

s(2)(a)

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**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 5:14 p.m.  
**To:** Ian Simpson  
**Subject:** FWD: CANTERBURY RECOVERY  
**Attachments:** CANTERBURY RECOVERY

Ian, grateful if you would respond and let s(2)(a) know I am abroad. Ta, Hugh

9(2)(a)

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**From:** 9(2)(a)@dia.govt.nz>  
**Sent:** Friday, 15 October 2010 5:05 p.m.  
**To:** Hugh Cowan  
**Subject:** CANTERBURY RECOVERY

Hugh,

With the announcement of Fletchers for the project management task and the information on and proposals for land remediation well down the track, it looks as though you and your team have got your heads above water. Well done!!

It is difficult to find a time and place to meet and discuss progress, and I would like to do that soon. But in the meantime can I please run this issue past you to gauge reaction and hopefully some help...and there is no rush for a response!

I am told by my staff in Canterbury, and to a degree relayed from the Recovery Managers, that they have difficulty obtaining statistics from EQC and the insurance industry around housing. Without the stats it is difficult for them to gauge and report progress or trends, and it is hard to scope downstream issues they may be called on to support or provide for. Is there some way the "officials" can access stats such as:

Nos of houses in each damage or restoration category.

Nos of families or households that are being accommodated temporarily by their insurance company.

Hope you can help me fill in a blind spot (amongst others).

Have a good weekend and I will try to make contact next week.

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9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 1:32 p.m.  
**To:** 9(2)(a)  
**Subject:** RE: Theme Leader input required to inform a paper to ECAN/Recovery Commission

Thanks 9(2)(a) have forwarded this to Ian with a suggestion that he contact you at some stage, in my absence (US for next fortnight).

H.

**From:** 9(2)(a)@gns.cri.nz  
**Sent:** Friday, 15 October 2010 1:20 p.m.

9(2)(a) Hugh Cowan; 9(2)(a)

**Subject:** Theme Leader input required to inform a paper to ECAN/Recovery Commission

Kia ora tatau,

As an update to 9(2)(a) email of 9/10/10, especially with regard to Platform funding issues for the earthquake response, some ECAN Commissioners 9(2)(a) in particular, who is also on the Recovery Commission) have expressed some frustration about the speed with which some pressing decisions relating to re-build or land-use are able to be informed by science information. As a first step, GNS Science is leading the compilation of a map of liquefaction in Christchurch using all useful existing information that has already been collected by UoC, GNS and a number of others so that areas of liquefaction are recorded. This, however, is just one component of where science can inform the recovery over the next few months or years.

Yesterday, wearing the Acting Platform Manager's hat, I attended an ECAN-convened meeting on science issues in Christchurch. The meeting was chaired by 9(2)(a) ECAN. Other attendees included 9(2)(a) from the Recovery Commission, 9(2)(a) representing EQC, representatives from Selwyn District Council and Christchurch City Council, Tonkin & Taylor, University of Canterbury (2), GNS Science (2+2 by phone), ECAN (1 other).

The meeting was pitched at a fairly strategic level, so detailed discussion of issues such as liquefaction were covered off afterwards. As Chair, 9(2)(a) clearly enunciated the opportunity that the region sees arising from this earthquake in terms of the science contribution:

- This is a rare opportunity to capture data and undertake earthquake research that will be of international standing.
- This research can (and is) inform(ing) difficult local decisions about re-building and future development in the short and medium term; on a longer timeframe it will influence the future shape of Christchurch.
- The research can provide the basis for new planning and construction approaches that can effect change nationally, especially around preventable issues such as unreinforced masonry, liquefaction, and land-use planning.

ECAN, under pressure from their own Commissioners and the Recovery Commission (9(2)(a) is common to both), urgently want to understand what science is currently underway (existing resources plus diversion/deferral of effort) and what work of demonstrable public value needs additional resource. They may want this information for a meeting of the Recovery Commission as early as next Wednesday (20<sup>th</sup> October).

In my view, this is hard to do. My intent is to write a 2-page document briefly setting out the context and opportunity, what work has been and is being done, and then listing about 6-8 bullet points of key research needed that will contribute to recovery decisions and national issues over the shorter and longer terms respectively. I will then give an estimate of current effort, diverted effort and what additional resource is required. To some extent the additional

resource will be a guess informed by factors such as existing costings of projects that Theme Leaders have already developed, available capacity, and likely political acceptability. I will provide this document to ECAN, hopefully today in a crude form, but in better shape on Monday once I am able to get some financial numbers from 9(2)(a).

To write this document I need from Theme Leaders involved in earthquake-related research TODAY:

- An update on what is currently being done. So maybe 3 brief bullet points on what you are aware of. I already know a lot of this, so keep it short - I can always ask for more detail if I need it. Don't forget to explain the value of what is being done, i.e. why you are doing it.
- Some bullet points from relevant themes about key earthquake-related science questions to tackle and how they will deliver value on a range of timeframes. I have a lot of material in this space already from some notes from 9(2)(a) and engineering and geotechnical input from 9(2)(a). Social Science plans are already well-developed. If 9(2)(a) has your material, please send it to me as she is away today. If not, send me 1-2 bullet points (not paragraphs!)

Note that people at the ECAN meeting saw the Platform as the ideal mechanism for coordinating the research and managing any additional resource.

Cheers, 9(2)(a)

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9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 1:32 p.m.  
**To:** Ian Simpson  
**Subject:** FW: Theme Leader input required to inform a paper to ECAN/Recovery Commission

Ian,

9(2)(a) attended the meeting described below but in my absence you may need to liaise with 9(2)(a) to establish what, if anything, we may do to assist. One question that may arise is the extent to which the Tonkin & Taylor work is to be supplemented by the efforts outlined below. The relationship between EQC and the Recovery Commission is one we'll need to move on swiftly. A call to 9(2)(a) (the engineer on the Commission) would be constructive 9(2)(a) since he understands our research facilitation role and processes, but you may already be following up with other members in the wake of your meetings with Mayor-elect...

Cheers  
Hugh

**From:** [redacted]@gns.cri.nz]  
**Sent:** Friday, 15 October 2010 1:20 p.m.

Hugh Cowan; [redacted]

9(2)(a)

**Subject:** Theme Leader input required to inform a paper to ECAN/Recovery Commission

Kia ora tatau,

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9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 1:23 p.m.  
**To:** 9(2)(a)  
**Subject:** RE: Visit to DC

9(2)(a)

-----Original Message-----

**From:** 9(2)(a)@usgs.gov]  
**Sent:** Friday, 15 October 2010 1:23 p.m.  
**To:** Hugh Cowan  
**Subject:** Re: Visit to DC

9(2)(a)

9(2)(a)

U.S. Geological Survey  
Sent from my BlackBerry

----- Original Message -----

**From:** "Hugh Cowan" [HACowan@eqc.govt.nz]  
**Sent:** 10/15/2010 10:54 AM ZE12  
**To:** 9(2)(a)  
**Subject:** RE: Visit to DC

Hope the Sun is shining when I visit too :-)

-----Original Message-----

**From:** 9(2)(a)@usgs.gov]  
**Sent:** Friday, 15 October 2010 11:35 a.m.  
**To:** Hugh Cowan  
**Subject:** Re: Visit to DC

Finally be back in Denver in 30 min. We had incredible field weather.

\*\*\*\*\*

9(2)(a)

U.S. Geological Survey  
Sent from my BlackBerry

----- Original Message -----

**From:** "Hugh Cowan" [HACowan@eqc.govt.nz]  
**Sent:** 10/15/2010 10:31 AM ZE12  
**To:** 9(2)(a)  
**Subject:** RE: Visit to DC

YES, happily...

-----Original Message-----

From: 9(2)(a) [redacted]@usgs.gov]  
Sent: Friday, 15 October 2010 11:31 a.m.  
To: Hugh Cowan; 9(2)(a) [redacted]  
Subject: Re: Visit to DC

Hugh, Can you give the same talk in Golden?

9(2)(a) [redacted]

\*\*\*\*\*

9(2)(a) [redacted]

U.S. Geological Survey  
Sent from my BlackBerry

----- Original Message -----

From: "Hugh Cowan" [HACowan@eqc.govt.nz]  
Sent: 10/15/2010 10:27 AM ZE12  
To: 9(2)(a) [redacted]  
Cc: 9(2)(a) [redacted]  
Subject: RE: Visit to DC

9(2)(a) [redacted]

My thoughts for a title:

Tales of Two Cities from Chile and New Zealand - the 2010 Earthquakes, Impacts and Recovery

H.

-----Original Message-----

From: 9(2)(a) [redacted]  
Sent: Thursday, 14 October 2010 9:58 a.m.  
To: Hugh Cowan  
Cc: 9(2)(a) [redacted]  
Subject: Re: Visit to DC

Hugh,

Unless 9(2)(a) [redacted] has you lined up for meetings on Monday afternoon 10/18 at the USGS, I'll arrange for you to talk at noon at IRIS, and I'll see if anyone else here would like to spend some time with you afterward. I have a meeting from 2-3 pm but otherwise my schedule is open on the 18th. How about a title of "Comparing the impact of and recovery from the 2010 Chile M8.8 and the Canterbury M7.1 earthquakes"?

9(2)(a) [redacted]

On Oct 8, 2010, at 5:09 PM, Hugh Cowan wrote:

> 9(2)(a) [redacted] happy to fit in. I simply dont have time to be more proactive

> about my visit but do believe the trip will be valuable once I am  
> there. Ironically, it will also offer respite. Good idea to copy 9(2)(a)  
> when you make a time for my talk, in case he is planning anything else  
> for me. Cheers Hugh

>  
> --- original message ---

> From: 9(2)(a)  
> Subject: Re: Visit to DC  
> Date: 9th October 2010  
> Time: 9:24:11 am

>  
> Hugh,

>  
> I can't imagine how much must be going at EQC at the moment.  
> Comparing the impact and recovery from Chile and Canterbury  
> earthquakes would be of interest here (IRIS was involved in aftershock  
> recording in Chile) and I could invite people from Carnegie, the  
> Smithsonian, USGS and NSF, though the audience would probably only be  
> 15-30 people. However I didn't understand 9(2)(a) comment as I  
> thought he was in Memphis. Is he now based in DC? Since it looks  
> like you are going out NSF on the afternoon of the 19th, What if you  
> talked at IRIS on the 18th, perhaps at lunch time?

>  
> 9(2)(a)

>  
>  
> On Oct 7, 2010, at 4:59 PM, Hugh Cowan wrote:

>> 9(2)(a)

>>  
>> Sorry for the very slow response from me, perhaps needless to say I  
>> am immersed in the recovery process - leading an RFP process for  
>> reinstatement project management - a \$1 billion contract to repair up  
>> to 50,000 homes. I still plan to travel.

>>  
>> I would be happy to give a talk at IRIS - perhaps an overview of the  
>> impact and recovery from the Chile M8.8 and the Canterbury M7.1.

>> Other plans for my time in DC are as follows - courtesy of 9(2)(a)

>> 9(2)(a)

>>  
>> Hi Hugh,

>>  
>> 9(2)(a) of NSF would like to meet with you the  
>> afternoon of the 19th. 9(2)(a) from the  
>> USGS were out of town, but I hope to hear from them today.  
>> Actually, I head to Reston tomorrow, so I will see them there. I do  
>> not think a talk in Reston would be that fruitful (compared to here  
>> or at IRIS, unless you think otherwise.

>>  
>> 9(2)(a)

>>  
>> regards

>>  
>> Hugh Cowan

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 12:52 p.m.  
**To:** 9(2)(b)(ii)  
**Subject:** RE: Request for Feedback on 9(2)(a)

Ha, so it is....

Thanks  
Hugh

-----Original Message-----

**From:** 9(2)(a)@gns.cri.nz  
**Sent:** Friday, 15 October 2010 12:51 p.m.  
**To:** Hugh Cowan  
**Subject:** Re: Request for Feedback on 9(2)(a)

Hi Hugh

It is at the botton of your email to me and this one.

Cheers, 9(2)(a)

----- Original Message -----

**From:** "Hugh Cowan" [HACowan@eqc.govt.nz]  
**Sent:** 15/10/2010 11:38 ZE12  
**To:** 9(2)(a)  
**Subject:** RE: Request for Feedback on 9(2)(a)

OK, but I accidentally deleted the email with the instructions, sorry! Could you have it sent to me again?

Hugh

-----Original Message-----

**From:** 9(2)(a)@gns.cri.nz  
**Sent:** Friday, 15 October 2010 12:34 p.m.  
**To:** Hugh Cowan  
**Subject:** Re: Request for Feedback on 9(2)(a)

Hi Hugh

That should be okay as long as you remember to do it when you return. It is done on line so you can do it any time.

Cheers, 9(2)(a)

----- Original Message -----

**From:** "Hugh Cowan" [HACowan@eqc.govt.nz]



Sent: 15/10/2010 11:12 ZE12

To: 9(2)(a)

Subject: RE: Request for Feedback on 9(2)(a)

Hi 9(2)(a)

I wont be able to do this until I return on 1 Nov. Let me know if this is not feasible so that Hay can arrange an alternative reviewer.

Hugh

-----Original Message-----

From: 9(2)(a)

[mailto: ]

Sent: Thursday, 14 October 2010 2:32 p.m.

To: Hugh Cowan

Subject: Request for Feedback on 9(2)(a)

Dear Hugh Cowan:

9(2)(a) who is currently enrolled in the Leadership Deep Dive Program, has requested your feedback as his/her Client/Customer. You have been asked to complete surveys via our Internet website. In order to provide adequate feedback, your surveys must be completed by 11/1/2010 (mm/dd/yyyy).

Unless you are the participant's direct manager, information will be reported in aggregate, so your individual feedback will remain anonymous. We can assure you that your answers will be treated in confidence and that the results will be presented in such a way that specific replies cannot be associated with specific individuals.

To begin:

\* Write down your username and password below as you will need it to log on to the site.

9(2)(a)

\* From your Internet browser (Mozilla Firefox 3.0 or higher or Internet Explorer 7.0 or higher) go to <http://surveys.haygroup.com>

\* This will bring you to the Hay Group Surveys Login screen. Enter your user name and password (they are not case sensitive). Click the Login button to continue.

\* Once you have logged on, a list of surveys will be displayed that you need to complete. To access a survey, click your mouse on the underlined survey name. Please complete all surveys listed on the web site.

To send your results to Hay Group, click the SUBMIT button. To ensure that your survey has been successfully submitted, please WAIT for the confirmation before continuing.

When you return to the Survey Menu Page, you will see the date and time you completed or saved your survey. THE SURVEY MUST BE COMPLETED BY 11/1/2010 (mm/dd/yyyy).

If you have any questions, please contact 9(2)(a)@haygroup.com.



9(2)(a)

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**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 12:07 p.m.  
**To:** 9(2)(a)  
**Subject:** RE: an effort to get reflection/FZGW research going in NZ...

9(2)(a) comes back to you, my host at IRIS is 9(2)(a)

H.

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**From:** 9(2)(a)@auckland.ac.nz]  
**Sent:** Friday, 15 October 2010 1:44 a.m.  
**To:** Hugh Cowan  
**Subject:** FW: an effort to get reflection/FZGW research going in NZ...

9(2)(a)

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9(2)(a)

9(2)(a)  
Institute of Earth Science & Engineering  
Rm 627, Level 6, 58 Symonds St.  
University of Auckland  
Private Bag 92019 Auckland Mail Center  
Auckland 1142, New Zealand

Web site: <http://www.iese.co.nz/>

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**From:** 9(2)(a)  
**Sent:** Friday, October 15, 2010 1:23 AM  
**To:** 9(2)(a)  
**Subject:** Out of Office AutoReply: an effort to get reflection/FZGW research going in NZ...

I will be out of the office 7-17 October. I will be checking email as often as possible, but please expect delays. For urgent matters related to EarthScope, please contact 9(2)(a)

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9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 12:02 p.m.  
**To:** 9(2)(a)  
**Subject:** FW: an effort to get reflection/FZGW research going in NZ...  
**Attachments:** Darfield\_Reflection\_&\_FZGW\_Experiment.doc

Grateful if you would file this as a proposal pending – not clear whether we would contribute directly or if so, by how much, but I am happy to lend support to 9(2)(a) effort in general.

H.

**From:** 9(2)(a)@auckland.ac.nz]  
**Sent:** Friday, 15 October 2010 1:19 a.m.  
**To:** Hugh Cowan;

9(2)(a)

**Subject:** an effort to get reflection/FZGW research going in NZ...

All you all,

In an effort to help support a collaborative project to study the Darfield EQ with the potential availability of the UoCalgary seismic profiling facility, I have contacted several of you. After checking that this idea was an acceptable one to all, my colleagues and I have assembled a 2 page “white paper” statement of the objectives and plan for this study. This document is not intended to replace anything any of you have already put in motion – it’s just a talking point to see if we could progress something and hope to get it funded.

Please take it as such and nothing more.

Among the people I contacted was Hugh Cowan of the EQC. Since he will be in Washington DC next week, he suggested that a document of the type attached be sent to him so he might look to see what collaborative support might be available for the proposed work. He has requested that I suggest a potential contact at NSF that might be open to considering sharing of this proposal with EQC. My only real contact there in the last few years have been 9(2)(a) in CD and 9(2)(a) in Equipment and Facilities. Post SAFOD, the group at Earthscope and Geophysics have changed and I am no longer sure who Hugh might approach there: 9(2)(a) In hopes that one of them might provide some guidance toward whatever assistance might or might not be available given the circumstances.

Are there other agencies that any of you know that might contribute to this effort?

As you know, many of us have been making a significant effort to get the UoCalgary reflection gear here over the past few years. The most recent effort before the Darfield event, has been associated with the ICDP Alpine Fault drilling pilot project, with 9(2)(a) in a leading role, and our IESE proposals for profiling using downhole sensors in the TVZ. Yet, given the associated expense of mobilizing for vib work, it would appear that none of these efforts has been able to stand on its own. Perhaps by sharing this cost among several projects we might facilitate several of them. Speaking personally, I have been frustrated by our lack of capacity/opportunity for progressing this line of research. Hopefully we can be more successful if we pull together on the current extraordinary opportunities.

Best,

9(2)(a)

9(2)(a)

9(2)(a)

Institute of Earth Science & Engineering  
Rm 627, Level 6, 58 Symonds St.  
University of Auckland  
Private Bag 92019 Auckland Mail Center  
Auckland 1142, New Zealand

Web site: <http://www.iese.co.nz/>

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**Collaborative Seismic Reflection & Fault Zone Guided Wave Study of 2010 Darfield Earthquake Zone**

9(2)(a)

<sup>1</sup>Institute of Earth Science and Engineering, University of Auckland, NZ; 9(2)(a)@auckland.ac.nz

<sup>2</sup>Southern California Earthquake Center, University of Southern California, CA, USA;

<sup>3</sup>University of Canterbury, Christchurch, New Zealand 9(2)(a)@canterbury.ac.nz

The New Zealand M7.1 Canterbury (Darfield) Earthquake on the 4<sup>th</sup> September 2010 occurred on a previously unknown strike slip fault buried beneath the alluvial plain that had not ruptured in at least 10,000 years and caused significant damage to the Christchurch urban area. Although diminishing in frequency and magnitude aftershocks of up to M4 continue to occur in the region. We can assume the damage zone of this splay fault of the South Island's transpressional regime was fully healed due to the long return times associated with this fault. Thus it presents an opportunity to examine the newly developed damage zone and provide a base line for further experiments to monitor the damage zone healing with time. We propose a collaborative IESE/UoCanterbury/SCEC study of this event's site.

We propose to deploy a high density seismic array across and along the rupture zone in the Canterbury plains to record both reflected vibrator seismic signals and Fault Zone Guided Waves (FZGW) from aftershock activity. The latter waves give direct evidence of the width and magnitude of fault damage. We deployed three broadband stations on the fault rupture within two weeks of the earthquake (Henderson et al., 2010) and are currently analysing these data for FZGWs. To continue these observations, we propose to use a multichannel seismic reflection recording system to profile reflections from the structure, stratigraphy, and the dispersion and amplitude-position characteristic of the Darfield Fault damage zone. A potential baseline deployment could use a 120 channel system (allowing 40 3C stations). However, in this proposal we seek to cooperate with UoCanterbury and SCEC colleagues to make use of this unique earthquake to greatly expand our understanding of fault character and damage.

An opportunity exists to mobilise the University of Calgary's 600 channel Aries Aram system as part of a collaborative program with the University of Canterbury. Canterbury has proposed to use the Aram system to profile the stratigraphy and offset structure surrounding the rupture zone. Their goal is to conduct seismic reflection profiling across the fault rupture to map the previously unknown fault geometry and its rupture through the Quaternary alluvium. IESE would assist carrying out this work with 9(2)(a) at the University of Canterbury. Recent seismic reflection profiling in NW Canterbury is of high quality (Dorn et al., 2010), holding promise for the Darfield study. The flat topography and widespread support of the landowners following the earthquake will aid rapid mobilisation. The seismic reflection data could be used to calibrate some of the information about the fault modelled using FZGW.

We proposed to use the Aram system in a follow on study, placing 200 3C stations along and across the Darfield rupture for a minimum of 2-3 week deployment. Calgary's geophones have 10 Hz natural frequency and we would replace some of the sensors with alternative 4.5 Hz geophones. If this system were to be mobilised for the Canterbury study, we would use Calgary's mini-vibe to test the ability of a vibroseis source to induce FZGWs. If successful, this would allow repeated studies in a year or two to map the healing of the damage zone associated with the fault rupture. Alternatively explosive seismic sources could be utilised to provide a repeatable experiment once aftershock activity has diminished.

If funding and timing worked out, this project would contribute cost sharing of and additional seismic source and receivers to a seismic experiment on the dominant fault feature in New Zealand's South Island, the Alpine Fault, scheduled for January 2011.

Previous FZGW experiments to study the effects or changes to faults and their damage zones associated with earthquake events, with increasingly dense instrument array through time, have been performed in California associated with the Landers, Hector Mine and Parkfield earthquakes (Li et al., 1994; Li and Vidale, 2001; Li et al., 2003; Li, 2007). These studies provided insight into the fault and rupture continuity, damage zone geometry and properties in space and time including information about crack density and fluid flow.

### References.

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Henderson, M., Boese, C., Savage, M. Fry, W., Thurber, C., Jacobs, K., Karalliyadda, S., Syracuse, E., Lord, N., Davy, R., Unglert, K., Carrizales, A., Eccles, J., Zaino, A., Rawlinson, R., Seward, A., Malin, P., Jolly, A., Townend, J., Shelley, A., and Wech, A., 2010, Portable broadband seismometer deployment to record aftershocks of the 4 September 2010 Darfield Earthquake. *Proceedings of the GeoNZ Conference 21-24<sup>th</sup> November 2010*.

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### Indicative Budget – Darfield Earthquake collaborative seismic reflection & FZGW study .

Personnel	SCEC Collaborator (Y-G Li)	1x1 mo.	US\$	9(2)(i)
	Aram Technician	1x1 mo.	US\$	
	Aram/vib Assistant	1x1 mo.	US\$	
	Seismic field crew	6x1 mo.	US\$	
Travel	SCEC Collaborator	1 Los Angeles-Canterbury ret	US\$	
	Aram Technician	1 Calgary-Canterbury return	US\$	
	Aram/vib Assistant	1 Calgary-Canterbury return	US\$	
	Seismic field crew	3 Auckland-Canterbury return	US\$	
	Canterbury crew	3 Canterbury-Darfield	US\$	
	Per diem	9x1 mo.	US\$	
Supplies	Misc. Aram batteries/computer		US\$	
	Misc. Mini-Vib fuel/materials		US\$	
Shipment	Aram – 600 ch	Calgary-Canterbury return	US\$	
	Mini – Vib	Calgary-Canterbury return	US\$	
			TOTAL US\$	

9(2)(a)

---

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 12:00 p.m.  
**To:** 9(2)(a)  
**Subject:** RE: Urgent quick question

Yes, it is correct! Oh, yes, and I recognise the photo. 😊

---

**From:** 9(2)(a) [redacted]@dia.govt.nz]  
**Sent:** Friday, 15 October 2010 11:52 a.m.  
**To:** Hugh Cowan  
**Subject:** Urgent quick question

Hi Hugh,

Sorry. A quick but urgent question please, regarding my (author's) profile in the journal.

My job title in Taiwan - I have it down as 9(2)(a) [redacted] as it is pretty tricky to translate to English. Is it alright? I am just suddenly thinking if it is ok.

Thanks, 9(2)(a) [redacted]

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9(2)(a)

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**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 11:53 a.m.  
**To:** 9(2)(a)  
**Subject:** FW: IPENZ Compendium of codified knowledge

Hi,

Could you please assist 9(2)(a) with this enquiry in my absence? Thanks  
Hugh

---

**From:** Reception3 On Behalf Of EQC Info  
**Sent:** Friday, 15 October 2010 11:51 a.m.  
**To:** Hugh Cowan; 9(2)(a)  
**Subject:** FW: IPENZ Compendium of codified knowledge

FYI

---

**From:** 9(2)(a) [mailto:9(2)(a)@ipenz.org.nz]  
**Sent:** Thursday, 14 October 2010 5:00 p.m.  
**To:** EQC Info  
**Subject:** IPENZ Compendium of codified knowledge

As part of its business plan for the current financial year, the Institution of Professional Engineers New Zealand (IPENZ) has established a publically-available Compendium of Codified Knowledge. See <http://www.ipenz.org.nz/ipenz/practicesupport/compendium.cfm> . For your own area of activity, enter "earthquake" and "seismic" as keywords and you will be led to many items. The scheme is to record the legal hierarchy of Act, Regulation, Code, Standard, and Engineering Design Guide wherever this exists.

In many instances the links lead to the required document. In others, the links lead to places from which the documents may be purchased – Standards are of this sort.

Many of your research papers are of engineering interest, and may provide guidance on ways of complying with the Building Code. Your item 223 on light vessels used at atmospheric pressure (milk tanks, wine tanks, grain silos) is exactly of this type, and we know that it is used for design purposes. I would like to itemise this paper (and some others) in our Compendium. Can it be made electronically available, or is it necessary to buy it from you? If it must be bought, how much does it cost, and what is the ordering process?

Sincerely,



9(2)(a)

IPENZ, Engineers New Zealand  
Ground Floor, 158 The Terrace  
PO Box 12 241, Wellington 6144

T 9(2)(a)  
F

[www.ipenz.org.nz](http://www.ipenz.org.nz)

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9(2)(a)

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**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 11:30 a.m.  
**To:** 9(2)(a)  
**Subject:** FW: Your call

9(2)(a)

For next week, thanks...

hugh

---

**From:** 9(2)(a)  
**Sent:** Thursday, 14 October 2010 7:26 p.m.  
**To:** Hugh Cowan  
**Subject:** Your call

Hi Hugh

So sorry I missed your call.

I will be available to undertake probity checks on how the process is going next week. I will stay in contact with 9(2)(a) frequently to do this.

The information I require from you for the file is as follows:

- Any e-mails that you have where you have been in contact with tenderers, especially while the tender was out in the market e.g. any tenderer questions and the answers, the notice to tenderers to extend the closing time.
- The letters sent to fletchers (accepting their proposal) and the letter sent do the Alliance declining theirs.
- The signed recommendations that went to the board (e.g. shortlist and select) – you can leave these with 9(2)(a) and I can collect them next week from her.

If I require anything else I can e-mail you while you are away.

Finally, I won't be in the office tomorrow so please have a safe journey to America and enjoy yourself.

Take care

9(2)(a)

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 11:21 a.m.  
**To:** 9(2)(a)  
**Cc:**  
**Subject:** RE: Geotechnical Reconnaissance Report of the 2010 Darfield Earthquake - DRAFT 15 October

Thank you for this, 9(2)(a) will not have time to review this myself because I depart for the US today. However, I have asked 9(2)(a) to liaise with you and facilitate whatever assistance you may require in my absence. I will be monitoring but responding sparingly to email, and will be back in the office on 1 November.

Regards  
Hugh

**From:** 9(2)(a)@canterbury.ac.nz]  
**Sent:** Friday, 15 October 2010 11:17 a.m.  
**To:** 9(2)(a); Hugh Cowan; 9(2)(a)  
**Subject:** Geotechnical Reconnaissance Report of the 2010 Darfield Earthquake - DRAFT 15 October

Hi all,

I will send you shortly via 'yousendit' the draft of the reconnaissance report (since the file is too large). You will find a few yellow-marked areas around references that need small edits, but otherwise there won't be any essential changes to the document.

The report summarises observations and evidence gathered in an intense 6-day reconnaissance conducted by 15 experts in geotechnical earthquake engineering. In this type of reports documenting facts is the key target, and we intentionally refrain from making interpretations (and keep those to a minimum level). Personally, I think the report will be of great value both for the recovery process and long term research. I hope you find it useful too.

I will be happy to wait for your comments and not publishing/posting the report until next Friday.

Best regards,

9(2)(a)

PS. Would you suggest that I send the report to selected people from ECan, CCC, WDC and SDC at this stage? Some of them were approaching me and expressing concerns about the potential impact of the report.

9(2)(a)

Department of Civil and Natural Resources Engineering  
University of Canterbury  
Private Bag 4800, Christchurch 8140  
NEW ZEALAND  
Ph: 9(2)(a)  
Fax: 9(2)(a)  
E-mail: 9(2)(a)@canterbury.ac.nz  
Web: <http://www.civil.canterbury.ac.nz>

**From:** 9(2)(a)  
**Sent:** Friday, 15 October 2010 9:50 a.m.

To: 9(2)(a)  
Subject: research report

Hi 9(2)(a)

Good to see you yesterday – albeit briefly!

You tabled a draft report on the reconnaissance work done by your team over the last month, which you indicated would be released next week.

I am interested to see if we can get a copy before its issue simply to ensure we are fully aware of its content and any conclusions that may have been drawn by the contributors.  
I talked to 9(2)(a) here at EQC and he indicated to me that there was an arrangement for him to see a copy, but he hadn't yet got in contact with you.

You will be aware that EQC is about to release a public version of the T&T report so of course our interest is to ensure that any public statement from EQC takes full account of any information or conclusions you may have arrived at.

Thanks

9(2)(a)

NZ Earthquake Commission

Phone: 9(2)(a)

Email: 9(2)(a)

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9(2)(a)

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**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 11:16 a.m.  
**To:** 9(2)(a)  
**Subject:** FW: Meeting with EQC and the Programme Manager-this Friday

---

**From:** 9(2)(a)@dbh.govt.nz  
**Sent:** Wednesday, 13 October 2010 3:55 p.m.  
**To:** Hugh Cowan  
**Subject:** FW: Meeting with EQC and the Programme Manager-this Friday

FYI

---

**From:** 9(2)(a)  
**Sent:** Wednesday, 13 October 2010 3:35 p.m.  
**To:** 9(2)(a)  
**Cc:** [Redacted]  
**Subject:** Meeting with EQC and the Programme Manager-this Friday

Gents

Just to let you know, EQC are organising a meeting for this Friday (time and place to be advised but we suspect the EQC offices in Deans Ave) to introduce the key personnel of the new programme management company that they have appointed to manage repairs.

The announcement of the successful company will be tomorrow.

EQC will contact you directly with time and place

The Department will also be represented at the meeting and it is a good opportunity for the PMO, EQC Councils and DBH to meet and start talking the work ahead.

9(2)(a) will also there and will cover some of the technical work being developed to assist the repair process.

Regards

9(2)(a)

**Department of Building and Housing**

9(2)(a)  
Fax: (04) 494 0290

Level 6, 86 Customhouse Quay  
P O Box 10 729, Wellington, New Zealand

Web: [www.dbh.govt.nz](http://www.dbh.govt.nz)

9(2)(a)

---

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 11:11 a.m.  
**To:** Ian Simpson  
**Subject:** RE: Construction Industry Council - opportunity to discuss post Canterbury Earthquake response, and improvements going forward?

Good idea to participate. They're angling for you.....and you might like to meet new folk. Happy to help out if you're committed elsewhere.

H.

---

**From:** Ian Simpson  
**Sent:** Wednesday, 13 October 2010 12:00 p.m.  
**To:** Hugh Cowan  
**Subject:** FW: Construction Industry Council - opportunity to discuss post Canterbury Earthquake response, and improvements going forward?

Hugh,

Thoughts on this? 18<sup>th</sup> Nov may be a bit early for us to gaze back and reflect on what worked (as we'll still be in the thick of it!), but I feel we should be represented.

Cheers,

Ian.

---

**From:** 9(2)(a)@branz.co.nz  
**Sent:** Wednesday, 13 October 2010 11:33 a.m.  
**To:** Ian Simpson  
**Subject:** Construction Industry Council - opportunity to discuss post Canterbury Earthquake response, and improvements going forward?

Good morning, Ian, and first a quick note of introduction. I am 9(2)(a) of the Building Research Association of NZ (BRANZ), and we have been actively working with EQC in Canterbury for the last few weeks, with my key engineering staff assisting with home assessments/evaluations where they can etc. I am also 9(2)(a) of the Registered Master Builders Federation, as well as 9(2)(a) of the Contractors Federation, and in both cases we worked closely with EQC on disaster recovery and management.

For my sins I am also 9(2)(a) Construction Industry Council (CIC), a body that represents all the peak body organisations involved in the industry – see [www.nzcic.co.nz](http://www.nzcic.co.nz) for more information about us. We have just under 30 members, and have all of the main players involved in the CIC, from owners to design to construction to regulation.

When we last met two weeks ago we discussed the concept of meeting with EQC, the Ministry of Civil Defence, and possibly the Insurance Council to discuss the relevant outcomes from the Canterbury earthquake to assess what had worked and what hadn't in terms of the immediate disaster response, and what the industry might be able to do in future to improve things.

Our meetings alternate between Wellington and Auckland, with the next meeting – the morning of 18 November – being held in Auckland.

I would like to invite you to that meeting, where we could facilitate the discussion referred to above. We will be similarly extending an invite to 9(2)(a) from the Ministry and 9(2)(a) from the Insurance Council. I would

suggest we would set aside 1.5 hours for the discussion – perhaps 10-15 minutes from each organisation as to their perspective on things, and then leaving time for a more general round-table discussion on where to next.

I would be grateful if you could get back to me with your thoughts on the concept. The CIC can be a powerful group to work with, given its coverage of and reach into the building and construction industry, and we would look forward to working with EQC on improving disaster responsiveness going forward in any way we can.

Regards

9(2)(a)



9(2)(a)

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PORIRUA CITY 5240  
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9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 11:09 a.m.  
**To:** 9(2)(a)  
**Subject:** FW: Meeting with EQC Management Contractor

-----Original Message-----

**From:** 9(2)(a)@ccc.govt.nz]  
**Sent:** Wednesday, 13 October 2010 11:05 a.m.  
**To:** Hugh Cowan  
**Cc:** 9(2)(a)  
**Subject:** Meeting with EQC Management Contractor

Hi Hugh,

Thank you for your phone call advising of the chance to meet with the Contractor on Friday 15 th October. I will brief 9(2)(a) who is Manager Building Consents and I am sure that he will be keen to meet with the Contractor. 9(2)(a) phone number is 9(2)(a)

Regards

9(2)(a)

9(2)(a)  
Environmental policy and Approvals Unit  
9(2)(a)  
@ccc.govt.nz

Web: www.ccc.govt.nz <<http://www.ccc.govt.nz/>> Christchurch City Council Civic Offices, 53 Hereford Street, Christchurch PO Box 73013, Christchurch, 8154

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9(2)(a)

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**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 11:05 a.m.  
**To:** 9(2)(a)  
**Subject:** FW: Developments on repairing Christchurch soils post-liquefaction:

9(2)(a)

The following was forwarded to me by EQC reception but I did not see it at the time. I don't know who these folk are and do not think any specific action is required or requested, however, since I am leaving today and do not have time to investigate, rather than file and forget I am forwarding to you in case it is a helpful piece of the jig-saw related to general public discourse on the topic of land remediation.

Regards  
Hugh

---

**From:** Reception **On Behalf Of** EQC Info  
**Sent:** Tuesday, 12 October 2010 4:03 p.m.  
**To:** Hugh Cowan  
**Subject:** FW: Developments on repairing Christchurch soils post-liquefaction:

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**From:** 9(2)(a)  
**Sent:** Tuesday, 12 October 2010 9:35 a.m.  
**To:** EQC Info; 9(2)(a)  
**Subject:** Fw: Developments on repairing Christchurch soils post-liquefaction:

**Subject:** Developments on repairing Christchurch soils post-liquefaction:

Dear Associates:

We are pleased that the recent rumours circulating around Christchurch have been incorrect and EQC has concluded, on the basis of geotechnical reports, that on more than 90% of existing building sites, the liquefied soils can be repaired... according to Gerry Brownlee.

REFERENCE:

A) ODT Online, Thu, 7 Oct 2010, News: National:

"Very few Cantabrians will be forced to relocate because their land is beyond cost-effective repair, the minister in charge of earthquake recovery, Gerry Brownlee, says.

"The geotechnical report delivered by consultant engineers to the Earthquake Commission (EQC) was good news for the vast majority of residents, he said today.

"I know the issue which is uppermost in the minds of many Cantabrians is the public release of the geotechnical reports that show which areas are damaged, and how badly they are damaged," he said.

"But to avoid conjecture and misunderstanding, which may cause stress to residents, this has to be released in conjunction with the Government's decisions on what will be done to address the damage in each affected area."

" Those decisions would be based on information from the EQC and its consultant engineers.

"The EQC would meet tomorrow to make decisions which would be used for a Cabinet paper to be considered on Monday.

"I expect the underlying message to be good news for the people of Canterbury, with the vast majority of land able to be repaired," he said..

"So even if houses are significantly damaged and require demolition, all but a handful of Cantabrians will be able to rebuild on their original site once the land is repaired."

" Mr Brownlee said that depending on the outcome of the Cabinet meeting, he intended briefing the three affected councils next week on the Government's plans.

" Soon after that the geotechnical maps of each damaged suburb would be released, along with an agreed plan for fixing the land in those suburbs and the indicative costs and time-lines for completing the work.

"This will not provide answers to every question but it will outline the Government's approach and a time-line for working through the issues of land repair, construction and accommodation over the months ahead," he said.

"Furthermore, a recent publication (**Liquefaction-induced damage during the 2010 Darfield Earthquake** by Rolando P Orense, Dr. Eng., PE, Department of Civil & Environmental Engineering, University of Auckland) has shown that my old firm, URS, has claimed success in repairing liquefied soils at Pegasus, a new housing development near Christchurch which performed well during the 09/2010 earthquake despite being sited on soil identified as liquefiable prior to development.

Pegasus town, located north of Kaiapoi) did not suffer any earthquake-related damage.

Aside from the lower level of shaking (as it is located further from the seismic source), the reason for this is that prior to commencing development of the town, Pegasus commissioned extensive geological and geotechnical investigations of the site, including evaluation of the risk of liquefaction following a large seismic event (URS --**an international professional services corporation, 2005**). *Pegasus Town Infrastructure Geotechnical Investigations and Assessment Report, Prepared for Infinity Investment Group. (First draft 24.09.2010??)*.

The results of these studies and previous earthquake hazard research were incorporated into the analyses and design criteria for liquefaction mitigation at Pegasus. As a result of recommendations made by URS, **Pegasus carried out the following processes which have assisted Pegasus to withstand the earthquake effects.**

**(1) Implementation of vibro-compaction method to densify the subsoils**

**(2) Use of vibro-roller techniques for built up areas and roads to supplement standard compaction process**

**(3) Subsoil drainage network (using Aquacell and other innovative drainage technique) which enabled the subsoil to be properly drained during the very wet conditions**

**Thus, the well-drained subsurface subsoils of vibro-compacted fill and specialised vibroflotation techniques used have enabled Pegasus to completely withstand the strong earthquake and the resulting liquefaction, lateral spread and settlement experienced in the surrounding districts. This may be adopted in Christchurch during the re-building process.**

There are various soil remediation techniques available for Christchurch soils now, including those described immediately above and employed by URS at Pegasus.

I have approached MAPEI (See email address above) and they offer their experience and expertise:

"Reading down the email (from 9(2)(a) there are a few methods proposed to consolidate the ground and prevent further liquefaction of the ground. Namely:

1. Electro Osmosis (GeoSierra technology)
2. X-Drain ...Variations on De-Watering (GeoSierra technology.. see email adres above)
3. Vibration-compaction, micro-vibration, vibro-roller and vibroflotation... employed by URS
4. Variations on Drain Piles

None of which we (MAPWEI) have anything specifically new or useful to bring to the table. However,

5. Compaction Grouting
6. Jet Grouting
7. Permeation Grouting
8. In Situ Soil Mixing...

Are things we (MAPEI) have more we can say about and we are happy to assist in designing mixes for Compaction Grouting, Jet Grouting and In Situ-Soil Mixing.

Especially, we can help with Permeation Grouting.

Now there remains a challenge to select the most appropriate technology for specific site conditions. GeoSierra, MAPEI and URS have each suggested limits for particular remediation technologies. Please contact them or myself if you require further information.

Regards,

9(2)(a)

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 10:45 a.m.  
**To:** 9(2)(a)  
**Subject:** RE: Government procurement work stream: Issues paper

Hi 9(2)(a) nice to hear from you although I am presently too busy to respond and to compound matters I leave for the US today, returning to the office 1 November. Perhaps you could send me a second draft later on? How critical is my input at this stage? If vital, I will print out and carry with me, if not I will attend when I return.

regards

Hugh Cowan  
 Research Manager  
 Earthquake Commission  
 Level 20, Majestic Centre  
 100 Willis Street, P.O. Box 790  
 Wellington, New Zealand  
 DDI 9(2)(a)

**From:** 9(2)(a)@med.govt.nz  
**Sent:** Tuesday, 12 October 2010 10:53 a.m.  
**To:** Hugh Cowan  
**Subject:** Government procurement work stream: Issues paper

Hi Hugh

I suspect you would be very busy at the moment! Please find attached the draft paper which summarises the interviews we had with 11 government agencies, all CRIs and Cawthron as part of the Government Procurement work stream of the CRI Taskforce implementation project. I've also attached a power point document which pulls out the key issues.

This is a *first draft* of the paper for you to review and provide your input. Please have a read through and let me know if there are any issues you think are not well articulated and need amending, and whether there are other priority issues which you consider are not addressed. I have tried to keep the discussion fairly general, but have provided some examples to help with the context – please let me know if you are comfortable with how this has been presented.

Interviewees were keen to know about the breadth of agency/CRI contracting arrangements. I've developed a Table which is referred to in page 12 which shows this. Could you please review the information I have and provide amendments if the information is incorrect? And also let me know if you are ok for this info to be included.

**Table 1: Sample of government procurement arrangements with CRIs (will need to be verified by interviewees)**

Government agency	Other research and science spending	Total annual CRI spend (08/09)	CRI	Types of arrangements
Earthquake Commission	?	9(2)(1)	GNS	10-year agreement, reviewed by Treasury



Please get back to me by **midday Monday 18 October** with your amendments and comments on the paper. Let me know if you require more time.

We will arrange a workshop/meeting for later on in the month/November to start prioritising the issues, and to determine what actions could be implemented to address them. Let me know if you would like to be involved in this.

Kind regards

9(2)(a)

-----  
9(2)(a)

New Zealand Government - Auckland Policy Office

Direct: 9(2)(a)@med.govt.nz  
Level 6 | Tower Centre | 45 Queen Street | PO Box 106 483 | Auckland | New Zealand  
<http://www.med.govt.nz>  
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9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 10:40 a.m.  
**To:** 9(2)(a)  
**Subject:** FW: Offer of assistance

Grateful if you would handle this enquiry as we have others – thanks for expression of interest. We have sufficient resources to meet current challenges but we are reviewing our requirements regularly and we'll add you to a register of qualified offers of assistance.

H./

**From:** 9(2)(a)  
**Sent:** Monday, 11 October 2010 4:55 p.m.  
**To:** Hugh Cowan  
**Subject:** Offer of assistance

Dear Hugh,

I understand that you are currently heavily involved in the Christchurch recovery, and in particular with the contracting of specialist services to delivery this.

I am guessing that you are very busy, so contacting you to offer assistance.

My background has been in running a large public project management services business as General Manager responsible the New Zealand and Australian operations. I recently left that business and established a specialist project management practice in NZ. A project that may have some relevance to what you are currently doing is the \$500M KiwiRail procurement of new trains for Auckland - I have been involved in the project management of this project since March 2010. Prior to this I managed a large team on the \$550m Auckland District Health Board Building Programme.

If you have a need for a senior experience project director, experienced at managing teams on large complex capital projects, then I would be very happy to send you a more detailed profile for your consideration.

Kind regards

9(2)(a)

9(2)(a)



9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 10:32 a.m.  
**To:** Ian Simpson  
**Subject:** FW: Canterbury

Ian, I'll leave this one to you since I am about to leave.

H.

**From:** 9(2)(a) [redacted]@med.govt.nz  
**Sent:** Monday, 11 October 2010 2:44 p.m.  
**To:** Hugh Cowan; Ian Simpson  
**Subject:** Canterbury

Ian and Hugh,

First of all to renew acquaintances: I am on the Steering Group for the Natural Hazards Research Platform and now more specifically engaged in the DPMC Policy Team. Hugh – you may recall us meeting when 9(2)(a) was in the hot seat.

I am coming up to speed rapidly with land remediation aspects and sat in on the EQC meeting with Minister Brownlee last week. 9(2)(a) & I have discussed how best to advance some questions I have primarily related to the T&T report. It would also be extremely useful to compare notes over the level and types of landowner information you have, and analysis you may be undertaking.

What best works for you eg. shall I touch base directly with 9(2)(a) or shall I work through Hugh? More than happy to discuss further.

Regards,

9(2)(a)

9(2)(a)

*Department of the Prime Minister and Cabinet*  
Mob 9(2)(a)

[newzealand.govt.nz](http://newzealand.govt.nz) - connecting you to New Zealand central & local government services

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9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 10:16 a.m.  
**To:** 9(2)(a)  
**Subject:** RE: Final version of your paper Dr5-5-4494

Well done, 9(2)(a) This represents a lot of work! Good on you for making the effort, I am sure many people will find this valuable.

Regards  
Hugh

-----Original Message-----

From: 9(2)(a) [mailto:9(2)(a)@dia.govt.nz]  
Sent: Friday, 15 October 2010 9:35 a.m.  
To: Hugh Cowan  
Subject: FW: Final version of your paper Dr5-5-4494  
Importance: High

Hi Hugh,

Fyi. The statement "Support from the Department of Internal Affairs and the Earthquake Commission has made the writing and publication of this paper possible." is now included in the Acknowledgement of the paper.

Cheers, 9(2)(a)

-----Original Message-----

From: 9(2)(a)  
Sent: Thursday, 14 October 2010 7:09 p.m.  
To: 9(2)(a)  
Subject: Final version of your paper Dr5-5-4494  
Importance: High

Dear Ms. 9(2)(a)

Thank you for your proofreading.

We have attached final version of your paper Dr5-5-4494 to this e-mail. Now your corrections have been included. Please check it and return your corrections, if any.

In addition to your correction, we have made one revision that is moving "Disclaimer" on the end of article at old version to the first of the article as a footnote for the consistency to the other articles of this special issue. As a result, all footnotes' number has been changed.

Please respond by Oct. 15 if you have corrections.

If no response is received from the author, the publisher will proceed by assuming that there are no further corrections to be made.

Your article is currently being finalized for publication.

No further communication is required on your part.

We will send a journal copy with an invoice to you when JDR Vol.5 No.5 is published.

Thank you for your cooperation and  
for choosing this journal as your publishing medium.

Best regards,

9(2)(a)

Fuji Technology Press Ltd.  
Toranomom Sangyo Bldg., 2-29,  
Toranomom 1-Chome, Minatoku,  
Tokyo 105-0001, Japan  
Tel: 3-3508-0051  
Fax: 3-3592-0648  
E-mail: disaster@fujipress.jp  
URL: <http://www.fujipress.jp/JDR/>

On Tue, 12 Oct 2010 09:50:33 +1300

9(2)(a)@dia.govt.nz> wrote:

> Dear Mr. 9(2)(a)

>

> Thanks for your email.

>

> Please find attached my notes for corrections, along with the revised  
> Figure 2 and Figure 3 (with minor editing to address the errors). I  
> have also attached the copyright transfer form and pagecharge agreement form.  
> Sorry about the delay, as I had been unsure if I should wait until the  
> editing was complete and the number of pages confirmed.

>

> Please don't hesitate to contact me should any further clarification be required.  
> Your acknowledgement of the receipt of this email would be appreciated.

>

> Many thanks.

>

> Best regards

> 9(2)(a)

>

> 9(2)(a)

>

> Civil Defence Emergency Management Policy Regulation and Compliance  
> Branch The Department of Internal Affairs Te Tari Taiwhenua Direct  
> Dial: 9(2)(a) www.dia.govt.nz

>

>

> -----Original Message-----

> From: 9(2)(a)

> Sent: Saturday, 9 October 2010 12:42 a.m.

> To: 9(2)(a)

> Subject: 1st proof of your paper Dr5-5-4494

> Importance: High

>

>

> Dear Ms. 9(2)(a)

- >
- > The proof of your article, to be published in the Journal of Disaster Research
- > Vol.5 No.5, is attached to this e-mail as a PDF file.
- >
- > Please proof-read it and return your corrections.
- > Acceptable at this stage are corrections about layout, spelling mistakes, wrong cross-references, and mistakes or updating in references.
- >
- > Please use Acrobat to edit the PDF file by adding "post-it" type notes, and return it via e-mail to [disaster@fujipress.jp](mailto:disaster@fujipress.jp).
- > If this is not possible, please print out the PDF file and write down the corrections and any other comments on it.
- > Then, send it to us by FAX (+81-3-3592-0648) or scan it to create a PDF file and send it to us via e-mail.
- >
- > If changes are minimal, you can alternatively return the corrections via e-mail, explaining where they occur in the paper (page number and line) and specifying both the old (wrong) version and the correction.
- >
- > The following questions have arisen during the preparation of your proof. Please answer them.
- >
- > - We have not yet received the following two documents required for publication. Have you sent us them by postal mail?
  - > 1. Copyright Transfer form
  - > 2. Pagecharge Agreement form
- > We would deeply appreciate your confirmation.
- >
- > No further publication processing will occur until this proof is returned.
- > Please respond by Oct 13 even if you have no corrections.
- > If no response is received from the author, the publisher will proceed by assuming that there are no further corrections to be made.
- >
- > Please note that this is your last chance to modify your paper.
- > The corrected version will be sent to you before publication.
- >
- > Thank you for your cooperation.
- >
- > Sincerely yours,
- >
- > 9(2)(a)
- > Fuji Technology Press Ltd.
- > Toranomom Sangyo Bldg., 2-29,
- > Toranomom 1-Chome, Minatoku,
- > Tokyo 105-0001, Japan
- > Tel: +81-3-3508-0051
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- > URL: <http://www.fujipress.jp/JDR/>
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9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 10:13 a.m.  
**To:** 9(2)(a)  
**Cc:**  
**Subject:** RE: GeoNet News and Darfield  
**Attachments:** GeoNet News Special Edition-amendments.pdf

Hi 9(2)(a)

Grateful if you would consider incorporating the changes I have made on the GeoNet News special issue. Thanks for compiling this record of the event.

Regards  
Hugh

**From:** 9(2)(a) [mailto:9(2)(a)@gns.cri.nz]  
**Sent:** Thursday, 14 October 2010 11:41 a.m.  
**To:** Hugh Cowan  
**Subject:** GeoNet News and Darfield

Good Morning Hugh,

As (hopefully) discussed with 9(2)(a) attached is the special edition of the GeoNet News, showing our response to the Darfield Event.

Its all primed and ready to print, we are getting an extra large amount and myself and 9(2)(a) will be heading down to Christchurch to give it to the public (libraries, info centres etc) and to the affected CDEM groups.

Thanks  
9(2)(a)

9(2)(a)

GNS Science

T 9(2)(a)

M

F

www.geonet.org.nz  
www.gns.cri.nz

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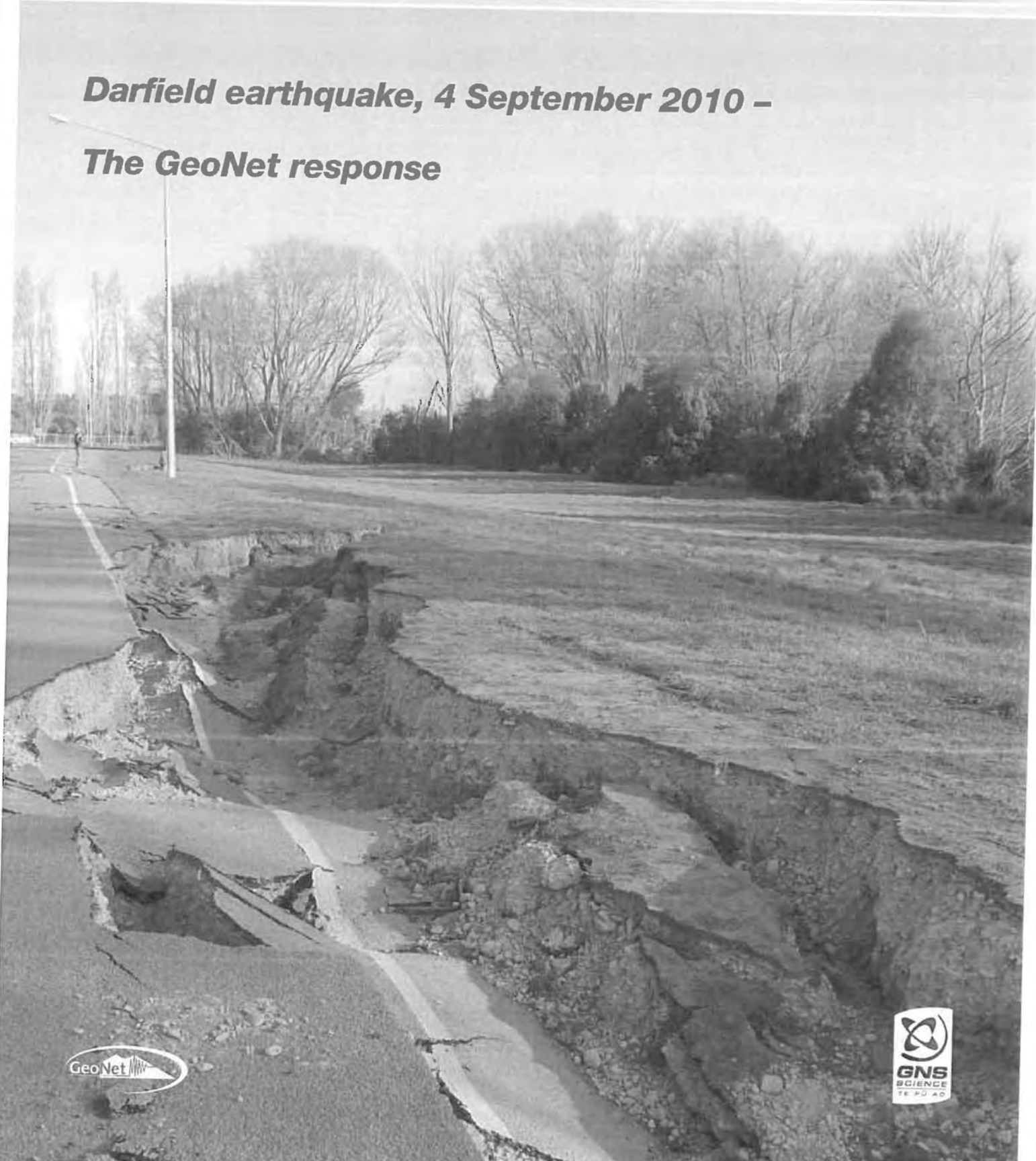
# GEONET NEWS

EXPLORING THE GEONET PROJECT

OCTOBER 2010

SPECIAL EDITION

## *Darfield earthquake, 4 September 2010 – The GeoNet response*





# GEONET NEWS

EXPLORING THE GEONET PROJECT

OCTOBER 2010

## SPECIAL EDITION

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### Cover image

Earthquake damaged road near Kaiapoi

[www.geonet.org.nz](http://www.geonet.org.nz)

### EDITORIAL

I was woken on Saturday 4 September, not by the earthquake as most people in Christchurch and the surrounding region, but by the 'serious' page from the GeoNet automated systems sent to the GeoNet duty response team. One look at the GeoNet website was all it took to confirm the seriousness of the earthquake that had occurred minutes earlier near Darfield in Canterbury, within 40km of the centre of Christchurch, New Zealand's second largest city. This started the GeoNet response reported in this special issue of GeoNet News. Our aim is to give you an insight into how we responded and how our systems work. My role in the two days following the earthquake was as the scientific liaison officer in the dedicated team working in the National Crisis Management Centre, ensuring that the relevant scientific information gathered by the GeoNet and wider GNS Science team was available to assist in the response to the earthquake.

The Darfield earthquake is the first high-impact geological event to affect the New Zealand community since the establishment of GeoNet in 2001, and the first such event in this country in the 'internet age'. The GeoNet website sustained continued heavy load which peaked at even higher levels after each strong aftershock. And a huge number of you took the time to fill in over 50,000 felt reports. This information, combined with the large amount of data collected by the GeoNet sensor networks, forms an internationally significant dataset for understanding the earthquake rupture process, building damage and the causes of severe liquefaction. Although the surface fault suggests a relatively simple earthquake source, the GeoNet sensor network data, particularly from stations near the rupture, show that it was actually very complex.

This is proving very important for our understanding of the earthquake process and the potential damage scenarios which will feed over time into improved building practices.

This earthquake touched many of us – demonstrating once again that we have a very connected community in New Zealand. One of my daughters lives in central Christchurch and was temporarily homeless after the earthquake. She was taken in by friends and within a week was back at work and in another house. A story of resilience that I am sure was repeated many times across the region. I have great sympathy for the people of Canterbury, but also great respect for the way people have met the challenges following the earthquake. Finally, I would like to thank all those who helped with the GeoNet response to the Darfield earthquake, particularly the people in the affected region who welcomed us in a time of great stress and assisted our response teams.

**Ken Gledhill**  
GeoNet Project Director

**Email:** [k.gledhill@gns.cri.nz](mailto:k.gledhill@gns.cri.nz)

GeoNet is a non-profit project operated by the Institute of Geological & Nuclear Sciences Limited (GNS Science) with core funding from the Earthquake Commission. It involves GNS Science building and operating a modern geological hazards monitoring system for New Zealand.

The GeoNet project started in 2001. It provides real-time monitoring and data collection for rapid response to and research into earthquakes, volcanic eruptions, tsunamis and landslides. Data collected by GeoNet are available free of charge. Visit [www.geonet.org.nz](http://www.geonet.org.nz) for more information.



## FIRST ON THE SCENE...

**John Ristau, GeoNet Duty Officer on the day of the earthquake, shares his experience.**



## THE FACTS

**When:**

Saturday, 4 September 2010 at 4:35 am  
(New Zealand Standard Time)

**Where:**

9km south-east of Darfield,  
37km west of Christchurch

**Depth:**

10.9km

**Magnitude:**

7.1

**Maximum intensity:**

MM9

Recorded at 295 New Zealand  
seismographs

7,093\* felt questionnaire responses  
received

No deaths directly attributable to the  
earthquake

Two Christchurch residents were  
seriously injured, one by a falling  
chimney and a second by flying glass

9 aftershocks of magnitude 5.0 or above\*

114 aftershocks of magnitude 4.0-4.9\*

\*As at 29 September 2010



- Likely to be felt (MM4-5)
- Possible contents damage (MM6-7)
- Possible structural damage (MM8+)

On Saturday, September 4 at 4:35am the M7.1 Darfield earthquake occurred. Within about a minute I received the regular earthquake notification page as well as the page notifying a 'serious' event. A serious page does not necessarily mean a major earthquake has occurred (some of the M5 aftershocks triggered as 'serious' pages). Therefore, it was not until I saw the shaking intensity map on the GeoNet home page that I realised a major earthquake had occurred. Shortly afterwards I received a call from the after hours call-centre concerning media enquiries about the earthquake. I asked then to hold all calls for about 15 minutes while I located the earthquake and then I called Ken Gledhill, the GeoNet Project Director, to update him on the situation.

I then began to take media enquiries while Ken, and Terry Webb the Natural Hazards General Manager, began to contact any available staff to meet at GNS Science as soon as possible. At about 5:45am I arrived at GNS Science along with a number of scientists, technicians, and support staff as part of the rapid response.

The responsibilities of the on-call Duty Officer are to locate potential felt earthquakes which trigger the pager and act as the primary contact with the media. Since there was a constant stream of media calls, Martin Reyners, Bill Fry, Brian Ferris, and Art Jolly (the duty volcanologist at the GNS Science office in Wairakei) took over locating most of the aftershocks. From Saturday evening through to Monday morning Art, Brian and I responded to pages for aftershocks. Through the weekend I received many enquiries from the national media for updates as well as international attention from media outlets in Australia, Canada, England and the Middle East. I was greatly assisted by Warwick Smith and Ken Gledhill in filling requests for in-person interviews, and by John Beavan and Andrew King with requests for more detailed information related to the earthquake. I would not have been able to fulfil all of the demands of the Duty Officer on the weekend without a great deal of help from a number of people.

**John Ristau**  
j.ristau@gns.cri.nz



## GEONET RAPID RESPONSE

**A few hours after the Darfield earthquake, the GeoNet rapid response team left for Canterbury with two vehicles full of seismic equipment. They arrived on the Sunday and split into two teams, each team deploying seismic instruments around rural Canterbury; on Monday all the instruments were installed and recording.**

Seismometers were positioned to encompass the 'cloud' of aftershocks surrounding the epicentre of the main-shock. The seismometers record continuously and are highly sensitive – they detect earthquakes that are too small to be felt. Accelerometers were mounted on concrete pads in sheds and garages, and were positioned as close to the fault rupture as possible with the hope of being near any future ground motion. These instruments can record very large amplitudes of shaking. Two sheds housing the accelerometers were directly on top of the fault rupture; both were so badly damaged by the shaking that they have been condemned.

On 8 September, a second GeoNet team was deployed to put out more strong-motion accelerometers – instruments designed specifically to record the stronger aftershocks likely to be felt at the surface. These were deployed to complement the Canterbury network – CanNet (page 6). The locations of the additional sites were recommended by GNS Science seismologists, who hope to use the aftershock data to gain insight into how buildings and ground types behave during earthquakes, and to refine the analysis of the aftershock data.

A small three-instrument 'building array' – multiple instruments at different levels within one building – was installed at the 13-storey Hereford Street Police building to investigate the response of high-rise buildings to shaking, and how the amplification of wave energy differs between the levels of a building.



**Right:** Temporary strong-motion accelerometer in a damaged shed. **Far right:** Technicians installing a strong motion sensor at Whitecliffs. **Below:** Earthquake damage at a Dallington property where strong motion equipment was installed. **Centre:** Installing a seismometer at Courtenay.



A high-rise was desirable for this installation as multi-storey buildings are sensitive to long-period ground motion. A two-instrument array was then installed in Opus's two-level Moorhouse Avenue building to study similar effects in the smaller buildings more typical in urban Christchurch.

Two more strong-motion instruments were deployed in the riverside suburb of Dallington, parts of which were severely affected by ground liquefaction caused by the mainshock. One instrument was placed in an area that suffered extensive liquefaction that had damaged houses, water mains and sewage systems, and flooded roads and properties with silt and sand. For comparison, a site was also installed 630m away, in the same street but in an area where liquefaction was noticeably absent. The aim of these sites is to investigate whether ground response during shaking may be associated with a soil's tendency to liquefy. Also of interest is the behaviour of the soils after liquefaction has already occurred – what happens during further shaking?

Further out of Christchurch, other instruments were deployed to help improve the quality of aftershock location solutions, which use waveform data from seismographs to calculate an earthquake's magnitude, location and depth. The more seismographs set up near an earthquake's epicentre, the better the resolution of data available for that earthquake, and therefore the more accurate the solution.

A small gap in the existing CanNet instrument coverage north of the Waimakariri River was filled in and another site, in Governor's Bay, will give a comparison of the shaking produced in an earthquake between Christchurch's relatively soft river-derived sediments, and the hard volcanic rock that makes up most of Banks Peninsula. The information from these sites will also be used to refine existing geophysical models for how fast seismic waves travel through the crust in the Canterbury area.

The ten short-period sensors deployed in the first trip have now been collected and the data is currently being added to the data from GeoNet's permanent network stations for analysis. The strong-motion instruments, including the three deployed in the initial response, are still recording onsite and will stay out until late October or November 2010.

We would like to extend a big thank you to the Christchurch Police, Opus, and all the landowners in Christchurch and the Canterbury region for allowing us onto their properties to install our instruments at a difficult time, and for making this research possible.

**Contact:** Lara Bland, Caroline Ashenden  
**Email:** l.bland@gns.cri.nz,  
c.ashenden@gns.cri.nz





**Far left:** The CUSP-3B installation at Greendale (GDLC). This was the closest sensor to the magnitude 7.1 mainshock, and recorded the strongest shaking, a value 1.25 times the acceleration due to gravity. **Left:** Testing the CUSP instrument at the University of Canterbury.

## CANNET: THE LITTLE NETWORK THAT COULD!

Some of the best near-fault ground-shaking measurements of the Darfield earthquake were recorded by the sensors of the CanNet network, a set of low-cost accelerographs installed throughout the Canterbury Plains and within Christchurch city.

CanNet was the vision of John Berrill from the University of Canterbury, prompted by Mark Yetton's studies of the Alpine Fault. It was started off in the mid-to-late 1990s with plans to buy 80 instruments, and deploy them throughout the Canterbury region to lie in wait to record the movement of the Alpine Fault when it eventually happened.

However, a network of that size was beyond the available funds which could only buy half that number, so the decision was taken to manufacture their own recorder. Hamish Avery, first on a summer project, then during the course of his ME and PhD degrees, designed the first instrument, the CUSP-3A accelerograph, under the supervision of University staff Mike Dewe and John Berrill, with technical input from Peter Coursey.

About four to five years into the project the Earthquake Commission (EQC) came forward saying they were interested in supporting it and assisting with funding. They proposed to buy the instruments, install them and run the network as part of the GeoNet project. The scientific direction and network design of CanNet would remain with the University of Canterbury.

An independent company, Canterbury Seismic Instruments Ltd (CSI), was formed in 2003 to manufacture the instruments. The first run of CUSP-3As was made and installed in 2004. This was followed by improved designs CUSP-3B in 2005 and CUSP-3C in 2006.

To find the sites, Neil Charters (then an ME student with a geological background), Caroline Françoise-Holden (now of GNS Science) and John Berrill spent a great deal of time pouring over maps. Neil was then responsible for establishing most of the actual installations on the Canterbury Plains. He would get agreement from the property owners, and pass the site data on to GeoNet staff who handled any legal work necessary, and who then instrumented the sites.

As we now know, it wasn't the planned-for Alpine Fault earthquake that was captured – it was the Darfield quake that was surrounded by the instruments of CanNet. The recordings have proven to be a tremendously important data set for both New Zealand and overseas scientists and engineers.

**Below:** The map shows the epicentre of the Darfield mainshock and the nearby stations of the CanNet network.

- Epicentre of Darfield mainshock
- Canterbury Strong Motion Network Sites
- National Network Seismograph Sites
- National Strong Motion Network Sites
- Tsunami Gauge Sites



Besides recording the true ground motion caused close to a major earthquake, the arrival of P and S waves have enabled very accurate estimates to be made of the location and depth of the mainshock and its larger aftershocks. In usual cases, this would be done by temporary seismograph deployments a day or two after a major earthquake.

So CanNet, an understated part of the GeoNet monitoring networks, has ended up playing a major part in recording data from this significant earthquake. It surely is the greatest little network in the world!

**Contact:** Hamish Avery, John Berrill, Colin Dyer

**Email:** hamish@csi.net.nz, john@csi.net.nz, c.dyer@gns.cri.nz

## THE GEONET DATA CENTRE CHANGES GEAR

**At 4:34am on Saturday, September 4, 157 GeoNet seismographs were dutifully recording ground shaking and sending in their real-time information to the GeoNet data hubs at Lower Hutt and Taupo. Another 192 strong-motion accelerographs lay in wait to capture any strong ground movements.**

One minute later a magnitude 7.1 earthquake started rupturing the earth's crust at 11km under the Canterbury Plains, breaking upwards and opening an ancient fault. Hundred of thousands of people were shaken awake, buildings were damaged and electricity and water stopped working.

Since then the systems have been assembling the aftershocks for location by the earthquake analysis team: Tom Bell, Jennifer Coppola, Brian Ferris, Jan Harris, Sara Page and Matt Stevens. Their job is to unscramble the wiggly lines and identify the individual earthquakes. It's still a job that is better performed by people than by computers. It's not just the sheer number of earthquakes that are the problem; it's that one earthquake can overlay others, making the signals very difficult to read. It's like trying to listen to 3 or 4 people at once – a confused babble!

The pattern of aftershocks provides valuable information to scientists about where the stresses are moving to, the type of faulting they are causing and the rate at which they are occurring. How the whole sequence behaves can give us a clue as to what we might expect in future earthquakes.

But it's not all deep seismology. The GeoNet website has carried science stories and news about the activities carried out by GNS Science staff and their research collaborators, both from New Zealand and overseas. Our aim has been to bring you the latest about what we have learned so far.

We also received hundreds of emails and dozens of phone calls for answers to other questions, some of which we can answer, and others for which we just don't know the answers.

We've received over 50,000 felt report questionnaires for the whole country during September; that compares with 9,000 in the previous eight months. Obviously not all of these can be checked, but we make sure the most significant ones make sense and are accurately located. The response to these is fantastic, and we have a wonderful data set to help define future earthquake modelling studies.

Behind the scenes the engineering sector has been looking at data from our accelerographs and seeing the nature of the ground shaking throughout Canterbury. The GeoNet seismic data repository has been regularly trawled by researchers interested in testing their theories and techniques against a modern earthquake – over 500 gigabytes in September.

Keeping this all going gives us enormous satisfaction – it's what GeoNet's Data Centre is here to do. But if some of the smaller earthquakes aren't on the website, or your question remains frustratingly unanswered, please accept that we are dealing with numbers and volumes truly well out of the ordinary!

**Contact:** Kevin Fenaughty  
**Email:** [k.fenaughty@gns.cri.nz](mailto:k.fenaughty@gns.cri.nz)



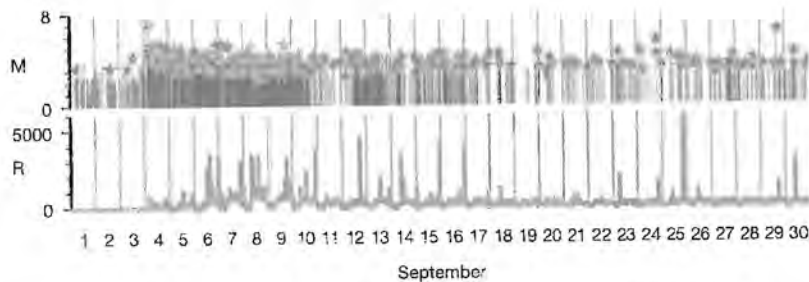
**Top:** Map showing over 7,000 felt reports received for the Darfield earthquake.

**Bottom:** Earthquake analysts examine an aftershock.



WWW.GEONET.ORG.NZ

### How the website coped



**Above:** The plot shows requests per second (R) in one minute averages (green line) as well as earthquakes for the month of September. Through the month more than 1,840 earthquakes (M) bigger than magnitude 2.0 were located (blue lines) and over 360 were judged to be shallow and large enough to be posted to the website (shown as red and yellow stars). Every widely felt earthquake causes a peak in website traffic.

The Darfield earthquake on 4 September and its aftershocks caused a great deal of traffic to the GeoNet website. In the first five days after the quake, the website served more traffic than for the entire 2009 year. For the month of September the website served over 564 million hits, equating to more than 1 terabyte of web traffic. We've also received a huge number of felt reports: over 56,000 for September. This huge increase in web traffic over a very short period of time presented some challenges and occasionally pushed the servers to their limits. Due to the flexible design of the website hosting, we were able to expand the capacity as interest in the aftershocks grew.

Prior to the Darfield earthquake the main website was hosted using three servers – one each in Wellington, Auckland and California – with network routing protocols used to select the best server to send a request to. Thanks to great work from our Internet Service Provider FX Networks and the improved peering in the New Zealand internet, the traffic is evenly distributed over the three servers. In the first week after the quake we were able to install an additional server in Palmerston North. It went live on 10 September, and added a lot of additional capacity to the website hosting.

On the day of the mainshock, additional application servers were added to help with collecting felt reports and serving Quake Search requests.

The ongoing aftershock sequence has caused interest in the GeoNet website to continue to climb. In late September, a cluster of magnitude 4 aftershocks saw requests to the website peak at nearly 6,000 per second. To help with the growing interest a more powerful server is being installed in Auckland.

The Darfield earthquake has provided an invaluable chance to test ourselves and improve our ability to respond when it counts. We greatly appreciate the high number of felt report submissions – coupled with the data collected by the strong-motion network, these will be an invaluable scientific data set and we greatly appreciate people taking the time to provide this information, even when their homes have been damaged.

**Contact:** Geoff Clitheroe  
**Email:** g.clitheroe@gns.cri.nz

#### Contact details

**GeoNet website:** www.geonet.org.nz  
**Email:** info@geonet.org.nz  
**Address:** GNS Science, PO Box 30-368, Lower Hut, 5040, New Zealand  
**Editor:** Sara Page

GeoNet News is published twice yearly. Additional copies are available, at no cost, for domestic delivery, from Leanne Dixon, GeoNet Administration Coordinator  
**Email:** ldixon@gns.cri.nz  
**Phone:** +64 4 570 4888

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Main funding agency



Lead organisation in the GeoNet project

ISSN 1175-0867 (Print) ISSN 1175-0820 (Online)

9(2)(a)

---

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 10:11 a.m.  
**To:** 9(2)(a)  
**Subject:** quick catch up by phone please

Hi 9(2)(a)

Further to my brief chat with 9(2)(a) this morning, I am keen to have a quick (20 min) catch up by phone at 1.00pm today. If this works for you then please use the following number:

9(2)(a)

9(2)(a)

regards

Hugh Cowan  
Research Manager  
Earthquake Commission  
Level 20, Majestic Centre  
100 Willis Street, P.O. Box 790  
Wellington, New Zealand  
DDI 9(2)(a)

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 9:45 a.m.  
**To:** 9(2)(a)  
**Subject:** Re: visit by Hugh Cowan, Research Manager for the Earthquake Commission in Wellington, New Zealand

9(2)(a)

— original message —

**From:** 9(2)(a)@usgs.gov>  
**Subject:** Re: visit by Hugh Cowan, Research Manager for the Earthquake Commission in Wellington, New Zealand  
**Date:** 15th October 2010  
**Time:** 9:33:02 am

Hugh,

I'm looking forward to it. Who is your point of contact at IRIS? 9(2)(a) perhaps?

9(2)(a)

— Original Message —

**From:** "Hugh Cowan" [HACowan@eqc.govt.nz]  
**Sent:** 10/15/2010 08:13 AM ZE12  
**To:** Hugh Cowan  
**Cc:** 9(2)(a)  
**Subject:** RE: visit by Hugh Cowan, Research Manager for the Earthquake Commission in Wellington, New Zealand

9(2)(a)

This sounds like a good plan and thank you for offering to attend my talk at IRIS. I look forward to meeting you if that works out for you.

regards

Hugh Cowan  
Research Manager  
Earthquake Commission  
Level 20, Majestic Centre  
100 Willis Street, P.O. Box 790  
Wellington, New Zealand  
DDI +9(2)(a)

— Original Message —

**From:** 9(2)(a)@usgs.gov]  
**Sent:** Friday, 15 October 2010 8:47 a.m.  
**To:** Hugh Cowan  
**Cc:** 9(2)(a)

Subject: Fwd: visit by Hugh Cowan, Research Manager for the Earthquake Commission in Wellington, New Zealand

Dear Hugh,

I serve as 9(2)(a) deputy in the USGS Earthquake Hazards Program in Reston, and help lead our overseas work. Through 9(2)(a) I understand that you'll be speaking at IRIS on Monday. I am traveling this week, but I believe my schedule on Monday will permit me to come to IRIS to hear your talk, and hopefully to take a few minutes of your time to talk about topics of mutual interest.

I'd appreciate hearing back from you to confirm that this is a good plan. I look forward to meeting you.

Cheers,

9(2)(a)

At 4:29 PM -0400 10/13/10, Elizabeth A Lemersal wrote:

> From: Hugh Cowan 9(2)(a)  
> Sent: 09/29/2010 03:06 PM ZE12  
> To: 9(2)(a)  
> Subject: Re: Status of things for your visit  
>  
> hi 9(2)(a)  
>  
> Thank you so much for helping out with these contacts. Sorry to hear that  
> 9(2)(a) will not be around but perhaps we'll meet one day.  
>  
> At NSF I would like to hear from someone about the RAPID response awards  
> (post-event opportunity science) and I have been given the name 9(2)(a)  
> 9(2)(a) (Marine Geol and Geophys) but we've not met and I have not made  
> contact. Presumably RAPID awards will be available to other disciplines  
> too.  
>  
> Other than that, is someone at NSF with whom I could discuss the topic  
> of  
> benefit-cost analysis - valuing information and particularly, valuing  
> improved information, i.e. the payback on hazards research etc...  
>  
> Sorry for my haste, am fronting the RFP process for reinstatement  
> project  
> management for repairs to 50,000 homes. Tender process should be  
> concluded  
> before my trip to US - I will be thankful to say the least.  
>  
> cheers  
> Hugh  
>  
> On Wed, Sep 29, 2010 at 11:35 AM, 9(2)(a)@usgs.gov  
> wrote:  
> Hi Hugh,  
>  
> Let me give you a rundown on my communications with folks regarding  
> your  
> visit. Unfortunately, 9(2)(a) will be on  
> travel at

- > that time. However, 9(2)(a) the Associate Program Coordinator,
- > and 9(2)(a) who runs the grants program, will be around.
- It
- > is possible that 9(2)(a) may be available too. I am awaiting date
- > and time info from them.
- >
- > At FEMA, 9(2)(a) suggested 9(2)(a) with the NEHRP
- > program. 9(2)(a) is Chief, Building Science Section Risk Reduction Branch,
- > Mitigation Division and the FEMA agency rep to NEHRP. 9(2)(a) a
- > geophysicist with FEMA Mitigation Division. I have contacted them about
- > availability and others you should talk to.
- >
- > Do you want me to check at NSF or do you have contacts there?
- >
- > In Golden, 9(2)(a) are arranging time for you, as
- > well as a talk.
- >
- > Let me know if you need contact info for anyone. Thanks!

> 9(2)(a)

> 9(2)(a)

- > Geology and Environmental Change Science Center
- > U.S. Geological Survey

9(2)(a)

9(2)(a) U.S. Geological Survey  
Earthquake Hazards Program

USGS, Mail Stop 905 email: 9(2)(a)@usgs.gov

12201 Sunrise Valley Dr. 9(2)(a)  
Reston, VA 20192

Earthquake info: <http://earthquake.usgs.gov/>  
Grants: <http://earthquake.usgs.gov/research/external/>

This email message (along with any attachments) is intended only for the addressee(s) named above. The information contained in this email is confidential to the New Zealand Earthquake Commission (EQC) and must not be used, reproduced or passed on without consent.

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 9:14 a.m.  
**To:** 9(2)(a) Hugh Cowan  
**Cc:**  
**Subject:** RE: visit by Hugh Cowan, Research Manager for the Earthquake Commission in Wellington, New Zealand

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Hugh Cowan  
Research Manager  
Earthquake Commission  
Level 20, Majestic Centre  
100 Willis Street, P.O. Box 790  
Wellington, New Zealand  
DDI 9(2)(a)

-----Original Message-----

**From:** 9(2)(a) [mailto:9(2)(a)@usgs.gov]  
**Sent:** Friday, 15 October 2010 8:47 a.m.  
**To:** Hugh Cowan  
**Cc:** 9(2)(a)  
**Subject:** Fwd: visit by Hugh Cowan, Research Manager for the Earthquake Commission in Wellington, New Zealand

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> To: 9(2)(a)  
> Subject: Re: Status of things for your visit

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> Let me know if you need contact info for anyone. Thanks!

>  
> 9(2)(a)

>  
> 9(2)(a)  
>  
> Geology and Environmental Change Science Center  
> U.S. Geological Survey

>  
> MS980 Federal Center  
> Denver, CO 80225-0046

Fax: (9(2)(a))

9(2)(a)

U.S. Geological Survey

Earthquake Hazards Program

USGS, Mail Stop 905  
12201 Sunrise Valley Dr.  
Reston, VA 20192

9(2)(a)

Earthquake info: <http://earthquake.usgs.gov/>  
Grants: <http://earthquake.usgs.gov/research/external/>

9(2)(a)

---

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 9:12 a.m.  
**To:** Ian Simpson  
**Subject:** Engineering Advisory Group  
**Attachments:** Draft TOR for Engineering Advisory Group 20101014.doc; Kestrel EQC Letter of Acceptance.doc; Letter\_Kestrel.doc

Ian,

As discussed, Dave Brunsdon will contact you sometime next week to brief you on the preparation of guidance material to inform engineering design and construction practice for repairs to Canterbury homes, and to agree "next steps" for wider engagement of stakeholders.

The attached (draft) terms of reference reflect where we are now. Also attached is my letter of engagement for Dave Brunsdon and his response. We have since had a meeting at which I have understood and agreed (verbally) the scope and likely cost of involvement of others to the end of October. This is likely to be a shade under 9(2)(b) in total, including Dave's time and disbursements.

FYI, I am tentatively working to a 2010-11 financial year expectation of about 9(2)(b) all up for additional strategic engineering advice related to the Canterbury quake.

regards

Hugh Cowan  
Research Manager  
Earthquake Commission  
Level 20, Majestic Centre  
100 Willis Street, P.O. Box 790  
Wellington, New Zealand  
DDI 9(2)(a)

## **EQC Engineering Advisory Group on House Repairs and Reconstruction Following the Canterbury Earthquake**

### **Draft Terms of Reference**

14 October 2010

#### **Background**

Following the Darfield, Canterbury Earthquake of 4 September 2010, the Earthquake Commission (EQC) established an Engineering Advisory Group to address a range of technical issues for the benefit of all parties involved in the recovery of residential dwellings.

#### **Objectives of the Advisory Group**

- (i) To establish the engineering requirements and regulatory linkages necessary to expedite the house repair and reconstruction process following the 4 September 2010 Canterbury Earthquake.
- (ii) To provide guidance to EQC, commercial insurers, the Canterbury Earthquake Recovery Commission and Christchurch City, Selwyn District and Waimakiriri District councils on the engineering requirements and regulatory issues and processes that will expedite the repair and reconstruction process following the agreement on land issues.
- (iii) To convey the engineering requirements for various repair and reconstruction options and techniques to the insurance, design and construction sectors.

#### **Particular Areas of Work**

The areas of work being addressed by the Engineering Advisory Group include:

1. Establishing appropriate structural and geotechnical engineering approaches to repair and reconstruction;
2. Obtaining consensus across the insurance sector of the technical objectives and recommended approaches;
3. Obtaining agreement with Christchurch City, Waimakiriri District and Selwyn District Councils on the regulatory issues and processes to be followed;
4. Communication of the technical objectives and processes to the engineering profession, affected agencies and to the wider construction sector;
5. Mobilisation of suitable engineering resources in support of the operations of EQC and other insurers.

#### **Principal Outputs of the Advisory Group**

The principal output of the Engineering Advisory Group is a Guidance Document addressing aspects including:

1. A summary of relevant insurance principles and requirements, and regulatory issues and requirements
2. Future performance expectations for foundations and floor systems for both repaired and reconstructed dwellings
3. Principal options for major re-levelling work for houses to be repaired

4. Recommended foundation and flooring systems for houses being completely rebuilt
5. Proposed arrangements for structural and geotechnical engineering input prior to and during construction work

### **Structure and Composition of the Engineering Advisory Group**

The Advisory Group is to comprise a small group of leading engineers and remediation specialists including representatives from the following organisations:

- EQC
- Department of Building and Housing
- BRANZ (incl. representing the NZS3604 Committee)
- Structural Engineering Society (SESOC)
- Geotechnical Society
- Tonkin and Taylor

The Advisory Group is to have access to and the ability to task other practitioners, researchers and agency representatives whose inputs would be of value to them.

The Advisory Group reports to Dr Hugh Cowan, Research Manager, EQC.

### **Proposed Time Frames and Arrangements**

- *To be developed*

4 October 2010

Dr Hugh Cowan  
Research Manager  
Earthquake Commission  
P O Box 790  
WELLINGTON

Kestrel Group Ltd  
www.kestrel.co.nz

Level 1  
114 Lambton Quay  
PO Box 5050  
Wellington  
New Zealand

PO Box 29066  
Christchurch

Dear Hugh

### **Canterbury Earthquake: Engineering Process Advice to EQC**

Thank you for your letter of 2 October seeking input in relation to engineering processes and resourcing following the Canterbury Earthquake. I am pleased to be able to assist EQC at this challenging time, and apply learnings from overseas earthquakes, in addition to drawing upon established relationships with NZ practitioners and researchers.

As you indicate, this role continues to evolve with different areas of emphasis and focus with each new week. By the end of October, a clearer view regarding the scope and duration of this role is likely to emerge. Based on the time committed during the period to date of 15<sup>th</sup> to 30<sup>th</sup> September of 41 hours, and my understanding of the work required during October, an involvement of between 2 and 3 days per week would seem likely for planning purposes.

In terms of budget, based on a proposed rate of 9(2)(j) plus GST, this corresponds to a range of between 9(2)(j) per week plus the expenses associated with one visit and two to three nights accommodation in Christchurch per week.

I trust this time and budget range is acceptable at this stage. Please also advise the appropriate process for covering the time and costs of those that I have involved in the proposed Engineering Advisory Group 9(2)(a).

Thanks again for the opportunity to assist EQC.

Yours sincerely

**Dave Brunsdon**

Director

db@kestrel.co.nz  
Ph 499 4433

Kestrel EQC Letter of Acceptance



9(2)(a)

---

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 8:58 a.m.  
**To:** 9(2)(a)  
**Subject:** FW: Request for Report

Grateful if you could advise 9(2)(a) on this. If it is one of our completed reports then it should be fine.

---

**From:** Reception3  
**Sent:** Friday, 15 October 2010 8:46 a.m.  
**To:** Hugh Cowan  
**Subject:** Request for Report

Hello Hugh I hope you are having a great morning,

Engineering Geology has requested a copy of

Strain Accumulation Episode Cities of Fault Movement in Otago  
(2004)  
EQC Ref: 3710  
Report No# 01/445

Is it ok to provide a copy of the above report?

Please advise

9(2)(a)

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 8:35 a.m.  
**To:** 9(2)(a)  
**Subject:** FW: GeoNet News and Darfield  
**Attachments:** GeoNet News Special Edition.pdf

**From:** 9(2)(a)@gns.cri.nz  
**Sent:** Thursday, 14 October 2010 11:41 a.m.  
**To:** Hugh Cowan  
**Subject:** GeoNet News and Darfield

Good Morning Hugh,

As (hopefully) discussed with 9(2)(a) attached is the special edition of the GeoNet News, showing our response to the Darfield Event.

Its all primed and ready to print, we are getting an extra large amount and myself and 9(2)(a) will be heading down to Christchurch to give it to the public (libraries, info centres etc) and to the affected CDEM groups.

Thanks

9(2)(a)

9(2)(a)

GeoNet Project  
GNS Science

T 9(2)(a)

M

F

[www.geonet.org.nz](http://www.geonet.org.nz)

[www.gns.cri.nz](http://www.gns.cri.nz)

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# GEONET NEWS

EXPLORING THE GEONET PROJECT

OCTOBER 2010

## SPECIAL EDITION

### *Darfield earthquake, 4 September 2010 – The GeoNet response*



**GEONET NEWS**

EXPLORING THE GEONET PROJECT

OCTOBER 2010

**SPECIAL EDITION****INSIDE****EDITORIAL**

First on the scene...	3
The facts	3
GeoNet rapid response	4
CanNet: The little network that could!	6
The GeoNet data centre changes gear	7
<a href="http://www.geonet.org.nz">www.geonet.org.nz</a> – How the website coped	8

**Cover image**

Earthquake damaged road near Kaiapoi

[www.geonet.org.nz](http://www.geonet.org.nz)

I was woken on Saturday 4 September, not by the earthquake as most people in Christchurch and the surrounding region, but by the 'serious' page from the GeoNet automated systems sent to the GeoNet duty response team. One look at the GeoNet website was all it took to confirm the seriousness of the earthquake that had occurred minutes earlier near Darfield in Canterbury, within 40km of the centre of Christchurch, New Zealand's second largest city. This started the GeoNet response reported in this special issue of GeoNet News. Our aim is to give you an insight into how we responded and how our systems work. My role in the two days following the earthquake was as the scientific liaison officer in the dedicated team working in the National Crisis Management Centre, ensuring that the relevant scientific information gathered by the GeoNet and wider GNS Science team was available to assist in the response to the earthquake.

The Darfield earthquake is the first high-impact geological event to affect the New Zealand community since the establishment of GeoNet in 2001, and the first such event in this country in the 'internet age'. The GeoNet website sustained continued heavy load which peaked at even higher levels after each strong aftershock. And a huge number of you took the time to fill in over 50,000 felt reports. This information, combined with the large amount of data collected by the GeoNet sensor networks, forms an internationally significant dataset for understanding the earthquake rupture process, building damage and the causes of severe liquefaction. Although the surface fault suggests a relatively simple earthquake source, the GeoNet sensor network data, particularly from stations near the rupture, show that it was actually very complex.

This is proving very important for our understanding of the earthquake process and the potential damage scenarios which will feed over time into improved building practices.

This earthquake touched many of us – demonstrating once again that we have a very connected community in New Zealand. One of my daughters lives in central Christchurch and was temporarily homeless after the earthquake. She was taken in by friends and within a week was back at work and in another house. A story of resilience that I am sure was repeated many times across the region. I have great sympathy for the people of Canterbury, but also great respect for the way people have met the challenges following the earthquake. Finally, I would like to thank all those who helped with the GeoNet response to the Darfield earthquake, particularly the people in the affected region who welcomed us in a time of great stress and assisted our response teams.



**Ken Gledhill**  
GeoNet Project Director

Email: [k.gledhill@gns.cri.nz](mailto:k.gledhill@gns.cri.nz)

GeoNet is a non-profit project operated by the Institute of Geological & Nuclear Sciences Limited (GNS Science) with core funding from the Earthquake Commission. It involves GNS Science building and operating a modern geological hazards monitoring system for New Zealand.

The GeoNet project started in 2001. It provides real-time monitoring and data collection for rapid response to and research into earthquakes, volcanic eruptions, tsunami and landslides. Data collected by GeoNet are available free of charge. Visit [www.geonet.org.nz](http://www.geonet.org.nz) for more information.



## FIRST ON THE SCENE...

**John Ristau, GeoNet Duty Officer on the day of the earthquake, shares his experience.**



On Saturday, September 4 at 4:35am the M7.1 Darfield earthquake occurred. Within about a minute I received the regular earthquake notification page as well as the page notifying a 'serious' event. A serious page does not necessarily mean a major earthquake has occurred (some of the M5 aftershocks triggered as 'serious' pages). Therefore, it was not until I saw the shaking intensity map on the GeoNet home page that I realised a major earthquake had occurred. Shortly afterwards I received a call from the after hours call-centre concerning media enquiries about the earthquake. I asked then to hold all calls for about 15 minutes while I located the earthquake and then I called Ken Gledhill, the GeoNet Project Director, to update him on the situation.

I then began to take media enquiries while Ken, and Terry Webb the Natural Hazards General Manager, began to contact any available staff to meet at GNS Science as soon as possible. At about 5:45am I arrived at GNS Science along with a number of scientists, technicians, and support staff as part of the rapid response.

The responsibilities of the on-call Duty Officer are to locate potential felt earthquakes which trigger the pager and act as the primary contact with the media. Since there was a constant stream of media calls, Martin Reyners, Bill Fry, Brian Ferris, and Art Jolly (the duty volcanologist at the GNS Science office in Wairakei) took over locating most of the aftershocks. From Saturday evening through to Monday morning Art, Brian and I responded to pages for aftershocks. Through the weekend I received many enquiries from the national media for updates as well as international attention from media outlets in Australia, Canada, England and the Middle East. I was greatly assisted by Warwick Smith and Ken Gledhill in filling requests for in-person interviews, and by John Beavan and Andrew King with requests for more detailed information related to the earthquake. I would not have been able to fulfil all of the demands of the Duty Officer on the weekend without a great deal of help from a number of people.

**John Ristau**  
j.ristau@gns.cri.nz

## THE FACTS

### When:

Saturday, 4 September 2010 at 4:35 am  
(New Zealand Standard Time)

### Where:

9km south-east of Darfield,  
37km west of Christchurch

### Depth:

10.9km

### Magnitude:

7.1

### Maximum intensity:

MM9

Recorded at 295 New Zealand  
seismographs

7,093\* felt questionnaire responses  
received

No deaths directly attributable to the  
earthquake

Two Christchurch residents were  
seriously injured, one by a falling  
chimney and a second by flying glass

9 aftershocks of magnitude 5.0 or above\*

114 aftershocks of magnitude 4.0-4.9\*

\*As at 29 September 2010



- Likely to be felt (MM4-5)
- Possible contents damage (MM6-7)
- Possible structural damage (MM8+)





**A few hours after the Darfield earthquake, the GeoNet rapid response team left for Canterbury with two vehicles full of seismic equipment. They arrived on the Sunday and split into two teams, each team deploying seismic instruments around rural Canterbury; on Monday all the instruments were installed and recording.**

Seismometers were positioned to encompass the 'cloud' of aftershocks surrounding the epicentre of the main-shock. The seismometers record continuously and are highly sensitive – they detect earthquakes that are too small to be felt. Accelerometers were mounted on concrete pads in sheds and garages, and were positioned as close to the fault rupture as possible with the hope of being near any future ground motion. These instruments can record very large amplitudes of shaking. Two sheds housing the accelerometers were directly on top of the fault rupture; both were so badly damaged by the shaking that they have been condemned.

On 8 September, a second GeoNet team was deployed to put out more strong-motion accelerometers – instruments designed specifically to record the stronger aftershocks likely to be felt at the surface. These were deployed to complement the Canterbury network – CanNet (page 6). The locations of the additional sites were recommended by GNS Science seismologists, who hope to use the aftershock data to gain insight into how buildings and ground types behave during earthquakes, and to refine the analysis of the aftershock data.

A small three-instrument 'building array' – multiple instruments at different levels within one building – was installed at the 13-storey Hereford Street Police building to investigate the response of high-rise buildings to shaking, and how the amplification of wave energy differs between the levels of a building.





**Right:** Temporary strong-motion accelerometer in a damaged shed. **Far right:** Technicians installing a strong motion sensor at Whitecliffs. **Below:** Earthquake damage at a Dallington property where strong motion equipment was installed. **Centre:** Installing a seismometer at Courtenay.



A high-rise was desirable for this installation as multi-storey buildings are sensitive to long-period ground motion. A two-instrument array was then installed in Opus's two-level Moorhouse Avenue building to study similar effects in the smaller buildings more typical in urban Christchurch.

Two more strong-motion instruments were deployed in the riverside suburb of Dallington, parts of which were severely affected by ground liquefaction caused by the mainshock. One instrument was placed in an area that suffered extensive liquefaction that had damaged houses, water mains and sewage systems, and flooded roads and properties with silt and sand. For comparison, a site was also installed 630m away, in the same street but in an area where liquefaction was noticeably absent. The aim of these sites is to investigate whether ground response during shaking may be associated with a soil's tendency to liquefy. Also of interest is the behaviour of the soils after liquefaction has already occurred – what happens during further shaking?

Further out of Christchurch, other instruments were deployed to help improve the quality of aftershock location solutions, which use waveform data from seismographs to calculate an earthquake's magnitude, location and depth. The more seismographs set up near an earthquake's epicentre, the better the resolution of data available for that earthquake, and therefore the more accurate the solution.

A small gap in the existing CanNet instrument coverage north of the Waimakariri River was filled in and another site, in Governor's Bay, will give a comparison of the shaking produced in an earthquake between Christchurch's relatively soft river-derived sediments, and the hard volcanic rock that makes up most of Banks Peninsula. The information from these sites will also be used to refine existing geophysical models for how fast seismic waves travel through the crust in the Canterbury area.

The ten short-period sensors deployed in the first trip have now been collected and the data is currently being added to the data from GeoNet's permanent network stations for analysis. The strong-motion instruments, including the three deployed in the initial response, are still recording onsite and will stay out until late October or November 2010.

We would like to extend a big thank you to the Christchurch Police, Opus, and all the landowners in Christchurch and the Canterbury region for allowing us onto their properties to install our instruments at a difficult time, and for making this research possible.

**Contact:** Lara Bland, Caroline Ashenden  
**Email:** l.bland@gns.cri.nz,  
c.ashenden@gns.cri.nz



## THE GEONET DATA CENTRE CHANGES GEAR

**At 4:34am on Saturday, September 4, 157 GeoNet seismographs were dutifully recording ground shaking and sending in their real-time information to the GeoNet data hubs at Lower Hutt and Taupo. Another 192 strong-motion accelerographs lay in wait to capture any strong ground movements.**

One minute later a magnitude 7.1 earthquake started rupturing the earth's crust at 11km under the Canterbury Plains, breaking upwards and opening an ancient fault. Hundred of thousands of people were shaken awake, buildings were damaged and electricity and water stopped working.

Since then the systems have been assembling the aftershocks for location by the earthquake analysis team: Tom Bell, Jennifer Coppola, Brian Ferris, Jan Harris, Sara Page and Matt Stevens. Their job is to unscramble the wiggly lines and identify the individual earthquakes. It's still a job that is better performed by people than by computers. It's not just the sheer number of earthquakes that are the problem; it's that one earthquake can overlay others, making the signals very difficult to read. It's like trying to listen to 3 or 4 people at once – a confused babble!

The pattern of aftershocks provides valuable information to scientists about where the stresses are moving to, the type of faulting they are causing and the rate at which they are occurring. How the whole sequence behaves can give us a clue as to what we might expect in future earthquakes.

But it's not all deep seismology. The GeoNet website has carried science stories and news about the activities carried out by GNS Science staff and their research collaborators, both from New Zealand and overseas. Our aim has been to bring you the latest about what we have learned so far.

We also received hundreds of emails and dozens of phone calls for answers to other questions, some of which we can answer, and others for which we just don't know the answers.

We've received over 50,000 felt report questionnaires for the whole country during September; that compares with 9,000 in the previous eight months. Obviously not all of these can be checked, but we make sure the most significant ones make sense and are accurately located. The response to these is fantastic, and we have a wonderful data set to help define future earthquake modelling studies.

Behind the scenes the engineering sector has been looking at data from our accelerographs and seeing the nature of the ground shaking throughout Canterbury. The GeoNet seismic data repository has been regularly trawled by researchers interested in testing their theories and techniques against a modern earthquake – over 500 gigabytes in September.

Keeping this all going gives us enormous satisfaction – it's what GeoNet's Data Centre is here to do. But if some of the smaller earthquakes aren't on the website, or your question remains frustratingly unanswered, please accept that we are dealing with numbers and volumes truly well out of the ordinary!

**Contact:** Kevin Fenaughty  
**Email:** [k.fenaughty@gns.cri.nz](mailto:k.fenaughty@gns.cri.nz)

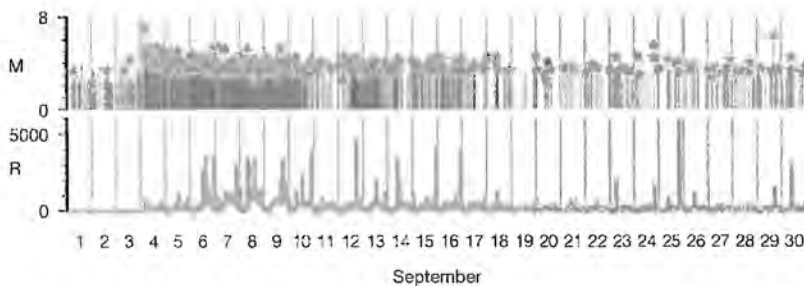


**Top:** Map showing over 7,000 felt reports received for the Darfield earthquake.  
**Bottom:** Earthquake analysts examine an aftershock.



WWW.GEONET.ORG.NZ

## How the website coped



**Above:** The plot shows requests per second (R) in one minute averages (green line) as well as earthquakes for the month of September. Through the month more than 1,840 earthquakes (M) bigger than magnitude 2.0 were located (blue lines) and over 360 were judged to be shallow and large enough to be posted to the website (shown as red and yellow stars). Every widely felt earthquake causes a peak in website traffic.

The Darfield earthquake on 4 September and its aftershocks caused a great deal of traffic to the GeoNet website. In the first five days after the quake, the website served more traffic than for the entire 2009 year. For the month of September the website served over 564 million hits, equating to more than 1 terabyte of web traffic. We've also received a huge number of felt reports: over 56,000 for September. This huge increase in web traffic over a very short period of time presented some challenges and occasionally pushed the servers to their limits. Due to the flexible design of the website hosting, we were able to expand the capacity as interest in the aftershocks grew.

Prior to the Darfield earthquake the main website was hosted using three servers – one each in Wellington, Auckland and California – with network routing protocols used to select the best server to send a request to. Thanks to great work from our Internet Service Provider FX Networks and the improved peering in the New Zealand internet, the traffic is evenly distributed over the three servers. In the first week after the quake we were able to install an additional server in Palmerston North. It went live on 10 September, and added a lot of additional capacity to the website hosting.

On the day of the mainshock, additional application servers were added to help with collecting felt reports and serving Quake Search requests.

The ongoing aftershock sequence has caused interest in the GeoNet website to continue to climb. In late September, a cluster of magnitude 4 aftershocks saw requests to the website peak at nearly 6,000 per second. To help with the growing interest a more powerful server is being installed in Auckland.

The Darfield earthquake has provided an invaluable chance to test ourselves and improve our ability to respond when it counts. We greatly appreciate the high number of felt report submissions – coupled with the data collected by the strong-motion network, these will be an invaluable scientific data set and we greatly appreciate people taking the time to provide this information, even when their homes have been damaged.

**Contact:** Geoff Clitheroe  
**Email:** g.clitheroe@gns.cri.nz

### Contact details

**GeoNet website:** [www.geonet.org.nz](http://www.geonet.org.nz)  
**Email:** [info@geonet.org.nz](mailto:info@geonet.org.nz)  
**Address:** GNS Science, PO Box 30-368, Lower Hutt 5040, New Zealand  
**Editor:** Sara Page

*GeoNet News* is published twice yearly. Additional copies are available, at no cost for domestic delivery, from Leanne Dixon, GeoNet Administration Coordinator  
**Email:** [l.dixon@gns.cri.nz](mailto:l.dixon@gns.cri.nz)  
**Phone:** +64 4 570 4888

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Main funding agency



EARTHQUAKE COMMISSION



Lead organisation in the GeoNet project

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 8:34 a.m.  
**To:** 9(2)(a)  
**Subject:** RE: visit by Hugh Cowan, Research Manager for the Earthquake Commission in Wellington, New Zealand

Thanks, 9(2)(a)

Question: did you contact anyone at NSF on my behalf, or no?

I would like to meet some senior with whom we might liaise in future on possible joint approaches to (funding) research following up on the Canterbury quake. However, I have left it so late to try to organise anything, I'll just have to take what comes. I am sure the meetings at IRIS and with your colleagues will be valuable.

Cheers  
Hugh

-----Original Message-----

**From:** 9(2)(a) [redacted]@usgs.gov]  
**Sent:** Friday, 15 October 2010 8:15 a.m.  
**To:** 9(2)(a) [redacted]  
**Cc:** Hugh Cowan  
**Subject:** Re: visit by Hugh Cowan, Research Manager for the Earthquake Commission in Wellington, New Zealand

9(2)(a)

It sounds like your plan is perfect in meeting him at IRIS. Can you and Hugh coordinate the timing? Thanks!

9(2)(a)

\*\*\*\*\*

9(2)(a)

U.S. Geological Survey  
Sent from my BlackBerry

----- Original Message -----

**From:** 9(2)(a) [redacted]  
**Sent:** 10/14/2010 12:06 PM EDT  
**To:** 9(2)(a) [redacted]  
**Subject:** Re: visit by Hugh Cowan, Research Manager for the Earthquake Commission in Wellington, New Zealand  
If Hugh is willing to make the trek out to Reston after his IRIS talk, that would be great. If it is possible to escape the office, I will save him the trouble by attending his talk and arrange to chat with him before or after it.

9(2)(a)

----- Original Message -----

**From:** 9(2)(a) [redacted]  
**Sent:** 10/14/2010 11:53 AM EDT  
**To:** 9(2)(a) [redacted]  
**Cc:** [redacted]

Subject: Re: visit by Hugh Cowan, Research Manager for the Earthquake Commission in Wellington, New Zealand  
I'm pretty sure that 9(2)(a) on travel starting on Tuesday. How about 4 PM on Monday?

From: 9(2)(a) /GD/USGS/DOI

To: 9(2)(a) /GD/USGS/DOI@USGS

Cc: 9(2)(a) /GD/USGS/DOI@USGS

Date: 10/14/2010 09:18 AM

Subject: Re: visit by Hugh Cowan, Research Manager for the Earthquake Commission in Wellington, New Zealand

FRom some seedy motel in North Platte, Nebraska,

Thanks, you guys,

I think it's really important for Hugh to meet with you guys after coming all the way from New Zealand, so I want to make this happen. Hugh is now scheduled to give a talk at Iris at noon on Monday. Will he be able to make that and still have time to meet with you? The other possibility is Tuesday Morning. Does that work?

9(2)(a)

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9(2)(a)

Geology and Environmental Change Science Center U.S. Geological Survey

MS980 Federal Center (303) 236-5344

Denver, CO 80225-0046 Fax: (303) 236-5690

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9(2)(a)

To: 9(2)(a)@usgs.gov>

From: 9(2)(a)@usgs.gov>

Date: 10/13/2010 06:41PM

cc: 9(2)(a)

Subject: Re: visit by Hugh Cowan, Research Manager for the Earthquake Commission in Wellington, New Zealand

9(2)(a)

I will be in the office on Monday, and happy to meet with Hugh if he decides it would be worth his time to visit. I am probably tied up between 2 and 4pm, but otherwise unscheduled.

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At 4:29 PM -0400 10/13/10, 9(2)(a) wrote:

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>I will be in the office on Monday 10/18 and I think 9(2)(a) will

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>He may have an idea of POCs for RAPID and for B:C related issues.

>NSF's website is pretty well populated with info, so that might be very

>useful for finding POCs at NSF.

>best

>9(2)(a)

>

>

>

> From: 9(2)(a) /GD/USGS/DOI

>

> To: 9(2)(a) @usgs.gov>

>

> Date: 10/06/2010 04:23 PM

>

> Subject: Fw: Status of things for your visit

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9(2)(a)

>U.S. Geological Survey

>Sent from my BlackBerry

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> 9(2)(a)

>

> 9(2)(a)

>

> Geology and Environmental Change Science Center

> U.S. Geological Survey

>

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 6:35 a.m.  
**To:** 9(2)(a)  
**Subject:** RE: Fw: visit by Hugh Cowan, Research Manager for the Earthquake Commission in Wellington, New Zealand

Hi, if I could avoid going out to Reston it would be better. Thanks Hugh

--- original message ---

**From:** '9(2)(a)@usgs.gov'  
**Subject:** Fw: visit by Hugh Cowan, Research Manager for the Earthquake Commission in Wellington, New Zealand  
**Date:** 15th October 2010  
**Time:** 5:39:25 am

Hi Hugh,

Out in rural Nebraska looking at a cool loess section. Just hit a spot with some phone signal. See below. Your advice on what to do is appreciated. Sounds like 9(2)(a) would move the talk to the next day.

9(2)(a)

\*\*\*\*\*

9(2)(a)

U.S. Geological Survey  
Sent from my BlackBerry

----- Original Message -----

**From:** 9(2)(a)  
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9(2)(a)

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Geology and Environmental Change Science Center U.S. Geological Survey

MS980 Federal Center (303) 236-5344  
Denver, CO 80225-0046 Fax: (303) 236-5690

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> Subject: Fw: Status of things for your visit

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>9(2)(a)

>U.S. Geological Survey

>Sent from my BlackBerry

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> From: Hugh Cowan 9(2)(a)

> Sent: 09/29/2010 03:06 PM ZE12

> To: 9(2)(a)

> Subject: Re: Status of things for your visit

>

>

>

>hi 9(2)(a)

>

>Thank you so much for helping out with these contacts. Sorry to hear

>that 9(2)(a) will not be around but perhaps we'll meet one day.

>

>At NSF I would like to hear from someone about the RAPID response

>awards (post-event opportunity science) and I have been given the name

>9(2)(a) (Marine Geol and Geophys) but we've not met and I have

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> Let me know if you need contact info for anyone. Thanks!

> 9(2)(a)

> 9(2)(a)

> Geology and Environmental Change Science Center  
> U.S. Geological Survey

> 9(2)(a)



9(2)(a)

**From:** Hugh Cowan  
**Sent:** Sunday, 17 October 2010 7:49 a.m.  
**To:** 9(2)(a)  
**Subject:** FWD: EQC Visit from the California Earthquake Authority  
**Attachments:** EQC Visit from the California Earthquake Authority

Hi, grateful if you could assist and let 9(2)(a) know I am in the US now, thanks hugh

9(2)(a)

**From:** 9(2)(a)  
**Sent:** Saturday, 16 October 2010 11:55 a.m.  
**To:** Hugh Cowan  
**Cc:** 9(2)(a)  
**Subject:** EQC Visit from the California Earthquake Authority

Hugh,

Hi, I am the Director of Claims for the California Earthquake Authority.

9(2)(a) has been in communication with your 9(2)(a) about a visit by the CEA executives to New Zealand. See below.

The four CEA executives have tentatively arranged to be there with the EQC during the week of November 15 through 18. Departing on the morning of the 19th.

I have been asked to pull together a schedule of what we could see and do during our visit. I am hoping you can help or direct me to the appropriate person.

Following is a list of the CEA team and their area of interest.

9(2)(a) He would like to see damage, and meet with your CEO. He has great knowledge and interest in reinsurance.

9(2)(a) He would like to see damage, and talk to your accounting head to learn about how you get the information to process payments and make sure you have monies to pay claims. He wants to understand what finances are used in this earthquake to pay claims. Are you going to issue debt to help pay the claims. He is also a reinsurance expert.

9(2)(a) - See damage and learn about the whole process for a response to a large scale earthquake. Learn about your legal system.

9(2)(a) I very much want to get out and ride along with inspectors and see how they evaluate and estimate damage. Learn about your project management office and processes. Your needs prioritization system. How you handle repairs for householders. Visit a EQC field office. Anything you think would be of interest to a fellow Claims executive.

Since we very much want to NOT inconvenience the EQC in any way, we need your suggestions on how to best use our time for the four days we are with you. (11-15 to 11-18.) We will travel to wherever you tell us to go. Wellington or Christchurch, or both.

I know you are a day ahead of us, so I am sending this to you on my Friday afternoon, in hopes that when I arrive back at work on my Monday am, you will have had time to give me a return e-mail with a rough idea of what we should plan for from a travel standpoint. We are anxious to make our plane reservations to take advantage of the lowest possible airfare.

Thanks much.

9(2)(a)

801 K Street, Suite 1000  
Sacramento CA 95814

9(2)(a)

-----Original Message-----

From: 9(2)(a)  
Sent: Tuesday, October 12, 2010 6:46 PM  
To: 9(2)(a)  
Cc:  
Subject: RE: EQC Visit

Hi 9(2)(a) The week of November 15 is looking very good, and we will begin looking into travel arrangements. I believe our team will consist of the following:

9(2)(a)

As I mentioned, we very much want to NOT inconvenience the EQC in any way. As time allows, however, we would be very interested in learning as much as possible from you all regarding the various public policy, financial, legal, and claim paying challenges you have been confronting in the weeks following the earthquake. Do you have any immediate suggestions which days of that week would work best to meet with members of the Ian, Hugh and perhaps others from the EQC? Should we coordinate directly with you regarding this visit?

Any suggestions you can provide regarding logistics (where to stay, what to see, where to go, who to meet with, etc....) while we are there would be greatly appreciated. Maybe it would be helpful to speak by phone sometime in the near future, and I will be happy to call at your convenience if you could suggest a time that would work best.

Many thanks, and we look forward to meeting you soon.

9(2)(a)

-----Original Message-----

From: 9(2)(a)@EQC.govt.nz  
Sent: Monday, October 11, 2010 12:10 PM  
To: 9(2)(a)  
Subject: RE: EQC Visit

Great. Look forward to hearing from you 9(2)(a)

Cheers,

9(2)(a)

-----Original Message-----

From: 9(2)(a)  
Sent: Monday, October 11, 2010 1:35 PM  
To: 9(2)(a)  
Subject: RE: EQC Visit

Thanks, 9(2)(a) Perhaps the week of November 15th will work. I need to check into a couple of things on our end to make sure, and I will get back to you as soon as possible. If we can't make this happen that week, it would either have to be mid-December or early January.

Take care,

9(2)(a)

9(2)(a)

California Earthquake Authority  
801 K Street  
Sacramento, CA 95814

9(2)(a)

-----Original Message-----

From: 9(2)(a) [redacted]@EQC.govt.nz]  
Sent: Sunday, October 10, 2010 2:11 PM  
To: 9(2)(a) [redacted]  
Subject: RE: EQC Visit

Hi 9(2)(a)

I've had a chat with Ian Simpson, our chief executive, and Hugh Cowan, our research manager, and they believe some time during the second half of November would be a good time for your visit. Perhaps you could organize some tentative dates and then we can confirm arrangements? Let me know your thoughts.

Kind regards,

9(2)(a)

-----Original Message-----

From: 9(2)(a) [redacted]  
Sent: Friday, October 08, 2010 2:51 PM  
To: 9(2)(a) [redacted]  
Subject: Re: EQC Visit

Thanks much, 9(2)(a)

9(2)(a)

Sent from my iPhone

On Oct 7, 2010, at 8:48 PM, "9(2)(a) [redacted]@EQC.govt.nz<mailto:9(2)(a)@EQC.govt.nz>> wrote:

Hi 9(2)(a)

Very nice to talk to you. Will be in touch next week once I've had a chance to talk to Ian Simpson (CEO) and 9(2)(a) [redacted] about your wish to visit.

Kind regards,



9(2)(a)

**From:** Hugh Cowan  
**Sent:** Monday, 18 October 2010 6:06 a.m.  
**To:** 9(2)(a)  
**Subject:** RE: 9(2)(a)

9(2)(a) am sorry, now you mention Chch I know who you mean. He is our procurement contractor. I do not have his number but you could reach him through 9(2)(a) our field ops leader. 9(2)(a) regards Hugh

--- original message ---

**From:** 9(2)(a)@med.govt.nz  
**Subject:** RE: 9(2)(a)  
**Date:** 16th October 2010  
**Time:** 5:35:24 pm

Hugh,

No probs.

I was introduced to him on Friday at EQC's office in Christchurch and just assumed he was EQC. I'll figure it out by another route.

Cheers,

9(2)(a)

9(2)(a)

Canterbury Earthquake Recovery Policy Team Department of the Prime Minister and Cabinet Mob 9(2)(a)

-----Original Message-----

**From:** Hugh Cowan [mailto:hacowan@eqc.govt.nz]  
**Sent:** Sunday, 17 October 2010 7:47 a.m.  
**To:** 9(2)(a)  
**Subject:** RE: 9(2)(a)

Hi 9(2)(a) not sure who you are referring to. Perhaps Ian can help, I am in the US at present. Regards Hugh

--- original message ---

**From:** 9(2)(a)@med.govt.nz  
**Subject:** 9(2)(a)  
**Date:** 16th October 2010  
**Time:** 2:38:11 pm

Hugh,

Sorry to bother you with a relatively trivial matter - can you please send me 9(2)(a) email address?

Cheers,

9(2)(a)

9(2)(a)

Canterbury Earthquake Recovery Policy Team Department of the Prime Minister and Cabinet Mob 9(2)(a)

9(2)(a)

---

**From:** Hugh Cowan  
**Sent:** Tuesday, 19 October 2010 4:11 p.m.  
**To:** 9(2)(a)@med.govt.nz  
**Subject:** FWD: FW: Christchurch EQC claims project management contract  
**Attachments:** FW: Christchurch EQC claims project management contract

Hi 9(2)(a) not sure that this request is appropriate but you will have a better sense of it. I know 9(2)(a) but do not have time to reply nor do I feel sure of the protocol that should apply in this case. Grateful if you would consider and respond for me if so inclined. Cheers Hugh



**Marija Bakulich**

---

**From:** EQC Info  
**Sent:** Tuesday, 19 October 2010 2:59 p.m.  
**To:** Hugh Cowan  
**Subject:** FW: Christchurch EQC claims project management contract  
**Attachments:** image001.jpg

---

**From:** 9(2)(a)  
**Sent:** Monday, 18 October 2010 11:29 a.m.  
**To:** EQC Info  
**Subject:** Christchurch EQC claims project management contract

Good morning

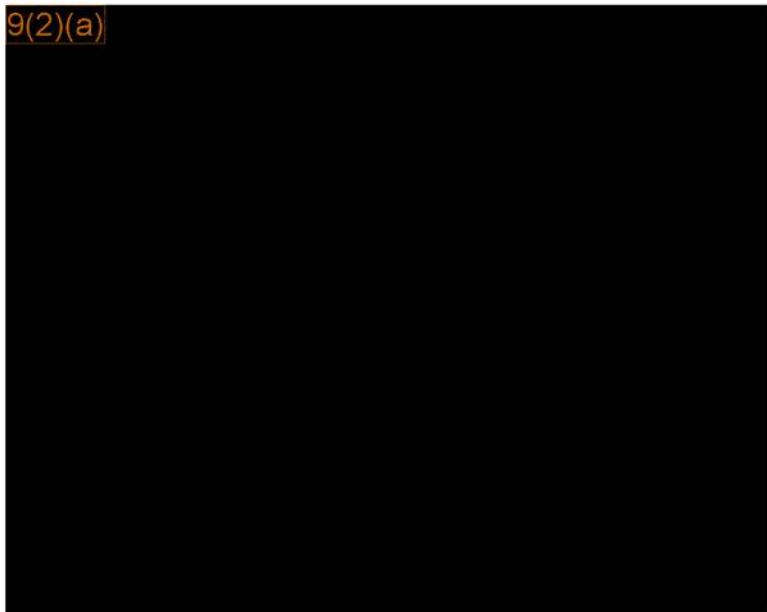
Is it possible to please be sent a copy of the contract tender documentation that was successfully won by Fletcher Construction for the Project Management to coordinate and manage building repairs valued at \$10,000 to \$100,000.

We are an established Christchurch/NZ building company specialising in building repairs, renovation and rebuilding and wish to understand the nature of the contract as part of deciding whether to participate in this segment of the rebuild.

Thank you

Regards

9(2)(a)



9(2)(a)

**From:** Hugh Cowan 9(2)(a)  
**Sent:** Tuesday, 19 October 2010 1:34 p.m.  
**To:** 9(2)(a)  
**Subject:** contacts on US visit

Hi 9(2)(a)

Further to my note to Ian earlier explaining the purpose and scope of my US travel, in case he sees merit in specifying them, the agencies I am visiting include:

Federal Emergency Management Agency (FEMA) - Building Science Division  
IRIS (Incorporated Research Institutions for Seismology - Director  
National Science Foundation (NSF) - Geotechnical Engineering Programme Director and Geophysics  
Programme Director  
US Geological Survey  
National Earthquake Information Center  
Impact Forecasting (AonBenfield)

regards  
Hugh

9(2)(a)

---

**From:** Hugh Cowan  
**Sent:** Tuesday, 19 October 2010 1:13 p.m.  
**To:** Ian Simpson; 9(2)(a)  
**Subject:** USA visit

Ian, my trip consists of three elements, 1. to liaise with US federal agencies about enhanced collaboration incl funding related to post quake investigations, esp liquefaction and building science, both of which will be crucial to informing future reassessment and pricing of risk by reinsurers, 2. Work with our reinsurance broker (modeling) on imminent version release of Minerva loss model, 3. Presenting to multisector grouping of hazard assessment agencies on NZ approach to CAT response planning, with focus on strengthening bilateral links. Trip planned since late 2009. Hope this is adequate. Let me know if you need more or different. Hugh

9(2)(a)

---

**From:** Hugh Cowan  
**Sent:** Tuesday, 19 October 2010 9:45 a.m.  
**To:** 9(2)(a)  
**Subject:** FWD:

9(2)(a)

**From:** 9(2)(a)@auckland.ac.nz>  
**Sent:** Tuesday, 19 October 2010 9:28 a.m.  
**To:** 9(2)(a) Hugh Cowan  
**Cc:**  
**Attachments:** Darfield\_Reflection\_FZGW\_Experiment.doc

Hugh, 9(2)(a)

Please find your mutual contacts for a potential discussion about our proposed study of fault healing at the Darfield NZ earthquake site.

As I described on the phone to 9(2)(a) this is a joint Southern California Earthquake Center and University of Canterbury and IESE initiative.

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9(2)(a) end\_of\_the\_skype\_highlighting 785 N

9(2)(a) begin\_of\_the\_skype\_highlighting 9(2)(a)  
9(2)(a) end\_of\_the\_skype\_highlighting 785 N

Thanks,

9(2)(a)

9(2)(a)  
9(2)(a)  
Institute of Earth Science & Engineering  
Rm 627, Level 6, 58 Symonds St.  
University of Auckland  
Private Bag 92019 Auckland Mail Center  
Auckland 1142, New Zealand  
Web site: <http://www.iese.co.nz/>

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## **Collaborative Seismic Reflection & Fault Zone Guided Wave Study of 2010 Darfield Earthquake Zone**

9(2)(a)

<sup>1</sup> Southern California Earthquake Center, University of Southern California, CA, USA; [9\(2\)\(a\)@usc.edu](mailto:9(2)(a)@usc.edu)

<sup>2</sup> Institute of Earth Science and Engineering, University of Auckland, NZ; [9\(2\)\(a\)@auckland.ac.nz](mailto:9(2)(a)@auckland.ac.nz)

<sup>3</sup> University of Canterbury, Christchurch, New Zealand; [9\(2\)\(a\)@canterbury.ac.nz](mailto:9(2)(a)@canterbury.ac.nz)

The New Zealand M7.1 Canterbury (Darfield) Earthquake on the 4<sup>th</sup> September 2010 occurred on a previously unknown strike slip fault buried beneath the alluvial plain that had not ruptured in at least 10,000 years and caused significant damage to the Christchurch urban area. Although diminishing in frequency and magnitude aftershocks of up to M4 continue to occur in the region. We can assume the damage zone of this splay fault of the South Island's transpressional regime was fully healed due to the long return times associated with this fault. Thus it presents an opportunity to examine the newly developed damage zone and provide a base line for further experiments to monitor the damage zone healing with time. We propose a collaborative IESE/UoCanterbury/SCEC study of this event's site.

We propose to deploy a high density seismic array across and along the rupture zone in the Canterbury plains to record both reflected vibrator seismic signals and Fault Zone Guided Waves (FZGW) from aftershock activity. The latter waves give direct evidence of the width and magnitude of fault damage. We deployed three broadband stations on the fault rupture within two weeks of the earthquake (Henderson et al., 2010) and are currently analysing these data for FZGWs. To continue these observations, we propose to use a multichannel seismic reflection recording system to profile reflections from the structure, stratigraphy, and the dispersion and amplitude-position characteristic of the Darfield Fault damage zone. A potential baseline deployment could use a 120 channel system (allowing 40 3C stations). However, in this proposal we seek to cooperate with UoCanterbury and SCEC colleagues to make use of this unique earthquake to greatly expand our understanding of fault character and damage.

An opportunity exists to mobilise the University of Calgary's 600 channel Aries Aram system as part of a collaborative program with the University of Canterbury. Canterbury has proposed to use the Aram system to profile the stratigraphy and offset structure surrounding the rupture zone. Their goal is to conduct seismic reflection profiling across the fault rupture to map the previously unknown fault geometry and its rupture through the Quaternary alluvium. IESE would assist carrying out this work with [9\(2\)\(a\)@canterbury.ac.nz](mailto:9(2)(a)@canterbury.ac.nz) at the University of Canterbury. Recent seismic reflection profiling in NW Canterbury is of high quality (Dorn et al., 2010), holding promise for the Darfield study. The flat topography and widespread support of the landowners following the earthquake will aid rapid mobilisation. The seismic reflection data could be used to calibrate some of the information about the fault modelled using FZGW.

We proposed to use the Aram system in a follow on study, placing 200 3C stations along and across the Darfield rupture for a minimum of 2-3 week deployment. Calgary's geophones have 10 Hz natural frequency and we would replace some of the sensors with alternative 4.5 Hz geophones. If this system were to be mobilised for the Canterbury study, we would use Calgary's mini-vibe to test the ability of a vibroseis source to induce FZGWs. If successful, this would allow repeated studies in a year or two to map the healing of the damage zone associated with the fault rupture. Alternatively explosive seismic sources could be utilised to provide a repeatable experiment once aftershock activity has diminished.

If funding and timing worked out, this project would contribute cost sharing of and additional seismic source and receivers to a seismic experiment on the dominant fault feature in New Zealand's South Island, the Alpine Fault, scheduled for January 2011.



Previous FZGW experiments to study the effects or changes to faults and their damage zones associated with earthquake events, with increasingly dense instrument array through time, have been performed in California associated with the Landers, Hector Mine and Parkfield earthquakes (Li et al., 1994; Li and Vidale, 2001; Li et al., 2003; Li, 2007). These studies provided insight into the fault and rupture continuity, damage zone geometry and properties in space and time including information about crack density and fluid flow.

**References.**

Dorn, C., Carpentier, S., Keiser, A.E., Green, A.G., Horstmeyer, H., Campbell, F., Campbell, J., Jongens, R., Finnemore, M., and Nobes, D.C., 2010, First seismic imaging results of tectonically complex structures at shallow depths beneath the northwest Canterbury Palins, New Zealand. *Journal of Applied Geophysics*. In press.

Henderson, M., Boese, C., Savage, M. Fry, W., Thurber, C., Jacobs, K., Karalliyadda, S., Syracuse, E., Lord, N., Davy, R., Unglert, K., Carrizales, A., Eccles, J., Zaino, A., Rawlinson, R., Seward, A., Malin, P., Jolly, A., Townend, J., Shelley, A., and Wech, A., 2010, Portable broadband seismometer deployment to record aftershocks of the 4 September 2010 Darfield Earthquake. *Proceedings of the GeoNZ Conference 21-24<sup>th</sup> November 2010*.

Li, Y., Aki, K., Adams, D. And Hasemi, A., 1994, Seismic guided waves trapped in the fault zone of the Landers, California, earthquake of 1992. *J. Geophys. Res.*. Vol. V99 (No. 6), pp. 11,705-11,722.

Li, Y. G., and Vidale, J. 2001, Healing of the shallow fault zone from 1994-1998 after the 1992 M7.5 Landers, California, earthquake. *Geophy. Res. Lett.*. Vol. 28 (No.15), pp. 2999-3002.

Li, Y. G., Vidale, J.E., Day, S.M., Oglesby, D.D. and Cochran, E., 2003, Post-seismic fault healing on the 1999 M7.1 Hector Mine, California earthquake. *Bull. Seism. Soc. Am.*. Vol. 93 (No. 2), pp. 854-864.

9(2)(a)

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**From:** Hugh Cowan  
**Sent:** Tuesday, 19 October 2010 9:44 a.m.  
**To:** 9(2)(a)  
**Subject:** FWD: RAPID fault guided waves on NZ earthquake  
**Attachments:** RAPID fault guided waves on NZ earthquake

9(2)(a)

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**From:** 9(2)(a)@auckland.ac.nz>  
**Sent:** Tuesday, 19 October 2010 9:20 a.m.  
**To:** 9(2)(a) Hugh Cowan  
**Subject:** RAPID fault guided waves on NZ earthquake

Hello,

Please find attached a short summary of a RAPID-type project 9(2)(a) (USC) and I would like considered for funding.

I will be in touch concerning it on Wed (NZ time).

Best,

9(2)(a)

---

9(2)(a)

9(2)(a)  
Institute of Earth Science & Engineering  
Rm 627, Level 6, 58 Symonds St.  
University of Auckland  
Private Bag 92019 Auckland Mail Center  
Auckland 1142, New Zealand

Web site: <http://www.iese.co.nz/>

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9(2)(a)

**From:** Hugh Cowan 9(2)(a)  
**Sent:** Tuesday, 19 October 2010 9:42 a.m.  
**To:** 9(2)(a)  
**Cc:** Hugh Cowan; 9(2)(a)  
**Subject:** Re:

Thanks 9(2)(a)

I am at IRIS today and I will visit NSF tomorrow, mid-late morning. I will hope to meet 9(2)(a).

regards  
Hugh

On Tue, Oct 19, 2010 at 9:27 AM, 9(2)(a) @auckland.ac.nz> wrote:

Hugh, 9(2)(a)

Please find your mutual contacts for a potential discussion about our proposed study of fault healing at the Darfield NZ earthquake site.

As I described on the phone to 9(2)(a) this is a joint Southern California Earthquake Center and University of Canterbury and IESE initiative.

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end\_of\_the\_skype\_highlighting 785 N

Thanks,

9(2)(a)

9(2)(a)

9(2)(a)

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Auckland 1142, New Zealand

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9(2)(a)

**From:** Hugh Cowan  
**Sent:** Tuesday, 19 October 2010 9:20 a.m.  
**To:** 9(2)(a)  
**Subject:** RE: FUEL CARD RECEIPTS

Hello 9(2)(a) I am presently in USA but I did hand taxi receipts to 9(2)(a) last week before I left. Regards Hugh

--- original message ---

**From:** "9(2)(a)@eqc.govt.nz"  
**Subject:** RE: FUEL CARD RECEIPTS  
**Date:** 18th October 2010  
**Time:** 3:59:24 pm

Hi Hugh

Sorry yes I mean Taxi receipts. Can you please hand them to me when you have a minute.

Cheers

9(2)(a)

-----Original Message-----

**From:** Hugh Cowan  
**Sent:** Friday, 15 October 2010 9:33 a.m.  
**To:** 9(2)(a)  
**Subject:** RE: FUEL CARD RECEIPTS

Hi 9(2)(a) do you mean taxi? I do not have fuel receipts. Cheers hugh

--- original message ---

**From:** "9(2)(a)@eqc.govt.nz"  
**Subject:** FUEL CARD RECEIPTS  
**Date:** 15th October 2010  
**Time:** 9:23:44 am

Hi Hugh

Can I please have the following fuel card receipts

DATE	DESTINATION	\$
18/09/10	Riccarton – City ChCh	13.20
31/08/10	Central Hutt – Wgton Airport	96.00
11/09/10	Wgtn Intl Airport – Lower Hutt	72.30



9(2)(a)

**From:** Hugh Cowan  
**Sent:** Tuesday, 19 October 2010 9:18 a.m.  
**To:** 9(2)(a)  
**Subject:** RE: EQC Visit from the California Earthquake Authority

Hi 9(2)(a) I notice you indicated my return as 26 Oct but in fact my first day in the office will be 1 Nov. I get back on Sat 30 Oct :)

--- original message ---

**From:** "9(2)(a)" <9(2)(a)@eqc.govt.nz>  
**Subject:** EQC Visit from the California Earthquake Authority  
**Date:** 17th October 2010  
**Time:** 3:27:26 pm

Hi 9(2)(a)  
Hugh Cowan and 9(2)(a) have asked me to respond to you regarding your proposed visit to New Zealand. Hugh is in the US at the moment (although not in California) and won't be back in the office until Tuesday, 26 October.

Things are still pretty frantic here, but we are happy to arrange meetings around the dates you have mentioned, ie, 15-18 November inclusive. We suggest two days in Wellington followed by two days in Christchurch, and will put together a programme on Hugh's return. If it is easier for you, we can arrange internal flights and accommodation for you.

Please let me know if I can be of assistance.

Regards

9(2)(a)

9(2)(a) | Earthquake Commission (EQC) Majestic Centre | 100 Willis Street | P O Box 790 | Wellington

-----Original Message-----

**From:** 9(2)(a)  
**Sent:** Saturday, 16 October 2010 11:55 a.m.  
**To:** Hugh Cowan (HACowan@eqc.govt.nz)  
**Cc:** 9(2)(a)  
**Subject:** EQC Visit from the California Earthquake Authority

Hugh,

Hi, I am the Director of Claims for the California Earthquake Authority.

My CEO, 9(2)(a) has been in communication with your 9(2)(a) about a visit by the CEA executives to New Zealand. See below.

The four CEA executives have tentatively arranged to be there with the EQC during the week of November 15 through 18. Departing on the morning of the 19th.

I have been asked to pull together a schedule of what we could see and do during our visit. I am hoping you can help or direct me to the appropriate person.

Following is a list of the CEA team and their area of interest.

9(2)(a) He would like to see damage, and meet with your CEO. He has great knowledge and interest in reinsurance.

9(2)(a) He would like to see damage, and talk to your accounting head to learn about how you get the information to process payments and make sure you have monies to pay claims. He wants to understand what finances are used in this earthquake to pay claims. Are you going to issue debt to help pay the claims. He is also a reinsurance expert.

9(2)(a) See damage and learn about the whole process for a response to a large scale earthquake. Learn about your legal system.

9(2)(a) I very much want to get out and ride along with inspectors and see how they evaluate and estimate damage. Learn about your project management office and processes. Your needs prioritization system. How you handle repairs for householders. Visit a EQC field office. Anything you think would be of interest to a fellow Claims executive.

Since we very much want to NOT inconvenience the EQC in any way, we need your suggestions on how to best use our time for the four days we are with you. (11-15 to 11-18.) We will travel to wherever you tell us to go. Wellington or Christchurch, or both.

I know you are a day ahead of us, so I am sending this to you on my Friday afternoon, in hopes that when I arrive back at work on my Monday am, you will have had time to give me a return e-mail with a rough idea of what we should plan for from a travel standpoint. We are anxious to make our plane reservations to take advantage of the lowest possible airfare.

Thanks much.

9(2)(a)

801 K Street, Suite 1000  
Sacramento CA 95814

9(2)(a)

-----Original Message-----

From: 9(2)(a)

Sent: Tuesday, October 12, 2010 6:46 PM

To: 9(2)(a)

Cc:

Subject: RE: EQC Visit

Hi 9(2)(a) week of November 15 is looking very good, and we will begin looking into travel arrangements. I believe our team will consist of the following:

9(2)(a)

9(2)(a)

As I mentioned, we very much want to NOT inconvenience the EQC in any way. As time allows, however, we would be very interested in learning as much as possible from you all regarding the various public policy, financial, legal, and claim paying challenges you have been confronting in the weeks following the earthquake. Do you have any immediate suggestions which days of that week would work best to meet with members of the Ian, Hugh and perhaps others from the EQC? Should we coordinate directly with you regarding this visit?

Any suggestions you can provide regarding logistics (where to stay, what to see, where to go, who to meet with, etc....) while we are there would be greatly appreciated. Maybe it would be helpful to speak by phone sometime in the near future, and I will be happy to call at your convenience if you could suggest a time that would work best.

Many thanks, and we look forward to meeting you soon.

9(2)(a)

-----Original Message-----

From: 9(2)(a) @EQC.govt.nz]  
Sent: Monday, October 11, 2010 12:10 PM  
To: 9(2)(a)  
Subject: RE: EQC Visit

Great. Look forward to hearing from you 9(2)(a)

Cheers,

9(2)(a)

-----Original Message-----

From: 9(2)(a)  
Sent: Monday, October 11, 2010 1:35 PM  
To: 9(2)(a)  
Subject: RE: EQC Visit

Thanks, 9(2)(a) Perhaps the week of November 15th will work. I need to check into a couple of things on our end to make sure, and I will get back to you as soon as possible. If we can't make this happen that week, it would either have to be mid-December or early January.

Take care,

9(2)(a)

9(2)(a)

California Earthquake Authority  
801 K Street  
Sacramento, CA 95814

9(2)(a)



-----Original Message-----

From: 9(2)(a) [redacted]@EQC.govt.nz  
Sent: Sunday, October 10, 2010 2:11 PM  
To: 9(2)(a) [redacted]  
Subject: RE: EQC Visit

Hi 9(2)(a) [redacted]

I've had a chat with Ian Simpson, our chief executive, and Hugh Cowan, our research manager, and they believe some time during the second half of November would be a good time for your visit. Perhaps you could organize some tentative dates and then we can confirm arrangements? Let me know your thoughts.

Kind regards,

9(2)(a) [redacted]

-----Original Message-----

From: 9(2)(a) [redacted]  
Sent: Friday, October 08, 2010 2:51 PM  
To: 9(2)(a) [redacted]  
Subject: Re: EQC Visit

Thanks much, 9(2)(a) [redacted]

9(2)(a) [redacted]

Sent from my iPhone

On Oct 7, 2010, at 8:48 PM, 9(2)(a) [redacted]@EQC.govt.nz<mailto:9(2)(a) [redacted]@EQC.govt.nz>> wrote:

Hi 9(2)(a) [redacted]

Very nice to talk to you. Will be in touch next week once I've had a chance to talk to Ian Simpson (CEO) and 9(2)(a) [redacted] about your wish to visit.

Kind regards,

9(2)(a) [redacted]

9(2)(a) [redacted]

**From:** Hugh Cowan  
**Sent:** Wednesday, 20 October 2010 11:12 a.m.  
**To:** 9(2)(a) [redacted]  
**Subject:** RE: TV One News

Phew! That is some task list you have compiled, 9(2)(a) [redacted] thanks for your effort ongoing. regards Hugh

--- original message ---

**From:** [redacted]  
**Subject:** RE: TV One News  
**Date:** 19th October 2010  
**Time:** 6:01:55 pm

Thanks 9(2)(a) [redacted]

I didn't see the news, so may have to follow your suggested link to TV On Demand.

Thanks also for the offer of a link to the GETS parties, but I think I'll avoid getting bogged down in that and leave it to Fletcher's resource machine to handle that.

Catching up with 9(2)(a) [redacted] of DBH today to get an update on their progress around streamlining the consenting process (with 9(2)(a) [redacted] of the FCC team), ahead of a DBH organised session with the 3 Council consenting leads and the PMO next Thursday.

9(2)(a) [redacted] advises that he expects the MoU to be signed with Fletchers today. Also that PMO construction and PI/PL insurance discussions are progressing. Hope to be updated on that later today.

Fletchers have a list of 100 homes and have realised that the assessors' definition of work isn't enough for them to get prices, so their first thoughts are to arrange scopes suitable for prices. Integrating with 9(2)(a) [redacted] make sure this is streamlined.

When 9(2)(a) [redacted] is back in town next week will start working with him and 9(2)(a) [redacted] a range of setup tasks. Current check list includes:

#### Commitment Approvals

- Scoping - who does QS v Architect, who approves?- managing expectations
- Pricing

- Comparison with EQC assessment
- Packaging and approval
- Operating near the \$100,000 limit

#### Scope Management

- Identifying departures from agreed scope
- Mechanism for sign-off
- Approaching the \$100,000 limit

#### Consenting process and sign-off

- Agree streamlined process with Councils - one process for all 3 Councils
- PMO engaged designers to document and inspect
- Record keeping of inspections
- Audit process
- Subsequent approval and records transfer to TA's

#### Reporting

- Tracking claims, properties assessed, starts and completes
- Forecasting total numbers, costs, completion

#### Governance framework

- Meeting cycles
- Agenda
- Participants

#### EECA interface

- Key points of contact
- How do we interface - integrated or completely separate work streams?

#### Data transfer

- What do FCC require
- What is confidential to EQC/Claimants
- Transfer mechanisms



PMO Construction Insurances

- All risks - impact of subsequent shakes
- PI
- PL

Forms of contract for physical works

Delegated authority limits

Cheers

9(2)(a)



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From: 9(2)(a) [mailto:9(2)(a)@med.govt.nz]  
Sent: Wednesday, 20 October 2010 10:52 a.m.  
To: 9(2)(a)  
Cc: Hugh Cowan  
Subject: TV One News

Hi 9(2)(a)

9(2)(a) a note, to say you looked very authoritative in your meeting shot on the news last night!

(Hugh, there was a piece last night on TVNZ news on the aftershocks and then some good coverage of the set of the PMO. You can watch last nights news on the TVNZ on demand service, I think it was the first or second item on the news).

The media response to the building repair activity seems very positive from what we can tell in Wellington.

Btw as of yesterday, 815 people had downloaded the Fletchers ad from GETS - 9(2)(a) can give you a list of who they were if you want it. The GETS advert directs them to the Fletchers web site, so there is not action beyond what Fletchers are doing normally, its just through GETS we can track things.

Regards

9(2)(a)

[newzealand.govt.nz](http://newzealand.govt.nz) - connecting you to New Zealand central & local government services

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9(2)(a)

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**From:** Hugh Cowan  
**Sent:** Thursday, 21 October 2010 3:51 p.m.  
**To:** 9(2)(a)  
**Subject:** FWD: a quick note, and catch up  
**Attachments:** a quick note, and catch up

9(2)(a) as discussed. I also sent it on to Ian earlier. Cheers Hugh

9(2)(a) —

**From:** 9(2)(a)  
**Sent:** Thursday, 21 October 2010 2:35 p.m.  
**To:** Hugh Cowan  
**Subject:** a quick note, and catch up

Hi Hugh

Appreciate that you must be frantic at the moment, but I promised to pass this message on to you. I have a large extended family in Christchurch, hence we spent our school holidays in CHCH, and while none of the immediate family have suffered any significant damage, one extended family is one of those waiting for the geotech reports before they know if they can rebuild their house. Given the focus of the last few days especially on a few disgruntled residents, I thought you should know that my families experience has been the total opposite. The most affected in our family have been very impressed with the responsiveness, compassion, and thoroughness of the EQC and council representatives that they have been involved with, as well as the utility and service providers who have provided services and help unsolicited (or solicited by EQC and council people) and with no expectation of being paid. They are also very complementary about the flow of information and timeframes for the assessments to date.

Also, my parents and friends also asked me to pass on how impressed they have been with geonet, and how useful it has been with understanding what has been happening. They have also been particularly impressed that the data from geonet has been accessible by other parties to develop various interpretations, such as the aftershock maps etc.

So well done to all at EQC, some may be quite vocal about perceived deficiencies, but many do really appreciate the hard work you must all be putting in and that it is a time of high stress for EQC staff.

On another note, can I drag you away for a coffee sometime? no strings

Regards

9(2)(a)

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Thursday, 21 October 2010 2:54 p.m.  
**To:** 9(2)(a)  
**Subject:** RE: a quick note, and catch up

Hi 9(2)(a) thanks for passing on these comments. I have passed them to Ian as I am sure he will appreciate this and also because I have escaped for a few days for meetings with our reinsurance brokers in Chicago. I will call you in early Nov. Glad to catch up then. Hugh

--- original message ---

**From:** '9(2)(a)'  
**Subject:** a quick note, and catch up  
**Date:** 20th October 2010  
**Time:** 8:35:02 pm

Hi Hugh

Appreciate that you must be frantic at the moment, but I promised to pass this message on to you. I have a large extended family in Christchurch, hence we spent our school holidays in CHCH, and while none of the immediate family have suffered any significant damage, one extended family is one of those waiting for the geotech reports before they know if they can rebuild their house. Given the focus of the last few days especially on a few disgruntled residents, I thought you should know that my families experience has been the total opposite. The most affected in our family have been very impressed with the responsiveness, compassion, and thoroughness of the EQC and council representatives that they have been involved with, as well as the utility and service providers who have provided services and help unsolicited (or solicited by EQC and council people) and with no expectation of being paid. They are also very complementary about the flow of information and timeframes for the assessments to date.

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So well done to all at EQC, some may be quite vocal about perceived deficiencies, but many do really appreciate the hard work you must all be putting in and that it is a time of high stress for EQC staff.

On another note, can I drag you away for a coffee sometime? no strings

Regards

9(2)(a)



9(2)(a) [REDACTED]

---

**From:** Hugh Cowan  
**Sent:** Thursday, 21 October 2010 2:47 p.m.  
**To:** Ian Simpson  
**Subject:** FWD: a quick note, and catch up  
**Attachments:** a quick note, and catch up

Ian, thought I would pass this on to you. Fyi, 9(2)(a) [REDACTED] is a former senior manager 9(2)(a) [REDACTED] regards,  
Hugh

9(2)(a)

---

**From:** 9(2)(a)  
**Sent:** Thursday, 21 October 2010 2:35 p.m.  
**To:** Hugh Cowan  
**Subject:** a quick note, and catch up

Hi Hugh

Appreciate that you must be frantic at the moment, but I promised to pass this message on to you. I have a large extended family in Christchurch, hence we spent our school holidays in CHCH, and while none of the immediate family have suffered any significant damage, one extended family is one of those waiting for the geotech reports before they know if they can rebuild their house. Given the focus of the last few days especially on a few disgruntled residents, I thought you should know that my families experience has been the total opposite. The most affected in our family have been very impressed with the responsiveness, compassion, and thoroughness of the EQC and council representatives that they have been involved with, as well as the utility and service providers who have provided services and help unsolicited (or solicited by EQC and council people) and with no expectation of being paid. They are also very complementary about the flow of information and timeframes for the assessments to date.

Also, my parents and friends also asked me to pass on how impressed they have been with geonet, and how useful it has been with understanding what has been happening. They have also been particularly impressed that the data from geonet has been accessible by other parties to develop various interpretations, such as the aftershock maps etc.

So well done to all at EQC, some may be quite vocal about perceived deficiencies, but many do really appreciate the hard work you must all be putting in and that it is a time of high stress for EQC staff.

On another note, can I drag you away for a coffee sometime? no strings

Regards

9(2)(a)

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Thursday, 21 October 2010 12:04 p.m.  
**To:** 9(2)(a)  
**Subject:** RE: CAE

By the way, it is CEA, not CAE. :)

--- original message ---

**From:** '9(2)(a)' <9(2)(a)@eqc.govt.nz>  
**Subject:** CAE  
**Date:** 20th October 2010  
**Time:** 5:49:19 pm

Great, thanks.

-----Original Message-----

**From:** Hugh Cowan  
**Sent:** Thursday, 21 October 2010 11:48 a.m.  
**To:** 9(2)(a)  
**Subject:** RE: Guy Fawkes function

Ok, then see if they can go to GNS plus meet with 9(2)(a) together, to get overview of disaster preparedness arrangements in NZ, Perhaps I can accompany them to keep messages relevant.

--- original message ---

**From:** '9(2)(a)' <9(2)(a)@eqc.govt.nz>  
**Subject:** RE: Guy Fawkes function  
**Date:** 20th October 2010  
**Time:** 5:29:10 pm

Can't do that because we've told them to come here for first two days and then go on to Christchurch. They won't be coming back here. Any other thoughts?

-----Original Message-----

**From:** Hugh Cowan  
**Sent:** Thursday, 21 October 2010 11:17 a.m.  
**To:** 9(2)(a)  
**Subject:** RE: Guy Fawkes function

Yes, we could send them out to GeoNet and they would better appreciate our mandate and community profile. I agree Public Policy is important, I am always looking for those connections, the challenge is finding anything more than the opinion of individuals. In this sense it could be beneficial for us if they were to meet 9(2)(a) together at EQC, AFTER they have been to Chch and net insurers etc. This way, 9(2)(a) would learn too via the visitors perspective. What do you think?

--- original message ---

**From:** '9(2)(a)' <9(2)(a)@eqc.govt.nz>  
**Subject:** RE: Guy Fawkes function  
**Date:** 20th October 2010  
**Time:** 5:06:29 pm

Getting back to CAE's visit - we want to keep them busy for the two days they are in Wellington because we haven't the time to entertain them the whole time. As well as insurance they want to talk about public policy - do you think ring 9(2)(a)? I know they're mainly interested in insurance but what about a tour of GNS and GeoNet? Grateful for your thoughts.

Have sent you a copy of my response to 9(2)(a) 9(2)(a) :)

-----Original Message-----

From: Hugh Cowan  
Sent: Thursday, 21 October 2010 9:05 a.m.  
To: 9(2)(a)  
Subject: RE: Guy Fawkes function

Thanks 9(2)(g)(i) Beautiful afternoon in Chicago, i.e. sunny weather. Hope yours has improved! Hugh

--- original message ---

From: '9(2)(a)' <9(2)(a)@ec.govt.nz>  
Subject: RE: Guy Fawkes function  
Date: 20th October 2010  
Time: 2:53:58 pm

I will deal with 9(2)(a) Hugh.

-----Original Message-----

From: Hugh Cowan  
Sent: Thursday, 21 October 2010 1:06 a.m.  
To: 9(2)(a)  
Subject: FWD: Guy Fawkes function

What did you tell me? :) i am of two minds how to deal with this but my better nature is to squeeze him in if we can. Did you put tickets aside for me? That would be 5 if required. :)

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Thursday, 21 October 2010 11:18 a.m.  
**To:** 9(2)(a)  
**Subject:** RE: Response to 9(2)(a)

Great response 9(2)(a) thanks a lot. Hugh

--- original message ---

**From:** 9(2)(a) <9(2)(a)@eqc.govt.nz>  
**Subject:** Response to 9(2)(a)  
**Date:** 20th October 2010  
**Time:** 5:06:49 pm

**From:** 9(2)(a)  
**Sent:** Thursday, 21 October 2010 11:03 a.m.  
**To:** 9(2)(a)  
**Subject:** RE: Guy Fawkes function

Hi 9(2)(a)

Sorry you were excluded from our list this year. I'm afraid because of the pressure of work caused by the Canterbury earthquake, Guy Fawkes was the last thing on anyone's mind. However, because the venue was booked and we had a huge number of extra people helping us and putting in extra hours, we decided to go ahead and make it an occasion more for the people who were on site and helping. Because we had to limit numbers, some of the regulars had to be excluded, and because we were running short on time this may not have been done with as much thought as it should. Please do not take this personally.

Regards

9(2)(a)

9(2)(a)

| Earthquake Commission (EQC)

Majestic Centre | 100 Willis Street | P O Box 790 | Wellington

Phone: 9(2)(a)@eqc.govt.nz

9(2)(a)–

**From:** Hugh Cowan  
**Sent:** Thursday, 21 October 2010 1:20 a.m.  
**To:** 9(2)(a)  
**Subject:** RE: CEA Visit

Hi 9(2)(a), sorry for delay replying to this. Unless you have already called them, I would skip 9(2)(a) and just focus on insurance. 9(2)(a) and in Chch 9(2)(a) AMI.

--- original message ---

**From:** "9(2)(a)" <9(2)(a)@cc.govt.nz>  
**Subject:** CEA Visit  
**Date:** 18th October 2010  
**Time:** 8:35:32 pm

Hi Hugh, spoke to CEO and Director of Claims of the CEA today. They stressed that they didn't want to inconvenience us in any way and add to our work load but I said we'd be happy to arrange the meetings for them. I know 9(2)(a) is more than happy to do so in Christchurch. They said they were particularly interested in the insurance side of things – claims/legal/financial/reinsurance/public policy/media/ - and even maybe talking to policyholders.

So with that in mind, who do you think I should make appointments with? Internally – 9(2)(a) Ian, 9(2)(a) you? 9(2)(a) anyone else?

And externally - Do you still think I should ring 9(2)(a) and ask him to suggest anyone else in his department? - also 9(2)(a) of MCDEM? 9(2)(a) from Insurance Council? – What about 9(2)(a) for legal? Anyone external for reinsurance?

9(2)(a) suggested programme for Christchurch is:

Travel to Christchurch – NZ433 – departing Wn 8.40, arriving Chc 9.25

10.00 Briefing

Tour around Response Office

Lunch

Meeting with Tonkin & Taylor

Meeting with Christchurch City

Visit to Kaiapoi site with engineers

Meet with Waimakariri and Selwyn Mayors

Dinner

18 November



Meeting with Fletchers – project management

AMI

Ports of Lyttelton

Darlington area – Fletcher hub

Lunch

Debrief

End 3pm

I think he wants to include 9(2)(a) or someone like that as well. (Very enthusiastic is our 9(2)(a))

Please let me have your thoughts and advice.

Thanks

9(2)(a)

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 22 October 2010 4:11 p.m.  
**To:** 9(2)(a)  
**Subject:** RE: T & T report

Hi 9(2)(a) always good to hear from you. My trip going well so far. Great to catch up with 9(2)(a) and my talk at IRIS was well received. Also very useful meetings with NSF and FEMA. In Chicago good meetings with our brokers. All very impressed with quality of GeoNet data. Regards to T&T report my guess is that oversight merely reflects extreme time pressure and, as you suggest, familiarity (breeds contempt) although surely not intended. I suggest however you mention to 9(2)(a) gently, the reminder to 'look out' for our interests. :)

--- original message ---

**From:** "9(2)(a)" <9(2)(a)@gns.cri.nz>  
**Subject:** T & T report  
**Date:** 21st October 2010  
**Time:** 5:56:49 pm

Hi Hugh

Hope your travels are going well.

Interesting to note the Tonkin & Taylor report (just released) makes extensive use of GeoNet data and information (and some GNS Science also), but at the end where the report lists references and other sources of information there is no mention of GeoNet or GNS Science. It could even be seen as "flattering", as any mention of GeoNet is done in a similar way as one might mention the Fire Service or Police! Perhaps this is an indication that GeoNet is now just taken as a part of New Zealand life.

Cheers, 9(2)(a)

--  
9(2)(a)

9(2)(a)

GNS Science - Te Pu Ao

DDI: 9(2)(a)

9(2)(a)

1 Fairway Drive, P.O. Box 30-368 Lower Hutt New Zealand

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9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 22 October 2010 11:34 a.m.  
**To:** 9(2)(a) @ MED  
**Subject:** RE: 2 things

Hi 9(2)(a), as note, could you call 9(2)(a) and ask him to clarify if he can. 9(2)(a) runs the national geodetic office at LINZ and it was he who originally approached me about reestablishing survey control in areas of land damage. If 9(2)(a) cant help then I suggest you call 9(2)(a) at MCDEM. 9(2)(a) knows a lot about spatial data availability post quake. Cheers Hugh

--- original message ---

**From:** "9(2)(a)" <9(2)(a)@med.govt.nz>  
**Subject:** 2 things  
**Date:** 21st October 2010  
**Time:** 5:20:03 pm

Sorry, just realised, in my e-mail below, by tonight I mean Friday night!

Also there is a note on your desk:

22 October - 8.50am

From 9(2)(a)

Referred to him from Linz - 9(2)(a) re spacial data for Christchurch

Asking you to give him a call on 9(2)(a)

Do you want me to pass this on to someone?

Regards

9(2)(a)

-----Original Message-----

**From:** 9(2)(a)  
**Sent:** Friday, 22 October 2010 11:05 a.m.  
**To:** 'Hugh Cowan'  
**Subject:** Blues Club  
**Importance:** High

Hi Hugh,

I reckon this was the place -

<http://www.kingstonmines.com/flash/main.html>

And funnily enough one of the bands I saw (which was great) is playing there tonight and tomorrow.

<http://www.bigjames.com/index.htm>

By the way, it was a great night out, but the area was a bit rough - I mean rough in a non-New Zealand kind of way (will make Naenae look like Seatoun), so recommend you order a Cab back. From memory the food was pretty good and if they still do them the ice buckets filled with beers went down well.

Enjoy, regards

9(2)(a)

-----Original Message-----

From: Hugh Cowan [mailto:hacowan@eqc.govt.nz]  
Sent: Friday, 22 October 2010 9:35 a.m.  
To: 9(2)(a)  
Subject: RE: CE001 - PM

Thanks, 9(2)(a) so you cant remember, so it must have been a unique experience! :)

--- original message ---

From: "9(2)(a)" <9(2)(a)@med.govt.nz>  
Subject: RE: CE001 - PM  
Date: 21st October 2010  
Time: 3:20:15 pm

Hi Hugh,

Glad it's going well.

Make sure you find a good blues club in Chicago, it was one of the best nights out I've ever had - pity I can't remember the name of the club - but sure the hotels or that guide book will have some details.

All is fine here as far as I can tell, Fletchers seem to be cracking on and doing well, Ministers seem happy and most people seem focussed on Land Remediation issues than our bit - there are no significant queries coming though - which says to me, they're all confident that we can be left alone now to get on and deliver. So stage 1 accomplished.

Catch you when you get back.

9(2)(a)

-----Original Message-----

From: Hugh Cowan [mailto:hacowan@eqc.govt.nz]  
Sent: Friday, 22 October 2010 9:08 a.m.  
To: 9(2)(a)  
Subject: RE: CE001 - PM

Thanks, 9(2)(a) My trip is going well. Productive meetings without exception so far. With 9(2)(a) today meeting loss modeling experts at Aon.

Even met an old acquaintance on 'our' team, from my days in Latin America. Small world. Cheers Hugh

--- original message ---

From: 9(2)(a) <9(2)(a)@med.govt.nz>  
Subject: RE: CE001 - PM  
Date: 21st October 2010  
Time: 2:59:20 pm

No worries, being dealt with.

-----Original Message-----

From: Hugh Cowan [mailto:hacowan@eqc.govt.nz]

Sent: Friday, 22 October 2010 8:05 a.m.

To: 9(2)(a)

Subject: FWD: CE001 - PM

Hi 9(2)(a) grateful if you would acknowledge this in my absence. Cheers Hugh

---

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9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 22 October 2010 9:08 a.m.  
**To:** 9(2)(a) @ MED  
**Subject:** RE: CE001 - PM

Thanks, 9(2)(a) My trip is going well. Productive meetings without exception so far. With 9(2)(a) today meeting loss modeling experts at Aon. Even met an old acquaintance on 'our' team, from my days in Latin America. Small world. Cheers Hugh

--- original message ---

**From:** '9(2)(a)' <9(2)(a)@med.govt.nz>  
**Subject:** RE: CE001 - PM  
**Date:** 21st October 2010  
**Time:** 2:59:20 pm

No worries, being dealt with.

-----Original Message-----

**From:** Hugh Cowan [mailto:hacowan@eqc.govt.nz]  
**Sent:** Friday, 22 October 2010 8:05 a.m.  
**To:** 9(2)(a)  
**Subject:** FWD: CE001 - PM

Hi 9(2)(a) grateful if you would acknowledge this in my absence. Cheers Hugh

---

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[REDACTED]

---

**From:** Hugh Cowan  
**Sent:** Friday, 22 October 2010 8:05 a.m.  
**To:** [REDACTED] @ MED  
**Subject:** FWD: CE001 - PM  
**Attachments:** CE001 - PM

[REDACTED] grateful if you would acknowledge this in my absence. Cheers Hugh

9(2)(a)

---

**From:** 9(2)(a)  
**Sent:** Thursday, 21 October 2010 4:57 p.m.  
**To:** Hugh Cowan  
**Subject:** CE001 - PM  
**Attachments:** Attachment withheld under 9(2)(i)

Hugh,

Attached 9(2)(i) invoice for bid evaluation week

Please do not hesitate to contact me if we can be of further assistance

kind regards

9(2)(a)

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9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 22 October 2010 4:16 p.m.  
**To:** 9(2)(a)  
**Subject:** RE: Deep Fault Drilling Project update

Hi 9(2)(a) just to confirm that I will be pleased to meet on my return. Also, I recently enjoyed meeting a Stanford contemporary of yours, 9(2)(a), at NSF. See you soon. Hugh

--- original message ---

**From:** 9(2)(a) <9(2)(a)@vuw.ac.nz>  
**Subject:** Deep Fault Drilling Project update  
**Date:** 21st October 2010  
**Time:** 9:35:48 pm

Dear DFDP colleagues,

Since we distributed the second Deep Fault Drilling Project, Alpine Fault, newsletter in early September, there have been several exciting developments regarding DFDP that we would like to bring to your attention.

Royal Society of New Zealand Marsden Fund support for two DFDP-related proposals Late last month, the Royal Society of New Zealand announced Marsden Fund support totalling NZ\$920k for a 1.5 km Alpine Fault borehole ("DFDP-2"). The proposal was submitted by 9(2)(a) (GNS Science) and 9(2)(a) (Victoria University of Wellington) on behalf of colleagues at seven organisations. Separate Marsden funding of NZ\$300k for a fault zone guided wave study at Gaunt Creek led by 9(2)(a) (University of Auckland) was announced at the same time.

As background for overseas colleagues, the Marsden Fund supports innovative research across the academic spectrum and this year awarded funding totalling NZ\$60m (~US\$45m) for 102 research projects. The application process is highly competitive, with a success rate this year of only 9.4%, so we are very happy to report that two DFDP-related proposals were successful.

Planning for DFDP-1 at Gaunt Creek

Meanwhile, technical, financial, and logistical planning for drilling at Gaunt Creek in early 2011 continues. The tendering processes for drilling and logging contractors commenced in September and an application for a long-term Department of Conservation concession has been publicly notified. Time is of the essence now in finalising contractual and technical plans so that drilling can commence in late January. Funding has been committed by GNS Science, the University of Bremen, the National Environmental Research Council (UK, via the University of Liverpool), and the universities of Auckland, Canterbury, Otago, and Victoria.

DFDP-2 planning and aligned funding applications The announcement of Marsden Fund support of DFDP-2 provides a firm basis for further technical planning, but additional funding will be required to enable the borehole to be designed and used to full scientific advantage. With that in mind, preparations are being made for an application to ICDP in mid-January for additional funding; that application will need to contain technical plans and pricing information, and a draft will be completed by early December and the AGU Fall Meeting.

Input from researchers interested in contributing to DFDP-2 planning is very welcome, and we would particularly encourage researchers outside New Zealand to consider submitting (or resubmitting!) proposals to local/national funding agencies in support of the project. Researchers interested in participating in the DFDP-2 project should contact Rupert Sutherland 9(2)(a) or 9(2)(a) as soon as possible.

Best wishes; enjoy the weekend,

9(2)(a) [redacted] on behalf of the [redacted] team. Released under the Official Information Act 1982

9(2)(a) [redacted]

School of Geography, Environment, and Earth Sciences Victoria University of Wellington P.O. Box 600 Wellington  
6140 New Zealand

9(2)(a) [redacted]

ph. 9(2)(a) [redacted]  
fax. [redacted]

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Saturday, 23 October 2010 7:02 p.m.  
**To:** 9(2)(a)  
**Subject:** RE: EAG Letters of Engagement

Hi 9(2)(a) acknowledging your email from Chicago. Glad to hear things are progressing well. I have not had time to review attachments yet. Re sign off for invoicing my suggestion is to seek Ian's approval directly in my absence, especially since you will be seeing him on Wednesday. By all means please forward this note to Ian together with any additional explanation necessary for him to understand scope and purpose. I did brief him before leaving and I have also drawn up a provisional supplementary budget for my areas of responsibility for board approval, against which this work will be drawn. Regards for now, Hugh

--- original message ---

**From:** '9(2)(a)' <9(2)(a)>  
**Subject:** RE: EAG Letters of Engagement  
**Date:** 22nd October 2010  
**Time:** 10:06:15 pm

Apologies, Hugh - I forgot to attach the overall budget spreadsheet

**From:** 9(2)(a) [mailto:9(2)(a)]  
**Sent:** Saturday, 23 October 2010 16:03  
**To:** Hugh Cowan (hacowan@eqc.govt.nz)  
**Subject:** EAG Letters of Engagement

Hugh

Further to my earlier email, and with apologies for bothering you with more detail, I'm also belatedly working on the letters of engagement for the EAG members, as we hopefully cover off the liability issues.

Attached is an updated draft of my letter of acceptance of your original letter, covering off the wider budget of the Group (greater than originally estimated, including my time inputs); a further developed terms of reference for the Group (which I propose to incorporate within the individual letters), and a draft letter to each of the consulting members of the Group.

These letters can't be completed as yet until the liability issues are fully covered off, I need to get these out by the end of this week to enable invoicing by 31 October.

As you will still be away at this time, who would you wish to be approving and signing on your behalf?

Many thanks

9(2)(a)

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Sunday, 24 October 2010 12:44 p.m.  
**To:** 9(2)(a)  
**Subject:** RE: DARFIELD EQ Catch up asac

Hi 9(2)(a) thanks for the update. I am still abroad and will be back in office 1 Nov. Only blackberry for now so wont elaborate but happy to catch up on return. You could liaise with 9(2)(a) and set a time. Cheers hugh

--- original message ---

**From:** "9(2)(a)" <9(2)(a)>  
**Subject:** DARFIELD EQ Catch up asac  
**Date:** 23rd October 2010  
**Time:** 6:22:34 pm

Hugh

It has been a couple of weeks since we talked. Where in the world are you now? Back home?

I am having a week off from MCDEM matters, including MCDEM e-mails and telecoms. I return to work Fri pm. However, I'm at home on NZSEE matters and am available through the e-mail and phone number below.

For you information I have put some time (days) into helping T+T (9(2)(a)) reconcile the T+T Stage I Report with the NZ GEER (9(2)(a)) report. I reviewed both last weekend. From interactions with T+T it emerged they think they can't use the 'restricted - not-for-profit' post eq remote sensing images/data (GeoEye, High Res ms verticals, LiDAR, and the Pre- Post- dLiDAR). Because of my negotiations with NZAM, AAM, and NZDF, I can help resolve this as from the NCMC I ensured the imagery was acquired to assist both Response and Recovery. Reasonable (not-for-profit) conditions apply.

Last Fri 15 I had catch ups variously with EQC (Ian, 9(2)(a)), and with 9(2)(a) and 9(2)(a).

Can you and I have a catch up, at your convenience?

9(2)(a)

9(2)(a)



9(2)(a)

**From:** Hugh Cowan  
**Sent:** Wednesday, 27 October 2010 4:03 p.m.  
**To:** 9(2)(a)  
**Subject:** RE: NZSEE

Hi 9(2)(a) I am at the tail end of a US trip and back in office next Monday. Will catch up for a coffee soon. Cheers  
Hugh

--- original message ---

**From:** "9(2)(a)" <9(2)(a)>  
**Subject:** NZSEE  
**Date:** 26th October 2010  
**Time:** 8:46:13 pm

Greeting Hugh

While I appreciate that you have undoubtedly been totally consumed by the events in Christchurch, I felt it appropriate to catch up on progress for an NZSEE tour and the preparation of appropriate papers for the NZSEE journal.

Please advise if I can be of any assistance in achieving these outcomes prior to Christmas.

Regards

9(2)(a)

9(2)(a)

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DDI 9(2)(a) M 9(2)(a)

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9(2)(a)

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**From:** Hugh Cowan  
**Sent:** Wednesday, 27 October 2010 12:51 p.m.  
**To:** 9(2)(a)  
**Subject:** RE: Engineering Advisory Group for Canterbury event

Hi, and thanks for the reassurance! I will show up for work, dont worry :)

--- original message ---

**From:** "9(2)(a)" <9(2)(a)@egc.govt.nz>  
**Subject:** RE: Engineering Advisory Group for Canterbury event  
**Date:** 26th October 2010  
**Time:** 5:25:45 pm

Your phone must be on US time - your calendar in the office shows Monday, 1 November. Get plenty of rest and sleep in the weekend and shake off any cold that might be coming on because things are pretty full on here and you won't be allowed to stay away!! - P :)

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Wednesday, 27 October 2010 12:20 p.m.  
**To:** 9(2)(a)  
**Subject:** RE: Engineering Advisory Group for Canterbury event

Hi 9(2)(a) just checking on the timing of a meeting of the Engineers advisory group. It appears on my phone as Sunday 31 Oct. Is that correct? Seems unusual. Is all ok? If correct, could you please let 9(2)(a) know. Thanks :)

--- original message ---

From: "9(2)(a)" <9(2)(a)@eqc.govt.nz>  
Subject: Engineering Advisory Group for Canterbury event  
Date: 26th October 2010  
Time: 5:03:10 pm

Hi 9(2)(a)

Further to my telephone call, I attach:

- Hugh's letter to 9(2)(a)
- 9(2)(a) acceptance
- Suggested letter to prospective consultant members of group
- Suggested Terms of Reference

9(2)(a) has said that although it's not crucial to get the letter out to the prospective members immediately, he'd like to be able to give them some assurance on terms of engagement on Friday, which includes something in respect of waiving liability.

We'd appreciate your advice.

Regards

9(2)(a)

9(2)(a)

9(2)(a) | Earthquake Commission (EQC)

Majestic Centre | 100 Willis Street | P O Box 790 | Wellington

9(2)(a) | Email: 9(2)(a)@eqc.govt.nz

9(2)(a)

---

**From:** Hugh Cowan  
**Sent:** Thursday, 28 October 2010 5:27 p.m.  
**To:** 9(2)(a)  
**Subject:** FWD: RE: Reminder: Working group 2 teleconference (Community Resilience 3-4pm today - Thursday 28 Oct)  
**Attachments:** RE: Reminder: Working group 2 teleconference (Community Resilience 3-4pm today - Thursday 28 Oct)

Hi 9(2)(a) I am not sure if you are on this mailing list but the cover note reference to risk communication and affected communities caught my eye. I have not attempted to open the attachment. Regards Hugh

9(2)(a)

**From:**

9(2)(a)

**Sent:**

Thursday, 28 October 2010 12:17 p.m.

**To:**

9(2)(a)

9(2)(a)

Hugh Cowan; 9(2)(a)

9(2)(a)

**Subject:**

RE: Reminder: Working group 2 teleconference (Community Resilience 3-4pm today - Thursday 28 Oct)

**Attachments:**

Responses notes.doc

Hi all,

Draft results of my in-depth, qualitative interviews and observations with individuals and community groups in Avonside, Richmond, Bexley and Halswell attached...These results are still **very rough** so keep that caution in mind. Be very interested in hearing what others have found.

Heaps of more contentious stuff not included here about poor communication; differences in the experiences of HNZ, owners and tenants; and upcoming challenges around remediation and future land uses. Also, varied 'resilience' across the different neighbourhoods.

Will try to dial in today.

Regards,

9(2)(a)

9(2)(a)

**Faculty of Environment, Society and Design**

P O Box 84  
Lincoln University 7647  
Christchurch, New Zealand

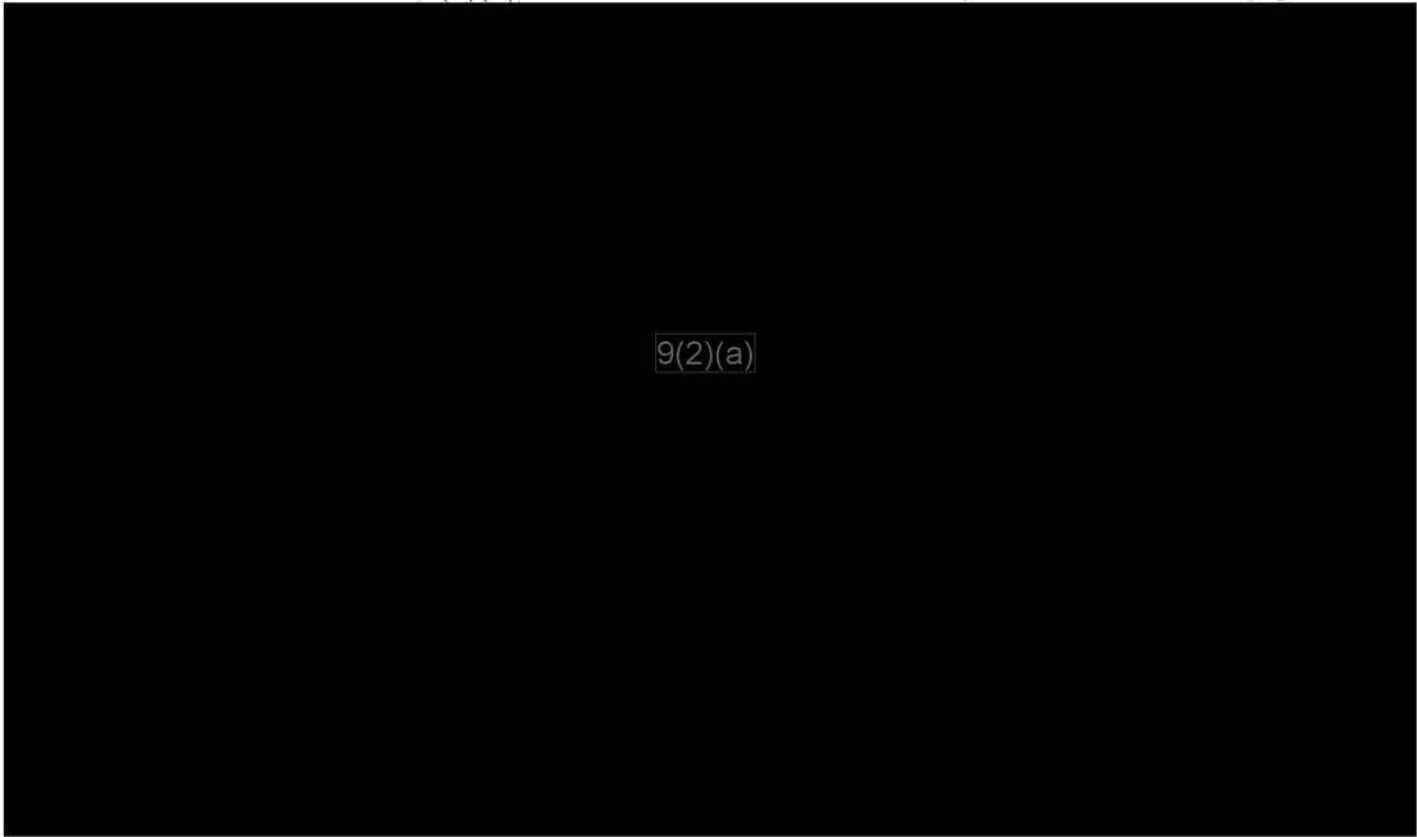
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e

w [www.lincoln.ac.nz](http://www.lincoln.ac.nz)

**Lincoln University, Te Whare Wanaka o Aoraki**  
*New Zealand's Specialist Land Based University*

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**From:** 9(2)(a)  
**Sent:** Thursday, 28 October 2010 10:11 a.m.  
**To:** 9(2)(a); HACowan@eqc.govt.nz;



9(2)(a)

**Subject:** RE: Reminder: Working group 2 teleconference (Community Resilience 3-4pm today - Thursday 28 Oct)

Hi 9(2)(a)

Are we part of this group? I am just a bit confused about how it works.

Also, could you please email me the spreadsheet of ChCh earthquake research projects.

Cheers

9(2)(a)

---

**From:** 9(2)(a) [mailto:9(2)(a)@gns.cri.nz]  
**Sent:** Thursday, 28 October 2010 9:00 a.m.  
**To:** 9(2)(a); HACowan@eqc.govt.nz;  
9(2)(a)



9(2)(a)

**Subject:** Reminder: Working group 2 teleconference (Community Resilience 3-4pm today - Thursday 28 Oct)

Canterbury Earthquake: Social science research

Just a reminder that there will be a catch-up for Working Group 2 (Community Resilience) today at 3-4 pm via teleconference.

Basic agenda

1. Update on research currently underway (or proposed)
2. Update from those in Canterbury

Instructions for dialling in are:

Dial the access number: 08 30 33

Put in the pin: 9(2)(a)

Regards

9(2)(a)

9(2)(a)

GNS Science  
1 Fairway Drive, Avalon  
PO Box 30368  
Lower Hutt  
New Zealand  
<http://www.gns.cri.nz/services/hazardsplanning/>

Ph: 9(2)(a)

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Christchurch Residents' Responses to the Christchurch Earthquake:  
Draft Notes ( [REDACTED] Lincoln University)

**'Reaction'**

Pre-cognisant:

Screaming, running blindly...

'I just held on for dear life'

'Somehow I was on my feet and running'

Semi-cognisant:

'He [husband] could have been dead on the floor but I would have stood on him trying to get to Nell [daughter]'

'I was somehow awake and on my way to the kids room before I even knew what was happening, but I couldn't walk properly'

'I tried to get to a doorframe but the dogs were in the way. Lucky I didn't get there because it was a glass door with the big glass windows right beside it'

Cognisant

'I knew straight away it was an earthquake and tried to crawl to the doorframe but couldn't'

'I just stayed in bed and held her [girlfriend]'

'I didn't move, I just waited to see if I could hear the house falling'

**'Response' part a (4.37-4.40am)**

Those without electricity hunted for a torch or cell phone (as a light source)

'Got some clothes on'

'Got under a table'

'Went to the doorframe'

'Lay there wondering what to do, listening'

'Ran outside, then ran in again. Then out again. I didn't know what to do'

'Stayed inside' because they were near the river and heard water running outside.

Those who had other people or pets in the house checked on them.

**'Response' part b (4.40-daylight)**

Not badly affected

First-aid

Left because they were scared of a tsunami

Called friends and family

'Checked the house'

'Found the dog'

Went outside and sat in the car or talked with neighbours

Had breakfast.

A surprising number (mostly men) went back to sleep.

Badly affected

'Scrambled' to find a safe place, who to call, 'what the hell is liquefaction and is it dangerous'

How bad is this? Are we (and surrounding neighbours) better or worse off? Who will help us? Who do we call (and how)?

Can we stay here? Is it safe? Will it get worse? Will the ground just swallow us up?

### **Saturday**

Cleaned up the mess – some messes just ‘too big to handle’.

Checked the house

Went to see or stay with friends or family

Went out looking around the neighbourhood

Tried to get supplies (water)

Tried to find out what to ‘do’ via cell phone or neighbours (those with no power), radio or television (‘do’= get water, go to the toilet, cook)

Pulled chimneys down (and other minor repairs)

**Sunday onwards**, Two groups: a) those who suffered little damage and b) those who still face on-going problems.

### Group A: Little Damage

Almost feel they are almost ‘back to normal’. They rarely - if ever - check geonet, have stopped ‘planning’ for earthquakes and are starting to raid their emergency kits.

Another smaller mostly female group are still very anxious; they cannot sleep or refuse to sleep in their own homes and hate being alone. Only one person had called the helpline (about her 3 year old daughter’s behaviour). There does not seem to be a clear relationship degree of damage to home (or person) and anxiety levels. Some of those who suffered no ostensible damage still feel very scared but also guilty about wanting help because they think others have lost much more.

### Group B: Physically (house, infrastructure or personal injury) affected.

Waiting patiently

Waiting impatiently

‘Can’t leave, but can’t stay either’.

Organising and participating in communal response\*

\* This is forming the next stage of my research – far more controversial and less easily analysed. I’m currently working with community groups and individuals in Avonside, Richmond, Halswell and Bexley, conducting on-site, in-depth interviews (and possibly a focus group), attending group meetings etc.

### **Analysis**

#### Preparedness

There is a very large difference between ‘preparedness’ and ‘being prepared’.

Hardly anyone had a fully stocked emergency kit + papers and documents + food and water for 3 days BUT people were very resourceful, using cell phones as a torch and camping equipment to boil water and cook. The most common preparedness adaptations are storing water and getting a working torch and radio.

Many have not prepared an emergency kit and do not intend to because a) the EQ actually confirmed they can cope quite well for a couple of days or b) if it was so bad they couldn’t cope for a couple of days they would ‘need a gun rather than an emergency kit’.

### Risks

Physical harm (e.g. chimneys) from EQ damage. Many spent the week after the EQ repairing minor damage with dismantling chimneys and getting doors and windows to shut/lock being the most common concerns.

Health (contamination). Advice about boiling the water did not get through in a timely fashion or in a way that made sense (for how long or how to boil water for three minutes when the jug switches off automatically). Advice about not flushing toilets was often simply ignored. People were happy so long as 'it' disappeared. Another sometimes overlooked health hazard arose when people were clearing contaminated silt and soil.

Well-being. There seems to be little relationship between degree to which people were affected in a tangible way (injury, damage to house) and levels of anxiety. Some who have been very badly affected (especially in terms of property) are showing incredible levels of resilience and innovation. Others are suffering badly with uncertainty around remediation, communication with council and EQC, ongoing health and infrastructure issues causing severe anxiety (despite some very brave appearances). Difficult for lay-people to understand geotech reports and the implications it has for them personally. More positively, many report improved neighbourly relationships.

Communication. Those badly affected have been given little information that they can use or understand, misinformation and sometimes even conflicting information! This problem has become an important part of the second stage of my research with residents in badly affected areas. The way information is delivered, as well as the content of the information is important.

### **Conclusions**

Add rubber gloves and masks to standard emergency kits (they double up anyway for first aid and flu). Add plastic bags (for faeces) to the list or suggest emergency kit items are kept in sealable bucket which can double as a toilet if you don't have a back yard to dig a hole in. Advice about 'what to do with your poo' was inadequate. People would be more likely to use a port-a-loo if it were 'theirs' rather than out on the road with '100 other bums on it'. Peg reminders to restock kits with daylight savings advertisements (much like the fire alarms).

Work with 2 degrees, Vodafone, telecom and other mobile companies to see if people can register for 'alerts', tsunami warnings and emergency updates.

'Triangle of life' versus 'stop drop and hold'? The 'triangle of life' has too much traction. Why should we just 'stop drop and hold'?

Some information is best delivered face-to-face and people are relying on word or mouth rather than websites for some news. Port-a-loo drivers are dispensing advice to those in sewerage-affected areas along the lines of 'if it's not bubbling up in your lawn, use your own toilet'. Minimally these drivers could be briefed to provide more useful – or at least not dangerous - advice. Generally, the content and complexity of each message should determine the means of its transmission. Neighbourhood

meetings appear to be working very well, but their success depends on the will and commitment of both residents and experts.

With appropriate caveats about liability, publish a list of signs to look for to see if a structural engineer should look over a house (particularly re shifting on, or cracking of, foundations). There is a sense that others are 'worse off' so people are just waiting to call an engineer or EQC; 'Who should I call? An engineer from the yellow pages?'. Some others are worrying needlessly about superficial cracking. References to a website may not be the ideal way to convey this information. Again, neighbourhood level meetings might be more costly, but more cost-effective in the long-term.

#### Connecting recovery and development.

Connect recovery with long-term risk avoidance: Some areas, though structurally sound, are marginal in terms of marketability. This combined with the likelihood of another earthquake or tsunami should inform decision-making.

Build cultural capital. Exemptions from building consent have shown some of these to have been unnecessary in the first place. Many people were perfectly capable of taking down their own chimneys and it was fortunate that we have remnants of a DIY culture in place. Similarly, our fondness for outdoor recreation and camping provided an abundance of experience such as being without electricity and cooking on a gas cooker or bbq.

First-point of contact outside the home was usually neighbours. Build 'community spirit' before it is needed. Build on and strengthen the goodwill built at neighbourhood level (rather than, or in conjunction with, city-wide strategies). Public recognition (if not appeasement) of the wishes of newly-formed community groups may serve longer-term aspirations around community involvement and broad participation as well.

People forget fast – it is has to be someone's job to remember. CDEM have been very good in many ways but the recovery process could align better with longer-term strategies such as the GCUDS, the city's revitalisation programme and LTCCPs. The 'chimneys to low-pollution heaters' is a good initiative (though it raises important questions about the resilience of what, to what) and there will be other opportunities along these lines. City planners and staff members of the planning school (at Lincoln University for example) are already familiar with many of these issues and there are many opportunities there for collaboration (student projects, knowledge of overseas trends, student labour!).

Resilience of what to what? As in the example above of connecting the removal of chimneys to low-pollution heaters, sometimes 'specified resilience' comes at a cost of 'general resilience': widespread conversion to heat pumps, for example, would be an absolute disaster under the conditions of massive infrastructural failure mid-winter. The connections between specified and general resilience need to be understood better.

Some people are not going to be able to move on from this for a very long time, if ever. Long-term recovery strategies, particularly for those in affected areas, have to be

developed collaboratively with people in those areas. Many already feel that the rest of the city is fixed whilst they still battle for basic services and facilities.

Other issues:

Housing New Zealand clients, tenants, elderly and those with children face additional problems. Those who now face 2 or more years of uncertainty and reconstruction/remediation face a range of extra problems as well.



9(2)(a)

---

**From:** Hugh Cowan  
**Sent:** Thursday, 28 October 2010 2:09 p.m.  
**To:** George Hooper  
**Subject:** RE: FW: EAG Timeline (hugh)

Thanks for the update George, and for your help around this. I would like to think that this issue partly arises from a misunderstanding of the role that EQC must play in order to get certain things done, for itself and for the wider community. Wish you a safe trip. Hugh

--- original message ---

From: "George Hooper" <9(2)(a)>  
Subject: FW: EAG Timeline (hugh)  
Date: 27th October 2010  
Time: 5:26:43 pm

Hugh,

9(2)(h)



We can discuss when you get back

Bets regards

George

Recovery Liaison

NZ Earthquake Commission

Phone: 9(2)(a)

Email: <mailto:9(2)(a)> 9(2)(a)

---

From: George Hooper [mailto:9(2)(a)]  
Sent: Thursday, 28 October 2010 12:10 p.m.  
To: 9(2)(a)  
Cc: 'Hugh Cowan'  
Subject: FW: EAG Timeline

9(2)(a)

9(2)(h)



Sincerely

9(2)(a)

Recovery Liaison

9(2)(a)

---

**From:** Hugh Cowan  
**Sent:** Thursday, 28 October 2010 5:41 p.m.  
**To:** 9(2)(a)  
**Subject:** RE: IOF 1st Quarter Report

Hi 9(2)(a) I am in the US and back in my office next Monday. I am happy to accept the report as a basis for invoicing of completed milestones but I cannot easily read it on my phone. Cheers Hugh

--- original message ---

**From:** "9(2)(a)" <9(2)(a)@gns.cri.nz>  
**Subject:** IOF 1st Quarter Report  
**Date:** 27th October 2010  
**Time:** 10:33:31 pm

Hi Hugh -

Please find attached a draft IOF 1st quarter report, for your review - sorry for the delay in getting it to you. I would ideally like to send the associated invoices out tomorrow (i.e. before end of October) - please can you confirm whether you are happy for me to do so?

Many thanks,

9(2)(a)

.....  
9(2)(a)

9(2)(a)

GNS Science

PO Box 30368, Lower Hutt 5040, New Zealand

D 9(2)(a), 9(2)(a), M: 9(2)(a)

[www.gns.cri.nz](http://www.gns.cri.nz)

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9(2)(a)

**From:** Hugh Cowan  
**Sent:** Thursday, 28 October 2010 11:35 a.m.  
**To:** Reception3  
**Subject:** RE: Msg from 9(2)(a) at Conferenz

Hi, I will be in my office next monday and will respond at that time. Thanks, hugh

--- original message ---

**From:** "9(2)(a)" <9(2)(a)@eqc.govt.nz>  
**Subject:** Msg from 9(2)(a) at Conferenz  
**Date:** 27th October 2010  
**Time:** 4:20:28 pm

Hugh Cowen,

9(2)(b) from Conferenz called following an invitation email she sent through last week. She would like to see if you are able to attend the conference Feb next year,

The conference is to do with emergency management and will be held with Civil Defense.

Can you please call 9(2)(a)

Thank you,

9(2)(a)

Reception.

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Thursday, 28 October 2010 10:13 a.m.  
**To:** 9(2)(b)(ii)  
**Subject:** RE: Sea Level rise

Ok 9(2)(a) catch you soon. Limited to blackberry, hence brevity. Regards hugh

--- original message ---

**From:** "9(2)(a)" <9(2)(a)>  
**Subject:** RE: Sea Level rise  
**Date:** 27th October 2010  
**Time:** 2:33:34 pm

Hi Hugh, That was a quick response from across the sea! EQC seem to have new tight protocols at reception and they didn't tell me you were overseas. In fact they wouldn't even give me your email and phone DD. The call centre this morning who took the call gave me your email and cell phone number which was interesting! I appreciate they are run off their feet what with Ch'Ch earthquake so I understand.

9(2)(a) and I had hoped to get this chapter sorted by end of week (he has just left CCRI to go to AgResearch to run the Global GHG Alliance Research in Wellington for 9(2)(a) and I am taking over the next stage of the research programme from him) but I can talk to you next week and resolve how we work the reference to EQC cover and let 9(2)(a) know that. I am available Monday morning but tied up a bit till Thursday. I will call you Monday.

Thx again for responding

Kind regards

9(2)(a)

9(2)(a)

Phone: +64 9(2)(a)  
Fax: +64 9(2)(a)  
Mobile: 9(2)(a)  
Email: 9(2)(a)

Climate Change Research Institute  
School of Government, Victoria University of Wellington,  
PO Box 600, Wellington 6140  
NEW ZEALAND  
Website: <http://www.victoria.ac.nz/climate-change/>

-----Original Message-----

From: Hugh Cowan [mailto:hacowan@eqc.govt.nz]  
Sent: Thursday, 28 October 2010 8:45 a.m.  
To: 9(2)(a)  
Subject: RE: Sea Level rise

Hi 9(2)(a) sorry you were not able to reach me, I am in the US and back in the office on 1 Nov. I wont have time to respond to your questions in writing just now but would be happy to discuss on return. Would you mind asking 9(2)(a) for a short extension, I am sure he would grant that if possible. He knows I am abroad. Regards Hugh

--- original message ---

From: "9(2)(a)" <9(2)(a)>  
Subject: Sea Level rise  
Date: 27th October 2010  
Time: 1:31:09 pm

Dear Hugh, I am involved with 9(2)(a) and professor 9(2)(a) at the Climate Change Research Institute at Victoria University in a FRST funded research project on Community Vulnerability, Resilience and Adaptation to Climate Change.

As part of this we have prepared a draft chapter using Auckland case study material on sea level rise and managed retreat from our research for a book on coastal management and climate change being coordinated by 9(2)(a) 9(2)(a). In the review process 9(2)(a) at NIWA raised a couple of issues which he suggested we check with you directly.

Our understanding is that included in the natural disasters covered in the case of residential land, is storm or flood. We have assumed that this would cover such events that are associated with sea level rise. It is less clear whether sea level rise is covered. In this context given that sea level rise is a known risk although its timing and magnitude are still somewhat uncertain does this make a difference as to whether these risks are covered?

The critical issues seems to us to be that damage from storm surge events especially could be exacerbated by sea level rise. So the two questions are

- 1 Is damage from flood and storm events at the coast exacerbated by sea level rise covered by EQC?
- 2 Is incremental sea level rise causing inundation at the coast covered?

I appreciate there may not be a clear cut answer to this but it would good to discuss this. I have been trying to call you but don't seem to get past the receptionist on two occasions. We need to amend some of the wording in the chapter depending on the answer to the questions above and have a deadline of 31 October to get the draft to 9(2)(a) So I will call you a bit later and discuss with you.



Kind regards

9(2)(a)

9(2)(a)

Phone: +64

Fax:

Mobile: +64

Email:

<mailto:9(2)(a)> 9(2)(a)

9(2)(a)

Climate Change Research Institute

School of Government, Victoria University of Wellington,

PO Box 600, Wellington 6140

NEW ZEALAND

Website: <<http://www.victoria.ac.nz/climate-change/>>

<http://www.victoria.ac.nz/climate-change/>

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 29 October 2010 3:23 p.m.  
**To:** 9(2)(a)  
**Subject:** RE: Greetings from 9(2)(a)

Hi 9(2)(a) Nice to hear from you. In fact, I have just landed in LA on my way home following a work trip to the US but not the west coast this time. I will be pleased to send you some info. One site to start would be the NZ earthquake engineering site. [nzsee.org.nz](http://nzsee.org.nz). Cheers Hugh

--- original message ---

**From:** "9(2)(a)" <9(2)(a)>  
**Subject:** Greetings from 9(2)(a)  
**Date:** 28th October 2010  
**Time:** 6:34:42 pm

Hi Hugh:

I hope that you are coping well with the tsunami of data from your recent earthquake! I didn't contact you earlier in hopes of at least slightly reducing your communication burden. If there is a convenient web site for me to go to find out about lifelines effects, particularly pipelines and electric power systems, I'd appreciate your sending it when you have a chance.

I was led to retire from the USGS rather quickly this summer, due to the closing down of the Yucca Mountain Project in Nevada. I spent over 2-1/2 years on the project, and view it as one of my most successful USGS activities--I served as the USGS Seismotectonics Science Advisor for the project, reporting to the YMP Science Director, 9(2)(a). I got to use all my past history with nuclear power projects, as well as my recently gained understanding of government agency bureaucracies. And in addition, 9(2)(a) and I have very much enjoyed moving to and living in Las Vegas! We are continuing on there (I say "there" because we are on the Kona Coast of the Big Island of Hawaii right now for a family vacation through next week) and very much enjoy the outdoors activities, the dry and warm weather, and the artistic side of Las Vegas. The humid air in Hawaii is a bit of a shock--we have become such delicate desert flowers!

I have kept an association with the USGS, and added a volunteer position with the University of Nevada in Las Vegas. This latter activity is a new direction for me in that I'm directly working with a few students and enjoying it very much! But I do not teach any classes, apart from an occasional class lecture.

Please bring me up to date on you and your activities, when you have a chance.

Best regards,

9(2)(a)

9(2)(a)

Earthquake Science Center  
U. S. Geological Survey, Menlo Park, CA

9(2)(a) Department of Geoscience University of Nevada, Las Vegas, NV

Secure mail: 9(2)(a)

Office/mobile phone: 9(2)(a)

9(2)(a)

**From:** Hugh Cowan  
**Sent:** Friday, 29 October 2010 3:18 p.m.  
**To:** 9(2)(a)  
**Subject:** RE: Fw: 360 deg feedback for advanced leadership course

Hi 9(2)(a) just landed in LA on my way home. I will do the feedback when I get back. Sorry I could not do this sooner.  
Cheers Hugh

--- original message ---

**From:** "9(2)(a)" <9(2)(a)@gns.cri.nz>  
**Subject:** Fw: 360 deg feedback for advanced leadership course  
**Date:** 28th October 2010  
**Time:** 5:23:10 pm

Hi 9(2)(a) and Hugh

I believe two out of the three of you have already filled in the survey - thank you. If the other one would just get it done that would be great (and sorry again for the hassle).

Thank you.

Cheers, 9(2)(a)

--

9(2)(a)

Section Manager GeoHazards Monitoring  
GNS Science - Te Pu Ao  
DDI: +9(2)(a) GNS: 64-4-570 1444 Fax: 9(2)(a) Mobile:  
9(2)(a)  
1 Fairway Drive, P.O. Box 30-368 Lower Hutt New Zealand

----- Forwarded by 9(2)(a) /GNS on 29/10/2010 13:20 -----

9(2)(a) /GNS  
14/10/2010 13:53

To  
9(2)(a) Hugh Cowan  
cc

**Subject**  
360 deg feedback for advanced leadership course

Gentlemen

I will start an advanced leadership course next month (at short notice), and for this I need to ask a group of people to do an online (360) survey on ME.

I know you are all very busy people, so I apologise for having to ask you to do this (you guys work most directly with me outside GNS Science), but I would be grateful if you could take the time.

You will be contacted by the survey people (HayGroup).

Thanks in advance.

Cheers, 9(2)(a)

--

Dr 9(2)(a)

9(2)(a)

Section Manager GeoHazards Monitoring

GNS Science - Te Pu Ao

DDI: 9(2)(a) GNS: 64-4-570 1444 Fax: 9(2)(a) Mobile:

9(2)(a)

1 Fairway Drive, P.O. Box 30-368 Lower Hutt New Zealand

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9(2)(a)

**From:** Hugh Cowan  
**Sent:** Sunday, 31 October 2010 2:20 p.m.  
**To:** 9(2)(a)  
**Subject:** RE:

Hi 9(2)(a) thanks for the update. I will be in the office tomorrow and will give attention to your request with urgency. No promises before then but I appreciate the circumstance and will see what may be possible. Regards Hugh

--- original message ---

**From:** 9(2)(a) <9(2)(a)@massey.ac.nz>  
**Subject:**  
**Date:** 31st October 2010  
**Time:** 2:08:05 pm

Dear Hugh,

I have been trying to call you in your office in Wellington earlier this week, but I was told that you are away until mid next week.

I am writing to you in regard to the pyroclastic flow disaster at Gunung Merapi this Tuesday, where blast-type pyroclastic density currents travelled down the Kali Gendol valley, then avulsed from the channel onto overbank areas between 3.5 and 6.5 km from the summit crater to destroy large parts of Kali Adem and to cause at least 33 casualties.

9(2)(a) is in Korea at the moment and he asked me to enquire EQC about the possibility of supporting an immediate response trip to Indonesia as a follow-up visit to our studies of the 2006 pyroclastic flows. The pyroclastic flow model, which we derived during the course of this last EQC-funded research campaign, allowed us not only to firstly model how, where and when this type of hazardous escape of pyroclastic flows from channels occurs. In fact, we also modeled the locations and estimated magnitudes of future valley-escaping events, such as that, which occurred last week.

There is a unique albeit short time-window now at the start of the rainy season for quantifying important fluid-dynamical and sedimentary parameters of the valley-escaping surges and the parental valley-confined flows. These parameters constitute the essential flow-dynamical data, which would allow us, in conjunction with the 2006 data, to derive a universal model of pyroclastic flow avulsion. Such a model could then be applied world-wide to identify potential pyroclastic flow avulsion sites and to quantify the effects and probabilities of these types of events.

In Indonesia, we already are in contact with our colleagues from the Indonesian Volcanological Survey (CVGHM) with whom we collaborate since 2007 through a MOU. Over the last five days we have also been discussing with our overseas colleagues from the Universities of Buffalo, USA, and Blaire-Pascal, Clermont-Ferrand in France how we can jointly support our Indonesian colleagues with on state-of-the-art hazard model of pyroclastic flow avulsion from channels.

I am in Wellington at a conference from 1.-3.11 and I was wondering whether there is a chance to discuss with you and explain thoroughly the objectives of such a rapid-response visit for current NZ-based research and for probabilistic hazard forecasting at Taranaki and Ngauruhoe. I give you my cell phone number 9(2)(a) as I might not be able to check emails regularly while in Wellington.

We would be glad if you could assist us in this enquiry, and I am looking forward your response, With all the best wishes, 9(2)(a)