflies			
Oxyethira	2	1.2	2
Paroxyethira	2	3.7	1
Crustacea			
Copepoda	5	2.4	1
Ostracoda	3	1.9	2
Worms	1	3.8	8
Springtails	6	5.3	1
Snails			
Lymnaeidae	3	1.2	1
Physa	3	0.1	4
Potamopyrgus	4	2.1	193
Mites	5	5.2	1

Percentage Counted	1.00
Number of taxa (including rare taxa)	13
Number of rare taxa	6
Number of animals	219
MCI	69
QMCI	3.85
MCI-sb	58
QMCI-sb	2.16
%EPT$_{taxa}$ (excluding Hydroptilidae)	0.00
%EPT $_{abundance}$ (exclduing Hydroptilidae)	0.00
ASPM	0.12

Sample processed by John Stark
Data entry and index calculation by John Stark (Stark Environmental Ltd)

Rare Taxa
10 in vial unless stated otherwise in cell comment

Field Record Form: Macroinvertebrates

Programme Name _____

Stream Name Borch Creek upper reach

Site Name 520 Hill Street South, Tasman

Site Code _____ **Sample No.** UBC-1

Reach Length 100 m

GPS Location (midpoint of reach) Easting 1614673 Northing 5421152

Date 2/05/22 **Time (NZST)** 0900

Field Personnel BR

Visit Metadata

Weather ○ Fine ✓ Overcast ○ Drizzle ○ Rain — Rain in last 24 hours? ○ Y ✓ N

Wind Direction ✓ NW ○ N ○ NE ○ SE ○ S ○ SW — Digital Photos ✓ Y ○ N

Wind Speed ✓ Calm ○ Light ○ Moderate ○ Strong

Water Appearance ✓ Clear ○ Turbid ○ Other _____

Stream Level ○ Low ✓ Normal ○ High ○ Other _____ m — Odour ○ Y ✓ N

Comments *(e.g. stock on banks/in water, scums, wildfowl, local bank erosion, new hazards, etc.)*

Refer rapid habitat assessment in report (Appnd A).

Collection Details

Method ✓ Kick-net ○ Other (describe) _____

Net Width 30 cm — Mesh size ✓ 0.5 mm ○ Other _____ mm

Habitats Sampled 95% run, 5% riffle
(e.g. riffle 30%, run 30%)

All Habitats Sampled in Proporton to Abundance? ✓ Yes ○ No

Streambed Area Sampled m^2 0.8 — No. of kicks 8

Preservative Type Ethanol

Supporting Measurements

Habitat Assessment? ✓ Yes Method: Clapcott (2015) ○ No

In-situ Water Quality Measurements? ○ Yes Variables: _____ ✓ No

Flow Measurement? ○ Yes _____ L/s ✓ No

Other _____

Other Notes *(e.g. deviation from protocols, QA/QC, courier assignment no.)*

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