

**Mt Messenger Bypass Project, Summary of Evidence of Tom Drinan
(Freshwater Ecology) for DOC**

1. The Project has the potential to affect pristine, or close to, forested aquatic habitats harbouring numerous biota of high conservation value. I consider that there are major shortcomings of the Application with respect to mitigating adverse effects on these freshwater biodiversity values. My evidence also comments on conditions that I believe would be required if consent is granted.

SEV

2. SEV is a useful tool for assessing streams in terms of their ecological function. It is not appropriate for assessing biodiversity values.
3. The Environmental Compensation Ratio or ECR is calculated using a formula based on a predicted decline in SEV score at the site of impact, and the predicted increase in the SEV score at the mitigation/restoration site. The inclusion of the multiplication factor of 1.5 in the ECR calculation accounts for the time lag and uncertainty of potential outcome.
4. In this case, Mr Hamill's own surveys confirm that the headwaters of the Mangapepeke Stream and the Mimi River catchments are of significant biodiversity value. The waterways of the area provide habitat for rare and 'At-Risk' taxa of notable conservation value (EIC [36]-[58]). This includes kākahi, longfin eel, giant kōkopu, īnanga and redfin bully, all having a conservation status of 'At Risk – Declining', as well as other species. In addition, the New Zealand freshwater fish database lists further species recorded in the Tongaporutu and Mimi River catchments including the shortjaw kōkopu ('Threatened – Nationally Vulnerable'), kōaro ('At Risk – Declining') and the giant bully. All ten of the freshwater fish taxa recorded are diadromous, meaning that they migrate between freshwater environments and the sea during some part of their life cycle.
5. I undertook a spatial analysis using the Freshwater Ecosystems of New Zealand (FENZ) database to assist in understanding the value of the Tongaporutu River and Mimi River catchments (by placing each within the context of environmentally similar catchments). This showed that we can expect the Tongaporutu River, and to a lesser extent the Mimi River, catchments to have significant conservation values throughout.

6. In my evidence, I refer to an extensive body of literature highlighting the importance of headwater streams. A recurring theme throughout much of this research is that headwater streams play an important role in actively sustaining biodiversity across many stream sizes, and probably contribute disproportionately to biodiversity at the river network scale (EIC [85] - [88]). These studies include, but are not limited to, Smith (2007) regarding the Mokau River. Mr Hamill's surveys for this Project confirm that the headwaters of the Mangapepeke Stream and the Mimi River catchments are of significant biodiversity value.
7. The SEV method is based on 14 ecological functions. Although three of these functions relate to 'Biodiversity Provision', two of these three are recommended to be excluded from the calculation of ECR. In the Guidelines, the reason stated is due to "*the difficulty of predicting these outcomes*". This refers to the difficulty in predicting a biodiversity response based on functionality alone e.g., effects of shading (from canopy cover).
8. Therefore, if the SEV guidelines are adhered to, only one out of 14 functions relate to 'Biodiversity Provision' ('Riparian Vegetation Intact'). The method does not incorporate the following measures of biodiversity:
 - (a) Diversity, distribution and population size of aquatic species.
 - (b) Their conservation status.
 - (c) Their habitat requirements for stages of their life cycle.
 - (d) Ecosystem representativeness, irreplaceability, and ecological integrity/ecological context.
9. Mr Hamill attempted to address this issue by including the two biodiversity functions recommended to be *excluded* from ECR calculations. These are 'Invertebrate Fauna Intact' and 'Fish fauna intact'. That approach is not recommended in the SEV guidelines, for good reason, and does not resolve the issue with applying the guidelines to high value aquatic environments.
10. I recommend applying a multiplication factor for headwater streams (derived from the Applicant's aquatic macroinvertebrate data).
11. I also recommend applying an SEV post-impact score (SEVi-I) of 0 for culverts. I consider the main incentive for designing culverts is to provide for fish passage (and not for what SEV score would be achieved within the culvert).

12. I calculate an additional 2581 m² would be required due to my recommended multiplication factor, and an additional 1893 m² would be required due to my approach of assuming an SEVi-I score of 0 for culverts (i.e., 4,474 m² in total extra). I note in Mr Hamill's rebuttal evidence [16] and speaking notes [16e], that an updated quantum of compensation is being proposed (11,536 m²). While I accept this falls short (by 1,091 m²) of what I recommend (12,627 m²), it is a considerable improvement.
13. I consider that the exact length and area of restoration should be finalised upon detailed construction plans on the basis of this methodology (multiplication factor and a SEVi-I score of 0 for culverts). I share the concerns of Wildlands Ltd (Supplementary Report at Section 2.16.8) that the total stream length to be restored cannot be confirmed until the offset reaches are known (and assessed) and it is important that tributaries earmarked for restoration purposes do not have indigenous woody vegetation along their riparian margins so that there is a clear benefit as a result of restoration works.

Fish Passage

14. I commend the Applicant for replacing culvert 12 with a bridge, removing the need for culvert 19, and for refining the design of seven of the culvert structures based on the New Zealand Fish Passage Guidelines (2018). Twelve of the 19 culverts are not being designed to the standard set out in these guidelines, but rather in general accordance with NZTA Fish Passage Guidance for State Highways (NZTA 2013). This is currently reflected in the Applicant's proposed consent conditions. I support the TRC Officer's proposed consent conditions that diversions and culverts shall not restrict fish passage or, alternatively reference to the 2018 Guidelines, and monitoring. I remained concerned with Mr McEwan's evidence that the minimum design standards in the fish passage guidelines may not be achievable for some culverts due to the steep grade¹.

Fish Recovery/Rescue Protocols

15. I recommended changes to the fish recovery/rescue protocols. In my opinion, measures to prevent the stranding or desiccation of aquatic biota are 'lower-hanging fruit'. These adverse effects are generally easiest to avoid with minimal effort and greatest certainty. If streams are only partially dewatered I

¹ McEwan EIC at [31] and footnote 8.

could accept Mr Hamill's approach allowing fish to 'voluntary leave' a stream as water recedes. I recommend an approach of netting and electric fishing be undertaken.

Potential effects of adverse sedimentation events

16. Regardless of the likelihood of occurrence, the adverse effects of sedimentation devices failing could be catastrophic for some aquatic communities. An adequate response should be provided for. My evidence recommends triggers for additional aquatic ecological monitoring and Mr Duirs' evidence recommends turbidity monitoring. Mr Hamill agrees that there is a gap in the feedback between the annual/biannual ecological monitoring and any response (Rebuttal at [60]). The details are to be contained in the ELMP (Section 8.5) rather than the consent conditions. This process details that if ecological effects from construction activities are assessed as 'moderate or greater' by the project ecologist, this will then be reviewed by a suitably qualified independent ecological reviewer and recommendations be presented to the Applicant and TRC to agree on an appropriate course of action. Without any proposed triggers for what ecological effects would be considered 'moderate or greater', or involvement of the Ecology Review Panel, I cannot support those conditions, although they are an improvement.

17. My evidence suggests appropriate triggers [146] and that if thresholds have been exceeded, the consent holder should undertake mitigation works, which should include sediment removal procedures and/or additional biodiversity offsets. The choice of mitigation measure, the quantity of mitigation, and the timeframe within which it will be implemented should be determined in conjunction with the Ecology Review Panel and TRC. These mitigation responses should similarly apply to the sediment deposition monitoring of the sediment plates at the Kahikatea Swamp Maire Forest.