

Before Hearing Panel

Under:

Resource Management Act 1991

in the matter of:

**Proposed Plan Change 5 to the
Operative Hamilton City District Plan**

Statement of evidence of

Dr KEVIN JOHN COLLIER

Dated: 12 September 2022

1. Introduction

1.1 I hold the degree of Doctor of Philosophy specialising in stream ecology from the University of Canterbury, and have over 35 years' experience as a freshwater ecologist. I have previously been employed as a freshwater scientist for the Department of Conservation (5 years), National Institute of Water and Atmospheric Research (13 years), Waikato Regional Council (9 years), and The University of Waikato (9 years) where I held the position of Associate Professor at the Environmental Research Institute.

1.2 I have published 129 peer-reviewed scientific papers, contributed to 20 book chapters, edited four books, and written over 100 reports on matters pertaining to freshwater ecology. I served on the editorial board of the scientific journal *Freshwater Reviews* (2010-16), and was associate editor for the international journals *Freshwater Science* (2010-18) and *Aquatic Conservation: Marine and Freshwater Ecosystems* (2010-20).

1.3 I have been involved in various studies of urban streams in Auckland and Hamilton where I have conducted ecological surveys. I was involved in the development of the Stream Ecological Valuation method for determining mitigation off-sets for urban development. My publications include three papers relating specifically to the effects of urban development on stream ecology.

1.4 I have an in-depth knowledge of the Mangakootukutuku catchment where I have sampled fish and aquatic invertebrates on several occasions. I have lived in a gully property bordering the stream for the last 16 years, and co-founded the Mangakootukutuku Stream Care Group in 2007 in recognition of the high biodiversity values of this stream and associated aquatic habitats. I have been involved in several submissions on regional and local plans relevant to Hamilton urban streams, including submitting on the original Peacockes Structure Plan in 2006. I compiled the Mangakootukutuku Stream Care Group's submission on Plan Change 5 as part of the current process.

1.5 I have read and agree to comply with the 'Code of Conduct for Expert Witnesses' contained in the Environment Court Consolidated Practice Note 2014. To the extent that the Code is relevant to my statement of evidence as an expert witness, my evidence has been prepared in compliance with that Code in the same way as I would if giving evidence in the Environment Court. In particular, unless I state otherwise, this evidence is within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

1.6 My evidence covers the following areas: (1) Ecological values of Mangakootukutuku Stream; (2) Effects of urban development on stream ecology; (3) Response to Hamilton City Council's S42A report; (4) Summary of key points.

1.7 When I reference "Mangakootukutuku Stream" in my evidence, I am referring to the stream network and associated aquatic habitats in the broader catchment upstream

of its inflow into the Waikato River, including parts of the network affected by Plan Change 5. When I refer to the “Peacockes Branch” I am talking specifically about tributaries and associated aquatic habitats draining the sub-catchment within the Plan Change 5 boundary.

2. Ecological values of Mangakootukutuku Stream

2.1 Mangakootukutuku Stream supports 10 species of native freshwater fish, including four species that are considered ‘At Risk - Declining’ by the Department of Conservation’s 2017 threat classification assessment, namely the giant kokopu (*Galaxias argenteus*), inanga (*Galaxias maculatus*), torrentfish (*Cheimarrichthys fosteri*) and longfin eel (*Anguilla dieffenbachii*). All of these threatened fish species, as well six of the seven more common native freshwater fish species present, are migratory and require unimpeded passage up and down streams to access habitat within the catchment. All 10 native fish species occur within the Peacockes Branch.

2.2 Surveys of stream invertebrate communities have highlighted the relatively high proportion of sensitive aquatic insect species present in the Peacockes Branch compared to other streams in Hamilton City. Waikato Regional Council monitoring data indicate this branch supports 18 species of mayflies and caddisflies which comprised on average 31% of the total invertebrate numbers at the downstream end of the Peacockes Branch over 2005-2021. These insect groups are regarded as indicators of stream health, and in my experience the values recorded at this site are high for urban streams. At the same site on the Peacockes Branch, values for the Macroinvertebrate Community Index, another indicator of stream health, averaged 106 indicative of ‘good’ water quality.

2.3 The aquatic invertebrate community health metrics for the Peacockes Branch outlined in paragraph 2.2 compare with 13 sensitive mayfly and caddisfly species comprising an average of 10% of total invertebrate numbers in the Mangakootukutuku mainstem over the same period, and an average Macroinvertebrate Community Index of 87 indicative of ‘fair’ water quality.

2.4 I co-ordinated a survey of 35 stream sites in and around Hamilton City and found that sensitive insect groups typically comprised less than 2% of aquatic invertebrate numbers and Macroinvertebrate Community Index values were typically around 70, indicative of 'poor' water quality (Collier et al. 2009). These differences highlight the high ecological condition of Mangakotukutuku Stream, and in particular the Peacockes Branch, relative to other streams in and around Hamilton City. I note the threatened snail *Glyptophysa variabilis* has been found in a small wetland area in part of the Mangakootukutuku Stream catchment.

2.5 Other biological sampling has highlighted the importance of seepages and springs for freshwater invertebrate biodiversity within the catchment. Areas of ground that remain permanently wet because of groundwater seepage can support unusual combinations of freshwater invertebrate species beneath ground-cover vegetation. Some of these species are aquatic insects found mainly in native forested areas and are uncommon in urban settings (Smith 2007). In addition, small springs which emanate on gully floors can provide cool-water habitats in summer that may serve as thermal refugia for some fish and invertebrates. These small seepage and spring areas are often overlooked in assessments of aquatic values and are very sensitive to disturbances, such as through vegetation removal and drainage.

3. Effects of urban development on stream ecology

3.1 Urbanisation effects on streams occur during two distinct phases: (i) the 'construction phase', and (ii) the 'establishment phase'. The construction phase is characterised by elevated levels of fine sediment and other runoff entering waterways from earthworks and construction activities which can degrade water quality and aquatic habitat. The main ecological impacts during the establishment phase are caused by stormwater connections which modify hydrology and water quality when they discharge directly to waterways. Once stormwater connections are established, their impacts are enduring and difficult to reverse.

3.2 Stormwater primarily affects stream life when rain runoff from impervious surfaces such as roads and roofs is directly piped to streams, resulting in more frequent and extreme high flows. As a result, stormwater runoff can hydraulically stress aquatic life and degrade habitat, for example by scouring streambeds where invertebrates live and eroding overhanging stream banks which several native fish species use as cover. Stormwater runoff can also degrade water quality by washing in contaminants from road surfaces, some of which also contaminate bottom sediments where stream invertebrates live. During summer, stormwater runoff from dark surfaces such as roads and carparks that absorb heat can reach very high temperatures and cause thermal stress to aquatic life near discharge points.

3.3 Overseas research has highlighted that impervious surfaces comprising as low as 2% of upstream catchment area can significantly affect sensitive invertebrate communities downstream if stormwater is piped directly to streams (King et al. 2011), although the most severe effects become evident at more than 5% upstream impervious area. To avoid these significant adverse impacts, stormwater management measures are required that involve detention, infiltration and transpiration of stormwater before it enters waterways.

3.4 Road construction and other activities that cross or occur within stream channels as part of urbanisation can affect upstream passage for native fish, many of which migrate to and from the sea to complete their life cycles. Culvert pipes under roads may become perched causing a vertical drop in stream level. When this happens upstream-moving fish have difficulty accessing habitat in the upstream catchment at times of low flow. Fish-friendly culvert designs are available to mitigate such impacts while also limiting upstream movement of non-native fish.

4. Response to Hamilton City Council's Section 42A report

4.1 In recognition of the ecological values of Mangakootukutuku Stream, in particular for the Peacockes Branch, and the well-documented adverse effects of urban

development on stream health, as outlined in Sections 2 and 3 of my evidence, the Mangakootukutuku Stream Care Group submission on Plan Change 5 sought to:

- Broaden the ecological considerations of the Plan to encompass streams and the ecological values they support;
- Ensure recognition of the importance of protecting native freshwater fish, in particular threatened fish species;
- Ensure recognition of the stream network as an ecological corridor where passage for native fish needs to be maintained or enhanced;
- Ensure explicit recognition of the impacts of urbanisation on stream hydrology, water quality and sediment quality as effects of development that need to be avoided, remedied or mitigated;
- Strengthen the requirements around monitoring and mitigation that reflect the high aquatic values and potentially significant impacts on streams of urban development;
- Highlight the opportunity to showcase stormwater mitigation technologies as part of the city centre design guide.

4.2 I note the S42A report (#7.65) recognises that the Mangakootukutuku Stream Care Group submission correctly identifies the various aquatic ecological values that exist within the gully network. I also note that Dr Mueller's evidence (#47) supports inclusion of fish passage provisions, and recommends that provisions be updated to reflect submission points related to aquatic species and management of aquatic habitats (#49), as submitted by the Mangakootukutuku Stream Care Group.

4.3 I support Hamilton City Council's decision in the S42A report to accept the Mangakootukutuku Stream Care Group submission points that:

- (i) highlight the wider aquatic ecological values that should be respected and protected,
- (ii) specifically identify the biodiversity value of threatened freshwater fish whose habitat is to be protected;
- (iii) recognise ecological corridors provided by the arms of the Mangakotukutuku Gully and provide for maintenance and enhancement of

native fish passage (now included in PC5 Appendix 1 District Plan Administration 1.2.2.26), and

(iv) strengthen the requirements for an indigenous fish management plan that requires mitigation measures and monitoring plans and responsibilities to be specified (PC5 Appendix 1 District Plan Administration 1.2.2.26).

4.4 I support the Plan Change 5 designation of Significant Natural Areas and Natural Open Space Zones that run along gullies as these will protect existing riparian vegetation alongside streams and provide opportunities to restore riparian cover. Riparian trees help stabilise stream banks that provide cover for native fish. In addition, protection of these corridors will help sustain biodiversity values of springs and seepages associated with the stream. These areas and zones will not necessarily protect against fish passage disruption or avoid stormwater impacts if runoff is directly piped to streams.

4.5 I was involved with consultation on the Mangakootukutuku Integrated Catchment Management Plan (ICMP) and support the distributed wetland approach for attenuating and treating stormwater runoff prior to it entering waterways. In my opinion, the final draft version of the ICMP, in concert with other mitigation and protection measures, should provide a level of protection from stormwater impacts under current conditions commensurate with the aquatic ecological values of the receiving environment if implementation, monitoring, maintenance and enforcement are carried out to required standards.

4.6 In paragraphs 4.7-4.10, I explain the rationale behind three submission points from the Mangakootukutuku Stream Care Group that were rejected in the S42A report, and why I consider these points are important to include in the Plan.

4.7 The stream care group's submission highlighted the opportunity to "*Showcase stormwater treatment opportunities through the use of rain gardens, pervious pavers, swales, catchpit filters etc*" as part of the Local City Centre Design Guide, because additional stormwater management measures specified at the design stage

would increase protection of aquatic ecological values in areas with high impervious cover, and additionally help raise public awareness of the importance of mitigating stormwater impacts. I note that Mr Craven, in Table 1 of the report accompanying his evidence, was generally supportive of this inclusion, with the exception of rain gardens, and recommended that the wording be changed to *“Showcase best-practice integrated stormwater management practices”*. I support Mr Craven’s proposed amendment and do not support the S42A recommendation that stormwater treatment options only be managed through the ICMP and Three Waters.

4.8 The MSCG submission strongly supported the wording in DEV01-PSP: P70 *“Manage stormwater to minimise the effect of urban development on Mangakotukutuku stream values and functions, maintain the ability of the stream to continue to provide habitat for threatened aquatic species and minimise adverse effects on the stream water quality and habitat”*. The S42A report states that this policy has now been deleted because it is *“sufficiently addressed by P61”*. The relevant policy in P61 seems to be #4: *“Safeguarding and enhancing the natural functioning and ecological health of freshwater bodies and areas of indigenous vegetation, water features and habitats”*.

4.9 In my opinion, the wording in the submission version for P70 provides a higher level of protection as it explicitly links stormwater impacts directly with aquatic ecological values and threatened fish species, water quality and aquatic habitat. In my opinion the original wording should be retained in order to enhance the strength of policies aimed at protecting aquatic ecological values, either by reinstating P70, replacing the wording of #4 in P61, or adding an additional point to P61.

4.10 The S42A report rejected the MSCG submission that the word ‘identified’ be deleted from DEV01-PSP: O13 as *“deletion removes clarity of the meaning and creates uncertainty as to what is being protected”*. If the word ‘identified’ is included to define which habitats and species should be protected, in my opinion the plan also needs to include a list of agreed ‘identified’ species or a process for arriving at an agreed list, and a mechanism to modify the list if new information arises.

5. Summary of key points

5.1 The Peacockes Branch of Mangakootukutuku Stream supports a diverse native fish community with four species considered threatened with extinction. The Peacockes Branch also supports a diverse invertebrate community with a range of sensitive species in relatively high numbers, indicative of good water quality. Streamside seepages and wetlands are also important for invertebrate biodiversity. These values are significant within the context of Hamilton City and the surrounding area.

5.2 Low levels of urban development can have significant adverse effects on downstream ecological health where stormwater runoff from impervious surfaces is piped directly to waterways. Appropriate attenuation and treatment of stormwater runoff before it enters streams is essential for protecting aquatic ecological values, particularly in areas with high impervious surface cover. Roding and other activities associated with urban development can disrupt native fish passage if appropriate mitigation measures are not taken.

5.3 I support:

- (i) the ICMP distributed wetland approach, in concert with other integrated stormwater management practices including on-site treatment and attenuation measures, to control stormwater impacts;
- (ii) Hamilton City Council's decision to recognise the importance of aquatic ecological values including native fish, provide for their passage requirements, and strengthen the requirements for mitigation and monitoring of aquatic ecological values, and
- (iii) Hamilton City Council's decision to provide for the protection of gullies through which streams flow.

In my opinion these measures collectively will help protect the ecological values of the Peacockes Branch of Mangakootukutuku Stream.

5.4 I do not support Hamilton City Council's S42A decisions outlined in my paragraphs 4.7-4.10. In my opinion, the following measures should be required to enhance protection of the high ecological values in the Peacockes Branch of Mangakootukutuku Stream:

- Include provision for best-practice integrated stormwater management practices in the Local City Centre Design Guide;
- Reinstate the original wording for DEV01-PSP: P70 at an appropriate place in the Plan;
- Develop a list of agreed 'identified' species or a process for arriving at an agreed list, and a mechanism to modify the list if new information arises, to inform DEV01-PSP: O13.

REFERENCES

Collier, K.J.; Aldridge, B.M.T.A.; Hicks, B.J.; Kelly, J.; Macdonald, A; Smith, B.J.; Tonkin, J. 2009. Ecological values of Hamilton urban streams (North Island, New Zealand): constraints and opportunities for restoration. *New Zealand Journal of Ecology* 32: 177-189.

King, R.S.; Baker, M.E.; Kazyak, P.F.; Weller, D.E. 2011. How novel is too novel? Stream community thresholds at exceptionally low levels of catchment urbanization. *Ecological Applications* 21: 1659-1678.

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