Aquatic Ecology

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Dear David,

Wakanui Creek Ecology

Scope of works

Residential development has been proposed for a land block on the corner of Farm Road and Racecourse Road, Ashburton (App. I, Fig. i). One waterway, Wakanui Creek, flows through the proposed development area (PDA). The waterway will not require realignment during the proposed development, although one road culvert will require installation during development. This will replace the existing farm culvert. The existing culvert has a diameter of c. 900 mm.

Excluding Wakanui Creek, no wetland habitats, as defined in the NES 2020, were identified in, or in the vicinity of, the PDA.

Of the two proposed stormwater retention areas within the PDA, one is in the immediate vicinity of the Wakanui Creek. Stormwater overflows from this retention basin are proposed to be directed into the waterway, via a cobbled outfall.

Physical habitat

Wakanui Creek is a long (c. 13 km) waterway which historically represented a braid of an old course of the Ashburton River when it flowed further north (1959 topographical maps). Historically it had either a surface water connection to the North Branch of the Ashburton River, or it originated from shallow groundwater of the same waterway. There is some evidence that a surface water connection to the North Branch was created in the 1960s to supplement the flow, presumably for irrigation or stock water. However, there appears be little surface-water connection at present.

Historically, Wakanui Creek meandered south-east through the old Ashburton township, flowing eastwards towards the Wakanui township and out to sea. However, in recent years, the lower course of the waterway appears to have completely dried up. In recent times (i.e. March 2023) there is no indication that Wakanui Creek has an outlet to the sea, with some groundwater water ponding well away from the beach gravels (Google Earth). Based on our assessment of historic maps and recent imagery, fish access into Wakanui Creek from both the sea, and the North Branch of the Ashburton River, has decreased to zero. This will reduce potential fish biodiversity to non-migratory species.

At the time of survey, the riparian zones of the Wakanui Creek within the PDA were disturbed. All mature trees, as depicted by Google Earth satellite imagery, had been removed, and evidence of mechanical vegetation removal was noted. Some local bed sediment was recorded, but a sediment fence had been installed across the Farm Road culvert, preventing further sedimentation downstream of the PDA.

One short riffle reach was observed near the northern PDA boundary, lined with gravel. Substrate in the remaining waterway consisted of firm sediment, with small amounts of woody debris throughout.

A Clapcott RHA (Clapcott 2015), conducted near the upstream fishing location, produced a physical habitat score of 20/100. This indicates the habitat for fish and macroinvertebrates provided by the Wakanui Creek is of a low quality. We expect that the RHA score for this reach would have been higher prior to the removal of riparian vegetation.

Ecology

- Macroinvertebrates

On the 18/04/2024, samples of the macroinvertebrate community were collected from two sites (one soft-bottomed and the other hard-bottomed).

The upstream sample was collected using the sampling protocol for hard-bottom streams (C1 in Stark *et al.* 2001). This involves using a 0.3 m wide, 500-micron kicknet, and disturbing the substrate with the sampler's foot. The downstream sample was collected using the sampling protocol for soft-bottom streams (C2 in Stark *et al*. 2001). This technique involves dislodging invertebrates from woody debris. The samples were then field preserved using denatured ethanol (90%) and transported to the AEL laboratory for identification using the standard identification keys (Chapman *et al.* 2011; Winterbourn 1973; Winterbourn *et al.* 2006).

The macroinvertebrate community index (MCI) was used to evaluate stream health. In the hard-substrate sample, the dominant macroinvertebrate taxon observed was the freshwater mud snail *Potamopyrgus antipodarum*, this species has an MCI of 4, indicating that it is tolerant of contaminated aquatic habitats. The next most abundant taxa were the non-biting midge (Chironominae and Orthocladiinae), which are also low scoring in respect to stream health. The MCI for the hard-substrate site was 75.7 which is indicative of "poor" water and habitat quality. In the soft-substrate sample *Potamopyrgus antipodarum* was also the most abundant taxon, followed by the exotic snail *Physa* sp., which has an MCI score of 0.1 in soft-bottom waterways. The MCI score for the soft-bottom site was 67.2 which is also indicative of "poor" stream health.

While carrying out the ecological survey, the woody-cased caddisfly *Triplectides* sp. was observed, yet none were identified from the samples. There may also be kākahi (freshwater mussel) present, as an empty valve was found. However, kākahi can be carried by birds, and may have been transported from another habitat.

- Fish

Fish sampling was conducted using a Kainga EFM300 electric fishing machine at two locations along the impacted reach of Wakanui Creek (App. I, Fig. i). The electric fishing current flowed for a total of 12 minutes during the fishing exercise.

A total of two fish species were identified in the Wakanui Creek during this survey (Table 2). These were, in order of abundance, the upland bully (*Gobiomorphus breviceps*)(App. Fig. i) and adults and juveniles of brown trout (*Salmo trutta*)(App. II, Figs. ii, iii). The upland bully is native to New Zealand, and has a conservation status of "Not Threatened" (Dunn *et al.* 2017). The brown trout was introduced to New Zealand as a sportfish, and therefore does not have a conservation status.

Table 1. The macroinvertebrate fauna at two sites in the upper Wakanui Creek.

		Hard Substrate		Soft Substrate	
		No.	MCI-hb	No.	MCI-sb
ANNELIDA					
Oligochaeta		3	1	2	3.8
CRUSTACEA					
Ostracoda		1	3	5	2.4
INSECTA					
Diptera					
Chironomidae					
Orthocladiinae		13	2	24	3.2
Tanypodinae		1	5		
Chironominae		11	3	9	3
Simuliidae	*Austrosimulium*	1	3		
Empididae				1	5.4
Ephemeroptera					
Leptophlebiidae	*Deleatidium*	4	8		
Trichoptera					
Hydrobiosidae	*Hydrobiosis clavigera*	1	5		
Hydroptilidae	*Oxyethira*	1	2	5	1.2
Coleoptera					
Elmidae	*Hydora*	2	6	1	7.2
ARACHNID	*Acari*	1	5	1	5.2
MOLLUSCA					
Gastropoda					
Hydrobiidae	*Potamopyrgus antipodarum*	53	4	37	2.1
Physidae	*Physa acuta*	4	3	31	0.1
Bivalvia					
Sphaeridae	*Sphaerium novaezelandiae*	4	3		
		HB		**SB**	
No. Scoring taxa		14		10	
TOTAL No. of animals		100		116	
Total indice score		53		33.6	
MCI		75.7		67.2	
% EPT taxa		6.0		4.3	

Table 2. Catch results from fish survey of Wakanui Creek, 22/04/2024.

Species	Common name	Upstream	Downstream	Total
Gobiomorphus breviceps	Upland bully	13	0	13
Salmo trutta	Brown trout	1	1	2
Total		**14**	**1**	**15**

These results are consistent with a previous survey of the fish population in the Wakanui Creek, downstream of the proposed development (AEL data). One species, the upland bully, was identified at Smithfield Road, following extensive fishing efforts at that location.

Impacts of increased residential density

The proposed residential development on Farm Road will occur on both sides of the Wakanui Creek, with an approximate mean development setback of 7.5 m from the water's edge, with the riparian margin planted in native vegetation. A walkway will meander along the true right bank (Coniston Park urban design report). The proposal encompasses the installation of a road culvert, two stormwater attenuation basins, with one adjacent to the waterway, and native riparian planting along both banks of the waterway (Coniston Park urban design report).

Being a natural waterway, the internal road culvert in Coniston Park will be required to comply with the NES-F 2020 in respect to sizing and invert bury for ecological passage, either as a permitted activity, or if not quite of that standard, requiring discretionary consent. The draft engineering plans (Davis Ogilvie, Plan SP03 B) indicated a pipe culvert of 825 mm, which may require consenting under the NES – F 2020. The existing culvert is also probably non-compliant in respect to the NES-F 2020 (App. II, Fig. iv), although fast-swimming trout may be able to negotiate its length to reach any potential spawning gravels upstream. Upland bullies spawn and rear locally (Jowett & Boustead 2001).

Of the two fish species present in the impacted waterway, the upland bully does not require fish passage to complete its lifecycle. The upland bully is largely non-migratory, rearing and reproducing in the same general habitat. However, brown trout need to access suitably clean gravel for spawning, which must be either upstream or downstream of this reach. It is likely that trout will need to negotiate the proposed road culvert, with upstream passage being of most ecological importance. The lack of eels, and other sea-migratory fish will be largely due to the poor sea access. However, even with the Wakanui Creek mouth open, downstream drying reaches and perched culverts are likely to limit the fish fauna to non-migratory fish, like those reported here.

Some, or most of the stormwater volume is expected to go to ground, depending on groundwater level and infiltration rates. However, the proposed stormwater retention basin has an overflow that will release water directly into the Wakanui Creek, just north of Farm Road. Discharge will have sporadic effects on surface water levels and flow rates in the Wakanui Creek, downstream of Farm Road. A temporary increase in flow and surface water depth will not significantly impact ecology within the waterway. Large brown trout prefer water velocities in the range of 0.4 to 0.6 $m.s^{-1}$, with a preference in the order of 0.5 $m.s^{-1}$, and depths of approximately 1 metre (Hayes & Jowett 1994). Juvenile brown trout prefer a range of water velocities between 0.3 and 0.9 $m.s^{-1}$, but prefer shallower water depths approximately 0.15-0.2 m (Jowett & Richardson 2008). Upland bullies are habitat generalists (Jowett & Richardson 2008) and the water depth above, along with some shallow riffle sections (i.e. stony shallow reaches with turbulent flow), will provide spawning and refuge areas for resident upland bullies. The abundance of upland bullies is related to the amount of stony substrate available to them (Jowett & Boustead 2001). We consider that adding coarse substrate will benefit the ecology, and will benefit refuge for native fish and trout fry. Based on draft landscaping plans, native riparian planting is proposed within approximately 7.5 m of the water's edge. Given the flat terrain, and porous topsoil, we consider that this buffer width will sufficiently filter any additional stormwater runoff caused by the proposed development, and if planted with the native vegetation, as depicted in the draft planting plan, will enhance ecological function in Wakanui Creek.

Discharge from the proposed stormwater retention basin may temporarily reduce water clarity during and after flood events for short periods. However, this impact will only for a short period, and will not adversely impact on the aquatic ecology any more than at present. Some mitigation recommendations are provided below.

Mitigation recommendations

AEL recommends the following:

- That the culvert specifications prescribed by the NES-F be followed, to ensure fish passage through the proposed road culvert.

- That a dense indigenous riparian zone is established along both banks of Wakanui Creek, with plantings suggested in the Urban Design Report (Novo Group, Rev. A, 2023). These serve to enhance ecological pathways along the waterway, and between aquatic lifestages and winged-adult lifestages which utilise bank vegetation.

Yours sincerely,

Mark Taylor, Riley Payne, Lucy Barltrop

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Appendix I. Site Map

Figure i. Sampling locations on Wakanui Creek, which flows south through the proposed development area. SP1 = hard-substrate invertebrate sampling site, SP2 = soft-substrate sampling site.

Appendix II. Field photographs

Figure i. Upland bullies, a common native fish, obtained from the proposed development area.

Figure ii. A juvenile brown trout from the upper reach of the proposed development area on Wakanui Creek.

Figure iii. An adult trout from the lower reach of the proposed development area.

Figure iv. The existing culvert in the proposed development area. This culvert is too narrow and perched too high under the NES-F 2020