



# **Building on the Edge**

The Use and Development of Land On or Close  
to Fault Lines



*Office of the*  
**PARLIAMENTARY COMMISSIONER FOR THE ENVIRONMENT**  
Te Kaitiaki Taiao a Te Whare Pāremata



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PO Box 10-241 Wellington [www.pce.govt.nz](http://www.pce.govt.nz)  
March 2001

## PHOTOGRAPHY & MAP CREDITS:

Institute of Geological & Nuclear Sciences

*“The Wellington fault line cutting across Wellington City”*

Institute of Geological & Nuclear Sciences

*“Active Faults identified in New Zealand”*

**ISBN: 0-908804-96-2**

## P R E F A C E

The shape of the New Zealand landscape is strongly influenced by two forces: human endeavour and tectonic plate movement. We have built our towns, cities and homes on land that is constantly subject to fracturing and differential movement as the eastern Pacific Plate grinds against and dives below the Australian plate to the west. Our history is of a settler people who have come to New Zealand seeking a better life and the freedom to live in ways and places where basic needs can be met and free reign can be given to creative impulses. Our history is also one of lives and homes lost through earthquakes, volcanic eruptions and landslips.

Over time successive governments have established a system of agencies and processes designed to mediate the impacts of these two forces and to protect us and the landscape from their adverse effects. The aim has been to establish a system enabling New Zealanders to survive and build on the edge. Like all human constructions, however, this system is constantly in need of improvement. Incremental improvements are a common response to system inadequacies but the cumulative effect of such changes is often a structure whose shape and internal relationships is a mystery to many people.

The Parliamentary Commissioner for the Environment has the function of reviewing resource management systems established by the Government and where appropriate advising relevant authorities on where action is required to make the system more effective. Citizens' surveillance of resource management processes and their communication of concerns to the Commissioner are essential elements of the review process. Investigations of citizens' concerns provide an opportunity to research and describe resource management systems as they are currently organised and to identify where there might be a lack of capability to respond effectively with preventive measures and remedial action, to natural or human activities adversely affecting the quality of the environment.

This report is the result of the efforts of many people. I would like to acknowledge the valuable contribution made by the people and organisations who gave freely of their time to meet with the investigation team or who provided submissions. Particular thanks go to retired geologist and Waikanae resident Mr Gerald Lensen, whose concerns about a resource consent granted by the Kapiti Coast District Council prompted my investigation and to my colleagues in the Office of the Parliamentary Commissioner for the Environment, Sarah Ireland, who undertook the bulk of the research and writing; Helen Beaumont who provided an internal review; Philip Hughes, who assisted with the planning of the investigation and the interviews; Jenny Robertson, who edited the report and Liz Shanks who assisted with the report layout.

**Bob McClymont**  
**Director Citizens' Concerns**  
**March 2001**

## EXECUTIVE SUMMARY

New Zealand is located over an active plate boundary and many parts of the country face a risk of earthquake damage within people's lifetimes. Addressing earthquake events to minimise loss of life and damage to property is a national issue. There is concern about the ability of the Building Act 1991 (BA) and the Resource Management Act 1991 (RMA) to adequately manage the use and development of land on or close to fault lines. This was conveyed to the Parliamentary Commissioner for the Environment (PCE) by a Kapiti Coast resident, with extensive experience in earth deformation, who drew attention to the granting of resource and building consents for the development of a local retirement complex sited over an active fault trace and unstable hill slope. Further information from the Earthquake Commission raised difficulties with section 36(2) of the BA, which impacts on insurance coverage for landowners. The New Zealand Geological Society raised concerns about the sufficiency of weight given to scientific evidence in reaching resource consent decisions.

The purpose of this investigation, conducted under section 16(1)(b) of the Environment Act 1986, is to assess the effectiveness of environmental planning and management carried out by public authorities for the use and development of land on or close to fault lines. The terms of reference are to identify key issues and any problems with the legislation governing the use and development of land on or close to fault lines and its implementation by local authorities; and to report on the outcomes of the investigation to the relevant public authorities.

Consultation took place with each of the agencies and organisations listed on page 2, as well as with the individual who raised the matter. Ideas were sought on gaps and possible improvements to the New Zealand system for addressing the use and development of land on or close to fault lines.

The resulting report outlines the current statutory regime and the key responsibilities of each of the agencies involved. The relevant work of the Building Industry Authority, the Department of Internal Affairs, the Ministry for the Environment, the Institute of Geological and Nuclear Sciences and the Ministry for Emergency Management is briefly described in so far as it impacts on land development and use over fault lines.

The following issues are discussed:

- access to information on risk, risk assessment and risk management;
- regional and district planning;
- building consents, the Building Code and integration between the Building Act 1991 and the Resource Management Act 1991;
- monitoring, education and guidance under the Building Act 1991; and
- issues in relation to section 36(2) of the Building Act 1991, including the need to educate people about their potential risk before the grant of building consent and before a property is purchased.

## C o n c l u s i o n s

Key conclusions reached are that:

- Buildings sited across faults that rupture in an earthquake will typically be more badly damaged than adjacent buildings, and that there is no existing technology that will prevent damage to buildings caused by fault rupture. For this reason it is widely accepted that it is inappropriate to site buildings on or close to active faults.
- Few of the territorial authorities investigated in the recent Institute of Geological & Nuclear Sciences study identified seismic hazard in their district plans and even fewer rules in their plan for managing earthquakes.
- The role of territorial authorities and district planning is pivotal because councils are responsible for issuing subdivision and land-use consents and also have responsibility for issuing building consents.
- Practical guidelines are urgently needed to enable councils to discharge their RMA responsibilities for the avoidance or mitigation of earthquake hazards. However, before this can be achieved, ways to incorporate information on seismic hazards and their management into plans and policy statements, and the most appropriate planning options for reducing risk need to be determined.

It is important that:

- Local authorities obtain accurate and relevant scientific information to enable them to assess and manage seismic risk.
- This information is incorporated into the objectives, policies and rules in district and regional plans and policy statements in a consistent manner.
- There is a system whereby territorial authorities and regional councils can regularly update scientific information on seismic hazards.
- The district plan identifies fault lines and areas of seismic hazard and provides for appropriate rules in these areas, with provision for site-specific investigations to be carried out and guidelines for those investigations.
- Territorial authorities do not rely solely on the building consent process to control development on or close to fault lines.
- At all times there is an integrated system for implementing and administering the RMA and BA and the building and resource consent processes.

## R e c o m m e n d a t i o n s

To address the deficiencies identified in the current system for managing the use and development of land on or close to earthquake fault lines, it is recommended that priority be given to:

1. The Ministry for the Environment working together with the Institute of Geological & Nuclear Sciences and other interested organisations with structural and geotechnical expertise to develop best practice guidelines for territorial authorities in avoiding or mitigating seismic hazard through the district plan process.

An essential first step will be the identification of barriers to incorporating scientific information into the policies, objectives and rules in plans and policy statements under the Resource Management Act 1991; the investigation and evaluation of planning and other options to reduce risk in different situations depending on seismic hazard type and the level of certainty that exists; and establishing a dialogue with local authorities to increase awareness of seismic problems and potential solutions.

2. The Department of Internal Affairs addressing in its current review of the Building Act 1991 the difficulties being experienced with the application of s36(2) of the Building Act 1991; and issues concerning the ongoing monitoring, enforcement, compliance, education and guidance under the Building Act 1991. This will need to be carried out in conjunction with the Building Industry Authority as the primary agency responsible for education and dissemination of information under the Building Act 1991, and for reviewing the operation of territorial authorities in relation to their functions under that Act.

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# 1. BACKGROUND

New Zealand is located over an active plate boundary. This means that most parts of the country are likely to suffer damage from earthquakes within a human lifetime.<sup>1</sup> While some regions, for example Wellington, are more at risk from earthquake than others, addressing earthquake events to minimise loss of life and damage to property is a national issue.<sup>2</sup> A map showing Active Faults identified in New Zealand is appended to this report (see Appendix II).

In May and August 2000 the Parliamentary Commissioner for the Environment (PCE) received correspondence from a citizen with 40 years research experience in earth deformation expressing concern about Kapiti Coast District Council's decision to grant resource and building consents to Winara Village Ltd for the development of a retirement complex situated over an active fault trace and unstable hill slope (see Box 1). Concern was expressed that the Building Act 1991 (BA) and Resource Management Act 1991 (RMA) were deficient in terms of their lack of control over the use and development of land on or close to fault lines.

The PCE also received correspondence from the Earthquake Commission (EQC) and the New Zealand Geological Society (NZGS). EQC was concerned about the application of section 36(2) of the BA and the consequent insurance implications for landowners. NZGS was concerned that despite correct RMA procedures being followed, a number of resource consent decisions were being made with insufficient weight given to scientific evidence, resulting in unsatisfactory outcomes.

Under section 17 of the Environment Act 1986 the PCE is required in the exercise of his powers to have regard to:

- (d) The effects on communities of people of -
  - (i) Actual or proposed changes to natural and physical resources:
  - (ii) The establishment or proposed establishment of new communities:
- (f) All reasonably foreseeable effects of any such proposal, policy or other matter on the environment, whether adverse or beneficial, short term or long term, direct or indirect, or cumulative.

**Thus, the PCE has decided to investigate the general issue of how public authorities are addressing the use and development of land (including the construction of new buildings) on or close to fault lines.** The investigation deals primarily with land on or close to fault lines, which is likely to be subject to fault rupture.

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<sup>1</sup> In terms of the requirements of the Building Act 1991 (BA) all parts of New Zealand are likely to experience an earthquake having a return period of 450 years.

<sup>2</sup> There have been major earthquakes in Marlborough (1848), Wairarapa (1845), North Canterbury (1890s), Murchison (1929), Napier (1931), Inangahua (1968) and Edgecumbe (1987).

## 1.1 Purpose of investigation

Pursuant to section 16(1)(b) of the Environment Act 1986, the purpose of this investigation is to assess the effectiveness of environmental planning and management carried out by public authorities in respect of the use and development of land on or close to fault lines.

## 1.2 Terms of reference

- To identify key issues and any problems with the legislation governing the use and development of land on or close to fault lines and its implementation by local authorities.
- To report on the outcomes of the investigation to the relevant public authorities by the beginning of March 2001.

The investigation is not an assessment/audit of Kapiti Coast District Council's performance in respect of the Winara Village Ltd proposal (see Box 1).

## 1.3 Methodology

In September 2000, staff of the PCE met with a number of agencies and organisations involved in the use and development of land on or close to fault lines, as well as the correspondent who raised the matter. These included the:

Building Industry Authority (BIA)  
Building Research Association of New Zealand (BRANZ)  
Department of Internal Affairs (DIA)  
Ministry for the Environment (MFE)  
Geological Society of New Zealand (GSNZ)  
New Zealand Society for Earthquake Engineering (NZSEE)  
Institute of Geological and Nuclear Sciences (GNS)  
Earthquake Commission (EQC)  
Kapiti Coast District Council (KCDC)

In addition, submissions on the draft report were received from the Ministry for Emergency Management (MEM), concerning its role in risk management of seismic events, and the Wellington Regional Council (WRC). These were taken into account in completing this report.

The different groups consulted by the PCE were asked to consider the current system of agencies and processes for the management of the use and development of land on or close to fault lines, with regard to their particular area of expertise. They were asked to comment on any concerns they had with the current system and on ways in which the system could be improved. During the course of this investigation a number of peripheral issues also arose concerning monitoring and education under the BA, and the application of section 36(2) of that Act.

The issues section of this report (Section 3) records the various views of these different agencies and organisations, followed by an evaluation of these concerns by the PCE.

### **BOX 1 WINARA VILLAGE LTD DEVELOPMENT**

Under the Kapiti Coast District Plan building construction within 20 metres of a fault trace is a controlled activity. This means that Kapiti Coast District Council (KCDC) cannot decline to issue resource consent but can only impose conditions on the consent according to the matters that it has reserved control over in the district plan.

The Winara Village application for land use and earthworks consents\* to build a retirement complex comprising 156 residential units was publicly notified in November 1998 and approximately 45 submissions were received. A pre-hearing

meeting was held and then the Council hearing in February 1999. One of the key issues of concern was the suitability of the land for development given that the property was likely to straddle a fault trace, evidence of which had been discovered at both ends of the property. It was considered likely that the fault trace on the property had been buried and masked by alluvial material.

KCDC considered that the applicants had obtained appropriate expert advice regarding the location of the fault. The consents were granted with conditions that a further site investigation should be undertaken by a suitably qualified person to locate the fault line. It was recognised, however, that it was probable that the results would be inconclusive. There was also a condition that if the fault line could be precisely located, then KCDC could review the conditions of the consent and if it was recommended, the development layout and design could be modified.

KCDC's decision was appealed by both the applicants and submitters to the Environment Court and settled by consent order dated 23 December 1999. This order tightened up the above conditions to ensure that during the site investigation, appropriate geological evidence was cited to support the conclusions reached, and that if warranted KCDC would review the consent and could insist the design was altered to ensure that there were no buildings constructed over the fault line. The number of residential units was also reduced by seven to 149.

This case illustrates two points in relation to planning for earthquake hazards:

1. The uncertainty in determining the location of the fault line and the level of scientific proof that is required.
2. The importance of appropriate provisions in the district plan. KCDC could not turn down the consent on the grounds that the development would straddle a possible fault trace because it was a controlled activity in the district plan.

Since this application, KCDC has released a summary of submissions for a plan change to require that building within 20 metres of an earthquake fault trace, as shown on the planning maps, is a discretionary rather than controlled activity. This means that while applications for resource consent to build within 20 metres of a fault trace could still be made, KCDC could turn the application down or require the design to be amended.

\*The land had already been granted subdivision consent.

## **2. THE CURRENT REGIME: KEY LEGISLATION AND AGENCIES**

### **2.1 Key legislation**

The Resource Management Act 1991 (RMA) and the Building Act 1991(BA) are the two key pieces of legislation that influence the use and development of land (including the construction of new buildings) on or close to fault lines. The provisions of the RMA address the sustainable management of natural and physical resources and govern what activities can take place on a particular site, e.g. building; and the BA governs how buildings can be constructed. However, where buildings are sited on land subject to seismic and other natural hazards there is some overlap between the two pieces of legislation.

#### *2.1.1 The Resource Management Act 1991*

The RMA defines "natural hazard" to mean "any atmospheric or earth or water related occurrence (including earthquake, tsunami, erosion, volcanic and geothermal activity, landslip, subsidence, sedimentation, wind, drought, fire or flooding) the action of which adversely affects or may adversely affect human life, property, or other aspects of the environment."<sup>3</sup> Under sections 30(1)(c)(iv) and 31(b) of the RMA, both regional councils and territorial authorities have responsibilities to provide for the avoidance or mitigation of natural hazards.

Both territorial authorities and regional councils may impose requirements in relation to the siting of buildings in areas subject to natural hazards for resource management purposes. In *Christchurch International Airport Ltd v Christchurch City Council*<sup>4</sup> the High Court found that section 7(2) of the BA did not prevent local authorities imposing conditions or promulgating rules for planning or resource management purposes despite the fact that the conditions or rules affected the construction of buildings. The Court found that the Building Code could be exceeded when resource management considerations justified such a departure. The question is whether or not preventing or controlling the siting of buildings on or close to fault lines is a legitimate resource management issue. The Court of Appeal has accepted that both territorial authorities and regional councils may have rules in their plans controlling the erection of new buildings in flood plains because it is within both agencies' powers to control the use of land for the avoidance or mitigation of natural hazards (see Appendix I).<sup>5</sup>

Most organisations consulted during this investigation believed preventing or controlling the siting of buildings on or close to fault lines was a legitimate resource management issue. The Building Industry Authority,

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<sup>3</sup> Resource Management Act 1991 (RMA) s2.

<sup>4</sup> *Christchurch International Airport Ltd v Christchurch City Council* [1997] NZRMA 145, 150-152 [*Christchurch Airport*].

<sup>5</sup> *Canterbury Regional Council v Banks Peninsula District Council* [1995] 3 NZLR 189, 196.

however, expressed the view that this could be more appropriately dealt with under the BA and Building Code.

Controls that may be exercised by territorial authorities through the district plan include: declining subdivision and land use consents, requiring special studies to be carried out, or imposing special conditions in seismic hazard areas. This investigation seeks to gain a better understanding of the issues associated with whether or not territorial authorities are exercising such controls effectively (see Section 3).

Section 35(5)(j) of the RMA imposes a duty on local authorities to gather information and undertake research to fulfil their functions under that Act. This includes information identifying fault lines and other seismic hazards in order to avoid or mitigate their effects. Section 26 of the BA imposes a similar duty.

### *2.1.2 The Building Act 1991*

The BA is designed to provide necessary controls relating to building work to ensure buildings are safe and sanitary.<sup>6</sup> These controls are to be co-ordinated with other controls relating to building use and the management of natural and physical resources.<sup>7</sup> The First Schedule to the Building Regulations 1992 sets out the Building Code, which is a series of minimum performance criteria for buildings.

Provided that a territorial authority is satisfied on reasonable grounds that a building complies with the Building Code, and the plans lodged in support of the consent are followed, a territorial authority must grant a building consent.<sup>8</sup> If it is not so satisfied, then it must either refuse consent or grant a waiver or modification of the Building Code.<sup>9</sup> Unless specifically provided for in another Act, no person can be required to achieve performance criteria in addition to or more restrictive than that specified in the Building Code.<sup>10</sup>

Clause B1 of the Building Code specifies structural performance criteria for buildings, including that buildings shall “have a low probability of rupturing, becoming unstable, losing equilibrium, or collapsing during construction or alteration and throughout their lives.” Account must be taken of “all physical conditions likely to affect the stability of buildings” including earthquake, and due allowance is to be made for “the characteristics of the site” and “accuracy limitations inherent in the methods used to predict the stability of buildings.

The Building Code is supported by series of Approved Documents (approved and issued by Building Industry Authority), which set out one means of complying with the Building Code. Approved Document B1 cites the New Zealand Standard 4203 *Code of Practice For General Structural Design and Design Loadings For Buildings* (NZS 4203). That document requires buildings to be designed to resist an earthquake with a return period of 450 years. However, Approved Document B1 specifically states that NZS 4203 cannot be used for the design of buildings in close proximity to a fault.

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<sup>6</sup> Building Act 1991 (BA) s6(1)(a).

<sup>7</sup> BA s6(1)(b).

<sup>8</sup> BA s34(3).

<sup>9</sup> BA s34(4).

<sup>10</sup> BA s7(2), however, see *Christchurch Airport* above n 4.

Another design may be used but only if the territorial authority is satisfied that the building meets the requirements of Clause B1 of the Building Code.

These provisions relate to how buildings are to be designed and constructed rather than where they are able to be located. However, if a building does not meet the structural performance criteria of the BA then it cannot be constructed on a particular site. Thus the BA does influence the location of buildings in close proximity to a fault.

## 2.2 Agencies

### 2.2.1 *Department of Internal Affairs*

The Department of Internal Affairs (DIA) administers the BA and is responsible for the implementation of government policy in respect of building. As part of its administration of the BA, DIA undertook two surveys (1994 and 1996) to measure how territorial authorities were implementing the new building controls process and to investigate the views of key users.<sup>11</sup>

### 2.2.2 *Ministry for the Environment*

The Ministry for the Environment (MFE) administers the RMA. MFE was established by the Environment Act 1986 to advise on all aspects of environmental legislation including policies for influencing the management of natural and physical resources. MFE also provides Government with advice on the application, operation and effectiveness of environmental legislation, the identification and likelihood of natural hazards and reduction of the effects of natural hazards, and the provision and dissemination of information to promote environmental policies including environmental education and promoting effective public participation in environmental planning.<sup>12</sup>

### 2.2.3 *Ministry for Emergency Management*

The Ministry for Emergency Management (MEM) was established in July 1999 (replacing the Ministry of Civil Defence) to promote a new overarching civil defence emergency management framework. The role and functions of MEM include provision of overarching civil defence emergency management policy advice; ensuring that the establishment of civil defence emergency management groups throughout New Zealand give effect to the goals and objectives of the Government; managing Government response and disaster recovery functions for large scale events that are beyond the capacity of local authorities; liaising with the civil defence emergency management sector; and addressing issues of reducing future risk. MEM has a particular role to advise and support local authorities in managing hazards.

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<sup>11</sup> *The Building Control Process in Territorial Authorities 1990-1993* Local Government Information Series No. 9, Local Government and Community Services Group, The Department of Internal Affairs, June 1994. *Building Controls; Views of Key Users* Local Government Information Series No. 16 Local Government and Community Services Group, The Department of Internal Affairs, 1996 [DIA Studies]. Whilst local authority bylaws still governed the Building Controls Process until 1993, the 1993 DIA study was carried out at a time where the BA processes had been operating for just over half a year.

<sup>12</sup> Environment Act 1986 (EA) (a), (c) and (e).

### *2.2.4 Territorial Authorities and Regional Councils*

Both territorial authorities and regional councils have responsibilities in relation to addressing seismic hazard (see Section 2.1). The role of territorial authorities and district planning is pivotal because territorial authorities have responsibility for issuing subdivision and land use consents and also have responsibility for issuing building consents. Regional councils also have a role in providing information to territorial authorities about the location of seismic hazard areas.

### *2.2.5 Building Industry Authority*

The Building Industry Authority (BIA) is an independent Crown entity set up under the BA with the fundamental purpose of managing New Zealand's building legislation. Its functions include approving documents for use in establishing compliance with the Code, determining matters of doubt or dispute in relation to building control, undertaking reviews of the operation of territorial authorities and building certifiers, granting accreditations of building products and processes, and disseminating information and providing educational programmes on matters relating to building control.<sup>13</sup>

### *2.2.6 Earthquake Commission*

The Earthquake Commission (EQC) is responsible for administering insurance against natural disaster damage provided under the Earthquake Commission Act 1993. EQC also has the function of facilitating research and education about matters relevant to natural disaster damage and methods of reducing or preventing natural disaster damage.<sup>14</sup>

## 2.3 Current activity

BIA has reviewed the provisions of the BA in relation to existing earthquake prone buildings as opposed to new buildings on land subject to earthquake. In 1998 BIA, with advice from a study group of the New Zealand Society for Earthquake Engineering and after public consultation, submitted to the Minister of Internal Affairs a series of recommended amendments to the BA to address the shortcomings of the legislation in this area.<sup>15</sup>

DIA is currently undertaking a limited review of the BA and intends to release a discussion document in May 2001. This document will incorporate the amendments suggested by BIA in relation to earthquake prone buildings, but has wider terms of reference. The objective of the review is to identify legislative and non-legislative options for improving the effectiveness of the overall building control regime and quality of regulation provided for by the BA, with emphasis on identifying ways to achieve further innovation and efficiency. One of the specific items of review is the interaction of the BA with other statutes, including identifying possible conflicts.<sup>16</sup>

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<sup>13</sup> BA s12(1)(b), (c), (d), (f) and (g).

<sup>14</sup> Earthquake Commission Act 1993 (ECA) 5(1)(a) and (e).

<sup>15</sup> See the Building Industry Authority's website at [www.bia.co.nz/publicat/news99/earthq.html](http://www.bia.co.nz/publicat/news99/earthq.html)

<sup>16</sup> Department of Internal Affairs "Building Act Review – Terms of Reference" 22 December 1999 [DIA Review].

MFE has not done any work specifically in the area of natural hazard planning. However, as part of its Quality Plan Programme, MFE is carrying out a gap analysis and natural hazard planning could be one “gap” identified on which MFE could issue guidance to local authorities. Two related areas of work by MFE are on dam safety and flood plain management (undertaken through the Sustainable Management Fund).

The Civil Defence Emergency Management Bill (the Bill) was introduced in November 2000 and intends to repeal and replace the Civil Defence Act 1983. The Bill aims to improve and promote reduction of risks through processes and structures that encourage and enable communities to undertake risk management.

A National Civil Defence Emergency Management Strategy is a 10 year strategy that is currently being prepared by MEM. The strategy is to be in place one year following the enactment of the Bill and will provide overarching strategic direction for the civil defence emergency management sector throughout New Zealand. The strategy will be developed through a consultative process with key government agencies and local government.

In relation to managing earthquake risk, MEM encourages an integrated approach to hazard management at a local authority level, to link land use management with risk reduction. The mechanism to enable this integrated planning to take place will be through Civil Defence Emergency Management Groups which are a consortia of local authorities based on existing regional council boundaries, working in partnership with emergency services. These groups will be required to produce a Civil Defence Emergency Management Plan which will have a strategic component that binds together the elements of the 4R’s: reduction, readiness, response and recovery. The aim is to ensure integrated management of hazards and risks, for example, identifying earthquake risk priorities and co-ordinating appropriate research and reduction strategies to manage those risks.

The Institute of Geological & Nuclear Sciences (GNS) has recently completed a study analysing how earthquake hazards are addressed within a number of plans and policy statements in the Hawke’s Bay, Waikato and Bay of Plenty regions.<sup>17</sup> This is part of GNS’s Hazards and Society Research programme which aims to better understand the impact of hazards on society and ways of managing risk. **The GNS study indicates that despite significant areas of New Zealand being subject to seismic events, few councils in the GNS study specifically identified seismic hazards in their plans and the majority did not have rules in their plans for managing earthquake hazards.**<sup>18</sup>

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<sup>17</sup> In all 24 district plans and regional policy statements from those regions were analysed.

See Becker, J and Johnston, D, 2000. *Planning and Policy for Earthquake Hazards in New Zealand*. Institute of Geological & Nuclear Sciences Limited science report 2000/28, p6 [GNS Report]. See also Julia Becker and David Johnston, Institute of Geological & Nuclear Sciences, *District Plans and Regional Policy Statements: How do they address Earthquake Hazards?* Planning Quarterly (September 2000) p22-23 [Becker and Johnston].

<sup>18</sup> GNS Report, above n 17, p21. Becker and Johnston, above n 17, p23.

In February this year, EQC announced that it is contributing \$5 million a year for at least 10 years to GNS to upgrade the national surveillance system for geological hazards (GeoNet). GeoNet, which is to be phased in over several years, will provide accurate information on the location and severity of ground shaking caused by earthquakes. This information will contribute to the knowledge of seismic hazards throughout New Zealand and will be an improved base for making decisions about location and design of buildings and other structures.

### 3. ISSUES

Earthquakes are inherently unpredictable events. No one can be certain **when** or **where** they will occur (although estimates of return period and the magnitude of the last event can be gleaned from geology and history). Earthquakes can cause fault rupture, severe earthquake shaking, earthquake-induced landslip and liquefaction (see Box 2).

Fault rupture can be predicted with a degree of certainty, as it will most likely occur along a fault line because it is an existing zone of weakness. However, rupture along a bedrock fault line 200-300m below ground may have fewer predictable effects on the surface (particularly where there is a change in strike direction of the adjacent surface traces).

This report deals primarily with land on or close to fault lines, which is likely to be subject to fault rupture. However, other earthquake hazards also need to be considered by public authorities. For example, in some New Zealand cities, such as Christchurch, there are few major fault traces but significant areas of land subject to liquefaction. It can be argued that liquefaction poses a much greater risk than fault rupture because while fault rupture requires rupture of a specific fault, liquefaction can occur where earthquake shaking reaches a certain level, regardless of the source of the earthquake rupture. Building on liquefaction prone land is an issue that needs to be addressed. However, it is not discussed in this report.

#### **BOX 2 THE CHI-CHI, TAIWAN EARTHQUAKE\***

On 21 September 1999 an earthquake of magnitude  $M_w = 7.6$  hit central Taiwan. The epicentre was near the town of Chi-Chi, 120 km from Taiwan's capital city of Taipei. More than 2,400 people were killed and more than 10,000 injured. At least 16,500 buildings collapsed or were severely damaged and more than 100,000 people were rendered homeless. At November 1999 the total direct cost of the earthquake was estimated to be at least NZ\$21 billion.

Surface fault rupture occurred along the Chelungpu Fault over a length of 83 km with large vertical displacements. As a consequence a number of cities and towns were severely affected by the earthquake. Along with fault rupture, parts of the affected area also experienced earthquake induced landslide and liquefaction.

One of the sobering features of this earthquake was that the Chelungpu Fault had been carefully mapped prior to the event and it was considered that movement was expected at a return period of greater than 10,000 years. In addition, there was evidence that much of the physical damage to buildings

(and associated casualties) was due to ground deformation on or near the fault line.

The Chi-Chi earthquake illustrates a number of important points in relation to this investigation:

- Only the most robust buildings will withstand direct fault movement effects, and even then only with considerable damage. The only practical means of mitigating damage due to ground deformation on the scale of the Chi-Chi earthquake is to avoid the construction of facilities close to the fault.
- Faults can be extremely unpredictable, and having identified a fault, care needs to be exercised in the application of expected return periods.

\* Information extracted from the Bulletin of the New Zealand Society for Earthquake Engineering Inc, Volume 33, no 2, June 2000, p105-167.

### 3.1 Information, risk assessment and risk management

Information to enable local authorities to assess and manage seismic risk and the difficulties in assessing that risk because of the unpredictability of any event is an important aspect of the use and development of land on or close to fault lines. A number of issues were identified during the investigation relating to information and the assessment and management of seismic risk by territorial authorities.

#### 3.1.1 Information

It was stated during the investigation that most of the information required to allow territorial authorities to address seismic hazard is already available. The major fault lines and many minor ones have been mapped by GNS. However, the view was raised that currently some local authorities can afford better access to information than others. In addition, population factors such as whether an area is rural or urban contribute to the magnitude of the consequences of an earthquake and influence the level of information that is necessary to enable territorial authorities to assess risk.

Whilst smaller territorial authorities in areas with lower seismic risk may choose not to use their limited resources addressing an unlikely event, regional councils also have a responsibility under the RMA to gather information concerning seismic hazards. The view was expressed that the problem was often not a lack of information, but inefficient transfer and sharing of information. Some parties felt that there needed to be a better two-way dialogue between regional councils and territorial authorities not only on the information required, but also on how the information could be translated into practical policies.

Some agencies and organisations also expressed concern that there is currently no direct linkage between scientific information about the location and return periods of fault lines and traces, and the information provided on land titles. In the case of subdivision, however, if a consent is granted subject to a condition that subsequent owners must comply with on a

continuing basis, a territorial authority must issue a consent notice specifying the condition, which may be registered on the title.<sup>19</sup>

It was also stated that there is no guarantee that any scientific information provided will be used in preparing district plans. One view was expressed that a more coherent system, such as the compulsory inclusion of seismic information in district and regional plans, needed to be developed. As scientific information is not static, it was also considered important for local authorities to have mechanisms in place for regularly updating planning instruments.

### *3.1.2 Risk assessment and management*

The view of the majority of public authorities and organisations was that territorial authorities only need to consider **active** fault lines, which are fault lines with a certain probability of occurrence (i.e. return period), in their risk assessment process. However, it is the perception of risk that determines which fault lines are considered **active**. For example, while some geologists **may** find that a fault line with a return period of 11,000 to 128,000 years is **potentially active**, engineers tend to take into account factors such as the possible lifespan of buildings and **may** consider only fault lines with much lower return periods of 2,500 years. However, there is not necessarily a clear division between geologists and engineers, and the question of how to define an **active** fault for the purposes of hazard evaluation is still under discussion.

One view expressed was that it was paternalistic to tell people where they could build through a regulatory approach. If people were willing to accept the risk then they should be granted the necessary approvals. However, the majority view was that people's perception of risk is often very different from the actual risk and there is an assumption that people know and comprehend the risk when often they do not. In addition, it was felt that an unsafe building puts more than just the original owner at risk and that such risks are matters of public interest.

Coupled with this, is the view that buildings can be designed to withstand earthquakes and that this is primarily dependent on the money spent. However, the most common belief was that if there is significant rupture on a fault line, there is no technology that will keep a building absolutely safe (see Box 2). There was general agreement that there is a need to ensure certain structures are not built over active fault lines, for example hazardous waste facilities and post-earthquake utilities such as hospitals. In addition, it was stated that it is easier to engineer some structures more robustly than others. However, the risk needs to be assessed and managed, and control exercised over the location and type of buildings.

Currently, insurance is not an issue for residential buildings because the Earthquake Commission insures all residential properties for damage caused by earthquake. However, insurance is at the tail end of a range of risk management options available to each person and does not avoid or mitigate the occurrence or effects of a disaster or compensate for loss of life.

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<sup>19</sup> RMA s 221.

Some agencies and organisations felt that local authorities would want to make sure they had done everything reasonably possible to ensure that if a second event occurred in the same location (i.e. in proximity to a fault line) the council would have a defensible position and not be held liable for any damage caused. For this reason it was considered that local authorities may be unwilling to allow a building constructed in proximity to a fault line and damaged in an earthquake to be re-constructed on the same site.

As described in Box 3, California has similar seismic risk to New Zealand. The difference is that California has actually experienced a number of recent large events the scale of which New Zealand has not seen since the latter half of the 19<sup>th</sup> century.<sup>20</sup> The Californian regime illustrates a potential response to earthquake hazard.

*PCE Comment*

Appropriate levels of information are vital to enable territorial authorities to manage the impacts of seismic events and then address them.

Territorial authorities need to acquire and be able to regularly update information about:

- the location of fault lines;
- the level of certainty of location i.e. surface definition;
- the probability of occurrence i.e. the return period;
- earthquake events other than rupture i.e. earthquake shaking, earthquake-induced landslip and liquefaction;
- the predicted amount of horizontal and vertical displacement.

This information can then be used to assess the seismic risk in a district or region and to appropriately manage that risk. **Identification of seismic hazards is the key to either avoiding them, or ensuring good site design to mitigate their effects.**

**BOX 3 SEISMIC HAZARDS IN CALIFORNIA**

California has similar seismic risk to New Zealand but a higher population density. In response to a number of large earthquakes over the last century, the Californian State Government enacted two pieces of legislation to reduce the impact of earthquakes on buildings used for human occupancy.

The Alquist-Priolo Earthquake Fault Zoning Act 1972 (APEFZA) was passed as a direct result of the 1971 San Fernando earthquake in which extensive surface fault ruptures damaged both residential and commercial buildings. The Act's main purpose is to prevent the construction of buildings used for human occupancy on fault traces; the Act only addresses fault rupture and not other earthquake hazards.

The APEFZA requires "Earthquake Fault Zones" to be identified around fault traces. Maps of the zones are distributed to local agencies for use in planning and controlling all new construction and alterations. Before a development can be permitted in the zone, a geological investigation is required to demonstrate that the proposed buildings will not be constructed across active faults. If a fault is found, a building for human occupancy

<sup>20</sup> With the exception of the 1931 Napier earthquake.

must be set back 50 feet (approximately 15m) from the fault. The fact that a property is located in an Earthquake Fault Zone must be disclosed to a potential buyer of a property before the sale is complete.

The Seismic Hazards Mapping Act 1990 extends this approach to cover non-surface fault rupture earthquake hazards, such as liquefaction and earthquake induced landslip through the identification of "Seismic Hazard Zones". Before a development or subdivision is approved in one of these zones, a site-specific investigation is required to determine whether a significant hazard exists at the site, and if so, what measures are required to reduce the risk to an acceptable level.

### 3.2 Regional and district planning

The use of seismic information by territorial authorities for appropriate environmental management was another key issue raised during the investigation.

The September 2000 study carried out by GNS, *Planning and Policy for Earthquake Hazards in New Zealand*<sup>21</sup>, reveals some interesting empirical data. Few local authorities investigated in this study of Hawke's Bay, Waikato and Bay of Plenty regions had incorporated information about the nature, location, and effects of earthquakes in their plans, and even fewer had rules about them.<sup>22</sup> A number of the district plans studied acknowledged the nature and extent of earthquakes, but considered that as a future event would have such wide reaching effects, planning solutions were not always practical.<sup>23</sup> There appeared to be no link between the type and level of seismic hazard in the district or region and the rules in the plan, and there was limited integration of policy between regional and district councils.<sup>24</sup>

GNS envisages continuing to study earthquake hazard planning by considering more district and regional planning documents. The next stage of this study includes:

- Identifying the barriers to incorporating scientific information into plans and policy statements made under the RMA.
- Investigating what options are available for reducing the risk in different situations, depending on the type of seismic hazard and the level of certainty that exists.
- Forming a group to consider options and develop guidelines to incorporate hazards in plans and policy statements.
- Establishing a dialogue with local authorities and increasing awareness of the problems and potential solutions.

Most public authorities and organisations consulted believed there was a need to address earthquake hazards in plans and policy statements created under the RMA. BIA however, considered that district plans should contain hazard maps showing, amongst other things, the location of faults, but opposed any suggestion that district plans should contain rules for the design and construction of buildings.

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<sup>21</sup> GNS Study, above n 17.

<sup>22</sup> GNS Study, above n 17, p21.

<sup>23</sup> GNS Study, above n 17, p21.

<sup>24</sup> GNS Study, above n 17, p19. Becker and Johnston, above n 17, p22.

Addressing earthquake hazards was considered by many of the public authorities and organisations consulted to be a two-stage process. The first stage includes identification of fault lines and seismic hazard areas and locating these on hazard maps in the district plan. The second stage requires site-specific investigations and geo-technical assessments to be carried out where the owner wishes to construct a building within the area. However, concern was raised that geo-technical reports can be expensive for developers, especially if they were to be required for a subdivision which related to a cross lease or boundary adjustment and which did not alter any building or subsequently create new buildings on the site.

Another issue raised was the tension between the landowner's property rights and the mechanisms used in the plan to address earthquake hazard. This was especially pertinent when the area around the fault is already subdivided and settled. However, it was suggested that the public interest in preventing unnecessary loss of life would outweigh the landowner's right to build in close proximity to a fault line. There is the possibility that landowners could build on the site and then on-sell the property having no responsibility for what might happen in the future. Future owners may not be fully aware of the risks and unrealistically expect it to be safe.

Concern was also expressed that while site-specific investigations are being carried out under the BA and the RMA, there is little uniformity of approach. Some commentators considered that territorial authorities do not have adequate expertise or access to expertise to carry out these investigations, and that while they frequently contract independent expertise and peer reviews, these independent contractors do not necessarily have guidance or criteria for carrying out or assessing these investigations either.

Many of the agencies and organisations consulted expressed the view that in some cases it is unnecessary to construct buildings over active fault lines. Parks or roads can be placed over the fault line instead of residential and commercial buildings, as shown by the Totara Park development in Upper Hutt, which is considered to be a good example of subdivision design where a fault trace lies in the development area. The view was expressed that a sensible approach was to include in the district plan a "no build" corridor 20m or wider, depending on the width of the fault zone or the uncertainty of its exact location, either side of active fault lines with shorter return periods, e.g. the Alpine fault.<sup>25</sup>

For fault lines with longer return periods (i.e. less active) it was considered appropriate to exercise a lesser degree of control, but their identification in the district plan is still important. (See Boxes 1 and 4 on the Winara Village Development and Nelson City Council and Tasman District Council for some New Zealand examples).<sup>26</sup>

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<sup>25</sup> However, BIA considered that while both inactive and active faults should be identified, no-build corridors were unacceptable. BIA considered that it should be left to landowners, their advisers, and territorial authorities to make informed decisions as to whether the proximity to those faults prevented the lawful construction of buildings in particular locations within the land concerned.

<sup>26</sup> Again BIA disagreed and considered there was no need for any additional controls over the construction of buildings.

The view was expressed that territorial authorities should not rely solely on people being communicated seismic hazard information through Land Information Memoranda (LIMs).<sup>27</sup> This was because few people (10-20%)<sup>28</sup> actually obtain LIMs before they purchase a property (when the LIM is most relevant), because they are expensive, often contain information already possessed by the purchaser, and there is no certainty that the sale will go ahead. However, under the BA a project information memorandum (PIM) must be obtained before a building consent can be issued. A PIM is required to contain information about the features of the land, including seismic hazard information that is relevant to the project, known to the territorial authority, and not apparent from the district plan.

Some public authorities and agencies felt that there needed to be a bigger emphasis on hazard and risk education at all levels. One view was that scientists need to clearly explain the effects and risk of the hazard to those commissioning the research; regional councils need to explain what the information means and how it can be useful to territorial authorities; and information should be made readily available to the public to enable them to understand the risk. This information is needed to enable government (at all levels) and the public to decide what level of risk they are willing to accept.

#### *PCE Comment*

Both regional councils and territorial authorities have responsibilities under the RMA to avoid or mitigate natural hazards such as earthquake. However, the RMA gives little guidance on **how** this is to be achieved.

Guidance is needed about the kinds of policies, objectives and rules territorial authorities should include in their district plan (i.e. model provisions) to promote a consistent approach across the country. A consistent approach and the development of relationships between agencies is particularly important because most, if not all, of New Zealand is susceptible to earthquake. Education about the issues, particularly of territorial authorities, is an ongoing task.

The GNS study should be continued and more funding is required to facilitate wider discussion of the issues with various bodies including the Geological Society of New Zealand, the New Zealand Society of Earthquake Engineers and the New Zealand Planning Institute. **There is also a role for the Ministry for the Environment to get involved in producing best practice guidelines for territorial authorities for addressing seismic risks.**

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<sup>27</sup> Land Information Memoranda are site specific and can be obtained from territorial authorities on request under section 44A of the Local Government and Official Information Act 1987 (see Appendix I).

<sup>28</sup> This figure was obtained from discussions with Kapiti Coast District Council in September 2000.

**BOX 4 TASMAN DISTRICT COUNCIL AND NELSON CITY COUNCIL**

*Nelson City Council (NCC)*

The Proposed Nelson City Resource Management Plan identifies potentially active fault lines based on GNS data commissioned by NCC in 1993. As the exact position of the fault line has not been accurately fixed at all locations, the fault hazard is shown on the map as a 200m wide band called a Fault Hazard Overlay (FHO). The fault line lies at approximately the centre of this band.

The plan thus signals that there is a hazard within this zone that must be addressed. The rule in the plan states that the erection, extension or alteration of a building within the FHO is permitted provided that “where a fault trace can be identified and precisely located...the building is set back at least 5 metres from the fault trace.” It is a restricted discretionary activity to build in this area with the council restricting its discretion to “hazard avoidance or mitigation measures”. Any application must be accompanied by a geo-technical assessment from a suitably qualified and experienced geo-technical engineer or engineering geologist.<sup>29</sup>

However, this rule does not apply where the Flaxmore Fault crosses an established residential suburb, because building in that area is largely limited to alterations and infill development, and because the fault is deeply buried it is uncertain how fault movement will propagate to the surface.

The faults identified in Nelson City are of low activity and do not meet GNS’s current definition of an active fault (i.e. movement in the last 128,000 years). However NCC considered that it was best to design new subdivisions to avoid building on them.

*Tasman District Council (TDC)*

A similar situation to the one described above exists in Tasman. On the maps included in the Proposed Tasman Resource Management Plan, potentially active faults identified by GNS in 1995 for TDC are shown as lines rather than bands, but the plan refers to zones encompassing those faults. TDC is considering amending the maps to show the faults as bands similar to the NCC maps.

Tasman District is also traversed by the active Alpine Fault. This fault is enclosed in a formal building exclusion zone 10 m either side of the surface traces of the fault. In some places along the fault there are multiple parallel surface traces resulting in a minimum of 20m exclusion zones. There have been public submissions about increasing the width of this zone in new subdivisions.

### 3.3 Building consent

The BA is not concerned with land use; it is the provisions of the RMA that govern what activities can take place on a particular site. However, the BA

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<sup>29</sup> BIA considers that the BA already requires buildings to incorporate “hazard avoidance or mitigation methods” and considers that special provisions in the district plans are unnecessary and probably contrary to section 7(2) of the BA.

provides controls relating to building work in order to ensure buildings are **safe** and sanitary, thus the BA is concerned with the nature of the land on which a building is to be erected because that will affect the structural design of the building.

### *3.3.1 The Building Code*

Clause B1 of the Building Code specifies performance criteria that must be achieved, and the Approved Documents cite New Zealand Standards (amongst other methods) of achieving them. If those methods do not apply, as in the case of buildings constructed in close proximity to fault lines, then another design may legally be used provided the territorial authority is satisfied that the building will comply with Clause B1. However, it was considered that in practice it was likely to be difficult to do this. This was thought to be due to the limitations of engineering technology and the amount of money a developer was willing to spend. As discussed above (Section 3.1.2), it is considered impossible to design buildings that will withstand major fault rupture.

As already indicated in Section 2.1.2 the Approved Documents for clause B1 cite NZS 4203, but state that the standard does not address the problem of “localised site effects such as earthquake ground motions due to unfavourable ground conditions or proximity to a fault” and where these are identified they should be the subject of a “special study”. The problem is that where NZS 4203 does not apply, there is limited guidance for territorial authorities on how to evaluate whether a particular design complies with Clause B1. In addition, the success of the NZS 4203 and any other design is dependant on current geo-technical engineering knowledge and practice. The success of the BA and Building Code in controlling building on or close to fault lines is also dependent on faults being precisely identified and located.

The view was expressed that while people with the required professional expertise are being contracted by territorial authorities to carry out special studies, there is no guidance or criteria on how this special study is to be carried out. It was stated during this investigation that the BA needed to be more specific and offer guidance on what a “special study” entails in order to create consistent standards across the country. However, definition may be difficult given the variation in site specific circumstances that might require a “special study”. BIA commented that it is not BIA’s role to prescribe alternative solutions such as special studies. BIA believes that it is a matter for the territorial authority in every case to decide whether it is satisfied that the proposed building will comply with the Building Code, subject to the rights of the parties to dispute that decision by way of an application to BIA for a binding determination.

### *3.3.2 Building Act 1991/Resource Management Act 1991 Integration*

Issues concerning the integration between the BA and the RMA were also raised during the investigation. Several of the authorities and organisations consulted were concerned that local authorities may not realise the importance of appropriate district planning, instead choosing to wait until a developer applies for building consent. It was considered that because compliance with the BA and the Code is a major issue, reliance on the BA

and the Code to prevent or control the use and development of land on or close to fault lines might not be effective.<sup>30</sup>

Compliance with the Code was seen as an issue partly because of a perceived lack of geo-technical expertise, both within territorial authorities and contracted by territorial authorities and developers. The operation of producer statements<sup>31</sup> and inadequate monitoring after the consent is issued are perceived to be other contributors to the problem. Inadequate monitoring itself is seen to arise in part from the pressure to cut costs and save time in processing building consents.

The inability to take a planned approach under the BA and Building Code could also be cited as a reason for including appropriate rules in the district plan relating to land use and development on or close to fault lines.

In addition, territorial authorities cannot refuse to grant building consent on the grounds that a resource consent that is required has not been obtained. However, under s35(1A) of the BA, territorial authorities may attach a certificate to a building consent stating that an authorisation under the RMA is required which materially affects the building work to be carried out, and that the authorisation has to be obtained before building work may proceed or that building work can only proceed to the extent specified in the certificate. It was noted that this causes confusion and raises expectations among developers about what they are able to do, and the grant of retrospective resource consent can result. Many of the public authorities and organisations consulted expressed the need to integrate resource consent and building consent processes. However, one party also acknowledged that there are some territorial authorities around the country exercising an internal co-ordinated approach to building and resource consents.

#### *PCE Comment*

A number of conclusions can be drawn from this discussion:

- Many of the public authorities and organisations consulted during this investigation expressed reservations about the ability of the BA and the Building Code to adequately control development on or close to fault lines.
- There needs to be guidance about what a “special study” entails when there are site effects which the NZS 4203 does not address.
- There is difficulty for territorial authorities in accessing specialist geo-technical expertise for undertaking and reviewing “special studies”.
- Monitoring and enforcing compliance with the BA and the Building Code is an issue that needs to be further investigated.
- There are unresolved issues concerning the integration of the RMA and the BA and the resource consent and building consent process that need to be investigated and addressed.

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<sup>30</sup> GNS also noted this as a point of concern in their study. GNS Study, above n 17, 21.

<sup>31</sup> Producer statement means any statement supplied by or on behalf of an applicant for a building consent or by or on behalf of a person who has been granted building consent that certain work will be or has been carried out in accordance with certain technical specifications (see BA s2). A territorial authority may, at its discretion, accept from the applicant a producer statement establishing compliance with all or any of the provisions of the Building Code (see BA s33(5)).

## 3.4 Other issues

### *3.4.1 Monitoring, education and guidance under the Building Act 1991*

One of the peripheral issues arising from this investigation is the limited amount of education, guidance and monitoring of the BA that is being carried out by the responsible authorities, namely DIA and BIA.

#### *Department of Internal Affairs*

As mentioned earlier, DIA carried out two surveys of the building controls process and the BA in the early years of its enactment. However, funding for more studies of this nature does not appear to be a priority. Issues raised in these studies primarily concerned costs, compliance and the time taken to process building consent applications.<sup>32</sup> The New Zealand Geotechnical Society has raised issues concerning the application of s36(2) of the BA with the DIA during the course of DIA's current review<sup>33</sup> (see Section 4 below). This matter is discussed in the next section of this report.

DIA takes the view that educating the wider community about the BA is BIA's responsibility under the provisions of the BA.

#### *Building Industry Authority*

BIA has a mandate to undertake reviews of the operation of territorial authorities and building certifiers, and to disseminate information and provide educational programmes on matters relating to building control.<sup>34</sup>

BIA keeps a database of waivers of the Code and also carries out an audit of each territorial authority approximately every five years. These audits are "snapshots" rather than in-depth studies, however, and they focus on the procedures and processes used by territorial authorities to satisfy themselves of compliance with the BA and Code rather than on whether acceptable outcomes are being achieved. The auditors (contracted by BIA) look at: who the territorial authorities accept producer statements from, who they ask to conduct peer reviews, and how the territorial authority satisfies itself on "reasonable grounds" that the provisions of the Code would be met by the proposed building work.<sup>35</sup>

The BIA has the power to reverse or modify a territorial authority's technical decisions about compliance with the Building Code by way of a determination under section 17 of the BA. Otherwise, the BIA has no powers of enforcement with respect to territorial authorities other than advising the Minister of Internal Affairs of poor performance.<sup>36</sup>

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<sup>32</sup> DIA Studies, above n 11.

<sup>33</sup> The scope of this review is set out on page 7 of this report. Communications with DIA in March 2001 indicated DIA was seriously considering legislative change to s36(2) as a potential outcome of its review.

<sup>34</sup> BA s12(d) and s12(g).

<sup>35</sup> Information taken from BIA's "Brief for the technical review of territorial authorities for the Building Industry Authority" 21 January 1999.

<sup>36</sup> Under section 15(3) of the BA if BIA believes that a territorial authority is not fulfilling its functions under the Act then it must make a written report to the Minister of Internal Affairs.

Several of the public authorities and organisations consulted held the view that there is a perception by those in the industry that BIA does more than it really does, for example, monitoring the ability of territorial authorities to provide accurate information in LIMs and PIMs. It was considered that initiatives for BIA to take on a wider, more active role would be welcomed by the industry.

Related to monitoring is the need for education and guidance for territorial authorities in implementing the BA. There is a perception that the BIA has not carried out any substantial educative work for the last two to three years and that it is was often hard to ask BIA for advice because of their role as “judge and jury” in the building industry.

BIA is also limited by available resources. Since 1994 BIA has been funded through the Building Industry Authority Levy, which is currently set at 65 cents for every \$1,000 of the estimated value of the building work over \$20,000.<sup>37</sup> Due to increased development immediately after the levy was introduced, the income from the levy was more than projected, and the amount of the levy was subsequently reduced. However, the Ministers of Internal Affairs and Finance, concerned about the possibility of income-driven expenditure and the prospect of years of dwindling development, placed a cap on the amount BIA was allowed to spend. Currently, BIA is allowed to spend \$2.7 million of the money acquired through the Building Levy. As a result BIA has a large surplus that it cannot use (around \$9.5 million), despite possibly inadequate monitoring and educational programmes. One of the outcomes of the current DIA review will be to assess an appropriate level of expenditure for the BIA.<sup>38</sup>

#### *PCE Comment*

Monitoring of the BA is necessary in order to determine whether the processes set out in the Act are working as intended and progress is being made towards achieving desired outcomes. This is an ongoing task and more resources need to be made available to BIA for this purpose. In particular, territorial authorities need to be monitored more often and the monitoring carried out needs to be more focused on the actual outcomes being achieved.

Similarly, BIA should be providing more guidance to territorial authorities and building certifiers in administering their responsibilities under the BA. It is considered that this can be done without compromising BIA’s role in determining matters of doubt or dispute in relation to building control. Education should be a major priority for BIA because it is a continual process to keep up with advances in products and technology, changes in standards, staff turnover in territorial authorities and the transfer of best practice.

#### *3.4.2 Section 36(2) of the Building Act 1991*

Section 36 of the BA applies to land that is “subject to or likely to be subject to erosion, avulsion, alluvion, falling debris, subsidence, inundation, or

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<sup>37</sup> The Building Industry Authority Levy Order 1995 (1995/241) clause 2. Prior to 1994 BIA was funded by Crown Grant.

<sup>38</sup> Personal Communication, Mark McGuire, DIA, 26 February 2001

slippage". If a person intends to carry out building work on this land and either or both the land and the building work are not adequately protected against the hazard, provided all other requirements are met, a territorial authority must issue building consent under s36(2) on the condition that a notice of the hazard is registered against the title to forewarn subsequent purchasers of the land. The effect of this notice is to protect the territorial authority from future liability for any damage caused if the hazard occurs and to require the Earthquake Commission and general insurers to consider declining claims.<sup>39</sup> In many cases this will leave the property owner effectively uninsured for that particular hazard.

However, section 36 does not list all natural hazards. In particular, damage by wind and earthquake is missing. Thus, it is considered that territorial authorities cannot issue s36(2) consents on the basis that the land is vulnerable to earthquakes.

Some parties consulted during the investigation were concerned that building consent is being issued with s36(2) notices on all properties in a given area, without there being an adequate study of the hazard and its effects on the specific development proposal. It was believed that territorial authorities need to exercise more discretion in issuing building consent under section 36(2). This was considered to be especially important given that the s36(2) notice applies to the whole title and could have effects such as decreasing the value of the property and impact on raising finance against the property. There are currently around 3,500 s36(2) notices on titles around the country and the number is increasing.<sup>40</sup> This is of grave concern to EQC because people generally do not understand the impact of s36(2) notices and have no perception of the risk involved, despite receiving a leaflet expressing the views of BIA, EQC, New Zealand Mutual Liability Riskpool, and the Insurance Council of New Zealand during the building consent process.

Section 36(2) is also considered to have a perverse effect on existing buildings. A number of alterations to existing buildings require building consent. If the land on which the building is sited happens to be subject to one of the listed hazards, a territorial authority must issue building consent for the alteration under section 36(2), which affects not just the alteration, but also the whole title. The view was expressed that this can be quite unfair, for example, where a property owner requires building consent to improve the hazard resistance of a property, or where land becomes subject to a hazard many years after the building is established and the property owner wants to carry out alterations which require building consent.<sup>41</sup>

Neither DIA nor BIA monitors the number of s36(2) notices on titles, or the application of section 36(2) by territorial authorities. BIA believes that section 36 should be revised to only address whether the proposed building work complies with the Building Code and not whether the land, as distinct from buildings, is protected from the hazard. Section 36 is to be addressed in the DIA's review of the BA, and BIA is drafting a suggested revision to address some if not all of the issues identified above.

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<sup>39</sup> ECA 1993 clause 3(d) of the Third Schedule.

<sup>40</sup> Approximate figure obtained from discussions with EQC in September 2000.

<sup>41</sup> The same rationale could apply to subdivision, i.e. cross lease and boundary adjustments.

The Wellington Regional Council (WRC) believes there is a need to flag property titles with hazard information so owners and potential owners are aware that there is a risk that they need to investigate further. WRC believes this might require the concept of section 36(2) notices to be expanded, possibly as an additional section in the RMA, so that it better acknowledges the continuum between land issues and building issues. WRC also believes that the section 36(2) list should be expanded to include earthquake and wind storm.

The New Zealand Geotechnical Society has recommended that s36(2) be repealed and replaced by an amendment to s36(1) requiring any report prepared by a competent professional to assess the impact of the natural hazard be retained by the territorial authority for future reference. The existence of the report and the type of hazard to which it applies would be identified on the property title. The society considers that section 36(2) issues could be dealt with by establishing a building line restriction beyond which a hazard is known to exist, for example, on cliff top properties or lots which are partially affected by flooding. If s36(2) is to remain the society considers that there needs to be a definition of the area of land which is being considered, a requirement that the territorial authority obtain a competent assessment of the hazard on that land and definition of the level of certainty required in such an assessment.<sup>42</sup>

*PCE Comment*

Section 36(2) reflects the idea that people should have freedom to build and live on any land they choose, provided that they assume the risk if the land is subject to any of the hazards listed.<sup>43</sup> While this provision may be necessary in certain circumstances, the blanket effect of s36(2) can render it unfair for the sorts of reasons already given. The reference to “land” in s36(2) should be defined and limited to the land that is actually affected by the building work. Section 36(2) should also not always be applied to the alteration of existing buildings, although in some cases it could be justified.

For the reasons discussed above, educating people about their potential risk before the issue of building consent and also before a property is purchased is essential.

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<sup>42</sup> Taken from a submission made by the New Zealand Geotechnical Society to DIA during DIA’s current BA review.

<sup>43</sup> See discussion in *Coramandel Peninsula Watchdog Inc v Hauraki District Council* [1997] 1 NZLR 557, 567.

## 4. CONCLUSIONS

Earthquakes are devastating and largely unpredictable events, with low probability but high impact. It is possible to mitigate the most damaging effects of earthquakes by avoiding obviously hazardous sites (such as known active faults) and by good seismic design and construction practice elsewhere.

Experience shows that buildings sited across faults that rupture during an earthquake will typically be more badly damaged than adjacent buildings, and that there is no existing technology that will prevent damage to buildings caused by fault rupture. For this reason it is widely accepted that it is inappropriate to site buildings on or close to active faults.

Research carried out by GNS indicates that despite the fact that most areas of New Zealand are subject to seismic events, few territorial authorities in the regions studied have identified seismic hazard in their district plans and even fewer have rules in their plan for managing earthquakes.

The role of territorial authorities and district planning is pivotal because territorial authorities have responsibility for issuing subdivision and land use consents and also have responsibility for issuing building consents.

Practical guidelines urgently need to be developed to enable territorial authorities to discharge their RMA responsibilities relating to the avoidance or mitigation of earthquake hazards. However, before this can be achieved, ways to incorporate information on seismic hazards and their management into plans and policy statements, and the most appropriate planning options for reducing risk need to be determined.

It is important that:

- Local authorities obtain accurate and relevant scientific information to enable them to assess and manage seismic risk.
- This information is incorporated into the objectives, policies and rules in district and regional plans and policy statements in a consistent manner.
- There is a system whereby territorial authorities and regional councils can regularly update scientific information on seismic hazards.
- The district plan identifies fault lines and areas of seismic hazard and provides for appropriate rules in these areas, with provision for site-specific investigations to be carried out and guidelines for those investigations.
- Territorial authorities do not rely solely on the building consent process to control development on or close to fault lines.
- At all times there is an integrated system for implementing and administering the RMA and BA and the building and resource consent processes.

## **5. RECOMMENDATIONS**

To address the deficiencies identified in the current system for managing the use and development of land on or close to earthquake fault lines, it is recommended that priority be given to:

1. The Ministry for the Environment working together with the Institute of Geological & Nuclear Sciences and other interested organisations with structural and geotechnical expertise to develop best practice guidelines for territorial authorities in avoiding or mitigating seismic hazard through the district plan process.

An essential first step will be the identification of barriers to incorporating scientific information into the policies, objectives and rules in plans and policy statements under the Resource Management Act 1991; the investigation and evaluation of planning and other options to reduce risk in different situations depending on seismic hazard type and the level of certainty that exists; and establishing a dialogue with local authorities to increase awareness of seismic problems and potential solutions.

2. The Department of Internal Affairs addressing in its current review of the Building Act 1991 the difficulties being experienced with the application of s36(2) of the Building Act 1991; and issues concerning the ongoing monitoring, enforcement, compliance, education and guidance under the Building Act 1991. This will need to be carried out in conjunction with the Building Industry Authority as the primary agency responsible for education and dissemination of information under the Building Act 1991, and for reviewing the operation of territorial authorities in relation to their functions under that Act.

## GLOSSARY OF TERMS

<b>Fault</b>	A fault is a fracture in the earth's crust along which geological formations on one side have moved relative to the other, usually at the time of an earthquake. Most faults have experienced repeated movements over a long period, and because of this the rocks close to a fault are often crushed and broken.
<i>Fault trace</i>	A fault trace is the line on the earth's surface defining the fault.
<i>Fault rupture</i>	Fault rupture occurs during earthquakes and almost always follows existing faults, which are zones of weakness.
<i>Liquefaction</i>	Liquefaction describes the event of water saturated ground (soil or sand) behaving like liquid during an earthquake.
<i>Return period</i>	The average time interval between large earthquakes on an active fault. Both the return period and the elapsed time since the most recent earthquake are the primary basis for establishing whether a fault is considered active or not.
<i>Seismic hazard area</i>	A seismic hazard area includes land on or close to a fault trace, and land at high risk of being subjected to fault rupture, severe earthquake shaking, earthquake induced landslip or liquefaction.
<i>Seismic risk</i>	The likelihood or probability of a seismic event and the potential consequences of the event.

## APPENDIX I

This appendix further illustrates and explains some of the key legislation and case law relevant to the issues raised in the report.

### *The Building Act 1991*

The BA promulgates a performance-based code. Thus, it is not **how** something is achieved that matters, but whether or not it meets the required outcome. The BA is concerned with ensuring that buildings built on earthquake prone land are constructed in a manner that minimises the potential impact of an earthquake through engineering and architectural design.

#### Case law on section 36 of the Building Act 1991

Both the Building Industry Authority (BIA) and the Courts have considered the possible interpretations of section 36.

BIA, in its Determinations 98/003 and 99/004 took the view that a section 36(2) notice could not be issued by the territorial authority if the proposed building work complied completely with the Building Code. The BIA stated that:

It is almost always possible, though frequently expensive, for buildings situated on [natural hazard prone] land to be designed and constructed so as to comply completely with the building code, which requires account to be taken of each of the listed hazards...If the territorial authority is satisfied that the building complies completely with the building code, then the risk for the territorial authority is no different from that associated with any other building...

Thus, a section 36(2) notice could only be issued in the limited circumstances where the territorial authority granted a waiver or modification of the building code under section 34(4) where there is additional risk related to the natural hazard.

The territorial authority involved in the determinations appealed BIA's decision on points of law to the High Court and the Court of Appeal in *Logan v Auckland City Council*.<sup>44</sup> Richardson P in the Court of Appeal decision in *Logan* stated "I see no basis in the scheme and purpose of the legislation for reading down the natural language of s36(2) and importing as a gloss the limitation that s36(2) can be invoked only where the territorial authority has granted a waiver or modification of the building consent."<sup>45</sup>

Accordingly, even where the Building Code is complied with, consent may still be issued under section 36(2) where the **land** on which the building is

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<sup>44</sup> *Auckland City Council v Logan* (Unreported, High Court, Auckland Registry AP 77/99, 1 October 1999, Hammond J). *Logan v Auckland City Council* (Unreported, Court of Appeal CA 243/99, 9 March 2000, Richardson P). [*Logan CoA*].

<sup>45</sup> *Logan CoA*, above n 44, 13.

sited remains subject to the natural hazard even though the building itself does not exacerbate the problem.

## *The Resource Management Act 1991*

The Second Schedule to the TCPA 1977 (and its predecessor the Town and Country Planning Act 1953) stated among the matters to be dealt with in District Schemes was “the avoidance or reduction of danger, damage or nuisance caused by...earthquake, geothermal and volcanic activity, flooding, erosion, land-slip, subsidence, silting and wind” (clause 8(a)). This requirement has disappeared with the enactment of the BA and the RMA in 1991. However, the obligation to take account of natural hazards still exists within the RMA.

### Natural hazards and the functions of local authorities

The RMA defines "natural hazard" to mean " any atmospheric or earth or water related occurrence (including earthquake, tsunami, erosion, volcanic and geothermal activity, landslip, subsidence, sedimentation, wind, drought, fire or flooding) the action of which adversely affects or may adversely affect human life, property, or other aspects of the environment."

Section 30(1)(c)(iv) of the RMA states that one of the functions of a regional council is to "control the use of land for the purpose of...the avoidance or mitigation of natural hazards..."

Section 31(b) of the RMA states that one of the functions of a territorial authority is the "control of any actual or potential effects of the use, development or protection of land, including for the purpose of the avoidance or mitigation of natural hazards..."

Plans must be prepared in accordance with these functions, thus both territorial authorities and regional councils can make rules for the avoidance or mitigation of natural hazards, including earthquake hazard, in their plans. In addition, under section 35(5)(j) local authorities are required to keep records of natural hazards “to the extent that the local authority considers appropriate for the effective discharge of its functions.”

### Case law

The Courts have given some comment on the implications of these provisions in *Canterbury Regional Council*<sup>46</sup> (Planning Tribunal) and *Canterbury Regional Council v Banks Peninsula DC*<sup>47</sup> (Court of Appeal). These decisions concerned the extent to which a regional council could prescribe rules in its regional plan to control development in areas where a particular natural hazard is likely to occur, in this case flood (the Waimakariri flood plain).

Canterbury Regional Council (CRC) had rules in its regional plan which controlled the erection of new buildings in the Waimakariri Flood Plain by

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<sup>46</sup> *Application by Canterbury Regional Council* [1995] NZRMA 110.

<sup>47</sup> *Canterbury Regional Council v Banks Peninsula District Council* [1995] 3 NZLR 189 [*Canterbury Regional Council*].

classifying such development as non-complying or prohibited activities. CRC applied to the Tribunal for a declaration stating that it was within a regional council's functions to make these rules, and that while territorial authorities could also make rules for the avoidance or mitigation of natural hazards, they could not be inconsistent with the rules in the regional plan because of the operation of section 75(2)(c)(ii). Section 75(2)(c)(ii) states that a district plan must not be inconsistent with any regional plan in regard to any matter of regional significance or for which the regional council has responsibility under Part IV of the Act. A number of territorial authorities in the region opposed the declaration.

The Tribunal declined to make the declaration requested by CRC. The Tribunal started from the position that Parliament would not have intended the two authorities to have the same function, and, combined with the different wording of sections 30(1)(c)(iv) and 31(b), this meant the functions of the authorities were different with respect to control over natural hazards. The Tribunal found that there was a difference between avoiding or mitigating the "effects" of a natural hazard (the territorial authority's function) and avoiding and mitigating the "occurrence" of the natural hazard (the regional council's function).

This meant that CRC could only make rules that essentially avoided or mitigated the "occurrence" of the hazard itself, not the rules which controlled the "effects" of the use, development and protection of land for the purpose of avoiding or mitigating the natural hazard. CRC then appealed the decision to the Court of Appeal.

The Court of Appeal disagreed with the Tribunal's approach stating that the definition of "natural hazard" included a reference to the "effects" of the hazard and that is why the words "effects of" in both sections 30(1)(c)(iv) and 31(b) were not used in relation to natural hazards i.e. it would be redundant.

The Court of Appeal stated that "what can be avoided or mitigated is not the occurrence, but its effect." This appeared to be based on the view that the "occurrence" of the natural hazard, particularly in the case of earthquake, could not be avoided or mitigated, and it was the **effects** of the occurrence that had to be managed. The Court of Appeal found that both regional councils and territorial authorities could make rules preventing the erection of buildings in flood plains for the purpose of avoiding or mitigating natural hazards - regional councils where it is of regional significance, and territorial authorities where it is of significance only to the district. Territorial authorities would always be bound by the operation of section 75(2)(c)(ii).<sup>48</sup>

## Subdivision

Section 106 of the RMA requires consent authorities to refuse the grant of subdivision consent if it considers that: the land or structure on the land for which consent is sought "is, or is likely to be subject to material damage by erosion, falling debris, subsidence, slippage, or inundation from any source" or any subsequent use of the land is likely to "accelerate, worsen or result in material damage to that land, other land, or structure" by those hazards, unless the consent authority is satisfied that the effects would be avoided,

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<sup>48</sup> *Canterbury Regional Council*, above n 47, 195-196.

remedied or mitigated by: rules in the district plan; conditions of a resource consent; or by other matters including works.

The onus is on the applicant to prove to the local authority that the land is not subject to the hazard or that appropriate measures have been taken to avoid, remedy or mitigate the hazard. The applicant also bears the financial burden of carrying out such measures.<sup>49</sup>

The Environment Court in *Kotuku Parks v Kapiti Coast District Council*<sup>50</sup> held that section 106 did not apply to the particular consent application because, “although a rare major event causing extensive inundation or erosion could occur on [the Kapiti Coast] at any time, it is not standard practice to design for such extreme events...” However the Court turned the application down for other reasons.<sup>51</sup>

The Resource Management Amendment Bill 1999 includes a proposal that section 106 be repealed.<sup>52</sup> The reasons for this were that land suitability was considered to be a matter for district plans rather than a specific section of the Act, and that s106 was unnecessarily restrictive, for example where a landowner needs subdivision consent for a boundary adjustment, where there is no physical alteration or potential for physical alteration of the land.

## *The Local Government Official Information and Meetings Act 1987*

The Local Government Official Information and Meetings Act 1987 section 44A provides for land information memoranda (LIMs) on specific sites to be issued by territorial authorities on request. A LIM is required to include any special features of the land concerned, including natural hazards, provided that it is known to the territorial authority but is not apparent from the district plan.

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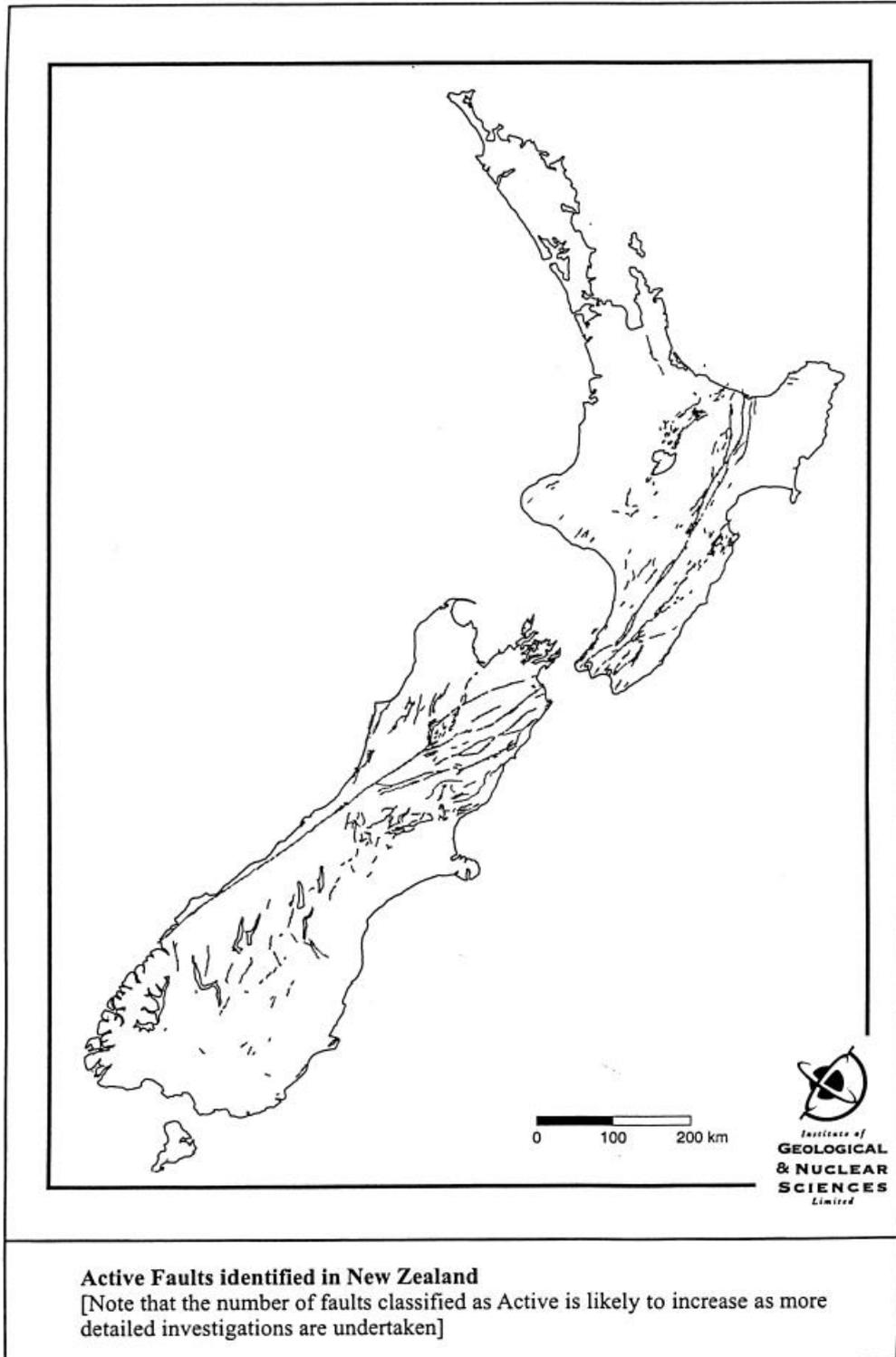
<sup>49</sup> *Foreworld Developments Ltd v Napier City Council* (1998) 5 ELRNZ 69.

<sup>50</sup> *Kotuku Parks v Kapiti Coast District Council* (Unreported, Environment Court, Wellington A73/2000, Sheppard J) [*Kotuku Parks*].

<sup>51</sup> The application conflicted with section 6(a) and (c) of the RMA and also hindered the exercise of Kaitiakitanga under section 7(a) of the RMA, see *Kotuku Parks*, above n 50.

<sup>52</sup> Resource Management Amendment Bill 1999 clause 41.

## APPENDIX II



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