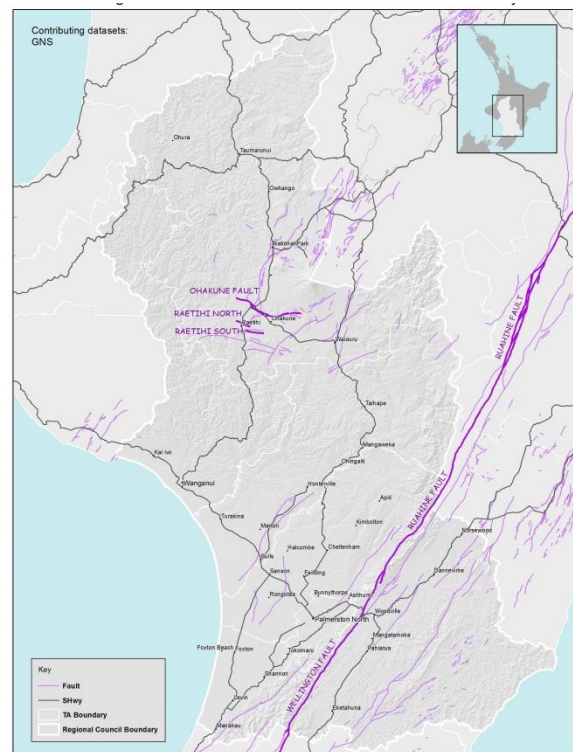
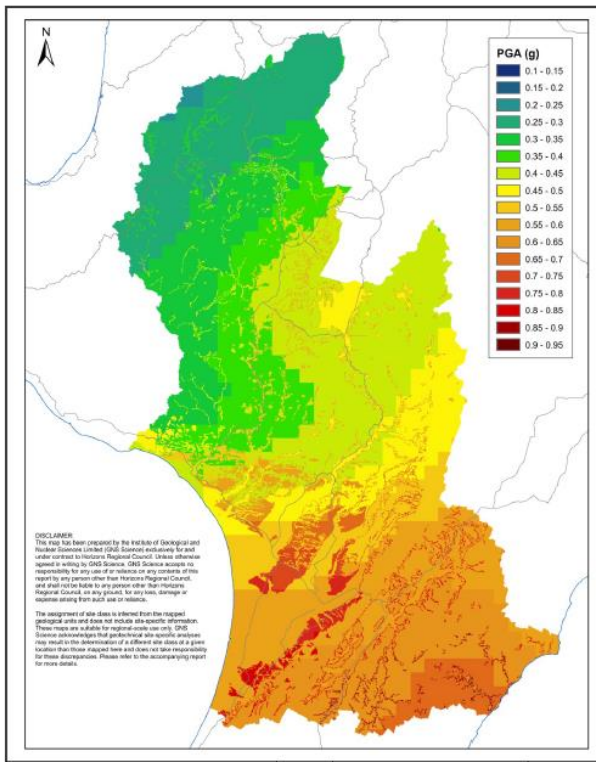


Manawatu-Whanganui Lifelines Project

Lifelines Initial Earthquake Response Plan



29 July 2019



Brendan Morris Consulting Limited is a hazards and emergency management consultancy. Based in Hamilton, the company offers services throughout New Zealand.

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Acknowledgements

I would like to acknowledge the support and assistance of the Manawatu-Whanganui Lifelines Advisory Group members who gave their time in compiling response information in support of this project.

I would also like to thank David Rei Miller and Ian Lowe for their leadership, guidance and support.

Approved by:



Brendan Morris, Director.

Issued: 29 July 2019

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Report status:

Version	Date	Status	Approved by:
1.0	13 June 2019	First draft	Ian Lowe
2.0	25 June 2019	Second draft, post comments by DR Miller and I Lowe	Ian Lowe
FINAL	29 July 2019	Complete, post Lifelines Advisory Group and Coordinating Executive Group reviews	Ian Lowe

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QUICK START GUIDE FOR IMMEDIATE RESPONSE

In the event of a major earthquake:

Establish Lifelines Utilities Coordinator (LUC) role in the Group Emergency Coordination Centre as soon as possible.

LUCs are to use the following guidance in response:

1. Start and continue initial response actions per **Section 3.2.2** of this plan
2. Review primary response coordination considerations per **Section 3.4** of this plan
3. Initiate contact with lifeline utilities using latest Manawatu-Whanganui Lifelines Advisory Group contact list
4. Use **Appendix 6** for summary status reporting
5. Use **Section 3.3** of this plan as required to understand initial impacts and lifeline utility actions for the different sector groups
6. To understand basic regional lifelines routes, priorities and criticalities, refer to the 2016 report '**A Vulnerability Assessment of Lifelines Infrastructure in Manawatu Whanganui**' (Manawatu-Whanganui Lifelines Group, 2016), **Section 3, pp. 10-25.**

Lifeline utilities are to use the following guidance in response:

1. Start initial response actions per **Section 3.2.3** of this plan
2. Use **Appendix 5** for status reporting
3. Review **Sections 3.3 and 3.4** as required to assist understanding of other sector priorities and actions.

1 INTRODUCTION

1.1 Purpose

The purpose of this plan is to provide an improved understanding of initial impacts, actions and priorities of lifelines utilities following a maximum credible earthquake event in the Manawatu-Whanganui CDEM Group area. This plan also provides guidance on the initial coordination requirements and actions for lifelines utilities following such an event.

1.2 Scope

This plan builds upon the foundation document for lifelines utilities in the region 'A Vulnerability Assessment of Lifelines Infrastructure in Manawatu Whanganui' (Manawatu-Whanganui Lifelines Group, 2016). The '2016 vulnerability assessment report' is supported by a previous detailed vulnerability analysis completed in 2005.

This plan does not extend the hazards and vulnerability work completed in 2005 and 2016, but uses the existing information to develop operational response priorities and actions for coordinating lifelines utility response.

This plan is specific to seismic hazards (ground shaking, liquefaction and landslides), and to a lesser extent, potential tsunami generated from a maximum credible earthquake event. While the plan does not cover other hazards, similar lifelines utility coordination actions may be applied to responses to other hazards.

This plan acknowledges that some actions described may not be required, but should be undertaken anyway to account for the likelihood and consequences of a total or partial communications outage. This creates a 'no-regrets' response environment in the initial stages of the response.

This plan is not intended to be a detailed statement of each lifelines utility role, responsibility and operational responses, as these remain the responsibility of each utility, and are outside the scope of this plan. However, it is noted that lifelines utilities will require business and leadership continuity plans in order to achieve their obligations for response.

1.3 Activation and operational period

This plan will be activated following a major earthquake affecting the Manawatu-Whanganui CDEM Group by decision of the CDEM Group Controller, or by default as follows:

- **Activation by decision:** will be communicated to the LUCs and lifelines utilities
- **Activation by default:** following reports of a major earthquake in the Manawatu-Whanganui CDEM Group, LUCs and lifelines utilities staff should attempt to contact the local EOC or ECC. If no contact is made within an hour, LUCs and lifelines utilities are to assume activation of this plan and undertake their tasks accordingly.

The operational period of this plan is 3-5 days, or until:

- Communications are established with all affected lifelines utilities, and
- A response action plan has been developed.

Due to the operational period specified, this plan covers initial response only, and does not consider the recovery phase.

1.4 Background

Following completion of the lifelines vulnerability assessment report (2016), discussions between the CDEM Group Emergency Management Office Manager and Lifelines Advisory Group (LAG) Chair identified the need for an

initial response plan for lifelines utilities for maximum credible events, particularly earthquake events. While the lifelines response and recovery arrangements for minor, frequent events are clear and well-practiced, a need for improving the understanding of response to maximum credible events was identified.

The need for this plan is to fulfil a perceived gap in initial understanding of probable impacts to and response priorities of lifelines utilities, current preparedness, probable support requirements for lifelines utilities, likely service restoration timeframes, and how initial coordination of lifelines utilities response would work following a major earthquake. The assumption is that the LUC and lifelines utilities will be 'in the dark' for a few days with respect to understanding the impacts following a maximum credible earthquake event.

The thinking behind this plan is to improve our collective understanding of what everyone will be doing while we're all 'in the dark' for the first few days. This plan is intended to help initial coordination of response until communications and a formal response structure are established.

The expected outputs of this plan are:

- Simple, clear arrangements that provide confidence that the Manawatu-Whanganui CDEM Group has a basic idea of lifelines impacts and initial coordination arrangements when a maximum credible event occurs
- Arrangements that are compatible with the National Crisis Management Centre (NCCMC) operating arrangements and Ministry of Civil Defence & Emergency Management (MCDEM) guidance.

1.5 Context of this plan

This plan is a supporting document to the Manawatu-Whanganui CDEM Group Plan 2016 – 2021 (Version 1.3, 2018). This plan is 'operational response' oriented, and sits alongside a range of processes, procedures, policies and other documents that provide detail about how the CDEM Group operates.

This plan helps to give effect to the CDEM Group Plan by:

- *'Encouraging co-operative planning and action between the various emergency management agencies....'*, and
- Contributing to fulfilling Strategic Goal 3 of the CDEM Group Plan: to ensure *'agencies are aligned, prepared and able to provide an effective response to an emergency'*.

From a broader national perspective, and in the words of the mission of the New Zealand Lifelines Council, this plan contributes towards the over-arching purpose of the lifelines project, which is to:

- *'Enhance the connectivity of lifeline utility organisations in order to improve critical infrastructure resilience.'*

1.6 How this plan was developed

The project methodology used to develop this plan is as follows:

Background information gathering: extensive review of existing similar guidance or plans was undertaken, including the Wellington Earthquake National Initial Response Plan, and guidance from the New Zealand Lifelines Council, and Lifelines Advisory Groups and CDEM Groups around New Zealand. A detailed review was undertaken of all Manawatu-Whanganui CDEM Group lifelines information, focusing on maximum credible earthquake event information.

Presentation to and consultation with the Lifelines Advisory Group: discussions were held with the LAG near the start of plan development to seek buy-in on the scope and intent, and advice on information required for the plan.

Attendance at the Hikurangi Response Plan Stakeholder Workshop: the purpose of attendance was to ensure that the assumptions behind this plan were informed by recent scientific investigations into large subduction zone earthquakes associated with the Hikurangi Trench, and the maximum shaking impacts to the Manawatu-Whanganui CDEM Group.

Information gathering from lifelines utilities: the following information was requested from all lifelines utilities:

- What are your initial actions for your lifeline utilities following the event?
 - What is most important?
 - Are there any existing standard operating procedures or business continuity plans that outline these initial actions?
- How will you conduct impact assessments? What information will you need?
- How will you establish communications with the local Emergency Operations Centre and Lifelines Utilities Coordinator?
- What are the likely restoration timeframes, assuming widespread damage?
- What are your main interdependencies?
- What will you need to know regarding the regional status of damage? What support, if any, are you likely to require from the CDEM Group?

Information was received in varying amounts and formats, including written responses to the questions asked, provision of standard operating procedures or plans, and by telephone interview if required. Once received, the information was collated to provide a broad overview by the following sectors:

- Telecommunications
- Electricity and Gas
- Regional Transport (State Highways, Rail, Airports, Port)
- 'Three-Waters' and Local Roads
- Hospitals (included within this plan as they are critical customers and integral to effective response).

The sector overviews and associated coordination actions form the core of this plan (per Section 3).

Development of draft plan: information and advice from all sources above was compiled into an outline draft.

Review and completion of final plan: the draft plan was reviewed initially by Ian Lowe (CDEM Group Manager), then sent out for feedback from LAG members. The plan was then revised and completed based on feedback.

1.7 Audience

This plan is intended primarily for:

- The LUC or persons performing the lifelines utility coordination role during a response in an ECC or EOC.
- Lifelines utilities within the Manawatu-Whanganui CDEM Group.

This plan may also be of interest to the following audience:

- CDEM Group Controllers
- The Group EMO Manager and staff
- ECC/EOC staff from across the CIMS functions, particularly Intelligence, Communications and Welfare
- The CDEM Group Joint Committee and Coordinating Executive Group
- Ministry of Civil Defence & Emergency Management (MCDEM) staff
- NCMC staff, in particular the National Lifeline Utility Coordinator and other Lifelines desk staff
- Lifelines Sector Coordinating Entities (SCEs)
- Other central government agencies and government officials involved in the response.

While the information contained in this plan may be useful to other audiences (such as other CDEM Groups), it is set at a Manawatu-Whanganui CDEM Group level, and therefore does not directly address the response actions to be followed by those other audiences.

2 MAXIMUM CREDIBLE EARTHQUAKE EVENT SCENARIO AND OPERATING ENVIRONMENT

The purpose of this section is to provide a brief overview of the maximum credible earthquake scenario and operating environment assumptions that underpin this plan. In addition, this section provides a brief overview of the critical lifelines infrastructure per Section 3 of the 2016 lifelines vulnerability assessment report.

2.1 Maximum credible earthquake event scenario

This plan assumes a 'maximum credible' earthquake event for the Manawatu-Whanganui CDEM Group, based on existing seismic information.

While it is not possible to define a single earthquake event that will produce maximum credible effects across the entire CDEM Group with absolute certainty, existing seismic information suggests that:

- Ground shaking will be around 8-9 on the MM scale, with Peak Ground Acceleration of ~0.5, which will result in widespread damage to buildings and infrastructure
- All regionally significant lifelines utilities will initially be inoperable or significantly degraded, including state highways and many local roads, rail, port and airports, electricity and gas, telecommunications and local three-water's services.
- Cascading and secondary hazards will affect the affected area. These hazards, which may exacerbate the primary impacts of the initial earthquake, may include:
 - Aftershocks: will continue throughout the impacted area for months or years
 - Tsunami: in coastal regions, depending upon the earthquake epicentre (most likely with a Hikurangi Trench event, impacting the east coast of the region)
 - Fire: particular risk in suburbs with reticulated gas and closely-packed houses
 - Flooding: storm water and flood protection systems will be compromised
 - Landslide, liquefaction and subsidence
 - Severe weather.

Further information on regional seismic hazards is outlined in section 5 of the 2016 lifelines vulnerability assessment report (pp. 30-40), a copy of which is provided in Appendix 1. Appendix 1 provides:

- An overview and exposure of seismic hazards across the region
- Maps showing faults, liquefaction, Peak Ground Acceleration and potential landslide hazards
- Infrastructure vulnerability assessment (critical assets exposure to hazard and potential service disruption) for liquefaction hazards, and for ground shaking, fault rupture and landslide hazards combined.

The infrastructure vulnerability assessment (Tables 3 and 4) provides much of the detail on potential damage and service disruption that could be expected from a maximum credible event.

Further information is provided in Appendices 2 and 3:

- Appendix 2: 2005 Manawatu-Wanganui Lifelines Project Report, Appendix 4 – District Risks – 1 Maps. The following maps included are of particular relevance to this plan:
 - Regional Seismic Hazards: 1000 Year Return Period Modified Mercalli Scale Earthquake Shaking Intensity
 - Faulting and Ground Shake Zones
 - Faulting and Liquefaction
- Appendix 3: A map of Modified Mercalli Intensity (MMI) from a magnitude 8.9 Hikurangi subduction earthquake scenario. This map shows less shaking intensity than that shown in Appendix 2, and is therefore not considered to increase the existing known risks from earthquakes when compared to the 2005 and 2016 reports.

2.2 Operating environment

The following operating environment assumptions have been made in the development of this plan, and will need to be verified as part of the initial response:

- The NCMC will be functional and operating from its primary site in Wellington or alternative site in Auckland, but may initially be operating at a reduced level
- The event has affected multiple regions/CDEM Groups
- A state of local emergency will be declared within 12 hours in the Manawatu-Whanganui CDEM Group, and may be upgraded to a state of national emergency depending upon damage to other regions
- The Manawatu-Whanganui CDEM Group ECC is functional at its primary location, but may initially be operating at a reduced level
- All Local EOCs are functional at a reduced level, operating from primary or alternate locations
- Response agencies, including emergency services and lifelines utilities are functional at a reduced level, either in their primary location or alternative locations
- All primary communications channels are initially down, and alternate communications channels are limited, but functional. Most responding agencies will be able to communicate, albeit in a much-reduced capacity, initially using a combination of satellite communications, radio and couriers
- The region is isolated from Wellington by road, and there is limited access on state highways to the north
- Palmerston North, Base Ohakea and Whanganui airports and Whanganui Port will have some level of operational ability within 48 hours
- National air and sea assembly areas outside the region are operable
- There are no financial barriers to justified response activities
- Community-led response will begin automatically and individuals will support each other with the resources they have available
- Some spontaneous self-evacuation will occur, and supported evacuation will occur - all air, sea and land assets moving into the region will depart with evacuees on board
- Automatic ordered mass evacuation out of the region will not take place, and any ordered evacuation that does occur will be conducted after a full assessment of the situation, and planned for accordingly.

If any of these assumptions are proven invalid, this plan will need to be adapted and/or provision made in the response action plan.

2.3 Critical regional lifelines infrastructure and interdependencies

The following excerpts are taken from the 2016 lifelines vulnerability assessment report.

Lifelines Infrastructure Vulnerability to Hazards

As concluded in the original 2005 lifelines project report, the seismic hazard is the most potentially damaging hazard from an infrastructure perspective with almost all lifelines services expected to suffer some level of damage in the 1:2500 year event. Restoration of major transmission lines, State Highways (or less damaged alternate local routes) and bulk water supplies will be a major focus in the first few days but temporary restoration of all services is likely to take days to weeks and full recovery of networks months to years (Executive Summary, p. 5).

The Region's Critical Lifelines Infrastructure

For this project [*the 2016 lifelines vulnerability assessment report*], lifelines organisations rated the criticality of their assets as nationally, regionally or locally significant, as defined in Section 3.1. Key points in relation to Manawatu-Whanganui's critical lifelines infrastructure include:

- With no significant fuel storage in the region, the fuel supply is almost completely reliant on the road network with fuel trucked in from ports in Wellington and Napier. Only 1-2 days' supply is typically held in service stations.

- Most of the region’s electricity is supplied from Bunnythorpe in the south, via transmission lines rated as regionally significant (Bunnythorpe is a critical pinch point in the North Island transmission network). The transmission lines from Taranaki provide an alternative (albeit reduced) supply for the region if those lines fail, as does the Tararua Wind Farm.
- Gas transmission lines running south from the Taranaki gas fields supply reticulated gas to the region and beyond (Hawke’s Bay and Wellington).
- Three north-south fibre cables through the North Island (Chorus) provide diversity for each other. The Palmerston North exchange is regionally significant as it provides switching into a number of local exchanges in the region and the Levin exchange provides an important North Island – South Island link (though there are alternatives).
- Kordia’s Wharite site provides telecommunications, broadcasting and radio services to and through the region and on to Taranaki.
- SH 1 and SH 2 (from Woodville north) and SH 57 (from Woodville south) are the nationally significant roads in the region. Manawatu Gorge [now closed]¹ remains a key vulnerability in the road network, at risk from both seismic and flood hazards.
- Other critical transport infrastructure includes the trunk rail lines, Palmerston North airport and the ‘inland port’ in Palmerston North which is one of three major food distribution centres in New Zealand (Exec. Summary, p. 6).

Lifelines Sector Interdependence²

All lifelines services rely to some extent on some or all of the other lifelines services in order to operate. Therefore, a hazard impacting on one lifelines network is likely to have a knock-on effect to others. In order to mitigate the risk that arises from this dependence, many lifelines have backup services should the service they rely on fail.

Figure 1 is a summary of the interdependencies between lifelines sectors during major disaster events where disruption is expected to all major networks. The ratings presented in this figure are illustrative only – the extent of dependence in a response situation will depend on the specific scenario. The total dependency scores illustrate the importance of electricity, roads, fuel and telecommunications to the other sectors, with air transport and broadcasting becoming more important in a major disaster event.

3: Required for Service to Function, 2: Important but can partially function and/or has full backup, 1: Minimal requirement for service to function.

The degree to which the utilities listed to the right are dependent on the utilities listed below	Roads	Rail	Sea Transport	Air Transport	Water Supply	Wastewater	Stormwater	Electricity	Gas	Fuel Supply	Broadcasting	VHF Radio	Telecomms	Total Dependency
Fuel	3	3	3	3	3	3	3	3	3		3	3	3	36
Roads		3	3	3	3	3	3	3	3	3	2	2	3	34
Tele-comms	3	2	2	2	3	3	3	3	3	2	2	3		31
Electricity	1	2	3	3	3	3	2		2	2	3	3	3	30
VHF Radio	2	2	3	3	2	2	2	2	2	2			2	26
Broadcasting	2	2	2	2	2	2	2	2	2	2		2	2	24
Air Transport	2	1	1		2	2	2	2	2	2	2	2	2	22
Water Supply	1	1	1	2		3	1	1	1	1	1	1	2	16
Stormwater	2	1	1	2	1	1		1	1	1	1	1	1	14
Wastewater	1	1	1	2	1		1	1	1	1	1	1	1	13
Rail	1		1	1	1	1	1	1	1	1	1	1	1	12
Sea Transport	1	1		1	1	1	1	1	1	1	1	1	1	12
Gas	1	1	1	1	1	1	1	1		1	1	1	1	12

Figure 1: Interdependency Matrix – During Disaster Event

¹ With closure of the Manawatu Gorge, vulnerability has now shifted to the Saddle and Pahiatua Track roads.

² Adapted to suit from the original report text.

3 OPERATIONAL RESPONSE

The purpose of this section is to provide an overview of the anticipated level of emergency, operating structure and lines of communication during response, initial LUC actions in response, and details on the actions, priorities and needs of lifelines utilities for large earthquake response.

3.1 Level of emergency and operating structure

3.1.1 Level of emergency

The nature of the maximum credible earthquake scenario means that *this plan is operational during Level 4 and Level 5 emergencies*. The definition of these events is provided within the CDEM Group Plan (refer to p. 49):

- **Level 4: A multi-agency emergency with more significant consequences than in level 3; co-ordination may be required between agencies or areas or both; CDEM Group ECC level support and co-ordination is required; CDEM Group-wide declaration made or being considered; national monitoring will occur and national support is available:** An emergency that is regionally significant, or where the response and resources provided to a single or multiple EOCs would benefit from being co-ordinated. This level of co-ordination is provided from a Group Emergency Co-ordination Centre (ECC). A state of local emergency should be declared and Group co-ordination initiated.
- **Level 5: A state of national emergency exists or the local emergency is of national significance; at this level, co-ordination by the National Controller will be required:** An emergency that is nationally significant, or requires national co-ordination and support for regionally co-ordinated responses. The respective national co-ordination facility, such as the National Crisis Management Centre (NCCM) or National Health Coordination Centre (NHCC), will be activated to support Group ECC/EOCs, which will in turn be supporting participating local/agency EOCs. A state of national emergency does not necessarily have to have been declared for this level of co-ordination to be initiated.

During Levels 4 and 5, the Group ECC will be operating in the 'Manage' mode, per Table 13 of the CDEM Group Plan (p.55).

3.1.2 Operating structure

Figure 2 shows the operational response structure for lifelines utilities in the Manawatu-Whanganui CDEM Group that applies for the purposes of this plan.

Figure 2 shows the response structure for a Level 4 event that affects more than one region. During a Level 5 event, it is likely that the Cabinet National Security Committee (NSC) will be activated to coordinate and direct national response, and that primary coordination of lifelines utilities will be done at the national level (dotted lines above).

At Level 4, the following communication processes between the GECC and lifeline utilities apply:

- **Local authority utilities** (three-water's and local roads) will **contact the LUC via the Local EOC**
- **Regional/national lifeline utilities** such as NZTA representatives, airports, broadcasters, telecommunications companies, electricity lines companies, and gas and petroleum distribution companies **contact and co-ordinate with the LUC in the GECC**. If contact cannot be made with the LUC, contact should be made with either the Local EOC, or Sector Coordinating Entity (SCE) if possible. Regional lifelines utilities should also provide status reports to Local EOCs, and liaise with Local EOCs on site-specific issues as required
- Coordination is primarily at the CDEM Group level, with reporting from the LUC as required up to the National LUC in the NCCM, and regional lifeline utilities reporting up to the national level via SCEs.

At Level 5, the local authority utilities and regional utilities will **continue to report as described above** via Local EOCs and the GECC. The key changes are:

- National lifelines utilities will liaise with the National Controller via the National LUCs (or processes) in the NCCM, as well as liaising with the GECC and Local EOCs
- The LUC collates and sends CDEM Group status reports to the NCCM.

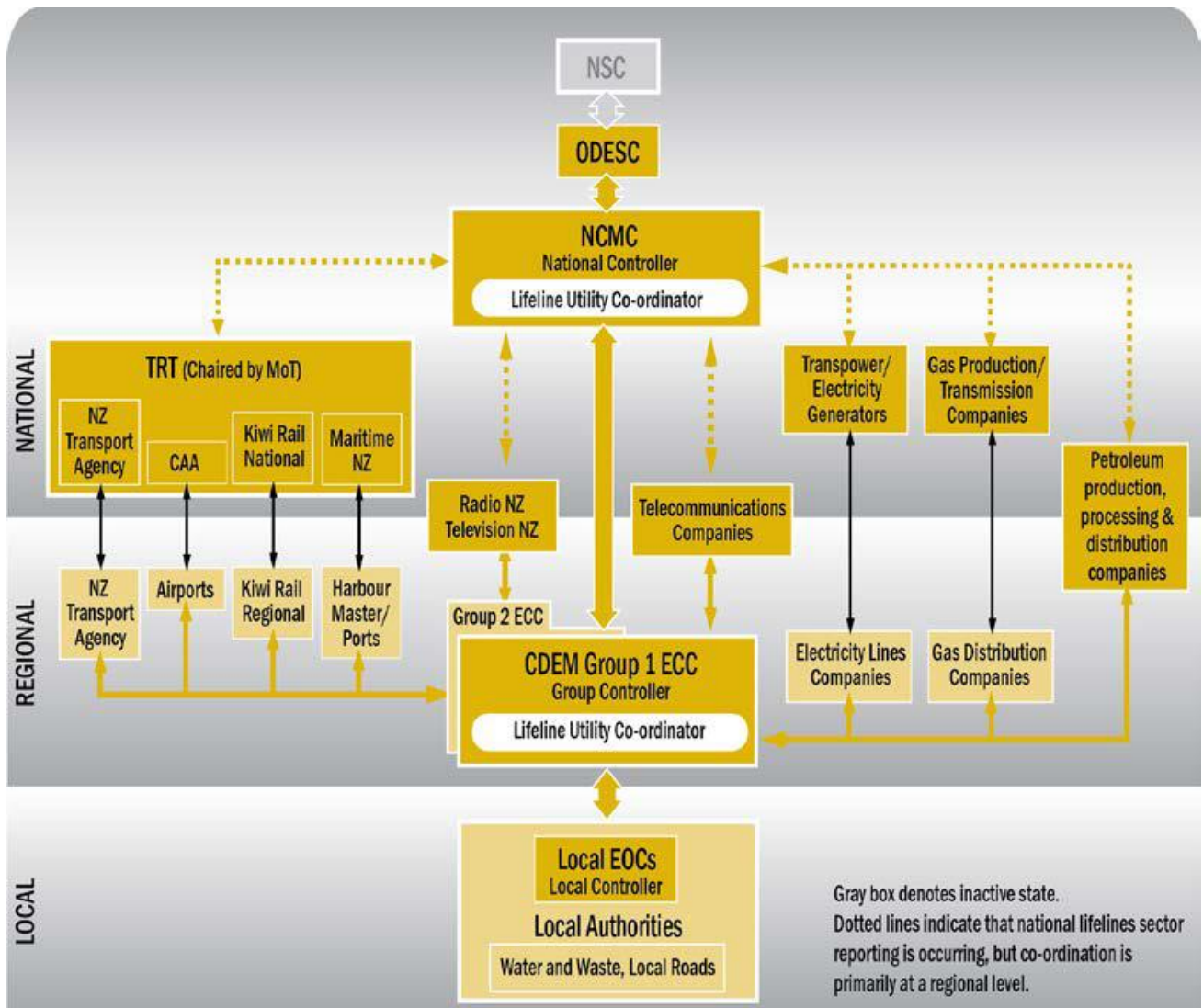


Figure2: Operational response structure for lifelines utilities in the Manawatu-Whanganui CDEM Group as it applies to this plan (Reference: Guide to the National CDEM Plan 2015, Section 13 Lifeline utilities, Figure 13.3, p. 13).

Information flows and two-way communication

The lines between individual organisations and coordinating groups represent lines of connection for communication purposes. Information flows via these lines of communication are two-way in nature:

1. Upward (or inward) to the coordinating agencies at each level; for example, impact and status reports, and requests for information or assistance
2. Downward (or outward) from the coordinating agencies; for example, reports on the overall event status; Controllers' taskings or requests, including specific response priorities where they differ from general expectations.

As well as the upward/downward communication shown in the diagrams, it is expected that a multitude of 'horizontal' communications will take place directly between individual organisations. Horizontal communication is encouraged between all agencies and organisations contributing to a response.

3.2 Lifelines utilities coordination and response actions

3.2.1 Overview of Lifelines Utilities Coordination

The Manawatu-Wanganui CDEM Group Plan (p. 60) states that lifeline coordination in the Group ECC is provided by the Lifeline Utility Coordinator (LUC) appointed by the Group. The LUC role includes:

- The coordination of the flow of information between lifeline utilities and the Group ECC
- Providing the Group Controller with information and advice about lifeline utilities
- Ensuring the lifeline utilities are aware of, and acting on the Group Controllers priorities regarding lifelines.

In summary, the objectives of LUCs are to coordinate the actions of lifeline utilities and CDEM organisations to provide a safe and effective response, and support the restoration of lifeline services as soon as possible.

Further information about the lifelines coordination role in the GECC is provided in Appendix 4.

3.2.2 Lifeline Utility Coordinator initial response actions

Following notification of the event and activation of the GECC, the LUC or person/team assigned LUC responsibilities should undertake the following actions:

1. Establish and maintain contact with regional lifeline utilities (those that communicate directly with the GECC, per Figure 2), and advise that the GECC is operational. Ask for contact details of the utility person/s that will provide the communication point with CDEM during the emergency. Ask for a quick comment on how extensively the utility's services are affected (and/or request a formal status report as per Appendix 5, if required). **Note:** refer to section 3.2.3 for detailed information on sector initial actions, priorities and needs.
2. Once received, provide a list of contact details to the Operations Manager, so that GECC messages (media releases, declarations, situation reports etc.) can be sent directly to utilities by the relevant GECC team.
3. Let other GECC managers know that you have established contact with the lifeline utilities and can access information from them, or pass on requests to them.
4. Confirm with operational Local EOCs that significant local water/waste and roading information should be reported via them to the GECC.
5. Maintain a log of all communications received. For important messages sent (e.g. initial notification of activation, messages requiring utility action, declarations etc.) set up automatic receipt notification and record times at which each utility receives the email. Follow up non-receipts with phone calls.
6. Request, receive and assess lifeline utility status reports. Facilitate impact assessments and information collection if required, and set agreed expectations on the frequency of reporting. Immediately advise the Operations Manager of requests for support or significant information received that other GECC staff may need to be aware of. Assess whether any 'inter-dependency' issues need to be addressed by utilities re-prioritising their restoration efforts. **Note:** refer to sections 3.3 and 3.4 for information on sector initial actions, priorities and needs.
7. Pass on requests from the Controller, such as in relation to service restoration priorities. Note that utilities should be asked to take into account these response service restoration priorities in the absence of any CDEM instruction to the contrary:
 - Critical health and disability services (e.g. District Health Boards, Public Health Units and land and air ambulance services)
 - Emergency services and management (e.g. New Zealand Police, Fire & Emergency New Zealand, Emergency Coordination or Operations Centres)
 - Lifelines infrastructure (e.g. energy, communications, water and transport)

- Vulnerable sectors (e.g. immobile or vulnerable groups of people such as in rest homes or prisons)
 - Isolated communities
 - Key areas (e.g. central business districts)
 - Commercial producers (e.g. manufacturing facilities and dairy factories)
 - Residential zones.³
8. Maintain a list of actions required from GECC and by utilities, status of action and response made to utility.
 9. Display key utility information on a whiteboard or screen if accessible.
 10. Develop lifeline utility status summary report per Appendix 6, and assist the intelligence team by providing utility information for GECC Situation Reports.
 11. Coordinate/facilitate sector coordination conference calls as required.
 12. Provide advice to the Controller, particularly with regard to regional impacts, response priorities, available resources, strategic goals, tactical objectives and action plans.
 13. Attend Controllers briefings as requested, report utility status, key actions required and respond to questions.
 14. Provide information for media releases, situation reports and central government reports about the status of lifeline utilities.
 15. Liaise with the NCMC, National LUC (if appointed), other CDEM Groups and the national Sector Coordinating Entities as required.

3.2.3 Lifeline utilities initial response actions

Following the event, lifeline utilities will immediately activate business continuity and response plans.

Following notification and activation of the GECC, lifeline utilities should undertake the following actions:

1. Establish contact with the LUC or GECC as illustrated in Figure 1 by whatever means available, and agree frequency of two-way reporting.
2. Provide status reports to the Local EOC and/or GECC as per the Status Report Template in Appendix 5, which covers:
 - Scale of event impact on network
 - Major disruptions experienced, including location and number of users affected
 - Estimated restoration times for known disruptions
 - Priority areas of response actions being undertaken
 - Alternative solutions available to users
 - Precautions, public information to be promulgated
 - Requests for support or specific information.
3. For regular reporting using the status report template, email is the preferred communication method. In the instance of failure of the preferred communication methods the following may be used, in order of preference: 1. Telephone; 2. Radio; 3. Physical attendance at the GECC (if possible).

³ Refer to Guide to the National CDEM Plan 2015, Version 2.0, Section 13 Lifeline utilities, p. 3.

4. When the GECC is operational, lifeline utilities should discuss draft media releases with the Group Public Information Manager prior to release, and copy media statements to the GECC when they are released.
5. Work within established CDEM Group structures, receive CDEM Group reports, and take CDEM actions as appropriate – including requests for prioritisation of services to support the response effort.⁴
6. National lifeline utilities liaise with the NCMC, National LUC and/or agreed National Sector Coordinating Entity as required, in addition to continuing liaison with the CDEM Group.

3.3 Initial actions, priorities, interdependencies and needs by sector

3.3.1 Overview

In order to assist with managing response, it is helpful to have a high-level understanding of the likely initial actions, priorities, interdependencies and needs of different sectors across the lifelines utilities in the Manawatu-Wanganui CDEM Group. For the purposes of this plan, the following groupings are identified⁵:

- Telecommunications
- Electricity and gas
- Regional transport (state highways, rail, airports and sea transport)
- Three-waters and local roads
- Hospitals.

This section summarises collective initial actions, priorities, interdependencies and needs by sectors - primarily to assist LUCs and/or GECC response staff with lifeline utility coordination during response, but also to inform individual lifeline utilities and Sector Coordinating Entities about these elements as they relate to other sector groups.

Response elements common to all sectors and implications for lifeline utility response coordination are also summarised at the end of this section.

3.3.2 Telecommunications

Table 1 shows the feedback on collective response elements for the telecommunications sector following a major earthquake, comprising input from Spark, Vodafone, 2degrees, Kordia, Vital (formerly TeamTalk), Chorus and Inspire Net.

Response elements	Collective feedback
Initial response actions	<ul style="list-style-type: none"> • Notify staff across organisations and initiate response procedures (form response teams, initiate business continuity and emergency response plans) • Assess key building infrastructure, restrict access where required and implement remote working procedures • Ensure staff safety • Begin impact assessment and response planning.
Response priorities	<ul style="list-style-type: none"> • Ensuring staff health, safety and wellbeing

⁴ Refer to section 3.2.2, bullet point '7' for service restoration priorities to take into account.

⁵ Note that these groupings are different to those presented in the 2016 vulnerability assessment report. This is due to a number of factors including:

- Commonality of response elements and 'ownership' between three-waters and local roads
- Similarity of response issues, actions and needs between electricity and gas
- Recent completion of the Regional Fuel Plan (2018), which clarifies responsibilities and response procedures
- Participation of hospitals in this plan process, despite them not being 'lifeline utilities' per se.

	<ul style="list-style-type: none"> • Impact assessment, particularly for the three main fibre cables and mobile services • Establishing individual response teams and initiating disaster response (response facility, assessment, planning, network monitoring, customer service, media communications etc.).
Existing response plans	<ul style="list-style-type: none"> • All sector organisations have business continuity management and emergency management plans.
How impacts are assessed	<ul style="list-style-type: none"> • The primary method used is remote monitoring systems via network operations centres to detect faults and report on network status. This method is the first option for all organisations • Visual ground-based inspection (if sites accessible), and use of all sources of local information, including contact from contractors, emergency services, CDEM staff and local people • Aerial observation (fixed wing, helicopter or drone).
How communications with CDEM are established	<ul style="list-style-type: none"> • All organisations will use normal communications channels (email, mobile and landline telephones) • Attendance at the GECC or Local EOC as a back-up option.
Likely restoration timeframes	<ul style="list-style-type: none"> • Not possible to predict with any accuracy overall. The following estimates were identified for this event: <ul style="list-style-type: none"> ○ Critical services for Wharite Peak restored within 36 hours, full restoration ~12 weeks (Kordia) ○ Mobile services: minimum 4 hours to days until partial restoration of service ○ Fibre: restoration timeframes in weeks, depending upon damage (Chorus).
Main interdependencies	<ul style="list-style-type: none"> • Road access • Mains power supply • Priority fuel supply • Helicopter access.
Information or support needed from CDEM	<ul style="list-style-type: none"> • Regional status of roads and access, especially bridges • Status of fuel availability, and priority access • Status of electricity supply, and restoration timeframes • Priority access to helicopters • Information on where people are congregating, or where mobile service is most needed.

Table 1: Telecommunications sector response elements and collective feedback.

3.3.3 Electricity and gas

Table 2 shows the feedback on collective response elements for the electricity and gas sector following a major earthquake, comprising input from Transpower, Genesis Energy, Electra, Scanpower, Powerco, First Gas and GasNet.

Response elements	Collective feedback
Initial response actions	<ul style="list-style-type: none"> • Immediate contacting of staff to ensure health, safety and wellbeing • Network monitoring and assessment to understand extent of the event and damage • Isolating power and gas networks to ensure public safety - minimising risks from live wires, and containment of gas leaks to prevent explosions/fire • Notify staff across organisations, mobilise and initiate response procedures (set up emergency response centres, form response teams, initiate business continuity and

	<p>emergency response plans)</p> <ul style="list-style-type: none"> • Establish individual response teams and initiate disaster response (restoration priorities and timeframes, customer service, media communications etc.) • Assess key building facilities to ensure they are intact.
Response priorities	<ul style="list-style-type: none"> • Same order as initial response actions above.
Existing response plans	<ul style="list-style-type: none"> • All sector organisations have business continuity management and emergency management plans.
How impacts are assessed	<ul style="list-style-type: none"> • The primary method used is remote monitoring systems via network operations centres to detect faults and report on network status • Visual ground-based inspection by staff and contractors (if sites accessible), and use of all sources of local information, including contact from contractors, emergency services, and local people • Aerial observation to detect major damage to lines and major gas pipeline ruptures (primarily by helicopter).
How communications with CDEM are established	<ul style="list-style-type: none"> • Most organisations will use a form of alternate communications as the primary means, most commonly satellite phones and radio-telephone networks • If the primary means above are unavailable, attendance at the GECC or Local EOC or regular telecommunications channels (if available) will be used.
Likely restoration timeframes	<ul style="list-style-type: none"> • Not possible to predict with any accuracy overall, and highly dependent upon road access and availability of contractors. The following estimates were identified for this event: <ul style="list-style-type: none"> ○ Days – months for dams, tunnels and power stations, depending upon the extent of damage (Genesis Energy) ○ Multiple gas pipeline failures may be 5-20 days for temporary restoration (First Gas) ○ Estimates for the national grid (Transpower): transformers ~1 month; grid-exit points several days; towers temporary structure within 12-24 hours, replacement in 1 week or more (highly dependent upon the overall extent of damage).
Main interdependencies	<ul style="list-style-type: none"> • Road access to allow visual inspections and repair work • Telecommunications access for reporting and repair coordination • Priority fuel supply • Helicopter priority access (including heavy-lift capability) • Connections to Transpower grid points – from 'black start' generation to exit-point dependence of lines companies • Availability of network repair materials • Agencies and landowners allowing access for repairs, and coordination of repairs with other utilities.
Information or support needed from CDEM	<ul style="list-style-type: none"> • Regional access status of roads – state highways and local roads • Status of fuel availability, and priority access • Intelligence on extent of region-wide damage, especially gas leaks (public health threat) • Priority access to helicopters • Region-wide restoration priorities • Access to communications equipment.

Table 2: Electricity and gas sector response elements and collective feedback.

3.3.4 Regional transport

Table 3 shows the feedback on collective response elements for the regional transport sector following a major earthquake, comprising input from the New Zealand Transport Agency, Higgins, KiwiRail and Whanganui Airport.⁶

Response elements	Collective feedback
Initial response actions	<ul style="list-style-type: none"> • Immediate contacting of staff to ensure health, safety and wellbeing • Establish individual response teams and initiate disaster response plans, with priority on public safety (closing damaged roads, closing the rail network until damage assessments can be made) • Commence impact assessment and visual inspections to understand extent of the event and damage, based on known vulnerabilities such as bridges and structures • Collate information and determine restoration priorities • Building and supplies assessment.
Response priorities	<ul style="list-style-type: none"> • Same order as initial response actions above.
Existing response plans	<ul style="list-style-type: none"> • All sector organisations have business continuity management and emergency management plans.
How impacts are assessed	<ul style="list-style-type: none"> • The primary method is visual ground-based inspection by staff and contractors (if sites accessible), complemented by use of all sources of local information, including contact from contractors, emergency services, and local people, and CCTV (state highways) • Aerial observation to detect major damage to roads and railway lines (primarily by helicopter) • Follow-up structural assessments as required, access permitting.
How communications with CDEM are established	<ul style="list-style-type: none"> • All organisations will use normal communications channels (email, mobile and landline telephones) • Attendance at the GECC or Local EOC as a back-up option.
Likely restoration timeframes	<ul style="list-style-type: none"> • Not possible to predict with any accuracy overall, and highly dependent upon road and rail access for contractors. The following estimates were identified for this event: <ul style="list-style-type: none"> ○ State highways: hours for minor damage, weeks for partial opening, months – years for some bridges depending upon damage (NZTA, Higgins) ○ Rail: minimum of weeks, with main trunk line (Waikanae – National Park) first priority for restoration, then branch line to Taranaki, then Napier (based on numbers, damage, demand and wider response priorities - KiwiRail) ○ Whanganui Airport: weeks, depending upon access routes.
Main interdependencies	<ul style="list-style-type: none"> • Road access to allow visual inspections and repair work (KiwiRail has some access of its own via road-rail vehicles) • Priority fuel supply • Telecommunications access for reporting and repair coordination • Mains power supply to the Kiwirail Main Trunk Line • Availability of contractors.
Information or support needed from	<ul style="list-style-type: none"> • Regional access status of all roads and alternate routes • Region-wide transport restoration priorities

⁶ Note: the quality and usefulness of the information provided would be enhanced by the inclusion of information from Palmerston North Airport and Whanganui Port. In addition, while not a part of the Manawatu-Whanganui Lifelines Group, the inclusion of New Zealand Defence Force information on RNZAF Base Ohakea would complement the existing information, since the base would be a key resource in any large scale response.

CDEM	<ul style="list-style-type: none"> • Status of fuel availability, and priority access • Priority access to helicopters (if road access unavailable) • Timeframes for electricity restoration • Good communications, event leadership and quality planning • Access to structural engineers.
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Table 3: Regional transport sector response elements and collective feedback.

3.3.5 Three-waters and local roads

Table 4 shows the feedback on collective response elements for the three-waters and local roads utilities following a major earthquake, comprising input from the Ruapehu District Council, Whanganui District Council, Rangitikei District Council, Manawatu District Council, Tararua District Council, Horowhenua District Council, Palmerston North City Council, and Horizons Regional Council.

Response elements	Collective feedback
Initial response actions	<ul style="list-style-type: none"> • Immediate contacting of staff and responders to ensure health, safety and wellbeing • Mobilise response staff and start impact assessment and visual inspections to understand extent of the event and damage to roads and three-waters assets, starting with main access roads, water supplies and wastewater treatment plants, followed by storm water and flood protection assets • Ensure damaged roads are closed, and provide traffic control as soon as possible to ensure road user safety (including emergency debris removal, dealing with hazardous materials, arranging detours etc.) • Collate asset damage information, determine restoration priorities and reporting • Public communications about roads closures and drinking water safety.
Response priorities	<ul style="list-style-type: none"> • Same order as initial response actions above, but noting the following: <ul style="list-style-type: none"> ○ Road inspections to focus on critical feeder routes, such as the Foxton – Shannon SH1 alternate route in Horowhenua, and the main feeder roads and bridges leading to the CBD in Whanganui ○ Three-waters initial priorities focus around 1. Secure supply of potable water: assessing access to water sources, bore sites, reservoirs and pump stations, and checking whether roads accessible and water tankers available etc., and 2. Provision of portable toilets if wastewater systems are inoperable ○ Flood protection inspections will begin with key assets in urban areas, such as stopbanks and flood gates.
Existing response plans	<ul style="list-style-type: none"> • All sector organisations have business continuity management and emergency management plans or processes in place.
How impacts are assessed	<ul style="list-style-type: none"> • The primary methods is visual ground-based inspection by staff and contractors (if sites accessible), complemented by use of telemetry/SCADA systems (if available) • Follow-up engineering/structural assessments as required, access permitting • Aerial observations (primarily by helicopter or fixed-wing aircraft) may be used to detect major damage to roads (particularly in inaccessible areas, such as the upper Whanganui River), and drones may be used for water and wastewater treatment assets, if these assets are inaccessible • Observational damage and photos are recorded either in hard copy or electronically, and reported to EOCs.
How communications with CDEM are established	<ul style="list-style-type: none"> • Primarily by attendance at the Local EOC, or at the GECC • If primary telecommunications systems are down, all organisations will use alternate forms of communication, primarily two-way VHF radios, and to a lesser extent satellite phones.

Likely restoration timeframes	<ul style="list-style-type: none"> • Not possible to predict with any accuracy overall. The following estimates were identified for this event: <ul style="list-style-type: none"> ○ Local roads: assume days-weeks for partial access restoration, months-years for significant damage, particularly in remote rural locations e.g. requiring bailey bridges ○ Potable water supplies: aim to provide within 3-5 days ○ Water and wastewater assets: months-years for complete restoration, and some facilities may be abandoned ○ Flood protection assets: months for initial repair to critical assets, years for restoration of larger schemes.
Main interdependencies	<ul style="list-style-type: none"> • Road access to state highways for local roads, and to key local routes for three-waters to allow visual inspections and repair work • Access to priority fuel supplies • Telecommunications access for reporting and repair coordination • Mains power • Availability of staff and contractors • Three-waters access to repair materials and parts.
Information or support needed from CDEM	<ul style="list-style-type: none"> • Regional access status of all roads and alternate routes within the CDEM Group, and linking to other regions • Region-wide road transport restoration priorities • Status of fuel availability, and priority access • Timeframes for electricity and gas supply restoration, and access to generators • Status of telecommunications and restoration timeframes • Status of hospitals, potable water supplies and FMCG.

Table 4: Three-waters and local roads utilities response elements and collective feedback.

3.3.6 Hospitals

Table 5 shows the feedback on collective response elements for hospitals following a major earthquake, comprising input from the MidCentral and Whanganui District Health Boards.

Response elements	Collective feedback
Initial response actions	<ul style="list-style-type: none"> • Immediate contacting of staff to ensure health, safety and wellbeing, assess injuries and access to hospital • Assess integrity of buildings and facilities, and access to lifelines supplies • Activate EOCs, assemble teams and connect with CDEM • Assess ability to manage casualties, provide immediate health needs of the community and maintain critical services • Reprioritise services by discharging patients if possible, stopping elective surgeries and community services, and increasing utilisation of primary care providers and private hospitals • Provide key public information and messaging • Facility recovery and logistics planning (such as food and water supply, pharmaceutical supply and waste management) • On-going public health planning such as displaced persons, care of the deceased and Disaster Victim Identification, on-going psychosocial health needs, and vulnerable people (such as patients at home, and those with on-going chronic conditions that may worsen).
Response priorities	<ul style="list-style-type: none"> • Same order as initial response actions above.
Existing response	<ul style="list-style-type: none"> • Both DHBs have numerous business continuity emergency management plans, including

plans	mass casualty plans.
How impacts are assessed	<ul style="list-style-type: none"> Along similar lines to the initial response actions above first, then assessing external infrastructure damage and implications, such as a loss of power and telecommunications.
How communications with CDEM are established	<ul style="list-style-type: none"> Both DHBs will use a form of alternate communications as the primary means – VHF radio networks and/or satellite phones If the primary means above are unavailable, attendance at the GECC or Local EOC or regular telecommunications channels (if available) will be used.
Likely restoration timeframes	<ul style="list-style-type: none"> Emergency Power generations within 30 minutes Distribution of energy (Steam/Electricity/Natural Gas) dependent on damage sustained (integrity of service tunnels/ducts/cabling etc.) Gas offline – running on diesel (7 days reserve) - reliant on external distribution and support Unavailability of 3 waters (Potable, Waste & Storm) - restoration subject to external distribution and support (no time frame offered) Medical Gases - portable systems only limited stock on site - reliant on external distribution and support Access/Roading - dependent on building damage/ground movement Fuel supply - 7 day diesel reserve for standby generators - reliant on external distribution and support for 91 Octane (community health vehicles) Sterilisation (surgical equipment) - total loss Supply/Distribution (Medical/Rationing/Engineering/Building) - limited reserve reliant on external distribution and support Patient Transfer/Staff Access - all activities reliant on airport/roading status.
Main interdependencies	<ul style="list-style-type: none"> Availability of mains power Road access to allow transport of the injured and access for staff Priority food and water supply.
Information or support needed from CDEM	<ul style="list-style-type: none"> Region-wide lifelines status – understanding the big-picture Road status and access Status of fuel availability, and priority access Support for clinical resupply (such as medical gases).

Table 5: Hospital response elements and collective feedback.

3.4 Primary response coordination considerations

3.4.1 Summary of initial actions, priorities, interdependencies and needs

The following observations are made based on the collective information provided in Tables 1-5 above, and are designed to inform initial LUC response actions:

1. During the first 24-48 hours, lifeline utilities will be at or near their response capacity, and concentrating on staff safety and wellbeing, activation of arrangements, and if possible initial impact assessments. There may be little room for any other actions within this timeframe.
2. Following the above, the next priorities will be on managing public health and safety risks such as damaged live electricity lines, gas pipeline leaks and water contamination issues.

3. Many lifeline utilities may not have the ability to contact CDEM within the first 24-48 hours, but all will attempt to do so as soon as possible by whatever means are available.
4. The main interdependency is road access (upon which impact assessments are highly dependent), followed closely by priority access to fuel, access to telecommunications and mains electricity supply.
5. Many lifeline utilities will request priority access to helicopters following the event, as they will depend upon access for assessment and immediate repair work.
6. There is a need for immediate, coordinated lifeline utilities reconnaissance and initial impact assessment (refer to the following section 3.4.2).

3.4.2 Reconnaissance and initial lifelines impact assessment

A lack of situational awareness will be of critical concern in the days following the earthquake, and developing an understanding of the scope and scale of impacts will be critical for enabling an effective response.

The following information requirements have been identified by the Manawatu-Whanganui Lifelines Advisory Group members (per Tables 1-5 above) as being response-critical immediately following the event:

Critical transport links and assets (land, air and sea)

- High-level aerial sweep of impacted areas to establish geographic scale of impacts
- Detailed assessment of the state highway and rail networks, including level of service available
- Status of Base Ohakea, Palmerston North and Whanganui airports, with particular focus on their ability to receive fixed and rotary wing aircraft, and any operational constraints or restrictions imposed
- Status of Whanganui Port, with particular focus on its ability to receive smaller coastal freight vessels and commercial boats, and any operational constraints or restrictions imposed
- Status of local roads, and alternative non-road routes into/out of the region (such as tracks and other minor routes).

Electricity and gas, telecommunications, fuel supply and three-waters and infrastructure

- Status of water storage facilities, water and wastewater services infrastructure, and areas affected by water outages and/or contamination
- Status of electricity and gas networks and infrastructure, areas affected by power and gas outages and any immediate public health risks
- Status of telecommunications networks and infrastructure (internet, mobile networks, landline, radio, television), including areas affected by communications blackouts
- Status of fuel distribution and storage infrastructure.

Hospitals

- Scale and scope of damage to Palmerston North and Whanganui hospitals, and support required.

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APPENDIX 1: 2016 SEISMIC HAZARD VULNERABILITY ASSESSMENT

This appendix is taken from the 2016 lifelines vulnerability assessment report (pp. 30 – 40). This section provides an overview and exposure of seismic hazards across the region, maps showing faults, liquefaction, Peak Ground Acceleration and potential landslides, and an infrastructure vulnerability assessment for liquefaction and ground shaking/fault rupture/landslide risks combined.

Earthquake

Hazard Overview

The Manawatu-Whanganui Region is geologically diverse with numerous potential earthquake sources. The region encompasses some of the most seismically active parts of New Zealand. Small earthquakes have occurred regularly throughout c.150 years of recorded history.

Hazard Exposure

Information used for this project to assess which assets were exposed to seismic hazards is as follows:

Faults

Active faults are sourced from the National Seismic model. In the region, the main ones include Ohakune and Raetihi (200-500 year return period activity), Wellington (1000 years) and the Ruahine Fault (1000-5000 years expected return period). There are a number of other known active faults in the region, as shown in Figure 1.

Peak Ground Acceleration

PGA hazard estimates are determined for the Manawatu-Whanganui region using GNS Science's National Seismic Hazard Model (NSHM; Stirling et al., 2012). The horizontal PGA estimates were incorporated with the New Zealand inferred site sub-soil class information to produce maps and datasets that show, at a regional scale, the estimated PGAs across the region with annual exceedance probabilities of 1 in 500, 1 in 1000 and 1 in 2500 (shown in Figure 3).

The return period (in years) for different levels of Modified Mercalli (MM) shaking intensity for the eighth largest urban areas in the Horizons Region is provided as a link to enable some comparison with previous work (Table 1).

A correlation between MM shaking intensity values and PGA values is provided in Table 2.

Landslide

Large, pre-existing landslides (or remnants of these) were identified from a study of geomorphic features using aerial photographs in 2008. The landslide hazard is shown in Figure 4. Assets in these areas are at risk of substantial land movement associated with a landslide.

Liquefaction

Areas considered at higher risk of liquefaction are characterised by saturated unconsolidated fine grained sediments. These include areas of reclaimed land (most susceptible), landslide deposits, dune sand, beach deposits and alluvial/colluvial / swamp deposits, particularly where there are high groundwater levels. Liquefaction of very high risk soils can occur at MM7, and high risk soils from MM8.

Assets in these areas can be subject to lateral spreading and subsidence. Areas that are underlain by gravels (such as the main river channels and their adjacent flood plains) are not expected to liquefy.

Regional scale liquefaction maps for this project have been developed based on:

- Eliminated geological units >10,000 years old, gravel or clay
- Remaining units assessed based on river gradient, historical liquefaction reports.

Mapped layers from liquefaction studies for Palmerston North and Whanganui cities were also available.

Table 1: Modified Mercalli Shaking Intensity Return Periods (in years) for the main urban areas

Town	MM7	MM8	MM9	MM10
Palmerston North	26	113	625	4237
Wanganui	40	278	3448	58824
Dannevirke	25	107	521	5000
Fielding	28	134	905	9804
Levin	25	103	502	3650
Taihape	36	201	1639	23256
Ohakune	47	208	684	3155
Taumarunui	101	750	7194	125000

Table 2: Correlation between MM Shaking Intensity and Peak Ground Acceleration (Hancos et al 2002)

MM Intensity	PGA (Peak Ground Acceleration, g)
5	0.03-0.04
6	0.05-0.08
7	0.10-0.15
8	0.18-0.25
9	0.3-0.5
10	>0.5

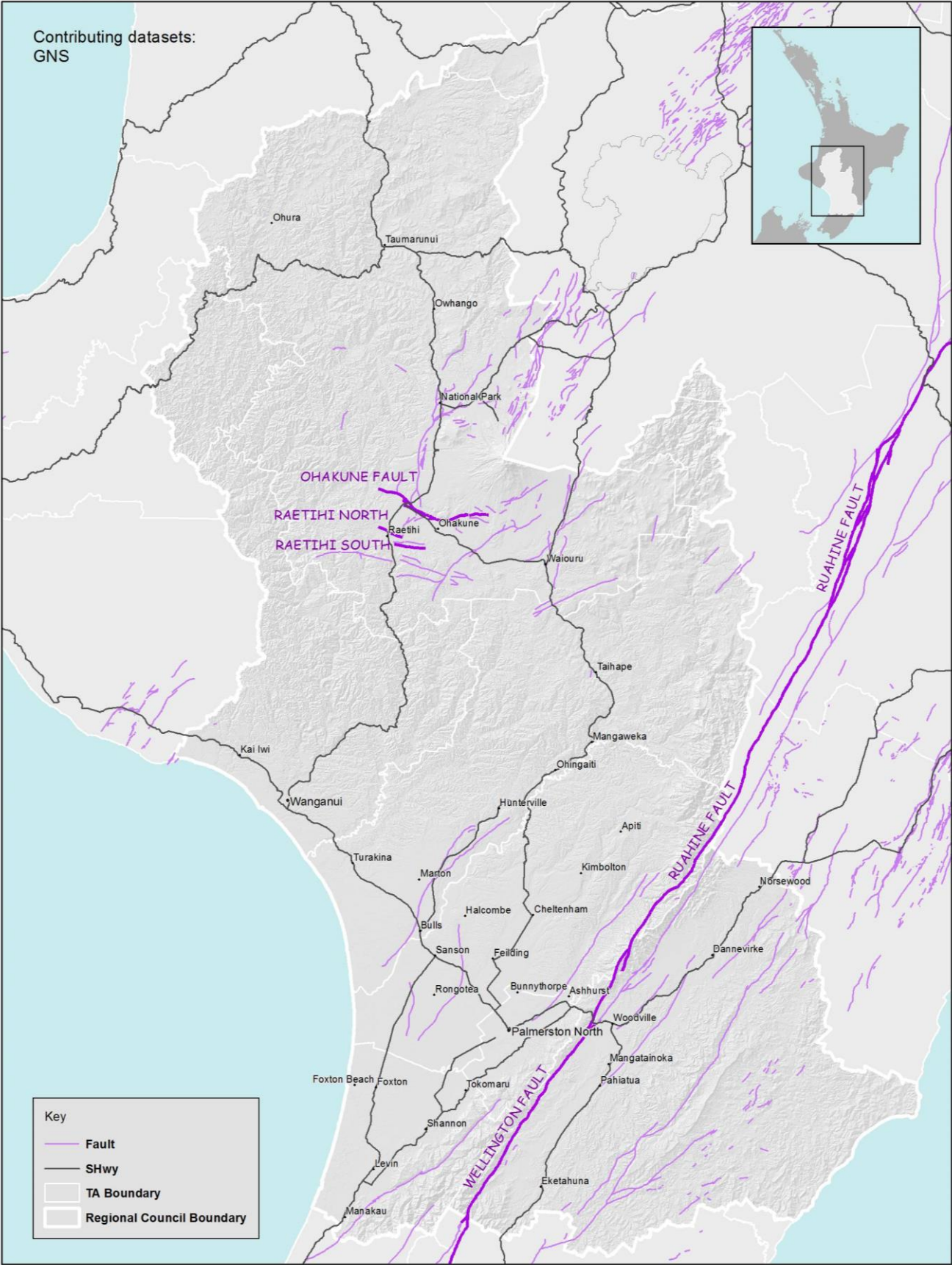
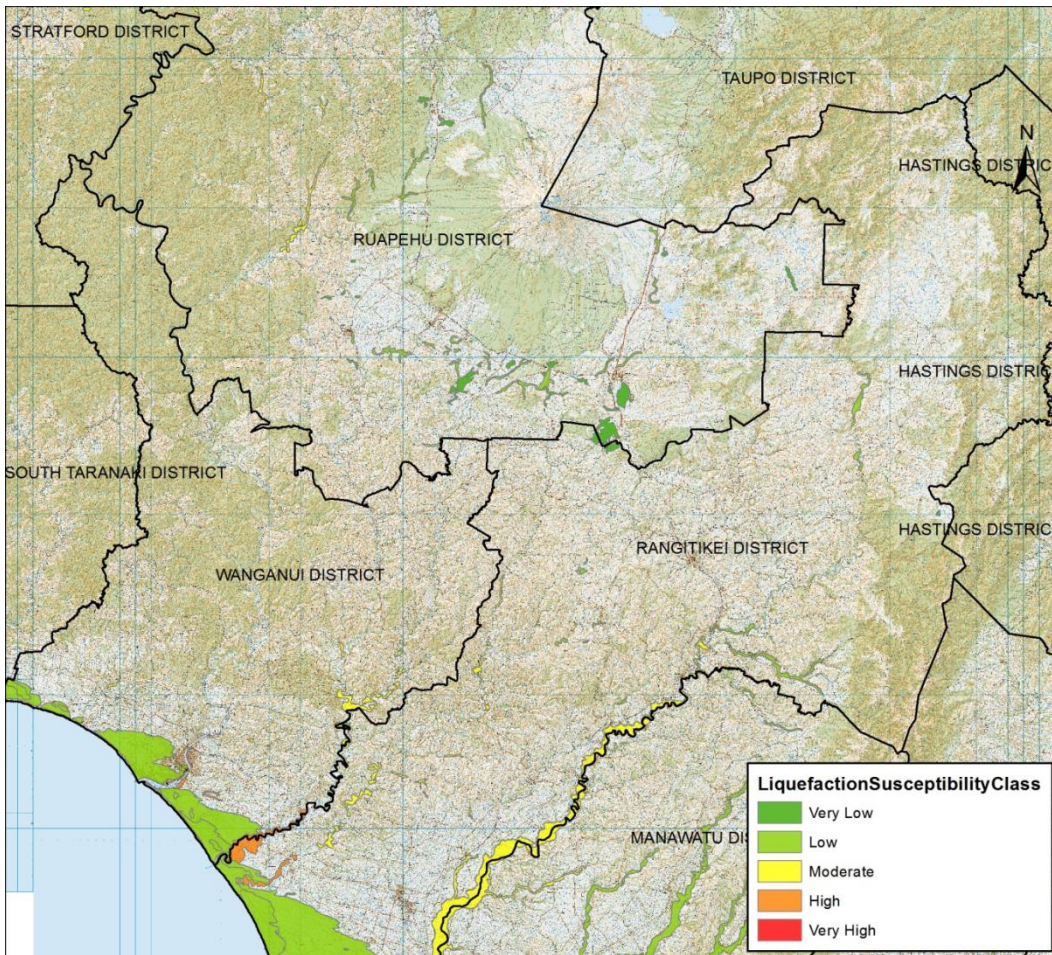
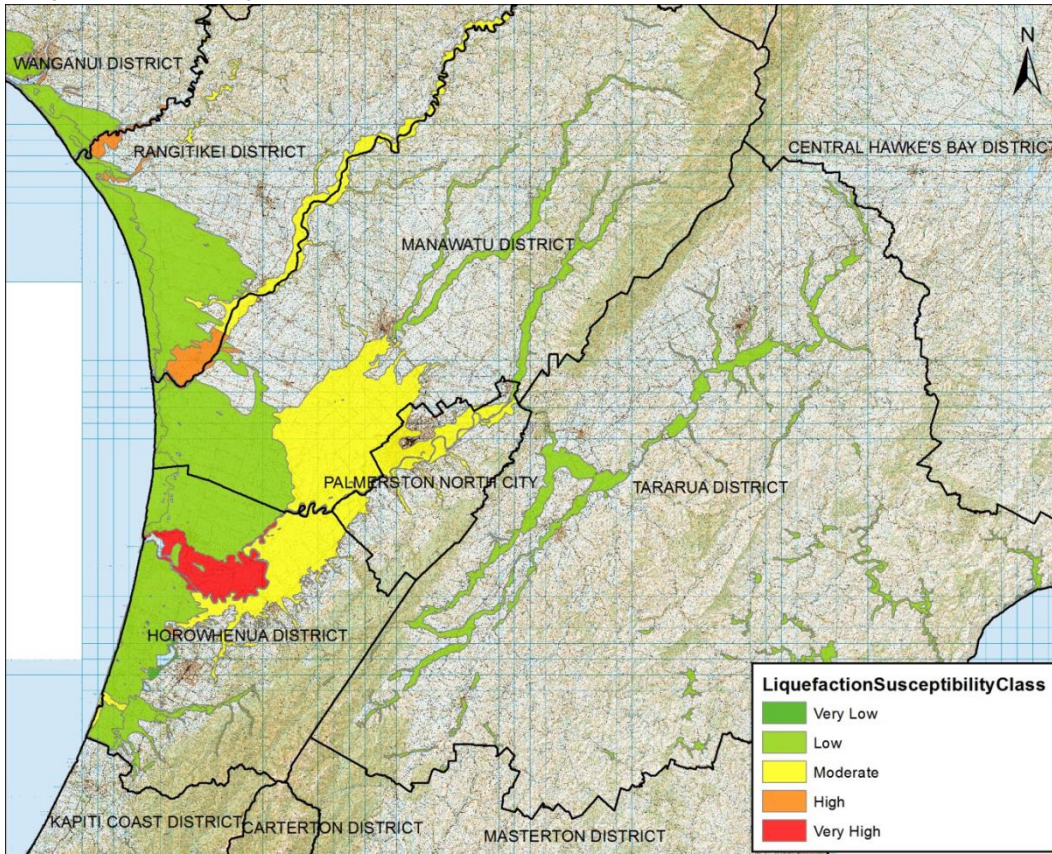


Figure 1: Active Fault Lines.



Rangitikei and Whanganui District



Horowhenua District, Tararua District, Manawatu District and Palmerston North City

Figure 2: Liquefaction Hazard

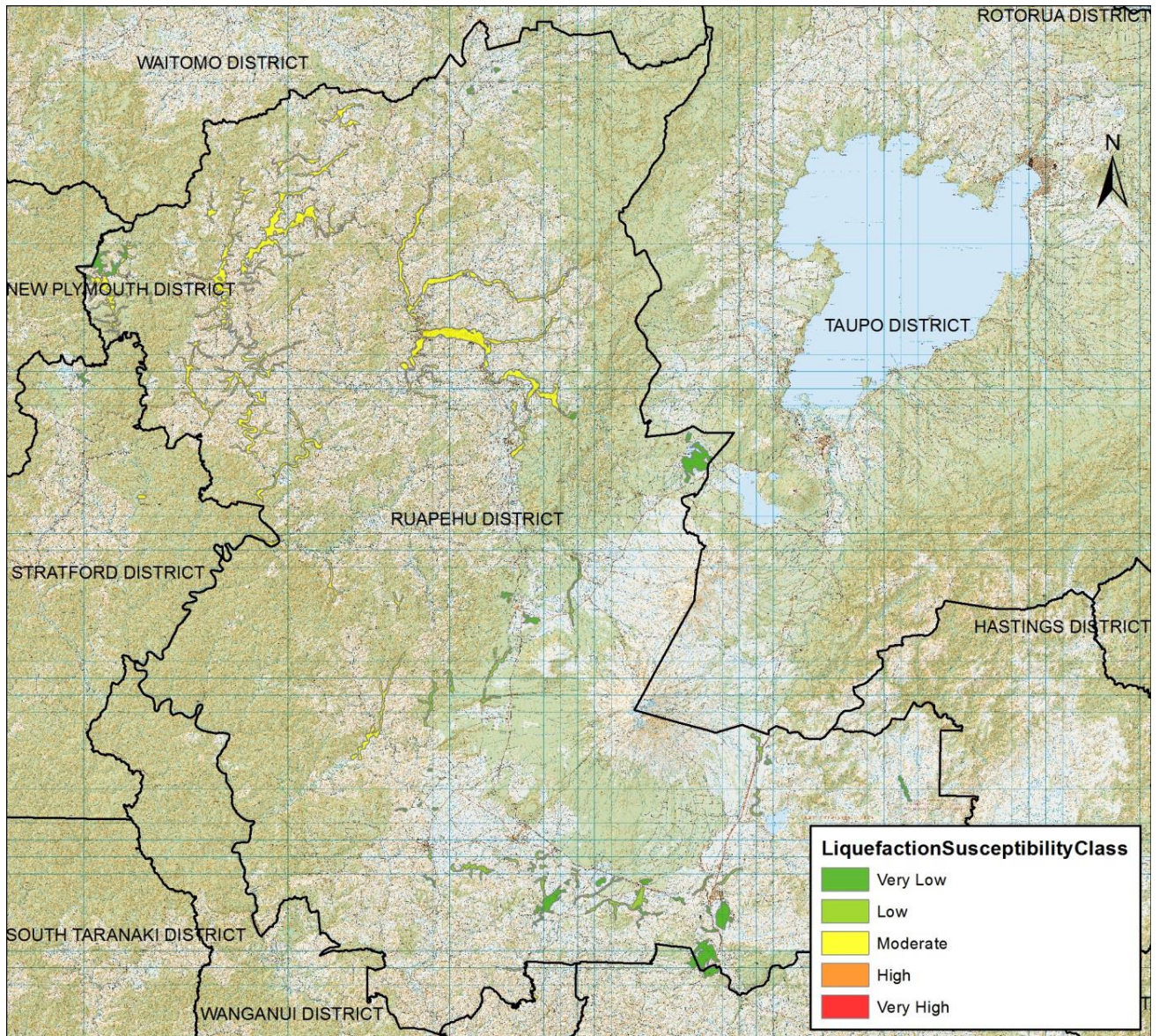


Figure 2 cont'd. Ruapehu District

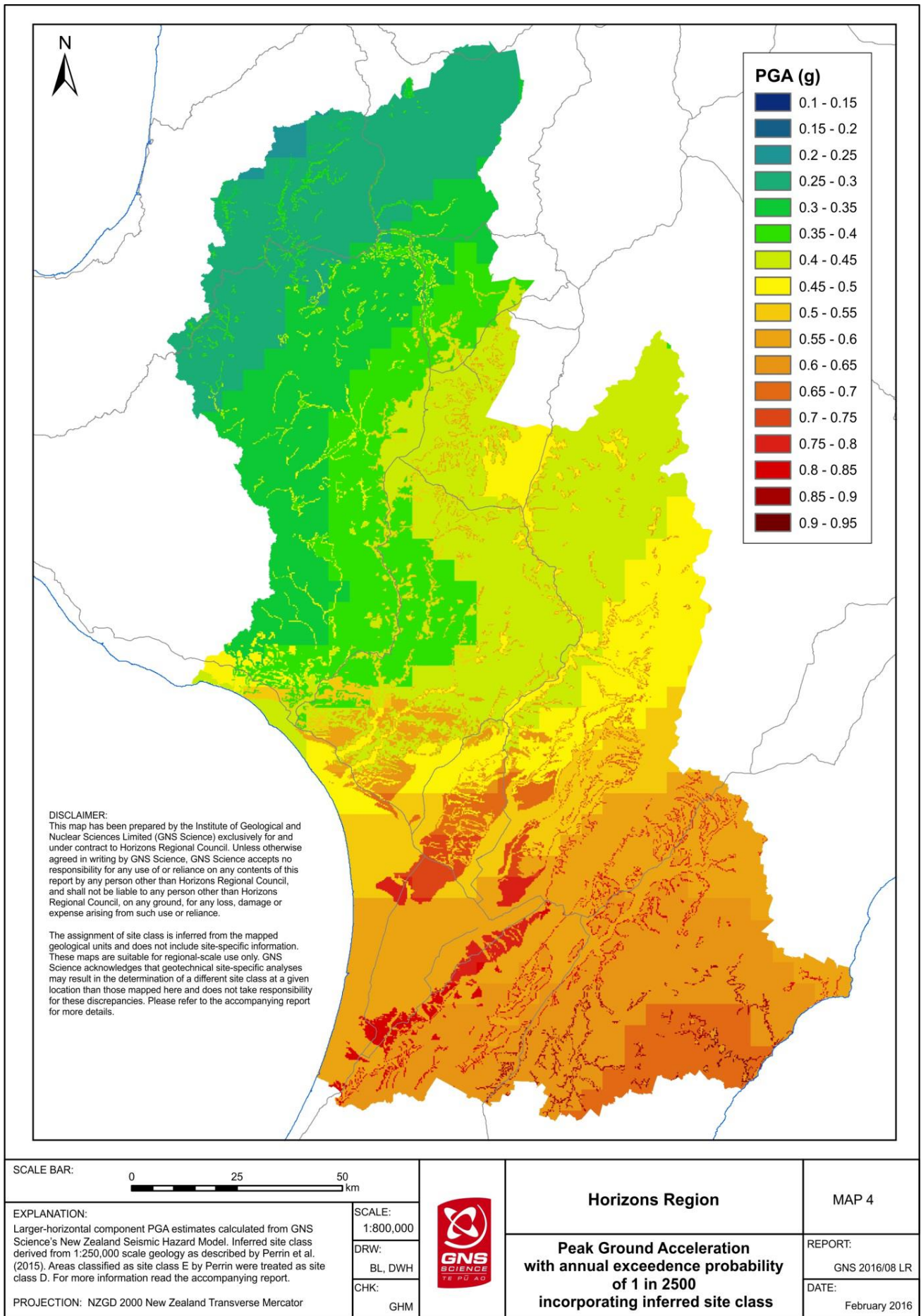


Figure 3: Peak Ground Acceleration with an annual exceedance probability of 1 in 2500 incorporating NZS 1170.5 site sub-soil class.

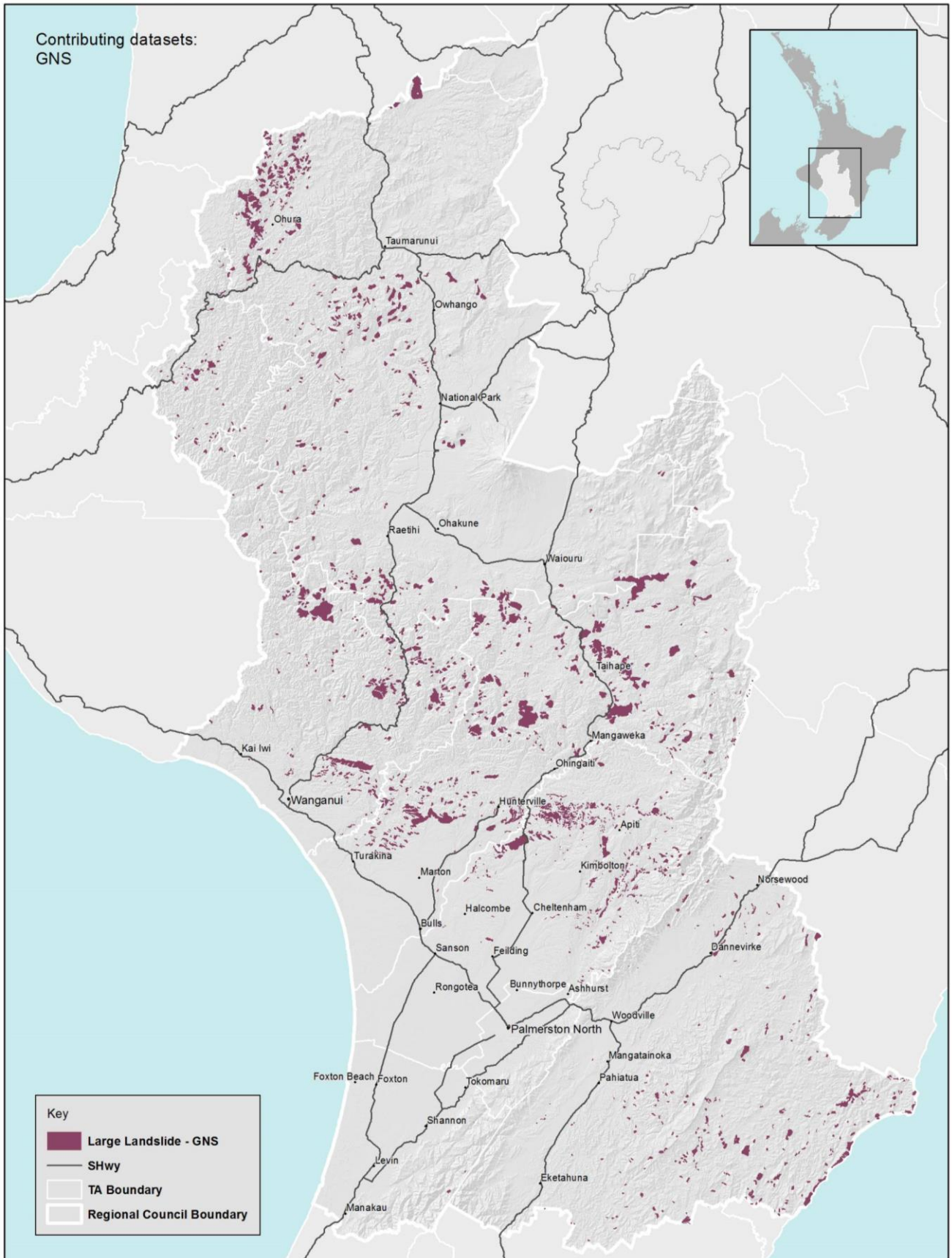


Figure 4: Large pre-existing landslides (mapped from geomorphic features)

Infrastructure Vulnerability Assessment

The expected effects from earthquakes that create a potential hazard to infrastructure includes:

- Surface fault rupture – in a large shallow crustal earthquake where the fault reaches the ground surface. The rupture can range in length from a few metres to hundreds of kilometres and with ground displacements of several meters possible. Shearing of assets can result where ground displacements occur.
- Land movements – in a moderate to large earthquake the ground in nearby areas maybe uplifted, dropped or tilted – again ground displacement can be several meters. In the Edgecumbe earthquake a large part of the ground in the Rangitaiki Plain dropped by up to 2m.
- Strong shaking is the most obvious earthquake hazard and can cause damage to structures – the extent of damage can be mitigated through modern seismic design.
- The combination of ground shaking and earth movement can produce secondary effects including rockfall / landsliding, tsunami, ground settlement and liquefaction.
- Liquefaction was shown in the Canterbury earthquakes to be particularly devastating to underground, brittle assets due to the associated differential ground subsidence and lateral spreading. Liquefaction of very high risk soils can occur at MM7, high risk soils from MM8 and moderate soils from MM9.

Table 3 provides a summary of the assessment of potential impacts of liquefaction on assets by lifeline utilities in the region. The largest area of liquefaction risk lies in the area between Palmerston North, Levin and Bulls. Disruption to almost all lifelines networks can occur in those areas.

Table 3: Potential asset damage and service disruption in liquefaction risk areas

Sector	Critical assets exposure to hazard	Vulnerability ⁷	Potential Service Disruption
Wastewater – MDC / Rang DC	Koitiata, Bulls, Kimbolton, Feilding and Awahuri have critical assets in liquefaction zones.	3-4	Damage to or destruction of plants, pumps and pipelines could lead to environmental damage and/or public health risk.
Wastewater - HDC	Foxton / Foxton Beach WWTP in high susceptibility area.	3-4	As above
Wastewater – PNCC	PNCC WWTP & some pump stations in moderate susceptibility area.	3-4	Partial loss of service to city due to damage to major pipeworks & structures.
Water Supply – MDC	Mangaweka, Stanway-Halcombe, Sanson, Bulls, Feilding and Himatangi Beach have critical assets in liquefaction zones.	3-4	Damage to or destruction of intakes, pumps, pipelines, reservoirs and/or plants could lead to loss of supply.
Water Supply – PNCC	Damage to PNCC AC pipes in liquefaction prone soil, southern part of town.	3-4	Disrupted water supply to affected areas.
Electricity – Distribution	Foxton Beach 33kV lines to substation. Castlecliff Sub, Whanganui Beach Rd Sub, Whanganui Taupo Quay Sub, Whanganui Hatricks Wharf Sub. Whanganui Peat St Sub Whanganui Kairanga Sub, PN Pascal St Sub, PN Feilding Sub Whanganui CBD/eastern urban Whanganui western urban PN CBD PN urban	3-4	Partial/total loss of supply Very low susceptibility Partial/total loss of supply High susceptibility Total/partial loss of supply Moderate susceptibility Total/partial loss of supply Low susceptibility Total/partial loss of supply High susceptibility Very low susceptibility Total/partial loss of supply Moderate susceptibility

⁷ 1: Unlikely to cause damage. 2: Possible damage, short term disruption. 3: Possible damage, longer term repairs (weeks/months). 4: Complete failure, full reconstruction required.

Sector	Critical assets exposure to hazard	Vulnerability ⁷	Potential Service Disruption
	Feilding region (3-4)		Low susceptibility
Electricity Transmission	Liquefaction in the Horowhenua district and Foxton, could significantly undermine transmission tower foundations on the Bunnythorpe-Paraparumu-Haywards circuits resulting in a number of tower collapses. Paraparumu sub would be supplied from south only. A number of transmission circuits could be affected by liquefaction in the Palmerston North area, but this has been identified in the model as lower liquefaction risk.	3	Redundancy with a supply from the Bunnythorpe-Linton-Wilton 220kV circuits that hug the ranges to the east. No immediate threat to supply to region, but would have national implications if circuits out for an extended duration. Temporary towers could be erected in 2-4 weeks, rebuilding failed towers would take months.
Flood protection	Tangimoana rock work	1-2	Weeks for permanent repair
Gas Transmission	Buried pipeline Pipeline on bridge crossings	1 2	Likely to be able to repair damage before major service impacts occur.
Telecomms - Chorus	Trunk fibre cables in manhole / duct systems in cities and towns.	1-2	Likely to be able to repair damage before major service impacts occur.
Transport – State Highways	SH 3 Whangaehu River Bridge Turakina Oroua River Bridge Awahuri SH3/1 Bulls Bridge SH1 Whirokino Trestle / Manawatu River Foxton Ohau to Manakau Sth Levin SH56 Manawatu River Bridge and stopbanks	3 3 3-4 4 1-2 3	Transportation disruption to National and Inter-regional routes affecting other utility and emergency service response, logistics distribution.
Flood Protection	Lower Manawatu Scheme	3-4	SH1 /SH3 flooding Months for permanent repair
Transport - MDC	Part or all of Turakina Beach Rd, Parewanui Rd, Kakariki Rd, Pohangina Rd, Pohangina Valley East Rd, Kawakawa Rd, Awahuri-Feilding Rd, Rongotea Rd, McDonell Rd, Tangimoana Rd, Rangiotu Rd and Himatangi Beach Rd are in liquefaction zones. Bridges along other lifeline routes could also be affected.	2 (pavements) 3-4 (bridges)	In some cases could cause roads to be impassable.
Water Supply – Whanganui DC	Water Supply Network along parts of Taupo Quay and Anzac Parade (SH4)	1-2	Short to medium term disruption (repairs estimated at 1-3 months)
Wastewater – Whanganui DC	Wastewater Network (including 2 Area Pumping Stations + Beach Road Pumping Station) along parts of Taupo Quay, Beach Road and Anzac Parade (SH4)	2-4	Medium to longer Term disruption (repairs estimated at 3-6 months)
Stormwater – Whanganui DC	Stormwater Network along parts of Taupo Quay and Anzac Parade (SH4)	1-2	Medium to longer Term disruption (repairs estimated at 3-6 months)
Roading – Whanganui DC	Roading Network along parts of Taupo Quay and Anzac Parade (SH4)	1-2	Medium to longer Term disruption (repairs estimated at 3-6 months)

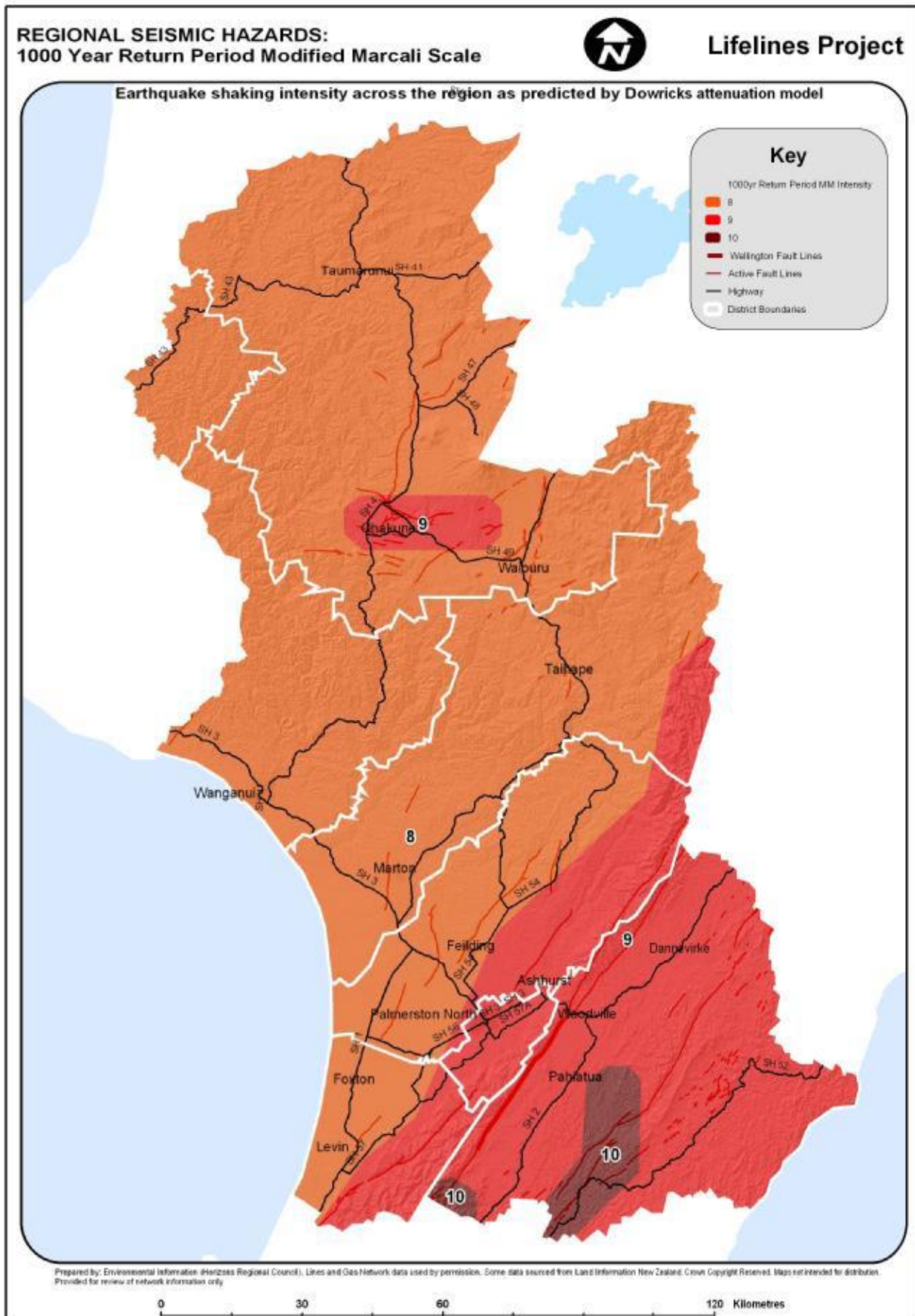
Table 4: Ground Shaking / Fault Rupture / Landslide Risk

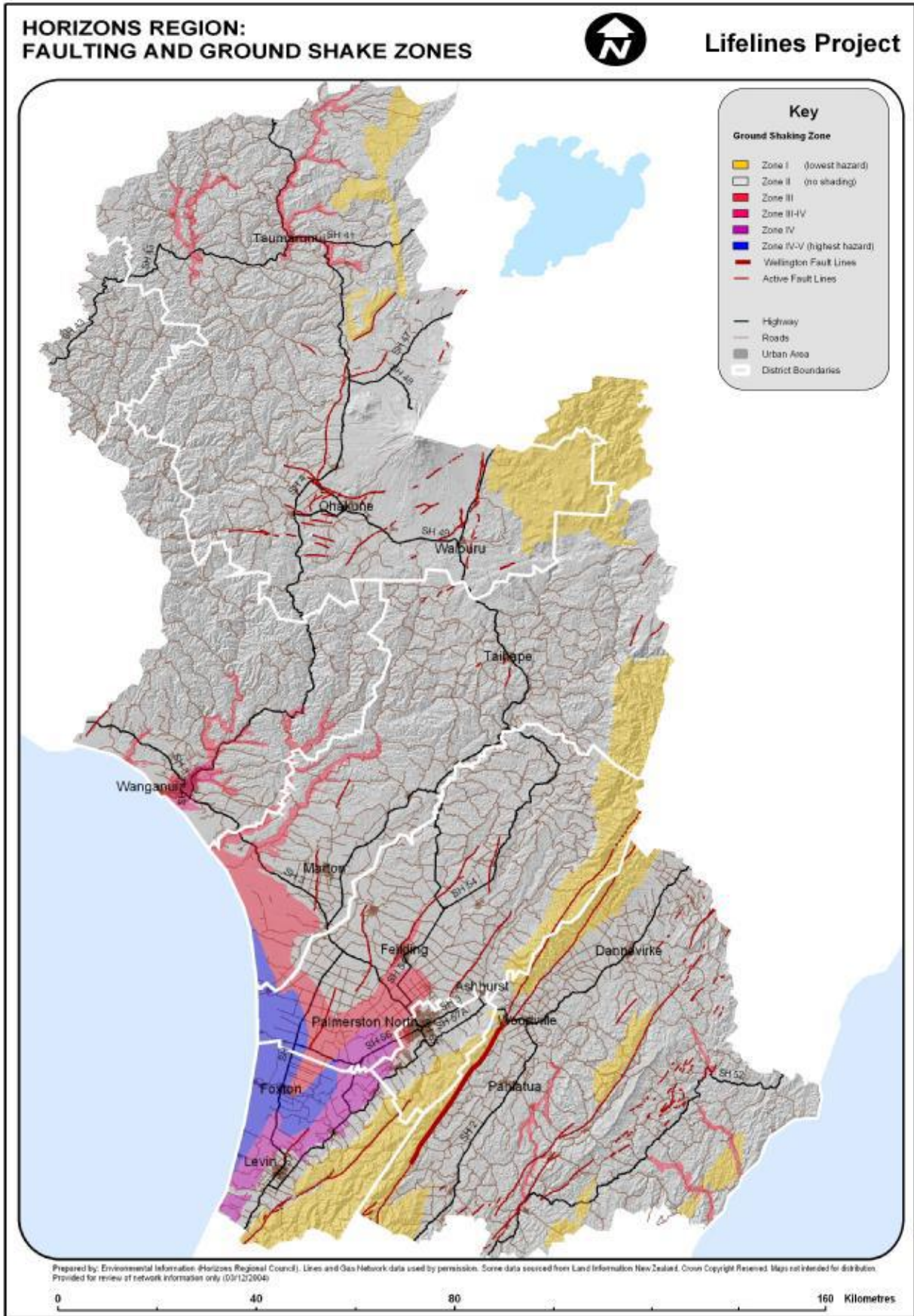
Sector	Critical assets exposure to hazard	Vulnerability ⁸	Potential Service Disruption
Water Supply – MDC/Rang DC	All assets in the District are at risk from earthquakes. The critical assets most at risk of high PGA are in the Taihape, Mangaweka, Hunterville, Marton, Rātana, Stanway-Halcombe, Sanson, Feilding, Rongotea and Himatangi Beach schemes. Taihape intake and part of raw water main, Mangaweka intake, parts of Hunterville RWS trunk main in vulnerable locations for landslip	1-4	Damage to or destruction of plants, pumps, pipelines and reservoirs could lead to loss of supply. Supply of raw water could be disrupted. Water supply would continue using treated water storage, and tankering if necessary.
Wastewater – MDC/Rang DC	All assets in the District are at risk from earthquakes. The critical assets most at risk of high PGA are in the Taihape, Mangaweka, Hunterville, Rātana, Halcombe, Sanson, Rongotea and Himatangi Beach schemes. Hunterville WWTP road access in vulnerable locations for landslip.	1-4 1-2	Damage to or destruction of plants, pumps and pipelines could cause environmental impacts, compliance issues, and/or public health risks. Access to WWTP could become difficult or impossible. Possibility of landslide continuing downslope and damaging plant.
Water Supply PNCC	Low risk apart from possibly along the access road to Turitea WTP by Turitea Stream.	2	Low risk of water supply shortage.
Electricity - Distribution	Whanganui CBD Whanganui Urban PN CBD PN urban Feilding CBD	2-3	Partial loss of supply / Low susceptibility
Electricity - Transpower	Towers and substations built to seismic standard (1:2000 return). Little damage expected from ground shaking.	2	Several weeks if towers suffer damage due to ground acceleration. No immediate threat to supply.
Telecomms - Chorus	Fibre cables pass fault lines in several areas. Multiple cables provide redundancy for each other.	2	Service impacts should be minimal unless all north-south cables impacted.
Transport – State Highways	SH3 Manawatu Gorge rock-fall (3) (72 bridges) SH1 Utuku (2), Mangaweka (3)	3 3	Inter-regional link to Hawkes Bay severed, but alternative route available. 72 bridges in gorge at risk of damage or overloading National Strategic Link – limited alternative routes

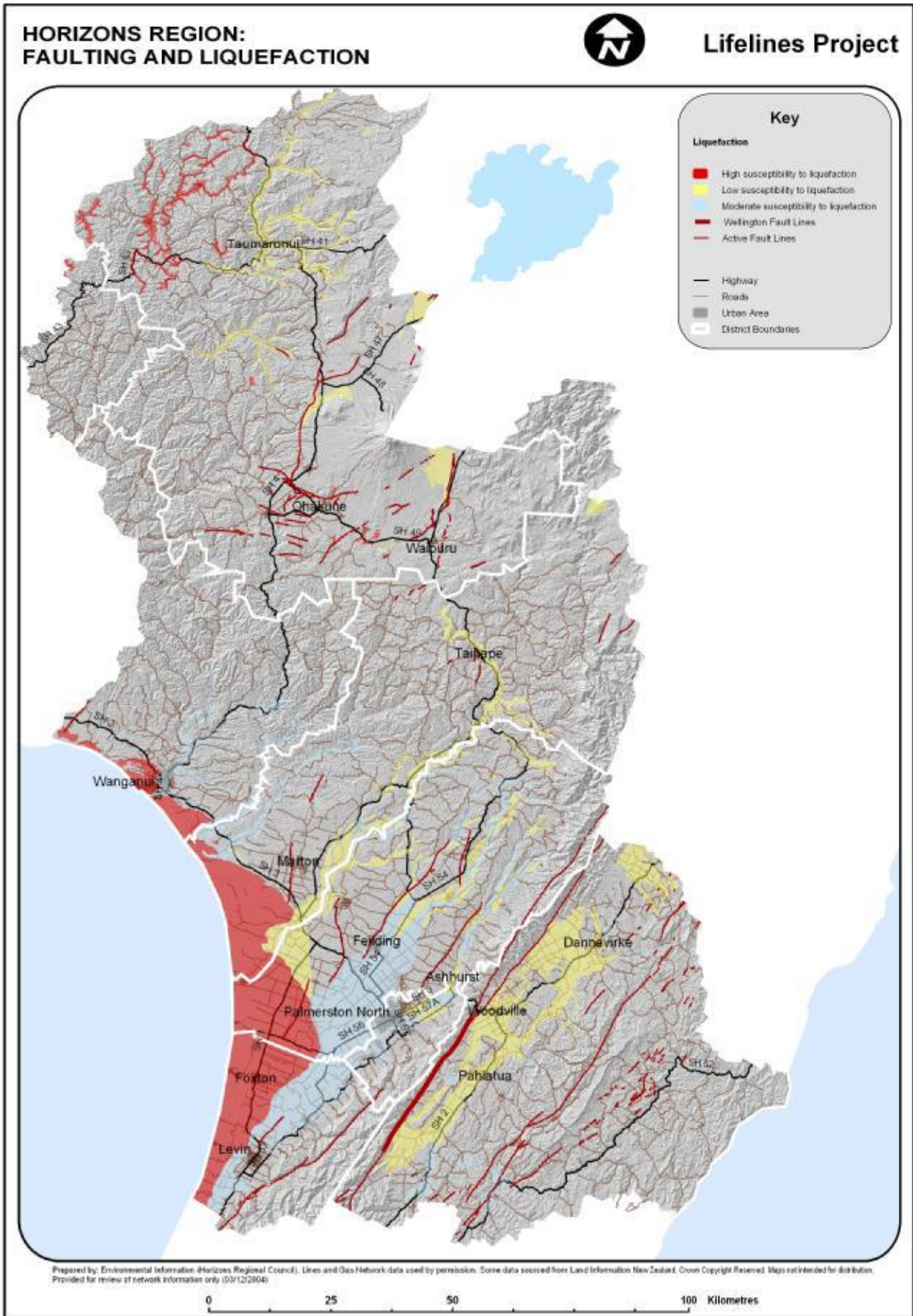
⁸ 1: Unlikely to cause damage. 2: Possible damage, short term disruption. 3: Possible damage, longer term repairs (weeks/months). 4: Complete failure, full reconstruction required.

Sector	Critical assets exposure to hazard	Vulnerability ⁸	Potential Service Disruption
Transport – MDC/Rang DC	All assets in the District are at risk from earthquakes. The critical assets most at risk of high PGA are Taihape-Napier Rd, Toe Toe Rd, Ongo Rd, Mangahoe Rd, Kauangaroa Rd, Rātana Rd, Kakariki Rd, Kawakawa Rd, Stewart Rd, Awahuri-Feilding Rd, Rongotea Rd, Tangimoana Rd, Rangiotu Rd and Himatangi Beach Rd.	2 (pavements) 3-4 (bridges/ structures)	Potentially slips blocking or damaging roads. Could affect evacuations and cut off certain communities.
	Sections of Taihape-Napier Rd, Te Moehau Rd, Spooners Hill Rd, Toe Toe Rd, Ongo Rd, Mangahoe Rd, Kauangaroa Rd vulnerable to landslides	2-4	Road closures, with duration depending on extent of damage, which could be severe.
Water Supply – Whanganui DC	Trunk Mains feeding major storage to Urban area.	2-4	Medium to long term disruption (repairs estimated at 4-12 months for bores and Trunk Mains and 2-6 months for standard network pipelines).
Wastewater – Whanganui DC	Main interceptors along the riverbanks and the rest of the network especially older earthenware pipes.	2-4	Medium to long term disruption (repairs estimated at 4-12 months for interceptors and 2-6 months for standard network pipelines).
Stormwater – Whanganui DC	All the network is vulnerable – especially older earthenware pipes.	2-3	Medium to long term disruption (repairs estimated at 4-12 months for larger pipelines and 2-6 months for standard network pipelines).
Roading – Whanganui DC	Both Urban and Rural roads affected and Bridges	2-4	Medium to long term disruption (repairs estimated at 4-15 months for Bridges and 2-6 months for roads).

APPENDIX 2: 2005 SEISMIC HAZARD MAPS







APPENDIX 3: HIKURANGI SUBDUCTION EARTHQUAKE SCENARIO

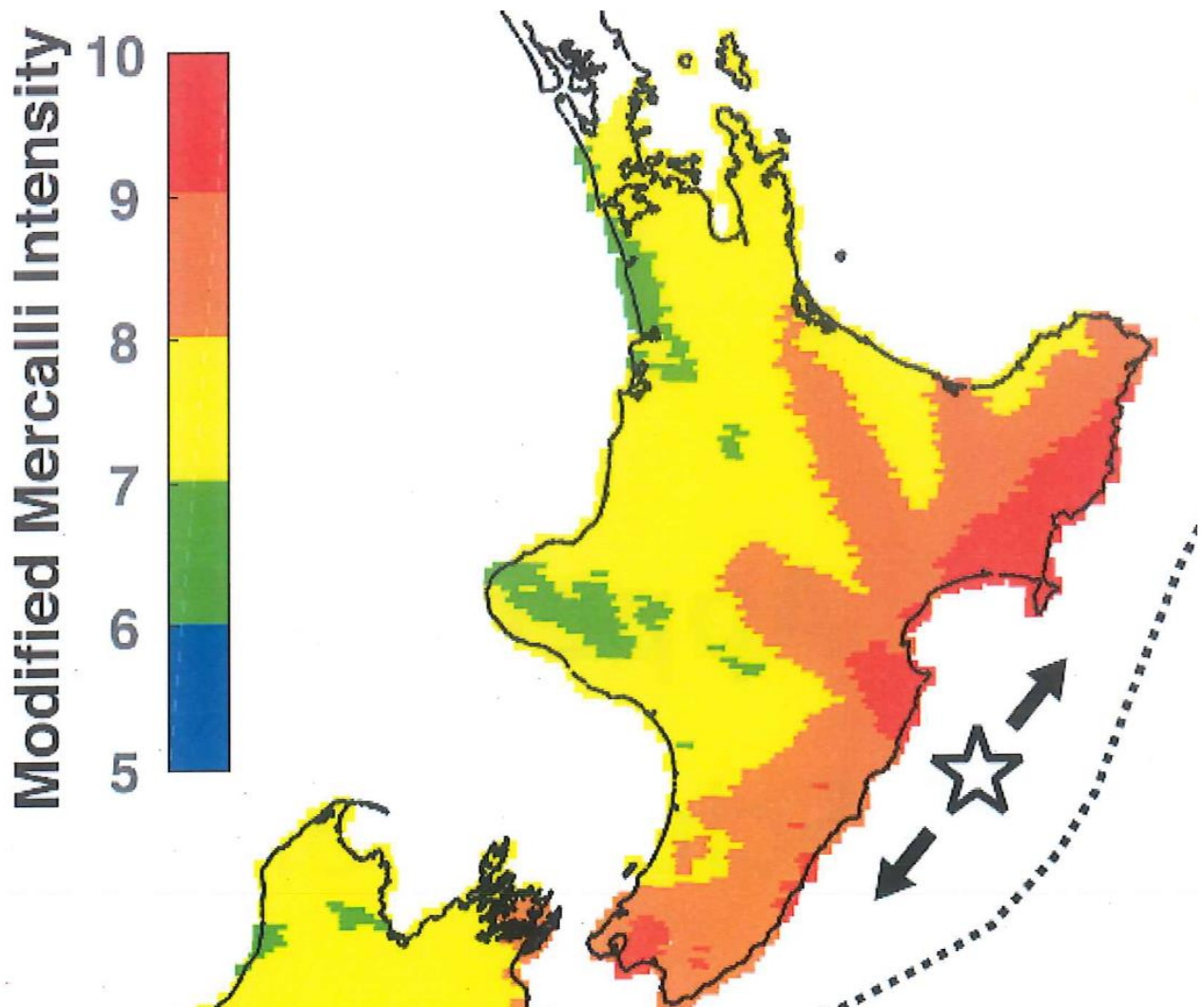


Figure A: A map of Modified Mercalli Intensity (MMI) from the magnitude 8.9 Hikurangi subduction earthquake scenario. Hypocentre is located at the centre of the rupture zone and indicated by a star. Dashed line corresponds to the Hikurangi trench. Arrows show the predominant directions of rupture propagation.

Figure adapted from East Coast LAB (2019). Hikurangi Response Plan Life at the Boundary Hawke's Bay Stakeholder Workshop 2019 Project Information pack, p. 4.

APPENDIX 4: LIFELINE UTILITY COORDINATION IN THE GECC

Lifelines Coordination

Lifeline utility coordination is a process of managing the flow of information between lifeline utilities and CDEM agencies. It is made up of the following components:

- Lifeline utilities provide information about their service disruption, response activities, priorities and expected developments to a central point - the CDEM Group Emergency Coordination Centre (GECC) for events affecting more than one territorial authority area
- The lifeline utility information is analysed and collated into a regional lifelines situation report covering all affected lifeline utility services
- The collated lifeline utility information is disseminated to all lifeline utilities along with other relevant emergency information to inform their own decision making and provide a regional perspective
- Critical lifeline utility information is passed to the CDEM Controller and other relevant GECC staff (and as appropriate, to Local and National Controllers) to aid decision making and priority setting
- CDEM support is provided to the utility to enable rapid restoration of critical utility services.

Lifeline Utility Coordination in the Manawatu-Wanganui GECC

The lifelines coordination processes (as defined above) are provided by the Lifeline Utility Coordinator (LUC) who operates in the GECC within the Operations (Liaison) function of the Coordinated Incident Management System (CIMS).

The LUC reports to the Controller and has the following major responsibilities:

- The primary contact point for lifeline utility CDEM representatives
- Maintaining a list of assisting and co-operating utilities and utility representatives
- Assisting in establishing and coordinating inter-utility contacts
- Keeping utilities supporting the incident informed of the incident status
- Monitoring the incident to identify current or potential inter-utility problems
- Receiving, collating and disseminating lifeline utility information
- Acting as spokesperson and advocate for lifelines utilities in the GECC
- Providing advice to the Controller in relation to lifelines utilities.

Lifeline utility staff may be asked to assist the LUC in the GECC on an 'as-required, if available' basis.


APPENDIX 5: LIFELINE UTILITY STATUS REPORT TEMPLATE

Note: this form is for *use by individual lifeline utilities* to report to the LUC and/or Sector Coordinating Entity on their status.

Civil Defence Emergency Management Report Organisation:		Print Name and Title		Signature	
		Prepared by:			
		Approved by:			
Civil Defence contact	Name:	Phone: Fax:	Mob: Email:		
Sent at (time):		To (name):		Receipt confirmed:	
		Via (number, email address)			
Item		Utility Report			
1. An overview of the scale and extent of event impact on the networks (including whether crisis management teams activated). Highlight significant change since the last status report.					
2. Major disruptions including <u>location/number of customers</u> affected in each location and estimated <u>restoration times</u> for known disruptions. Note any known <u>critical community or utility sites affected</u> by the service disruption. Provide maps of outage areas if available.					
3. Priority areas of response actions being taken (including status of CDEM requests for prioritisation of services).					
4. Note alternative solutions available to users (where appropriate).					
5. Public information and precautions to be promulgated and current actions being taken by utility to distribute information.					
6. Requests for support or specific information.					
7. Any other critical pending issues					

APPENDIX 6: LIFELINE UTILITIES STATUS SUMMARY REPORT TEMPLATE

Note: this form is *used by the LUC* (or lifelines coordination function) to compile individual lifeline utility reports (refer to Appendix 4).

 Lifeline Utilities Status Summary Report	
Status Report Number: # 000	Date and Time Issued: 00:00 hrs 00/00/0000
Coordination Centre: Group ECC	Period Covered From:
	Date: 00/00/0000 Time: 00:00 hrs
Event: <i>[Name and date of event here]</i>	Period Covered To:
	Date: 00/00/0000 Time: 00:00 hrs
Summary of event and critical issues	
<i>[Brief description of event here]</i>	
<i>[Summary of critical emerging issues or concerns]</i>	
Summary of lifelines utilities status, priorities and needs by sector	
Electricity and Gas	
Transpower:	
Regional lines companies/generators:	
Regional gas providers:	
Telecommunications	
Mobile providers	
Digital Radio, Wi-Fi, Landline, Fibre, Broadcasting	
Transport (Regional)	
New Zealand Transport Agency	
Kiwirail	

Airports and Port		
3-Waters and Local Roads		
Ruapehu District	3-Waters	Local Roads
Whanganui District	3-Waters	Local Roads
Rangitikei District	3-Waters	Local Roads
Manawatu District	3-Waters	Local Roads
Tararua District	3-Waters	Local Roads
Palmerston North City	3-Waters	Local Roads
Horowhenua District	3-Waters	Local Roads
Horizons Regional Council	River flood protection schemes	
Hospitals		
MidCentral DHB		
Whanganui DHB		
Authorisation		
Status Report Prepared By: [Name here]		Status Report Approved By: [Name here] Date / Time of Approval: 00/00/0000 00:00 hrs
Next Status Report Due At:		
Date and Time: 00/00/0000 00:00 hrs		
Distribution		
Include CIMS functions, all partner agencies represented at the GECC, the NCMC and any other activated sub-functions. Include all lifeline utilities not represented at the GECC and external liaison.		
[As per email distribution list].		

APPENDIX 7: GLOSSARY

CDEM	Civil Defence Emergency Management.
Interdependency	In the lifeline utility sector context, interdependency relates to the dependence by all lifeline utilities on at least some of the other lifeline utilities. For example, electricity operators depend on telecommunications for coordinating response and recovery, telecommunications operators need electricity for plant to operate and fuel refineries depend on water supply for cooling.
Emergency	Means a situation that: <ul style="list-style-type: none"> ▪ Is the result of a happening, whether natural or otherwise, including without limitation, any explosion, earthquake, eruption, tsunami, land movement, flood, storm, tornado, cyclone, serious fire, leakage or spillage of any dangerous gas or substance, technological failure, infestation, plague, epidemic, failure of or disruption to an emergency service or lifeline utility, or actual or imminent attack or warlike act; and ▪ Causes or may cause loss of life or injury or illness or distress or in any way endangers the safety of the public or property in New Zealand or any part of New Zealand; and ▪ Cannot be dealt with by emergency services, or otherwise requires a significant and coordinated response under the Act. <i>CDEM Act 2002.</i>
Emergency Coordination Centre (ECC)	A response coordination centre where the CDEM Group level response to an emergency may be supported or coordinated.
Emergency Operating Centre (EOC)	An emergency response centre where the local level response to an emergency is managed and delivered from.
Hazard	Has the same meaning as in section 4 of the CDEM Act and means something that may cause, or contribute substantially to the cause of, an emergency.
Lifeline Utility (Lifeline Organisation)	A lifeline utility is an organisation that provides an essential service and is defined in Schedule 1 of the CDEM Act 2002, including water, wastewater, ports, airports, roads, rail, electricity, gas, petroleum, telecommunications, and broadcast media organisations.
Lifelines Groups	Lifelines Groups (sometimes referred to as Lifelines Engineering Groups or Lifeline Utility Groups) operate regionally and: <ul style="list-style-type: none"> ▪ undertake reduction and readiness planning (the lifelines group itself does not have an operational role in response and recovery) ▪ have members including lifeline utilities, scientists, emergency managers and other professionals.
Lifelines Utilities Coordinator (LUC)	A non-statutory CDEM Group position usually performed within emergency coordination centres, responsible for coordinating and liaising with lifeline utilities on behalf of the Controller during responses to emergencies. Coordination of lifeline utilities involves gathering and dissemination of information to and from lifeline utilities (impact reports, response priorities, situation reports, hazard information etc.), maintaining an overview of the lifeline utility situation and providing information and advice to the Controller to provide a safe and effective response.
National Crisis Management Centre (NCMC)	The centre that facilitates Central Government crisis management arrangements and offers inter-agency and scalable operability to deal with any type of emergency. The NCMC is managed and maintained in a continued state of readiness by the Ministry of Civil Defence & Emergency Management.
Risk	The effect of uncertainty in meeting objectives. Usually described as the

combination of *likelihood* and *consequence*.

**Sector
Coordinating
Entities (SCEs)**

SCEs provide a prearranged means of national level sector coordination through a point of contact for each lifeline sector in the event of a major civil defence emergency. Sector coordination helps ensure clear reporting lines within sectors and to the LUC operating in the NCMC.

An SCE is the organisation, group of sector representatives, or individual agreed by the sector to undertake one or more of the following functions in an emergency:

- Facilitate sector specific solutions that do not require Government assistance/support
 - Co-ordinate and provide sector situational information to the NCMC, participate in NCMC planning activities and distribute NCMC information to their sector
 - Co-ordinate requests for assistance with the NCMC/Government
 - Co-ordinate with other affected sectors.
-