
**BRIEF OF SUPPLEMENTARY EVIDENCE OF ANDREW CAMERON MACLENNAN
HAZ – HAZARDS AND RISKS**

Qualifications and Experience

- 1 My qualifications and experience are set out in paragraphs 6 to 8 of my section 42A report titled *Chapter 12: HAZ – Hazards and risks* and dated 4 May 2022.

Code of Conduct

- 2 I have read and agree to comply with the Environment Court’s Code of Conduct for Expert Witnesses, contained in the Environment Court Practice Note 2014. I have complied with the code in preparing my evidence. Other than where I state that I am relying on the advice of another person, I confirm that the issues addressed in this statement of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of Evidence

- 3 This supplementary statement of evidence updates the recommendations I made in my section 42A report titled Chapter 12: HAZ – Hazards and risks. That chapter comprises two sections: HAZ-NH Natural Hazards and HAZ-CL Contaminated Land. The matters addressed in this statement of evidence, in relation to each section, are set out below.

- 4 For HAZ-NH Natural Hazards:

4.1 Move CE-P2(4) from the CE Chapter to the HAZ-NH Chapter.

4.2 Amend HAZ-NH-P1, HAZ-NH-P4, HAZ-NH-P10, CE-P1(1), CE-P2((1)(d) and CE-P2(4) to clarify their application when managing coastal hazards.

4.3 Amend the format of HAZ-NH-P7.

4.4 Amendments to APP6.

- 5 For HAZ-CL Contaminated Land:

5.1 Add a new sub-clause to HAZ-CL-P14.

5.2 A new method into HAZ-CL-M10 related to managing closed landfills.

6 Where I have recommended additional amendments to provisions, my recommendations are shown in addition to my original section 42A recommendations. The key below sets out how these different recommendations are shown.

Key to proposed amendments

Appearance	Explanation
Black text	Text as notified
Black text with <u>underlining</u> or strikethrough	Amendments recommended in s42A report.
Red text with <u>underlining</u> or strikethrough	Additional amendments recommended in supplementary evidence where there has been no previous amendment to the 'as notified' provision text.
Red strikethrough with <u>black-underlining</u>	Text that was recommended to be inserted in s42A report (black underline) but now recommended to be deleted by supplementary evidence (red strikethrough).

7 In the same way as the original section 42A report recommendations, the scope for all proposed amendments is included as a footnote to the amended provisions. Where the amendments were recommended in the section 42A report, the supporting explanation is in the section 42A report. Where the amendments are recommended through this supplementary evidence, the supporting explanation is contained in this supplementary evidence.

Errata

8 Appendix 1 of this evidence is a table of the corrections to the recommendations in my s42A report. My recommendations were correctly recorded in the s42A version of the pORPS.

HAZ-NH Natural Hazards

HAZ-NH-P1, HAZ-NH-P4, and HAZ-NH-P10

9 In paragraph 56 of my section 42A report I recommended accepting the submission by Port Otago (00301.047) to amend HAZ-NH-P10 – Coastal hazards to confirm the relationship between HAZ-NH-P2, HAZ-NH-P3, HAZ-NH-P4, and HAZ-NH-P10.

10 For additional context:

- HAZ-NH-P2 requires an assessment of natural hazard risk (acceptable, tolerable, significant) in accordance with the criteria set out within APP6.
- HAZ-NH-P3 states that new activities must achieve specific outcomes based the level of natural hazard risk associated with the activity (significant risk avoided, tolerable risk managed, acceptable risk maintained).
- HAZ-NH-P4 requires that the existing natural hazard risks are reduced.
- HAZ-NH-P10 provides specific direction on management of natural hazard risk that are potentially affected by coastal hazards.

11 The proposed drafting in my s42A report was to confirm that HAZ-NH-P2, HAZ-NH-P3, and HAZ-NH-P4 do not apply to land that is potentially affected by coastal hazards, as HAZ-NH-P10 provides specific direction on the management of coastal hazards and gives effect to Policy 25 of the NZCPS.

12 Following discussions at the pre-hearing meeting I consider further amendments are required to the CE – Coastal Environment and HAZ-NH – Natural Hazards Chapters to clarify which provisions in the pORPS identify and manage coastal hazards.

13 I consider it would add certainty to the pORPS if the provisions identifying coastal hazards were contained within the HAZ-NH chapter rather than being split between the HAZ-NH chapter and the CE chapter. In the notified version of the pORPS, CE-P2(4) requires the identification of coastal hazard areas. This policy is implemented by method HAZ-NH-M1(2)(c) which requires the identification of coastal hazards in accordance with Policy 24 of the NZCPS. I recommend that CE-P2(4) be moved from the CE Chapter to the HAZ-NH chapter because it is more logical to group the natural hazard provisions together in the HAZ-NH chapter.

14 I recommend the following amendments:

HAZ-NH-P1A – Identifying areas subject to coastal hazards

Identify areas that are potentially affected by coastal hazards (including tsunami), giving priority to the identification of areas at high risk of being affected.¹

HAZ-NH-P1 – Identifying areas subject to *natural hazards*

¹ 00301.047 Port Otago

For hazards not identified in accordance with HAZ-NH-P1A² Using the best available information, identify areas where *natural hazards* may adversely affect Otago's people, communities and property, by assessing:

(1) ...

HAZ-NH-P4 – Existing activities

In areas identified under HAZ-NH-P1 as subject to natural hazards,³ Reduce existing *natural hazard risk* to a tolerable or acceptable level by:

HAZ-NH-P10 – Coastal hazards

In addition to HAZ-NH-P1 and HAZ-NH-P5 to HAZ-NH-P9 above,⁴ On any *land* that is potentially affected by coastal hazards over at least the next 100 years:

- (1) avoid increasing the *risk (in relation to natural hazards)* of social, environmental and economic harm from coastal hazards,
- (2) ensure no *land* use change or redevelopment occurs that would increase the *risk (in relation to natural hazards)* to people and communities from that coastal hazard,
- (3) encourage *land* use change or redevelopment that reduces the *risk (in relation to natural hazards)* from that coastal hazard, **and**
- (4) ensure decision making about the nature, scale and location of activities considers the ability of Otago's people and communities to adapt to, or mitigate the *effects* of, sea level rise and *climate change*, **and**

(5) apply HAZ-NH-P5 to HAZ-NH-P9.⁵

HAZ-NH-M1 – Statement of responsibilities

In accordance with section 62(1)(i)(i) of the RMA 1991,⁶ the responsibilities for the control of land use to avoid or mitigate natural hazards or any group of hazards are as follows:

...

² 00301.047 Port Otago

³ 00301.047 Port Otago

⁴ Clause 16(2), Schedule 1, RMA

⁵ Clause 16(2), Schedule 1, RMA

⁶ Clause 16(2), Schedule 1, RMA

(2) the Regional Council is responsible for:

...

- (c) ~~in the coastal environment~~, identifying ~~the~~ coastal hazards as required by ~~CE-P2(3)(4)~~⁷ HAZ-NH-P1A⁸ in accordance with Policy 24 of the NZCPS, mapping the extent of those areas in the relevant *regional plan(s)* and including those maps on a *natural hazard* register or database, and

CE-P1 – Links with other chapters

Implement an integrated approach to managing Otago’s coastal environment which Rrecognises that:

- (1) coastal hazards must be identified ~~in accordance with CE-P2(4)~~⁹ and managed in accordance with the HAZ–NH – Natural hazards section of this RPS;

CE-P2 – Identification

Identify the following in the coastal environment:

- (1) the landward extent of the coastal environment, recognising that the coastal environment includes:
- (a) the *coastal marine area*,
 - (b) islands within the *coastal marine area*,
 - (c) areas where coastal processes, influences or qualities are significant, including coastal lakes, lagoons, tidal estuaries, saltmarshes, coastal wetlands, and the margins of these,
 - (d) areas at risk from coastal hazards as identified in ~~CE-P2(4)~~ HAZ-NH-P1A,¹⁰

...

~~(4) — areas that are potentially affected by coastal hazards (including tsunami), giving priority to the identification of areas at high risk of being affected,~~

⁷ 00137.135 DOC

⁸ 00301.047 Port Otago

⁹ Clause 10(2)(b)(i) of Schedule 1 of the RMA – consequential amendment arising from 00301.047 Port Otago

¹⁰ Clause 10(2)(b)(i) of Schedule 1 of the RMA – consequential amendment arising from 00301.047 Port Otago

and¹¹

Section 32AA evaluation

15 Because my recommendations essentially re-order existing provisions and do not propose any substantive changes, no section 32AA assessment is necessary.

HAZ-NH-P7(2)

16 In paragraphs 200 to 209 of my section 42A report, I analyse the submission points relating to HAZ-NH-P7. Following discussions at the pre-hearing meeting I have re-considered this provision. I consider the drafting would be improved if the policy is restructured to clarify how the 'or' following sub-clause (5) is to be interpreted. The intention of the drafting was that sub-clause (6) stand alone and not be bound by the restrictions in sub-clauses (1) – (5). I recommend the following amendments:

HAZ-NH-P7 – Mitigating *natural hazards*

Prioritise risk (*in relation to natural hazards*)¹² management approaches that reduce the need for *hard protection structures* or similar engineering interventions, and provide for *hard protection structures* only when:

~~(1) *hard protection structures* are essential to manage risk to a level the community is able to tolerate,~~¹³

(1A) the following apply:¹⁴

~~(2)(a)~~ there are no reasonable alternatives that result in reducing the risk (*in relation to natural hazards*)¹⁵ exposure,

~~(3)(b)~~ *hard protection structures* would not result in an increase in risk (*in relation to natural hazards*)¹⁶ to people, communities and property, including displacement of risk (*in relation to natural hazards*)¹⁷ off-site,

~~(4)(c)~~ the adverse effects of the *hard protection structures* can be adequately managed, and

¹¹ Clause 10(2)(b)(i) of Schedule 1 of the RMA – consequential amendment arising from 00301.047 Port Otago

¹² Clause 10(2)(b)(i) of Schedule 1 of the RMA – consequential amendment arising from 00230.013 Forest and Bird

¹³ 00301.050 Port Otago

¹⁴ Clause 16(2), Schedule 1, RMA

¹⁵ Clause 10(2)(b)(i) of Schedule 1 of the RMA – consequential amendment arising from 00230.013 Forest and Bird

¹⁶ Clause 10(2)(b)(i) of Schedule 1 of the RMA – consequential amendment arising from 00230.013 Forest and Bird

¹⁷ Clause 10(2)(b)(i) of Schedule 1 of the RMA – consequential amendment arising from 00230.013 Forest and Bird

(5)(d) the mitigation is viable in the reasonably foreseeable long term or provides time for future adaptation methods to be implemented, or

(6)(2) the *hard protection structure* protects a *lifeline utility*, or a facility for essential or emergency services.

Section 32AA evaluation

17 Because my recommendations for HAZ-NH-P7 seek to improve its drafting and do not propose any substantive changes, no section 32AA assessment is necessary.

APP6 – Methodology for natural hazard risk assessment

10 In paragraphs 439 to 447 of my section 42A report, I analyse the submission points relating to Step 2 – Natural Hazard Consequence of APP6. Following pre-hearing discussions, I have considered whether a minor clarification to *Table 7: Consequence table* is required for consistency with the rest of the table. In particular, I have considered whether the word ‘affected’ should be removed from the ‘Buildings’ column of the ‘Catastrophic’ and ‘Insignificant’ rows as follows:

Severity of Impact	Built				Health & Safety
	Social/Cultural	Buildings	Critical Buildings	Lifelines	
Catastrophic (V)	≥25% of buildings of social/cultural significance within hazard zone impact area ¹⁸ have functionality compromised	≥50% of affected ¹⁹ buildings within hazard zone impact area ²⁰ have functionality compromised	≥25% of critical facilities within hazard zone impact area ²¹ have functionality compromised	Out of service for > 1 month (affecting ≥20% of the town/city population) OR suburbs out of service for > 6 months (affecting < 20% of the town/city population)	> 10± dead and/or > 1001 injured ²²
...					

¹⁸ 00138.147 QLDC
¹⁹ Clause 16(2), Schedule 1, RMA
²⁰ 00138.147 QLDC
²¹ 00138.147 QLDC
²² 00138.147 QLDC

Insignificant (i)	No <i>buildings</i> of social/cultural significance within hazard zone <u>impact area</u> have functionality compromised	< 1% of affected ²³ <i>buildings</i> within hazard zone <u>impact area</u> have functionality compromised	No damage within hazard zone <u>impact area</u> , fully functional	Out of service for up to 2 hours (affecting ≥20% of the town/city population) OR suburbs out of service for up to 1 day (affecting <20% of the town/city population)	No dead No injured
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18 These suggested amendments have been considered by Scott Kelly a Natural Hazards Planner at the Institute of Geological and Nuclear Sciences Limited (GNS Science). In paragraphs 17 and 18 of his evidence, he states:

'I support the removal of "affected" in the description of 'catastrophic' and 'insignificant' consequence in the buildings' column, and the change from "hazard zone" to "impact area" throughout the consequence table.

The removal of "affected" in the description of 'catastrophic' and 'insignificant' consequence in the buildings' column fixes a drafting error within the pORPS version of Table 7 and aligns these consequence descriptions with others within the table.'

19 On that basis, I recommend making these amendments. The change will provide consistency with the rest of the consequence table as all other references to 'buildings' within the consequence table do not relate to 'affected buildings'.

20 In paragraph 470 of my section 42A report I analyse the submission points relating to Step 4 – Undertake a quantitative risk assessment of APP6. Following discussions at the pre-hearing meeting, I have considered whether natural hazard events with 'catastrophic or major' consequences should also require a quantitative risk assessment through the process set out in Step 4 of APP6 to determine whether the risk is tolerable or significant.

21 This has also been considered by Mr Kelly at GNS Science. In paragraphs 13 to 15 of his evidence he states:

'Kelly et al. (2021) recommended that the trigger for a quantitative risk assessment be where the qualitative risk assessment found that two out of three natural hazard scenarios resulted in risk that was tolerable or significant. The

²³ Clause 16(2), Schedule 1, RMA

pORPS does not adopt this recommendation. The trigger in the pOPRS for a quantitative risk assessment is where “one of the three natural hazard scenarios generate risk that is significant”.

ORC’s submission sought that “If the assessment undertaken in Steps 1–3 determines that one of the three natural hazard scenarios generate risk that is significant, or if a consequence is catastrophic or major, undertake a quantitative risk assessment utilising the following methodology’.”.

The quantitative risk assessment trigger sought by ORC provides a middle ground to that recommended in Kelly et al. (2021) and that within the pORPS. However, it should be noted that ORC’s proposal is not entirely based on risk and, in the additions sought by ORC, would be based solely on consequence.’

- 22 As highlighted in the advice from Mr Kelly, during the development of APP6 the trigger suggested by GNS Science (Kelly et al., 2021) was modified by council staff as it was considered the requirement to undertake a quantitative risk assessment where the qualitative risk assessment found two out of three natural hazard scenarios resulted in risk that was ‘tolerable’ or ‘significant’ was too onerous. Instead, the quantitative risk assessment at Step 4 of APP6 is triggered if the qualitative risk assessment finds that one of the three natural hazard scenarios generates significant risk.
- 23 I support the position that the trigger in Step 4 proposed by GNS Science (Kelly et al., 2021) is too onerous, as it could result in activities with tolerable risks and ‘minor’ or ‘moderate’ consequences requiring a quantitative risk assessment. However, I also acknowledge that the current drafting of the Step 4 does not adequately consider lower likelihood events with high consequences. I consider an amendment to Step 4 is required to capture events with a tolerable risk and catastrophic consequence.
- 24 It is important to note that the recommended amendment to the quantitative assessment trigger needs be read in conjunction with the recommended amendments to the ‘Health and Safety’ column of the consequence table within my section 42a report²⁴ which reduced the thresholds for Catastrophic, Major, Moderate, and Minor events. I consider the combination of these two recommended changes achieves a similar outcome to that being sought by ORC in their submission.

²⁴ Paragraph 458 of Section 42A Hearing Report - Chapter 12: HAZ – Hazards and risks

25 I recommend that the trigger for requiring a quantitative risk be:

Step 4 – Undertake a quantitative *risk* assessment

While Steps 1-3 will qualitatively categorise *natural hazard risk* based on a community's understanding and acceptance level of *risk*, it will not provide quantitative understanding of the *risk* a *natural hazard* presents to the built environment, or health and safety.

If the assessment undertaken in Steps 1-3 determines that one of the three *natural hazard* scenarios generate *risk* that is significant, or a tolerable risk with a catastrophic consequence²⁵, undertake a quantitative *risk* assessment utilising the following methodology:²⁶

Section 32AA evaluation

26 The proposed amendment to Step 4 of APP6 may result in additional transactional costs as it introduces an additional requirement for consent applicants to undertake a quantitative risk assessment, if the qualitative risk assessment finds that one of the three natural hazard scenarios generates a risk that is tolerable but with a potential catastrophic consequence.

27 There will be social and economic benefits in adopting this recommended change as it would require a more robust assessment of the natural hazard risks associated with low probability events with catastrophic consequences.

28 On balance, I consider the costs of the further assessment associated with this suggested amendment will be outweighed by the social and economic benefits of ensuring a more robust assessment is undertaken to quantify the natural hazard risks associated with low probability events with catastrophic consequences.

29 When considering the efficiency and effectiveness of the suggested amendment in achieving objective HAZ–NH–O1 (when compared to the notified drafting), the amended drafting will be more effective as it will require a more robust assessment of the risks associated with low probability events with catastrophic consequences. In the short term I consider the suggested amendment may be less efficient as it will require additional transactional costs as more in-depth natural hazard assessment will be required for low probability events with

²⁵ 00415.002 ORC

²⁶ This methodology has been developed in general accordance with the Australian Geomechanics Society, 2007 methodology, which may usefully provide additional guidance. (New footnote attributed to 00138.147 QLDC)

catastrophic consequences. However, in the longer term I consider this option will ensure that communities are better informed about the potential risk from natural hazards. This will result in efficiencies in long term as developments will be better able to adapt to the effects of natural hazards.

HAZ-CL Contaminated Land

HAZ-CL-P14

- 30 In paragraph 514 of my section 42A report I analyse the Ngāi Tahu ki Murihiku submission point (00223.119) relating to HAZ-CL-P14 and recommend no change to this policy as subclause (4) requires closed landfills to be managed in accordance with a closure plan that sets out monitoring requirements and, where necessary, any remedial actions to address risks. The reference to on-going risk clearly provides scope to require the effects of natural hazards to be considered as part of this plan.
- 31 Following discussions at the pre-hearing meeting, I now consider an additional subclause is required in HAZ-CL-P14 to acknowledge that the identification and management of closed landfills and contaminated land at risk from the effects of climate change should be prioritised. I also agree that a new method in the HAZ-CL chapter is required to provide a process to identify and manage closed landfills and contaminated land at risk from the effects of climate change.
- 32 I recommend the following amendments to HAZ-CL:

HAZ-CL-P14 – Managing contaminated land

~~Actively m~~Manage contaminated or potentially *contaminated land* so that it does not pose an unacceptable *risk* to people and the *environment*, by:

- (1) assessing and, if required,² monitoring *contaminant* levels and environmental *risks*,
- (2) protecting human health in accordance with regulatory requirements,
- (3) avoiding, as the first priority, and only where avoidance is not practicable, mitigating or remediating, adverse *effects* of the *contaminants* on the *environment*, ~~and~~
- (4) requiring closed *landfills* to be managed in accordance with a closure plan that sets out monitoring requirements and, where necessary, any remedial actions required to address ongoing *risks*, and.

(5) prioritising the identification and management of closed landfills and contaminated land at risk from the effects of climate change.²⁷

HAZ-CL-M8A – Prioritisation and action plans

Otago Regional Council and territorial authorities, in consultation with Kāi Tahu and the community, must together:

(1) identify closed landfills and contaminated land at risk from the effects of climate change,

(2) assess the risk and the potential effects of release of contaminants,

(4) develop and implement action plans to avoid release of contaminants from the identified closed landfills and contaminated land, and

(5) review sites and their level of risk every five years.²⁸

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- 33 The addition of HAZ-CL-P14(5) and HAZ-CL-M10 will result in additional costs as it introduces an additional requirement for the Otago Regional Council and territorial authorities, (in consultation with Kāi Tahu and the community) to undertake identification, risk assessment, and management processes for closed landfills and contaminated land at risk from the effects of climate change.
- 34 There will be environmental, social, and cultural benefits to this recommended change as it will proactively require the management of historic areas of contamination to ensure they do not adversely affect the environment or areas of cultural significance. There will also potentially be an economic benefit associated with the suggested amendment as proactively managing historic areas of contamination may cost less than reactively cleaning up debris from a historic landfill.
- 35 On balance, I consider the costs associated with this suggested amendment will be outweighed by the environmental, social, and cultural benefits of proactively identifying and managing closed landfills and contaminated land at risk from the effects of climate change.

Andrew Cameron Maclennan

11 October 2022

²⁷ 00223.119 Ngāi Tahu ki Murihiku

²⁸ 00223.119 Ngāi Tahu ki Murihiku

Appendix 1 - Section 42A Report – Errata

Provision	S42A Report Paragraph number	Error	Corrected Text
HAZ-NH-M4	63	Section 42A recommendations (contained in the analysis and in the s42A version of the pORPS) not correctly shown in report version of the provision.	<p>HAZ-NH-M4 – District plans</p> <p>[...] (7) ... (a) an assessment of the level of <i>natural hazard risk</i> associated with the proposal in accordance with APP6, and (b) an assessment demonstrating how the proposal will achieve the outcomes set out in Policies HAZ-NH-P3 and HAZ-NH-P4, and (8) [...]</p>
HAZ-NH-M2(1)	255	Section 42A recommendations (contained in the analysis and in the s42A version of the pORPS) not correctly shown in report version of the provision.	<p>HAZ-NH-M2 – Local authorities</p> <p><i>Local authorities</i> must <u>work collaboratively to</u>.²⁹ (1) assess the level of <i>natural hazard risk</i> in their region or district in accordance with HAZ-NH-P2 and APP6, including by: (a) consulting with communities, stakeholders and partners (<u>Kāi Tahu</u>)³⁰, including <u>with local authorities in neighbouring regions</u>³¹ regarding <i>risk</i> levels thresholds, and [...]</p>
HAZ-NH-M2(1)(a)	314	Section 42A recommendations (contained in the analysis and in the s42A version of the pORPS) not correctly shown in report version of the provision.	<p>HAZ-NH-M2 – Local authorities</p> <p><i>Local authorities</i> must <u>work collaboratively to</u>.³² (1)...</p>

²⁹ 00138.156 QLDC

³⁰ 00226.258 Kāi Tahu ki Otago

³¹ 00013.015 ECan

³² 00138.156 QLDC

			(a)consulting with communities, stakeholders and partners (<u>Kāi Tahu</u>) ³³ , <u>including with local authorities in neighbouring regions</u> ³⁴ regarding <i>risk</i> levels thresholds, and [...]
HAZ-NH-PR1	379	Section 42A recommendations (contained in the analysis and in the s42A version of the pORPS) not correctly shown in report version of the provision.	<p>HAZ-NH-PR1 – Principal reasons</p> <p>[...]</p> <p>The negative effects of natural hazards are generally best managed by avoiding development in areas that are known to be subject to natural hazards. However,³⁵ †The majority of the region is subject to some form of hazards <i>risk</i>, to a greater or lesser extent. While avoidance of <u>natural hazard risk</u>³⁶ may be the preferred option in many cases, in other situations mitigating the <i>effects</i> of <i>natural hazards</i> to tolerable levels will be a feasible option to ensure the health, safety and well-being of the community. The changing nature of <i>natural hazards risk</i> due to <i>climate change</i> means that planning provisions need to be able to adapt to a future <i>natural hazards environment</i>.</p>

³³ 00226.258 Kāi Tahu ki Otago

³⁴ 00013.015 ECan

³⁵ 00119.024 Blackthorn Lodge

³⁶ 00119.024 Blackthorn Lodge