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TO	Katherine Dorofaeff, Principal Policy Planner
FROM	Dr Jack McConchie, Technical Principal
DATE	12 January 2015
SUBJECT	M.Y. & S.A. Blackburne (Submission 44-11)

Submission

M.Y. & S.A. Blackburne in their submission on the Proposed Kapiti Coast District Plan (Submission 44-11) seek:

4. *Remove the fault avoidance area notation on 41 Blackburne Road: because there is no (or insufficient) evidence that any fault exists.*

The submission provides no evidence or argument for the removal of the section of the Ohariu Fault (Northern End), described as "Fault Avoidance Area - Uncertain Constrained", shown on Map 18C – Natural Hazards appended to the Proposed District Plan.

Introduction

The Kapiti Coast District Council has undertaken considerable work to identify earthquake fault rupture hazards in the District. A risk-based planning framework has been adopted for addressing the hazards associated with development of land on or near active fault traces.

Background

In 2003 the Kapiti Coast District Council commissioned the Institute of Geological & Nuclear Sciences (GNS) to identify and map the active fault traces in the Kapiti Coast District (Van Dissen & Heron, 2003). GNS's methodology was consistent with the Ministry for the Environment *Interim guidelines on planning for development of land on, or near, active faults* (Kerr *et al.*, 2003). The methodology involved:

1. Identifying all known active fault traces, and related features, in the Kapiti Coast District;
2. Mapping and defining the positional coordinates of the fault traces, and related features;
3. Classifying all parts of a fault in terms of the fault complexity of surface rupture;
4. Defining Fault Avoidance Zones for each of these parts; and
5. Determining the average recurrence interval of surface rupture faulting (i.e. Recurrence Interval Class) for each fault.

Subsequent to Van Dissen & Heron (2003) the Minstry for the Environment's guidelines for planning for development of land on or close to active faults were finalised (Kerr *et al.*, 2003b). These final guidelines contain a series of case-studies, including the application of the methodology, results and recommended process specifically within the Kapiti Coast District. The work summarised in Van Dissen & Heron (2003) is directly referenced, reviewed and endorsed as 'best practice'.

Details of known active fault features within the Kapiti Coast District were obtained from a number of sources, including: published papers, unpublished GNS Science and Client reports, drill hole data, previous GNS clients and sub-contractors (Pritchard Group and Cuttriss Consultants), the Kapiti Coast District Plan, and the authors' first-hand knowledge of the geology and active faulting in the district, including trenching studies along the Ohariu Fault. This information was supplemented with air photo interpretation of the district.

Van Dissen & Heron (2003) identified five active fault traces within the District: Ohariu Fault, Northern Ohariu Fault, Gibbs Fault, Otaki Forks Fault and the South-east Reikorangi Fault.

The mapped fault features were used to construct fault rupture zones (zones within which future rupture is likely to cause intense ground deformation). In some areas, these zones are based on the position of a simple linear fault-line, and the width of the zones reflects the accuracy of capture. In other places, the zone is based on complex features or inferred where no features are preserved. In these areas the width of the zone is large and reflects both the complexity and uncertainty of the fault location on the ground, and the accuracy of delineation.

Surface rupture Fault Complexity is an important parameter used in defining rupture hazard at a site. When fault rupture deformation is distributed over a wide area, the amount of deformation at a specific locality within the distributed zone is less compared to where the deformation is concentrated on a single well-defined trace. The relative fault rupture hazard/risk is therefore less within a zone of distributed deformation than within a narrow well defined zone. The fault feature data compiled for the Kapiti Coast was used to categorise the fault rupture complexity for all parts of each active fault in the district. The MfE Interim Guidelines define Fault Complexity of surface rupture using the following terms:

- Well defined: fault rupture deformation is well defined and of limited geographic width (e.g. metres to tens of metres wide);
- Distributed: fault rupture deformation is distributed over a relatively broad geographic width (e.g. tens to hundreds of metres wide), and typically comprises multiple fault traces and/or folds;
- Uncertain: the location of fault rupture deformation is uncertain, usually because the fault has not been mapped in detail, or because evidence of deformation has been either buried or eroded away;

- Distributed & Uncertain - constrained: the location of fault rupture deformation can be constrained to lie within a relatively broad geographic width (e.g. tens to hundreds of metres wide). *Distributed Fault Complexity* applied to areas where fault rupture deformation is distributed over a relatively broad, but defined, geographic width (e.g. tens to hundreds of metres wide), typically as multiple fault traces and/or folds. *Uncertain - Constrained Fault Complexity* applies to areas where the location of fault rupture is uncertain because evidence has been either buried or eroded but where the location of fault rupture can be constrained to a reasonable geographic extent (≤300 m).

Ohariu Fault

The Ohariu fault is one of the major earthquake-generating faults in the Wellington region. It extends approximately 70km north-northeastwards from offshore of the Wellington south coast, through Porirua, to at least Waikanae (Figure 1). North of Waikanae, the name of the Ohariu fault changes to the Northern Ohariu fault which extends northward to near Palmerston North.

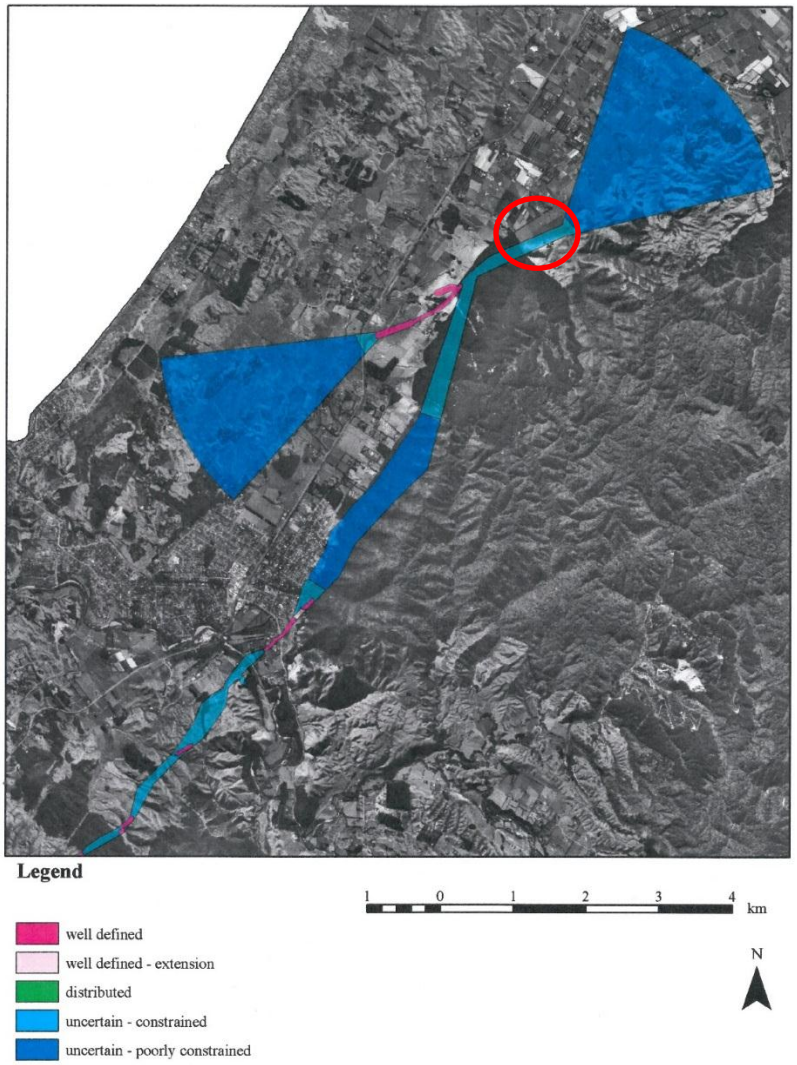

Figure 1: Location of the Ohariu Fault and disputed fault avoidance area (circled in red).

Trenching and other detailed studies on the Ohariu fault have determined that the fault has a right-lateral slip rate of approximately 1-2mm/yr, and an average recurrence interval of surface rupture earthquakes of 1500-5000 years. It most recently ruptured the ground surface about 1000 years ago, and is capable of generating earthquakes in the order of magnitude 7.5. Individual surface rupture earthquakes along the fault are expected to generate 3-5 metres of right-lateral displacement at the ground surface, and a lesser and variable amount of vertical displacement.

The recurrence interval of 1500-5000 years for the Ohariu fault spans several Recurrence Interval Class boundaries defined in the MfE Interim Guidelines (Kerr *et al.* 2003). Based on the mean of this range (3250 years), the fault is placed in Recurrence Interval Class II, >2000 years to ≤3500 years (Van Dissen & Heron, 2003).

Parts of the Ohariu fault fall into the well-defined, uncertain-constrained, and uncertain-unconstrained complexity classes. In the area under dispute, the Ohariu fault is uncertain-constrained and based on a series of springs and saddles.

Process so far

In 2005, Council prepared *Plan Change 61 - Review of Earthquake Fault Traces* which adopted a risk based approach to development on or near active fault traces. This approach is based on the Ministry for the Environment's *Planning for Development of Land on or Close to Active Faults*: *A guideline to assist resource management planners in New Zealand* (MfE Guidelines 2003). The Fault Avoidance Zones in Plan Change 61 were based on the Van Dissen & Heron (2003) and updated to include additional more recent site-specific investigations.

Plan Change 61 was notified in 2007. Following a Hearing in 2009, the Commissioners recommended that the Kapiti Coast District Council adopt Plan Change 61 with a few minor amendments e.g., the removal of the Hadfield Fault.

On 3 June 2010, Council adopted the following resolution on Plan Change 61, based on the Commissioner's recommendations:

> *"That the Council, being satisfied as to the matters in section 32 of the Resource Management Act 1991, adopts Plan Change 61: Fault Avoidance Zones, as set out in Schedule 1 of the attached Commissioners' Report; and*
>
> *That all submissions and further submissions made in respect of Plan Change 61: Fault Avoidance Zones are accepted, accepted in part or rejected for the reasons given in the attached Commissioners' Report and Summary of Submissions."*

The Plan Change was made operative on 14 October 2010. Consequently the Ohariu Fault, including that section under dispute in this submission, is currently included within the operative District Plan (Figure 1). It has been carried over into the Proposed District

Plan. This submission is therefore seeking to have this section of the Ohariu Fault removed from the Proposed District Plan without providing any evidence or justification for such an action.

Required information

No guidance is provided within the Proposed District Plan regarding the information and level of detail required to revoke or change the provisions of the District Plan regarding Fault Avoidance Zones. However, it is likely that as a minimum the Fault Avoidance Zone would need to be trenched to at least the standard required for locating structures. This would require that:

- Trenching is undertaken by a 'suitably qualified person'. This would involve whoever is looking to undertake the work sending through a copy of their CV, together with details of their relevant trenching experience, to Council for approval;
- It is established with some confidence that there is no evidence of a fault in the vicinity, including preparation of a detailed log and photographic record of a least one trench across the entire Fault Avoidance Zone;
- The suitably qualified person (geologist/geological engineer etc.) would interpret the log/photographic record and provide a report to Council which details the investigation, trenching methodology, findings, and recommendations and advice regarding the presence or absence of the fault; and the confidence of their professional judgement;
- The trenching results would then be assessed by Council in relation to other information it holds and any professional advice it obtains;
- The trenching information would be sent to GNS, who would update the fault information, provided the information is considered robust; and
- If there are any changes to the Fault Avoidance Zones the District Plan could then be updated. However, updating the Operative District Plan would involve a plan change, and as such there would be a time delay. Any trenching information received prior to the plan change going through could be incorporated at the time of the plan change hearing. Depending on timing, and the scope of submissions, the Proposed District Plan, could be amended through the hearings and decision process.

Recommendation

The Ohariu Fault (Northern End), described as “Uncertain Constrained”, shown on Map 18C – Natural Hazards appended to the Proposed District Plan is already included within the operative District Plan. The ‘science’ and justification for this zoning was fully reviewed and evaluated during the District Plan Change 61 hearing. That hearing considered evidence relating to all faults within the District.

The submitter provides no evidence or argument supporting the removal of this section of the Ohariu Fault from the maps which form part of Proposed District Plan. The submission states that there is no, or insufficient, evidence that any fault exists.

However, as has been outlined, a robust process was followed in including the fault avoidance areas associated with Ohariu Fault, in the Operative District Plan by means of Plan Change 61. Consequently the fault should remain as shown.

References

Kerr, J., Nathan, S., Van Dissen, R., Webb, P., Brunsdon, D., King, A., 2003b: Planning for development of land on or close to active faults: A guide to assist resource management planners in New Zealand. Report prepared for the Ministry for the Environment by the Institute of Geological & Nuclear Sciences, Client Report 2002/124, Project Number 440W3301.

Kerr, J., Nathan, S., Van Dissen, R., Webb, P., Brunsdon, D., King, A., 2003: Planning for development of land on, or close to active faults: An interim guideline to assist resource management planners in New Zealand. Institute of Geological & Nuclear Sciences Client Report 2002/124 (prepared for Ministry for the Environment, New Zealand).

Van Dissen, R. & Heron, D. 2003: Earthquake fault trace survey Kapiti Coast District. Report prepared for Kapiti Coast District Council by the Institute of Geological & Nuclear Sciences, Client report 2003/77, Project Number 430W6910