(THEME: RESPONSE)

Seizing The Newcastle Moment: Data Collection In The Aftermath Of A Flood Event

David Gibbins1, Dr Philip Haines2, Duncan McLuckie3 and Andrew Gissing4

1 Newcastle City Council / dgibbins@ncc.nsw.gov.au

2 BMT WBM P/L / phaines@wbmpl.com.au

3 / Department of Environment & Climate Change / Duncan.McLuckie@dnr.nsw.gov.au

4 / State Emergency Service / Andrew.Gissing@ses.nsw.gov.au

ABSTRACT

Post flood data collection is critical to gaining an understanding of not only flood behaviour but the behaviour of people during a flood event, learning from the event, and examining how best to improve management of the flood risk and emergency response and recovery into the future.

The Newcastle June 2007 flood event provided an opportunity to collect a myriad of data post the event.

This paper will discuss:

- the types of data that were collected

- who was responsible for collecting the data

- the funding sources that may be able to be accessed

- establishment of committees as being keys to success

It will also consider lessons learnt out of the June 2007 event and highlight missed opportunities for data collection and make recommendations on what should occur to ensure that future opportunities are not missed.

INTRODUCTION (THE SKY FELL IN)

In the morning and early afternoon of June 8 2007 the people of Newcastle were flinging emails to each other showing photos of an amazing spectacle – a ship coming to grief on Newcastle's iconic Nobby's beach at the top of town. The main street, which never clogs – even at peak hour - became a car park. People came to see for themselves, many unaware that by early evening they would become shockingly trapped by something even less expected: a flash

flood that would see "invincible" 4WDrives and late model imported cars abandoned in the dark at crazy angles by people fleeing for their lives.

Figure 1 Trapped "out of the blue".

After the storm and flooding had ended disaster recovery was rightly the focus, but in the background some were asking questions about data collection for the Newcastle flash flooding. Here was an opportunity that must be seized, not just in the interests of Newcastle, but potentially in the State and National interest. Post flood data collection is needed to verify computer models of flood behaviours, improve knowledge about flood impacts (hydraulic, economic and on people), to enhance land use planning information and emergency planning, and to improve the community's confidence in the basis of decision making – computer flood models.

Many in State Government, Local Government, and consultancies had worked the long weekend. Council's GIS system was proving too "fiddly" for a quick start, the plan room was having difficulty finding any paper maps of the whole of Newcastle on which street names could be read, no one knew how big the flood was or completely where it had been, staff were stressed - and already data were disappearing. Traumatised people were washing off floodmarks, damaged furniture and cars were being carted away and no one was counting!

Newcastle was as unprepared for data collection post flash flood as it had been in some ways for the flash flood.

SIEZING THE MOMENT?

Stressed staff were offered to "do whatever was needed" for data collection, but there was no system. Soon some paper maps and texta colours appeared – and already it was clear there was duplication and overlaps – and frustration – exactly WHERE were the surveyors to take their levels? WHO was going to instruct them?

Unknown to Council at the time, a team of flood modellers from BMT WBM (who was already engaged in flood modelling work for Council) were also recording flood marks in some of the worst affected areas.

At the same time SES crews where collecting information through reconnaissance of damaged areas and receiving requests for assistance from the public, which provided helpful information on impacted areas.

What organisation should be responsible? Should it be Premier's Department? The SES? DOCS? Hunter Valley Research Foundation, just Council? How will the multitude of potential data sources – public and private be accessed?

All the time volatile information like water debris marks continued to disappear and truckloads of damaged household goods were being carted away.

Why wasn't all of this sorted out ahead of the flood?

POTENTIAL FUNDING SOURCES

Funding for post event data collection and associated reporting for large scale flood events has at times been made available through a subsidised grant under the State's Floodplain Management Program managed by the Department of Environment and Climate Change. This requires councils to provide a 1/3rd share of funding.

In the case of the floods in the Hunter and the Central Coast the potential to fund post event data collection under the Natural Disaster Relief Arrangements (NDRA) was examined where this was beyond the resources of councils to reasonably collect. It was agreed that collection of key data on the impacts of the event could be collected with NDRA funding (requiring no council matching funding).

A written report documenting the data collection, details, maps, evidence and sources was to be prepared. Note that the density of information collected was reduced where flood impacts were widespread.

A PATHWAY

Council, DECC and SES collaboration led to:

1. Council would collect scientific flood (Rainfall, Water level and blockages) and sample economic damages data. This would be coordinated and largely implemented through an external resource (BMT WBM P/L). Council would provide the identified water level Survey teams.

2. The SES would carry out the sample social interviews about the impacts of the flooding on people and how people responded in the emergency situations of the flash flood.

3. The sample economic data collected by Council would feed into the mix of available information on the economic impacts of flood events.

4. Council's data collection would be managed through an interagency Steering Committee comprising DECC, SES and Council, within a communication strategy prepared through Council's Communication Group.

5. At the completion of Council's data collection, as far as practicable, data would be mutually exchanged with others who had collected data, such as Premier's Department, DOCS, the Department of Health, Hunter Valley Research Foundation, and others.

IMPLEMENTING THE PATHWAY

A communication strategy was developed.

An efficient methodology for conducting the field interviews was developed, using streamlined electronic data capture and transfer methods (utilising hand held PDAs, digital photography and GPS). BMT WBM staff and Council survey staff identified flood marks through extensive field reconnaissance, spanning more than eight weeks. Council survey staff then revisited each site and registered the floodmarks to Australian Height Datum (AHD), whilst also collecting valuable surrounding level information, such as floor levels.

Questionnaires were distributed to selective residences that were likely to be within the expected flood inundation extents. Three separate questionnaires were developed covering topics of (i) physical flood behaviour; (ii) residential economic losses; and (iii) commercial economic losses. Appropriate questionnaires were distributed according to the property type and discussions held with landholders.

The questionnaires were also posted electronically on Council's web-site. Questionnaire information entered by the respondents directly populated an underlying electronic database, with spatial connectivity accessed through entering their property address.

OVERVIEW OF THE DATA COLLECTED (AT TIME OF WRITING)

Data collected on the flood event fell into three categories:

- Rainfall / meteorological data;

- Flood levels / behaviour data; and

- Economic damages data.

Rainfall / meteorological data

Meteorological data was obtained from Bureau of Meteorology and included synoptic charts and radar information collected from throughout the Hunter and Central Coast area. The radar data was compiled and mapped at specific times throughout the 24 hour period surrounding the storm event, and

an animation developed showing the variations in spatial and temporal distribution and rainfall intensity.

Rainfall data was also obtained from the Bureau of Meteorology pluviograph stations (including Nobby's Head), as well as pluvio stations operated by Hunter Water Corporation (HWC). Dr Mark Thyer from the University of Newcastle has analysed information collected from the 18 operational HWC pluvios within the Newcastle and Lake Macquarie area. As outlined further in Haines and Thyer (in prep.), the highest rainfall occurred in southern Newcastle (Merewether/Adamstown Heights) and extended south to Northern Lake Macquarie (Redhead/Croudace Bay/Belmont), with three gauges recording over 300 mm. In comparison, only about 200mm fell in other Newcastle suburbs. The majority of the rainfall occurred between 3:00pm and 8:00pm, with particularly high intensities between 4pm and 6pm.

For the 6 to 12 hour duration period, up to 10 of the 18 HWC pluvio stations recorded rainfall in excess of the 100yr ARI rainfall depths based on AR&R (1987). (Haines and Thyer, in prep.).
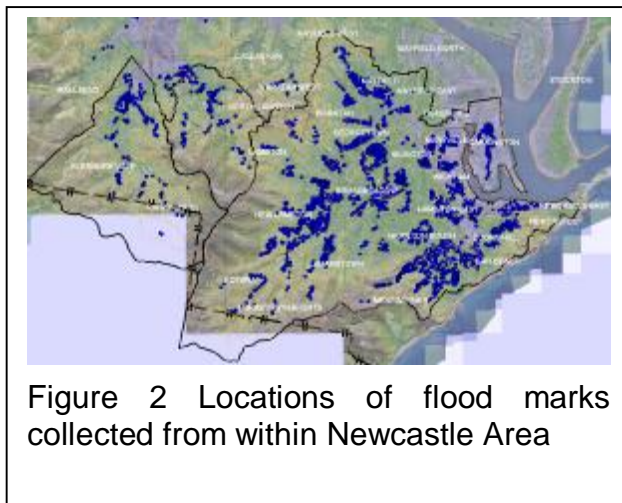
Flood levels / behaviour data

Figure 2 Locations of flood marks collected from within Newcastle Area

Approximately 1500 flood marks were collected from locations across the city (Figure 2). Most of these flood marks were observed as flood debris lines, suggesting a high degree of confidence in the marks. The rapid deployment of staff to the field immediately following the event was critical in capturing such a high number of debris lines, indicating maximum flood levels reached.

The flood marks were recorded across all flood affected suburbs of Newcastle, as field teams worked systematically from one area to the next, door knocking on houses and businesses, using existing flood maps as a guide to the locations of likely impact.

As well as peak flood levels, information was collected on flood behaviour, including flood velocities, directions of flow and timing of the flood hydrograph. Critical information was also collected on blockages within the system. Preliminary hydraulic analysis showed that blockage of critical culverts within the drainage system could have significant impacts on flood levels and extents (Haines and Thyer, in prep.). Numerous blockages were recorded throughout Newcastle City, ranging from wheelie bins to cars to shipping containers. The timing of the blockages during the flood event is important in understanding its impacts. Unfortunately, whilst some information is available

regarding blockage post event, it is near impossible to determine precisely when culverts became blocked.

Flood damages data

Economic data on flood damages was collected through the completion of questionnaires. Different questionnaires were filled out for commercial and residential properties. In total, economic data was obtained for 78 residential properties and 14 commercial properties. This return was small compared to the estimated 10,000 – 15,000 properties affected by flooding, with an estimated 1,000 – 2,000 properties experiencing over-floor flooding. It is expected that the sensitivity of personal information regarding flood losses and the tenuous nature of insurance payouts may have been factors adding to the reluctance of affected residents in completing damages questionnaires.

Information on economic losses gathered through the questionnaire process will be used, in combination with other data sources, to help define the financial consequences of the Newcastle June 07 flood. This information is currently being compiled and assessed through State Government, and is likely to be used to better cost future floodplain management initiatives across the state.

GAPS

In scoping the BMT WBM commission, it was initially hoped that more potential data sources could be explored, however, these had to be abandoned once the enormity of the effort required to collect the primary data (ie flood marks) became apparent. Examples of additional data that could not be pursued include:

- Information from the Media – sound recordings of people phoning in to radio stations describing what they experienced – and thousands of photos (>10,000) posted to media web sites.

- Detailed information of insurance claims that would have greatly facilitated sampling economic impacts.

- Detailed information from the insurance industry of the locations and damage values to vehicles (estimated 5,000 vehicles).

- Good information from Utilities (including Council) on damages to infrastructure and clean-up activities.

LESSONS LEARNT

Although each experience will be different, some lessons Newcastle Council has learnt about post flood data collection include:

- Plan for data collection in advance – just like emergency planning.

- Establish (for example by Memorandums of Understanding) roles and responsibility and data sharing arrangements between organisations – public and private.

- Have a system in place that is consistent and efficient from the start.

- Don't underestimate the complexity and effort (time and cost) to collect the data.

- Don't overlook the psychological impacts on those collecting the data.

POTENTIAL APPLICATIONS BEYOND NEWCASTLE

Significant amounts of post event flood damage data is not available, particularly for commercial premises. The data collected on residential and commercial damages will go into the mix of available data for broader considerations of the economic impacts of flood events. This may well provide some of the base data for improved knowledge of flood damages and the derivation of improved flood damage curves at some point in the future.

The SES collected data through a community survey to evaluate the community's response to storm warnings. It is quite common for the SES to conduct such surveys as part of its post flood reviews. Key learning points from the surveys are incorporated in relevant emergency plans. Wider benefits are realised through an improved knowledge of how people react to emergency warnings and flooding. This knowledge can be used to improve warning systems, emergency management principles and communications strategies.

CONCLUSIONS

With approximately 1500 data points available for model validation, the Newcastle flood models could become the most extensively calibrated models – possibly in the world.

There must be sufficient financial and human resources to carry out the tasks in reasonable time.

Flood modellers can be amazed at what they see in the field when they are engaged in post flood data collection. This feedback loop is indeed a rare opportunity and assists their modelling – especially in complex situations such as urbanised catchments under flash flooding, highlighting potential issues such as blockage of culverts and bridges.

The experience of post flood data collection after the Newcastle June 8 flash floods (albeit in crisis mode) suggests data collection systems should be:

- coordinated across all the agencies, including protocols for sharing source and result data;

- not only across scientific rainfall and observed flood behaviour information but also across social and economic information;

- ruthlessly efficient in its data collection methods (which really requires system design before the flood);

- focused on people interviewing people – in the field, while still providing on line facilities;

- adequately resourced – which will most likely require funding assistance and external resources as well as prior training;

- carried out; AND managed within a well thought out communication strategy.

TAKE HOME MESSAGE

Capturing information after a landmark flood will greatly help plan for the future. Setting up multi-agency agreed post flood data capture systems and dedicated resources well in advance is recommended!

The most effective method of gathering data after a flood is sending people into the field to talk to people.

Post flood data collection in urbanised catchments after flash flooding is more complex and will take longer than you think!

REFERENCES

Haines, P. and Thyer, M. (in prep.) "Rainfall and Flooding of the "Pasha Bulker" Storm, Newcastle, June 2007" Submitted to the 2008 FMA conference, Wollongong

ACKNOWLDEGEMENTS

Hunter Water Corporation – providing rainfall and blockages information

All residents of Newcastle who graciously provided information on flood behaviour and economic losses.

The SES for co-ordinating and making available the funding that made the data collection possible.

The Steering Committee for their valuable insights and contributions to managing the project.