

BEFORE THE SOUTHLAND REGIONAL COUNCIL

APP-20191150 and APP-20191703

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of applications for resource consents for the
Lake Te Anau to Manapouri multi use trail

BY **THE FIORDLAND TRAILS TRUST**
Applicant

BRIEF OF EVIDENCE OF DAVID JOHN HAMILTON

13 March 2020

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EVIDENCE OF DAVID JOHN HAMILTON

1. My full name is David John Hamilton. I am a consulting engineer and I reside in Alexandra.

Qualifications and Experience

2. I hold the following qualifications and am a member of the following organisations:
 - (a) Bachelor of Engineering (Hons) (Agricultural); and
 - (b) A post-graduate certificate in Engineering Hydrology; and
 - (c) I am a Fellow of Engineering New Zealand; and
 - (d) I am a member of the New Zealand Society on Large Dams, Water New Zealand, Irrigation New Zealand, and the New Zealand Hydrological Society.
3. I am now semi-retired working part-time for Geosolve Limited, based in Alexandra. I have worked in river, flood and erosion control, drainage, irrigation, water supply, engineering hydrology and water resources for 50 years. This work has included seven years with Ministry of Works and Development on irrigation and water resources in Otago (1969-1977); two years in Western Samoa (1977-79) on hydrology and water supply; three years as Deputy Chief Engineer, one year as Chief Engineer of the Hawkes Bay Catchment Board (1979-1983); six years as Chief Engineer of the Otago Catchment Board (1983-1989); and eight years as Director of Operations/Director Technical Services with the Otago Regional Council (1989-1997). I operated my own consulting firm for 20 years (1997-2017) and acted as a specialist consultant to a range of public and private clients throughout New Zealand. I joined Geosolve Limited in 2017 as a part-time staff member.
4. I have read the Code of Conduct for Expert Witnesses (Rule 330A, High Court Rules and Environment Court Practice Note 2014) and I agree to comply with it. I have complied with it in the preparation of this statement of evidence.

SCOPE OF EVIDENCE

5. I have been retained by Fiordland Trails Trust (FTT) to provide expert evidence on the impact of a retrospective resource consent for a 35m section of Leg 6 of the Lake 2 Lake Trail on the hydrology of a wetland that part of the trail crosses.
6. In particular my evidence relates to the appropriate mitigation that could improve the conditions at the site between two culverts at approximately either end of the section of trail.

7. My evidence deals with the following:
 - (a) List of reports prepared
 - (b) Reviews
 - (c) Comments on the Officers Report
 - (d) Conclusions

REPORTS

8. In September 2019 I conducted a desktop review of the application to modify the wetland. It reviewed the hydrological aspects of the trail and recommended a culvert be installed at the approximate centre point of the section of trail. This review was undertaken using aerial photos from GoogleEarth that were flown over a number of years. It was then provided to FTT as a 3 page letter on 2 September 2019. This letter was attached to the evidence of Simon Beale for the September 2019 hearing.
9. My letter was then included as part of the application for the diversion of surface and ground water (APP-20191703) in late 2019.
10. On 17 January 2020 I had a site inspection accompanied by David Boniface and Simon Beale. I subsequently provided a further letter to FTT on 31 January 2020 to clarify matters relating to the trail construction following my site visit. This letter made the same recommendation as the 2019 letter but recommended enhancements to the third culvert design to improve water level control and distribution.

REVIEWS

11. The initial desktop review included consideration of the original application APP-20191150, the additional information requested and supplied by WSP Opus on 1 April 2019 and the Wildland Consultants Reports of 26 February and 11 April 2019. Aerial imagery from 2007 to 2019 was viewed to assist in the review.
12. I concluded that the construction of the trail between the northern and southern culverts had reduced the interflow to the higher ground between the two 800mm culverts. In Figure 1 to the September letter I identified an area *potentially* affected through a lower water if the flows were not restored (the "Affected Area").
13. The effects of the trail on the wetland were identified in a Wildland Consultants

report that states:

- The trail cuts across the flow of water in the upper part of the wetland, and diverts previously inflowing water into an adjacent stream. This is likely to cause local drying of the wetland adjacent to the water table, and reduce water flow to the larger downstream part of the wetland. These effects are likely to cause local changes in wetland vegetation over time, allowing facultative wetland species such as mānuka to increase in abundance at the expense of obligate wetland species such as purei.
14. I recommended that a third culvert should be installed to ensure that groundwater levels downstream of the trail and between the other two trail culverts should be raised to provide better conditions for what I understood, from the information to hand, to be significant wetland vegetation.
 15. I also identified that the excavation of the water table draining toward the southern culvert on the upstream side of the track had reduced the flow downstream of the trail. I recommended that it be filled in to restore the hydrological functioning of the wetland that excavation had affected.
 16. Attached as Appendix 1 is my September 2019 letter.
 17. The Fiordland Trails Trust subsequently applied to divert surface and ground water (APP-20191703) via a third culvert.
 18. On 29 November 2019 a copy of Wildlands “Review of Effects of the Fiordland Trail on Wetland Values” dated 6 November 2019 was emailed to me. Kelvin Lloyd, after a site visit on 4 November 2019, clarified that the wetland values on the higher ground downstream between the original two culverts were not sufficient to warrant the additional culvert because of the nature of the vegetation not having high wetland values.
 19. Kelvin Lloyd considered that installing a third culvert would exacerbate the adverse hydrological effects on the wetland above the cycle trail and deliver water from that area to scotch broom scrub that does not comprise wetland vegetation. He continues to support the in-filling of the water table feeding the southern culvert.
 20. I am aware that Mr Beale has considered Dr Lloyd’s observations and is broadly in agreement with him. I note however that Mr Beale has some significant differences in his recommendations to Dr Lloyd, namely he has noted the presence of some isolated patches of wetland vegetation in the Affected Area and the potential to enhance the total area of wetland habitat via the third culvert. I agree with Mr Beale

that restoring and enhancing the interflow to the Affected Area would potentially extend the area of wetland habitat (I am mindful that this also requires weed control measures, but do not comment on the appropriateness or otherwise of the same).

21. Therefore, if the third culvert should proceed, I consider there should be refinements to the design concept that will enable water level maintenance upstream of the trail, including two lengths of 110 or 160mm drain coil branching from the 300mm intake pipe and stoplogs. With these improvements the third culvert will provide for an opportunity to increase the area of wetland downstream of the trail by providing a steady flow of water downstream of the trail.
22. I attach Figure 2, a concept drawing of the layout for the third culvert that show the refinements to achieve the improvements.

CONCLUSIONS

23. It is concluded that the construction of the trail between the northern and southern culverts has reduced the interflow from upstream to downstream of the trail through the higher ground between the two 800mm culverts. A small area adjacent to the water table that feeds to the southern culvert would also have been affected.
24. It is recommended that remediation be undertaken:
 - (a) filling in of the water table as previously proposed by WSP Opus in their letter of 1 April 2019, and
 - (b) placing a 300mm diameter culvert through the high ground approximately halfway between the two larger culverts. The actual location should be confirmed on site. This, with the refined design to maintain upstream water levels and to distribute water to the higher ground downstream of the trail, will extend the area of wetland between the two original culverts.



David John Hamilton

Date: 13 March 2020



Figure 1: Approximate location of third culvert

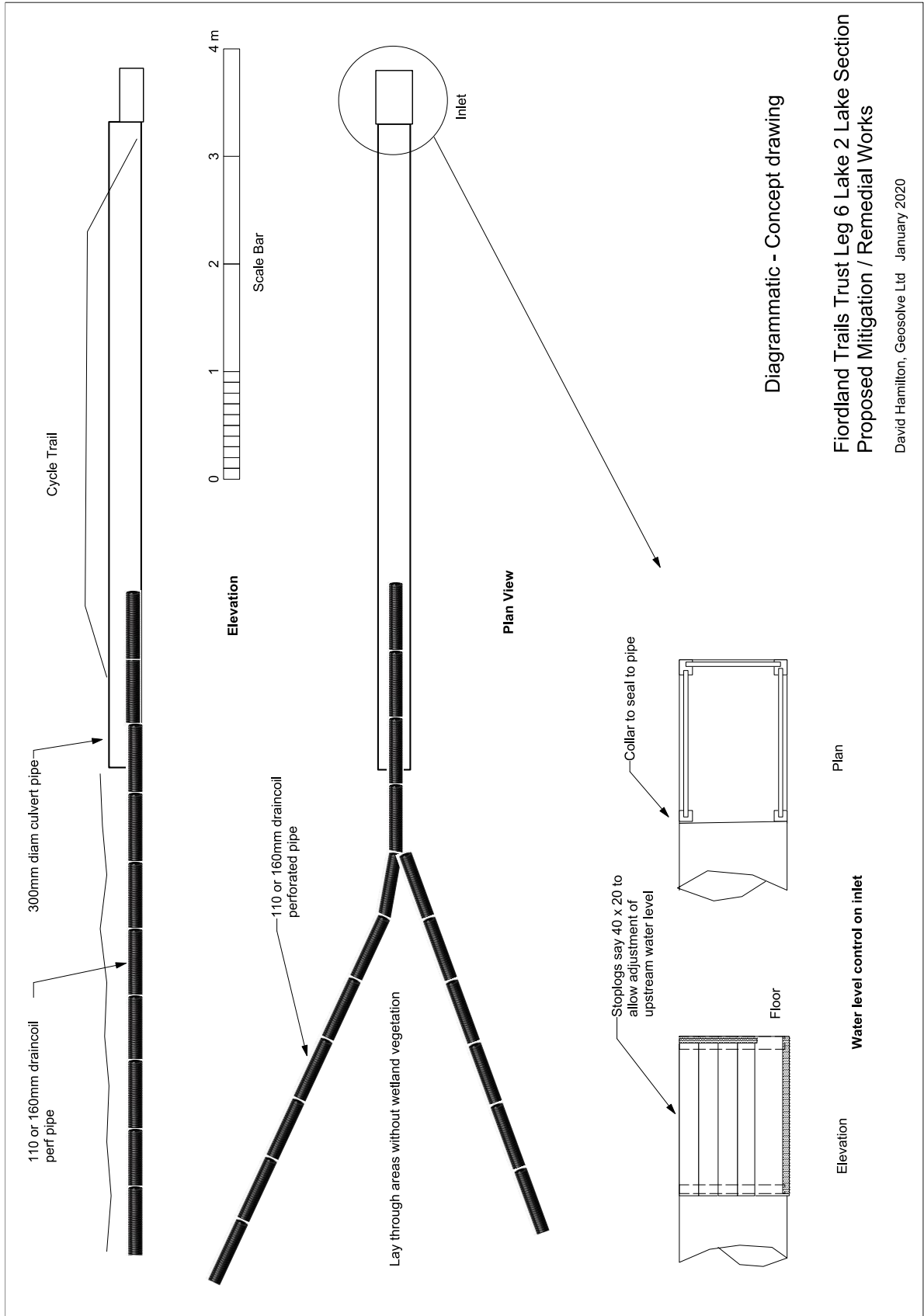


Figure 2: Concept diagram of proposed third culvert layout

Appendix 1 September 2019 Letter



GeoSolve Ref: J190531
2 September 2019

Fiordland Trails Trust

Attention: David Boniface [dajeck@xtra.co.nz]

Hydrology Review Fiordland Trails Trust Lake 2 Lake Leg 6

Resource Consent Application Reference: APP-20191150

Dear David,

In accordance with our Agreement dated 22 August 2019 we have undertaken a desktop review of existing information relating to the application for a retrospective consent for wetland modification on a section of Leg 6 of the Lake 2 Lake Trail near Manapouri. This report reviews the hydrological aspects of the trail and recommends remediation work.

Material Reviewed

The Opus resource consent application and the Environmental Report by Beale Consultants November 2018 have been reviewed. The effects of the trail on the upper part of the wetland have been identified in Wildland Consultants report dated 26 February 2019 Effects Assessment that states:

- The trail cuts across the flow of water in the upper part of the wetland, and diverts previously inflowing water into an adjacent stream. This is likely to cause local drying of the wetland adjacent to the water table, and reduce water flow to the larger downstream part of the wetland. These effects are likely to cause local changes in wetland vegetation over time, allowing facultative wetland species such as mānuka to increase in abundance at the expense of obligate wetland species such as purei.

In addition the Environment Southland request for further information dated 7 March 2019 and the Opus reply dated 27 March 2019 has been reviewed.

Aerial Imagery and Photos

The site has not been visited. Aerial photos with 0.75m and 0.4m definition for the area taken in 2008 and 2017 respectively have been used for site familiarisation. GoogleEarth images from 2007, 2013, 2014 and 2019 have also been viewed. Drone images supplied by David Boniface and ground photos from Simon Beale and David Boniface have been viewed.

Culvert installation

Two 800mm diameter plastic pipe culverts have been installed and details of depth of invert provided (David Boniface L2L Trail Leg 6, Culvert Analysis, Supply Bay Road to Twidle Property, August 2018). The channels upstream and downstream of the culverts do not appear to have been altered so groundwater levels should be similar to before construction.

Track Construction and Watertable

The track construction included stripping of vegetation and most topsoil. The placement of fill for the trail would have reduced natural flows at that level. Flows in the gravels underneath the stripped zone would still pass through the site.

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Photos of the watertable that drains towards the southern culvert on the upstream side of the track indicate that this is up to 400mm deep, although generally more like 300mm. This watertable picks up a small channel that would have continued on to ground between the two culverts downstream of the track.

Area potentially affected by reduced groundwater levels

The areas potentially affected by the track construction on upstream and downstream sides of the track are shown on the attached Figure 1.

Proposed Solution

The proposed remediation by way of filling in the upstream watertable is supported as a part solution. A small diameter pipe, nominal size 300mm to 400mm diameter, to pass the higher elevation water between the 800mm culverts would return water to the area of higher ground below the track, and ensure this area does not dry out. This should be placed approximately halfway between the two larger culverts, with the actual location to be confirmed on site. It is considered that a culvert with the ability to pass 20 l/s should be sufficient. This could be provided by a 200mm diameter culvert. Smaller culverts can have a tendency to get root bound and cleaning out is easier with a culvert in the 300 to 400mm diameter size and should be used. See Figure 1 attached for details.

Discussion and Conclusion

It is concluded that the construction of the trail between the northern and southern culverts has reduced the interflow from upstream to downstream of the trail through the higher ground between the two 800mm culverts. A small area adjacent to the watertable that feeds to the southern culvert would also have been affected.

It is recommended that remediation be undertaken:

- (a) through filling in of the watertable as previously proposed by Opus in letter 27 March 2019, and
- (b) placing a 300-400mm diameter culvert through the high ground approximately halfway between the two larger culverts. The actual location should be confirmed on site.

Yours faithfully,



David Hamilton
Senior Water Resources Engineer



Fiordland Trails Trust Leg 6 Lake 2 Lake Section
 Proposed Mitigation/ Remediation Works
 Base image is drone image supplied by David Boniface
 David Hamilton, Geosolve Ltd 2 September 2019

Figure 1: Drone image of section of trail showing proposed remediation work