

# **Marlborough District Council**

## **Seismic Hazards Project**

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**Advisory Practice in Respect of the Presence of Fault Lines**

**Especial Considerations for LIM's and PIM's**

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## Document Control

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1.0	18/6/03	First Copy for discussion	13 pages
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## Fault Lines

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### Fault History

Marlborough is in a tectonically active zone with a lengthy geological history and an ongoing process of tectonic plate translation. The nature of the tectonic history is such that there are many structural breaks (faults) through the fabric of the country that are of a “fossil” character. There is a range of faults with episodic movement in response to the tectonic process having planning significance, “active” faults.

There are information sources that provide considerable detail as to faults albeit at a very small scale and a comparatively low level of accuracy. These require specialist interpretation in the context of a particular proposal and only an expert investigator can do this.

Because of the complexity and degree of the historical fracturing of the regional fabric it must not be assumed that in any particular representation of fault patterns that all features are presented.

### Hazard Map

For day-to-day management of activities in Marlborough those faults considered to have been active within the last 10000 years have been compiled on the Hazard Map. The fixing of the Wairau Fault has been carried out at several points below the Waihopai River where the surface expression was sufficiently definitive (Geotech, 2003). This work and a general review carried out by Geotech Consulting Ltd have enabled the presentation of the significant fault surface expressions with an estimate of positional accuracy.

The second, important, parameter of a fault expression is the estimation of the activity that has occurred. Previously there has been a practice to classify faults into three groups (Class I, II, III) based on its movement history. The method had no formal status but was commonly used by specialist practitioners and is referred to in documentation used as inputs to Council’s Resource Management Plans.

The Hazard Map based on Geotech’s work proposes to use more a recent approach of classification (King *et al*, 2003) combined with the, also more recent, activity classification (van Dissen *et al* 2003).

### Planning Maps

The faults shown on the District Planning maps are:-

- Part of the Picton Thrust Fault system
- The Waikawa Fault

#### *Picton Thrust Fault*

The Picton Thrust Fault system is a complex tectonic feature now considered to be of an age that excludes it from planning consideration.

#### *Waikawa Fault*

The Waikawa Fault was identified in the documentation for the preparation of the Resource Management Plan as “... at least Class III active ...” (Sutherland *et al* 1992). That opinion may be based on the estimate of Late Holocene by one investigator. Much more recent work in some depth puts the age estimate more pre-Holocene (12000 to 18000 years BP) and thus not a planning consideration.

Importantly, in respect of the Waikawa Fault, the area is largely developed over the area through which the apparent trace passes. If a buffered plot is made using the suggested accuracy then there is little of the land south of Waikawa Road that does not come within the shadow of the plot.

## Presentation of Faults

The fault expressions are presented for office and public use as “zones” and being an area buffered to the line feature representing the accuracy recommended by Geotech Consulting Ltd. The accuracy reflects the current state of knowledge and presented as a guide for public use. The interpretation “on site” and assumptions drawn have to be carried out by an appropriately qualified professional, given the inherent variability of the records from which the map is compiled

In the following Table the indicative Recurrence Interval is the state of knowledge when this document is produced. The building importance is indicative, specific geotechnical information and the particular proposal may indicate other outcomes.

Recurrence Interval	Previously subdivided or developed land	New (greenfields) sites	Fault Name
<= 2000 years	1	1	Awatere
			Clarence
			Wairau
> 2000 <= 3500 years	1, 2	1	Elliott
			Vernon
>3500 <= 5000 years	1, 2	1, 2	London Hill
> 5000 years	1, 2, 3 or 4	1, 2, 3 or 4	Hog Swamp

## Use of Information

It must be borne in mind that specificity can only be obtained from direct fieldwork and even then the accuracy of determining the location of possible extent of rupturing will be variable.

### *Resource Consents*

As a first cut when, for instance, assessing Resource Consents the maps provided with the Geotech Report will indicate whether there is a particular feature in the vicinity. If it is felt that a feature is relevant then consider the degree of accuracy and if this appears likely to mean the proposal is within bounds then the more specific maps compiled in *Arcview* should be consulted.

### *Building Consents*

The process is essentially the same as for Resource Consents except that consideration is to be given to the Class of building as set out in the Draft Standard Section 3 (See links below). A particular Class may

be permitted to be constructed within the zone but not across an established rupture. If it is proposed that a structure be in very close proximity or in fact straddle a feature then serious consideration must be given as to why a Section 71 Building Act notice is **not** required.

### **Mapping Information**

The specific fault dataset is now available in Arcview within the “LIMS Project” – this can be accessed through the services of the LIMS team.

Appendix II shows “Key Maps” as the general location of the active faults – if it is considered that a particular proposal is proximate to a feature then the “LIMS Project” maps should be consulted.

#### ***Wairau Fault -Renwick Section***

New field work (early 2006) within the township at the corner of Highway 63 and Agincourt Street has identified an extension of the Wairau Fault as a result of trenching by Dr Yetton.

#### ***Wairau Fault -Bankhouse Section***

Trenching of the southern strand of the fault was carried out mid 2006.

### **Statutory Considerations – Land Stability**

If a proposal falls within a buffer zone there will be a need to consider the implications of the requirements of Section 106 of the Resource Management Act 1991 and Section 71 of the Building Act 2004. This is a situation of “case by case” and no particular guidelines are presented here.

## LIM's PIM's – Statements.

If a property falls within a buffer zone then the following Statements are appropriate generally:-

LIM	<p>The property has plotted over it the buffer zone of the XXXX fault and this is believed at present to have a Recurrence Interval of YYYY years.</p> <p>The above information may have implications for development of the property. In certain circumstances there may be restrictions or refusals of consent applications.</p> <p>Any person taking an interest in the property and who considers that the indicated proximity or possible consequences is of concern should consult an appropriately qualified professional for advice.</p>								
PIM	<p>The project is located within the buffer zone around the XXXX Fault, which is believed at present to have a Recurrence Interval of YYYY years. The proposed use of the Building is / is not consistent with the “importance” considered appropriate for such a location.</p> <p>To complete the statement the particular facts have to be synthesised to give the appropriate response. An explanatory Note attaches (<i>see Appendix-I</i>)</p> <table border="1" data-bbox="336 931 1441 1285"> <thead> <tr> <th data-bbox="336 931 707 1061">Within Zone / Appropriate Importance</th> <th data-bbox="707 931 1070 1061">Within Zone / Appropriate Importance / Straddles or contiguous to Rupture</th> <th data-bbox="1070 931 1441 1061">Within Zone / Inappropriate Importance</th> </tr> </thead> <tbody> <tr> <td data-bbox="336 1061 707 1285">The Building Act requires no special provisions. Owners may wish to consult a specialist Geotechnical Engineer before presenting an application for Building Consent.</td> <td data-bbox="707 1061 1070 1285">Movement has the potential to physically affect the building integrity. For construction of the project a Notice will be required to be placed on the Certificate of Title pursuant to Section 36 of the Building Act 1991.</td> <td data-bbox="1070 1061 1441 1285">Movement has the potential to physically affect the building integrity. For construction of the project a Notice will be required to be placed on the Certificate of Title pursuant to Section 36 of the Building Act 1991</td> </tr> </tbody> </table>			Within Zone / Appropriate Importance	Within Zone / Appropriate Importance / Straddles or contiguous to Rupture	Within Zone / Inappropriate Importance	The Building Act requires no special provisions. Owners may wish to consult a specialist Geotechnical Engineer before presenting an application for Building Consent.	Movement has the potential to physically affect the building integrity. For construction of the project a Notice will be required to be placed on the Certificate of Title pursuant to Section 36 of the Building Act 1991.	Movement has the potential to physically affect the building integrity. For construction of the project a Notice will be required to be placed on the Certificate of Title pursuant to Section 36 of the Building Act 1991
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NOTE	<p>XXXX = Fault Name where known otherwise “- -Unnamed Fault “</p> <p>YYYY= Undetermined Period. Note – as at second quarter 2004 there is some contention as to the recurrence interval for the Wairau Fault in the “Delta” segment (See Geotech 2003b). The recurrence interval needs to be established or otherwise assumed on the basis of advice from an appropriately qualified professional.</p>								

## Interpretation

Zone	In the context of this document “zone” has its ordinary meaning and is not to be interpreted as having any inference or meaning in the context of the Resource Management Act.
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## References

- Geotech Consulting Ltd,  
2003a *Marlborough District Seismic Hazard Investigation Program – Phase 1: Identification of Active Fault Traces in Marlborough District.*
- Marlborough District Council  
*(Note: this is published on MDC Web Page)*
- Geotech Consulting Ltd,  
2003b *Paleoseismic trench investigation of the active trace of the Wairau section of the Alpine Fault, Renwick area, Marlborough District.*
- Marlborough District Council
- King, Brunsdon Sheppard  
and ors, 2003 *Building Adjacent to Active Faults.*  
Proc. Pacific Conference on Earthquake Engineering, Christchurch Paper 158
- New Zealand Standards *Draft As/NZ 1170 Section 3 Structural Actions*
- New Zealand Standards *Draft As/NZ 1170 Section 4 Earthquake Actions*
- Sutherland, Kirk, Bell, 1992 *Natural Processes and Environmental Hazards in the Marlborough Sounds: Issues and Options.*
- Marlborough District Council.
- Van Dissen, Berryman,  
Webb and ors, 2003 *An Interim Classification of New Zealands Active Faults for the Mitigation of Surface Rupture Hazard.*  
Proc. Pacific Conference on Earthquake Engineering, Christchurch Paper 155

Cautionary Note:- The New Zealand Standards cited are Draft and may not reflect in the final version when published. The material referred to is considered appropriate in the context of this document.

## Links

Paper by King & ors	<a href="..\Process\EQPB\Paper158.doc">..\Process\EQPB\Paper158.doc</a>
Paper by Van Dissen & ors	<a href="..\Process\EQPB\Paper155.doc">..\Process\EQPB\Paper155.doc</a>
Draft Standard Section 3	<a href="..\Process\EQPB\Draft AS NZ 1170-0-AMT4-Section3.pdf">..\Process\EQPB\Draft AS NZ 1170-0-AMT4-Section3.pdf</a>
Fault Lines – Sketch Maps	<a href="..\Process\Geotechnical\MDC Fault 1 040520.pdf">..\Process\Geotechnical\MDC Fault 1 040520.pdf</a>
Trenching at Delta Locality	<a href="Fault Line\Delta Trench\Wairua Fault Trenching report.pdf">Fault Line\Delta Trench\Wairua Fault Trenching report.pdf</a>



## **Appendices**

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### **Appendix I – Building Importance Level**

The following Table is abstracted from

AS/NZ 1170.0:2002 Structural Design Actions Part 0: General Principles.

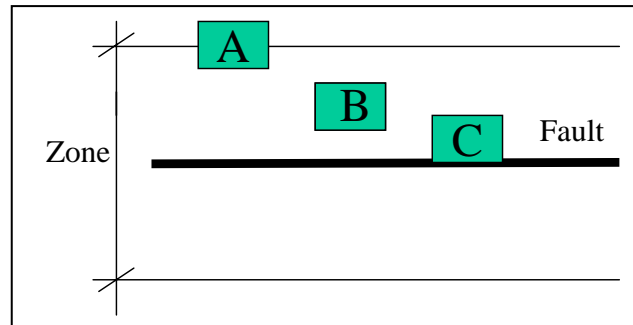
<b>IMPORTANCE LEVELS FOR BUILDING TYPES</b>		
<b>Level</b>	<b>Comment</b>	<b>Examples</b>
<b>1</b>	Structures presenting a low degree of hazard to life and other property.	Structures with a total floor area of <math><30\text{m}^2</math> Farm buildings, isolated structures, towers in rural situations. Fences, masts, walls, in-ground swimming pools.
<b>2</b>	Normal structures and structures not in other categories.	Buildings not included in Importance Levels 1,3 or 4. Single family dwellings. Car parking buildings.
<b>3</b>	Structures that, as a whole, may contain people in crowds or contents of high value to the community or pose risks to people in crowds.	Buildings and facilities as follows <ul style="list-style-type: none"> <li>a) Where more than 300 people can congregate in one area.</li> <li>b) Day care facilities with a capacity greater than 150.</li> <li>c) Primary school or secondary school facilities with capacity greater than 250.</li> <li>d) Colleges or adult education facilities Buildings and facilities with a capacity greater than 500.</li> <li>e) Health care facilities with a capacity of 50 or more residents but not having surgery or emergency treatment facilities.</li> <li>f) Airport terminals, principal railway stations, with a capacity greater than 250 people.</li> <li>g) Correctional institutions.</li> <li>h) Multi-occupancy residential, commercial (including shops), industrial, office and retailing buildings designed to accommodate more than 5000 people and a gross area greater than <math>100000\text{m}^2</math></li> <li>i) Public assembly buildings, theatres and cinemas of greater than <math>1000\text{m}^2</math></li> </ul> Emergency medical and other emergency facilities not designated as post disaster facilities. Power generating facilities, water treatment and waste water treatment facilities and other public utilities not designated as post-disaster. Buildings and facilities not designated as post-disaster containing hazardous materials capable of causing hazardous conditions that do not extend beyond the property boundaries
<b>4</b>	Structures with special post disaster functions.	Buildings and facilities designated as essential facilities. Buildings and facilities with special post-disaster function. Medical emergency or surgical facilities. Emergency service facilities such as fire, police stations and emergency vehicle garages. Utilities required as backup for buildings and facilities of importance level 4. Designated emergency shelters, designated emergency centres and ancillary facilities Buildings and facilities containing hazardous materials capable of causing hazardous conditions that extend beyond the property boundaries.
<b>5</b>	Special Structures (outside the scope of this standard - acceptable probability of failure to be determined by special study).	Structures that have special functions or whose failure poses catastrophic risk to a large area (e.g. $100\text{ km}^2$ ) or a large number of people (e.g. 100,000). Major dams, extreme hazard facilities.

## Appendix II – Section 71 Building Act 1991

Explanatory Note - for assisting in compiling information for inclusion in the issue of a Project Information Memorandum (PIM) pursuant to the provisions of the Building Act 2004. In the considerations of issuing a Building Consent it should be documented that the matters in Section 35 have been traversed.

### *Explanatory Examples*

Three Cases arise as follows -



### Case A

The building is identified as being outside but contiguous with Zone boundary; or straddling the Zone boundary. In this event Importance Level 1, 2 buildings would have no considerations for Section 71 in this context. Otherwise, the presence of the fault should be advised to the Applicant.

### Case B

The building is identified as being within the Zone. Importance level 1 & 2 (building alterations) gives rise to no considerations if the building is considerably more than 20 metres from the feature. Importance Level 2 (new buildings) would require the applicant to have independent professional advice. A key factor would be the degree to which the applicant has researched the location. Section 71 should be seen as a distinct possibility. A full appraisal must be made for Importance Level 2 (the format of Section 47 Building Act 1991 provides a good template)

### EXAMPLE

The project is located within the buffer zone around the XXXX Fault, which is believed at present to have a Recurrence Interval of YYYY years. The proposed use of the Building is / is not consistent with the “importance” considered appropriate for such a location.

The building is within the buffer zone and has **Importance Level 2**.

The Building Act requires no special provisions.

Owners may wish to consult a specialist Geotechnical Engineer before presenting an application for Building Consent.

**Case C**

No issue for Importance Level 1 but the Applicant must be notified of the possibility of ground disturbance. Otherwise a full appraisal with sound arguments as to why a Section 71 requirement is **not** triggered.

**Note**

In the Geotech documentation the location accuracy is the distance each side of the fault line expression (inferred or defined) whereas the “zone” is the width arrived at by doubling the location accuracy.

### **Appendix III – Key Maps**

Note that the maps are for indicative purposes only and if uncertain about the proximity of a feature to a proposal then the full data set is to be consulted.

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