

Large scale investigations

- Development & implementation of complex methodologies

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Introduction

New Zealand has provided a number of recent examples where large urban areas have required investigation. These areas create a number of challenging obstacles to overcome and highlight the need for early planning and regular communication with stakeholders.

These investigations can be difficult to plan and may require the use of a number of different techniques to collect and collate useful data for decision makers.

Framed around two recent examples of large-scale projects where large amounts of data have been collected. This paper looks at the importance of:

- planning an investigation from an early stage;
- development and use of different methodologies including questionnaires and interviews;
- collating large quantities of data;
- the importance of talking to people to gain relevant information; and
- regular communication with clients and stakeholders; and
- lessons learnt

Case Study 1: LDAT Team Christchurch

Following the events of 4 September 2010 in Christchurch the EQC quickly had to expand their team of assessors from 29 full time staff to over 1300. The Land Damage Assessment Team or LDAT was rapidly formed, managed by Tonkin and Taylor. The LDAT team ultimately pooled more than 400 specialists from 39 consultancies to provide and report on assessments for over 65,000 Christchurch and Kaiapoi properties from September 2010 to December 2011.

Rapid broad scale assessments were undertaken in the days following the quakes using aerial photographs, LIDAR¹ data and on-ground damage reporting. This information helped to create the first versions of the damage maps. Mapping of the severity of land damage determined the areas that needed more detailed individual property inspections (T&T, 2012). These provided the primary targets for the first of the LDAT teams on the ground. The teams then progressively moved outwards. Eventually LDAT teams were dispatched across the whole of the city, and on any given day 40 to 45 teams could be found anywhere from North New Brighton to the Port Hills.

The LDAT team modified an original EQC form to a more detailed site assessment questionnaire to ensure the correct information was collected. In the following months this questionnaire underwent three major changes. The primary reasons for these changes were that the role of the land assessor and the way the information was to be used became more defined, and minor changes were made to provide more consistent information. Land and limited building damage information was collected. Template questionnaires/forms included the types of land damage identified for the Plains and for the Port Hills. In addition a site plan containing a recent aerial photograph was used to sketch the location of any observed land effects for each individual property.

EQC LDAT assessed properties in the affected areas based on physical address, regardless of whether there was an EQC claim lodged. This was done because more than 90 percent of the properties in the worst affected suburbs had lodged an EQC claim for at least one of the main earthquakes. It was, therefore more efficient to assess properties by going house-to-house, rather than only inspecting properties around Christchurch once a claim for land damage was received by EQC (T&T, 2012).

Teams of two were given a list with a number of properties on a particular street to visit each day. No appointments were made with the residents and assessors were expected to enter all the properties on the list without prior warning. This meant that it was important that the assessors were well mannered and well informed. Reactions of the

¹ LIDAR - Light Detection And Ranging. This technology uses ultraviolet, visible, or near infrared light to image objects and measure distance. Typically the laser sensor is mounted on a plane (or satellite) and flown over the target area. The sensor emits a light beam and records the returned signals. The differences in each signal's return time, signal strength, and x, y, z co-ordinates are captured for later data processing (NZ Geospatial Strategy).

public were mixed from those that were happy to see us and very helpful to those that became upset or angry. In the case of the angry/upset sometimes you could talk to the residents calmly, explain what you were doing and why it needed to be done and undertake the assessment, other assessments had to be terminated and followed up with at a later date. There was no time constraint, most properties took around 30 minutes, however for properties that had large or multiple retaining walls, or had sustained a significant amount of damage, assessments could take longer.

There were a number of observations made during the course of this investigation:

- All staff underwent empathy training with a psychologist in preparation to handle stressed and emotional people. This included how to deal with upset and/or angry people, i.e. apologize and walk away/ stay and help if possible. There are many stories - one assessor spent the entire day with one lonely scared lady, even staying for dinner that night.
- Not all people are suited to undertake this type of work. Some assessors lacked the social skills required to handle upset owners. Often it required someone who had an approachable manner, good interpersonal and communication skills, was able to read peoples emotions, had a sound understanding of what was happening (in general), and how the information was to be used.
- Due to the large number of assessors the questionnaires had to be rigorously standardized to ensure that the right data was collected and that there was enough information on each property.
- Teams worked in pairs and this was important, not just for personal safety but also for dealing with the public. Typically one assessor would talk to the resident while the other assessed the damage.
- Assessments were peer reviewed every day and a debrief session was held at the end of each day. This meant that if any problems arose in what was being recorded, how it was recorded, or if any additional data/modification were required to the assessment sheets they could be implemented immediately.
- Aerial photographs were provided to record site features on but there were different interpretations on the detail of information required. It is essential to be specific with regard to the type of additional information that is meaningful.

The individual assessments were then peer reviewed by others in the LDAT team, before being inputted into a central database. The data from these individual assessments has since been used collectively to identify areas with liquefaction and individually for insurance purposes - close out public and private insurance claims, and carry out land repairs.

Public information during these assessments was available primarily via the internet <http://canterburyearthquake.org.nz> and media releases. We found that most of the public had received information or knew that information had been released but many were confused as to the status of their property or, if they knew the status, were confused as to what that meant for them.

We soon realized that it was worth taking the time to explain to the residents/owners how the process worked; this is where having informed and competent staff became especially important. This explanation made it easier for them to understand where we fit into the process and also let them know what could be expected with regards to other assessors and who had to look at the property (i.e. EQC had structural and land damage assessment teams and private insurers also had their own assessors).

Although the LDAT project is not related purely to contamination or contaminated land it provided a number of insights which were then taken into account when designing and undertaking the Moanataiari Project.

Case Study 2: Moanataiari

The Moanataiari Subdivision ('the site') is located just north of the Coromandel Peninsula township of Thames. The area currently consists of 212 residential properties, a primary school, a childcare center, and some industrial development on the southern fringe. This area like many others in the Coromandel Peninsula has been the site of gold mining since the late 1800s. Gold in the Coromandel is contained within quartz reefs, which are formed when volcanic rich elements are deposited within the earth's crust. These deposits are called epithermal deposits and contain elevated levels of gold, silver, arsenic, cadmium, copper, lead, and zinc. It has been confirmed from various sources that the area of the Moanataiari Subdivision was built on land that was reclaimed from the Firth of Thames.

From the late 1800s until around the early 1940s mine tailings and mullock from the local mines and stamper batteries was dumped on the foreshore. A seawall formed around these tailings was constructed as part of the Thames Harbour Board works in the 1920s. The land within the seawall continued to be reclaimed in the 1950s and 60s using weathered local rock. This second stage of reclamation was reportedly capped with clay prior to housing development.

A Ministry for the Environment (MfE) Report from 2001 identified the subdivision as been constructed from mine tailings and the author of the report identified these tailings as a potential source of contamination for the Firth of Thames. The Waikato Regional Council became aware of this report in 2006. Following this, limited soil testing was undertaken at the Moanataiari Primary School in 2007. This assessment reported that the presence of a clay cap, soil test results and healthy vegetation indicated that there was no immediate health risk to residents (WRC, 2012).

A preliminary site investigation was undertaken across the Moanataiari subdivision in October 2011 testing publically accessible land. This testing indicated that the soil contained elevated levels of arsenic, lead and antimony (PDP, 2011).

In November 2011 a public meeting was held to inform Moanataiari residents about the situation and inform them of the next steps. The council also provided health advice on how they should manage risks from potential arsenic exposure.

A request for tender to investigate the subdivision was sent out to consultants in 2011. As part of this tender there was a requirement for community liaison. To achieve this aspect of the work we made appointments to talk to each of the landowners/residents. We felt this aspect helped the land owners feel involved in the process and gave them the opportunity to have someone personally explain the process and answer any questions or concerns they had at the time. We also attended weekly community meetings to answer any technical questions that arose. This helped assure the community to feel like they were being heard, kept them up to date with how the project was progressing, and later helped when we had to explain methods of land remediation.

One of the vital parts of this project was the questionnaire/interview process. This provided the main source of information regarding how people used their property e.g.

did their children play outside, how much of their diet consisted of produce sourced from their gardens.

The questionnaire was carefully planned and structured so that all the information required from the residents was collected at one time, meaning that there was limited interruption to day-to-day living. The staff undertaking the interviews had previous experience in carrying out this type of work. They also had a good understanding of what information was required, how it was going to be used and a contact at the council to direct residents to if there were any questions that they could not answer. The first step of the interview process was spent clearly explaining to the resident the process of what was planned, why the information was required and what they could expect in the coming months.

The only additional work that was not collected at the time of the interview was related to providing an accurate percentage of ground cover. Estimates were made during the initial site visit but an additional, more accurate, number was generated using aerial photographs to estimate remedial costs.

The data collected from the interviews and questionnaires was then inputted into an excel spreadsheet so that it could be analysed.

Lesson's Learnt

LDAT

- Be specific as to the amount and type of additional information required, this can be especially important on aerial photographs/plans;
- If you are working with a large number of individuals, these individuals should undergo an assessment to ensure that they a) are competent and have a grasp of what information needs to be recorded and b) have the interpersonal skills to communicate well with both their team members and with the public. And at the very least provide a set of questions that could be asked to get any additional information;
- Having the residents/owners there was invaluable in allowing the assessor to make an accurate deduction of what had occurred on their property. It also allowed for the assessor to establish what damage had occurred inside the buildings to potential identify land damage beneath the building;

- If you are carrying out an assessment without an appointment and in the absence of the resident/owner leave a card or form saying that someone had been in to assess their property and provide links to where to find additional information. Most importantly this card could show who we were and what they could expect (we were EQC assessing the land only, there were other people around doing this and that etc. and what would happen with the information we had gathered).
- For large areas such as Christchurch, provide an updated publicly viewable map showing progress so that people could see what was happening and where we were, again, if they understood what was happening and were left in the dark as little as possible they were much more understanding towards us and our goals.

Moanataiari

- Be consistent with regard to filling in the questionnaire. In this case it was easy as there was only two people completing the forms had a clear understanding of what was required and both of the staff had previous experience in the area;
- The client had provided contact cards and a contact number so that if there were questions that the assessors could not answer or queries that arose following the interview somebody was available to answer them. We felt this helped to alleviate any concerns of the residents and provided additional support if they felt they needed it;
- It may seem like a simple investigation, but when there are over two hundred properties involved it is vital that there are good systems in place with regard to record keeping and tracking of information, budgets, and progress – be organized; and
- Community consultation from the onset of the investigation helped to ensure the residents to feel they have had the opportunity to have their say. However it is vital that as a consultant you stick to the facts and your area of expertise. It is very easy to be drawn off on tangents about unrelated topics.

Future developments

Ideally given the size and nature of the LDAT project it would have been convenient to make use of available technology e.g. to have the form section on a tablet and the sketch section done by hand. This would have alleviated the illegible writing and made it

faster for data input processes. However, in reality on a large project such as this it would have taken too long to type out the communication with the residents/owners or any of the larger handwriting sections, the assessors would have required additional training and the tablets would have required constant maintenance. The use of this type of data collection would probably only work well if prior testing had been undertaken to iron out any bugs.

Some aspects of these projects may have also been made easier if plans and aerial photographs were available in an electronic format where other features such as topographic maps, streambeds, areas could be accessed. It would have also made plans easier to decipher i.e. use of blue or black pen over dark areas, and clear annotated notes.

Producing a questionnaire and conducting interviews

When creating a questionnaire it is important to have a clear aim and objective of what information you think you require.

May only use 5% of the information that you collect, but at the outset we don't always know what information will become important.

Think about how you plan to use the data you collect, whether it will need to be transposed or analysed, these things can take significant time

The simplest method is a spreadsheet like excel. This allows data entry responses to be coded and can allow for statistical analyses quickly and simply, if required

Be careful how questions are worded and what you are asking, sometimes it is the simplest questions which may offend e.g. how long have you lived in this house?

Be careful of leading questions, assuming opinions, and vague questions.

If you are planning to undertake interviews as part of your investigation, we recommend that you consider the following:

- The population you are targeting; are they elderly, working, parents?
- The time of day;
- Number of questions;
- Number of open questions; these can take a long time to answer and can become difficult to transcribe correctly; and

- How you plan to collate and transcribe the information

Conclusion

Investigation of developed areas with a large number of residents has the advantage that there is a rich source of information available. Gathering this data in a useful and sensitive manner is a skill, and one not every contaminated land practitioner or engineer may necessarily have. Care needs to be taken in selecting the interviewers and the questionnaire methodology to ensure that the gathered data has the maximum usefulness and that the residents have the opportunity to ask questions. It is important to remember that the information exchange has to work both ways.

DISCLAIMER

Opinions expressed in this paper are those of the author and should not be taken in any way as representing the view of Tonkin and Taylor Ltd.

Appendix A: Summary table of both case studies

LDAT Christchurch	Moanataiari Subdivision
Emergency situation – questionnaire evolved over time with three major changes	Planned clearly from the onset of the project
Public were not informed prior to individual assessments.	Residents were informed prior to the assessments and an appointment was made to visit each property.
No time limits. Assessments generally took around 30 minutes dependent on the size of the property, damage and the resident	Limited time. Each assessment was undertaken in 15 minutes.
Undertaken in pairs Total team of ~400	Assessment undertaken individually Total team of 2
Reviewed every day and followed up if information was missing	Reviewed once all properties assessed – missing information was not picked up until much later.
No consultation undertaken. All information provided by public notices or the recovery website	Community consultation undertaken from the beginning

Appendix B: References

T&T, July 2012. *Earthquake Commission – Canterbury earthquakes 2010 and 2011 land report as at the 29 February 2012.*

New Zealand geospatial strategy, 2012. *Collating NZ's LiDAR data*

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CSI, June 2010. *Moanataiari Subdivision, Thames, scoping report – historical contamination review.*

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Waikato Regional Council, 2012. *Timeline: history of the subdivision and project*

<http://www.waikatoregion.govt.nz/Community/Whats-happening/Moanataiari-subdivision/>