SUBMISSION

to the

GRANTHAM FLOODS COMMISSION OF INQUIRY

Amanda Gearing

Journalist, researcher

30 June 2014, Brisbane

Executive summary

During my research after the flash flood disaster in Toowoomba and the Lockyer Valley in January 2011, it became clear that the progress of the flood peak as it moved down the catchment from Helidon was delayed by at least an hour and as much as an hour and a half before it struck the township of Grantham. A hydrology report by SKM in April 2011 failed to account for the effect of a large earthen embankment around the Grantham quarry. The Queensland Floods Commission of Inquiry asked SKM to re-write their hydrology report. The following month, the owners of the quarry, Wagner Investments had heavy earth-moving equipment take down a large section of parts of the remaining embankment.

The subsequent hydrology report (SKM2), submitted in September 2011, accounted for the quarry embankment but claimed this large obstacle delayed and minimised the flooding in Grantham. Grantham residents who experienced the disaster and who were eye witnesses of what happened believe the findings of the second hydrology report to be incorrect regarding four important flood variables: timing, speed, direction and depth. Examination of aerial vision, photographs, flood marks and eye witness accounts reveals the TuFlow model used to produce SKM2 was not calibrated to the on-ground evidence. The model output therefore does not represent what happened or explain the suddenness of the onset of very fast-flowing water more than two metres deep through the town without warning that was inescapable by able-bodied people who were in their homes that day.

The following information combines evidence from eye witness accounts, scientific data such as the Helidon hydrograph and surveyed flood height data which indicate aspects of the SKM2 report which indicate the TuFlow model (or a similar model) needs to be calibrated and re-run in order to obtain an accurate scenario of the disaster that will more capably inform both government agencies and local residents of what happened and why so that the risk of a similar disaster at this location can be reduced in future.

In memoriam

The following 13 people died in or near Grantham on 10 January 2011:

James Perry, 40 - Toowoomba

Pauline Magner, 65, Dawn Radke, 56,

and their granddaughter Jessica Keep, 23 months – Grantham

Christopher Face, 63, Brenda Ross, 56,

and her son, Joshua Ross, 25 – Grantham

Llync-Chiann Clarke, 31, and her children

Garry Jibson, 12, and Jocelyn Jibson, five – Grantham

Jean Gurr, 88 – Grantham

Bruce Marshall, 67 – Grantham

Reinskje 'Regina' van der Werff, 86 – Grantham

Table of Contents

List of Figures

Acknowledgements

My grateful thanks go first to the many survivors, rescuers, emergency service personnel and others who were willing to speak to me about their sometimes terrifying experiences during the flood. Without them the causes of the additional catastrophic effect of the flooding in Grantham would not have been detected so that precautions can be taken in future to reduce the risk of a similar event in future.

My thanks are therefore extended to the people from Helidon, Carpendale and Grantham and emergency services personnel who contributed to my research in 2011 and since then, many of whom remain in contact with me as they have sought answers to their many questions: Roy and Judy Abraham, Helen and Graham Besley, Norrie Blume, Nathan Chadwick, Stuart Damrow, Angela Emmerson, Scott Frame, Elizabeth Fraser, Garth French, Tom and Sandra Friend, Sean Gillespie, Katherine Godley, Julie Johnson, Matthew Keep, Mark Kempton, Gilbert Kilah, Frank King, John King, Johnathon Klaassen, Brad and Natasha Long, John and Kathy Mahon, Shirley Marshall, Danny McGuire, Tony McIntosh, Andrew Neil, Neil Pennell, Paul Pepi, Geoff Purton, Rachelle Rogers, Jonathan and Annaka Sippel, Lisa, Hahns, Klaus and Ilsa Spierling, Kendall Thompson, Mark Turner, Peter and Marie Van Straten, Marty Warburton, Lloyd and Jean Warr, Robert Wilkin and Gavin and Kelly Zischke.

I also wish to acknowledge the dedication of this Inquiry's investigation team in speaking to relevant witnesses and gathering statements, photographs, videos and other evidence to present to the Commissioner of this Inquiry.

Introduction

This submission aims to synthesise as briefly as possible the evidence gathered by myself and others during 2011 and since then, which raise questions about the validity of the second SKM Hydrology Report regarding flash flooding in the town of Grantham that was accepted by the Queensland Floods Commission of Inquiry as being accurate.

SKM produced an initial Hydrology report in April 2011. On reading this it was obvious to me that the findings were inaccurate because the study ignored the existence of a large embankment around the Grantham quarry. I made a submission to the Flood Commission of Inquiry. The Inquiry dismissed the first SKM Hydrology report and asked for a second one. In May 2011, large sections of the remaining embankment on the northern side of the quarry were removed. The second SKM hydrology report was submitted in September 2011. It was accepted by the Queensland Floods Commission of Inquiry.

The evidence in this submission raises the contention that the second SKM report erred with regard to four significant variables of the flood on 10 January 2011 at Grantham, specifically:

- The **timing** of the onset of the flooding in Grantham
- The **speed** of the flood water in Grantham
- The **depth** of the flood water between Kapernick's bridge and Grantham, and
- The **direction** of the flood water from the quarry to Grantham.

In addition, the lack of calibration of the TuFlow model to the available eye witness accounts of what happened in various locations and the lack of ground-truthing of the model output with on-ground evidence regarding maximum flood heights and debris patterns across the landscape, mean the model output does not accurately represent what happened.

In addition, the SKM2 model runs which claimed to produce a level of accuracy so high that it was able to estimate the maximum flood height to within 2cm and the

timing of the peak of the flood to within 5 minutes with no plus or minus for margins of error, when comparing the pre-quarry terrain and the post-quarry terrain, is at odds with the lack of calibration of the model. Findings of the SKM2 report that were so precise were not believable given the lack of calibration:

> Water levels in the town of Grantham were delayed by the presence of the quarry, which caused more of the flood water to travel along the longer route of the main Lockyer Creek channel than would have been the case if the quarry had not been in place and water had broken out through location B and toward the railway line. The rising limb of water level hydrographs at locations in the town of Grantham (locations D, E and F) was delayed by 5 minutes due to the quarry and peak water levels were 0.09, 0.04 and 0.02 m lower than in the pre-quarry simulation at Charles Road and Gatton-Helidon Road intersection, William Street and Harris Street respectively.

The Insurance Council of Australia report found that the flood had a very rapid onset, rising to 2 to 2.5m in 10 to 15 minutes and moving at 2 to 3 metres per second which accounted for the major damage to nearly every house on the flood plain sustaining major damage.

> Water depths of 2.0-2.5 m over the floodplain were realized in perhaps 10-15 minutes; velocities are expected to have been 2-3 m/s. Nearly every house on the floodplain area of Grantham suffered major damage from inundation and water velocity. A number of houses were washed off their stumps; some houses were totally destroyed; many were rendered uninhabitable (Insurance Council of Australia Hydrology Panel 2011, iii).

It is important that the discrepancies between the two reports and discrepancies between them and multiple eye witness accounts, photographs and data such as aerial video vision taken from helicopters on the day, be reconciled so that an accurate scientific picture can emerge. This will then be able to inform authorities about the actions necessary to reduce the risk of future catastrophic flooding in and around Grantham and recue the risk of loss of life and property in future.

The degree of error in the estimated maximum flood height by the SKM2 model at Carpendale appears to be so great that it seems impossible to have been caused by either accident or incompetence. The maximum flood depth immediately west of the quarry at the McIntosh residence, for example, has been independently measured by

a registered surveyor at 128.85m AHD (Australian Height Data) (Cork 2015). The maximum height of the flood at the quarry was reported by the SKM2 model to be 124.6m AHD (Jordan 2011, 6). A difference in maximum flood height of more than four metres at this critical location needs to be explained given that a four metre head of floodwater being suddenly released across a landscape would be likely to move a lot faster and with more force than the relatively slow and gentle spread of flood water across a floodplain. Questions must therefore be asked as to why the hydrology model output was accepted by the Queensland Floods Commission of Inquiry as accurate when it was so obviously at odds with the accounts of many eye witness statements that were in the possession of the QFCI.

Acceptance by the Queensland Floods Commission of Inquiry of the second SKM Report has led to negative consequences for the flood survivors. The obvious errors it contains has resulted in the traumatic experiences of many survivors of the flood being invalidated because their reality was officially denied in the Report of the Inquiry. There is much research which confirms that validation is an important step in enabling people who have survived trauma to be able to begin to recover. Thus it is my hope that the presentation of the evidence at the hearings of this Inquiry and the findings will at last validate the experience of the people who survived the flood and provide an accurate scientific explanation for what happened and why.

Recommendations from this Inquiry will provide useful information to inform action at national, state and local government levels as well as information for individuals and communities about how the risk profile of living on a flood plain can change when significant landscape features in riparian zones are built or changed. It is hoped that the recommendations will be adopted and that adoption of the recommendations will lead to safer communities in the eastern seaboard where intense rainfall falling in steep catchments along the Great Dividing Range and moving quickly towards the coast pose a significant hazard. Changes which make these communities safer in the future will be a fitting legacy to the 13 people who died in and near Grantham in this disaster on 10 January 2011.

The following section of this submission will present evidence with reference to the five terms of reference of the Commission of Inquiry “to make full and careful inquiry in an open and independent manner with respect to the following matters, but

not so as to include a review or investigation of the way in which the Queensland Floods Commission of Inquiry was conducted:

1. the flooding of the Lockyer Creek between Helidon and Grantham on 10 January 2011, with specific reference to any natural or man-made features of the landscape which could have altered or contributed to the flooding;
2. whether the existence or breach of the Grantham quarry caused or contributed to the flooding of Grantham;
3. whether the existence or breach of the Grantham quarry had a material impact on the damage caused by the flooding at Grantham;
4. whether the breach of the Grantham quarry had implications for evacuation of Grantham;

how these matters were first investigated and how eyewitness accounts were dealt with, particularly by State Government agencies and Emergency Services."

1.1.1 Background

The following background to the disaster is an extract from the first chapter of my book *The Torrent: Toowoomba and Lockyer Valley, January 2011*, published by the University of Queensland Press in January 2012 (Gearing 2012b).

From June 2010, a La Niña climate pattern had been deepening in the central Pacific Ocean. Cool surface water was streaming across the equator. The pattern continued intensifying, becoming one of the strongest La Niña systems on record. Sea surface temperatures in the Australian region during 2010 were +0.54 °C above the 1961 to 1990 average, the warmest on record for the Australian region. Record high monthly sea surface temperatures were set during 2010 in March, April, June, September, October, November and December. From August, heavy rainfall became increasingly widespread across Queensland. Many areas of the state received double their long-term average rain, and during September many locations received more than four times the normal monthly rainfall.

The Bureau of Meteorology conducted briefings and exercises with local councils to prepare for the coming extreme wet season. In October, the Bureau briefed the

premier and cabinet. In early November, Emergency Management Queensland's (EMQ) Toowoomba office coordinated an exercise for five disaster management groups in the Lockyer Valley and Darling Downs to practise their emergency response to a major flood and storm event, simulating a tropical cyclone crossing the coast and causing widespread flooding. For two days during Exercise Orko, evacuation plans were rehearsed, call centres were given practise dealing with large numbers of emergency calls, public information and warning systems were refined, and ideas for improvements were noted.

Monsoon rains began from the end of November, causing major flooding across the southern half of the state. Over Christmas an intense rain band flooded the coastal cities of Bundaberg and Rockhampton, as well as many inland towns. Queensland Premier Anna Bligh launched a public appeal to help victims of the floods.

By early January the situation was becoming so serious that the regional director of the Bureau of Meteorology personally briefed the State Disaster Management Group and the premier and her cabinet. At the briefings he predicted several hundred millimetres of rain over the following four to eight days. Widespread flooding continued. For the first time in the state's history, entire populations of small towns beside major rivers were evacuated by helicopter, as floodwaters engulfed them.

The intense monsoon was then enhanced by the arrival of a periodic pressure wave, the Madden Julian Oscillation, on 9 January. At 5.00am the next morning, the Bureau of Meteorology issued a severe weather warning for heavy rainfall leading to localised flash flooding. Unfortunately, residents of the Lockyer Valley are not generally aware that they belong to the Bureau's south-east coast district, so they didn't understand that flash flood warnings in that area posed a threat to them. From 1.00am on 10 January, a group of intense thunderstorms started to cross the coast. Between 9.00am and 9.30am, two intense thunderstorms in the band of storms crossed the coast. A flood warning was issued at 10.28am for Lockyer Creek and rivers in the Brisbane Valley. One of the storms moving south-west converged with another moving west and formed a single storm at about 11.00am. It passed over Somerset Dam and Wivenhoe Dam, the main water supply dams of the state capital, Brisbane. A severe weather warning was issued at 11.00am for heavy rainfall leading to localised flash flooding. The combined storm measured about 40 kilometres across. It continued moving southwest at 30 kilometres per hour, intensifying as it

went, until it was producing rainfall of 100 mm per hour as it passed across the Upper Brisbane River Valley towards Toowoomba.

As the storm cell approached Toowoomba, it was forced upwards over the Great Dividing Range, then slowed down and continued to intensify. The situation was becoming more dangerous. At 1.00pm the Bureau phoned the State Disaster Coordination Centre, reporting exceptionally heavy rainfall of 75 mm in one hour, west of Wivenhoe Dam. They were expecting flash flooding in Toowoomba in the next hour or two. The Bureau also reported that a volunteer 'storm spotter' at Cressbrook Dam had reported several landslides caused by the heavy rain. By early afternoon the Bureau realised the conditions could result in the most severe flooding in the Brisbane Valley since the record flood of 1974. With the city of Ipswich and the state capital under threat, their priority was flood forecasting, warning and monitoring of the lower Brisbane River to estimate potential flooding levels and to liaise with the major dam operators and the city councils of Brisbane and Ipswich.

Medical sonographer Neil Pennell, a keen weather watcher who lives at Kalbar, 60 kilometres south-west of Brisbane, was checking the Bureau's radar. The centre of the storm was showing as yellow to orange, indicating a very heavy rain rate of at least 50 mm of rain per hour. He knew that anyone outdoors looking at the sky would not see the storm coming because it was embedded in a broad area of light rain. There would be nothing to prompt people to go indoors and look at the radar. That storm, falling on an already-sodden catchment, was going to be a disaster. People who lived near creeks needed to get to the nearest hill. He looked at the front page of the Bureau's website. There were no warnings. At 1.10pm he asked meteorologist Anthony Cornelius via an online weather forum:

> Anthony, do you think BOM [the Bureau of Meteorology] is on the case with that [storm] cell. If not you probably know who should be told about it. Those rain rates between Esk, Crows Nest and Toowoomba are truly frightening. I fear that there could be a dangerous flash flood very soon particularly in Grantham. Am I overreacting?

Another weather forum member, Adam, posted at 1.41pm:

> It has absolutely bucketed down in the last 30 minutes in Toowoomba. I wouldn't be surprised if we got 50 mm. Keep a close eye on the Lockyer

> Creek at Helidon and now Cressbrook Creek. There will be a wall of water coming down it.

Neil Pennell was becoming very anxious. He looked at the front page of the Bureau's website. There were still no specific warnings. He posted again to the forum at 1.42pm:

> Dave, I live in an area that is equally not used to being so saturated and equally not used to falls of that nature. I just know that 56 mm in an hour right now here would produce a flood of frightening proportions and one likely to put lives at risk. Falls higher than this in the immediate area are likely. I repeat my question . . . Does someone in Esk, Grantham, Toogoolawah need to know what's possible. Who do we tell?'

The Bureau's computer system registered river rises at Helidon, but only a few readings were available because the computer system had automatically marked most of the readings as being incorrect. Shortly after 4.00pm the Bureau's Flood Warning Centre saw the readings. It seemed the gauge must be faulty, because there were significant jumps in the water level readings as well as missing values. The Bureau had no network of flood warning rainfall gauges above the Helidon gauge to be able to work out whether the suspect readings at Helidon could be true. Televisions in the Flood Warning Centre showed news footage from Toowoomba of a red-brown churning torrent sweeping cars down creeks like toys. By 4.50pm the Flood Warning Centre staff realised the creek rises in Lockyer Creek were most likely to be accurate. The centre directed radio and television broadcasters to use the Standard Emergency Warning Signal (SEWS) and issued an extraordinary flash flood warning for Lockyer Creek at 5.00pm.

> Very heavy rainfalls have been recorded in the Toowoomba area and caused extreme flash flooding. This rainfall is also causing extreme rises in the upper Lockyer Creek at Helidon with very fast and dangerous rises possible downstream at Gatton in the next few hours. Rises will extend downstream of Gatton during tonight.

The warning was repeated at 8:37pm.

Unfortunately, by the time the Bureau realised a life-endangering disaster was occurring in the Lockyer Valley, all those who died between Toowoomba and Grantham were already dead.

Unanswered questions

From the many interviews I conducted there were common questions which emerged and for which there have been no satisfactory answers provided by authorities. The explanation of 'unprecedented disaster' is not a sufficient answer for families who lost family members without warning and for those who lost pets, their homes and all their possessions and for the many who narrowly escaped with their lives that day by taking big risks to save themselves or others from the torrent. Many survivors also carry a sense of survival guilt, questioning why they survived when innocent children died. Some survivors' lives since the flood have been so difficult that they now wish they had died during the disaster and they feel jealous of those who died because they were spared the agony of going on with life. Common difficulties expressed by residents include being triggered to thoughts of the flood by the sound of helicopters because of the incessant helicopter searches in the weeks after the flood; reports of bodies being found; the funerals; the agony of 'not knowing' the whereabouts of the three bodies which have not been found; the pain of multiple simultaneous grief for family members and friends in their community; the difficulties of fighting seemingly-uncaring insurance companies; the hard work of cleaning, rebuilding and re-establishing their lives; the pain of relationship breakdown due to the flood; the challenges of confronting post-traumatic stress disorder; the challenges of caring for their traumatised children; the fear of a similar disaster happening every time it rains; the inability to undertake recreation in water - such as swimming at the beach or in a pool; and everyday effects such as not being able to have a bath.

Why the lack of warning?

The entire population of Grantham was not clearly warned by any authority of an impending deadly flash flood disaster to strike their town on a day when it was overcast but not raining. The lack of warning played a significant role is undermining the people's trust in authorities such as police, local, state and federal government agencies and left them vulnerable to the loss of human lives, beloved pets and for many, the loss of houses and possessions. There is an uneasy sense of escape for many people who have realised that if the disaster had occurred at night when people were asleep and could not see, or during the school term when parents in cars would have been waiting to collect their children and students would have been waiting at

the bus stop in Anzac Avenue, several hundred people could have been killed, including themselves and/or their children.

Why the difference from the 'usual' pattern of flooding?

Many residents have pointed out that the 1974 flood rose to a similar depth in the town as the 2011 flood but that the 1974 event did not result in deaths and destruction of houses and property.

Figure 0.1. Place of death: Locations of the 8 adults and 5 children who died in the Grantham flash flood disaster on 10 January 2015.

The high water mark at the quarry was the quarry gate and the properties between the quarry and Grantham had no flood water across them (Friend 2015). It was therefore the surprise onset of the flood as a fast-moving powerful wave carrying a large load of potentially dangerous debris that requires careful explanation so that the same set of circumstances which caused the disaster can be prevented in future and people can regain their sense of safety.

Why was there such serious and obvious inaccuracy in the scientific investigation?

For those who lived through the disaster, the invalidation of the hydrology report which denied their reality was a significant factor in not allowing them to recover because they perceived that they were not believed. Being believed is necessary for traumatised people to begin to recover. Calibration of the TuFlow model with witness evidence and ground-truthed by debris patterns and maximum flood heights to yield a believable model output which accords with what witnesses experienced, is a necessary step in the recovery for the flood survivors.

Why the lack of emergency services?

Lack of pre-disaster planning and lack of evacuation instructions or orders have left the community feeling abandoned in the face of an overwhelming weather event. The reason for the failure of adequate warnings needs to be clearly explained. No public community apology has been given by any of the relevant authorities.

Reluctance of governments to investigate

Lockyer Valley Regional Council repeatedly requested an Inquiry into the Grantham Flood. The reluctance of either the Bligh or the Newman governments to investigate the discrepancies in the SKM2 report added considerable stress and distress to the flood survivors. This is most acute amongst those Grantham residents who still live in 'ground zero' because their properties could not be sold or because they could not afford to move to the new estate, or because they decided for other reasons not to move. The delay has meant that several people have died, or will die, before the result of this Inquiry is known.

The seeds of this Inquiry

In writing The Torrent during 2011 it became obvious that the flow of the flood peak stopped for between an hour and an hour and a half. This could not be safely stated in the book because my contract with the publisher required me to take personal legal liability for the entire text. I therefore had to simply accept the official findings by SKM2. However, I did understand and hear the ongoing high level of distress and the invalidation of the flood survivors. I established a secret Facebook group which enabled people who were 'in the water' to be able to communicate. Senior reporter Nick Cater expressed interest in the story and I introduced him to some of the survivors during a two-day visit to Grantham with him in 2014. He also became convinced that there were wide discrepancies between the SKM2 findings and the on-ground truth. To settle this discrepancy, *The Australian*, which had published coverage of the disaster in 2011 and the investigation by Chief Reporter Tony Koch and myself in June 2011, commissioned Consulting engineers DHI to review SKM2. The reviewers did not run the model but they were able to point out significant flaws in the SKM2 report. The newspaper published the report findings in early March and called for a Commission of Inquiry. Lockyer Valley Regional Council repeated their calls for an Inquiry, this time through Peter Wellington who held the balance of power in the Queensland Parliament.

Over the following weeks, speculation increased. Wagner Investments managing director Denis Wagner publicly defended the SKM2 report. Media comment by him claiming that Wagner's quarry mitigated the Grantham flood and that 'we sort of live with the knowledge [the quarry] probably saved a few lives', in a report by Nance Haxton on *The World Today* on March 10, angered and greatly distressed local residents who lived near the quarry and whose properties have never been flooded in recorded history (Haxton 2015).

Local resident and engineering company director Sean Gillespie, who lives directly east of the quarry, had had maximum flood heights on his property validated by a local registered surveyor. He and John Gallagher, who had collected the data, released it to me. The data conflicted significantly with SKM2, indicating the maximum flood height of the water across the quarry had been under-reported by more than four metres. A four metre height of stored floodwater west of the quarry backing up in the landscape for an hour or more, coming over the embankment and breaking down the embankment, as observed by Jon Sippel, which then roared across the paddocks, decreasing to two metres high by the time it struck Grantham, finally was scientifically plausible. I forwarded the information to Peter Wellington on April 14. He told me that the Premier Anastasia Palaszczuk indicated she would support an Inquiry. The Premier announced the Inquiry in Parliament a few days later.

1.1.2 Final puzzle pieces - The boy the barrels and Black Bob

It seemed obvious by then that all the evidence collected now needed to be brought together. Dennis Wagner's comment drove me to re-investigate everything we knew about the rescue of Teddy Perry, 8, who had been carried on his father's back and put on a cattle feeder in a paddock east of the quarry. How had he been flung out of the creek and survived? Had he and his father gone under Kapernick's bridge or over it? It did not seem possible they would have survived going over it (see section 1.2 Timing). Did they come down the creek earlier when the water was not as high as the Kapernick's Bridge and before the embankment collapsed? Did they survive because the creek had broken its banks at the quarry bend and swept them into the paddock? (see section 1.2 - Speed)

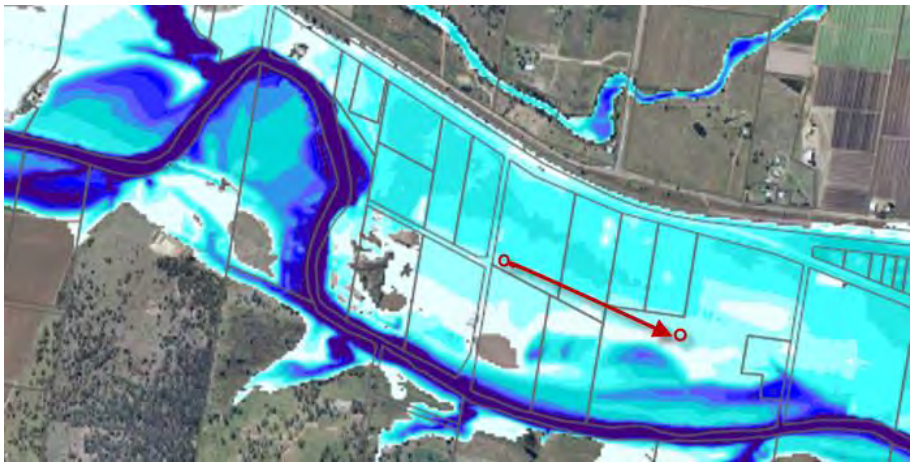


Figure 0.2. Boy found alive: Volunteer firefighter Kendall Thompson rescued Teddy Perry from the top of a cattle feeder swept from John Gallagher's farm paddock towards Grantham, as shown above.

I looked again at the long series of photos I had of the flood at Kapernick's Bridge. In addition to looking at the water height, I now looked at the amount of floating debris that did not move despite the huge amount of water coming over the bridge for 80 minutes as timed by the photo series. A bright blue barrel and a bright yellow barrel remained in the series of photographs, not moving down the creek. The flood water was rising fast but not moving down the catchment.

Figure 0.3. Not moving. Blue barrel stationery in Lockyer Creek.

The photo series adds some of the missing information to the Helidon hydrograph that shot up from 4m to more than 13m and then stopped recording for some hours. The photos indicate the flood peak lasted much longer than previously thought.

A former quarry employee was now needed to verify the original quarry landscape in the face of contradictory claims. I posted a request on the secret Facebook page and was referred to Harold 'Black Bob' George. We met at the quarry and walked around the outer road. Mr George confirmed the piles of overburden now between the road and the quarry were not there during the ten years he worked at the quarry. His evidence directly and emphatically counters the public claims of Dennis Wagner that their company did not alter the landscape.

Drone vision clearly shows the tree scours on the western side of the quarry embankment and a broken telegraph pole snapped off about five metres above the remaining section of quarry embankment. The broken pole supports the evidence of Jon Sippel who observed a much higher embankment on the inside of the remaining embankment when he drove across the embankment to service power poles some months before the flood.

The natural ground level indicated by a very old fencepost at the base of the western side of the quarry embankment was surveyed at 121.18AHD. It appears likely that the natural ground level on the western side of the quarry was built up by 7.67m, a height which meant flood water poured over the 'high bank' of the creek and across land that has never been flooded since white settlement.

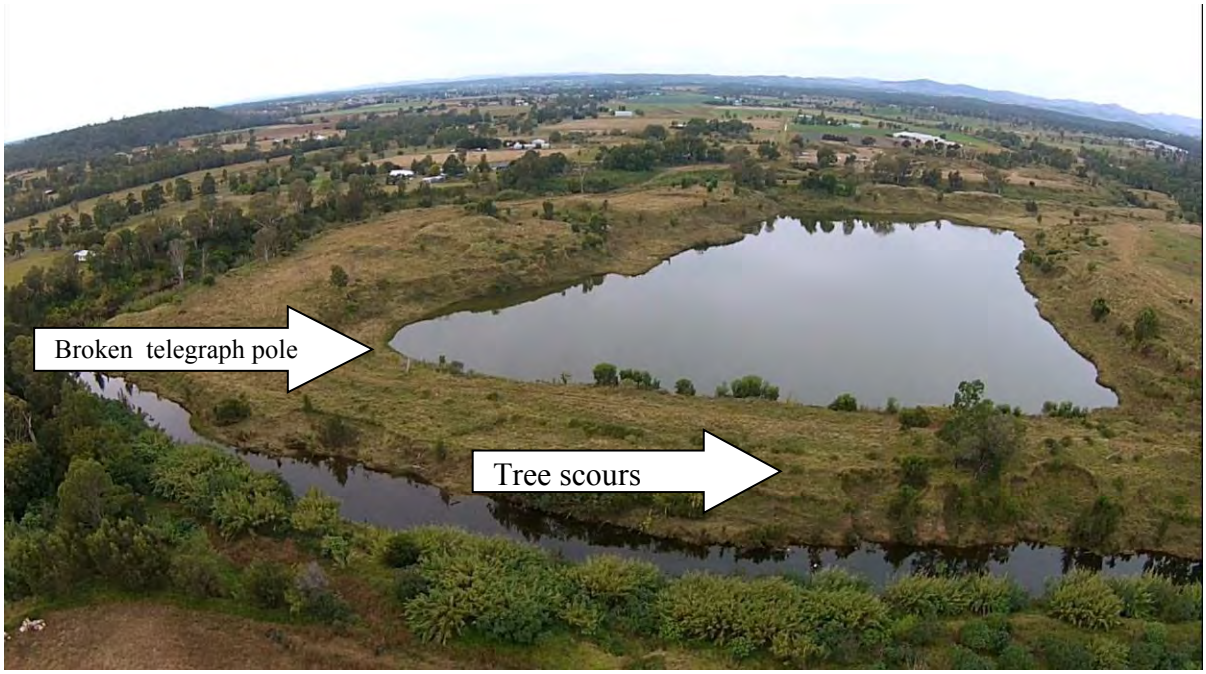


Figure 0.4. Western quarry embankment showing the remaining high sections of the embankment on the northern side of the quarry embankment and, in the foreground, tree scours and a broken telegraph pole on the remaining lower section of the western embankment.

Conclusion

The question remains, Was this a natural disaster or a man-made catastrophe within a natural disaster? Certainly it was a significant natural disaster. However it appears there were also ways in which the natural disaster was exacerbated by human intervention in the landscape.

It is hoped that the Inquiry's investigation into the matters referred to in the Terms of Reference will yield answers to the questions for which residents do not yet have believable answers despite the passing of more than four years since the disaster.

Many people who participated in my flood research did so because of the need they felt to contribute to improved warning systems, improved emergency responses, and to help as far as possible to prevent a similar disaster in this location, or other similar geographic locations in Australia in the future.

Evidence addressing the terms of reference

1.2 Flooding of the Lockyer creek between Helidon and Grantham on 10 January 2011, with specific reference to any natural or man-made features of the landscape which could have altered or contributed to the flooding.

Grantham is located on the coastal plain between the Great Dividing Range and the coast. Lockyer Creek travels towards the east and passes about one kilometre south of the township of Grantham. After leaving Helidon, Lockyer Creek flows relatively straight except for a large horse-shoe loop about three kilometres west of the town.

Figure 0.1. Aerial photograph: Lockyer Creek from Helidon to Grantham. (Source: Google maps.)

The inside of this loop was a low pocket where sand, gravel and top soil gradually built up during floods. The low pocket was farmed for many years but a quarry was established there around 1980.

Figure 0.2. Original quarry landscape. Note the absence of any embankments on the west side of the quarry.

The quarry was mined for sand, gravel and loam by CSR (George 2015). A former employee of the quarry, Harold George said that when the sand, gravel and loam was mined, no material was placed above natural ground level due to the area being in a riparian zone. Mr George attended the quarry site on May 31, 2015 and walked around the quarry pit. He observed that the landscape had changed significantly since he had worked there. He noticed large amounts of soil had been added to the edges around the quarry pit which appeared to be 4.5metres to 6m in height (George 2015). Mr George said any claim that the embankments are 'natural ground' are not true, since they were not there when he worked there.

Mr George was living at Grantham on the day of the flood. From his vantage point he saw Kenly Arndt's vehicle swamped and Danny McGuire's fire truck swept off the road. The fire truck was heading to the west but was pushed backwards to the east.

Questions:

Why was material dumped above natural ground level (121.18AHD) to a height of several metres? Were any permissions obtained?

What action or legislation can be enacted to prevent similar landscape change in or near other creeks in Australia, especially where the building of a structure severely occludes a narrow section of a valley, such as that between Lockyer Creek and the railway embankment in this landscape?

The railway line from Helidon to Grantham runs along an embankment that prevents water from Lockyer Creek spreading out further north across the flood plain. The area between Lockyer Creek and the Gatton-Helidon Road is about one kilometre wide. The deep horseshoe bend in Lockyer Creek around the quarry narrows this to about 200m, forming quite a narrow bottleneck. Flood survivor John Mahon drove east along the Gatton-Helidon Road very shortly before his house was struck by the floodwater. He looked towards Lockyer Creek and observed water appearing to be above the creek banks and a lot of floating debris that was not moving. He arrived at home and went to his shed to find a generator. This is when he observed water moving rapidly along the highway towards his house. He gathered his family as the water rose extremely quickly. They phoned their daughter Rachelle to say good bye because they believed they would all die.

Rachelle called for helicopters and Rescue 500 responded to her call. John Mahon helped his two daughters, two grandsons and his wife to climb on the roof. He was unable to lift himself onto the roof and was clinging to the gutter. He reports that there was a point when the floodwater suddenly became very heavily laden with mud and sand (Mahon 2011). This account supports the observation by Jon Sippel of a loud crashing noise lasting around 15 seconds at about that time of the quarry embankment collapsing (Sippel 2011). Frank King who was clinging to a tree in Railway Street reported the same observation of the water suddenly becoming like ‘liquid mud’ (King 2011).

Given the height of the embankment, the significant occlusion of the narrow section of valley near the quarry and the quantity of water in Lockyer Creek on 10 January 2011, it is clear that the embankment around the quarry both altered the flow of the floodwater and, when it failed and was destroyed, contributed to the release of a huge amount of backed up water towards the town of Grantham.

Questions:

How much water banked up in the landscape west of the quarry wall during the afternoon before being suddenly released?

What was the speed, direction, depth and timing of the 'dam burst' that occurred when the backed-up floodwater overtopped the quarry wall, destroyed the western side of the embankment and broke down significant sections of the opposite side of the embankment and sped towards Grantham?

Figure 0.3. Aerial photograph of the quarry soon after the flood.

The western embankment of the quarry had a road across the top (marked by the arrow, above) which compacted the soil in that area. This remaining roadway remains in the picture above. On the inside of this roadway the quarry embankment was a lot higher, up to five metres higher. This was not accounted for in the SKM model. The height of the inner embankment is attested to by an electrician Jon Sippel who lives in Quarry Access Road and who was on the site and drove across the quarry embankment road about 9 months earlier to service the power line. From his ute, Jon Sippel looked out his windscreen and could not see the top of the inner embankment.

The composition of the embankment was investigated in May 2011 by fluvial geomorphologist Dr Jerry Maroulis who attended the site with me. In February 2014 when more information came to hand and Jerry was visiting Australia from his home in Holland, I made a series of short videos of his findings. These have been submitted to the Inquiry. Dr Maroulis made the following findings in brief:

- The quarry embankment formed what amounted to a solid obstruction to the floodwater, slowing the flow for long enough for a large amount of sediment to be deposited west of the quarry embankment (visible in aerial photographs taken in 2011 - submitted to the Inquiry)
- There is debris that indicates the flood current moved directly east over the quarry and across the paddocks.
- Aerial footage taken on the day of the flood clearly shows trees scours on the western side of the quarry embankment. These scours indicate the flow was to the east, directly in line with the town of Grantham.
- The railway line might have contained the flow. Effectively you did have a wall of water coming through – the rate and speed and rate of vertical rise was phenomenal.
- If the embankment had not been built up and the loop had been a low pocket – the flow could have dispersed across the low pocket.
- The embankment formed a barrier to the flow. Once the water depth flowed over the wall, it destroyed the wall.
- The embankment had layers of grass, sand and rocks. It was not constructed. The material was dumped. It is not a natural part of the landscape.
- Terrain level – TuFlow model – There are questions about how much water was in the quarry – water balance modelling could be done to find out how much water was in it but at the rate of flow, the capacity of the quarry would not have made a difference.
- Elevation – the quarry terrain is about 8m higher than in the town so the water was flowing downhill towards the town adding more energy to the flow.

- The amount of damage at the properties immediately east of the quarry and furthest from Lockyer Creek indicate the greatest damage and therefore the greatest force was directly east of the quarry.
- The flood water was viscous with large amounts of sediment from upstream farmland.
- The model needs to be calibrated to make it more accurate – a lot of things were missed.
- There was a second breech in the quarry wall (in addition to the breach noted in the SKM2 Report). Standing in the breach, the material is 'very fresh' estimated at under ten years old with grass layers.

Timing

Questions regarding the timing of the flood peak as it moved down the catchment are critical to an understanding of what happened at Grantham because the flood peak was so large. At Helidon, missing data in the hydrograph does not help. The hydrograph topped at 13.88m and stopped working for some time before beginning to record again some time later. What is not clear is how much higher the creek rose at Helidon, if at all and for how long the maximum flow was maintained before it fell again?

Question:

How much higher did Lockyer Creek rise at Helidon, if at all, and for how long was the maximum flow maintained before the level began to fall again?

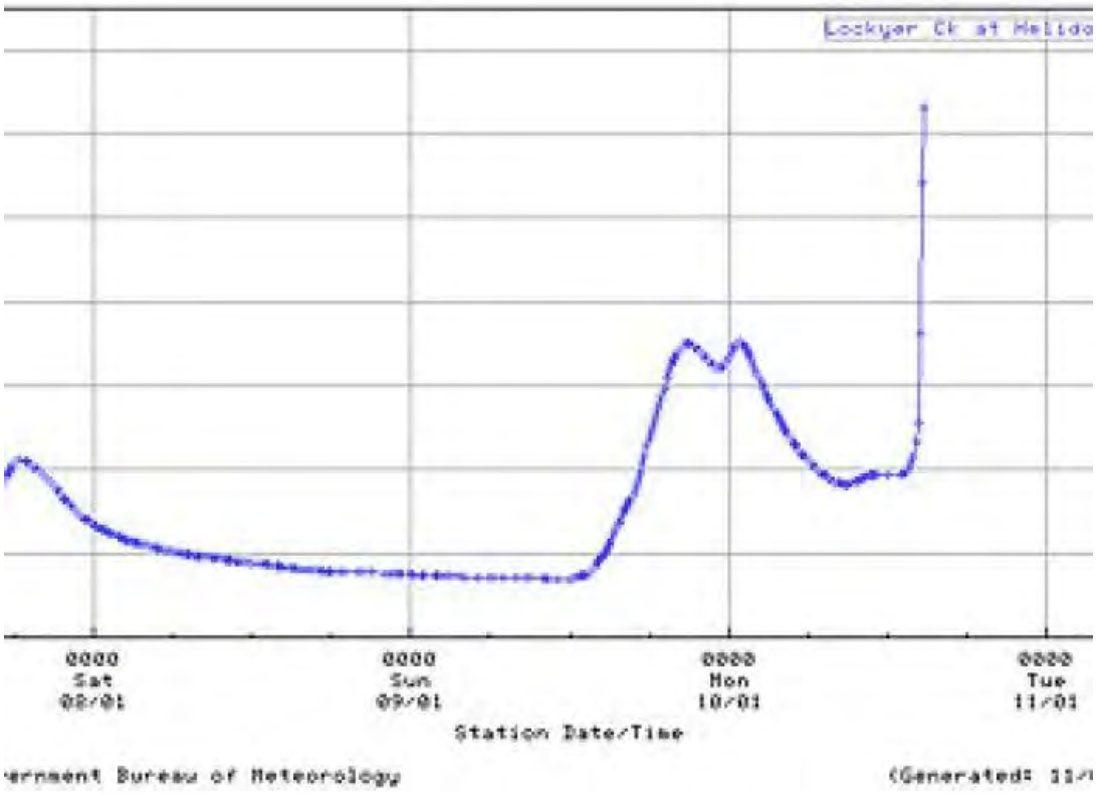


Figure 0.4. Helidon Hydrograph, 10 January 2011. (Bureau of Meteorology, Queensland).

A long series of photographs taken on the day of the flood about three kilometres downstream from Helidon, at Kapernick's Bridge provide some indication. This series of photographs has been submitted to the Inquiry and is summarised here in Section 1.2 - Timing.

Speed

The speed of the floodwater in the town of Grantham is one of the most contentious questions. According to the colour-coded key. The SKM2 report estimates the peak velocity of the flood water in most of the township of Grantham ranged from less than .5m per second (1.8 km/hr) to 1.5m/sec (5.4 km/hr). Residents who were in the water dispute this strongly and there is video evidence which also indicates the water speed was far higher than estimated by SKM2.

The estimates of water speed by witnesses in the water and observing the current range from 60km/hr (16.6m/sec) to 80km/hr (22.2m/sec). Given the very wide discrepancy between the account of witnesses and the model output, it is important to clarify the true water speed in light of a dam-burst scenario which appears far more likely than the 'slow flood' scenario presented by SKM2. The inability of people to

escape the flood supports the contention this was not a slow flood scenario. In this disaster, the speed of the current ripped people's clothes off, swept cars down the street, ripped houses from their footings and smashed brick walls.

The SKM2 model output indicates that the highest velocity of the flood water across the ground was just north of Lockyer Creek (assuming a direction of water moving to the north east), however this was the area where the flood water was shallowest, slowest and least damaging (see for example Lockyer Produce where the water was about one metre deep at maximum and with very little current).

The area of greatest velocity, power and damage was in a line directly from the Grantham quarry along the Gatton-Helidon Road to the town. Further evidence of this line being the location of highest impact is that the bodies of some of the people swept away from here and who drowned, were found directly east of the town.

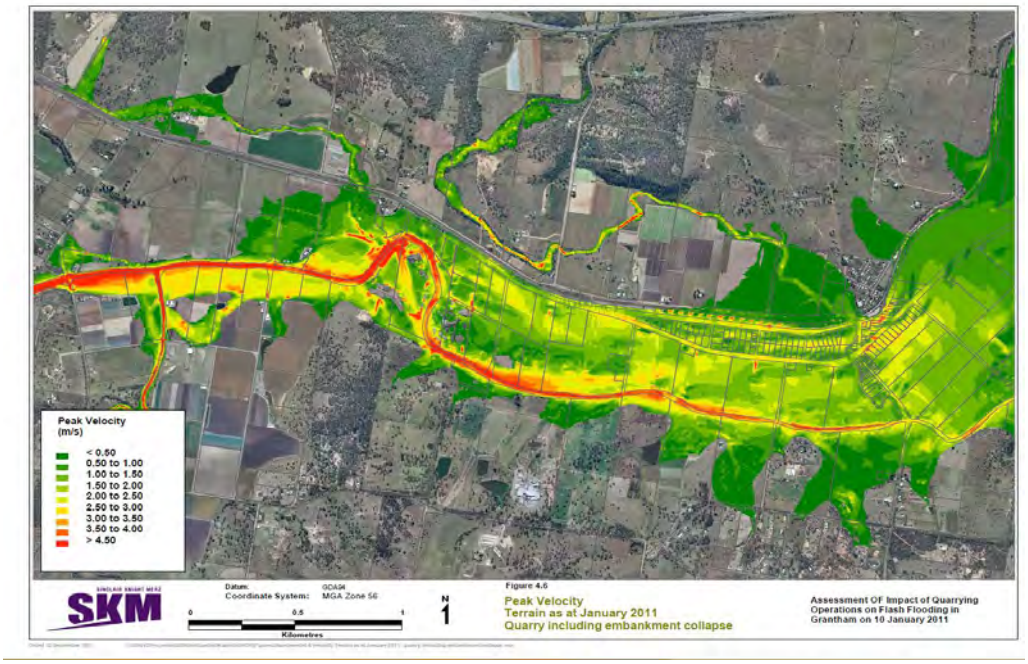


Figure 0.5. Peak velocity including embankment collapse.

The highest velocities estimated by the model for Lockyer Creek are more than 4.5m/sec (16.2km/hr).

Depth

The depth of the floodwater west of Grantham quarry is a key question for the Inquiry to determine. The occlusion of the valley at this point meant water built up in the landscape between Kapernick's Bridge and the quarry. Height data at this

location needs to be added to the hydrology model to verify maximum flood heights and the quantity of water that backed up.

Evidence which supports the contention that water built up in the landscape west of the quarry includes the discovery of debris from a house west of Kapernick's Bridge that was found *upstream* of the house. This indicates there was a strong *backward* current at this location at the height of the flood.

Figure 0.6. Debris was dumped upstream of the house west of Kapernick's Bridge indicating a strong *backward* current at this location.

The flood height at McIntosh's farm, verified at 128.85m AHD is likely to have been lower than the flood height at the quarry since the water moving up the gully towards the McIntosh house flows in the reverse direction of the creek current.

Surveyed heights of the flood and points in the landscape in this area are set out in the diagram below. The surveyed height of 128.85mAHD is a conservative estimate based on the maximum flood height at the McIntosh house. Since the water flowing to the McIntosh house must have flowed downhill, it seems quite certain that the height across the quarry must have been more than 128.85mAHD, or at least five metres higher than the estimate provided in the SKM2 model output. The natural ground level was surveyed at 121.18AHD, as indicated by a very old fence post at the base of the western side of the quarry embankment. It appears therefore, that the natural ground level at this location has been built up by 7.67m.

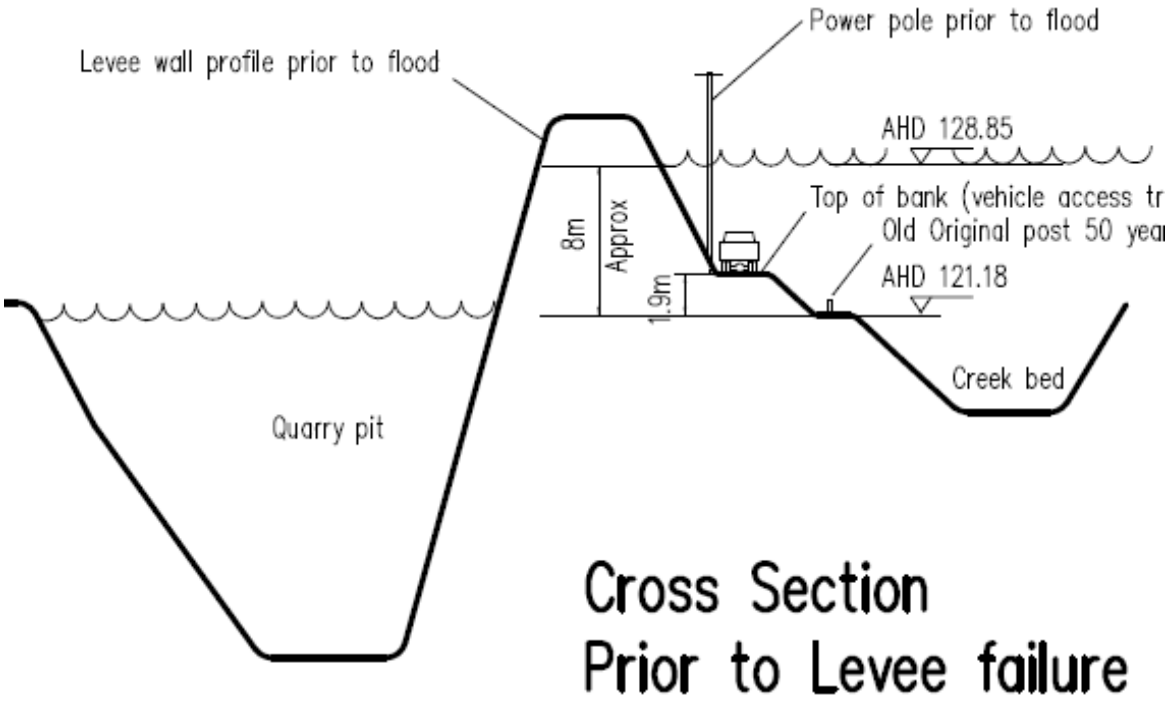
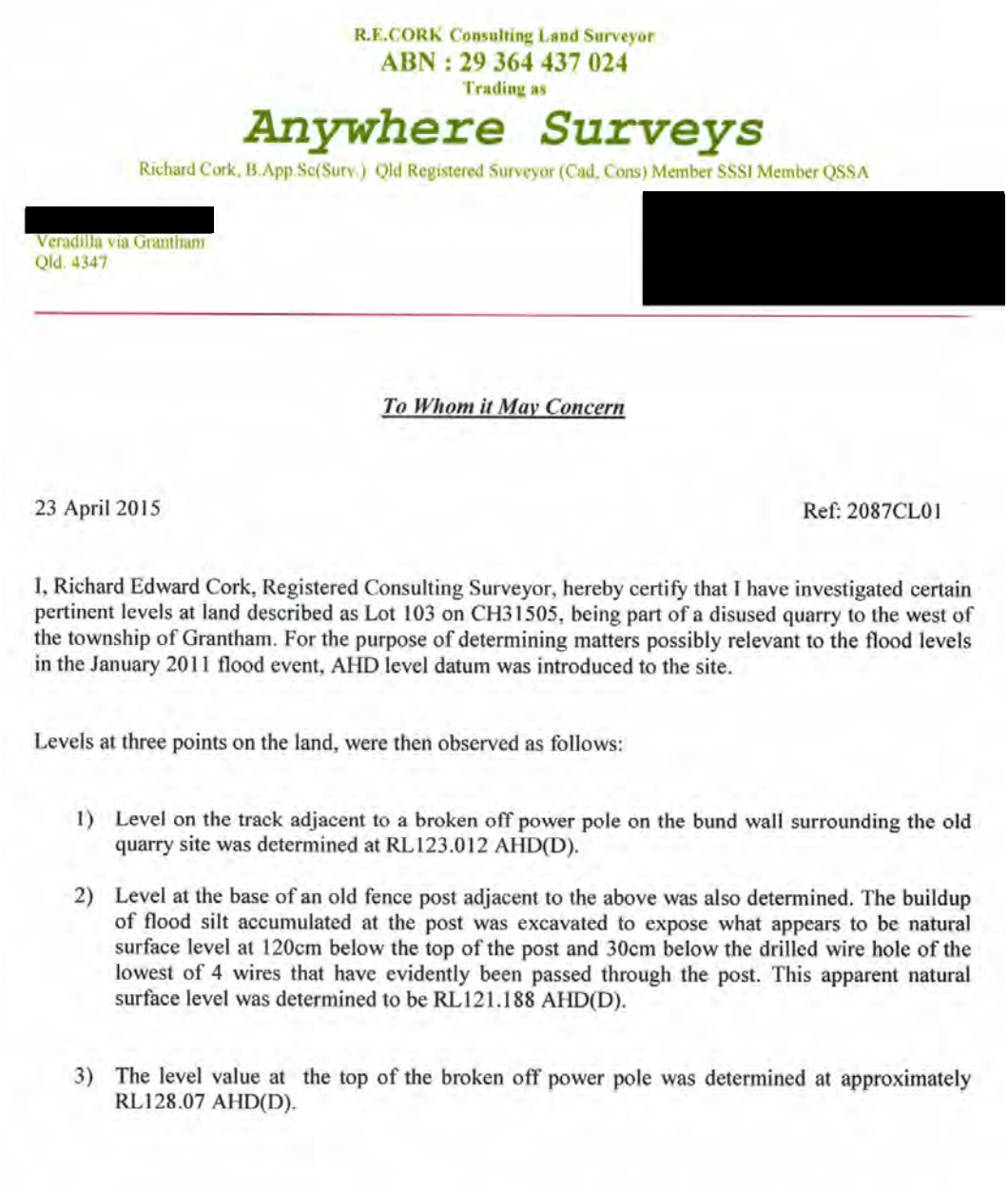


Figure 0.7. Cross section of the western embankment of the quarry. Note the height of the inner side of the embankment.

East of the quarry, the depth of the flood was several metres higher than estimated by the TuFlow model output, as indicated by the muddy residue to the top of the house roof.

Figure 0.8. East of the quarry: note the depth of the flood as indicated by the muddy residue to the top of the house roof.

Registered survey heights were provided by Richard Cork of Anywhere Surveys.



R.E.CORK Consulting Land Surveyor
ABN : 29 364 437 024
Trading as
Anywhere Surveys
Richard Cork, B.App.Sc(Surv.) Qld Registered Surveyor (Cad, Cons) Member SSSI Member QSSA

[redacted]
Veradilla via Grantham
Qld. 4347

[redacted]

To Whom it May Concern

23 April 2015 Ref: 2087CL01

I, Richard Edward Cork, Registered Consulting Surveyor, hereby certify that I have investigated certain pertinent levels at land described as Lot 103 on CH31505, being part of a disused quarry to the west of the township of Grantham. For the purpose of determining matters possibly relevant to the flood levels in the January 2011 flood event, AHD level datum was introduced to the site.

Levels at three points on the land, were then observed as follows:

1) Level on the track adjacent to a broken off power pole on the bund wall surrounding the old quarry site was determined at RL123.012 AHD(D).

2) Level at the base of an old fence post adjacent to the above was also determined. The buildup of flood silt accumulated at the post was excavated to expose what appears to be natural surface level at 120cm below the top of the post and 30cm below the drilled wire hole of the lowest of 4 wires that have evidently been passed through the post. This apparent natural surface level was determined to be RL121.188 AHD(D).

3) The level value at the top of the broken off power pole was determined at approximately RL128.07 AHD(D).

Figure 0.9. Flood levels across the quarry. Natural ground level at the quarry site was 121.188 AHD. The top of the broken power pole was surveyed as being 128.07m AHD (Source: Anywhere surveys).

Direction

The high velocity of water through the SKM2 'breach' appears to indicate the main force of the flood returned to Lockyer Creek. In fact, the breach would have been several metres under water. What was going on at the surface was visible from the helicopters in the sky on the day. Their vision shows clearly the main current flowing in line with the bed of Lockyer Creek from the west, going straight across the quarry, and directly striking the farm houses west of Grantham and then houses in Grantham.

Aerial vision from Channel 7 and 10 news helicopters indicates the main force of the flood was directly across the quarry. The direction is indicated by the doors of the shed on Sean Gillespie's shed (see Photograph below). The doors blew out and were left pointing directly towards Grantham.

Figure 0.10. Shed east of the quarry struck from the west, bursts open the doors. Note the direction of the doors which point directly towards Grantham.

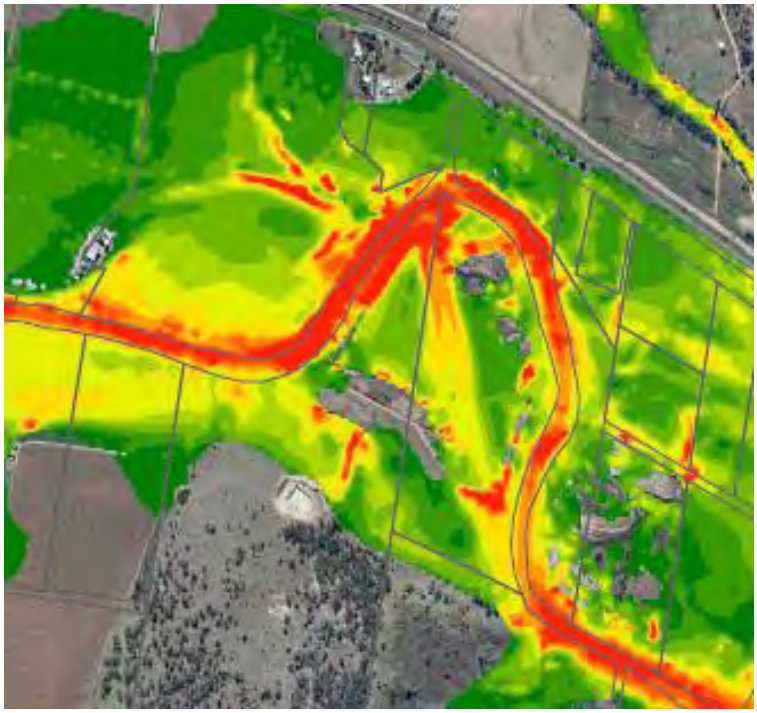


Figure 0.11. Close-up of Peak velocity from the SKM2 model output. This velocity pattern is not matched by the aerial vision which shows the main current tracking in line with Lockyer Creek straight across the quarry and across the farm paddocks towards Grantham (not into the creek as shown here.)

If the main current had been, as indicated in the figure above, back towards Lockyer Creek, more damage would be expected in that area. Piles of sand at the sand batching plant could have been expected to be washed away. They were not, as shown below.

Figure 0.12. Video still: Sand batching plant at Grantham quarry. 10 January 2011. Note the piles of sand after the flood peak. (Source: Ten news aerial footage).

1.3 Whether the existence or breach of the Grantham quarry caused or contributed to the flooding of Grantham.

There is no doubt the amount of flood water moving down the catchment from Helidon that registered 4000m3/sec according to the Helidon hydrograph, was going to cause a flood in Grantham of significant depth. What is in doubt is whether the river system would have coped with the flood if the water could have flowed over the low pocket west of the town as it has previously done during flood events e.g. 1974 and 1996. It should be noted also that on the day after the January 10 flood, a similar flow on January 11 did remain in the creek at Carpendale and rose slowly in Grantham as observed by residents in previous 'normal' floods. In addition the rural residential properties between Carpendale and Grantham were not flooded on the second day (possibly due to the destruction of the western and eastern embankments on 10 January).

Figure 0.13. Grantham quarry: aerial May 2011. Note the area of earthworks on the northern side of the quarry where a section of remaining embankment is being taken away from what Denis Wagner claims publicly to be a 'natural landscape'. (Source: The Courier-Mail)

An important question for the Inquiry to answer is whether the owners of the quarry were aware before the flood of the effect that the embankments they built might have on the farms and the community downstream. It is also relevant to assess the behaviour of the quarry owner immediately after the flood and subsequently. There are several events which infer that the quarry owners were well aware that the quarry embankment had some contribution to the severity of the flood in Grantham. The following events contribute this view:

- Lockyer Valley Regional Council mayor Steve Jones was telephoned about six days after the flood and was asked by the company if people were 'blaming the quarry'.
- A Wagners representative blocked the quarry exit using a vehicle and confronted a reporter and photographer. He tried to confiscate their memory card of photos of heavy earthmoving machinery destroying part of the quarry embankment in May 2011.

- Contradictory statements by Denis Wagner. 1. That the landscape around the quarry is the natural landscape (to DERM and to the public via the media.) and 2. Evidence from the photos (see below) of the height of the embankment that is being removed using heavy earthmoving equipment.

Figure 0.14. Grantham quarry. The same area as the aerial photo above. Note the height of the embankment compared with the dozer and trucks. (Source: The Courier-Mail)

Timing

A series of photographs was taken by Teressa Kluck at Kapernick's Bridge on the day of the flood. The camera's time/date stamp was not correct. The photos could not therefore be precisely timed but approximate timing could be obtained if other photographers there had accurate timestamps which could be compared because the early photographs in the series were taken at one to two minute intervals and the water was rising very quickly. The photographer has timed the series using the digital file properties using the first photo as the starting point to time the series. These times give a sense of the speed of the changing river height over a period of just over three hours. The series selected is timed at ten minute intervals, or as close as possible to that to give an overview of the event from this location.

Figure 0.15. Zero minutes: Lockyer Creek at Kapernick's Bridge, 10 January 2011. (Source: Teressa Kluck).

Figure 0.16. Eight minutes: Lockyer Creek at Kapernick's Bridge, 10 January 2011. *(Source: Teressa Kluck).*

Figure 0.17. 20 Minutes later: Lockyer Creek at Kapernick's Bridge, 10 January 2011. *(Source: Teressa Kluck).*

Figure 0.18. 25 minutes later: Lockyer Creek at Kapernick's Bridge, 10 January 2011. (Source: Teressa Kluck).

From this point in the sequence of photos, a large amount of floating debris begins to accumulate on top of the water. This indicates the water is not moving down the creek.

Figure 0.19. 30 minutes later: Lockyer Creek at Kapernick's Bridge, 10 January 2011. (Source: Teressa Kluck).

Figure 0.20. 35 minutes later: Lockyer Creek at Kapernick's Bridge, 10 January 2011. *(Source: Teressa Kluck).*

At 38 minutes, a large blue barrel came over the bridge. It is this barrel which is pictured until at least after the photo taken at 103 minutes, so for a total of at least 65 minutes. A large white boxlike object appears in the photo at 103 minutes and is still present in the photo at 124 minutes.

After 103 minutes, the next photograph was taken at 124 minutes, so it is possible the barrel remained for another 21 minutes.

Figure 0.21. 40 minutes later: Lockyer Creek at Kapernick's Bridge, 10 January 2011. (Source: Teressa Kluck).

Figure 0.22. 50 minutes later: Lockyer Creek at Kapernick's Bridge, 10 January 2011. *(Source: Teressa Kluck).*

Figure 0.23. 59 minutes later Lockyer Creek at Kapernick's Bridge, 10 January 2011. *(Source: Teressa Kluck).*

Figure 0.24. 70 minutes later Lockyer Creek at Kapernick's Bridge, 10 January 2011. (Source: Teressa Kluck).

Figure 0.25. 78 minutes later Lockyer Creek at Kapernick's Bridge, 10 January 2011. (Source: Teressa Kluck).

Figure 0.26. 100 minutes later: Lockyer Creek at Kapernick's Bridge, 10 January 2011. (Source: Teressa Kluck).

Figure 0.27. 124 minutes later Lockyer Creek at Kapernick's Bridge, 10 January 2011. (Source: Teressa Kluck).

Speed

Murphys Creek resident Selwyn Schefe drowned at Murphy's Creek after being swept from the back of a utility with his daughter Katy, 6, at about 1.30pm, fairly soon after the beginning of the intense rain began to run off the steep catchment of the Great Dividing Range and swelled Murphy's Creek extremely quickly. Katy's body was found at Murphy's Creek but Selwyn's body travelled 49.3 kilometres and was found at Tarampa. This means his body was carried past Postman's Ridge, Helidon, Grantham and Gatton and must have negotiated the loop of Lockyer Creek around the quarry west of Grantham.

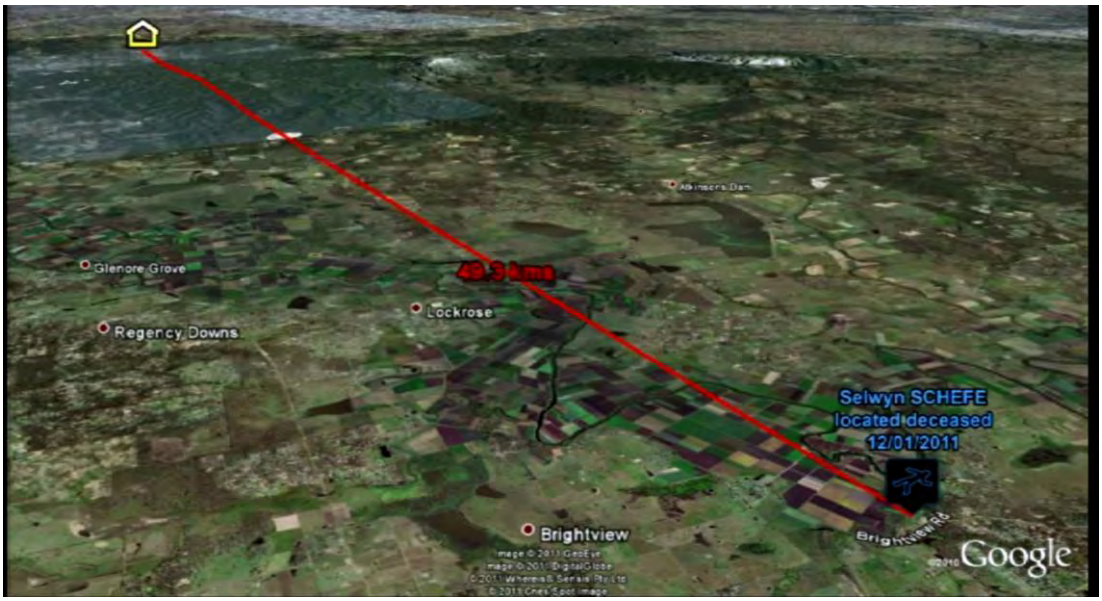


Figure 0.28. Selwyn Schefe. *(Source: QPS video The Event)*

Sylvia Baillie's house was destroyed after a direct hit from the tsunami wave through Postman's Ridge that was later measured by hydrologists at 9.8m high (see graphic below). Her brick house was destroyed, including carpets being ripped from the slab. Her body came past Helidon and past the quarry, and was deposited in Harris Street in Grantham. It is not known whether her body remained in Lockyer Creek and came up Sandy Creek to Harris Street, or was propelled from Lockyer Creek at the quarry and swept across the paddocks to Harris Street. The exact location of her body in the house may be able to determine this question.

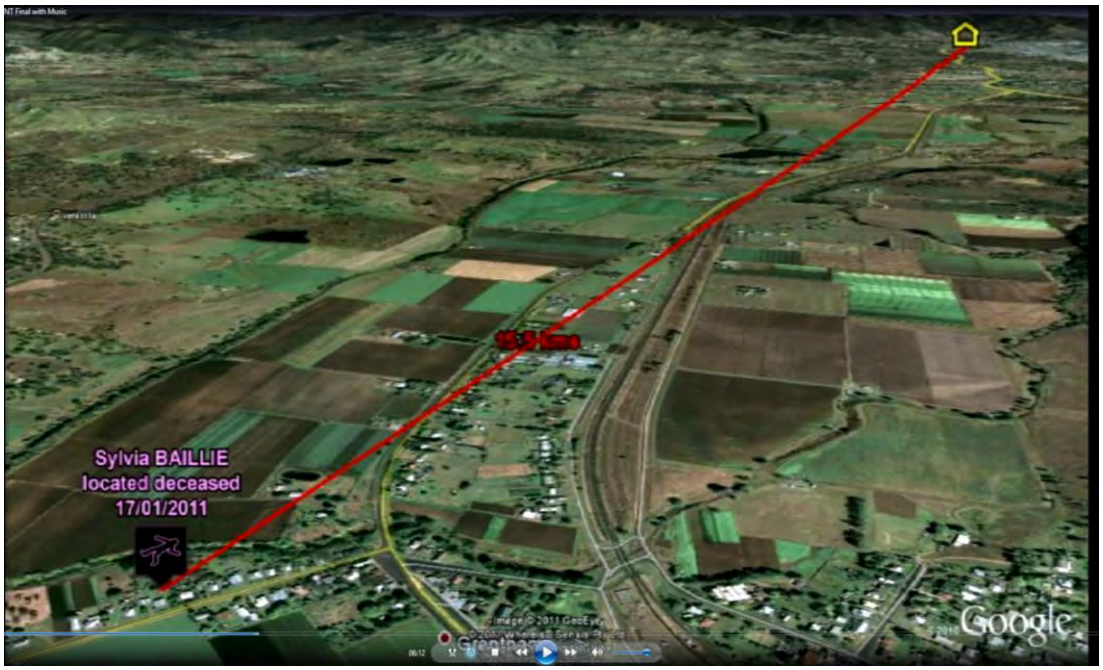


Figure 0.29. Sylvia Baillie. *(Source: QPS video The Event)*

Another two people were swept down Lockyer Creek: James Perry and his son Edwin 'Teddy' Perry. James Perry and Jennifer Thorncraft were driving home to Toowoomba when their car was swept off the highway at Helidon. Aerial vision from helicopters tracked them on top of the car until the car sank suddenly. Mrs Thorncraft was rescued from a tree top in the floodwater by a swift water rescue team Brad Mills and Andrew Neil who commandeered a news helicopter at the scene and swam to her using a back eddy to reach her.

Question:

Could further questioning of swift water rescuers Brad Mills and Andrew Neil enable hydrologists to better quantify the size of the back eddy and establish whether floodwater backing up at Carpendale was backing up as far as Helidon?

In one of the most courageous rescues in the disaster, James Perry carried his son Teddy on his back from Helidon to Carpendale. If they had remained in Lockyer Creek they almost certainly would have drowned. It is uncertain whether they came under Kapernick's Bridge but if they came over it, it seems likely they would have either come apart from each other or been killed by the force of hitting the rails along the sides of the bridge. It seems most likely therefore that they came under the bridge

before the floodwater reached as high as the bridge and that they came out of the creek at the quarry bend and were swept across the paddock. Mr Thorncraft appears to have seen a cattle feeder above the water and managed to get his son onto it. James was not able to lift his own body onto the cattle feeder and Teddy saw his father submerge (Gearing 2011). Rescuers initially saw the cattle feeder sticking out of the water by only about a foot. This indicates the water depth must have been deeper than that calculated by the SKM2 hydrology report. If the maximum water depth at the location of the cattle feeder was .5m – 1m deep, it is unlikely that James Perry would have drowned since he could have stood or even sat up in the water. It appears the water depth must therefore have been deeper. Flood debris or other photographs could confirm this and allow for better calibration of the TuFlow model.

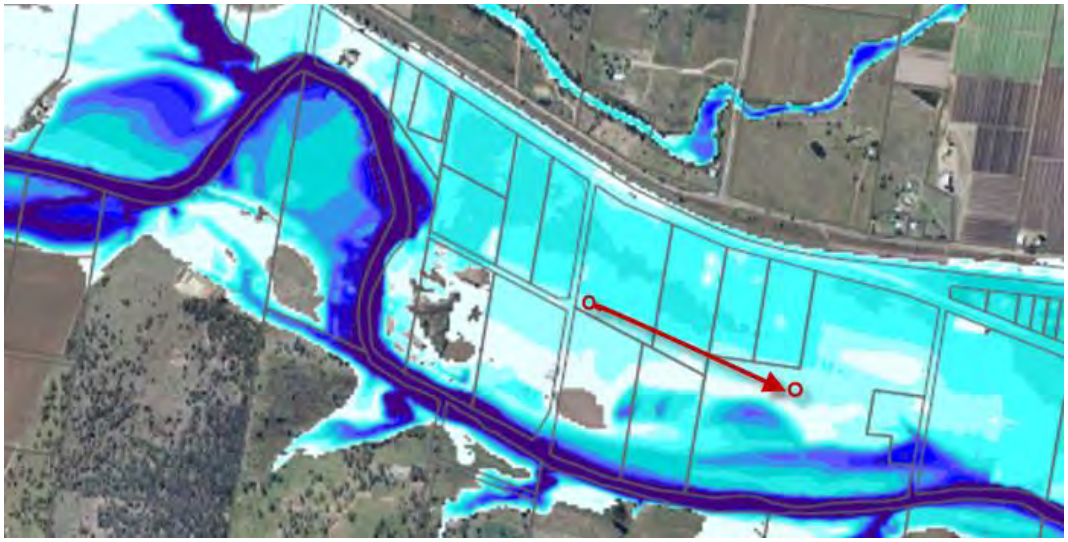


Figure 0.30. A steel cattle feeder estimated to be 2 tonnes and with half a tonne of feed in it, was carried from west to east across farm paddocks and deposited as shown above.

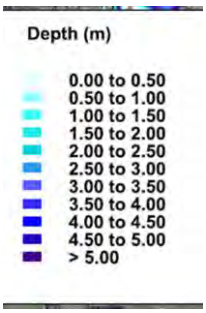


Figure 0.31. Boy found alive: Volunteer firefighter Kendall Thompson rescued Teddy Perry from the top of this cattle feeder swept from John Gallagher's farm paddock towards Grantham.

Depth

The depth of floodwater in Grantham in 'normal' floods rises slowly via Sandy Creek. The sudden onset of fast-moving and fast-rising floodwater capable of ripping a high-set house from its stumps, carrying houses significant distances and destroying a brick veneer house is unprecedented. Grantham resident Rob Wilkin described the speed with which the water rose in graphic terms – arguably more akin to a dam-burst scenario than a typically slow-moving, slow-rising flood plain flood event (Gearing 2012a):

> Once the first wall (of water) hit it didn't even go over the top of the road so the vehicles were safe to be there at that time. It was probably 40 seconds later that the second one came through that swept the vehicles off the road. We were cut off to the railway line, there was probably seven foot of water running through there by then. We stood there for a second and then thought 'Shit! Quick! Jump in the boat!' which we did. And then the next wave came through. I was in the boat hanging over the edge with one arm trying to undo the straps on the trailer. That was when the third wave came through which was enough to float the boat, which rose the water level another good six foot. That was when I saw people swept onto the railway fence trying to hang on. We raced over there to help (Gearing 2012a).

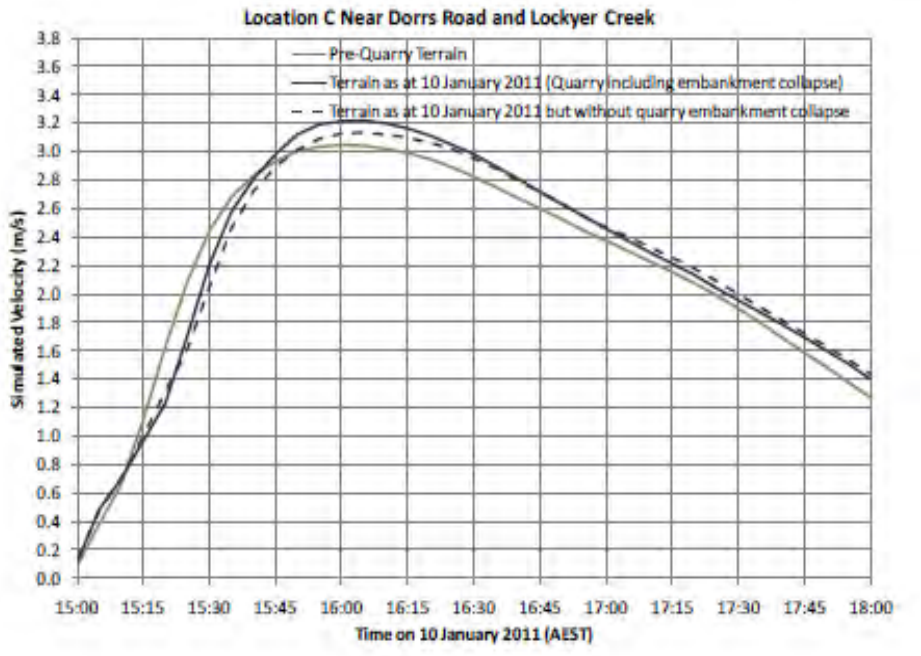


Figure 0.32. The graph shows the floodwater took an hour to rise to the maximum velocity and that the velocity fell slowly. Witnesses observed the water rise instantaneously, flow fast for about 20 minutes and then suddenly disappear back into the creek.

1.4 Whether the existence or breach of the Grantham quarry had a material impact on the damage caused by the flooding at Grantham.

Had the flooding at Grantham arrived as it usually did via Sandy Creek, it is unlikely to have caused severe damage such as the destruction of greenhouses and sweeping houses from their stumps and taking them across the landscape. The extent of the damage caused meant that when the QFCI was held, many of the people most affected by the flood were not yet in a home, had no computer or the capacity to confront and write about their experiences. They were struggling with daily living and working. Many of their accounts therefore were not available to the QFCI.

Figure 0.33. Wilkin's house was lifted from its stumps and swept across the road to the neighbouring flower farm where the greenhouses were destroyed.

Figure 0.34. Peter and Marie van Straten's house being swept from Anzac Avenue across Armstrong Road to a farm paddock 1.7km downstream.

Timing

From my research with flood survivors higher up the catchment and in Grantham, the flood peak would have reached Grantham soon after 2.30pm. The 'wave' from the west did not arrive until shortly before 4pm (Danny McGuire's Triple Zero call was at 4.01pm). The banking up of the floodwater at Carpendale therefore appears to have delayed the onset of the flood peak at Grantham by approximately one hour and 20 minutes. The series of photos at Kapernick's Bridge showing floating objects that stop east of the bridge and do not float downstream confirms the contention that floodwater was not moving down the catchment (see Section 1.2 Timing).

Direction

The direction of the torrent unleashed is clear from debris trails (as shown by the Taskforce Galaxy report).

Figure 0.35. Photograph: Taskforce Galaxy – Flood direction.

1.5 Whether the breach of the Grantham quarry had implications for evacuation of Grantham.

Failure to evacuate Grantham on the evening of 9 January on the advice of local volunteer Emergency Services worker Danny McGuire meant that on 10 January, residents were still at home in an unsafe location given the forecast for more rain on the already-sodden catchment. The sudden onset of the flood meant evacuation was impossible once people were alerted to the impending disaster.

Timing

On the evening of January 9, Volunteer Firefighter Danny McGuire made a formal request to police to evacuate the lower part of Grantham. Police refused to evacuate residents. McGuire door-knocked lower parts of the town and advised evacuation, especially of residents new to the area with young children. I have verified this with some of those people who did evacuate on the evening of 9 January on McGuire's advice.

It is known that various people (such as Tony McIntosh) telephoned Gatton Police and other residents to warn them that Grantham was about to be catastrophically flooded. This is verified by a phone call he made that was captured on a video being filmed at the time. Mr McIntosh warned that:

My place is covered with water. Toowoomba's just had 400mm today. You'll have a wall of water heading to Grantham any minute. This is an absolute disaster. Now get out of town. I don't even know if you'll even get out of town. Maybe if you go really quick. I'm telling you. I'm ringing everyone I can. Ok. Get out of Gatton. Go!

Figure 0.36. Flash flood warning: Video still taken at McIntosh farm (with flood height about 1.5m below the peak) which captures a phone call to police to warn of the approaching disaster.

There are unconfirmed reports that police in Gatton believed it would be too dangerous to try to go to Grantham to warn people of the danger and therefore did not attempt to provide on-ground warnings or assistance. This alleged abandonment by authorities has left residents feeling untrusting of authorities.

Question:

What specific warnings were given to Gatton Police about the imminent flooding of Grantham and when?

What effort was made to warn Grantham residents with on-ground warnings?

What time did Police arrive in Grantham (other than Sgt Minns who lived there)?

Several people who made Triple Zero calls could not be helped. Brad Long, for example made a Triple 0 call when he and his wife were clinging to the railway

fence. Brad did not realise he was talking to an automated recording and after giving details three times, he swore because of his desperation. He was distraught when the line dropped out, thinking the operator hung up because he swore. He gave his phone to his wife, who tried again. While she was on the phone, the fence they were clinging to began to rip from the ground. She let go of the fence and the phone and thought they would both drown. Brad had determined that if she drowned he would also drown himself and die with her.

Lack of warning combined with the sudden onset of the flood resulted in very traumatic experiences of death, loss and survival for people in Grantham. These include the account of Elizabeth 'Bess' Fraser who went with her partner to move a car a short distance to the railway line. When she looked back she saw the town flooded and realised the power of the floodwater around her house where her invalid sister and her nephew and a friend were living meant they could not be rescued. Bess phoned and asked her nephew to hug his mother and assure her everything would be alright even though Bess knew they were about to die. She did not want them to be afraid.

Jonathan Klaassen tells a similar story, of leaving his house to go to his brother's house, and of turning around and seeing Grantham under water.

Rob Wilkin was alerted to the danger and took his wife and children in their car to check their surroundings. He suddenly saw the flood wave, realised his former employer Lisa Spierling and her children would not have time to get in a car and get to safety in the two minutes he estimated they had before the wave would strike. Mr Wilkin left his car with the engine running and his wife and children inside to run into the Spierling house and get Mrs Spierling and her three children (Spierling 2011).

Danny McGuire was swept from his truck on Gatton-Helidon Road and knew his wife and two of his children were dead. On his account he was so distressed that he was preparing to suicide into the water. The only reason he had to live at that moment was if his son Zac, 8, had managed to cling to a tree. Mr McGuire called to Zac but heard no reply over the roar of the water. After some time he did hear a reply.

Other people who clung on in the torrent were terrified. Gilbert Kilah clung to a telegraph pole with his fingers wedged under the earth wire running down the pole. On his account he was terrified something heavy or sharp would cut his fingers off and that he would die. Frank King was clinging to a tree across the road from Gilbert. Mr King was terrified that sheets of iron under the water might suddenly slice his body open.

Rescue crews were also in precarious situations at times. Rescue 500 rescue technician Mark Turner was rescuing Fran Arndt when she grabbed him and he was pulled under water. Mr Turner was held under water for so long that he came within seconds of drowning. Meanwhile the pilot, Mark Kempton and his crewman Darren Parsons could not see Mark Turner and were preparing to release the cable to prevent the helicopter crashing if the cable became snagged in the trees. (They did not have helmet communications at the time and relied on hand signals.) Darren decided to pull the cable up, hoping Mark Turner had the flood victim in a harness ready to be lifted. Fortunately he did. Video from the helmet camera shows several flood victims were so cold and stiff that they were almost dropped as they were placed in the helicopter. Mark Turner completed all the rescues despite having no harnesses for children – he had to carry the children in his arms.

The trauma of the Keep family is difficult to comprehend. Matthew Keep saw his son swept away inside his house, then he saw his mother in law in trouble and was unable to help her. Matthew was swept from his house and from a short distance away saw furniture being swept from his house and believed his daughter, 5 had drowned. He then helped rescue a family by helping them climb on their roof. From there he saw his wife and directed a helicopter to rescue her. Once in the helicopter himself, he realised his baby daughter had died. At the evacuation spot he asked the crew to save his children but was told they would not go inside houses. Fearing for their lives, Matthew went back to the house himself and with Jonathan Klaassen, rescued his daughter, 5 and his son, 4. People who saw Mr Keep during this time and later that evening when he returned to Grantham to help rescue other people, observed that they had never seen anyone looking so distraught.

Speed

The speed of the onset of the flood in Grantham was inescapable by adults and children alike, be they fit and healthy or elderly or disabled, even those who were in

the relative safety of their own homes. Those people who did survive did so by climbing into the ceiling of their houses, onto the roof or into trees. People who made Triple O calls could not be helped. A woman who dialled Triple 0 for help drowned moments later when the fire truck in which she was a passenger was swamped. She could not escape from her seatbelt in time to climb from the truck. Two of her children drowned beside her. Some people managed to phone Triple 0 and spoke to communications operators. When told no help would be able to reach them, they gave their names and details of where searchers would find their bodies. The trauma of this situation for both the people at risk and for the communications operators is a heavy emotional toll of the disaster.

Figure 0.37. The torrent: Water speed, depth and turbulence indicate the very fast and dangerous torrent which struck buildings and people in Grantham.

The people who did survive in the worst-affected area along the Gatton-Helidon Road, did so only due to acts of courage. A grandmother, for example, was able to take her child and several grandchildren to safety by climbing a ladder to the roof. As the water rose to gutter level, she realised her invalid mother who she had put on a table because she could not climb a ladder, could not be rescued. The elderly lady perished (Gearing 2012b). Other elderly people also perished in their own homes.

Even fit and able-bodied people also found it very difficult to survive even when they were in a solid house that was not washed away, due to the speed and power of the current that was so strong that it prevented a person 'walking through it'. Another significant factor was the element of surprise. Brad Long stated that if his family had had as little as ten minutes' warning of the true scale of the disaster, the three family members who died could have been saved.

Depth

The depth of the fast-moving floodwater meant that vehicles and boats could not negotiate the flood to save people.

Figure 0.38. Depth, turbulence and speed of the flood water at the house behind the shop in Anzac Avenue meant rescuing anyone during the height of the flood by boat was impossible. *(Source: Bess Fraser)*

The only boats which did rescue people were Rob Wilkin's motor boat which was in his front yard and which he was in as the flood waves arrived and which he managed to unstrap from the trailer. He rescued Michelle Keep and her son Brendon who were clinging to the railway fence. The motor overheated and broke down before he could also rescue Brad and Natasha Long who were clinging to the other side of the fence. Ray van Dyke later used his canoe to rescue several people from Harris Street after the current subsided.

Direction

The unexpected direction of the onset of the flood being from the west, meant that local people who were suddenly alerted to the danger fled from Sandy Creek which was the usual focus of flooding. Kenly and Fran Arndt received a warning phone call and set off towards the west, driving directly into the flash flood wave which hit them so suddenly that neither saw the wave before it hit. Mr Arndt reported that he thought he'd suddenly gone blind until he realised their vehicle was underwater. Other residents who saw the flood wave coming, screamed for people who were fleeing the wrong way to turn around and go the other way, adding confusion, and in some cases great distress, to people such as Rob Wilkin, in an already traumatic life-endangering situation.

Consequences

The emotional, financial and relationship toll of the failure to evacuate the population of Grantham before the disaster is incalculable. The deaths of 12 residents has been a heavy toll. In addition, hundreds of people underwent unnecessary trauma and grief for the loss of family members, friends, pets, houses, cars and personal possessions. Lance Richardson and his mother Morva Richardson looked on helplessly as the brick house beside the pub exploded and crumbled into the torrent. Others, such as Marty Warburton feared he would die when his shop filled with water and the button on his cap was hitting the ceiling. He dived out the front door and climbed to the awning of his service station. From there he tried to rescue people only to be shocked that the bodies floating past him were not swimming but dead.

Several marriages and relationships broke down on the day of the flood in situations where, for example, women were alone with their children and their husband was away from the house. In one case the husband was the only person willing to cross the flooded Grantham railway bridge to rescue a teenager on top of a floating car before the vehicle was sucked under the bridge. He succeeded in the rescue.

Many children were deeply traumatised and have needed extended medical care to recover. Zac McGuire, for example, did not speak to his father for several weeks after the flood despite the death of his mother and siblings. Other children saw their parents in precarious situations and feared they would die.

The loss of houses meant dozens of families had to seek temporary accommodation and for times ranging from months to years lived in shipping containers, sheds or with relatives and friends. Many suffered severe financial stress because they had to pay mortgages for their ruined house as well as pay for accommodation for themselves and their family. Those with insurance often had long-running battles to seek insurance payouts, many received a fraction of the replacement cost of their losses, many were not insured and sustained high-value losses. Of those residents who have not been able to afford to move from the disaster zone, some are paying much higher insurance premiums than before the flood.

1.6 How these matters were first investigated and how eyewitness accounts were dealt with, particularly by state government agencies and emergency services.

Timings accepted by the QFCI about the onset of the flood in Grantham are disputed by local residents and time-stamped photographs. SES workers who claimed to have set out for Grantham to warn people at 2.30pm claim to have been unable to get into town because they saw a shipping container floating down the road. This did not happen until after 4pm, as shown by time-stamped photographs taken by Marty Warburton. Following the release of the QFCI Report, the SES timing was challenged and the SES volunteer conceded his timing about have been wrong by at least an hour. Lisa Spierling's account of driving to Gatton to do some banking and returning to Grantham well after 3pm was discounted by the QFCI

Figure 0.39. Rescuers and rescued: Brothers Jim and Rob Wilkin with some of the 31 people the brothers saved as the flash flood struck Grantham on 10 January 2011.

1.6.1 Conclusion

For the residents of Grantham to recover their sense of safety and begin to rebuild trust in authorities, several steps are necessary.

First, the unanswered questions need to be answered:

Why was material dumped at the quarry above natural ground level to a height of several metres (estimated at 7.67m)?

Were any permissions obtained?

If so, what precautions were taken to ensure the embankment would not put downstream residents at risk?

What action or legislation can be enacted to prevent similar landscape change in or near other creeks in Australia, especially where the building of a structure severely occludes a narrow section of a valley, such as that between Lockyer Creek and the railway embankment in this landscape?

How much water banked up (volume and depth) in the landscape west of the quarry wall (and for how long) before being suddenly released and striking downstream residents and properties?

What was the speed, direction, depth and timing of the 'dam burst' that occurred when the backed-up floodwater overtopped the quarry wall, destroyed the western side of the embankment and broke down significant sections of the opposite side of the embankment and sped towards Grantham?

To do this, the following steps are needed:

- The TuFlow model or another suitable hydraulic model needs to be calibrated to the eye witness accounts and the on-ground evidence so that the timing, speed, depth and direction and of the flood can be accurately reported.
- The SKM2 report should be withdrawn and replaced on the public record with an accurate scientific analysis of this dangerous flood event.

Prevention of a similar occurrence needs to be reduced as far as possible. The following steps are recommended:

- The quarry needs to be filled in and the landscape rehabilitated to natural ground level of approximately 121.18 AHD, so that future floods will flow across the low pocket rather than break from the creek bed and inundate rural properties between the quarry and the Grantham.
- Legislation is needed to prevent quarrying or mining in riparian zones such as this and any other sites similar to the low pocket in Lockyer Creek at Carpendale.
- Creek systems in south east Queensland should be surveyed to ensure no similar structures have been built which may result in similar fast-flooding of downstream land or communities.

It is also to be hoped that once the questions are answered, that any individuals, organisations or businesses who may be responsible for possible man-made aspects of this disaster are called to account.

Bibliography

Cork, Richard. 2015. *Anywhere surveys. Maximum flood heights.*

Friend, Tom. 2015. Media interview with the author.

Gearing, Amanda. 2011. Qld floods inquest: stories of courage, sacrifice in emotional replay." *Crikey.com*. November 2, 2011.

Gearing, Amanda. 2012a. *Queensland floods anniversary: Rob Wilkin*. ABC Radio National Breakfast (viewed 13 January 2012).

Gearing, Amanda. 2012b. *The Torrent: Toowoomba and Lockyer Valley, January 2011*. Brisbane: University of Queensland Press.

George, Harold. 2015. Media interview with the author.

Haxton, Nance. 2015. "The World Today." *Calls growing for Grantham flood inquiry*. Performed ABC News (viewed 10 March 2015).

Insurance Council of Australia Hydrology Panel. 2011. "Flooding in the Brisbane river catchment January 2011: Volume 4. Flooding in Lockyer Valley Regional Council LGA 4.

Jordan, Philip. 2011. *Provision of hydrological advice to Queensland Floods Commission of Inquiry: assessment of impact of quarrying operations on flash flooding in Grantham on January 2011* SKM.

King, Frank. 2011. PhD research interview with the author

Mahon, John. 2011. PhD research interview with the author.

Sippel, Jon. 2011. PhD research interview with the author.

Spierling, Lisa. 2011. Interview with the author 9 March 2011.