To: Minister for Canterbury Earthquake Recovery

CERA
Canterbury Earthquake Recovery Authority

SENSITIVE

Port Hills White Zone Update and Decision Process

Date	28 October 2011	Priority	Medium
Report No	M/11/0133	File Reference	M/11/0133

Action Sought

		Deadline
Hon Gerry Brownlee *Minister for Canterbury Earthquake Recovery*	Note the information provided in this briefing	

Contact for Telephone Discussion (if required)

Name	Position	Telephone	1st Contact
Diane Turner	General Manager, Strategy, Planning and Policy		☑
Henry Dowler	Senior Advisor (Strategy, Planning and Policy)	Withheld under section 9(2)(a)	
Withheld under section 9(2)(g)(i)			
Jan Kupec	Geotechnical Engineer		

Minister's office comments

- ☐ Noted
- ☐ Seen
- ☐ Approved
- ☐ Needs change
- ☐ Withdrawn
- ☐ Not seen by Minister
- ☐ Overtaken by events
- ☐ Referred to

Comments

Port Hills White Zone Update and Decision Process

Purpose

1 This report provides background information on geotechnical hazards in the Port Hills White Zone, an update on White Zone work being led by the Christchurch City Council (CCC) and related information on:

- a draft decision-making process, jointly developed by CCC and CERA to address very complex Port Hills recovery issues and associated rezoning decisions;
- CCC's approach to setting a tolerable life-safety risk for geotechnical hazards in the Port Hills (which is consistent with international best practice);
- potential, during November/December 2011, to rezone green up to 800 more residential properties from the Port Hills White Zone; and
- alignment of the life-safety risk approach in the Port Hills with the approach to previous 'flat land' zoning decisions.

Executive Summary

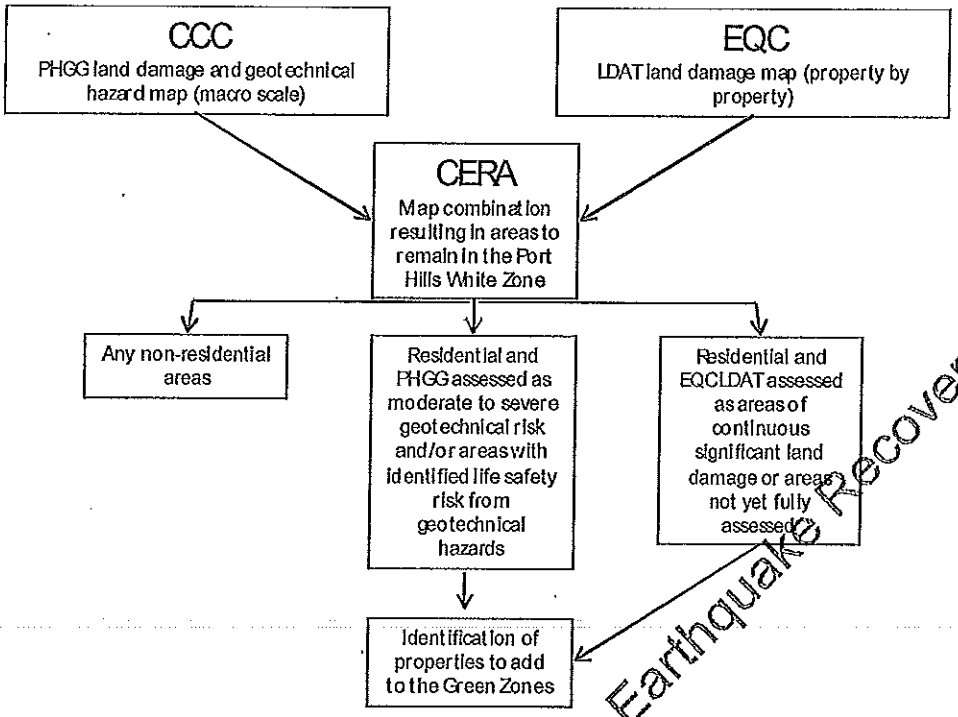
2 Many Port Hills residential properties remain exposed to geotechnical hazards (eg, rockfall, cliff collapse, debris inundation and land movement) and associated life-safety risks. Out of approximately 3700 residential properties (almost 500 of which are vacant sites) in the Port Hills White Zone around 1400 are within the rockfall 'shadow' and around 100 are within the cliff collapse hazard zone (top & bottom of cliff). The remaining 2,200 are zoned white due to EQC land damage assessment.

3 CCC is leading the Port Hills recovery activity as CCC owns most of the land on which the hazards exist and is the organisation with primary regulatory responsibilities. CCC has engaged GNS Science and is working with the Port Hills Geotechnical Group (PHGG) to undertake the complex, extensive and time intensive geotechnical and risk assessments necessary to inform decisions about life-risk and rezoning.

4 CERA and CCC have jointly developed a draft decision-making process for Port Hills recovery (refer Attachment A) which will help ensure that the Crown's interests are adequately considered and addressed, including by:

- alignment of the Port Hills approach with the approach to previous 'flat land' zoning decisions and with any EQC and private insurers' hazard management obligations and interests; and
- consideration of funding issues, options and responsibilities for longer-term hazard mitigation and/or retreat occurs after decisions about a tolerable life-safety risk level and reclassification of the Port Hills White Zone to green zones is complete.

5 The acceptance by CCC of a tolerable life-safety risk level for geotechnical hazards in the Port Hills is the next critical step in the decision process. As summarised in the diagram on the following page, the CCC acceptance of a tolerable life-safety risk level will, along with information from PHGG and EQC assessments, enable decisions on where mitigation/remediation works, reoccupation and rebuilding of residential properties can proceed, and where properties are exposed to an unacceptably high risk.



6 Based on the most recent advice from CCC, key short-term project dates and activities include:

- *3 November*: Preparation of final Avoca Valley rockfall risk contours. The Avoca Valley area is being used to pilot the ground-truthing methodology that will be used to verify or correct calculated rockfall risks so that final contours can be prepared for the balance of the areas within the rockfall shadow.
- *10 November*: CCC Council meeting is expected to agree to CERA being advised that a portion (up to 800) of residential properties in the Port Hills White Zone have a very low calculated risk from rockfall (10^{-6} or lower). Subject to land damage assessments for those properties, there would be potential for some or all of the properties to be rezoned green.
- *22 November*: CCC Councillor workshop covering operational aspects of the project and answers to questions raised by Councillors at an earlier October life safety risk workshop.
- *6 December*: CCC Council meeting is expected to accept, based on advice provided by GNS Science, a tolerable life-safety risk level for the Port Hills of 10^{-4} (1 in 10,000). This risk level is consistent with international risk management standards that have been interpreted for the New Zealand context (see the table in Attachment B) and with previous work in New Zealand on natural hazard risks and the building code

7 Extensive ground truthing work in the Port Hills is required to confirm the accuracy of modelled life-safety risks and some land damage assessments remain to be completed. This means it will likely be early 2012 before reports on mitigation/remediation and/or retreat options for all remaining Port Hills White Zone properties can be finalised. Financial and cost-benefit analyses will then need to be completed, including clarifying the role of EQC 'imminent risk cover' for dwellings at risk.

Background

8 The Port Hills have not suffered the same type of area-wide land damage (liquefaction and lateral spreading) that occurred on flat land in greater Christchurch. However, many Port Hills residential properties remain exposed to geotechnical hazards and associated life-safety risks. The hazards include potential rockfall, cliff collapse, debris inundation and land movement such as slipping and renting.

9 The hazards that threaten residential properties are on land owned by CCC, private owners and the Crown (conservation land managed by the Department of Conservation).[1] Between 70-80 percent of the potential rockfall sources are on land owned by CCC. The remaining 20-30 percent of the total rockfall sources is on private land, with most of the land on the Lyttelton side of the hills being in private ownership.

10 On 27 June 2011 Cabinet noted that earthquake-related issues in the Port Hills differ from flat land and will be addressed in a separate paper (CAB Min (11) 24/15 refers). Cabinet also agreed to the definitions of four zones for residential properties across Christchurch City, Waimakariri and Selwyn Districts: Green, Orange, Red and White.

11 On 5 September 2011 initial Port Hills Green Zones were announced, with approximately 9700 residential properties in the Green Zone and 3700 remaining in the White Zone (excluding rural and rural-residential houses).[2] Due to life-safety risks, a conservative approach was taken in defining the White Zone.

12 CCC is leading the Port Hills recovery activity as the owner of most of the land on which the hazards exist and as the regulator with primary responsibility under civil defence emergency management, resource management, local government and building legislation. To develop a sound evidence base for policy decisions, CCC has engaged GNS Science and is working with the Port Hills Geotechnical Group (PHGG) to undertake geotechnical and risk assessments. These ongoing assessments are complex, extensive and time intensive.

13 CERA is actively supporting this CCC-led work to help ensure that the Crown's interests are adequately considered and addressed.

Comment

The CCC-CERA decision-making process

14 CCC and CERA have jointly developed a draft decision-making process for Port Hills recovery (refer Attachment A) that involves ensuring that:

- high quality technical assessments and advice enable CCC to make robust, evidence-based decisions that support timely and cost-effective recovery;

[1] The Department of Conservation manages the Godley Head Reserve at the eastern-most tip of the Port Hills. The Reserve contains historic sites and a network of walking and mountain-biking tracks. As there are a small number of residential properties near or on the Reserve, geotechnical hazards have been assessed by the Port Hills Geotechnical Group. None of these residential properties have ever been issued a building consent, however, a number are now subject to dangerous building notices under section 124 of the Building Act 2004. Management of public safety in the Reserve by the Department will largely involve information systems such as warning signs.

[2] Out of approximately 3700 Port Hills White Zone residential properties (almost 500 of which are vacant sites) around 1400 are within the rockfall 'shadow' and around 100 are within the cliff collapse hazard zone (top & bottom of cliff). The remaining 2,200 are zoned white due to EQC land damage assessment.

- CCC decisions about a tolerable life-safety risk level do not create inappropriate precedents that might compromise future local or national hazard management policy decisions and actions (including for Port Hills land owned by the Crown);
- the CCC approach to Port Hills hazard management is not inconsistent with the Government flat land zoning decisions;
- there is an appropriate alignment between the CCC approach and any EQC and private insurers' hazard management obligations and interests;
- any potential requirement to use Crown recovery powers to support CCC activities is identified early; and
- consideration of funding issues, options and responsibilities for longer-term hazard mitigation and/or retreat occurs after decisions about a tolerable life-safety risk level and reclassification of the Port Hills White Zone to green zones is complete.

15 As summarised in the next section of this paper, the acceptance by CCC of a tolerable life-safety risk level for geotechnical hazards in the Port Hills is the next critical step in the decision process.

A tolerable life-safety risk level for geotechnical hazards in the Port Hills

16 Legislation is generally unclear regarding where liabilities lie for natural hazards and there is no obvious legal redress for landowners affected by naturally occurring hazards.[3] Although some statutes[4] provide a mandate for hazard management plans and rules, there is no specific guidance and direction to assist the development of such plans and rules. National standards have been developed and are applied by local authorities with respect to hazardous substances, road safety and building design, however, there is no national standard addressing rockfall or cliff collapse hazards and associated life-safety risks.

17 In addition to hazard reduction/mitigation requirements implemented through regional resource management planning, CCC is required by the Civil Defence Emergency Management Act 2002 and the Canterbury Civil Defence Emergency Management Group Plan to identify and assess hazards within its district and to develop hazard reduction measures. CCC is therefore following international best-practice for risk management by considering the acceptance of a tolerable life-safety risk level for residential properties exposed to geotechnical hazards on the Port Hills. Attachment B provides further information about best-practice assessment of tolerability for life-safety risks.

18 CCC acceptance of a tolerable life-safety risk level will, along with information from PHGG and EQC assessments, enable decisions on where mitigation/remediation works, reoccupation and rebuilding of residential properties can proceed, and where properties are exposed to an unacceptably high risk. The specific tolerable risk level will enable a risk level to be calculated for each Port Hills property and development of hazard maps.[6] In turn, this

[3] The nuisance abatement provisions of the Health Act are a possibility, but as these have only been applied to man-made nuisances it is doubted that the Courts will extend these nuisance provisions to natural hazards. This could be tested in the Courts, but there are a number of reasons against extending the nuisance provisions to naturally occurring hazards.

[4] Resource Management Act 1991, Soil Conservation and River Control Act 1941, Building Act 2004, Earthquake Commission Act 1993, Land Drainage Act 1908, Civil Defence Emergency Management Act 2002, and Canterbury Earthquake Recovery Act 2011.

[5] Geotechnical and risk reports are based on models specific to the Port Hills with an assumed average daily occupancy of 16 hours and have limited scope for adoption in other parts of New Zealand (ie, as specific data collection, assessment and modelling would be needed to produce similar reports for other areas of New Zealand). Accepted tolerable life-safety risk levels will only apply to residential properties. Schools and other public buildings will not have a life-safety risk level applied to them through this process. For such buildings, a different type of risk calculation involving the number of deaths (N) for a given frequency of N or more deaths per year should be used.

will enable the feasibility, viability and timeliness of risk mitigation works to be investigated and costed.

19 To inform its decision about a tolerable life-safety risk level, CCC commissioned advice from GNS Science. The GNS report [6] recommends that CCC accept a tolerable life-safety risk level for the Port Hills of 10^{-4} (1 in 10,000).[7] This risk level, is consistent with international risk management standards that have been interpreted for the New Zealand context (see the table in Attachment B). It is also broadly consistent with previous work in New Zealand on natural hazard risks and the building code.

20 For properties with a risk level of 10^{-4} or higher, the GNS report recommends retreat or remediation. For properties with a risk level between 10^{-4} to 10^{-5} and lower, it suggests reoccupation be considered.

21 CCC Councillors and staff were briefed about life-safety risks at a workshop on 11/12 October 2011 by GNS Science and the international risk management expert (Tony Taig) who peer reviewed the GNS paper. A further CCC workshop on the GNS report is planned for 22 November 2011 and a final CCC decision on the tolerable life-safety risk level for the Port Hills should be made at the following Council meeting on 8 December 2011.

Potential to turn green a further 800 residential properties

22 Although the final CCC decision on a tolerable life-safety risk will not be made until December, the next 10 November 2011, Council meeting will be asked to agree to CERA being advised that a portion (up to 800) of residential properties in the Port Hills White Zone have a very low calculated risk from rockfall (10^{-6} or lower). Subject to land damage assessments for those properties, there would therefore be potential for some or all of the properties to be rezoned green. The CCC advice would relate to properties with a very low calculated risk level of 10^{-6} (1 in 1 million) or lower.[8]

23 If 800 properties were rezoned green that would leave around 2900 residential properties in the Port Hills White Zone. CERA also understands that the remaining assessment work around the hazards and risks for the remaining White Zone properties will be very complex, extensive and time consuming. CCC has advised that the final peer review of the GNS rockfall modelling and report to CCC is expected in November 2011. CCC is also working with PHGG consultants to finalise new, standard contracts for the forward Port Hills geotechnical work programme.

24 A pilot programme in the Avoca Valley area to test and confirm the ground truthing methodology is almost complete. Preparation of final Avoca Valley rockfall risk contours should be finished by 3 November 2011. CCC currently estimates that up to 2500 hours of ground truthing work will be required in the Port Hills.

25 It will be early 2012 before it will be possible to complete the assessment of mitigation and/or retreat options for all properties. Financial and cost-benefit analyses will then need to be completed (including clarifying the role of EQC 'imminent risk cover'[9] for dwellings at risk),

6 Saunders, W., Berryman, K. 2011. *Proposed Risk Assessment Criteria For Evaluating Earthquake-Induced Slope Instability Hazards In Port Hills Suburbs.* GNS Science paper V2.

7 With about 400 people dying each year on New Zealand roads out of a population of 4 million, that equates to a life-safety risk of 10^{-4}

8 CERA and Tonkin & Taylor will still need to assess land damage.

9 Under the Earthquake Commission Act 1993 'physical loss or damage', in relation to property, includes any physical loss or damage to the property that (in the opinion of the Commission) is 'imminent' as the direct result of a natural disaster which has occurred. CERA understands that current EQC policy and practice treats 'imminent' as including loss or damage that is likely to occur within 12 months. Where the Commission

reporting and decision-making (ie, the latter stages of the decision process summarised in Attachment A. It is, however, the Council's intention to roll-out decisions as areas/suburbs have been assessed.

Alignment of the Port Hills approach with flat land zoning decisions

26 Despite the differences between flat land damage and the Port Hills geotechnical hazards and associated life-safety risks, decision-making is driven by many common factors, including:

- ensuring public safety through robust, thorough technical assessments of hazards, risks (including future susceptibility) and impacts on people's homes, businesses and livelihoods;
- running an easily understood zoning and communication process, despite complex technicalities that underpin decision-making, to provide clarity for land-owners, residents, and businesses in the affected areas; and
- ensuring decisions are timely, so home- and business-owners, insurers and investors have ongoing confidence in decisions made.

27 Broadly, the approach to determining whether to zone land green would be similar to the approach taken for flat land. The most important criterion is the geotechnical/scientific assessment of the hazards/ and mitigation/remediation options, albeit that there are quite different issues to address on flat land and Port Hills areas.[10] There are also economic and pragmatic criteria. Engineering solutions for land/hazard remediation and/or risk mitigation must be economically viable and zones must be sensible – for example, defined along observable lines such as rivers and other topographical features, roads and/or property boundaries where engineering solutions and cost-effectiveness align.

28 CERA will continue to highlight to CCC the importance of these common factors and criteria to ensure that the CCC approach to the Port Hills is consistent with the Government's flat land zoning decisions. Further advice will be prepared for you by CERA during November/December 2011 immediately after update information is provided by CCC (ie, to help inform decisions on rebuild, remediation, retreat and funding options for the Port Hills recovery).

29 The basis for cost estimates will be an analysis of the assessment of potential mitigation/remediation options. The underlying cost-benefit approach to assessing life-safety risk will need to be generally consistent with the approach and methodology used for assessing recovery options for residential properties in other areas of greater Christchurch. This will be taken into account when finalising the approach and methodology to be used across advice relating to safety standards and regulation.

Consultation

Treasury and the Department of Prime Minister and Cabinet have been provided with a copy of this paper.

Financial implications

considers that any property is in imminent danger of suffering natural disaster damage, the Commission may, by written notice to the insured person, limit its liability for any such damage occurring after the time of receipt of the notice by the insured person to the amount for which the property is insured under this Act at that time.

[10] Flat land decisions primarily took account of options to address earthquake damage, while in the Port Hills the focus is on future risk, particularly from rockfall.

30 This paper has no direct financial implications. However, the CCC decision on the life-safety risk level will influence the extent of cost-effective remediation and retreat options, which may have financial implications for the government.

Recommendations

31 It is recommended that you:

1	**Note** that Christchurch City Council (CCC), as a regulator and owner of much of the Port Hills land on which geotechnical hazards occur, is leading work to address Port Hills recovery issues	**Note**
2	**Note** that CERA is actively supporting the CCC-led work, including the joint development of a Port Hills decision-making process including the approach to rezoning from White to Green (Attachment A)	**Note**
3	**Note** that CCC's approach to setting a tolerable life-safety risk for geotechnical hazards in the Port Hills is consistent with international best practice and Port Hills decision-making can be managed to ensure alignment with previous 'flat land' zoning decisions	**Note**
4	**Note** that shortly after the next, 10 November 2011, Council meeting CCC is expected to provide information to CERA that could potentially enable up to 800 'low risk' residential properties to be released from the Port Hills White Zone (ie, to go green)	**Note**
5	**Note** that before any rezoning decision about low risk properties could be made, ground truthing and Port Hills Geotechnical Group cross-checks for each property will need to be completed and such checks may take up to 3 weeks to complete	**Note**
6	**Note** that, because assessment work around the hazards/risks and mitigation/retreat options for the properties that will remain in the Port Hills White Zone will be very complex, extensive and time consuming, it will be early 2012 before final advice can be prepared on rebuild, remediation, retreat and funding options for this area	**Note**
7	**Forward** this briefing note to the Minister of Finance, the Associate Minister of Finance (Hon Steven Joyce), the Minister of Housing, the Minister for the Environment, and the Associate Minister for Canterbury Earthquake Recovery (Maurice Williamson) for their information.	**YES / NO**

NOTED / APPROVED / NOT APPROVED
Hon Gerry Brownlee **Minister for Canterbury Earthquake Recovery**
Date: / / 2011

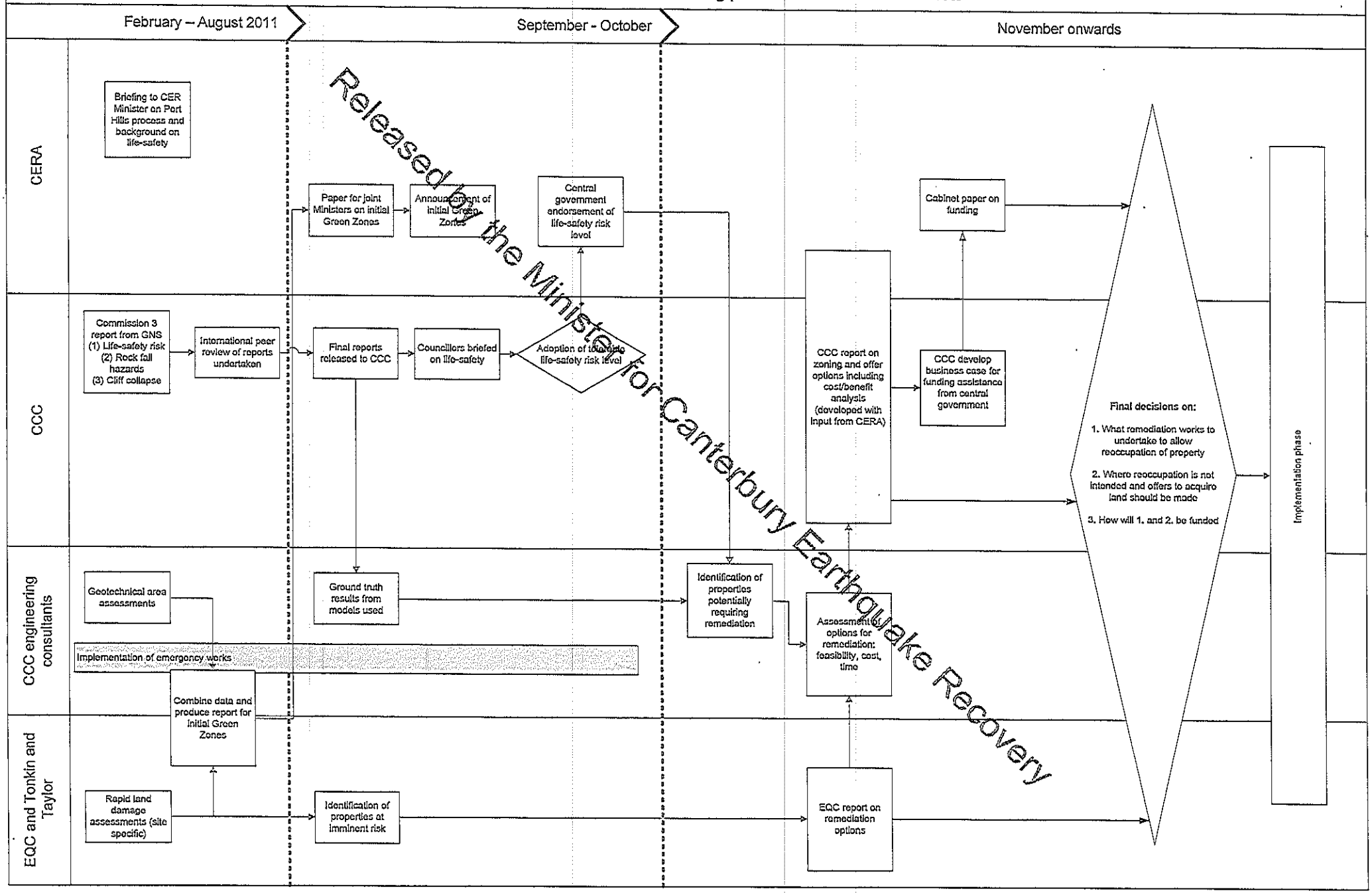
Diane Turner
General Manager – Strategy, Planning and Policy

Attachment A: Port Hills Decision Process Diagram

(Attached below this page as a separate hard-copy document)

Attachment B.

Recovery of the Port Hills: Decisions relating to geotechnical hazards from Council land affecting private land and Council assets



Attachment B: Best-practice assessment of tolerability for life-safety risks

The Joint Australia New Zealand International Standard on Risk Management – Principles and Guidelines (AS/NZS ISO 31000:2009) describes three key risk management process steps: (1) Risk identification; (2) Risk analysis; and (3) Risk evaluation.

Life-safety risk assessments are considered as part of the risk analysis step and can be assessed qualitatively, quantitatively or a combination of both. Quantitative assessments are considered the most robust as they are based on data and information rather than guesswork.

Life-safety risks are calculated as probabilities and are the likelihood that an individual may die from an event occurring in a one year period. For example, a life-safety risk of 10^{-3} means that an individual has a 1/1000 (1 in 1,000) chance of dying in a year. A life-safety risk could be calculated for travelling on New Zealand roads: about 400 people die each year on the roads out of a population of 4 million. This equates to a life-safety risk of 10^{-4} (1 in 10,000).

This type of calculation can be modified to include the expected exposure of an individual to the risk. For example, the greater the number of kilometres travelled each year by an individual on the roads the higher the risk level they will face.

International best-practice from the United Kingdom, Netherlands, Australia and New Zealand has led to a description of tolerability for life-safety risks. This has been adapted to the New Zealand context (see the Table on the following page). A life-safety risk is considered less tolerable when an individual is involuntarily exposed to it, or where they are exposed to risk by virtue of where they work or live. Whereas those who choose to undertake a risky activity for some benefit (eg, a person undergoing risky medical treatment) are often willing to tolerate higher levels of risk.

In New Zealand, the Ministry of Civil Defence and Emergency Management has commissioned reports on risks posed by the Ruapehu lahar and the flood risk to a holiday park by the Waiho River. Both of these reports utilise life-safety risks as a measure for determining tolerable risk levels. In the report for the Waiho River, a range of tolerable life-safety risks are discussed in the context of risk from dams and industrial plants. 10^{-5} (1 in 100,000) is the risk level the report uses as a comparison for the actual risks faced by residents of the holiday park on the edge of the Waiho River.

Table: International best-practice assessment of tolerability for life-safety risks

Tolerability	Risk level (individual annual fatality risk)	Significance in the New Zealand context	Recommendation from the GNS report
Tolerable	10^{-6} to 10^{-7} per year and lower (1 in 1 million to 1 in 10 million per year and lower)	Unlikely to be nationally significant unless there are some very special features at risk	Consider reoccupation
	10^{-5} to 10^{-6} per year (1 in 100,000 to 1 in 1 million per year)	Many New Zealanders probably already face natural risks at home and at work of this scale. Might want to avoid new consents to add to the numbers where possible.	
Generally tolerable	10^{-4} to 10^{-5} per year (1 in 10,000 to 1 in 100,000 per year)	Some New Zealanders probably already face natural risks at home and at work of this scale. Definitely avoid new consents to add to the numbers where possible.	Consider reoccupation of existing residential areas Consider remediation to reduce risk or disallow new residential development
	10^{-3} to 10^{-4} per year and higher (1 in 1,000 to 1 in 10,000 per year)	Government should not be comfortable if risks at this level are being imposed on people without their consent, or with people being induced to accept risks at this level.	Consider remediation to reduce risk to tolerable levels, or retreat
Intolerable	10^{-2} to 10^{-3} per year (1 in 100 to 1 in 1,000 per year)	Widely regarded as intolerable even for beneficiaries of an activity with a degree of control over the risk. There needs to be special reasons to tolerate any kind of individual risks at this scale from any cause	
	Above 10^{-2} per year (1 in 100 and higher)	Intolerable for almost any accidental cause in any developed country. Even if the risk is entirely for the benefit of the exposed person special care is warranted to ensure the recipient really understands and accepts the risk	