
IN THE MATTER **The Resource Management Act 1991**

AND **Applications by SOL Quarries Ltd to
extend the existing SOL quarry onto land
at 93 and 133 Conservators Road,
Christchurch (RMA 2019 373 CRC193563,
CRC193564, CRC193773)**

BEFORE **Canterbury Regional Council and
Christchurch City Council**

APPLICATION

ON BEHALF OF **SOL Quarries Ltd.**

EVIDENCE OF MARK JAMES TAYLOR

Introduction

1. My full name is Mark James Taylor. I am an ecological consultant in respect to aquatic values. I hold the qualification of a Bachelor of Science. I have read the Environment Court practice note on expert witnesses that took effect on 1 December 2014 and I undertake to comply with it.
2. I have 35 years experience in aquatic habitat assessment, firstly nine years with MAF Fish (Ministry of Agriculture and Fisheries), followed by eight years with NIWA (the National Institute of Water and Atmospheric Research) and since 2001, within my own company, Aquatic Ecology Limited.
3. I am a member of the Limnological Society of New Zealand, and a former member of the Styx River Living Laboratory Board of Management (2002-2004).
4. I am the author of many reports and papers pertaining to fish ecology over a long career.
5. In respect to this consent application, AEL, under my direction, was commissioned by SOL Quarries Ltd. to evaluate and report on the aquatic ecology of the Paparua Stockwater Race (PSR) where it borders the quarry (Webb 2019).
6. Our localised study only recorded one common fish species, the upland bully (*Gobiomorphus breviceps*), a common inhabitant in waterways within and beyond Christchurch. Its conservation status is 'not threatened' (Dunn *et al.* 2017).
7. The invertebrate fauna was also of low diversity, and dominated by three species of common aquatic snails.

8. Over the last 20 years, CCC and ECan have been generally successful in remediating reaches of utility waterways, but always within the ecological limitations imposed by factors beyond their control. The major limitations are: limited recruitment of juvenile fish and invertebrates along the aquatic corridor, and the lack of control of water quality. In respect to water races, additional constraints may be imposed on improving physical habitat design (i.e. naturalising) under the guise of maintaining hydraulic capacity for the conveyance of water for irrigation and stock. In regard to raceways, it is implicit that the priorities of stockwater and irrigation water are higher than enhancing instream ecological values.
9. It is considered that ecological naturalisation and water conveyance are mutually exclusive. This is a generalisation, and varies from case to case. With good knowledge of the site-specific ecological requirements and the hydraulics, often a compromise can be reached.
10. I have read Ms Tredinnick's comments cited in the Sec. 95 report, which relate to CCC's general habitat enhancement initiatives in the city. I have considered these comments in the resident ecological context, but also knowledge of the ecology of the raceway further downstream, and other habitats in the Papanui Race network.
11. The raceway downstream of the Quarry is almost completely un-naturalised. It branches at Conservator Road with the south-flowing branch limited to the road reserves of Conservators Road, then Savills Road, before going to ground near Pound Road west of the Christchurch Airport (App. I, Fig. i). The north-flowing branch along Conservators Road, diverts for a short distance

through private property at 150 Conservators Road, but flows east for about 0.5 km before also going to ground north of the Christchurch Airport.

12. Ms Tredinnick also refers to a separate branch of the Paparua raceway (Race D) which runs through Yaldhurst Estate and forms the baseflow of what is commonly known as Haytons Drain. This is pictured in her Fig. 6 of her S42A report, which is the Council Reserve there. There were 4 species there, including the sea-migratory longfin and shortfin eels, but also upland bullies and brown trout. This waterway has been naturalised in at least 2 additional reaches downstream (Champions Mile, and Karamu Estate) both of which AEL has been involved in waterway design and ecology.

13. However, I wish to draw hydrological and ecological distinctions between the naturalised habitats along Race D (Yaldhurst, Champions Mile and Karamu) and the channelised habitat at SOL Quarry. In contrast to the SOL Quarry raceway, habitats in Yaldhurst Estate, Champions Mile and Karamu Estates (all on Race D of the Paparua Raceway Network) do not run to ground but connect *via* Haytons Drain and ultimately the Heathcote River. So, sea-migrant fish, in principal, can access these habitats either from the north by entrainment through the Waimakairiri River intake or from the south, *via* Haytons Drain and the Heathcote River. Upstream fish migrants from the Heathcote River, but probably only the 2 eel species, could possibly reach Yaldhurst naturalised reaches through a long (1.7 km) piped section under the industrialised zones of Sockburn and Hornby.

14. However juvenile fish arrive, with higher biodiversity in the Race D habitats, there was ecological merit in committing resources to naturalise them, which duly took place. Because they flow through or adjacent to residential areas and reserves, these habitats also have a higher amenity value than those at the SOL Quarry site.
15. In contrast to Race D habitats, AEL did not have discretion to advise on naturalisation on SOL Quarry. Our understanding is that SDC required the form and capacity of the diverted channel to be similar to the existing (p 10 of Webb 2019). Therefore, there was no point in discussing naturalisation in the AEL report, although I agree with Ms Tredinnick (p 15, 16 s95 report) that riparian planting will consolidate the banks and provide habitat for invertebrates.
16. With the SDC limitation to ecological enhancement, and fortuitously, upland bullies, the only species present, will thrive in channels with simply a cobble substrate upon which they can spawn, take refuge, and forage for invertebrates. The upland bully is a non-migratory versatile species with high reproductive potential.
17. I have looked at Ms Tredinnicks conditions for the construction and commissioning of the new channel (p 16), and have little difficulty with them, and they are largely similar to those outlined in the AEL report.
18. However, settled sediment has been experimentally demonstrated to reduce habitat for upland bullies (Jowett & Boustead 2001), hence the AEL's cautionary remarks about minimising sediment encroachment into the new channel and obscuring the gravel base. Dredging (or suction with a fine fish

screen) which removes sediment, but leaves the cobble base, will maintain upland bully habitat.

19. Ms Tredinnick (p 16) claims that the AEL report has omitted the potential (ecological) effects of the quarry operation on the new channel beyond the diversion process. However, in the conclusion of the AEL report (p 12), its stated that “the proposed diversion is likely to have minimal impact on the waterway with regard to its water quality and ecological values as it will remain limited by the habitat features above.” Further in the conclusion “If the recommendations below are followed, the new channel is likely to hold equal ecological value to the decommissioned channel, without jeopardising the values of the downstream ecosystem”.
20. Ms Tredinnick states that the applicant has now agreed to provide “new vegetation along the water race”(p 16), but it is unclear if this represents a riparian vegetation of any ecological benefit. If, and only if, that vegetation overhangs the water race will there be some expected increase in fish abundance (due to increased natural food supply enhancement), but not fish biodiversity which will always be limited by poor site access. The supplied figure in the CCC's s 95 report (Fig. 4), suggests an absence of riparian vegetation, and other than the treeline, no riparian vegetation of ecological benefit.
21. As a corollary, I therefore disagree with Ms Tredinnick's comment (p. 15) that the addition of instream boulders and overhanging vegetation will improve biodiversity, because ecological corridors into this reach are weak.
22. Contrary to the apparent assertion (to me) in the CCC s95 report (p 16), AEL report does not recommend the provision of fish

barriers, AEL simply states that upstream fish barriers already exist (e.g. culverts, weirs etc) between the Waimakariri River intake and the SOL Quarry site (page 9). As above, the channel goes to ground a short distance downstream.

Draft Consent Conditions

23. I have read the draft conditions (version 7, dated 5th June 2020). I particularly endorse the use of an automated dust suppression system (Cond. No. 17) which should provide continuous protection for the surrounding environment, including waterways.
24. The dust suppression system requires a maximum water take from the water race of 104 cubic metres/day (Cond. 19), which, if averaged, equals an instantaneous rate of 1.2 L/s, and would be ecologically acceptable in this hydraulic and ecological context.

S42A Reports

25. The Canterbury Regional Council s42A report states that the SDC guidelines, generally to be adequate to minimise any potential effect of surface water quality and aquatic ecology (para 325).
26. I have read the memo by CCC Surface Water and Land Drainage Planner Emily Tredinnick, dated 16th October 2020, along with her suggested conditions. I disagree that re-establishment of the eco-system with the diversion will take 'some time'. If the existing cobble base is translocated, along with the fish, then the ecosystem will re-establish over a short timeframe. This is because the ecology is simple, and if the invertebrates can be

kept viable during the transfer, along with the fish, then the ecology will re-establish quickly. This will be assisted by the significant flow passing along the channel, with the new reach benefiting from significant ecological drift (e.g. invertebrates, juvenile fish) from further upstream. Upland bullies mature and spawn in their first year. I accept this discussion was omitted from the 2019 AEL report.

Public submissions

27. I electronically scanned the 14 public submissions for ecological aspects but failed to find any.

References:

- Dunn, N. R.; Allibone, R. M.; Closs, G. P.; Crow, S.; David, B. O.; Goodman, J. M.; Griffiths, M.; Jack, D.; Ling, N.; Waters, J. M.; Rolfe, J. R. 2017. Conservation Status of New Zealand freshwater fishes, 2017. Department of Conservation, Wellington. 15 p.
- Jowett, I. G.; Boustead, N. C. 2001: Effects of substrate and sedimentation on the abundance of upland bullies (*Gobiomorphus breviceps*). *New Zealand Journal of Marine and Freshwater Research* 35: 605-613.
- Webb, C. J. 2019. Assessment of Environmental Effects; Paparua Stockwater Race (PSR) Diversion. Aquatic Ecology Limited, Christchurch. *Aquatic Ecology Report No. 172*. 17 p.

Appendix I.

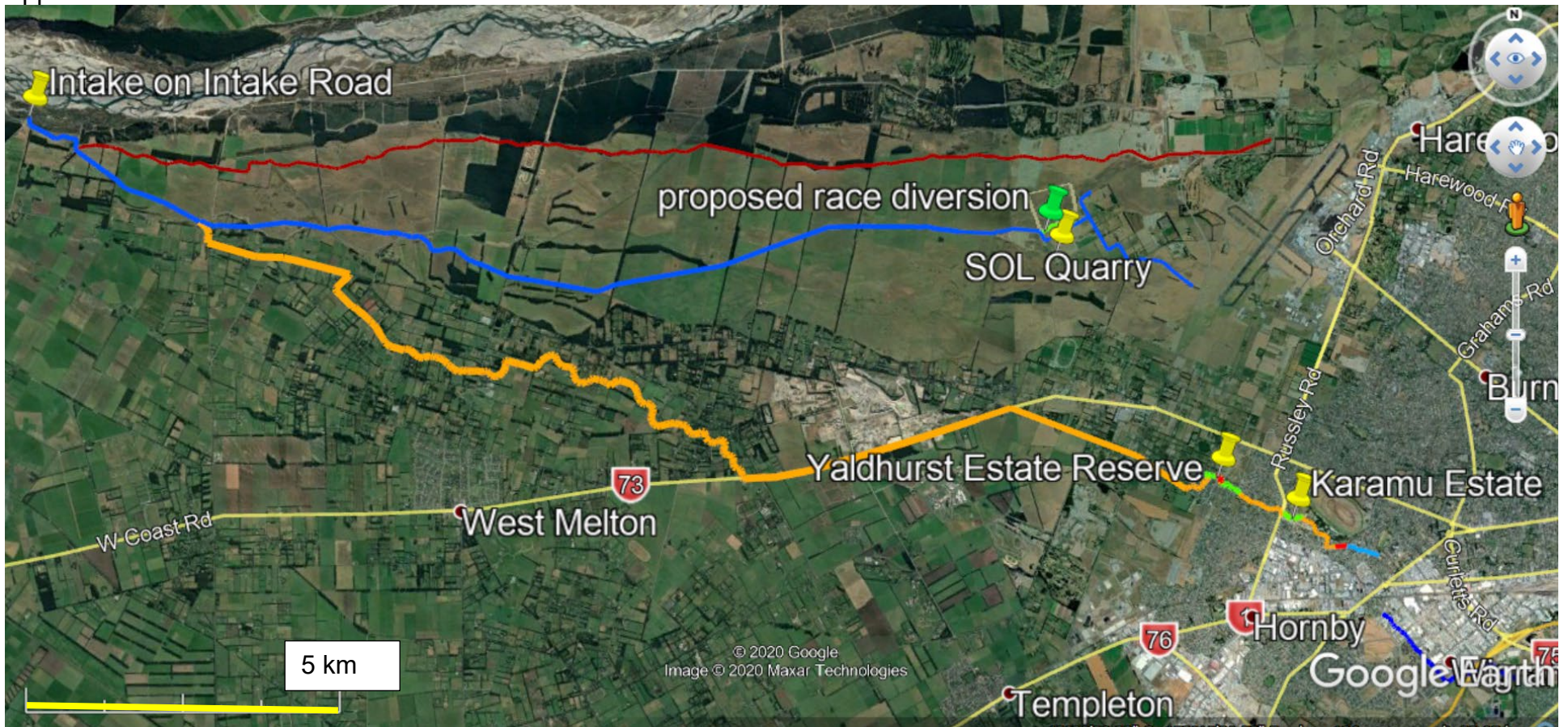


Figure i. Location of SOL Quarry and naturalised reaches of Race D, forming the baseflow of Haytons Drain.