Further Submission to Stream Three Hearings for "Plan Change 1 to the Natural Resources Plan"

Submitter:	Wellington Branch of New Zealand Farm Forestry Association (Wgtn-NZFFA)
Address:	New Zealand Farm Forestry Association 9th Floor, 93 The Terrace, Wellington PO Box 10 349, The Terrace Wellington 6140
Submitted by:	Eric Cairns
About this organization.	The NZFFA represents people who own small-scale private forests and/or are interested in the many values of trees. Currently we have over 1200 members representing a good cross-section of the approximately 16,000 entities owning private forests in New Zealand. In the Wellington region, the NZFFA has about 100 members with direct interests or ownership in small scale forestry,

Contact details for this submission are:

Submitter: Wellington Branch New Zealand Farm Forestry Association
Submitted by: Eric Cairns
Contact address: 178 Mangaroa Valley Road
RD1
Upper Hutt 5371

Email; cairnse178@gmail.com

Ph 0277846658

Table of Contents

Summary:

- Our original Submission is S036
- In the first instance, we still consider that GW has provided insufficient stringency to override the NESCF, and we therefore support the NZFFA submission regarding insufficient stringency.
- In consideration of Mr Pepperell's issues with dealing with NESCF permitted activities, we say that education of both contractors and forest owners and a higher level of enforcement needs to be conducted, as some industry people need to be made aware of and encouraged to use best available environmental practises.
    - We note that historic plantings (no riparian setbacks and with every available corner planted) have created legacy issues that may yet drag on for another 30 years.
- We comment on the S42A report for Stream 3
    - We agree with the proposal to remove the prohibition of harvesting for Plantation Forestry on steep land.
    - We agree that the proposed high, and highest risk erosion prone forestry land mapped by Nation *et al* did not meet the definition of highly erodible land as defined in the Regional Policy Statement and that the mapping for "high erosion land" should not be used to prohibit forestry activity.
    - Should the Commissioners reject the NZFFA argument of insufficient stringency to override NESCF, our fallback position is to require consented forestry activities, only on steeper land (>26degrees) in those part FMUs where TAS Visual Clarity fail. That includes restrictions for afforestation, replanting and harvesting
        - The reason for proposing this, is that GW can then enforce use of industry best practise methods to minimise loss of sediment to water bodies, but consent cannot be refused, so the industry still has confidence in supply chain continuity.
        - The steeper land (>26 degrees, mapped by Easton et al) presents the highest risk of surficial erosion, either through earthworks or temporary vegetation clearance.
        - We see no need for heightened control of lower risk forestry operations on land less than 26 degrees slope
    - Failing that, we would support Restricted Discretionary consents for forestry activities in those pFMU where Visual Clarity fails to meet TAS.
    - We support use of Methods M44a parts a, b and c and M44b regarding identification of high-risk areas, financial support to retire out at risk areas and dissemination of knowledge and training relating to forestry operations.

- As a result of proposed discretionary controlled activity for planting and harvesting and forestry earthworks in all catchments upstream of Hutt Boulcott, we are relitigating the validity of TAS Visual Clarity set for Hutt Bouclott and other rivers.
    - Current median VC at Boulcott is 2.45m, whereas TAS is set at ≥2.95m
    - Argument is proposed why the TAS set for Hutt at Boulcott is unreasonable.
    - Mean annual air temperature, whether above or below 12^0C is a key attribute. The Wellington region, due to climate warming, is on the cusp of exceeding that value. Several streams in the Hutt and near Porirua are already classified as SFS category 2 because their mean annual temperature is above 12^0C.

- Our literature review indicates that Suspended Fine Sediment classes used for NPSFM were based on old temperature data (1950-1980) and that use of newer temperature data (1991-2020) would substantially reduce the required target attribute states for Visual Clarity for several more water bodies in the Wellington region.
- Use of new temperature data is very likely to reduce TAS VC at Makara Stream, Horokiri Stream and other streams near Porirua, as well as Mangaroa River. Possibly it would affect Te Awa Kairangi/Hutt as well.
- We show that Visual Clarity for Hutt Boulcott is inversely dependent of flow rate. Higher flow rates are expected low down in a catchment but in this case flows are exacerbated by large areas of impermeable surface and storm water from urban areas, thus contributing to lower VC (increased scouring).
- The flood control programme used by GW to regularly groom and contour gravel beds over some 16km of Te Awa Kairangi/Hutt River surely generates SFS and contributes to the failure of TAS Visual Clarity at Hutt Boulcott. By how much we don't know, but in the tenor used by GW for other land use activities in the catchment, River Gravel bulldozing should be recognised as contributing to failure of TASVC, and therefore compromising the ability of other land users upstream to operate (requiring restricted discretionary consents). One solution to this issue is to reevaluate the TAS VC and reduce it to its baseline value.

- We generally support and welcome the technical evidence provided for Stream 3 Forestry and Earthworks by Dr Greer, Mr Blyth, Mr Pepperell and Mr Reardon.

Stream 3, S42a Report, Forestry

Wellington NZFFA generally supports the S42a report and some of the proposed changes in strategy. i.e.

- To not prohibit harvesting of plantation forest on steeper land,
- To set aside the mapping for high and highest erosion risk land but retain them as guidance documents (renamed potentially erodible land)
- To use non-regulatory methods to encourage improvement of the environmental performance of Plantation Forestry industry.
- To improve training and advice available to contractors, GW staff and landowners.
- Through appropriate Water Plans, to gather more information about sources of sediment and the temporal nature of those sources, to assess appropriateness of TAS (Vis Clarity and SFS), including in regard to mean annual temperature increases since 1990 and to customise mitigation efforts to reduce sediment, based as much as possible, on the facts.
    - Wgtn-NZFFA would appreciate the opportunity to have input to those water plans
- While we still see shortcomings in how TAS Visual Clarity is set, as outlined elsewhere in this submission, we do hold strong environmental values and wish to contribute our share of effort to improving the broad spectrum of environmental outcomes.
- The S42a report appears to downplay the incidence of shallow landslides as a contribution to sediment in the Wellington region. Table 3, copied from the Nation, Easton Blyth Contaminant modelling report (March 2025), indicates that for Porirua, that shallow landslides still account for 36% of sediment entering the harbour.

Table 3. Calibrated annual sediment loads.

Monitoring Site	Total Modelled Load (t/year)	Modelled Erosion Process (t/yr, proportion in parentheses)		
		Surficial & Urban	Shallow Landslide	Streambank
Pauatahanui Stream at Gorge	3853	1643 (43%)	1675 (43%)	535 (14%)
Porirua Stream at Town Centre	4443	2534 (57%)	1107 (25%)	801 (18%)
Horokiri Stream at Snodgrass	3925	1558 (40%)	1655 (42%)	713 (18%)
Total	12220	5735 (47%)	4436 (36%)	2049 (17%)

- We note that the influence of earthworks (or forestry harvesting) is not included in the modelling.
- 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. E.g. runoff from gravel roadways/tracks, livestock access to waterbodies etc.

Most recent monitoring records

Some within NZFFA fear that a single event or short-term trend at any downstream monitoring site might be used to shut down forestry harvesting or associated earthworks for an indefinite period. Over the longer term, increased frequency of severe storms will almost certainly increase suspended sediment levels in water bodies

a. Note 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.
b. If erosion events emanating from climate change are regarded as "not part of the natural state", does that also mean that eventually all forestry activities will become restricted discretionary activities?

The revised WH.R20 and P.R19 both refer to

> where the most recent Wellington Regional Council monitoring record measure of visual clarity for the relevant catchment does not meet the target attribute state at any monitoring site within the relevant part Freshwater Management Unit set out in Table 8.4,

We would prefer a clarification regarding the most recent WRC monitoring record. It is not appropriate to use the most recent VC **(monthly**) reading to dictate land use activities. Monthly readings can fluctuate widely according to flow rates and are likely to be higher during the winter months or during flood flows. Rather, the longer-term trends of median data over a 5 year or longer-term should be used to assess the condition of the waterbody. (Isn't that the definition of a trend in this context?).

Before applying restrictions, GW should also take into consideration whether natural events have affected the median VC values (e.g.one in 50 year floods or more severe, or even increasing frequency of less intense heavy rain events).

We also ask that TAS Visual Clarity for all rivers are periodically reviewed to take into account changes driven by climate change.

We need to be quite clear about proposed restrictions on forestry activities, as the rules appear to contradict the policy WH.P28 which discuss part FMUs **and receiving environments**.
The explanatory text preceding WH.R20 appears to conflict with the rule itself.

> The text says that if the most recent monitoring record for VC meets TAS...at any monitoring site within the relevant **part Freshwater Management Unit** set out in Table 8.4, … **then NESCF prevails**
> Then WH.R20 says, restricted discretionary activity applies .....where the most recent Wellington Regional Council monitoring record measure of visual clarity for the relevant catchment does not meet the target attribute state at any monitoring site within the relevant **part Freshwater Management Unit** set out in Table 8.4, is a restricted discretionary activity….

Does a part FMU now include the downstream (receiving) area (say Hutt Boulcott, if Mangaroa at Te Marua fails VC) (not according to the definition of part FMU in NPSFM)

What if Mangaroa fails, but Pakuratahi, Hutt, Akatarawa and Whakatikei pass. Are upstream environments in another watershed then unrestricted

What if only Hutt at Boulcott fails but all upstream pFMU pass.

In respect of receiving environments, we suggest that Pauatahanui inlet sediment objectives were not intended to prohibit upstream activity if the relevant stream (say Horokiri), complied for TASVC. This needs to be clarified.

Consents fees:

These have not yet been announced, but we imagine that the fees would be similar to consent fees already set for "discharge sediment to land/water/land use combined > 0.3ha". i.e. perhaps >$6800 for a combined earthworks and harvesting consent over a limited period.

For a small block harvest, that is a considerable sum and would be payable regardless of whether or not the woodlot was on steep land close to a water body or on flat land away from streams. i.e. regardless of there being either a high or low risk of sediment leakage.

We would prefer that small blocks and low risk activities be exempt from consents fees.

Does PC1 meet the stringency test to warrant overriding National Environmental Standard

We suspect not. The arguments are fleshed out in the submission by our National Body for NZFFA. This our first choice of action.

If the stringency test is not met, then rules WH.R20 and P.R19 will not apply.

In general, our members do not agree that increased regulation per se will provide the environmental outcomes sought by GW and disagree that PC1 should override the NESCF. One of our NZFFA members writes:

* We support the National NES-CF standards

* We do not support the Wellington Regional Council proposal to make Forestry a Restricted Discretionary Activity

* Forestry in this region used to be a permitted activity with conditions. If you could not meet the conditions, then you defaulted to the Discretionary activity.

* People cannot afford the cost of consent with no guarantee it being granted before income from harvesting arrives. What we will see is that forestry will no longer be affordable or be seen as a viable alternative land use, and land values of our forestry land will collapse.

* On our property we recently harvested some trees under the NES-PF rules. Mid way through the harvest the GW staff visited to check out the operation. They were happy with what they saw.

Proposal for GW to use Consent Control of forestry activities on steeper land where part of the FMU fails TASVC

If the commissioners reject our argument of insufficient stringency to override NESCF, then our next preference will be that only steeper land in an FMU where downstream TASVC is not met needs additional controls. Where land steeper than 26 degrees (Potentially erodible land as mapped by Nation et al, and therefore having a higher risk of surficial erosion from earthworks or vegetation clearance), would be subject to controlled consent for all forestry activities as previously outlined.

- Except that we see no need for certified Forestry Management Plans.
- Steeper land does not need to be retired from harvest if conditions can be met
- Council will be able to ensure that industry best practise is used, but cannot refuse a consent, thus safeguarding critical supply chains.
- Low risk harvesting on less steep land is not unnecessarily controlled, and costs are minimised.
- Note that the activity status of a forest will depend on whether monitoring points meet or fail TASVC trends, and that this may change over time. Consents may be required from afforestation onwards, or, if TASVC improves, forests may no longer require consents. **The process for managing change of status for permitted or consented activities is not yet defined.**

Restricted Discretionary Consents

Should the Commissioners not agree to controlled activity only on steepest land, then our next fall-back position is to support Restricted Discretionary Consent for all forestry activities as outlined by the S42a Stream 3 Report under rules WH.R20 and P.R19. This is 3rd in line for our preferences.
The proposed Matters of Discretion conditions are copied in the text box on the next page.
We note that this is a substantial shift in viewpoint on behalf of GW.

Wellington Branch NZFFA are divided in their support for using Restricted Discretionary Consents to override NESCF, as some of us fear that there is too much uncertainty as to whether or not forestry activities will be consented, and that refusal to grant consent may be for reasons over which the applicant has no control.

We make the following comments:

- At first sight, the rules appear to default to granting consent for harvesting and earthworks subject to contractors following best practise guidelines. We do support referring to NZFOA Best Practise guidelines within Forest Management Plans. Forest Practice Guides • Documents Library: Forest Owners Association. These are an illustrated suite of recommended methods that could be employed for any particular situation.
- What is not clear is whether or not Council Officers would require additional safeguards over and above those described in the NZFOA best practise guidelines.

    - For examples, a ban on winter earthworks or requiring excessive sediment control structures with or without additional flocculant chemicals, or what constitutes stabilisation of a site after harvest.
    - GW staff might not accept that use of "standard" methods listed in the NZFOA good practise guides are sufficient and potentially could ask for expert reports to justify that a proposed approach would indeed minimise loss of sediment. This would add expense and delays in gaining consent.
    - We note that the FOA Best Practise Guidelines are not an exhaustive list of mitigations, as use of coppicing or more durable species, longer rotation times between harvesting, small coupe harvesting or continuous cover canopy regimes are not presently in the NZFOA guidelines.
- Effectiveness of some of the mitigations may not be apparent until next harvest cycle. E.g. larger planting setbacks or retiring out awkward corners. I.e. at time frames much longer than used to assess trends in median visual clarity and beyond the 2040 window to achieve TASVC.
- It is not clear how restricted discretionary consents "add value" to council control compared to regular consented activity. We ask, is the level of control mandated by restricted discretionary consent therefore necessary.

- Inevitably, there will be some leakage of sediment under storm events, and adhering to best practise will not be sufficient to contain everything.

    - Matters of discretion, point 2, refers to cumulative effects on surface water bodies. With more recent understanding of fluvial sediment flows, it is now understood that any sediment leakage arising from anthropogenic land use will add to "natural" sediment reservoirs downstream, and delay the achievement of TAS VC, but we point to modelling of land use changes and predictions of whether or not TAS can be achieved within specified time frames.
    - We hope that Matters of Discretion Point 2 would not be casually used to prevent harvesting.
    - We understand that **group drinking water supplies** and **community drinking water supplies** may be obsolete terms and have been superseded by the term **drinking water supply** as defined in Water Services Act 2021.

- Matters of discretion points 3 and 4 are well within the scope of expected requirements of the Forestry Management Plans.

- Forest owners, contractors and their staff, need a high level of certainty regarding supply of logs and business continuity. There are contractors with massive financial loans, shipping space to book, and other supply chain issues. It is bad enough during an industry downturn. Failure to get harvesting consent will compound other risks. Restricted Discretionary Consenting is partly about managing risk (or loss of sediment). It will leave a major industry vulnerable to the subjective views of Regional Council Officers who review applications and grant consents.

Matter of Discretion point 1

> The content and implementation of the **forestry management plan(s)**, including the actions, management practices and mitigation measures necessary to ensure that soil erosion and the discharge of sediment will be **minimised.**

Matters of Discretion point 2

Adverse effects, including cumulative and localised adverse effects, on:

> (i) **surface water bodies** and coastal water, and particularly sites identified in Schedule A (outstanding water bodies), Schedule C (mana whenua), Schedule F (ecosystems and habitats with indigenous biodiversity), Schedule H, (contact recreation and Māori customary use), and Schedule I (important trout fishery rivers and spawning waters), and
>
> (ii) **group drinking water supplies** and **community drinking water supplies**

Matters of Discretion point 3

The monitoring, record keeping, reporting and information provision requirements for the holder of the resource consent (including auditing of information) to demonstrate and/or monitor compliance with the resource consent and the **forestry management plan(s)**

Matters of discretion point 4

> The timing, frequency and requirements for review, audit and amendment of the **forestry management plan(s)**

Do GW plans encourage or discourage investment in commercial tree planting

For small blocks, there appears to be a growing number of conditions and compliance costs that disproportionally affect the viability of small woodlots, and PC1 is just one more example. Landowners will see small woodlots as a liability, and they will be less inclined to plant trees (perhaps even indigenous restoration or biodiverse exotic stands) for fear of being regulated on matters that affect how they can use their resource. Those owners with less than 20 hectares of pastoral land may well consider that farming livestock plus a few strips of riparian planting, carries far less risk than woodlots. Environmental regulations designed to control the effects of forestry will actually discourage landowners from planting woodlots (with net positive ecosystem services) but encourage use of livestock that create greenhouse gases and contribute to climate change (net negative ecosystem services).

For those with large areas of rural land and considering commercial forestry, they will need to take due diligence for all kinds of risk. Not only for land price, climate change (risk of storms and landslides), market access and long-term future log prices, and access to contractors, but also the regulatory environment. The regulatory environment (RMA, ETS, local body rating) is increasingly volatile and uncertain, and while NZ public may wish for a low carbon economy along with fossil fuel substitution in the future, the costs and complexities of regulations continue to increase, and at times, seem out of step with each other.

We should not take it for granted that a large NZ resource in exotic timber will always be there to provide the raw materials for our Nations low carbon bioeconomy of the future. Unfortunately, it seems that the NZ public are still very happy to build homes in steel and to build high-rise in concrete, to use imported wood-based product from even the most unregulated sources and to purchase our future carbon liabilities from offshore.

The proposed Restricted Discretionary Consenting will also apply to Carbon and Permanent Forests categories registered in the ETS (for at least afforestation and replanting). Whilst permanent carbon forests (including native afforestation) may seem attractive to some at present, the ETS payments will dry up sooner or later, and fixed costs will continue. There is speculation that Exotic forestry may even be excluded from the ETS (advice from Parliamentary Commissioner for Environment). Many of us do not see the price of carbon coming down any time soon, and that it will be impractical to pay the carbon price burden in order to change land use (currently about $50,000/ha.)

We say that:

- the income from afforestation still relies heavily on harvesting to derive income and therefore to justify the long-term investment,
- that Plantation Forestry should continue to be encouraged on suitable land types by virtue of all the ecosystem services that it affords,
- and that regulations affecting the viability of plantation forestry should not impose more restrictions than they really need to.

Minimum areas exempt?

Whilst small woodlot harvesting is said to be more likely to leak sediment, such forests also tend to have higher unit costs of harvesting and log transport. If a forest is located in a non-complying FMU, additional restricted discretionary consent fees for earthworks and harvesting (as well as other forestry activities) may well render small forests not viable.

We note under WH.R17 and P.R16, that vegetation clearance of **up to 2 ha on erosion prone land** is a permitted activity (provided conditions are met) regardless of the TAS VC state in the FMU. This does not align with woodlot activities, where even 1ha of woodlot on flat land, away from water bodies, will be subject to discretionary conditional consent if TAS VC is not met somewhere downstream.

We ask, that somehow, low risk harvesting of small woodlots defers to NESCF.

Classification of erosion prone land

As a result of the proposed changes in the Section 42a report, this topic may no longer be contentious. Wgtn-NZFFA supports the proposed change in status of the identified potentially erosion prone land, and that the associated maps should not be used to prohibit future harvesting.

At the time we commissioned a report, we were unaware that an additional layer for woody vegetation had been introduced.

Our expert consultant in this matter is Dr Les Basher, whose evidence is attached as Appendix 2. He effectively states that the mapping that he reviewed was not fit for its intended purpose. (A version that did not include the woody vegetation layer).

We agree with Shannon Watson (S42a Forestry Report) that the mapping may serve some useful purpose as a guide to ground truthing of Farm Management plans.

We agree with Mr Watson for several categories of erosion prone land to be removed. They do not serve a useful purpose.

Objective WH09 and Table 8.4 Target Attribute States

We commented on these topics in our original submission (S036) and in our further submission for Stream 2. However, the S42a report relating to Forestry has indicated a change in approach, i.e. Requiring restricted discretionary consent only where downstream (including receiving environments) TAS for clarity is not met. An example was given for Hutt River at Boulcott failing to meet TAS VC and therefore imposing Restricted Discretionary Consents for forestry activities in the upstream Whakatikei, Akatarawa, Pakuratahi, where pFMUs are compliant for TAS VC.

The S42a Forestry Stream 3 Appendix 4 with recommended changes does not explicitly include downstream receiving environments, so WH.R20 needs clarification

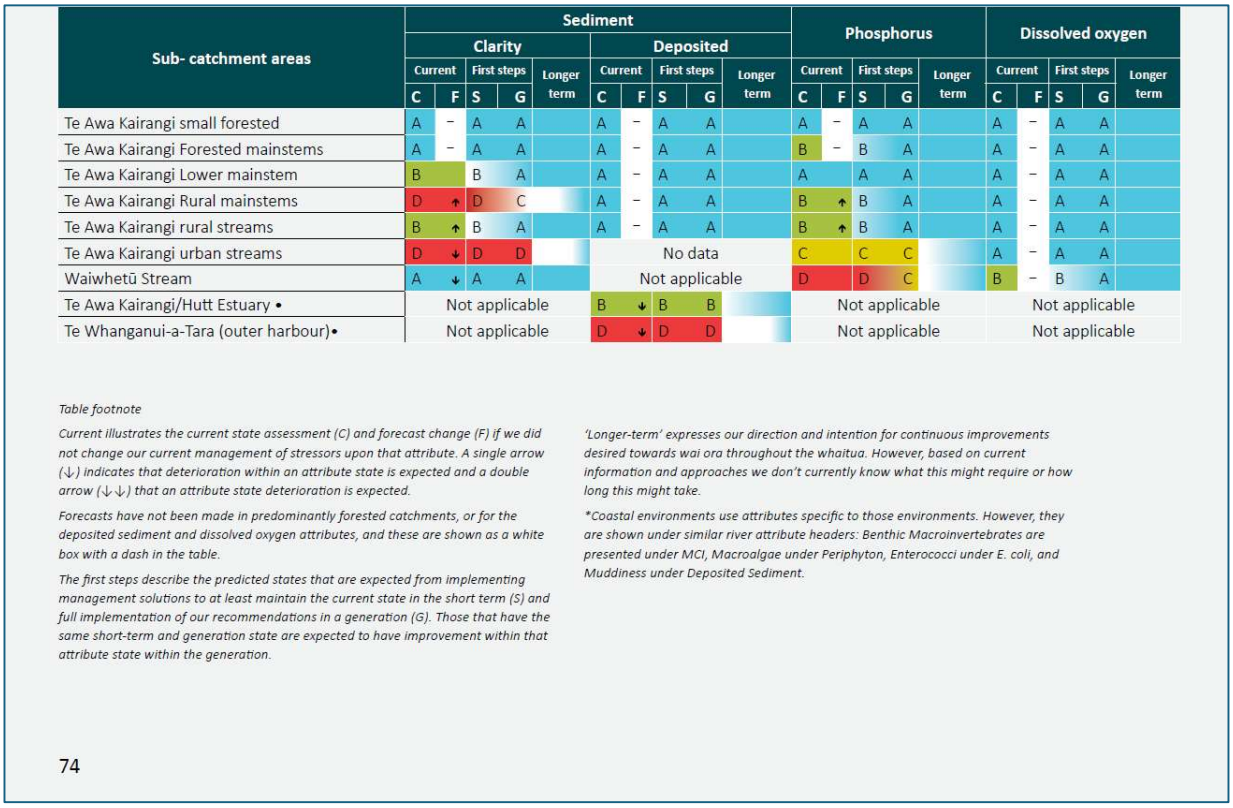
We have therefore examined the TAS recommended by the Whaitua Implementation Report TWaT in more detail.

We have read the HS3 technical evidence of Dr Greer.

> HEARING STREAM THREE – EARTHWORKS, VEGETATION CLEARANCE AND FORESTRY AND RURAL LAND USE. 15 APRIL 2025

We note that Te Awa Kairangi Lower mainstream (i.e. Hutt at Boulcott) is currently ecology State C for Clarity but the Whaitua report wishes it to improve to State A over the longer term.

The table below, copied from the WIP report, shows Te Awa Kairangi lower mainstream (Boulcott) as State B for clarity. This differs from the State listed in PC1



Sub- catchment areas	Sediment										Phosphorus					Dissolved oxygen				
	Clarity					Deposited														
	Current		First steps		Longer term	Current		First steps		Longer term	Current		First steps		Longer term	Current		First steps		Longer term
	C	F	S	G		C	F	S	G		C	F	S	G		C	F	S	G	
Te Awa Kairangi small forested	A	–	A	A		A	–	A	A		A	–	A	A		A	–	A	A	
Te Awa Kairangi Forested mainstems	A	–	A	A		A	–	A	A		B	–	B	A		A	–	A	A	
Te Awa Kairangi Lower mainstem	B		B	A		A	–	A	A		A		A	A		A	–	A	A	
Te Awa Kairangi Rural mainstems	D	↑	D	C		A	–	A	A		B	↑	B	A		A	–	A	A	
Te Awa Kairangi rural streams	B	↑	B	A		A	–	A	A		B	↑	B	A		A	–	A	A	
Te Awa Kairangi urban streams	D	↓	D	D		No data					C		C	C		A	–	A	A	
Waiwhetū Stream	A	↓	A	A		Not applicable					D		D	C		B	–	B	A	
Te Awa Kairangi/Hutt Estuary •	Not applicable					B	↓	B	B		Not applicable					Not applicable				
Te Whanganui-a-Tara (outer harbour)•	Not applicable					D	↓	D	D		Not applicable					Not applicable				

Table footnote

Current illustrates the current state assessment (C) and forecast change (F) if we did not change our current management of stressors upon that attribute. A single arrow (↓) indicates that deterioration within an attribute state is expected and a double arrow (↓↓) that an attribute state deterioration is expected.

Forecasts have not been made in predominantly forested catchments, or for the deposited sediment and dissolved oxygen attributes, and these are shown as a white box with a dash in the table.

The first steps describe the predicted states that are expected from implementing management solutions to at least maintain the current state in the short term (S) and full implementation of our recommendations in a generation (G). Those that have the same short-term and generation state are expected to have improvement within that attribute state within the generation.

'Longer-term' expresses our direction and intention for continuous improvements desired towards wai ora throughout the whaitua. However, based on current information and approaches we don't currently know what this might require or how long this might take.

**Coastal environments use attributes specific to those environments. However, they are shown under similar river attribute headers: Benthic Macroinvertebrates are presented under MCI, Macroalgae under Periphyton, Enterococci under E. coli, and Muddiness under Deposited Sediment.*

74

Greer, Easton, writing on river classes, quote Hutt at Boulcott as NRP river class 4 (Lowland, large, draining ranges) and Suspended Fine Sediment Class **(SFS) class 3.**

We also note that lower Mangaroa River is NRP class 6 (low small) and **SFS class 3** and Horokiri Stream is NRP River Class 2, **SFS class 3**. Makara Stream is given as NRP class 2 and **SFS class 3**

However, a couple of rivers at low altitude (warmer mean temperature) are given as **SFS class 2**, and therefore, have much more generous allowance for Visual Clarity. I.e. Waiwhetu, Hulls Creek and Taupo at Plimmerton. This will be because the notation warm-wet (instead of cool-wet) climate drives the SFS class according to spatially averaged temperature over the whole catchment. The threshold for this is mean temperature ≥12^{0}C.

The documents referenced by NPSFM (2020) refer to the NZ River Environment Classification (2010) which references a 2003 Landcare publication. This in turn references a 1998 Landcare report 'Climate Surfaces for NZ (LC9798/126)', using a 1950-1980 NZ Meteorological Service temperature data set. This data is available online at: LENZ - Mean annual temperature | LRIS Portal, explicitly using temperatures over the 1950-1980 period.

Now, a database from NIWA is available, access at a cost, for the period 1991-2020 https://data.niwa.co.nz/products/climatology-grids/files/67256be042bbd95b42950e92. We know NZ average temperatures have risen substantially over the last 15-20 years, and strongly suspect that Makara Stream, Mangaroa River, Horokiri Stream and perhaps the Te Awa Kairangi Hutt River would trigger the ≥12^{0}C mean temperature and therefore move to warm-wet and therefore **SFS class 2** category.

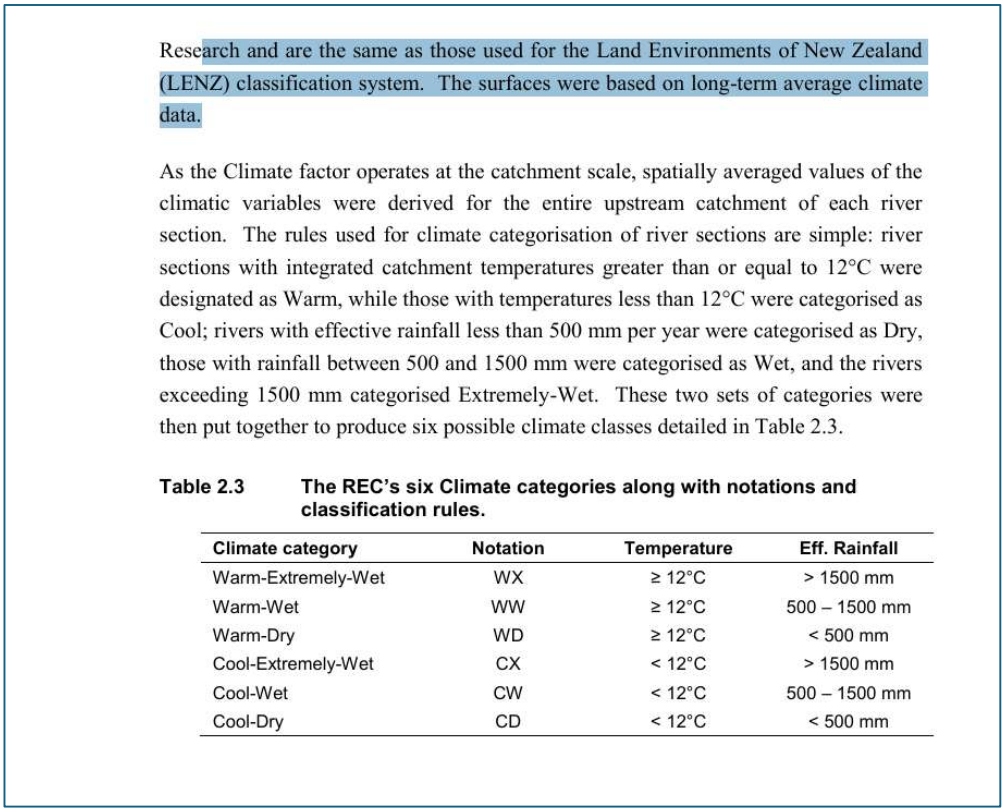
The TAS VC for SFS class 2 rivers would then be the greater of ≥0.93m or baseline value, either of which are much less than the current TAS of 2.95m for Boulcott, and 1.67m (adjusted for CDOM) for Mangaroa or 2.2m for Makara. All of these would then be classified ecological **State A for SFS class 2.** Horokiri stream would also default to State A.

Table 44 from Greer report 2023-006, chapter 10, showing Natural Resource Plan River (NRP) Classes and Suspended Fine Sediment (SFS) Classes. Whilst some information draws on the NPSFM dated 2020, the document references trail links to 1950-1980 temperature data.

Table 44: Locations, NRP river classes, NPS-FM 2020 sediment classes and significance (in relation to Objectives O18 and O19 of the NRP) of sites in different TAoP Whaitua and WTWT part-FMUs.

Whaitua	Part-FMU	Site	Easting	Northing	NRP river class	SFS class	DFS class	Sig. O18	Sig. O19
TAoP	Pouewe	Horokiri S. @ Snodgrass	1761804	5450652	2	3	4	N	N
TAoP	Rangituhi	N/A			2	2	1	N	N
TAoP	Takapū	Pāuatahanui S. @ Elmwood Bridge	1761097	5446783	2	3	4	Y	N
TAoP	Taupō	Taupō S. @ Plimmerton Domain	1756919	5450368	6	2	0	Y	N
TAoP	Te Rio o Porirua	Porirua S. @ Glenside	1753290	5438364	2	3	4	Y	N
TAoP	Te Rio o Porirua	Porirua S. @ Milk Depot	1754366	5443031	2	2	2	Y	N
TWT	Kaiwharawhara Stream	Kaiwharawhara S. @ Ngaio Gorge	1749069	5431077	2	3	4	Y	N
TWT	Korokoro Stream	N/A			2	3	4	Y	N
TWT	Ōrongorongo	Ōrongorongo R. @ Ōrongorongo Station	1758930	5413094	1	3	4	Y	Y
TWT	South-west coast rural streams	Mākara S. @ Kennels	1743530	5433635	2	3	4	N	N
TWT	Te Awa Kairangi forested mainstems	Akatarawa R. @ Hutt Confluence	1776183	5449184	1	3	4	Y	Y
TWT	Te Awa Kairangi forested mainstems	Hutt R. @ Te Marua Intake Site	1780071	5450158	1	3	4	Y	Y
TWT	Te Awa Kairangi forested mainstems	Pākuratahi R. 50m Below Farm Ck	1784607	5451677	1	3	4	Y	Y
TWT	Te Awa Kairangi forested mainstems	Whakatikei R. @ Riverstone	1772256	5446748	4	3	4	N	N
TWT	Te Awa Kairangi lower mainstem	Hutt R. @ Boulcott	1761038	5437628	4	3	4	Y	N
TWT	Te Awa Kairangi lower mainstem	Hutt R. Opposite Manor Park	1766679	5442285	4	3	4	Y	N
TWT	Te Awa Kairangi rural mainstems	Mangaroa R. @ Te Marua	1778726	5448590	1	3	4	N	N
TWT	Te Awa Kairangi rural streams - Mangaroa Lower	N/A			6	3	4	N	N
TWT	Te Awa Kairangi rural streams - Mangaroa Upper				3	3	4	N	N
TWT	Te Awa Kairangi rural streams - Pākuratahi				1	3	4	N	Y
TWT	Te Awa Kairangi small forested				1	3	4	N	Y
TWT	Te Awa Kairangi urban streams	Hulls Ck adjacent Reynolds Bach Dr.	1767288	5442588	2	2	2	N	N
TWT	Te Awa Kairangi urban streams	Stokes Valley S. @ Eastern Hutt Rd	1766285	5441567	2	3	4	N	N
TWT	Wainuiomata rural streams	Wainuiomata R. D/S of White Br.	1757315	5415739	4	3	4	Y	N
TWT	Wainuiomata small forested	Wainuiomata R. @ Manuka Track	1768301	5430792	1	3	4	Y	Y
TWT	Wainuiomata urban streams	Black Ck @ Rowe Parade end	1763349	5429187	3	3	4	N	N
TWT	Waiwhetū Stream	Waiwhetū S. @ Whites Line East	1760977	5434510	6	2	2	N	N
TWT	Wellington urban	Karori S. @ Mākara Peak	1744222	5427016	2	3	4	N	N
TWT	Wellington urban	Owhiro S. @ Mouth	1747228	5421631	2	3	4	N	N

Figure: Partial description of River Classes according to Climate



Research and are the same as those used for the Land Environments of New Zealand (LENZ) classification system. The surfaces were based on long-term average climate data.

As the Climate factor operates at the catchment scale, spatially averaged values of the climatic variables were derived for the entire upstream catchment of each river section. The rules used for climate categorisation of river sections are simple: river sections with integrated catchment temperatures greater than or equal to 12°C were designated as Warm, while those with temperatures less than 12°C were categorised as Cool; rivers with effective rainfall less than 500 mm per year were categorised as Dry, those with rainfall between 500 and 1500 mm were categorised as Wet, and the rivers exceeding 1500 mm categorised Extremely-Wet. These two sets of categories were then put together to produce six possible climate classes detailed in Table 2.3.

Table 2.3 The REC's six Climate categories along with notations and classification rules.

Climate category	Notation	Temperature	Eff. Rainfall
Warm-Extremely-Wet	WX	≥ 12°C	> 1500 mm
Warm-Wet	WW	≥ 12°C	500 – 1500 mm
Warm-Dry	WD	≥ 12°C	< 500 mm
Cool-Extremely-Wet	CX	< 12°C	> 1500 mm
Cool-Wet	CW	< 12°C	500 – 1500 mm
Cool-Dry	CD	< 12°C	< 500 mm

The suspended sediment categories in PC1 are only affected by mean air temperature (more or less than 12^{o}C), altitude (low [<400 m], hill or mountain) and underlying rock type. They are not affected by land cover or position in the catchment, even though both of those factors also contribute to suspended sediment.

Figures below copied from NPSFM 2020

Appendix 2C – Sediment classification tables

In this Appendix, **REC groups** refers to the classes and categories described in the New Zealand River Environment Classification User Guide (*see* clause 1.8), except where those REC groups are further clustered according to table 26.

Table 23 Suspended sediment class composition

Suspended sediment class	Suspended sediment clustered River Environment Classification groups
1	CD_Low_HS; WW_Low_VA; WW_Hill_VA; CD_Low_Al; CW_Hill_SS; CW_Mount_SS; CW_Hill_VA; CD_Hill_SS; CD_Hill_VA; CD_Low_VA; CW_Low_VA; CW_Mount_VA; CW_Mount_HS; CD_Mount_Al; CW_Hill_Al; CW_Mount_Al; WD_Low_Al
2	CD_Low_SS; WW_Low_HS; WW_Low_SS; WW_Hill_HS; WW_Hill_SS; WW_Low_Al; WD_Low_SS; WD_Lake_Any; WD_Low_HS; WD_Low_VA
3	CW_Hill_HS; CW_Lake_Any; CD_Lake_Any; WW_Lake_Any; CW_Low_HS; CW_Low_Al; CD_Hill_HS; CD_Hill_Al; CD_Mount_HS; CD_Mount_SS; CD_Mount_VA
4	CW_Low_SS

Table 26 – Further clustering of River Environment Classification groups specific to this appendix

REC variable	REC groups	Clustered REC groups
Climate	Warm-Wet	Warm-Wet (WW)
	Warm-Extremely Wet	
	Warm-Dry	Warm-Dry (WD)
	Cold-Wet	Cold-Wet (CW)
	Cold-Extremely Wet	
	Cold-Dry	Cold-Dry (CD)
Topography (Source of flow)	Lowland	Lowland (Low)
	Lakefed	Lakefed (Lake)
	Hill	Hill (Hill)
	Mountain	Mountain (Mount)
	Glacial Mountain	
Geology	Soft Sedimentary	Soft Sedimentary (SS)
	Plutonic Volcanic	
	Miscellaneous	
	Hard Sedimentary	Hard Sedimentary (HS)
	Alluvium	Alluvium (Al)
	Volcanic Basic	Volcanic (VA)
	Volcanic Acidic	

Table 8 below taken from NPSFM and shows that SFS class 2 and SYS class 3 have very different TAS VC. For Wellington region, the only difference contributing to SFS Class 2 or Class 3 is whether average mean air temperature of the river catchment area is more or less than 12°C.

Table 8 – Suspended fine sediment

Value (and component)	Ecosystem health (Water quality)			
Freshwater body type	Rivers			
Attribute unit	Visual clarity (metres)			
Attribute band and description	Numeric attribute state by suspended sediment class			
	Median			
	1	2	3	4
A Minimal impact of suspended sediment on instream biota. Ecological communities are similar to those observed in natural reference conditions.	≥1.78	≥0.93	≥2.95	≥1.38
B Low to moderate impact of suspended sediment on instream biota. Abundance of sensitive fish species may be reduced.	<1.78 and ≥1.55	<0.93 and ≥0.76	<2.95 and ≥2.57	<1.38 and ≥1.17
C Moderate to high impact of suspended sediment on instream biota. Sensitive fish species may be lost.	<1.55 and >1.34	<0.76 and >0.61	<2.57 and >2.22	<1.17 and >0.98
National bottom line	**1.34**	**0.61**	**2.22**	**0.98**
D High impact of suspended sediment on instream biota. Ecological communities are significantly altered and sensitive fish and macroinvertebrate species are lost or at high risk of being lost.	<1.34	<0.61	<2.22	<0.98

Based on a monthly monitoring regime where sites are visited on a regular basis regardless of weather and flow conditions. Record length for grading a site based on 5 years.

Councils may monitor turbidity and convert the measures to visual clarity.

See Appendix 2C Tables 23 and 26 for the definition of suspended sediment classes and their composition.

The following are examples of **naturally occurring processes** relevant for suspended sediment:

- naturally highly coloured brown-water streams
- glacial flour affected streams and rivers
- selected lake-fed REC classes (particularly warm climate classes) where low visual clarity may reflect autochthonous phytoplankton production.

In light of a warming climate and increase in average temperatures, river types in our two whaitua that were previously designated C-W (cold wet) should be reviewed to see whether they now fit more appropriately into W-W (warm-wet), as this would then place them into different SFS categories.

Earthworks for River Flood Protection

As mentioned in our primary submission, The Hutt River between Maoribank Corner and Melling Bridge is subject to extensive grooming and recontouring by bulldozer, so is actually highly modified and frequently disturbed. From time to time, the river is also realigned to prevent undermining critical infrastructure. This has been happening under consent WGN130264 – Te Awa Kairangi/Hutt River and for many years previously.

- The riverbed distance between Melling Bridge and Pomare plus Silverstream Bridge to Maoribank is 16km, and beach areas along these reaches are periodically (every 3 to 5 years?) ripped free of emerging vegetation and recontoured.
- Our understanding of recent theories for fluvial transport of sediment including SFS (referenced by Dr Greer) is that this "earthworks/river bed disturbance" is highly likely to exacerbate SFS over the longer term. Not only will operating very heavy machinery accelerate powdering of the bed gravels, but existing fine material will be made more accessible to high river flows and form accumulations downstream.
- Riverbank erosion is already a proven source of SFS, and loosening of riverbed substrate during recontouring will make fines more accessible.
- Should Greater Wellington deem flood mitigation of greater importance than the health and wellbeing of the water body, (effectively overriding the NPSFM) then the TAS for VC needs to be reduced accordingly.
    - (Protecting infrastructure from floods would be the third priority after wellbeing of the water body and human health)

In line with PC1 proposed restrictions on any land use activities that might exacerbate erosion and contribute to failure to meet TAS VC in downstream areas, we challenge the process used by GW to carry out flood protection. Very clearly the river work will exacerbate SFS and contribute to a failure to meet TAS VC at Boulcott.

Even though GW operates through consents, the failure of Hutt Boulcott to reach TASVC will disadvantage all forestry activities and land users upstream of Boulcott. Greater Wellington, as part of its due diligence, needs to carefully assess how this TAS has been set and whether the numeric value is reasonable and achievable.

The photo below is copied from the GW publicity published in the Upper Hutt Leader, June 2024

Lower Visual Clarity at Boulcott is also due to Higher Water Flows

An analysis of VC readings obtained by GW (from their Open Source Data Base) for Te Awa Kairangi Hutt along its length and at some of the tributaries, reveals that the Boulcott site rarely has higher VC than the average of input flows (of the major upstream tributaries) and then, only at low flow levels, However, at **flow rates exceeding 11.4 m^3/sec, VC at Boulcott was always worse that the average of the contributing major rivers**. For 90% of all measurements, VC at Boulcott was worse than the average upstream flows. See Table on next page.

We attribute the declining VC 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. No doubt **additional storm water from the urban environment** adds to higher flow rates at Boulcott over and above natural levels. The impervious surfaces in all urban areas upstream of Boulcott include the suburbs of Avalon and Taita, plus Stokes Valley and the entire city of Upper Hutt. **It is therefore unrealistic to expect SFS category 3, State A clarity so far down a major river flowing through major cities.** i.e. the median clarity at Boulcott is never going to be as good as the major upstream tributaries, and for fluvial transport reasons described by Dr Greer, even in its natural state, will never ever have been as good as the tributaries.

Table: Visual Clarity at Hutt Boulcott versus Selected Upstream Sampling Sites, ranked by Flow rate at Taita Gorge. Data for July 2017-March 2023.

(Red formatted data in RH column is where Boulcott was clearer than the average upstream values)

Taita Gorge Mean Daily Flow		Hutt River – Boulcott	Whakatikei River	Akatarawa River	Hutt River – T. M. Intake	Pakuratahi River	Mean VC for Whakatikei, Akatarawa, Hutt at Te Marua and Pakuratakhi	Boulcott VC minus mean
Date	Flow (m^3/s)	Black Disc (m)	Black Disc (m)	Black Disc (m)	Black Disc (m)	Black Disc (m)		
16/03/2020	3.3	6.46	5.41	5.25	7.95	5.50	6.03	0.43
14/02/2019	3.4	5.18	4.06	5.57	6.40		5.34	-0.16
16/02/2021	3.4	3.33	2.85	4.64	2.82	0.88	2.80	0.53
24/01/2018	3.5	5.65	3.41	5.58	5.44	5.66	5.02	0.63
9/05/2022	3.6	1.54	5.08	5.77	7.84	6.86	6.39	-4.85
14/04/2021	4.2	2.15	4.05	2.95	2.84	3.84	3.42	-1.27
19/04/2022	4.2	6.86	4.08	6.56	6.98	6.24	5.97	0.90
17/03/2021	4.6	4.33	5.36	5.89	2.69	6.62	5.14	-0.81
18/01/2022	4.8	3.76	5.82	7.22	6.88	6.87	6.70	-2.94
15/03/2022	5.1	5.12	4.81	5.30	7.34	6.29	5.94	-0.82
19/02/2020	5.1	2.94	1.68	3.36	3.44	5.92	3.60	-0.66
20/03/2018	5.6	4.03	7.33	7.56	6.31	7.02	7.06	-3.03
20/01/2021	5.6	2.91	3.92	4.31	2.26	4.39	3.72	-0.81
13/03/2019	6.3	2.28	0.73	1.27	4.59	4.38	2.74	-0.46
10/07/2017	6.4	6.17	6.58	7.19	6.38	5.68	6.46	-0.29
21/05/2020	6.4	7.57	7.74	8.70	10.12	9.35	8.98	-1.41
11/08/2020	6.8	5.04	2.65	4.13	5.78	5.97	4.63	0.41
13/11/2017	6.8	0.21	5.49	5.34	7.85	6.28	6.24	-6.03
15/12/2017	7.9	4.80	4.11	5.56	4.03	4.81	4.63	0.17
9/11/2021	8.5	3.54	4.36	5.93	5.09	5.99	5.34	-1.80
15/06/2020	8.6	4.65	5.41	7.84	8.28	6.69	7.06	-2.41

Taita Gorge Mean Daily Flow		Hutt River – Boulcott	Whakatikei River	Akatarawa River	Hutt River – T. M. Intake	Pakuratahi River	Mean VC for Whakatikei, Akatarawa, Hutt at Te Marua and Pakuratakhi	Boulcott VC minus mean
7/11/2022	8.9	5.72	5.54	5.31	6.30	5.86	5.75	-0.03
14/01/2020	11.2	3.38	2.22	3.26	3.03	4.38	3.22	0.16
14/08/2018	11.4	5.75	4.97	6.75	8.62	5.90	6.56	-0.81
16/05/2018	11.4	1.72	3.42	3.60	3.72	0.87	2.90	-1.18
7/12/2022	11.5	5.11	5.38	4.86	6.31	6.85	5.85	-0.74
15/02/2018	12.5	2.45	4.66	3.70	3.98	3.98	4.08	-1.63
15/01/2019	13.0	0.72	2.70	2.57	0.55	0.71	1.63	-0.91
17/06/2021	13.2	1.63	1.70	1.36	1.36	5.22	2.41	-0.78
13/07/2021	13.3	2.41	5.08	7.03	8.23	7.77	7.03	-4.62
18/09/2018	13.7	1.35	2.39	2.60	1.49	2.52	2.25	-0.90
7/03/2023	13.7	3.00	3.37	4.12	3.76	4.62	3.97	-0.97
18/11/2020	14.1	1.48	0.49	2.61	5.75	2.99	2.96	-1.48
22/10/2020	14.5	4.18	5.09	5.98	5.50	5.69	5.57	-1.39
8/04/2019	14.6	0.44	1.03	2.04	0.64	0.96	1.17	-0.73
8/02/2023	14.8	3.20	4.00	3.35	3.95	4.83	4.03	-0.83
15/10/2018	14.9	4.30	4.99	4.80	5.66	5.16	5.15	-0.85
15/10/2019	16.5	3.29	2.96	4.42	5.51	4.04	4.23	-0.94
10/10/2022	16.9	3.49	3.45	4.49	2.17	4.34	3.61	-0.12
9/09/2019	17.5	2.54	4.03	4.49	4.85	5.46	4.71	-2.17
14/11/2018	18.7	3.24	3.68	4.20	4.77	5.66	4.58	-1.34
16/12/2020	19.1	3.18	3.89	4.95	6.37	5.73	5.24	-2.06
10/06/2019	19.3	2.45	2.38	2.85	4.09	3.19	3.13	-0.68
15/09/2020	20.0	1.02	3.31	1.91	0.98	2.26	2.12	-1.10
17/10/2017	20.0	2.87	4.00	5.72	5.51	4.05	4.82	-1.95
14/09/2022	20.3	2.68	3.48	5.82	5.30	3.22	4.46	-1.78
20/12/2019	21.1	0.03	1.57	0.22	0.03	0.04	0.47	-0.44
20/12/2018	23.9	0.28	0.99	0.67	0.60	1.00	0.82	-0.54

Taita Gorge Mean Daily Flow		Hutt River – Boulcott	Whakatikei River	Akatarawa River	Hutt River – T. M. Intake	Pakuratahi River	Mean VC for Whakatikei, Akatarawa, Hutt at Te Marua and Pakuratakhi	Boulcott VC minus mean
9/07/2019	25.0	2.74	3.79	4.72	5.70	5.36	4.89	-2.15
17/07/2018	27.4	1.00	3.09	3.10	1.43	2.16	2.45	-1.45
14/10/2021	40.1	0.57	2.75	3.12	0.57	0.72	1.79	-1.22
17/04/2018	40.5	1.33	3.21	3.24	3.16	4.08	3.42	-2.09
25/07/2022	41.5	1.65	3.29	5.66	3.78	3.62	4.09	-2.44
12/01/2023	43.1	0.78	3.19	4.37	0.72	1.23	2.38	-1.60
16/06/2022	46.2	0.67	2.85	2.93	2.78	2.72	2.82	-2.15
14/09/2021	47.7	0.50		3.12	1.16	1.30	1.86	-1.36
11/09/2017	56.9	1.49	3.34	3.39	2.60	2.22	2.89	-1.40
12/05/2021	60.3	0.26	1.48	1.00	0.59	1.28	1.09	-0.83
14/05/2019	69.6	2.16	2.92	2.73	3.09	3.11	2.96	-0.80
14/07/2020	85.0	1.82	2.83	3.14	3.25	3.28	3.13	-1.31
15/02/2022	88.3	0.98	2.45	3.80	1.75	1.58	2.40	-1.42
14/08/2017	92.7	0.36	0.99	1.19	0.94	1.05	1.04	-0.68
13/08/2019	100.1	0.25	1.21	0.82	0.92	1.31	1.07	-0.82
12/11/2019	102.9	0.84	1.75	2.42	1.91	2.03	2.03	-1.19
15/12/2021	137.8	0.24	0.40	0.71	0.38	0.30	0.45	-0.21
8/08/2022	161.6	0.05	0.61	0.38	0.04	0.04	0.27	-0.22
18/08/2021	251.0							
13/06/2018	284.1	0.14	0.82	0.65	0.16	0.18	0.45	-0.31
count	**68**	**67**	**66**	**67**	**67**	**66**	**67**	
Median	**14.6**	**2.45**	**3.39**	**4.13**	**3.78**	**4.21**	**3.72**	

We also hold matching VC data for Hulls Creek and Mangaroa River, both quite small in volume compared to the combined flow of the other main tributaries, but having significantly lower median VC. The input from Hulls and Mangaroa will slightly depress the median Bouclott VC value.

The timing of mean flow rate at Taita may be slightly offset to clarity measurements (by perhaps 12-14 hours), Consequently plots of Boulcott VC vs mean daily flow are not very highly correlated. Plot not shown.

Request to revise TAS VC for Hutt at Boulcott

We say that an expectation for Hutt Boulcott to meet SFS Class 3A is unrealistic, and agree with Dr Greer who states in his technical evidence for Stream 3 -EARTHWORKS, VEGETATION CLEARANCE AND FORESTRY AND RURAL LAND USE.15 APRIL 2025, paragraph 34, to the effect that for Hutt at Boulcott to achieve its TAS VC grade A, most of the catchment would need to be returned to its natural state. Clearly such a state is not achievable.

As a result of Hutt Boulcott being affected by higher water flows and persistent river flood control mitigation, it is unlikely to ever achieve SFS Class 3 State A again. We ask that until a water plan does a review of all issues, including a review of River categories (C-W or W-W), that the TAS VC for Hutt at Boulcott be reset at baseline levels.

Such a change to TAS might therefore allow GW to continue with its flood control programme without regard to the impact on upstream land practice, thereby allowing forestry activities in several upstream environments to operate under NESCF.

From GW data between 2018 and 2023 (67 consecutive data points), current median VC is 2.45m so SFS category 3, State C, with bands 2.22m to 2.57m seems appropriate. This is still well above the wai ora threshold for clarity.

Support for requirement that Visual Clarity and TSS should have good correlation at low flows

In relation to Mangaroa River and our previous criticism (stream 2 submission) concerning the high method uncertainty of calculated required sediment reductions, we now find a quote from Mr Blyth that supports our stance that in order to accurately predict required sediment reduction percentages, a good correlation between TSS and VC is required in the region of TAS VC.

> From Easton, Blyth, section 9.5 of Greer Report 2023-006 prepared for Greater Wellington
>
> "Limitations
> The approach undertaken in this memo uses best available information and follows methods established in the literature, however limitations that are difficult to quantify are inherent in the data and methods. In particular, the use of median clarity and modelled average annual loads as key inputs fail to account for temporal aspects of erosion and sedimentation; for example, sediment mitigation measures that reduce high-flow loads (e.g., gullying or land sliding processes) may not be apparent in clarity measurements during mid- or low flows. Hence, it is unlikely that clarity values of upwards of 5 metres as predicted for the Horokiri Stream under the Improved and WS scenarios (Table 39) will be achieved in reality, even if the modelled ~50% reduction in sediment load occurs."

Response to evidence from Dr Greer PC1 Stream 3 – EARTHWORKS, VEGETATION CLEARANCE AND FORESTRY AND RURAL LAND USE. 15 APRIL 2025

We welcome the detailed explanations offered by Dr Greer and agree with many of them. The revelations about the lack of requirement for rigorous scientific evidence to support council policy is disconcerting and makes it harder for to us use the "Lack of Stringency" argument regarding Council's desire to override NESCF.

Response to evidence Mr Byth on Freshwater Farming and Forestry

We welcome the literature review of plantation forestry vs pastoral/livestock grazing on similar terrain. This review adds to information that we provided in our original submission, and shares similar conclusions, that Plantation Forestry, over the lifecycle of a stand, has substantially less sediment production than hill country pastoral farming on similar land types. However, we still lack good comparative data for relatively stable hill country such as exists in the TAoP and TWaT Whaitua, and where forestry is harvested using modern methods.

We note that Mr Byth's summary comparing pastoral use to PF considered only one harvest cycle. This caution also applies to Mr. Blyth's scenario for sediment yields over a single forest rotation of about 30 years. There needs to be acknowledgement for an expectation of much reduced earthworks (and resulting lower sediment yields) at second and subsequent rotations of plantation pine.

Many forests in the Wellington area are into their second or third rotation and can reuse the roading and tracks installed for the first harvest. Provided that the existing infrastructure can be reused, the amount of sediment produced at harvest will be substantially lower. The larger (and steeper) blocks will now most likely use tethered harvesters (winch assisted), which not only have a relatively light ground footprint, but it also lays trees across the slope with fewer broken tops (rather than across waterways with extensive stem breakage, as was formerly done for manual falling), and high-quality road access will be along ridgelines. Thus, the comparison between Plantation Forestry and pastoral use over multiple forest rotations should continue to improve in favour of forestry.

We agree with Mr Blyth that all sorts of options exist to mitigate sediment loss from recently harvested sites, and that the original PC1 proposal to retire steepest forestry land had not considered other means of mitigating sediment loss.

We welcome Mr Blyth's informed comments on Visual Clarity monitoring, paragraphs 39-44. However, we note that Hulls Creek has median VC of only 1.2m, having been designated SFS Class 2, for which NBL is only 0.93m. This stream also drains the Pinehaven urban area. With such a low VC, it is doubtful that the impact of forestry harvesting on VC for Hulls Creek would be noticed.

We also agree with Mr Blyth's suggestions for additional monitoring (paragraph 45), as we too wish for regulation to be informed and guided by facts but consider that research should also extend to monitoring the performance of whole forest lifecycles (not just the harvesting period), including for second and third rotation forests. The additional monitoring needs to look at all potential sources of sediment, not just forestry harvesting.

Response to evidence from Kevin Reardon on Forestry

We welcome that GW has sought input from forestry professionals to the Plan Change 1.

We are generally in support of Mr Reardon's summary which comes from a professional forestry consultant perspective.

In respect of unintended consequences to prohibiting harvest from the steepest most erosion prone land, we would like to draw attention to our original submission, that this would encourage the use of ground-based harvesting for smaller areas of valley bottoms and ridge lines (if these were still accessible by road). Ground based harvesting, and particularly use of forwarders, can be very heavy on softer ground (valley bottoms) that inherently has more seepages and gullies and ephemeral waterways. Surficial runoff is at high velocity on lower slopes and loss of sediment from such areas will be hard to control and could result in worse outcomes than allowing cable-based harvesting of the whole slope.

We welcome Mr Reardon's call for additional training and support to be given to contractors and Forest Owners. We request that NZFFA be invited to play a role here.

Response to evidence from Joshua Pepperell on Forestry

We generally support this regulatory summary provided by Mr Pepperell, including that a small amount of Red Zoned land exists within the TWaT Whaitua, albeit not in plantation forestry. We note the difficulties that GW finds in administering the NESCF.

Whilst some of those issues might be addressed through Nationwide changes to NESCF, the possibility of locally administered (Restricted Conditional) Consenting, where TAS clarity attributes are not met, does allow a pathway forward and improved environmental outcomes.

The issue of "unless unsafe to do so" may still remain, in respect of removing debris from hard to access stream beds, but alternative solutions, such as debris dams or similar can still minimise downstream risks.

If GW were able to find more experienced site auditors, that might also resolve on site differences of opinion.

Appendix 1, Letter of support from Dr Les Basher

7/1/25

Eric Cairns

Wellington Branch

New Zealand Farm Forestry Association

Dear Eric

Attached are comments on the three aspects of the Wellington Branch NZFFA submission on Plan Change 1 to the Natural Resources Plan of Greater Wellington Regional Council for which you sought advice. That is:

- the proposal to restrict forestry harvest from about 10% of the steepest forestry land in two Whaitua, based on erosion risk modelling to identify target land,
- the relative erosion susceptibility of greywacke slopes in the area, and;
- the stated goal of achieving no increase in sediment load above the natural state.

In my opinion the approach to identifying target land is flawed and it is highly arguable whether the controls proposed are justified, considering greywacke is one of the least erodible rock types in New Zealand.

Yours sincerely

Dr Les Basher

Appendix 2, Dr Les basher Expert testimony (Appended as PDF)

EroSed Services

Memo

To: Eric Cairns

From: Dr Les Basher

cc:

Date: 20/12/24

Re: Statement of support for aspects of the Wellington branch NZ Farm Forestry Association submission on Plan Change 1 to the Natural Resources Plan of Greater Wellington Regional Council

---

Introduction

Proposed Change 1 to the Natural Resources Plan (NRP) of Greater Wellington Regional Council (GWRC) includes changes that relate to sediment generation from land disturbance activities associated with commercial forestry (earthworks and harvesting). The Wellington branch of NZ Farm Forestry Association (referred to hereafter as simply NZFFA) prepared a submission on the Plan Change and have requested commentary on aspects of their submission related to:

- the proposal to restrict forestry harvest from about 10% of the steepest forestry land in the Whaitua Te Whanganui-a-Tara and Te Awarua-o-Porirua Whaitua, based on erosion risk modelling to identify target land;
- the relative erosion susceptibility of greywacke slopes in the area and their relative erosion risk under plantation forest, including during the window of vulnerability;
- the stated goal of achieving no increase in sediment load above the natural state.

These are areas in which I have professional expertise.

Background and qualifications

My full name is Leslie Robert Basher. I have a BSc (geology, University of Canterbury) and PhD (soil science, Lincoln College). I am a member of several relevant professional societies including the New Zealand Society of Soil Science, the New Zealand Geosciences Society and New Zealand Association of Resource Management. I am currently self-employed (since October 2020) as a consultant on erosion and sediment issues. Prior to this I worked for Manaaki Whenua – Landcare Research (and its predecessor organisations) for 43 years as a scientist and research programme leader. During this time I was involved in many erosion research programmes and I completed numerous contracts on erosion for all the major land uses in New Zealand (forestry, pastoral farming, horticulture, urban). My career focused on measurement and modelling of erosion processes, along with their mitigation. I remain a Research Associate of MWLR.

My previous relevant work experience includes multiple reports and papers on erosion-related risks (landslides, debris flows, surface erosion processes) associated with plantation forestry[1]. I led work that developed the Erosion Susceptibility Classification for the National Environmental Standard for Plantation Forestry[2]. I have led development of an approach to better characterise landslide and debris flow risks at forestry operational scale by independently considering both susceptibility (to landslides and debris flows) and climatic drivers of the frequency of these events[3].

[1] For examples:

- Phillips C, Marden M, Basher LR 2018. Geomorphology and forest management in New Zealand's erodible steeplands: an overview. Geomorphology 307: 93–106;
- Basher L, Harrison D, Phillips C, Marden M 2015. What do we need for a risk management approach to steepland plantation forests in erodible terrain. New Zealand Journal of Forestry 60(2): 7–10;
- Marden M, Basher L, Phillips C, Black R 2015. Should detailed terrain stability or erosion susceptibility mapping be mandatory in erodible steep lands? NZ Journal of Forestry 59 (4): 32–42;
- Phillips C, Marden M, Basher L 2015. Forests and erosion protection – getting to the root of the matter. New Zealand Journal of Forestry 60(2): 11–15;
- Amishev D, Basher L, Phillips C, Hill S, Marden M, Bloomberg M, Moore J 2014. New forest management approaches to steep hills. MPI Technical Paper 2014/39. Prepared for MPI by Scion, Landcare Research and University of Canterbury.
- Basher LR, Hicks DM, Clapp B, Hewitt T 2011. Sediment yield responses to forest harvesting and large storm events, Motueka River, New Zealand. New Zealand Journal of Marine and Freshwater Research 45: 333–356

[2] Basher L, Barringer J 2017. Erosion Susceptibility Classification for the NES for Plantation Forestry. Landcare Research Contract Report LC2744 for the Ministry for Primary Industries;
Basher L, Lynn I, Page M 2015. Update of the Erosion Susceptibility Classification (ESC) for the proposed National Environmental Standard for Plantation Forestry - revision of the ESC. MPI Technical Paper No. 2015/13. Prepared by Landcare Research for the Ministry for Primary Industries (Landcare Research Contract Report LC2196).

[3] Basher L, Barringer J, Spiekermann R 2019. Assessment of landslide and debris flow susceptibility for Nelson Forests estate. Landcare Research Contract Report LC3569 for Nelson Forests Ltd.;
Basher L, Rosser B 2020. Analysis of rainfall frequency and magnitude, OneFourtyOne New Zealand forest estate: implications for landslide hazard. Landcare Research Contract Report LC3730 for OneFourtyOne New Zealand.

As a basis for providing this assessment, I have read the NZFFA submission, the erosion modelling report (Easton et al. 2023), and relevant parts of the GWRC Proposed Plan Change 1. My comments are restricted to those areas for which I have technical expertise.

Assessment of erosion risk modelling and identification of target land

GWRC use a modelling approach, documented in Easton et al. (2023), to assess erosion risk and identify land proposed for restrictions on forestry and pasture land uses. Erosion risk would normally be evaluated as a function of susceptibility of the land to erosion, frequency of erosion-causing events and consequences of those events. The Easton et al. (2023) approach really only assesses susceptibility even though the word "risk" is used.

Easton et al. (2023) provided what they call spatial erosion risk layers to GWRC to allow identification of "the most erodible 10% by area" of land currently in forestry in each Whaitua. To do this they use the model dSedNet to characterize surface, bank and landslide erosion risk. Surface and landslide erosion are then amalgamated to a single hillslope risk layer. Surface erosion is estimated by a New Zealand version of RUSLE which provides sediment yield predictions (t ha^{-1} yr^{-1}). Risk of landslide erosion is simply estimated as a function of slope angle rather than using a spatially distributed modelling approach which would far better reflect spatial variation in landslide risk/susceptibility. This approach defines any land steeper than 26° as "at risk". Bank erosion is expressed as relative susceptibility of stream reaches derived from Smith et al. (2019).

The modelling approach used is, in my opinion, deeply flawed

- Landslide erosion is likely to be the largest contributor to long-term sediment yield, therefore it is important to assess this as accurately as possible. The crude approach to landslide erosion does not use the power of the available Digital Elevation Model to be able to predict spatial variation in landslide erosion and more accurately predict the most susceptible areas, methods which are currently being used elsewhere in New Zealand[4]. Zoning by slope angle is simplistic and inappropriate in my opinion. Furthermore, the choice of a threshold slope angle of 26° based on the data presented in DeRose (2013) and Dymond et al. (2016) is also problematic. The data presented in those two papers was based on analysis of Tertiary soft rock hill country rather than greywacke. This terrain

[4] See for example Smith HG, Spiekermann R, Betts H, Neverman AJ (2021). Comparing methods of landslide data acquisition and susceptibility modelling: examples from New Zealand. Geomorphology 381

is far more susceptible to landslide erosion than greywacke and therefore the choice of this threshold slope angle for greywacke slopes is completely inappropriate.

- In my opinion the use of the Revised Universal Soil Loss Equation (RUSLE) on steep pasture and forested slopes is problematical, considering that the model has never been well calibrated for these conditions. Easton et al. (2023) note that RUSLE predicts high erosion rates even with extensive native woody vegetation cover, and it is rainfall and slope angle that have the dominant effects on modelled erosion rates. The map of RUSLE-modelled surface erosion is largely a slope map and in my view the predictions of sediment yield (t ha^{-1} yr^{-1}) are likely to be highly unreliable and have high uncertainty.
- Combining landslide and surface erosion into a single risk layer also seems inappropriate to me. Easton et al. (2023) argue it was done to "to provide a single risk layer that is easier to understand and disseminate than two separate layers" and "provides flexibility of mitigation options for potential treatment". In my opinion, because the two processes require completely different mitigation approaches (acknowledged by Eason et al. 2023) they need to be assessed separately so that the appropriate mitigation(s) are selected.

The hillslope modelling approach provides a relative assessment of erosion risk, rather than an absolute assessment. This is because a) it uses three different metrics for the 3 processes (surface erosion – t ha^{-1} yr^{-1}, landslide – all slopes >26°, bank erosion – relative susceptibility), and b) it only considers local risk within the two Whaitua rather than having a regional or national perspective. Consider the statement in the S32 report (p107) that "All plantation forestry activities in these FMUs are permitted activities under the NES-PF regulations, because there is no land in these FMUs that is identified on the NES-PF erosion susceptibility classification system to be of very high (red) risk. However, the erosion susceptibility mapping undertaken for Greater Wellington (Easton S., Nation T., Blyth J., 2023) shows that there is land that is currently used for plantation forestry in these FMUs that has a very high risk of erosion." In my opinion, this land is far from "at very high risk to erosion" and the NES-PF erosion susceptibility mapping is a better expression of the real (moderate) risk of erosion .

In my opinion the modelling is not fit-for-purpose, simplistic and inappropriate. GWRC have not demonstrated that the land for which controls are proposed is truly high erosion risk and that the proposed controls are justified.

Relative erosion susceptibility of greywacke

Most of the hilly land likely to be proposed for retirement from forestry is underlain by greywacke. Analysis of the relative susceptibility of different types of rocks to erosion was one of the bases of the Erosion Susceptibility Classification (ESC) developed for the NES for Plantation Forestry (Basher et al. 2015 – see Table 1). There is a wide range of rock strength across New Zealand with greywacke (Gw in Table 1) classed as very strong (i.e. one of the least erodible rock types in New Zealand). As a result the hilly greywacke land in these Whaitua is classed as moderately susceptible to erosion in the ESC and a proposal to require retirement of some of this land seems completely at odds with management of forestry under the NES-PF on a consistent national basis.

Table 1 Relative rock strength of different unweathered rock types (Table 7 from Basher et al. 2015)

Rock strength	**Rock type[1]**
Extremely weak	Ng, Rm, Ta, Sc, Lp, Kt, Tp, Ft*, Vu*, Pt, Wb, Us*, Uf*
Very weak	Mo, Ft*, La*, Vu*, Af, Gr*, Us*, Uf*
Weak	Mf, Me, Lo, Mx, Ac
Strong	Tb, Vb, Cl, Gl, Mm, Mb, Sm, Sb, Cw, Li*
Very strong	Vo, Ar, Si, Cg, **Gw**, Li*, Sx, Sy
Extremely strong	In, Gn, Um, Gs, Ma

[1] Symbols follow Lynn et al. (2009); *These rock types exhibit a range of rock strength

This lower susceptibility of greywacke slopes to landslides is also illustrated by the figure included in the NZFFA submission (Fig. 1). This figure shows quite clearly that greywacke slopes produce far fewer rainfall-induced landslides than Tertiary soft rock slopes. This process (rainfall-induced landslides) is likely to be the dominant sediment-producing process both in the long-term and during infrequent high-intensity storms and greywacke, and is the process typically targeted for mitigation in hill country.

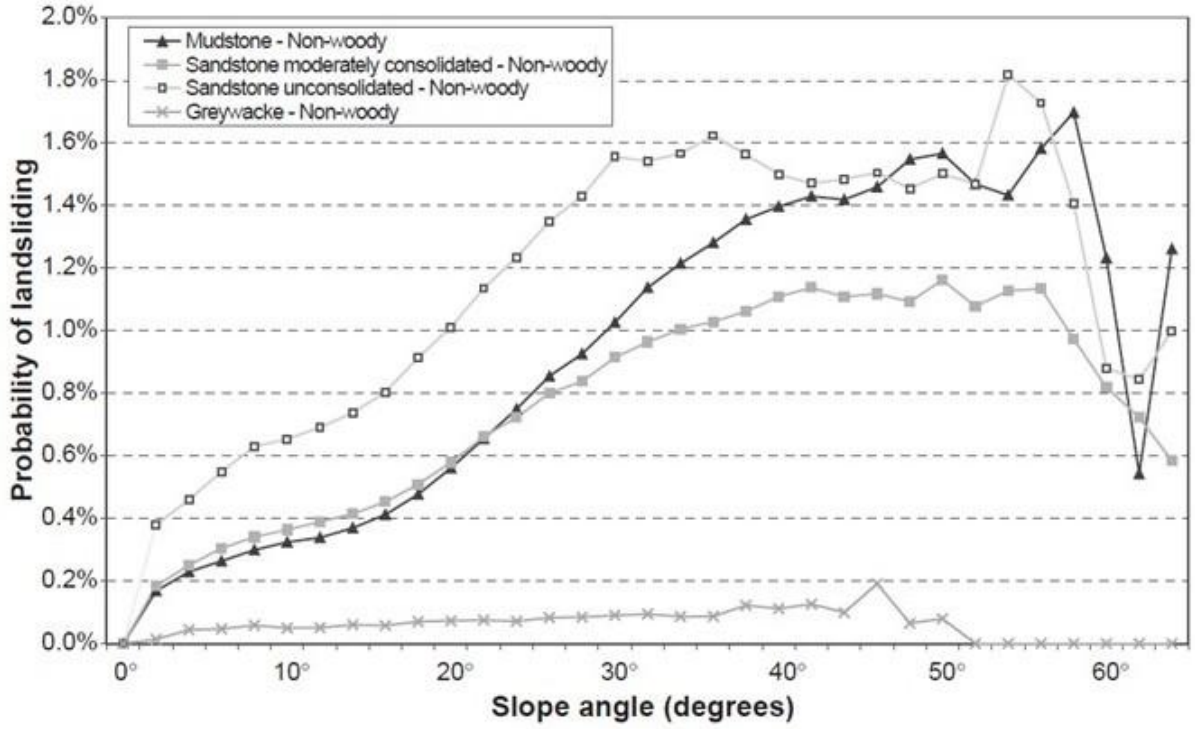


Figure 1 Graph of landslide probability (under non-woody vegetation) versus slope angle for the four main rock types in Manawatu–Wanganui hill country (from Dymond et al. 2006).

While greywacke slopes are typically relatively stable under closed canopy plantation forest, when the trees are harvested the risk of erosion increases for a period of time as a result of changes in hillslope hydrology and soil strength. This “window of vulnerability” can last up to 8 years. While harvested greywacke slopes do have increased susceptibility to erosion post-harvest (both landsliding and surface erosion as a result of earthworks), in my opinion the extent of increase would be far lower than for less stable rock types. I am not aware of any studies that have examined post-harvest erosion from greywacke slopes nor compared post-harvest erosion from greywacke with other rock types.

Sediment loss not above natural

GWRC appear to have a goal of returning hydrology and erosion to more natural rates by 2040. Objective WH.02, b. states “the hydrology of rivers and erosion processes, including bank stability are improved and sources of sediment are reduced to a more natural level“. Similarly in Schedule 34 (Plantation Forestry Erosion and Sediment Management Plan) one of the objectives

(Management Objective B2) is to “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 my opinion this is both inappropriate and unrealistic. Much of the land in these two Whaitua would originally have been forested. Much of the forest has been removed and this will have increased both total runoff and flood flows, and likely increased sediment load from a range of processes including landslides and bank erosion. In addition, parts of the Whaitua have been developed for housing and this will also have increased total runoff and peak flows. Therefore returning hydrology and erosion to more natural rates seems unrealistic and inappropriate to me.

While NZFFA suggests a need to find a better way of defining natural levels, in my opinion natural levels are not appropriate because they would be difficult to achieve given the changes in hydrology and slope stability that have occurred since human settlement.

In my opinion the practicality of both achieving and measuring " no increase in sediment load above the natural state" is highly questionable. There are two reasons for this:

- firstly, it is expensive and time consuming to measure sediment load therefore reliable measurements are infrequently carried out in New Zealand;
- secondly, sediment load is typically highly variable at all temporal scales (storm event to annual). Annual sediment load can range enormously (e.g. a study of the Motueka River estimated annual sediment load to range from 0.006 to 1.6 M t) and therefore identifying the impact of relatively small changes in land use is near impossible. In addition impacts of land use change are often assessed via modelling, but the models typically have large error limits and are also inadequate for identifying the impact of small land use changes.

Conclusions

The proposal to restrict forestry harvest from about 10% of the steepest forestry land in the Whaitua Te Whanganui-a-Tara and Te Awarua-o-Porirua Whaitua, based on erosion risk modelling to identify target land is poorly founded and inappropriate. It is arguable whether the controls proposed are justified considering greywacke is one of the least erodible rock types in New Zealand, and plantation forest on greywacke has a low relative erosion risk including during the window of vulnerability. I agree with the NZFFA submission that “the case to prohibit

plantation forestry from the highest 10% relative risk of erosion prone forestry land does not stack up and may not reduce sediment levels in water bodies".

The stated goal of achieving no increase in sediment load above the natural state is both inappropriate and unrealistic given the transformation of the land (hydrology and slope stability) since human settlement.

I agree with the NZFFA submission that rather than prohibit plantation forestry from the steepest slopes, GW should explore other ways of mitigatng the risk of erosion from steep slopes after harvesting and should allow the stricter ESC controls under the NES for Commercial Forestry to take effect before introducing more stringent land use controls.

References

Basher L, Lynn I, Page M 2015. Update of the Erosion Susceptibility Classification (ESC) for the proposed National Environmental Standard for Plantation Forestry - revision of the ESC. MPI Technical Paper No. 2015/13. Prepared by Landcare Research for the Ministry for Primary Industries (Landcare Research Contract Report LC2196).

De Rose, RC (2013). Slope control on the frequency distribution of shallow landslides and associated soil properties, North Island, New Zealand. Earth Surface Processes and Landforms 38: 356-371

Dymond JR, Herzig A., Basher L, Betts HD, Marden M, Phillips CJ, Roygard J (2016). Development of a New Zealand SedNet model for assessment of catchment-wide soil conservation works. Geomorphology 257: 85-93

Dymond JR, Ausseil A-G, Shepherd JD, Buettner L 2006. Validation of a region-wide model of landslide susceptibility in the Manawatu–Wanganui region of New Zealand. Geomorphology 74: 70–79.

Easton S, Nation T, Blyth J 2023 Erosion Risk Mapping for Te-Awarua-o-Porirua and Te-Whanganui-a-Tara Prepared for Greater Wellington Regional Council

Lynn IH, Manderson AK, Page MJ, Harmsworth GR, Eyles GO, Douglas GB, Mackay AD, Newsome PJF 2009. Land Use Capability Survey Handbook – a New Zealand handbook for the classification of land, 3rd ed. Hamilton, AgResearch; Lincoln, Landcare Research; Lower Hutt, GNS Science.

Smith HG, Spiekermann R, Dymond J, Basher L 2019. Predicting spatial patterns in riverbank erosion for catchment sediment budgets. New Zealand Journal of Marine and Freshwater Management 53: 338–362