

**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

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**BRIEF OF EVIDENCE OF SIMON HERBERT BEALE**

**16 March 2019**

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## **1. QUALIFICATIONS AND EXPERIENCE**

- 1.1 My full name is Simon Herbert Beale. I am a Director of Beale Consultants Limited, an independent ecology and planning consultancy.
  - 1.2 I hold a Bachelor of Science in Zoology from the University of Otago and a Bachelor of Forestry Science from the University of Canterbury. I am a Member of the New Zealand Ecological Society the Environment Institute of Australia and New Zealand and the New Zealand Planning Institute. I am a Certified Environmental Practitioner.
  - 1.3 I was previously employed by MWH New Zealand Limited for 22 years and more recently with WSP Opus as a terrestrial ecologist and environmental planner. Much of my recent experience has been dedicated to undertaking ecological assessments for infrastructure projects and tourism related developments.
  - 1.4 I am familiar with the ecology of the affected wetland and its setting having conducted a site visit in the company of Mr Boniface on 11 October 2018 and on 17 January 2020.
  - 1.5 I have prepared a report dated November 2018 which describes the terrestrial ecology of the wetland, its ecological significance and the ecological effects of trail construction. I have corresponded with Dr Lloyd on matters arising from that report.
  - 1.6 I drafted a brief of evidence in anticipation of the hearing of this application that was set down for September 2019.
  - 1.7 This evidence is the same evidence prepared for the 2019 hearing (subject to some minor amendments and additions to improve clarity) but has been updated to provide my opinion on the application to divert water for the purpose of the third culvert. I have removed the former Appendix 1 as Mr Hamilton is now producing that report himself. Attached as an appendix to this evidence is a version of the evidence with the additions underlined.
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## **2. CODE OF CONDUCT**

2.1 I have read and am familiar with the Code of Conduct for Expert Witnesses, in the current Environment Court Practice Note (2014), have complied with it, and will follow the Code when presenting evidence to the Council. I also confirm that the matters addressed in this statement of evidence are within my area of expertise, except when relying on the opinion or evidence of other witnesses. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

## **3. SCOPE OF EVIDENCE**

3.1 My evidence will cover the following matters:

- wetland description
- ecological significance of wetland
- ecological effects
- agreed remedial and compensatory measures
- the staff reports
- conclusions

3.2 In preparing this evidence I have read the following documents:

- The resource consent application for wetland modification prepared by WSP-Opus including appendices lodged with Environment Southland on 18 February 2019;
- The WSP-Opus response to the further information request from Environment Southland dated 7 March 2019;
- Peer review assessments prepared in letter form by Dr Lloyd to Environment Southland dated 26 February, 8 April, 11 April and 6 November 2019;
- Statement of evidence of Dr Lloyd dated 7 March 2020;
- The staff reports prepared by Mrs Nicol; and
- A report prepared by Mr Hamilton dated 2 September 2019.

- Statement of evidence of Mr Hamilton dated 16 March 2020.
- 3.3 I corresponded with Dr Lloyd by email and phone on 12 March 2019 in regard to the initial peer review he conducted at the request of Environment Southland.
- 3.4 In assessing the ecological effects of the proposed third culvert I rely on the evidence of Mr Hamilton.

#### **4. WETLAND DESCRIPTION**

- 4.1 The wetland as described in my report is classified as a marsh. It is influenced by a spring fed stream that splits into two branches that define the wetland extent at the trail crossing. The wetland is subject to moderate to high water fluctuations as evidenced by areas of mud and silt that exist on the upstream side of the trail.
- 4.2 The wetland vegetation contains sedgeland dominated by pukio (*Carex secta*) that lines both streams and mixed shrubland with a sedgeland ground cover that grows on the muddy-silty ground between the streams. The shrubland consists of stands of manuka (*Leptospermum scoparium* var. *scoparium*), shrubs of mingimingi (*Coproma propinqua*) and weeping mapou (*Myrsine divaricata*). The sedge rautahi (*Carex geminata*) is dominant across the ground beneath an open shrubland canopy near the trail.

#### **5. ECOLOGICAL SIGNIFICANCE OF WETLAND**

- 5.1 The wetland has been determined to be ecologically significant in terms of Section 6(c) of the RMA when assessed against the assessment criteria listed in Appendix 3 of the Southland Regional Policy Statement. My assessment is set out in my report that accompanied the AEE.
- 5.2 The wetland reflects the high degree of representativeness, exhibiting natural diversity characteristic of wetlands in the Upukerora Ecological District. The significance of the wetland is further reflected by its location in a land environment where the indigenous vegetation has been reduced to less than 20% nationally and the role it plays in maintaining important biological and hydrological functions, including the stability of the riparian margins.
- 5.3 I agree with Dr Lloyd that marsh wetlands are one of the wetland classes, along with swamps, that have been reduced to the greatest extent in the country since pre-human times and therefore triggers the rarity/distinctiveness criterion.

## **6. ECOLOGICAL EFFECTS**

### Effects on wetland hydrology and function

- 6.1 In his peer review Dr Lloyd states that the adverse effects of trail construction on the wetland is more than minor due largely to hydrological effects. In particular he states the trail is likely to cause local drying of the wetland adjacent to the constructed water table while the trail itself is likely to reduce water flow to the large part of the wetland downstream of the trail. He adds that the adverse hydrological effects are likely to change the composition of the wetland vegetation over time. Dr Lloyd notes however that remediation, mitigation, or compensation actions could potentially address the adverse effects.
- 6.2 In response to Dr Lloyd's assessment, the Trust commissioned hydrologist Mr Hamilton to undertake a desktop assessment of potential hydrological effects and to recommend appropriate remedial work. In his report Mr Hamilton concludes that trail construction has reduced natural surface and sub-surface flow from upstream to downstream of the trail. This reduced flow has occurred within the zone stripped of topsoil along the trail route. A plan attached to his report defines the extent of the wetland potentially affected by the trail being an area immediately adjacent to the water table and a wedge shaped area downstream of the trail.
- 6.3 Mr Hamilton supports the infilling of the water table and considers the groundwater levels upstream and downstream of the existing culverts have been retained. He recommends the placement of an additional 300mm diameter culvert between the northern and southern culverts in order to return water to an area of higher ground downstream of the trail to ensure this area does not dry out.
- 6.4 During an exchange of emails Dr Lloyd and I agree that infilling of the water table using the same peat/silt material that was excavated is the best means of minimising any localised drying of the wetland. This would need to be undertaken in autumn or winter to avoid burying the sedge rautahi which will naturally recolonise the infilled water table.
- 6.5 Dr Lloyd and I agree that the infilled water table needs to be monitored to address any settlement that occurs to ensure the original ground level is maintained. This would be undertaken immediately after the remedial works have been implemented and then on two further occasions to assess whether there has been any settling that requires any refilling before any active growth or colonisation of the infilled water table by rautahi.

6.6 Retention of the existing culverts and placement of the additional (third) culvert as recommended by Mr Hamilton, along with infilling of the water table, will in my opinion avoid any adverse effects on the hydrology of the wetland. This will, therefore, maintain wetland function by ensuring that potential localised changes in the wetland vegetation will be avoided. In his evidence Mr Hamilton addresses the concerns of Dr Lloyd that the third culvert will exacerbate the adverse hydrological effects on the wetland upstream of the cycle trail. Mr Hamilton proposes refinements to the culvert design concept that will enable water level control upstream of the trail while enhancing the area between the two culverts below the trail. I address this latter point at paragraph 6.15.

6.7 Dr Lloyd in his assessment drew attention to the existence of a grove of exotic trees upstream of the wetland on private property which are likely in his opinion to be crack willows. However, recent correspondence with the landowner confirms that these trees are Japanese fodder willow (*Salix schwerinii* “Kinuyanagi”) which I understand are non-invasive and not a threat to wetlands. While I have been onsite, I have not assessed these trees.

#### Effects on natural character

6.8 Dr Lloyd in his assessments states that problem weeds such as Scotch broom that occurs in patches in the wetland are very likely to be having an adverse effect on the natural character of the wetland. Dr Lloyd adds that control of Scotch broom could mitigate these adverse effects on natural character.

6.9 The natural character values of wetlands, including stream margins, encompass natural elements such as indigenous wetland vegetation and its spatial distribution, natural drainage patterns (both surface and sub-surface) and the quality and diversity of habitat for indigenous flora and fauna.

6.10 I agree with Mrs Nicol that there are adverse effects from the trail on natural character through the removal of indigenous vegetation.

6.11 I support the proposed condition of consent requiring the consent holder to undertake an active weed management programme over an area of approximately 2,000 m<sup>2</sup> upstream of the trail beyond the active weed control corridor that is currently in place. Weed control in this area should target Scotch broom, gorse, Darwin’s barberry and other problem weed species and should involve targeted spraying on at least a twice-yearly basis. The programme would be ongoing in tandem with the current trail corridor control programme. This

programme could extend to the removal of a mature rowan tree downstream of the cycle trail and nearby regenerating rowan as recommended by Dr Lloyd.

- 6.12 In particular weed control over this area will reduce competition for indigenous wetland plants and allow them to exert structural dominance over this part of the wetland enhancing its natural character and protecting and restoring areas of indigenous vegetation.

Cumulative loss of wetland

- 6.13 Dr Lloyd in his assessment refers to adverse effects arising from the cumulative or direct loss of wetland extent due to trail construction. He notes that while the extent of wetland loss is relatively small the adverse effects are more than minor. In my opinion the small area of wetland lost will not diminish the range and diversity of the indigenous vegetation and habitats in the wetland by a more than a minor extent.
- 6.14 Dr Lloyd proffers options that will have positive effects on the wetland. These involve the control of problem weeds such as Scotch broom as previously mentioned. Dr Lloyd adds that if these actions, which I consider are compensatory, are undertaken with sufficient care and diligence, the ecological effects of trail construction on the wetland function and natural character would be less than minor. I agree with Dr Lloyd.
- 6.15 I support the third culvert and in particular the layout of the draincoil pipes as shown on Figure 2 of Mr Hamilton's evidence, especially as this offers an opportunity to increase the extent of wetland downstream of the trail. In combination with the die back of broom scrub (referred to on page 4 of the ecological assessment and in Dr Lloyd's report of 6 November 2019) due to chemical control undertaken by the Trust, these measures have the potential to create suitable conditions for wetland plants to establish.
- 6.16 In my view a small but constant flow from the culvert downgradient of an elevated area of Scotch broom and into an area of sprayed gorse would create suitable conditions for wetland plants by creating an area of permanently wet ground. These conditions would be further improved by an increase in overhead light conditions as the sprayed broom "opens up" due to die back and would further improve conditions for wetland plant establishment. I note that this area is close to wetland plants bordering the culverted streams which are a seed source for plant establishment.

6.17 I therefore do not agree with the conclusion in the section 42A report that the wetland will be subject to inappropriate use and development that will compromise natural character as a consequence of the application for the third culvert.

6.18 In summary the adverse effects arising from the direct loss of wetland would be less than minor when assessed against the positive effects that will be derived from the installation of the third culvert and implementation of the remedial and compensatory measures as discussed above. These measures will ensure wetland function and habitat quality is maintained and that the residual effects of wetland lost due to trail formation will potentially be reduced through wetland creation downstream of the trail.

## **7. SUMMARY OF REMEDIAL AND COMPENSATORY MEASURES**

7.1 In summary the remedial and compensatory measures I recommend are:

- Infilling of the water table in accordance with the methodology agreed to between the two ecologists;
- Installing a 300mm diameter culvert about halfway between the northern and southern culverts to reinstate surface and shallow sub-surface flows to the wetland downstream of the trail which could lead to the creation of an additional area of wetland;
- Retain the existing northern and southern culverts;
- Undertaking programmed control of weed species occurring in an area of approximately 2,000 m<sup>2</sup>-upstream and downstream of the trail.

7.2 I note that the infilling of the water table and undertaking control of problem weeds are remedial and compensatory measures supported by ecologist's Dr Alan Mark and Mr Chris Stowe who provided submissions in support of the application.

## **8. STAFF REPORTS**

Wetland Modification (APP-20191150)

8.1 In Section 2.3 of her report Mrs Nicol states the hydrological effects of the trail on the wetland and the effects arising from direct loss of wetland vegetation are more than minor. However, she qualifies these statements with the bracketed words "prior to any remediation proposed". I assume the inclusion of this qualifier



reflects her recognition of the positive effects of the measures recommended by Dr Lloyd in reducing adverse effects of the trail on the wetland.

- 8.2 With respect to the commentary on Objective 14 of the proposed Southland Water and Land Plan (pSWLP) I disagree with Mrs Nicol that the proposal will not maintain the natural wetland. The small area of wetland lost due to the trail construction has not in my opinion diminished the range and diversity of the indigenous vegetation and habitats in the wetland. Furthermore, the volunteered remediation and enhancement measures, in particular the measures aimed at restoring hydrological functioning, notably with the installation of a third culvert will maintain the life supporting capacity of wetland areas downstream of the trail through reinstatement of surface and sub-surface water flows. This will in turn avoid changes that may occur in the composition of the indigenous wetland vegetation communities arising from an alteration of the wetland hydrology.
- 8.3 Reinstatement of the wetland hydrology in combination with weed control is consistent with Objective 14 as it will restore and maintain the range and diversity of the indigenous plant communities and habitats within the wetland. As such, the quality of the wetland will not be reduced by the presence of the trail and there will be positive effects from the measures proposed.
- 8.4 In terms of Objective 17 of the pSWLP I agree with Mrs Nicol that the natural character value of the wetland has been diminished by trail construction on the basis that there has been removal of indigenous wetland vegetation within the trail corridor. However the control of problem weeds in the wetland over a 2,000 m<sup>2</sup> area as volunteered by the Trust will in my opinion compensate for these localised effects on the natural character of the wetland by increasing the overall extent of indigenous wetland vegetation in the vicinity of the trail, including the riparian margins.
- 8.5 Under Policy 32 of the pSWLP it is my contention that the construction of the trail is not contrary to this policy on the basis that while a small area of the wetland has been lost, its protection is assured through remedial hydrological measures and through control of problem weeds such as Scotch broom and gorse. In the absence of control measures these weeds would increase in density and area within the wetland contribute to a decline in wetland function and habitat quality.
- 8.6 The remedial hydrological and weed control measures are focussed on protecting the indigenous vegetation and habitats of the wetland which are assessed as ecologically significant under Section 6(c) of the Act. These measures will also

maintain wetland function. These positive effects additionally align with the intent of Policy 32 of the pSWLP as well as Policy 34 of the pSWLP in terms of wetland creation. This multi-faceted approach to remedying the adverse effects of the trail on the wetland is also consistent with Policy 40 of the Operative Regional Water Plan.

- 8.7 In terms of Policy 33 of the pSWLP it is clear that the trail has reduced the wetland area by a small amount. However, the remedial and compensatory measures recommended by Dr Lloyd and Mr Hamilton which I endorse will in my opinion maintain the function and quality of the wetland and address the reduction in the area of wetland affected by the trail. Put another way these measures will compensate for the reduction in wetland area.

#### Diversion of Surface Water and Groundwater (APP-20191703)

- 8.8 In Section 2.3 - Effects on habitat and ecosystems, Mrs Nicol states that the effect of the culvert on the wetland will be more than minor. She bases this view on the November 2019 memorandum from Dr Lloyd that opines the third culvert would exacerbate the upstream effects of the trail and deliver water to non-wetland species.
- 8.9 I have dealt with the delivery of water to non-wetland (scotch broom mainly) species above at paragraphs 6.15 and 6.16.
- 8.10 In terms of exacerbating upstream adverse effects, Dr Lloyd bases this on his onsite observation of the pattern of wetland vegetation being confined to the banks of the existing streams, meaning the two culverts proposed as part of the original application would adequately maintain the downstream flow of water to the areas of wetland habitat. While I agree in general terms as set out above, my own onsite observations reveal the possibility to enhance the area of wetland habitat through Mr Hamilton's proposed culvert design. Secondly, some isolated "open" areas of wetland and patches of wetland plants (sedgeland) were observed beneath the manuka canopy between the streams, beyond the riparian margins. This constitutes a vegetation pattern comprising of manuka/broom scrub and wetland.
- 8.11 The culvert inlet would however require a stoplog or similar to ensure the water table is maintained on the upstream side of the trail to ensure it does not adversely affect the hydrological conditions of the immediate area of wetland.

- 8.12 Thus, on the basis of the inlet culvert design recommended by Mr Hamilton I would contend that the effects would be less than minor as the purpose of the culvert design is to maintain the upstream water level in the wetland and that it will lead to positive effects and an overall enhancement of wetland habitat.
- 8.13 The culvert design as recommended by Mr Hamilton is in my opinion consistent with Objective 10 of the RWP as it will maintain the water level in the wetland and consequently maintain the diversity and integrity of the wetland habitats. Furthermore, the design achieves Policies 38 and 40 of the RWP and Policy 14 and Objective 17 of the pSWLP as adverse hydrological effects on the wetland will be avoided and wetland function and natural character maintained.
- 8.14 In terms of Policy 33 of the pSWLP and Policy BIO.2 of the RPS, Mrs Nicol considers the proposed culvert would result in further modification of the wetland area, along with its fragmentation. The culvert design recommended by Mr Hamilton includes the provision of stoplogs to ensure the water level in the wetland upstream of the trail is maintained to avoid any potential adverse effects on the hydrology of the wetland that could otherwise lead to a reduction in wetland area.

## **9. CONCLUSIONS**

- 9.1 Both ecologists are in agreement that the marsh wetland is ecologically significant.
- 9.2 Both ecologists agree that the remedial measures involving the infilling of the table is appropriate and will effectively address the localised hydrological adverse effects on the wetland.
- 9.3 The proposed culvert installation as recommended by Mr Hamilton is an appropriate remedial measure in addressing adverse hydrological effects on areas of wetland that exist between the culverts downstream of the trail through reinstatement of surface and shallow sub-surface flows. The proposed culvert will result in a positive ecological effect as it has the potential to increase the extent of the wetland area downstream of the trail.
- 9.4 The combination of remedial measures will ensure the hydrological function of the wetland is maintained while avoiding any potential changes in the indigenous wetland vegetation cover within the affected areas.

- 9.5 The implementation of programmed weed control within the wetland as agreed to by the Trust is an appropriate compensatory action in response to wetland loss caused by trail construction. This will mitigate the effects of trail construction on the natural character of the wetland by providing suitable conditions for indigenous wetland vegetation to recolonise infested areas and an area downstream of the trail to the benefit of the wetland's natural character.
- 9.6 The proposed third culvert in combination with the existing and proposed weed control measures and infilling of the water table will maintain wetland function and in turn protect in the long term the indigenous vegetation and habitats of indigenous fauna that are assessed to be significant under section 6(c) of the Act.
- 9.7 I agree with Dr Lloyd that the ecological effects of trail construction on the wetland would be less than minor if the recommended remedial and compensatory measures are undertaken with sufficient care and diligence.



Simon Beale  
Senior Ecologist

16 March 2020

**APPENDIX 1**  
**Marked-Up Evidence**

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- 6.14 Dr Lloyd proffers options that will have positive effects on the wetland. These involve the control of problem weeds such as Scotch broom as previously mentioned. Dr Lloyd adds that if these actions, which I consider are compensatory, are undertaken with sufficient care and diligence, the ecological effects of trail construction on the wetland function and natural character would be less than minor. I agree with Dr Lloyd.
- 6.15 I support the third culvert and in particular the layout of the draincoil pipes as shown on Figure 2 of Mr Hamilton's evidence, especially as this offers an opportunity to increase the extent of wetland downstream of the trail. In combination with the die back of broom scrub (referred to on page 4 of the ecological assessment and in Dr Lloyd's report of 6 November 2019) due to chemical control undertaken by the Trust, these measures have the potential to create suitable conditions for wetland plants to establish.
- 6.16 In my view a small but constant flow from the culvert downgradient of an elevated area of Scotch broom and into an area of sprayed gorse would create suitable conditions for wetland plants by creating an area of permanently wet ground. These conditions would be further improved by an increase in overhead light conditions as the sprayed broom "opens up" due to die back and would further improve conditions for wetland plant establishment. I note that this area is close to wetland plants bordering the culverted streams which are a seed source for plant establishment.

6.17 I therefore do not agree with the conclusion in the section 42A report that the wetland will be subject to inappropriate use and development that will compromise natural character as a consequence of the application for the third culvert.

6.18 In summary the adverse effects arising from the direct loss of wetland would be less than minor when assessed against the positive effects that will be derived from the installation of the third culvert and implementation of the remedial and compensatory measures as discussed above. These measures will ensure wetland function and habitat quality is maintained and that the residual effects of wetland lost due to trail formation will potentially be reduced through wetland creation downstream of the trail.

## **7. SUMMARY OF REMEDIAL AND COMPENSATORY MEASURES**

7.1 In summary the remedial and compensatory measures I recommend are:

- Infilling of the water table in accordance with the methodology agreed to between the two ecologists;
- Installing a 300mm diameter culvert about halfway between the northern and southern culverts to reinstate surface and shallow sub-surface flows to the wetland downstream of the trail which could lead to the creation of an additional area of wetland;
- Retain the existing northern and southern culverts;
- Undertaking programmed control of weed species occurring in an area of approximately 2,000 m<sup>2</sup>-upstream and downstream of the trail.

7.2 I note that the infilling of the water table and undertaking control of problem weeds are remedial and compensatory measures supported by ecologist's Dr Alan Mark and Mr Chris Stowe who provided submissions in support of the application.

## **8. STAFF REPORTS**

### Wetland Modification (APP-20191150)

8.1 In Section 2.3 of her report Mrs Nicol states the hydrological effects of the trail on the wetland and the effects arising from direct loss of wetland vegetation are more than minor. However, she qualifies these statements with the bracketed words "prior to any remediation proposed". I assume the inclusion of this qualifier

reflects her recognition of the positive effects of the measures recommended by Dr Lloyd in reducing adverse effects of the trail on the wetland.

- 8.2 With respect to the commentary on Objective 14 of the proposed Southland Water and Land Plan (pSWLP) I disagree with Mrs Nicol that the proposal will not maintain the natural wetland. The small area of wetland lost due to the trail construction has not in my opinion diminished the range and diversity of the indigenous vegetation and habitats in the wetland. Furthermore, the volunteered remediation and enhancement measures, in particular the measures aimed at restoring hydrological functioning, notably with the installation of a third culvert will maintain the life supporting capacity of wetland areas downstream of the trail through reinstatement of surface and sub-surface water flows. This will in turn avoid changes that may occur in the composition of the indigenous wetland vegetation communities arising from an alteration of the wetland hydrology.
- 8.3 Reinstatement of the wetland hydrology in combination with weed control is consistent with Objective 14 as it will restore and maintain the range and diversity of the indigenous plant communities and habitats within the wetland. As such, the quality of the wetland will not be reduced by the presence of the trail and there will be positive effects from the measures proposed.
- 8.4 In terms of Objective 17 of the pSWLP I agree with Mrs Nicol that the natural character value of the wetland has been diminished by trail construction on the basis that there has been removal of indigenous wetland vegetation within the trail corridor. However the control of problem weeds in the wetland over a 2,000 m<sup>2</sup> area as volunteered by the Trust will in my opinion compensate for these localised effects on the natural character of the wetland by increasing the overall extent of indigenous wetland vegetation in the vicinity of the trail, including the riparian margins.
- 8.5 Under Policy 32 of the pSWLP it is my contention that the construction of the trail is not contrary to this policy on the basis that while a small area of the wetland has been lost, its protection is assured through remedial hydrological measures and through control of problem weeds such as Scotch broom and gorse. In the absence of control measures these weeds would increase in density and area within the wetland contribute to a decline in wetland function and habitat quality.
- 8.6 The remedial hydrological and weed control measures are focussed on protecting the indigenous vegetation and habitats of the wetland which are assessed as ecologically significant under Section 6(c) of the Act. These measures will also

maintain wetland function. These positive effects additionally align with the intent of Policy 32 of the pSWLP as well as Policy 34 of the pSWLP in terms of wetland creation. This multi-faceted approach to remedying the adverse effects of the trail on the wetland is also consistent with Policy 40 of the Operative Regional Water Plan.

- 8.7 In terms of Policy 33 of the pSWLP it is clear that the trail has reduced the wetland area by a small amount. However, the remedial and compensatory measures recommended by Dr Lloyd and Mr Hamilton which I endorse will in my opinion maintain the function and quality of the wetland and address the reduction in the area of wetland affected by the trail. Put another way these measures will compensate for the reduction in wetland area.

#### Diversion of Surface Water and Groundwater (APP-20191703)

- 8.8 In Section 2.3 - Effects on habitat and ecosystems, Mrs Nicol states that the effect of the culvert on the wetland will be more than minor. She bases this view on the November 2019 memorandum from Dr Lloyd that opines the third culvert would exacerbate the upstream effects of the trail and deliver water to non-wetland species.
- 8.9 I have dealt with the delivery of water to non-wetland (scotch broom mainly) species above at paragraphs 6.15 and 6.16.
- 8.10 In terms of exacerbating upstream adverse effects, Dr Lloyd bases this on his onsite observation of the pattern of wetland vegetation being confined to the banks of the existing streams, meaning the two culverts proposed as part of the original application would adequately maintain the downstream flow of water to the areas of wetland habitat. While I agree in general terms as set out above, my own onsite observations reveal the possibility to enhance the area of wetland habitat through Mr Hamilton's proposed culvert design. Secondly, some isolated "open" areas of wetland and patches of wetland plants (sedgeland) were observed beneath the manuka canopy between the streams, beyond the riparian margins. This constitutes a vegetation pattern comprising of manuka/broom scrub and wetland.
- 8.11 The culvert inlet would however require a stoplog or similar to ensure the water table is maintained on the upstream side of the trail to ensure it does not adversely affect the hydrological conditions of the immediate area of wetland.

- 8.12 Thus, on the basis of the inlet culvert design recommended by Mr Hamilton I would contend that the effects would be less than minor as the purpose of the culvert design is to maintain the upstream water level in the wetland and that it will lead to positive effects and an overall enhancement of wetland habitat.
- 8.13 The culvert design as recommended by Mr Hamilton is in my opinion consistent with Objective 10 of the RWP as it will maintain the water level in the wetland and consequently maintain the diversity and integrity of the wetland habitats. Furthermore, the design achieves Policies 38 and 40 of the RWP and Policy 14 and Objective 17 of the pSWLP as adverse hydrological effects on the wetland will be avoided and wetland function and natural character maintained.
- 8.14 In terms of Policy 33 of the pSWLP and Policy BIO.2 of the RPS, Mrs Nicol considers the proposed culvert would result in further modification of the wetland area, along with its fragmentation. The culvert design recommended by Mr Hamilton includes the provision of stoplogs to ensure the water level in the wetland upstream of the trail is maintained to avoid any potential adverse effects on the hydrology of the wetland that could otherwise lead to a reduction in wetland area.

## **9. CONCLUSIONS**

- 9.1 Both ecologists are in agreement that the marsh wetland is ecologically significant.
- 9.2 Both ecologists agree that the remedial measures involving the infilling of the table is appropriate and will effectively address the localised hydrological adverse effects on the wetland.
- 9.3 The proposed culvert installation as recommended by Mr Hamilton is an appropriate remedial measure in addressing adverse hydrological effects on areas of wetland that exist between the culverts downstream of the trail through reinstatement of surface and shallow sub-surface flows. The proposed culvert will result in a positive ecological effect as it has the potential to increase the extent of the wetland area downstream of the trail.
- 9.4 The combination of remedial measures will ensure the hydrological function of the wetland is maintained while avoiding any potential changes in the indigenous wetland vegetation cover within the affected areas.

- 9.5 The implementation of programmed weed control within the wetland as agreed to by the Trust is an appropriate compensatory action in response to wetland loss caused by trail construction. This will mitigate the effects of trail construction on the natural character of the wetland by providing suitable conditions for indigenous wetland vegetation to recolonise infested areas and an area downstream of the trail to the benefit of the wetland's natural character.
- 9.6 The proposed third culvert in combination with the existing and proposed weed control measures and infilling of the water table will maintain wetland function and in turn protect in the long term the indigenous vegetation and habitats of indigenous fauna that are assessed to be significant under section 6(c) of the Act.
- 9.7 I agree with Dr Lloyd that the ecological effects of trail construction on the wetland would be less than minor if the recommended remedial and compensatory measures are undertaken with sufficient care and diligence.



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16 March 2020