



Canterbury Earthquake Recovery Authority

To Minister for Canterbury Earthquake Recovery

Subject Process for decisions on Port Hills

Action required

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Withheld under section 9(2)(s)(i)

Withheld under section 9(2)(a)

It is recommended that you:

- 1 **Note** Christchurch City Council's role in leading hazard risk management regarding tolerable life-risk for the Port Hills area; **Note**
- 2 **Note** the implications of the Council adopting a tolerable life-safety risk level; **Note**
- 3 **Note** decisions on Port Hills likely to require central government input (e.g. life-risk and potentially funding) and officials will report back to you separately on this. **Note**
- 4 **Note** officials will report back to Ministers CER and Finance by 4 August 2011 on potential areas to be re-classified as Green for potential announcement mid-August; **Note**
- 5 **Note** the following next steps: **Note**
 - 5.1 3 reports from GNS on life-safety risk issues in the Port Hills, expected by *mid-late August*;
 - 5.2 adoption of a tolerable life-safety risk level for geotechnical hazards, expected from Christchurch City Council by the *end of August*.

Hon Gerry Brownlee

Minister for Canterbury Earthquake Recovery

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Released by the Minister for Canterbury Earthquake Recovery

Purpose of report

- 6 This briefing note outlines:
 - 6.1 Hazard assessment work completed to date in the Port Hills;
 - 6.2 Next steps to be carried out to enable an announcement of re-classification of some areas of the Port Hills to Green Zones;
 - 6.3 The significance of the adoption of life-safety risk levels;
 - 6.4 Some of the potential implications for central government in respect of the Port Hills.

Background

- 7 On 27 June 2011 Cabinet noted the issues on the Port Hills are of a different nature to the low-lying areas and will be addressed in a separate paper (CAB Min (11) 24/15 refers). The Port Hills areas have not suffered the same type of area-wide land damage (namely liquefaction and subsequent lateral spreading).
- 8 Area-wide land damage in the Port Hills is characterised by the following:
 - 8.1 rock fall risk;
 - 8.2 cliff collapse;
 - 8.3 debris inundation; and
 - 8.4 land movement (slipping and rifting).
- 9 Further significant damage has occurred as a result of the recent 13 June aftershocks and a number of areas have required reassessment by the Port Hills Geotechnical Group and Tonkin & Taylor.

Implications of further seismic activity

- 10 The 22 February and June aftershocks caused significant land movement and rock displacement in the Port Hills. There is a high probability that seismic activity will be ongoing in the greater Christchurch area with a 94% probability of a magnitude 5.0–5.9 aftershock occurring in the year from 15 July 2011.
- 11 If an aftershock of magnitude greater than 5.5 occurs within in the Port Hills, or immediate surroundings, a complete reassessment of the Port Hills area would be required. This would significantly increase timeframes and costs for remediation and retreat.

Hazard assessment work undertaken to date

- 12 The Port Hills Geotechnical Group comprises six geotechnical engineering companies and is led by the Christchurch City Council to collect and review data from geotechnical hazards arising from the earthquakes of 22 February and 13 June 2011 (and associated aftershocks).
- 13 The primary objective has been to assess existing damage to properties, lifelines and infrastructure from recent earthquakes and their aftershocks. The secondary objective

was to identify areas that are at heightened risk from large-scale geotechnical hazards and to prepare mitigation measures to deal with those hazards. Geotechnical hazards on the Port Hills include large-scale land movement (slippage and land cracking), cliff collapse, debris inundation and rock fall.

- 14 The outcome from the work undertaken by Port Hills Geotechnical Group to date is geotechnical hazard maps showing areas where properties, infrastructure and lifelines on the Port Hills were damaged from recent earthquakes and their aftershocks. These maps are also showing their assessment of areas with an increased risk from geotechnical hazards, but also areas where there was no damage and there is minor to very low risk from geotechnical hazards.
- 15 To ensure safety, the Christchurch City Council has issued notices under the Building Act to a list of properties identified by the Port Hills Geotech Group as affected by life-safety issues. These Building Act notices (section 124) prohibit entry to the property and maintain the status quo that has been put in place by the February and June red stickers. They are not part of any future classification of land on the Port Hills regarding future occupation.

EQC assessments

- 16 The information assessed was collected on behalf of Christchurch City Council specifically to identify life safety issues and is a global (macro scale) rather than site-specific assessment. It complements but does not replace site specific assessments undertaken by EQC for insurance purposes. Site-specific assessments for EQC have been undertaken by Tonkin and Taylor. Primary criteria for assessment were; site-specific minor to severe landslide damage, retaining wall failures, minor to major rock fall damage, imminent risk of rock fall damage and risk to lifelines or life-safety risk.
- 17 The outcome of this work is land damage map on a lot-by-lot basis showing where an individual property is at risk from geotechnical hazards. This map is *currently* being finalised by Tonkin and Taylor.

Next steps before any re-classification announcements can be made on the Port Hills white zone

- 18 Several pieces of work must be carried out **before** any announcements on the Port Hills White zone can be made. This work is expected to take 3-4 weeks, and is critical to understanding the hazards and risks to property on the Port Hills.
- 19 These steps are:
 - 19.1 Receive finalised land damage map from Tonkin and Taylor;
 - 19.2 Combine the Port Hills Geotechnical Group and Tonkin and Taylor land damage maps, including drafting of a final combined map;
 - 19.3 Interpretation of the final combined map to identify distinct areas that can be classified as Green at this stage, and rationale provided on why they are considered safe;
 - 19.4 Drafting of a new zone classification map for the Port Hills showing some Green Zones, and the remainder of residential areas as Orange Zones;
 - 19.5 Report back to Ministers CER and Finance by 4 August 2011 on potential areas to be re-classified as Green for potential announcement mid-August;
 - 19.6 Updating of Landcheck website data layers ready for the announcement.

- 20 The land damage map from the Port Hills Geotechnical Group prepared on the macro-scale hazards must be combined with the site-specific land damage map from Tonkin and Taylor to produce one coherent and consistent map before any decisions can be made regarding to properties risk level from geotechnical hazards.
- 21 Assessing the hazards and life-safety risk using only one of the maps cannot be done as the assessments were developed independently. Any individual property may show up as a risk on one map but not on the other. Instead the information needs to be compiled into a single new map, to give a definitive answer on the hazards for any given property.
- 22 Once the combination and interpretation of the maps is completed, we expect to be able to advise joint Ministers that some areas of the Port Hills can be classified as Green, and the remainder will be classified Orange. Green Zone properties may have some building and land damage but should be readily fixable by EQC and private insurers. (Green Zones in the Port Hills will have the same definitions as Green Zones in the flat-land areas of Christchurch City.)
- 23 It is expected an announcement on some Green Zones could be made by mid-August 2011. The Green Zones may include Westmorland, and Diamond Harbour. More Green Zones will be announced for the Port Hills at a later date.

Further steps required for subsequent announcements on the Port Hills

- 24 As noted above, recovery of the Port Hills is being lead by the Christchurch City Council. CERA is developing with the Council and EQC, a process for key decisions. The following steps will be required prior complete re-classification of the Port Hills White zone to either Green or Orange zones. Timeframes are indicated where known from the Council.
 - 24.1 receipt of 3 reports from GNS, on life-safety risk issues in the Port Hills, expected by *mid-late August*;
 - 24.2 adoption of a tolerable life-safety risk level for geotechnical hazards, expected by the *end of August*;
 - 24.3 detailed geotechnical assessment of remediation options and their effectiveness, including costing expected by the *end of September*;
 - 24.4 assessment of possible timing and social impacts for remediation and retreat options expected by the *end of September*;
 - 24.5 an assessment of funding sources and options, including that provided by EQC through mitigation of an imminent risk posed as a direct result of natural disasters, expected by the *end of September*;
 - 24.6 final decisions from Cabinet, Council and EQC on recovery and funding options *expected to be mid-October*;
 - 24.7 remediation work is continuing on the Port Hills now, which will enable lot-by-lot assessment by PHGG, peer-reviewed by Christchurch City Council appointed geotechnical specialist, to determine if hazards have been removed, mitigated or still existent, and risk reduced to an acceptable level (*timing to be advised*);
 - 24.8 removal of Building Act section 124 notices and Orange zones re-classified to Green or areas of retreat.

Critical decision regarding tolerable life-safety risk

- 25 The Christchurch City Council must adopt a tolerable life-safety risk level for the Port Hills for risk from rock fall, cliff collapse and debris inundation before the remainder of decisions regarding remediation and retreat of these areas can be made. The Council is

required by the Civil Defence Emergency Management Act 2002, and the Canterbury Civil Defence Emergency Management Group Plan to identify and assess hazards, and to develop hazard reduction measures. In order to do this, the Council is following international best-practice by adopting tolerable life-safety risk levels.

- 26 Life-safety risks are calculated as probabilities and are the chance that any individual may die in a one year period. For example, a life-safety risk of 10^{-4} means that an individual has a 1/10000 (1 in 10000) chance of dying in a year.
- 27 The GNS papers only provide guidance for tolerable life-safety risk from a probabilistic perspective. Ultimately it is up to the community and the authorities to decide on what levels of risk are or are not acceptable in making decisions on the rebuilding, reoccupation and/or retirement of properties.
- 28 A GNS paper will help inform which level should be adopted for the Port Hills *Risk assessment criteria for evaluating earthquake-induced hazards, Saunders and Berryman 2011*¹. The adoption of tolerable life-safety risks for the Port Hills will be made by the Council by the end of August.
- 29 Two further GNS papers on life-safety risks (one on rock falls and one on cliff collapse) will then be considered for adoption by the Council. Together their adoption will enable hazard maps to be developed identifying properties at risk on a lot-by-lot basis. These maps are produced by models specific to the Port Hills and assess risk over a 50 year timeframe using the life-safety risk level adopted by Council as a critical input.
- 30 The Crown may have an interest in which risk-level is adopted as tolerable, given it may set a precedent across New Zealand for managing geotechnical hazards. No other councils have adopted tolerable life-safety risk levels for such hazards. The decision will also ultimately determine the level of funding required to recover from the earthquakes in the Port Hills, which may have implications to the Crown.

Life-safety risk adoption Option A: Cabinet approve a tolerable life-safety risk level which Christchurch City Council would then adopt and use to determine the number of properties affected by geotechnical hazards

Life-safety risk adoption Option B: Christchurch City Council adopt a tolerable life-safety risk and use to determine the number of properties affected by geotechnical hazards

- 31 Officials will provide further advice on these options next week.

Summary of life-safety risk criteria and interpretation

- 32 The table below summarises life-safety risk recommendations from the GNS paper by Saunders and Berryman, and the recommendations for the Port Hills from the separate GNS report on life-safety risk from rock falls. Note that these papers are not yet officially released.

¹ Saunders, W., Berryman, K. 2011. Proposed Risk Assessment Criteria For Evaluating Earthquake-Induced Slope Instability Hazards in Port Hills Suburbs. GNS Science paper V2.

From Saunders and Berryman (2011)		GNS report on life-safety risk from rock falls in the Port Hills
Risk level (individual annual fatality risk)	Significance	Recommendations
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 of these residences, provided residents are well informed of future life risk arising from land instability in the Port Hills suburbs. Property specific assessments should be carried out, and the opportunities for engineering mitigation considered. If these are not viable or cost-effective, then consider retreat.
10 ⁻⁵ to 10 ⁻⁶ per year (1 in 100000 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.	
10 ⁻⁴ to 10 ⁻⁵ per year (1 in 10000 to 1 in 100000 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.	
10 ⁻³ to 10 ⁻⁴ per year and higher (1 in 1000 to 1 in 10000 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.	

33 Life-safety risks can be calculated for travelling on New Zealand roads and are used as a comparison to the risks calculated for rock fall on the Port Hills in the GNS report. About 400 people die each year on the roads out of a population of 4 million. This equates to a life-safety risk of 1×10^{-4} (1 in 10000).

Impacts of geotechnical hazards on the Port Hills

34 Preliminary geotechnical (area-wide) assessments have been undertaken in the Port Hills. The Port Hills Geotechnical Group estimated 1500 properties are subject to geotechnical hazards, with some 480 properties deemed uninhabitable until remediation works are completed. Some properties may not be able to be reoccupied and/or rebuilt as remediation is technically and economically unviable. It is estimated the number of properties in this category is around 120.

35 The tolerable life-safety risk level adopted, and the site-specific assessments by Tonkin and Taylor by will impact on these figures. They are likely to increase.

36 Land movement impacts include both slippage and renting (cracking or tearing) of land. This will require on going monitoring and arising issues may need to be resolved at a later stage.

Recommendations

It is recommended that you:

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