

**BEFORE THE INDEPENDENT HEARINGS PANELS APPOINTED TO HEAR AND MAKE
RECOMMENDATIONS ON SUBMISSIONS AND FURTHER SUBMISSIONS ON PROPOSED PLAN
CHANGE 1 TO THE NATURAL RESOURCES PLAN FOR THE WELLINGTON REGION**

UNDER the Resource Management Act 1991 (the
Act)

AND

IN THE MATTER of Hearing of Submissions and Further
Submissions on Proposed Plan Change 1 to
the Natural Resources Plan for the
Wellington Region under Schedule 1 of the
Act

**STATEMENT OF REBUTTAL EVIDENCE OF DR MICHAEL JOHN
CRAWSHAW GREER**

ON BEHALF OF GREATER WELLINGTON REGIONAL COUNCIL

HEARING STREAM THREE – EARTHWORKS, VEGETATION

CLEARANCE AND FORESTRY AND RURAL LAND USE

16th of May 2025

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INTRODUCTION

1 My full name is Dr Michael John Crashaw Greer. I am the Principal Freshwater Scientist at Torlesse Environmental Ltd.

2 I have read the evidence and statements of:

- 2.1 Transpower New Zealand Limited – Submitter S177
- 2.2 Horokiwi Quarries Limited – Submitter S2
- 2.3 Wellington Branch of New Zealand Farm Forestry Association – Submitter S36
- 2.4 New Zealand Farm Forestry Association – Submitter S26
- 2.5 China Forestry Group – Submitter S288
- 2.6 New Zealand Carbon Farming Group – Submitter S263
- 2.7 Wellington International Airport Ltd – Submitter S101
- 2.8 Guildford Timber Company – Submitter S210
- 2.9 Winstone Aggregates – Submitter S206
- 2.10 Rosco Ice Cream – Submitter S220
- 2.11 Forest & Bird – Submitter S261
- 2.12 Upper Hutt City Council – Submitter S225
- 2.13 Wellington City Council – Submitter S33
- 2.14 NZTA – Submitter S275
- 2.15 Porirua City Council – Submitter S240
- 2.16 Wairarapa Federated Farmers – Submitter S193
- 2.17 Wellington Water Ltd – Submitter S151
- 2.18 Meridian Energy – Submitter FS47
- 2.19 The Telecommunications Companies – Submitter S41
- 2.20 Environmental Defence Society – Submitter S22

- 3 In preparing this rebuttal evidence, I have also reviewed;
- 3.1 The submissions relevant to the Section 42A report on Objectives and Ecosystem Health and Water Quality Policies;
 - 3.2 Ms Alisha Vivian's¹, Mr Gerard Willis'² and Mr Shannon Watson's³ S42A Officer's Reports;
 - 3.3 The Statements of Primary Evidence of Mr James Blyth^{4,5}; and
 - 3.4 The Statement of Rebuttal Evidence of Mr James Blyth⁶.

QUALIFICATIONS, EXPERIENCE AND CODE OF CONDUCT

- 4 My qualifications and experience are set out in paragraphs 4 to 13 of my Statement of Primary Evidence⁷. I repeat the confirmation given in that report that I have read and agree to comply with the Code of Conduct for Expert Witnesses.

RESPONSES TO SUBMITTER EVIDENCE

- 5 My evidence addresses:
- 5.1 Technical matters raised in the evidence and statements lodged by the submitters to PC1 listed in paragraph 2.

¹ Plan Change 1 to the Natural Resources Plan for the Wellington Region Section 42A Hearing Report. Hearing Stream 3: Earthworks. Prepared by Alisha Vivian for Greater Wellington Regional Council (dated 15th April 2025)

² Plan Change 1 to the Natural Resources Plan for the Wellington Region Section 42A Hearing Report. Hearing Stream 3: Rural Land Use. Prepared by Gerard Willis for Greater Wellington Regional Council (dated 15th April 2025)

³ Plan Change 1 to the Natural Resources Plan for the Wellington Region Section 42A Hearing Report. Hearing Stream 3: Vegetation clearance and forestry. Prepared by Shannon Watson for Greater Wellington Regional Council (dated 15th April 2025)

⁴ Evidence of James Mitchell Blyth on Behalf of Greater Wellington Regional Council (dated 15th April 2025).

⁵ Evidence of James Mitchell Blyth on Behalf of Greater Wellington Regional Council (dated 15th April 2025).

⁶ Rebuttal Evidence of James Mitchell Blyth on Behalf of Greater Wellington Regional Council (dated 16th May 2025).

⁷ Evidence of Michael John Crawshaw Greer on Behalf of Greater Wellington Regional Council (dated 15th April 2025).

² RESPONSE TO MATTERS RAISED IN SUBMITTER EVIDENCE FROM WELLINGTON WATER LIMITED

Risks associated with earthworks conducted within five metres of a surface water body

6 In paragraph 7.7 of her Statement of Evidence, Ms Caroline Horrox (on behalf of Wellington Water Limited (WWL)) states that she does not consider the inclusion of a five-metre setback requirement for surface water bodies in Ms Vivian's¹ recommended new earthworks rules (Rule WH.R23A and P.R22A) to be effective or efficient, noting the following concerns:

6.1 *"In some cases, it might be difficult to confirm whether a waterway qualifies as a 'surface water body as there are numerous exclusions"; and*

6.2 *"Effects can be avoided or managed by adopting good construction practices and robust erosion and sediment control measures, irrespective of a waterway's proximity".*

7 I am unsure why Ms Horrox considers that the exclusions in the operative NRP definition of surface water body make it difficult to determine whether a waterway meets the definition. There are three main exclusions in that definition:

7.1 Ephemeral watercourses;

7.2 Water storage ponds; and

7.3 Water treatment ponds.

Only one of which, ephemeral watercourses, introduces any uncertainty regarding whether a waterway meets the definition. In my opinion, it should generally be clear whether a lake is acting as a water storage or treatment pond from it having been constructed for that purpose and its ongoing use. I also do not consider the uncertainty introduced by the ephemeral water course exclusion justifies the removal of the setback requirements from surface water bodies in recommended new rule Rule WH.R23A and P.R22A¹ as:

7.4 The Council provides clear guidance on how to go about determining whether a watercourse is ephemeral under the operative NRP (see links below for the

Council's watercourse classification guidance⁸ and maps of highly modified rivers and streams maps⁹);

- 7.5 A number of permitted activities in the operative NRP reference surface water bodies and therefore necessitate regulated parties to assess whether potentially impacted watercourses are ephemeral (e.g., farm refuse dumps, offal pits, clean fill material, discharges from contaminated land, minor discharges and stock access). Thus, the requirement for plan users to assess whether a waterway is ephemeral and exempt from the definition of surface waterbody is not new; and
- 7.6 I have been involved in dozens of such stream classification exercises in the Wellington Region and, in my experience, they are rarely technically challenging or contentious, especially with regards to identifying ephemeral watercourses. Normally, the most challenging component of stream classification is determining whether a watercourse (ephemeral or not) is considered a river under the RMA, which does not need to be considered when determining whether a waterway meets the operative NRP definition of surface water body.

- 8 Earthworks near a river have the potential to undermine the banks resulting in bank erosion that does not generally occur during works conducted further afield. Such erosion not only increases sediment input into the impacted waterway, but can also reduce the quality and quantity of the habitat provided by the bank. In my experience reviewing numerous earthworks consent for the Council, the mechanism by which these effects are avoided and minimised is generally by ensuring that a robust Erosion and Sediment Control Plan (ESCP) is implemented; with the Council achieving this by commissioning an independent review of the ESCP and imposing a consent condition that requires there to be no erosion or scour of the bed or banks of any river. Accordingly, I agree with Ms Horrox that *"the effect of earthworks on freshwater quality and ecology can be avoided or managed by adopting good construction practices and robust erosion and sediment control measures"*. However, I am unsure if there is any certainty that such robust erosion and sediment control measures will be implemented as part of a permitted earthworks activity in the absence of a independent review of the ESCP. Whether this justifies the

⁸ <https://www.gw.govt.nz/assets/Documents/2022/04/Watercourse-categorisation-guidance-document-v2.pdf>

⁹ <https://gwrc.maps.arcgis.com/apps/webappviewer/index.html?id=87a85d0ad2a3493fbeccb789eac79773>

five-metre setback requirements of recommended¹ new Rules WH.R23A and P.R22A is a planning matter that is outside the scope of my expertise.

Note: Similar concerns regarding the five-metre setback requirements of recommended new rule Rule WH.R23A and P.R22A are raised in the Statements of Evidence of:

Ms Pauline Whitney on behalf of Transpower New Zealand Limited (paragraph 9.8.9)

Risks associated with allowing more than 3000m² of earthworks in any one year when conducted across large properties as part of multiple projects

- 9 Paragraph 8.1 to 8.4 of her Statement of Evidence records Ms Horrox's concerns about the annual 3000m² cap on earthworks per property in Rule WH.R23 and P.R22. Specifically, in relation to resource consent being required when multiple small earthworks projects are undertaken across large sites in a single year.
- 10 From an effects management perspective, there is no scientific justification for removing this cap for large sites that discharge to a single receiving environment, regardless of whether works are undertaken as multiple projects. Theoretically, the amount of sediment entering a single waterway from 3000m² of earthworks conducted over a year should not be impacted by the number of projects it is conducted for. However, the same does not apply when the property is sufficiently large that earthworks spans multiple surface water catchments. For example 5998 m² of earthworks on a single property split evenly between two surface water catchments would be expected to have the same effects as separate 2999m² earthworks operations on two properties in two different surface water catchments (assuming similar practices). However, under Rule WH.R23 and P.R22 it would require resource consent while the two 2999m² earthworks operations would not.
- 11 Whether Rule WH.R23 and P.R22 can be amended in a workable manner to allow greater than 3000 m² of earthworks per year in a single property provided no single surface water body is impacted by greater than 3000m² is a policy matter that is outside of the scope of my expertise.

Note: Similar concerns regarding the 3000m² cap on earthworks per property in Rule WH.R23 and P.R22 are raised in the Statements of Evidence of:

Ms Suzanne Rushmere on behalf of Upper Hutt City Council (paragraph 16 to 19); and

Ms Catherine Heppelthwaite on behalf of the NZ Transport Agency Waka Kotahi (paragraph 6.15 to 6.19).

RESPONSE TO MATTERS RAISED IN SUBMITTER EVIDENCE FROM WAIRARAPA FEDERATED FARMERS

Confusion regarding the extent to which PC1 requires a return to natural state

- 12 In paragraph 50 to 60 of Dr Leslie Basher’s Technical Evidence (on behalf of Wairarapa Federated Farmers (WFF)) he suggests that the sediment related objectives of PC1 require return to natural state by 2040, and notes that this is not realistic.
- 13 To clarify, the suspended fine sediment TASs in Table 8.4 and 9.2 of PC1 only require an improvement in this attribute in five of the 16 part-FMUs in the TAoP and TWT Whaitua:
- 13.1 Te Awa Kairangi lower mainstem;
 - 13.2 Te Awa Kairangi rural streams and rural mainstems;
 - 13.3 Wainuiomata urban streams;
 - 13.4 Parangārehu catchment streams and South-west coast rural streams; and
 - 13.5 Takapū.
- 14 As stated in paragraph 34 of my Statement of Primary Evidence⁷ the suspended fine TASs for Te Awa Kairangi lower mainstem part-FMU does indeed require an improvement to a level that approximates natural state. However, the suspended fine sediment TASs for the other listed part-FMUs only require an improvement to the National Bottom Line, which broadly, and theoretically, speaking reflects a 20% deviation from natural state^[1,2]. Thus, PC1 does not uniformly require an improvement to natural state. Indeed, natural state visual clarity is only required in 44% of the TWT and TAoP Whaitua (i.e., the area that contributes to the Te Awa Kairangi lower mainstem part-FMU), of which 66% is already in native land cover. This means that only 20% of the TWT and TAoP Whaitua are expected to reduce sediment losses to a level that is close to natural state.
- 15 My understanding of the provisions in PC1 that reference ‘natural’ in relation to sediment differs from Dr Basher’s. Specifically, Dr Basher has interpreted the text “*sources of sediment are reduced to a more natural level*” in Objectives WH.O2 and P.O2 to mean that

sediment sources must be reduced to natural levels by 2040. In contrast, my reading is that sediment sources only need to be improved to some extent by 2040 (presumably to the levels required by the TASs), thereby becoming more representative of natural levels than the current state.

- 16 Nevertheless, I do agree with Dr Basher that the phrase *“avoid an increase in risk of loss of sediment to water relative to the risk of loss that exists from the land in a natural state”* in Schedules 33 (Vegetation Clearance Erosion and Sediment Management Plan) and 34 (Plantation Forestry Erosion and Sediment Management Plan) does suggest that such activities cannot increase sediment losses above natural levels, and I consider this to be inconsistent with most of the suspended fine sediment TASs in Tables 8.4 and 9.2. However, I note that this phrase would no longer appear in PC1 if Mr Watson’s recommended deletion/amendment³ of Schedules 33 and 34 are adopted.

RESPONSE TO MATTERS RAISED IN SUBMITTER EVIDENCE FROM WELLINGTON BRANCH OF NEW ZEALAND FARM FORESTRY ASSOCIATION

Contribution of pulse discharges to suspended fine sediment TASs not being met

- 17 On page 5 of his Further Submission to Stream Two Hearings for “Plan Change 1 to the Natural Resources Plan” (his ‘Further Submission’) Mr Eric Cairns (on behalf of the Wellington Branch of the New Zealand Farm Forestry Association (Wgn-NZFFA)) notes that *“contrary to the arguments proposed by Dr Greer relating to indefinite but small proportion of total annual sediment being stored and slowly leaked as suspended fine sediment in remote lower stretches of river, we suspect that frequent small sources of discoloration in water bodies, although only a small fraction of total annual sediment load, play a disproportionate role for median visual clarity measurements made closer to source”*. Then, on page 18, he suggests that the Council’s River engineering works on the main stem of the Hutt River is *“is highly likely to exacerbate SFS over the longer term”*. However, he presents no evidence to support these statements. I also note that later in his further submission Mr Cairns contradicts these statements by attributing *“the declining VC [in the lower reaches of the Hutt River] down to higher flows disturbing stored SFS or scouring, as has been noticed for other catchments where higher mean flows are inversely correlated to VC”*
- 18 I acknowledge that the literature on the contribution of resuspended stored (from storm events) sediment to visual clarity during baseflows is sparse, and the exact cause of degraded visual clarity in different rivers is uncertain. My own research has also shown that

river engineering practices can contribute to significant reductions in visual clarity immediately after works^[3]. Nevertheless, studies have shown that sediment stored in tributaries during ‘pulse’ events can continue to contribute sediment to the mainstem of a catchment for many years (~25 in the case of the Waipoua River (Gisborne) after Cyclone Bola (a 50-year return rainfall event in 1988)^[4]), and that, in some cases, that stored sediment can be a more important contributor to baseflow suspended sediment concentrations (and therefore visual clarity) than bank erosion^[5]. Thus, I do not consider the opinions expressed in Mr Cairns’ Further Submission as evidence that pulse sediment discharges after events such as commercial forest harvesting have a negligible impact on median visual clarity. Especially, in light of Mr Blyth’s Statement of Primary Evidence⁴ which suggests that plantation forestry is still a source of anthropogenic sediment, losing approximately three to six times more than native forest over a 30-year time frame due to pulses during and post-harvest.

Note: Similar concerns regarding the contribution of river engineering works to visual clarity in the Hutt River are raised in the Statements of Evidence of:

Mr Hamish McGregor on behalf of the China Forestry Group (page 13).

Potential for natural events to delay achievement of suspended fine sediment TASs

- 19 On page 6 of his Further Submission, Mr Cairns notes “*that major natural events (surely not regulated as anthropogenic) may delay a water body improving to meet TAS VC, or could result in an otherwise compliant FMU falling below TAS VC*”. This not only contradicts his earlier statement regarding only a “*small proportion of total annual sediment being stored and slowly leaked as suspended fine sediment in remote lower stretches of river*”. It also ignores that if the land-cover in a catchment is modified, sediment losses during severe weather events can be expected to be greater than in natural catchments^[6]. Thus an increase in sediment losses due to storm frequency can indeed be at least partially attributed to anthropogenic sources. Importantly, high sediment concentrations (i.e., poor visual clarity) do not directly influence the suspended fine sediment attribute state of a river, as that is calculated from median visual clarity. Instead sediment losses impact the suspended fine sediment attribute state by increasing the amount of sediment stored in a river that is available for resuspension later.

Baseline state of suspended fine sediment in the Te Awa Kairangi lower mainstem part-FMU

- 20 Mr Cairns states on page 12 of his Further Submission “*that Te Awa Kairangi Lower mainstream [sic] (i.e. Hutt at Boulcott) is currently ecology State C for Clarity*”. This is incorrect; visual clarity in the Te Awa Kairangi lower mainstem part-FMU is currently in the B band for visual clarity (see Table 4 of my Statement of Primary Evidence for Hearing Stream 2).¹⁰

Potential to continually update suspended sediment classes of certain part-FMUs

- 21 The suspended sediment class a river falls within has a significant impact on the stringency of the national bottom line and attribute state thresholds that apply to it under the NPS-FM 2020. On pages 13 to 18 of his Further Submission, Mr Cairns suggests that the Council may have assigned the wrong suspended sediment class to the Mākara Stream, Mangaroa River, Horokiri Stream and Hutt River, and, consequently, set overly stringent suspended fine sediment TASs for these rivers. Mr Cairns’ opinion seems to be driven by the potential effects of climate change on mean air temperature in the catchments of the aforementioned rivers.

Note: *I acknowledge that this matter sits within the topics covered by Hearing Stream 2. Mr Cairns did not raise it during that hearing stream. Thus, I have addressed it in this Statement of Rebuttal Evidence to allow the Panels to factor in my opinion on this issue when considering Mr Cairns’ Further Submission.*

- 22 Climate (temperature and rainfall) is one of two River Environment Classification (REC)¹¹ variables that determines a river’s suspended sediment class under Appendix 2C of the NPS-FM 2020. Specifically, the REC classifies the climate of each REC reach as being ‘Warm’ or ‘Cool’ based on whether the mean annual air temperature in its upstream catchment is greater or less than 12°C. In his Further Submission, Mr Cairns identifies that the assignment of the REC’s climate classes was based on climate data collected between 1950 and 1980^[7]. He then goes on to opine that he “*strongly suspects*” that Mākara Stream, Mangaroa River, Horokiri Stream and perhaps the Hutt River now have mean catchment air temperatures greater than 12°C, and that the Council should consider the climate of these rivers to be Warm-Wet, rather than Cool-Wet, when assigning suspended sediment classes. This would result in all of these rivers being assigned to suspended sediment class

¹⁰ Evidence of Michael John Crawshaw Greer on Behalf of Greater Wellington Regional Council (dated 28th February 2025).

¹¹ The REC is a database of catchment spatial attributes, summarised for every segment in New Zealand’s network of rivers.

2 (instead of 3) under the NPS-FM 2020, which has a significantly less arduous national bottom line than what has been considered in PC1 (0.93 vs 2.22 metres). I do not consider there is a scientific basis for such an amendment, as:

- 22.1 Firstly, it is my understanding that the Council has no discretion in this matter. The process for assigning the NPS-FM 2020 sediment class is prescribed by the NPS-FM 2020. Thus, it does not seem possible to simply adopt an alternative methodology.
- 22.2 Secondly, Mr Cairns has not provided evidence to support his conclusion that mean air temperatures in the aforementioned catchments have increased above 12°C. Unfortunately, the data needed to categorically confirm or refute Mr Cairns opinion is behind a significant NIWA paywall. Nevertheless, recent trend analysis in NIWA's latest climate change impact assessment^[8] for the Council, combined with the climate data that shaped the REC climate classifications (and NPS-FM 2020 suspended sediment classes), can help determine whether there is a significant risk of the Mākara Stream, Mangaroa River, Horokiri Stream, and Hutt River catchments having been assigned to the wrong suspended sediment class.
- 22.3 Mean annual temperature across the Wellington Region has been increasing at a rate of approximately 0.009°C per year^[8] (based on climate sites in Wellington City at Kelburn (+0.0091°C/yr from 1930-2017) and Masterton (+0.0087°C/yr from 1930-2017)). This means that there has been an estimated 0.4°C increase in mean annual air temperature since 1980. When that value is applied to the estimated mean annual air temperature for the Mākara Stream, Mangaroa River, Horokiri Stream, and Hutt River catchments at 1980, only the Mākara Stream catchment exceeds the REC 12°C threshold between the Warm and Cool climate categories (see Table 1). Consequently, I do not agree with Mr Cairns' opinion that the Council should treat the aforementioned rivers as if they belong to suspended sediment class 2 under Appendix 2C of the NPS-FM 2020.

Note: *I am not a climate scientist, and the analysis above and in Table 1 is only provided to assess whether, as suggested by Mr Cairns, there is a significant risk of the REC climate classes not being fit for the purpose of assigning suspended sediment classes under the NPS-FM 2020. Accordingly, the values set out in*

Table 1 should not be treated as accurate estimates of mean annual temperature in the listed catchments.

Table 1: Mean annual air temperature in the Mākara Stream, Mangaroa River, Horokiri Stream and Hutt River catchments between 1950 and 1980 compared to adjusted mean annual air temperature at 2025 (calculated from the long-term trend of +0.009°C/yr^[8]). Red cells indicate where the REC 12°C threshold between the Warm and Cool climate categories is exceeded

Whaitua	Part-FMU	Site	Mean air temperature 1950-1980 (°C)	Adjusted air temperature @ 2025 (°C)
TWT	Parangārehu catchment streams and South-west coast rural streams	Mākara S. @ Kennels	11.93	12.34
	Te Awa Kairangi lower mainstem	Hutt R. @ Boulcott	10.63	11.04
	Te Awa Kairangi rural streams and rural mainstems	Mangaroa R. @ Te Marua	10.90	11.31
TAoP	Pouewe	Horokiri S. @ Snodgrass	11.57	11.98

23 Thirdly, the current state of visual clarity in the Mākara Stream, Mangaroa River, Horokiri Stream and Hutt River does not support Mr Cairns' view that these rivers now have a natural visual clarity that is more reflective of suspended sediment class 2 than 3. The modelled median reference (natural) state of visual clarity for suspended sediment class 2 is listed in Franklin *et al.*^[9] as 1.11 metres. As shown in Table 2, visual clarity in all of the rivers listed above (see Table 4 of my Statement of Primary Evidence for Hearing Stream 2¹⁰) is at least 30% higher than this, despite significant modification to the landcover in their upstream catchments (>44%) and the naturally occurring colour in the Mangaroa River (see paragraph 154 and 155 of my Statement of Primary Evidence for Hearing Stream 2⁹). Thus, there is no evidence to suggest that their natural visual clarity is more reflective of rivers in sediment class 2 than 3.

Table 2: Current median visual clarity (from Table 4 of my Statement of Primary Evidence for Hearing Stream 2⁹) at monitoring sites in the Mākara Stream, Mangaroa River, Horokiri Stream and Hutt River compared to the modelled natural reference state of rivers in suspended sediment class 2 (from Franklin *et al.*^[9]).

Whaitua	Part-FMU	Site	Modelled reference visual clarity of suspended sediment class 2 (m)	Current visual clarity (m)	Δ in metres (and %)
TWT	Parangārehu catchment streams and South-west coast rural streams	Mākara S. @ Kennels	1.11	1.42	+0.31 (28%)
	Te Awa Kairangi lower mainstem	Hutt R. @ Boulcott		2.83	+1.72 (155%)
	Te Awa Kairangi rural streams and rural mainstems	Mangaroa R. @ Te Marua		1.45	+0.34 (31%)
TAoP	Pouewe	Horokiri S. @ Snodgrass		2.45	+1.34 (121%)

Issues with using latest data to determine if suspended fine sediment TASs are achieved

- 24 On Page 6 of his Further Submission, Mr Cairns requests clarification on how “*the most recent Wellington Regional Council monitoring record*” referenced in Mr Watson’s recommended explanatory note to Rules WH.R20 and P.R19³ will be used to determine whether the visual clarity TASs for a part-FMU are met or not, and consequently, whether commercial forestry activities require a resource consent under PC1 or can be carried out under the Resource Management (National Environmental Standards for Commercial Forestry) Amendment Regulations 2023 (NES-CF).
- 25 I am in agreement with Mr Cairns that the Council needs to develop and implement a consistent approach for determining where and when the TASs in Tables 8.4 and 9.2 of PC1 are met. Not just in relation to suspended fine sediment for commercial forestry, but all attributes which dictate how an activity is managed through a rule or policy (e.g., *E. coli*, dissolved inorganic nitrogen, dissolved reactive phosphorus and suspended fine sediment in Rules WH.R30 and P.R28). There is simply too much variability in water quality data to expect regulated parties to determine their own activity status through assessment against the TASs using a simple pass-fail approach on an annual, or even monthly, basis.
- 26 Under the NPS-FM 2020 an attribute is degrading in a FMU or part of a FMU when “*any site or sites to which a target attribute state applies is experiencing, or is likely to experience, as a result of something other than a naturally occurring process, a deteriorating trend*”. Under the NPS-FM 2020 regional councils are required to undertake the following steps when determining whether an attribute is degrading:

- 26.1 To assess trends in attribute states (that is, whether improving or deteriorating):
 - 26.1.1 determine the appropriate period for assessment (which must be the period specified in the relevant attribute table in Appendix 2A or 2B, if given); and
 - 26.1.2 determine the minimum sampling frequency and distribution of sampling dates (which must be the frequency and distribution specified in the relevant attribute table in Appendix 2A or 2B, if given); and
 - 26.1.3 specify the likelihood of any trend.
 - 26.2 If a deteriorating trend is more likely than not:
 - 26.2.1 investigate the cause of the trend; and
 - 26.2.2 consider the likelihood of the deteriorating trend
 - 26.3 If a deteriorating trend that is the result of something other than a naturally occurring process is detected, any part of an FMU to which the attribute applies is degrading.
- 27 This process provides a methodology by which the Council could develop a pathway to follow when determining whether a site is meeting the TASs or not. An example of such a pathway is set out in Figure 1 below. Importantly, it is unlikely that if the Council implemented such an approach that regular grading against the TASs would be undertaken. The reliance on trend analysis means that, in my opinion, there is little benefit in benchmarking against the TASs more frequently than the five-yearly regional policy statement and plan effectiveness reporting frequency specified in Section 35 (2A) of the RMA. Adoption of this reporting frequency would mean that regulated parties would have a high level of certainty regarding their on-going consenting requirements (i.e., they can undertake activities without risk of an unscheduled update regarding achievement of the TASs resulting in resource consent requirements changing halfway through an activity). I understand that Council is considering whether this is the most appropriate approach and will confirm in Hearing Stream 4 (as the issue is likely to arise again then).

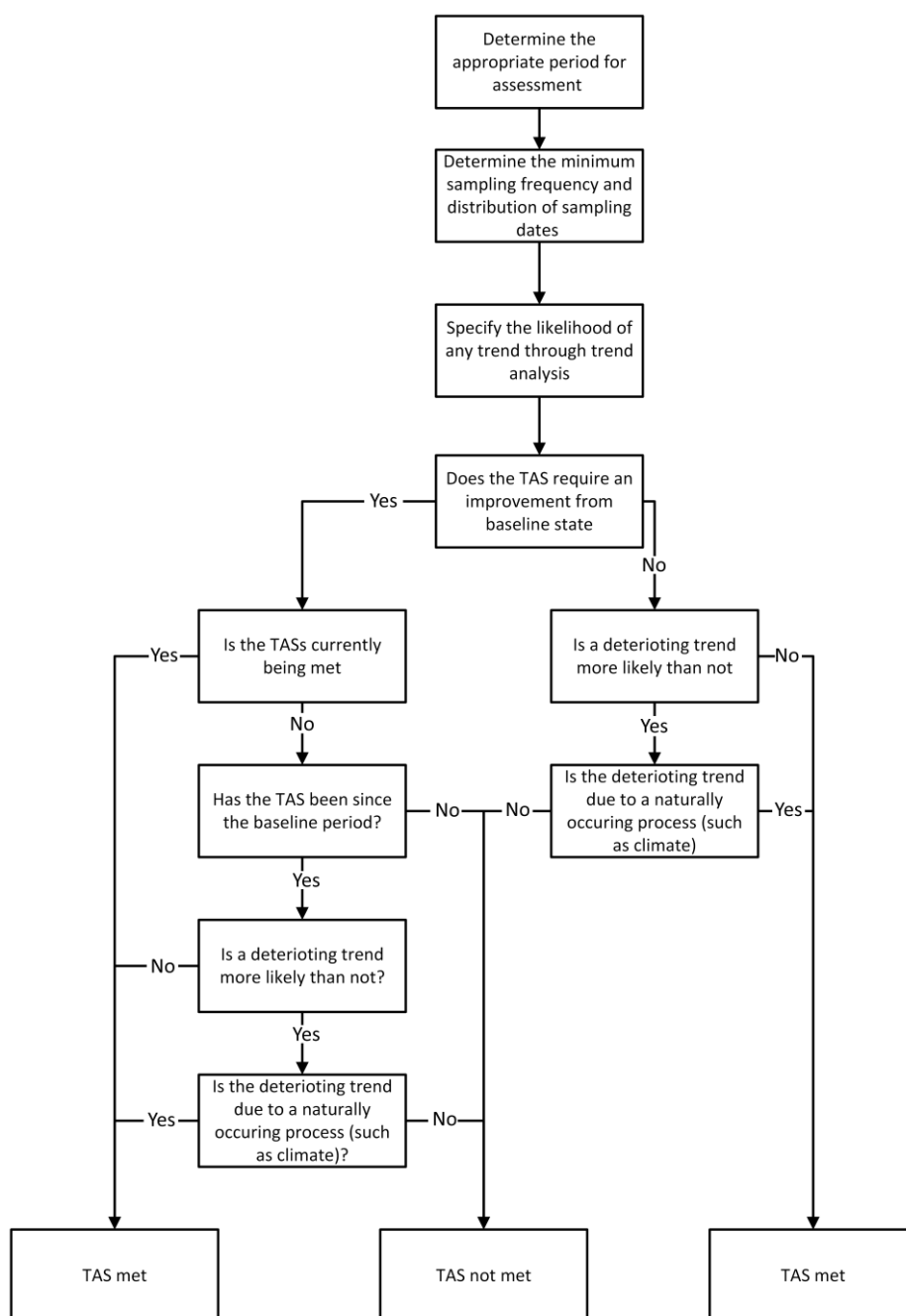


Figure 1: Potential pathway for the Council to determine whether a TAS is met.

- 28 Regarding Mr Watson's recommended explanatory note to Rules WH.R20 and P.R19³, I consider that the specific sites listed in Tables 8.4 and 9.2 of PC1 should be explicitly referenced. The reason being that the TASs do not apply to the Council monitoring sites not listed in those tables. Thus, they should not be considered when determining whether consent is required for a commercial forestry activity.
- 29 I suggest the following amendments to Mr Watson's recommended explanatory note would be justified scientifically:

Where the most recent Wellington Regional Council reporting carried out in accordance with 2A of Section 35 of the Resource Management Act (1991) monitoring record demonstrates the measure of visual clarity suspended fine sediment at for the relevant catchment sites listed in Table 8.4/ 9.2 meets the target attribute states at any the specified monitoring site within for the relevant part Freshwater Management Units (including all those downstream of the commercial forestry activity) set out in Table 8.4, commercial forestry activity is regulated by the Resource Management (National Environmental Standards for Commercial Forestry) Regulations 2023. Between PC1 becoming fully operative and the release of Wellington Regional Council's first report under 2A of Section 35 the Resource Management Act (1991), the target attribute states for suspended fine sediment shall be considered met in those part-FMUs where the baseline state of the relevant site in Table 8.4/ 9.2 is better than the target state.

Note: Similar concerns regarding how the latest water quality data will be used to determine if a TASs is being met are raised in the Statements of Evidence of:

Mr McGregor on behalf of the China Forestry Group (page 13);

Mr Christopher Hansen on behalf of Guildford Timber Company Limited (paragraph 28);

Mr Jerome Wyeth on behalf of the New Zealand Farm Forestry Association (NZFFA) (paragraphs 61 to 63); and

Mr Egon Guttke on behalf of NZFFA (page 5).

Potential to review suspended fine sediment TASs to partial out the future effects of climate change

30 Mr Cairns requests “that the TAS Visual Clarity for all rivers are periodically reviewed to take into account changes driven by climate change” on Page 6 of his Further Submission. I understand that under the current policy framework the Council has limited ability to undertake such reviews as:

30.1 The TASs cannot be reviewed and amended without a plan change;

30.2 All but one of the TASs that require an improvement in suspended fine sediment are set at the national bottom line or an equivalent colour-adjusted-threshold (Te Awa Kairangi rural streams and rural mainstems part-FMU only).

Accordingly, for everywhere except Te Awa Kairangi lower mainstem part-FMU, making the suspended sediment TASs in PC1 more lenient to account for climate change effects would require either:

30.2.1 Amendment to, or removal of, the suspended fine sediment national bottom lines in the NPS-FM 2020; and/or

30.2.2 An amendment to the NPS-FM 2020 that allows an attribute to degrade from baseline state.

31 However, when assessing whether the current suspended fine sediment TASs are met or not, the Council will need to consider when non-achievement in part-FMUs where the TASs were previously met is the result of climate or land-use. If it is the former, the Council should still consider the TAS to be met (see paragraph 24 to 29). Hopefully that allays some of Mr Cairns' concerns regarding the potential for climate change to increase the regulatory burden placed on commercial forestry activities.

The applicability of TASs to upstream part-FMUs that contribute to their non-achievement

32 Page 6 of his Further Submission, Mr Cairns questions whether “a part FMU now include[s] the downstream (receiving) area”. While I cannot comment on whether PC1 works in that way, from a scientific perspective it should. If land-use activities and/or discharges directly contribute to freshwater quality at a TAS site, they should be managed in accordance with the TASs set for that site, regardless of whether they are conducted within the boundaries of the corresponding part-FMU. Importantly, if PC1 does not take that approach there is little chance of achieving the TASs for Te Awa Kairangi lower mainstem part-FMU given that the boundaries of that part-FMU really only cover the bed of the Hutt River. Thus, achieving the TASs for that part-FMU relies entirely on managing land-uses and discharges in those part-FMUs that flow into it.

Note: Similar concerns regarding the applicability of the TASs in Table 8.4 and 9.2 to upstream part-FMUs are raised in the Statements of Evidence of:

Mr McGregor on behalf of the China Forestry Group (page 13); and

Mr Hansen on behalf of Guildford Timber Company Limited (paragraph 33).

Contribution of tributary catchments to visual clarity in Te Awa Kairangi lower mainstem part-FMU

33 Between pages 19 and 26 of his Further Submission, Mr Cairns appears to question the relative importance of the Hutt Rivers tributaries to visual clarity in the mainstem. I am not entirely certain what Mr Cairns is seeking to demonstrate with this section of his Further Submission. However, if he is suggesting that reducing sediment losses from tributaries of the Hutt where commercial forestry is the predominant land-use (i.e., the Whakatikei and Akatarawa rivers) will not contribute to the achievement of the suspended fine sediment TASs for Te Awa Kairangi lower mainstem part-FMU, I do not agree. The sediment modelling contained in Mr Blyth's Statement of Primary Evidence for this Hearing Stream⁵ and Hearing Stream 2¹² suggests that:

- 33.1 The 17% reduction in sediment load (from baseline state) required to achieve the amended visual clarity TAS for the Mangaroa River (which captures 50% of the pastoral land cover upstream of Te Awa Kairangi lower mainstem part-FMU^[10]) only achieves 10% of the reduction required by the TAS for the mainstem of the Hutt River;
- 33.2 The complete removal of all sediment from the Mangaroa River would only achieve 59% of the required load reduction for Te Awa Kairangi lower mainstem part-FMU; and
- 33.3 Consequently, sediment load reductions are likely to be required across all major tributaries to contribute to the achievement of the visual clarity TASs for Te Awa Kairangi lower mainstem part-FMU.

RESPONSE TO MATTERS RAISED IN SUBMITTER EVIDENCE FROM GUILDFORD TIMBER COMPANY

Potential for baseline state not to be maintained in Te Awa Kairangi urban streams part-FMU

34 In paragraph 29 of his Planning Evidence, Mr Christopher Hansen (on behalf of Guildford Timber Company Limited) states that *"there is no guarantee that the "A" TAS [for Te Awa Kairangi urban streams part-FMU] can be maintained, particularly in time with likely increase and changes in land use activities in the Silverstream/Pinehaven area"*. I do not agree with this opinion for the following reasons:

- 34.1 The current median visual clarity of 1.22 metres at the monitoring site in for Te Awa Kairangi urban streams part-FMU (Hulls Ck adj. Reynolds Bach Dr.) well

¹² ¹² Evidence of James Mitchell Blyth on Behalf of Greater Wellington Regional Council (dated 28th February 2025).

exceeds the A band threshold of 0.93 metres. Thus, a greater than 30% degradation in this attribute would be needed for it to shift into the B band; and

- 34.2 If a degradation in visual clarity were to occur in Te Awa Kairangi urban streams part-FMU, the Council would be required under Clause 3.20 of the NPS-FM 2020 to take action to halt or reverse it by changing the provisions of PC1 or preparing an action plan. Given the extent to which visual clarity in this part-FMU exceeds the A band threshold, it is reasonable to assume that the Council will have ample time to detect and respond to any reduction in visual clarity before it is degraded to the B band.

Proximity of rivers to forestry blocks

- 35 In paragraph 31 of his Planning Evidence, Mr Hansen suggests that there *“will be commercial forestry activities that due to their location on a site away from any waterways”* and that *“this would be particularly true for the submitters site which is over 300ha and has a distance of approx. 6km from the eastern to the western boundary meaning that many normal commercial forestry activities will not locate[d] anywhere near a waterway”*. I am unsure why Mr Hansen considers this to be the case, and I consider he is incorrect. To demonstrate this, I have undertaken two geospatial analysis exercises:

- 35.1 In the first, I overlaid the mainland areas of Whaitua Te Whanganui-a-Tara (TWT) and Te Awarua-o-Porirua (TAoP) Whaitua (excluding urban areas) with a grid of points located 50 metres apart and calculated how far away each point is from the nearest river (as identified by the REC);
- 35.2 In the second, I split the mainland areas of TWT and TAoP Whaitua into example 300 hectare (ha) blocks described in Mr Hansen’s Planning Evidence (i.e., 6000m longitude × 500m latitude) and calculated the number and length of the rivers in each block (as identified by the REC).

Note: *Due to the irregular boundaries of TWT and TAoP Whaitua some blocks were generated adjacent to the coast or the northern and eastern edges of the whaitua that were less than 300 ha. Those less than 200 ha were excluded from this analysis.*

- 36 The geospatial analyses described above in paragraphs 35.1 and 35.2 suggests that:

- 36.1 No point in the TWT and TAoP Whaitua is more than two kilometres from a river (including streams) ($\pm 50\text{m}$);
 - 36.2 Across the TWT and TAoP Whaitua the average distance to a river is only 310 metres ($\pm 50\text{m}$);
 - 36.3 90% of the TWT and TAoP Whaitua are within 560 metres of a river ($\pm 50\text{m}$); and
 - 36.4 If the TWT and TAoP Whaitua were split up into the 300 ha blocks described in Mr Hansen's Planning Evidence (i.e., 6000m longitude \times 500m latitude):
 - 36.4.1 The average number and length of river in each block would be 13 and 4.36 km respectively;
 - 36.4.2 All blocks would have at least three unique rivers with a total length of 782 metres; and
 - 36.4.3 90% of blocks would have at least 18 unique rivers with a total length of 6.08 km.
- 37 These results do not support Mr Hansen's suggestion that "*many normal commercial forestry activities will not locate[d] anywhere near a waterway*". Furthermore, they likely underestimate the proximity of commercial forestry activities to rivers in the TWT and TAoP Whaitua as, for a number of reasons¹³, the REC does not identify all small streams in the river network. It is also important to understand that no matter the proximity of a commercial forestry block to a river, ultimately if it generates run-off, any sediment in that run-off will be discharged to a freshwater and/or coastal environment.

Replacement of the PC1 part-FMU with more defined drainage catchments in relation to Rule WH.R20

- 38 In his Planning Evidence (paragraph 38 of), Mr Hansen requests in relation to Rule WH.R20 that the Panels "*replace the broad pFMU by using the more defined drainage catchments as the geographical area*". I am unsure exactly what Mr Hansen means by this. However, if he is suggesting that that the part-FMUs listed in Tables 8.4 and 9.2 of PC1 and charted on the associated maps (78 and 79) should be amended to reflect "*more defined drainage*

¹³ Including the low resolution (30m) of its underlying digital elevation model and the minimum catchment area (20 ha) used for stream channel initiation^[11].

catchments” I do not agree. The Council has given significant thought to the current part-FMUs, which are designed:

38.1 To reflect the variability in land-cover patterns between different catchments and the objectives set for different rivers in the TWT and TAoP Whaitua Implementation Programmes (WIPs); without

38.2 Imposing arduous and redundant monitoring restrictions on the Council.

39 Consequently, I consider the part-FMUs in the notified version of PC1 to be the best available approach for spatially applying the TASs in Tables 8.4 and 9.2.

40 Alternatively, if Mr Hansen is suggesting that the resource consent requirements for commercial forestry activities under RuleWH.R20 should be determined through comparisons of visual clarity within the “*defined drainage catchment*” in which they are planned with the TASs set for the wider part-FMU, I also do not agree.

41 As set out in my paragraph 26 of my Statement of Primary Evidence⁷, PC1 is primarily focused on managing cumulative effects at a catchment scale; requiring improvements throughout the part-FMU, regardless of local water quality, so that the TASs is achieved at the specified sites while allowing for some ‘*unders and overs*’ in their upstream catchment. The approach potentially recommended by Mr Hansen, whereby the activity status of commercial forestry activities is determined by local water quality is inconsistent with this approach. It is also important to note that such an approach could be more stringent than what is recommended by Mr Waston³.

42 Applying the Table 8.4 and Table 9.2 suspended fine sediment TASs at a local scale would, in some cases, allow for some commercial forestry activities to be undertaken without resource consent in part-FMUs where the TAS is not met at the specified site. However, it would also result in other commercial forestry activities requiring resource consent in catchments where the TASs are met at the site but not at the “*defined drainage catchment*” discussed in Mr Hansen’s Planning Evidence. This will have the biggest impact in the Hutt River catchment. There, under Mr Watson’s recommended approach³, resource consent, will no longer be required for commercial forestry activities once visual clarity at the Hutt R. @ Boulcott and Mangaroa R. @ Te Marua monitoring sites reaches 2.95 and 1.67 metres respectively (note achievement of the TASs would need to be determined by the Council in the manner like that described in paragraph 24 to 27); regardless of local water quality in the “*defined drainage catchment*” where such an activity is planned. In contrast, under an

approach where local water quality determines consent requirements, resource consent would be required in all “*defined drainage catchments*” in this catchment where visual clarity is not in the A band (i.e., the most stringent of the relevant TASs), regardless of whether the TASs are met at the sites specified in Table 8.4 and 9.2. Basically, moving away from the ‘*under and overs*’ approach taken in PC1, benefits the *unders* to the detriment of the *overs*.

CONCLUSIONS

43 ²I do not agree with Ms Horrox (WWL) that the inclusion of a five metre setback from surface water bodies in Ms Vivian’s recommended new earthworks Rule WH.R23A and P.R22A¹ should be deleted, as:

43.1 I do not consider that it is difficult to determine whether a waterway meets the operative NRP definition of surface water body; and

43.2 It is uncertain whether the erosion and sediment control measures implemented as part of permitted earthworks activities will be sufficiently robust to effectively minimise the risk of bank erosion resulting from works conducted within five meters of a surface water body.

44 From an effects management perspective, there is no scientific justification for Ms. Horrox’s (WWL) request to delete the annual 3000m² cap on earthworks per property in Rule WH.R23 and P.R22, except in cases where a property is sufficiently large to span multiple surface water catchments, ensuring that no single catchment is subjected to more than 3000m² of earthworks per year.

45 Contrary to the views expressed in Dr. Basher’s Technical Evidence (WFF), PC1 does not require a universal improvement in visual clarity to a natural state. However, I agree with Dr. Basher that the phrase “*avoid an increase in risk of loss of sediment to water relative to the risk of loss that exists from the land in a natural state*” in Schedules 33 and 34 implies that vegetation clearance and commercial forestry activities cannot increase sediment losses beyond natural levels. In my opinion, this is inconsistent with most of the suspended fine sediment TASs in Tables 8.4 and 9.2.

46 I do not consider the opinions expressed in Mr. Cairns’ Further Submission to Stream Three Hearings for “Plan Change 1 to the Natural Resources Plan” (Wgn-NZFFA) as

evidence that pulse sediment discharges following events such as commercial forest harvesting have a negligible impact on median visual clarity.

47 Mr. Cairns' (Wgn-NZFFA) statement that "*that major natural events (surely not regulated as anthropogenic) may delay a water body improving to meet TAS VC, or could result in an otherwise compliant FMU falling below TAS VC*" ignores the fact that if the land-cover in a catchment has been modified, sediment losses during severe weather events can be expected to be greater than in natural catchments. Thus, an increase in sediment losses due to storm frequency can indeed be at least partially attributed to anthropogenic sources.

48 Mr Hansen's (Guildford Timber Company Limited) view that "there is no guarantee that the "A" TAS [for the Te Awa Kairangi urban streams part-FMU] can be maintained, particularly in time with likely increase and changes in land use activities in the Silverstream/Pinehaven area" is not supported by the available water quality data and ignores the fact that if such a degradation were to occur the Council would be required to halt or reverse it by changing the provisions of PC1 or preparing an action plan (as per Clause 3.20 of the NPS-FM 2020)

49 Following on from paragraphs 46 to 48, it is my opinion that none of the statements in the evidence of Mr Cairns (Wgn-NZFFA) or Mr Hansen (Guildford Timber Company Limited) regarding the potential contribution of urban development, river engineering, or severe weather to sediment loads in the Hutt River catchment justify relaxing the commercial forestry provisions in PC1 (noting that Mr Watson has relaxed these provisions for other reasons like those described in paragraph 35 of my Statement of Primary Evidence⁷). Information provided in Mr Blyth's previous statements of evidence indicates that:

49.1 Commercial forestry is an anthropogenic source of sediment; and

49.2 Reductions in sediment losses from those tributaries of the Hutt where commercial forestry is the predominant land use (i.e., the Whakatikei and Akatarawa rivers) are necessary to achieve the suspended fine sediment TAS for the Te Awa Kairangi lower mainstem part-FMU.

50 None of the information introduced by Mr Cairns or Mr Hansen constitutes scientific evidence that contradicts this. Accordingly, I see no scientific basis to recommend that Mr Watson amend his position on the need for regulation of commercial forestry (beyond the NES-CF) within the TAoP and TWT Whaitua.

- 51 Mr. Cairns' (Wgn-NZFFA) assessment of the baseline state of visual clarity in the Te Awa Kairangi lower mainstem part-FMU is incorrect.
- 52 I do not consider there to be a scientific basis for Mr Cairns' (Wgn-NZFFA) suggestion that the Council should treat the Mākara Stream, Mangaroa River, Horokiri Stream, and Hutt River as if they fall within suspended sediment class 2 under the NPS-FM 2020, in order to enable more lenient suspended fine sediment TASs to be set. Furthermore, it is my understanding that the NPS-FM 2020 does not permit the Council to make such a reclassification.
- 53 I agree with Mr Cairns (Wgn-NZFFA) that the Council should develop and implement a consistent approach for determining where and when the TASs in Tables 8.4 and 9.2 of PC1 are achieved. This approach should apply not only to suspended fine sediment in the context of commercial forestry but also to all attributes that influence how activities are managed under relevant rules or policies. Accordingly, I consider that the following amendments to Mr Watson's recommended explanatory note to Rules WH.R20 and P.R19 are scientifically justified:

Where the most recent Wellington Regional Council reporting carried out in accordance with 2A of Section 35 of the Resource Management Act (1991) monitoring record demonstrates the measure of visual clarity suspended fine sediment at for the relevant catchment sites listed in Table 8.4/ 9.2 meets the target attribute states at any the specified monitoring site within for the relevant part Freshwater Management Units (including all those downstream of the commercial forestry activity) set out in Table 8.4, commercial forestry activity is regulated by the Resource Management (National Environmental Standards for Commercial Forestry) Regulations 2023. Between PC1 becoming fully operative and the release of Wellington Regional Council's first report under 2A of Section 35 the Resource Management Act (1991), the target attribute states for suspended fine sediment shall be considered met in those part-FMUs where the baseline state of the relevant site in Table 8.4/ 9.2 is better than the target state.

- 54 I understand that under the current national policy framework the Council has limited ability to regularly review the TASs for visual clarity to account for the effects of climate change as suggested by Mr Cairns (Wgn-NZFFA). However, when assessing whether the current suspended fine sediment TASs are met or not, the Council will need to consider when non-achievement in part-FMUs where the TAS was previously met is the result of climate or land-use. If it is the former the Council should consider the TAS to be met.

Hopefully that allays some of Mr Cairns' concerns regarding the potential for climate change to increase the regulatory burden placed on commercial forestry activities.

- 55 Regarding Mr Cairns (Wgn-NZFFA) questions around whether a *"part FMU includes the downstream (receiving) area"*, in my scientific opinion it should. If land-use activities and/or discharges directly contribute to freshwater quality at a TAS site, they should be managed in accordance with the TASs set for that site, regardless of whether they are conducted within the boundaries of the corresponding part-FMU. Importantly, if PC1 does not take that approach there is little chance of achieving the TASs for the Te Awa Kairangi lower mainstem part-FMU given that the boundaries of that part-FMU really only cover the bed of the Hutt River.
- 56 Geospatial analysis does not support Mr Hansen's (Guildford Timber Company Limited) suggestion that *"many normal commercial forestry activities will not locate[d] anywhere near a waterway"*.
- 57 In his Planning Evidence, Mr Hansen (Guildford Timber Company Limited) requests in relation to Rule WH.R20 that the Panel's *"replace the broad pFMU by using the more defined drainage catchments as the geographical area"*. In his Planning Evidence (paragraph 38 of), Mr Hansen requests in relation to Rule WH.R20 that the Panels *"replace the broad pFMU by using the more defined drainage catchments as the geographical area"*. I am unsure exactly what Mr Hansen means by this. However, if he is suggesting that that the part-FMUs listed in Tables 8.4 and 9.2 of PC1 and charted on the associated maps (78 and 79) should be amended to reflect *"more defined drainage catchments"* I do not agree. Alternatively, if he is suggesting that that the resource consent requirements for commercial forestry activities under Rule WH.R20 should be determined through comparisons of visual clarity within the *"defined drainage catchment"* in which they are planned with the TASs set for the wider part-FMU, I also do not agree.



DATE: 16th May 2025

DR MICHAEL JOHN CRAWSHAW GREER

PRINCIPAL SCIENTIST, DIRECTOR

TORLESSE ENVIRONMENTAL LIMITED

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