

1. Executive Summary

1.1. Assignment

Consultel Associates Ltd has been charged with providing an independent professional assessment of the emergency communications systems used by Lifeline Utilities which are members of the Auckland and/or Wellington Engineering Lifelines Groups. Lifeline Utilities are defined in Schedule 1 of the Civil Defence Emergency Management Act 2002 and are listed in section 10.8.

A survey was emailed to all known contacts within the Auckland and Wellington Lifeline Groups to assess current and planned emergency communications infrastructure, and to identify dependencies on contractors or other agencies, and on system vulnerabilities. Responses were received from a broad cross-section of utilities, sufficient to provide a good view of current communications infrastructure. A summary of the survey and results is contained in section 4.

Three open workshops were held with Lifelines members and other interested parties, one in Wellington and two in Auckland. The workshops clarified and explored responses from the survey and canvassed possible solutions. The workshops (late February 2004) coincided with a series of storms that resulted in major flooding of areas in the lower North Island. These events caused some disruption to the workshops with participants being required for emergency co-ordination, but also provided valuable insights into requirements and current shortcomings.

A review of available technologies was conducted, along with consideration of other related project activity to determine the most appropriate systems to use for emergency communications.

1.2. Requirements

1.2.1. CDEM Act 2002

The Civil Defence Emergency Management Act 2002 defines Lifeline Utility organisations and their duties with respect to Emergency Management. Relevant sections of the Act are reproduced in section 10.7

Every Lifeline Utility must ensure that it is able to function to the fullest possible extent, even though this may be at a reduced level, during and after an emergency.

1.3. Current Situation

1.3.1. Key Survey findings

Utilities use public networks for most of their communications. These include telephones on PABXs and the fixed-wire telephone network, mobile cellular phones, trunked-mobile radio-telephones, and *Internet* email.

Of organisations that responded to the survey, 73% had some form of independent wireless communications system available that could be used for emergency communications if the public networks were unavailable. However in most cases these systems were designed for internal communications and could not be used to contact other Lifelines or emergency services.

All utilities were highly dependent on contractors to carry out some functions (mostly on-site). Communication with contractors is generally by public networks.

Message volumes within Lifelines organisations are much greater than external volumes (to other Lifelines or to CDEM EOCs).

1.3.2. Workshop directions

Participants recognised a general dependence on public networks and a subsequent need to understand capability and limitations in the networks particularly under emergency conditions.

Interest was shown in systems that were independent of public networks for use in major emergencies when public networks could be inoperable or overloaded. It was recognised that satellite-based services offered the most comprehensive coverage and services.

There is not, in general, an adequate level of operational documentation of emergency communications networks within utilities.

1.3.3. General

There are various degrees and levels of natural (and otherwise) disasters that could affect Lifelines' operations. Some will be of a local nature, others will be more widespread with a corresponding wide-ranging impact on the operations. There can be network issues that, although local in nature, have a widespread impact on the network's ability to deliver service.

Many Utilities are heavily dependent on the public communications networks, operated by Telecom, TelstraClear, Vodafone, Teamtalk and Broadcast Communications Ltd (BCL). This is particularly so for inter-utility communication. Much of the support and maintenance for these networks is subcontracted to service companies.

1.3.4. Various disaster scenarios and exposures

Exposures to the communications infrastructure from disasters caused by:

- earthquake
- flood
- storm
- tsunami
- volcanic eruption
- fire
- hazardous materials
- terrorist activity
- utility failures

have been considered.

The major public communications networks are robust, with important functions protected by node or component redundancy, and key routes protected by trunk diversity.

Because of this, in general, the impact of disasters is likely to be localised in its effect on the communications networks.

A localised network failure that isolated an important Lifelines Utility control centre would be significant.

1.3.5. Overloading and Priority

The most significant overall risk is that of overloading and congestion, particularly if significant parts of the public networks are disabled.

There is some capability to provide priority for emergency calls, and use of dedicated circuits to route 111 calls. All 111 calls, wherever originated, are delivered to Operators terminated in the Telecom PSTN.

A more detailed and specific study of call prioritisation, and how it has been implemented, in the public networks should be carried out.

1.4. Recommendations

1.4.1. Communications in non-declared emergency

Recommend that Lifelines:

- Use existing public systems (as appropriate for each utility) with provision for backup by not relying on any one system.
- Use private (radio) systems where necessary for coverage outside public networks
- Maintain a master register, co-ordinated by the Lifelines Co-ordinators, of current contact details for all utilities and emergency managers.
- Define processes for establishing communications via the register:

1.4.2. Communications in a declared emergency

In a declared emergency,

1.4.2.1. Between Lifeline Utilities Emergency Operations Centres

In most emergency situations communication with other Utilities Emergency Operations Centres will be possible using normal everyday communications systems.

It is recommended that:

- Each Utility EOC have at least 3 separate means of communication installed and available. These systems need to be compatible between utilities and have sufficient capacity to handle priority communications traffic.
- At least one of these systems should be satellite-based.

Details and examples are given in section 10.2.1.1.

1.4.2.2. Between Lifeline Utilities Emergency Operations Centres and key contractors

Communications between Lifeline EOCs and their contractors will be critical in the recovery and restoration phases of emergencies.

- Contractors should have robust internal communications systems relevant to the geography and nature of the work they undertake.
- Contractors' control centres should have the same level of emergency communications as the relevant Lifelines EOC (see 10.2.1.1), and those systems should be compatible.

Lifelines utilities should ensure these conditions are written into contractor agreements.

1.4.2.3. Between Lifeline Utilities Emergency Operations Centres and a Lifelines Coordination Centre

A Lifelines Coordination Centre may be necessary to provide a link and backup point between Utilities. The Lifelines Coordination Centre will have direct emergency communications systems with the relevant Regional EOC(s) utilising the systems employed by the CDEMG.

- Utilities EOCs should have at least 3 diverse means of communicating with the Lifelines Coordination Centre,
- At least one of which should be satellite-based.

Further work is required to define the scope of a Lifelines Coordination Centre before a definitive communications plan can be proposed. It could be incorporated within the CDEM EOC or be standalone as shown in the following diagram.

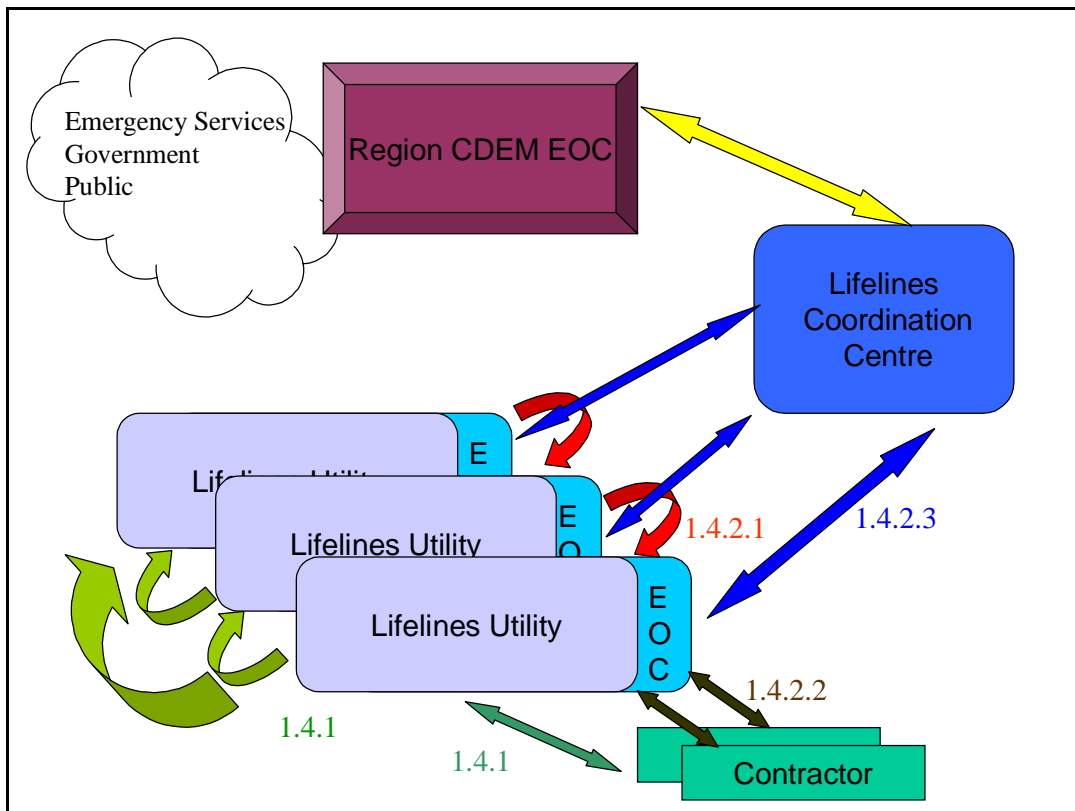


Figure 1 showing communications between Lifelines organisations (the numbers refer to the recommendations above)

1.5. Summary of Recommendations

It is recommended that **each Lifelines utility** should:

1. in general, have at least three separate communications systems available to provide redundant access and each with sufficient capacity to handle all emergency communications.
2. ensure that at least one of those systems is satellite-based and capable of delivering voice connections to the public voice networks (PSTN and cellular). Of the satellite services available the Iridium system is recommended, however Lifelines using one of the other services should continue to do so. Future developments in the iPStar and Inmarsat systems should also be closely monitored.
3. ensure that the communications systems of their critical subcontractors are compatible with those of the utility.
4. ensure any new or upgraded systems have Internet Protocol capability.
5. adopt a set of standard requirements and design guidelines for inter and intra-utility communications systems. A suggested set is included in section 10.9.
6. plan for limited bandwidth being available – for example: have low-resolution black & white copies of critical network diagrams, charts, equipment layouts etc for use in emergencies when only limited data or fax capability will be usable.
7. increase the capacity of battery and generator supplies in key control centres and for communications equipment to allow 72 hour standalone operation.

It is recommended that the **Lifelines Group(s)** should:

8. develop and maintain a master register of current contact details for all utilities and emergency managers¹.
9. define processes for establishing inter-utility communications via the register.
10. review in detail the prioritisation of (emergency) calls available within the public networks to ensure this has been implemented to maximum advantage. This needs to be an “end-to-end” view rather than an internal view.

It is recommended that **CDEM Groups** should:

11. determine, in conjunction with the respective Lifelines Groups, an appropriate holder for the master register (available 7/24 with full emergency communications facilities).
12. engage, in conjunction with the respective Lifelines Groups, the amateur radio AREC groups to provide “last-ditch” emergency support.
13. set a target date (say up to a year) by which Lifelines should demonstrate that they meet the above recommendations.

Further detailed recommendations are contained in section 10.3.

1.6. Estimated Costs

By utilising existing infrastructure as much as possible, costs have been kept to a minimum.

Most organisations surveyed already utilise three or more separate means of communication and apart from some possible upgrading of handsets to ensure compatibility with contractors’ cellular or VHF radio systems, little capital expenditure is likely to be required to meet this need.

Only 2 organisations surveyed currently have satellite-based communications available for emergency use. A number of options are available, including short-term rental, long-term lease, or purchase. Costs for systems range from approximately \$2000 per year to rent a satellite phone, to around \$10,000 to install a broadband satellite terminal.

Because of the high development costs, relatively low numbers in use, and the need to ensure a reliable and stable platform, satellite communications technology does not evolve as quickly as say cellular telephony. The development plans of the major providers are also generally well communicated allowing a reasonable assessment of the available options for any given user situation. For example with Inmarsat about to launch a new generation of satellites (see 9.4.2) in 2005 it would be unwise to invest in the purchase of handsets for their current system. The suppliers of the handsets can generally advise appropriate options.

¹ There is a list of Lifelines emergency contact details. AELG one is updated and circulated every 3 months.