DOC 4

MELBOURNE STORM REPORT

Analysis of early warnings issued by EWN
March 6 2010
Melbourne hail event

THE AUSTRALIAN EARLY WARNING NETWORK

Case study in the effectiveness of early warning in the protection of property

25 March 2010

[redacted]
Managing Director
The Australian Early Warning Network

THIS BUSINESS SUPPORTS
EWN

Executive Summary

On 6 March 2010 EWN issued a series of warnings to locations in and around Melbourne about to be impacted by severe thunderstorms packing hail, flash flooding and damaging winds. Warnings were sent to Mobile (text), email and desktopALERT. This report analyses and explains the process, details feedback from recipients and demonstrates the substantial success of the system to save property during this event.

It is quite clear these warnings and the system saved people (and insurance companies) from considerable loss during this hail event.

Detailed in this report is just some of the feed back we received from members describing their experience during the Melbourne hail event. We have a lot more feedback which reveals the behavior of those receiving warnings...and those who did not. Evident is that:

1. Many people were entirely unaware of the approaching storm or its nature
2. EWN members took heed of our warnings and successfully acted to protect property
3. Many more people other than EWN members were alerted as a result
4. Significantly more property could have been protected if assistance were provided to EWN

Feedback also confirms previous member survey results which show some 97% of them take action to protect property, 83%when possible log on to BOM website to continue to monitor the event and 92% tell others. These numbers seem high but are probably not surprising given they are from a population who have been proactive in joining EWN to do just that. It should be noted, that taking action may include further monitoring or information discovery.

As commented previously, EWN protected far more than just its members. It is not unusual for one warning to be distributed to hundreds of others. (*I have received back emails that have done the rounds with hundreds on the distribution list*)

Why does this matter? EWN is the only location based delivery system for severe weather in the world. Over three years of experience and technology development have produced a unique IP that is proven and highly effective in the protection of property. This is an initiative of global significance that reduces claims, protects property and helps make the community a safer place to live.

This is one case study of many. For more such reports please contact the author [redacted] at the address provided or [redacted] on mobile [redacted] or phone [redacted]

Phone: [redacted] Mobile [redacted] email [redacted]

Melbourne Hail Storm Warning

COPY OF A WARNING

WEATHER ALERT

THE AUSTRALIAN EARLY WARNING NETWORK

VIC Severe Thunderstorm Warning: Large Hail, Flash Flooding, Damaging Winds

EWN FOUNDATION SPONSOR

Source: Bureau of Meteorology

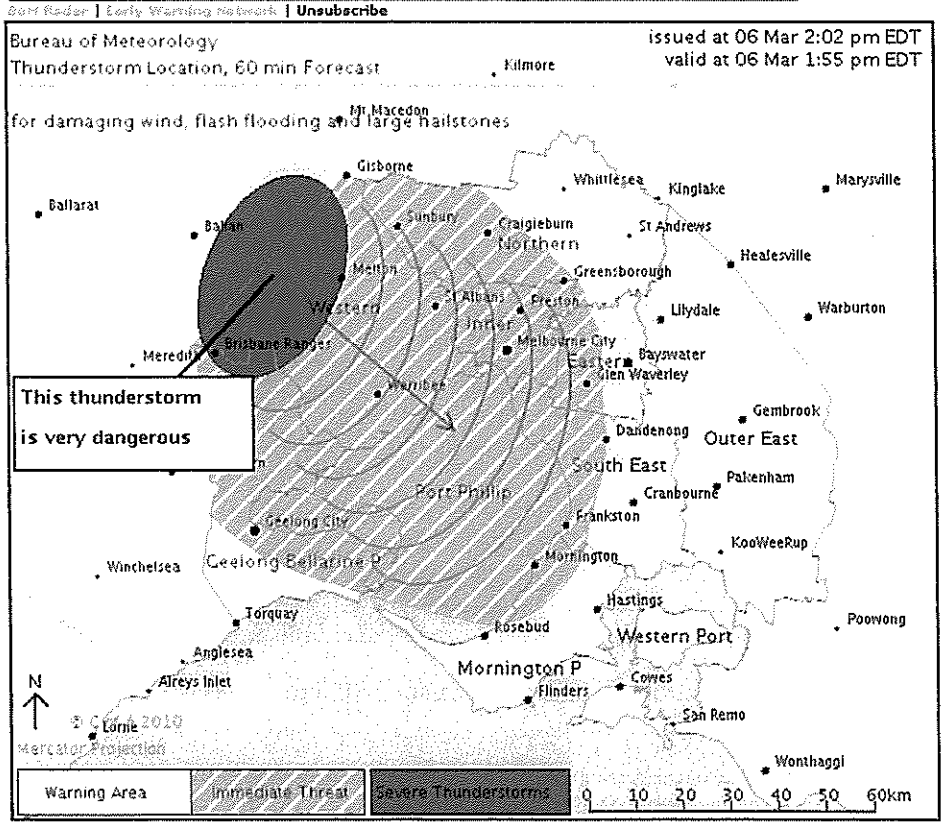
For people in the Inner, Western, Geelong and Bellarine Peninsula, Port Phillip and parts of the South East, Eastern, Northern and Mornington Peninsula Local Warning Areas.

Issued at 2:02 pm Saturday, 6 March 2010.

The Bureau of Meteorology warns that, at 1:55 pm, very dangerous thunderstorms were detected on weather radar near Gisborne and Melton. These thunderstorms are moving towards the southeast. Very dangerous thunderstorms are forecast to affect Footscray, St Albans, Sunbury and Werribee by 2:25 pm and Caulfield, Craigieburn, Glen Waverley, Greensborough, Melbourne City and Preston by 2:55 pm.

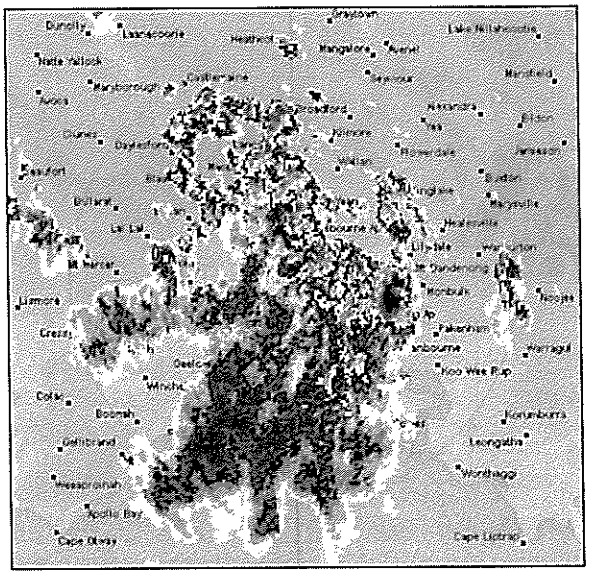
Damaging winds, very heavy rainfall, flash flooding and large hailstones are likely.

The State Emergency Service advises that people should:
* Keep clear of fallen power lines.
* secure any loose objects in the vicinity of your home.
* keep away from creeks and drains.
* do not drive vehicles through flooded areas.
* stay indoors if possible.
* Avoid using the phone during the storm.
* if you are outside, avoid sheltering under trees
* listen to the radio for storm updates
* switch off your computer and electrical appliances



Introduction

EWN internal forecasting for Saturday 6 March 2010 was for severe weather. At 10:13AM EWN began to provide specific and geo targeted warnings to those populations that were going to be impacted by rapidly developing severe weather. This began in the middle and upper west of the state and by the end of the day had progressed across the greater proportion of Victoria.

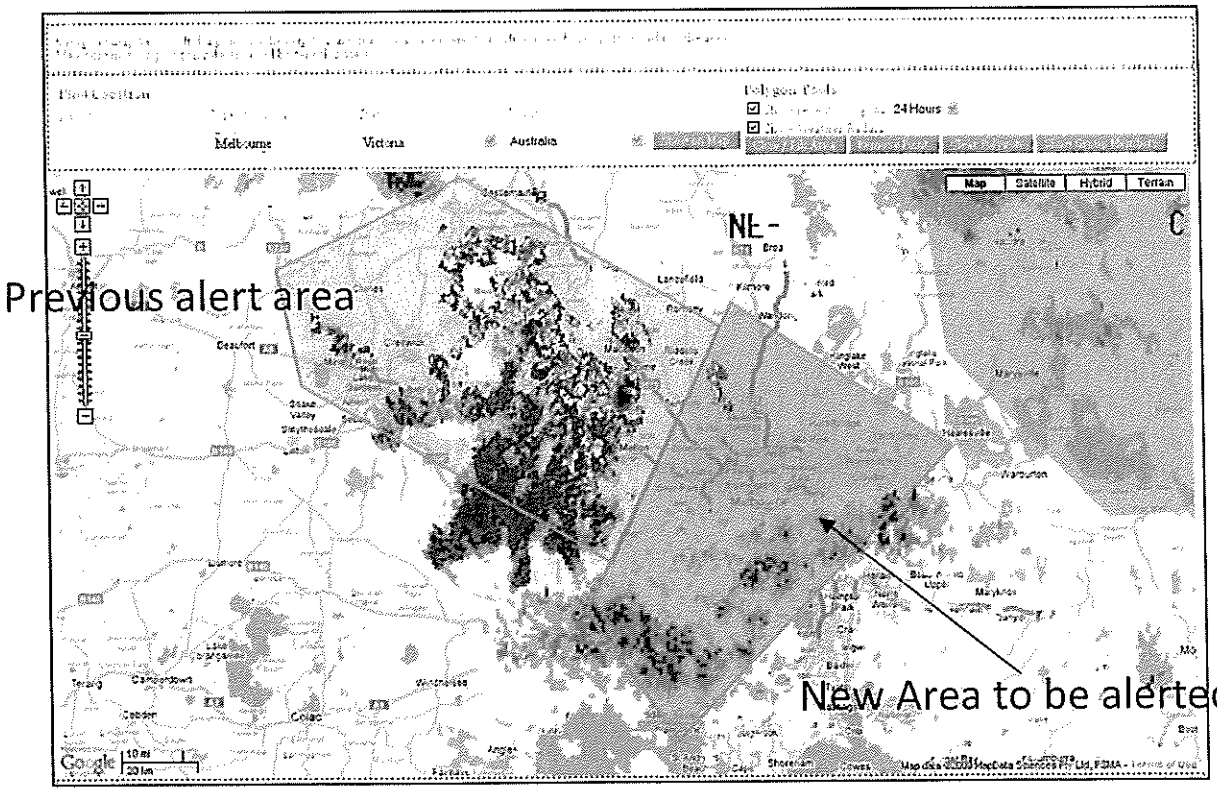


The following pages break down EWN's warning process on that day illustrated by GNIS* system reports of the areas targeted with each warning.

EWN has provided early warning to its members for every severe weather event experienced in Australia since September 2007, including targeted alerts on Black Saturday.

An example of the email warning can be viewed here:
https://www.ewn.com.au/media/melbourne_hailstorm.aspx
The radar loop for the entire event can be viewed here:
http://www.theweatherchaser.com/radar-loop/IDR023-melbourne/2010-03-06-00/2010-03-06-12

To assist the reader in understanding how EWN tracks and provides warning, the screen grab below illustrates how weather radar is overlaid on EWN's mapping system along with previous alerts already delivered. This provides track history and allows projection of impact areas. The system is accurate to within ten metres.

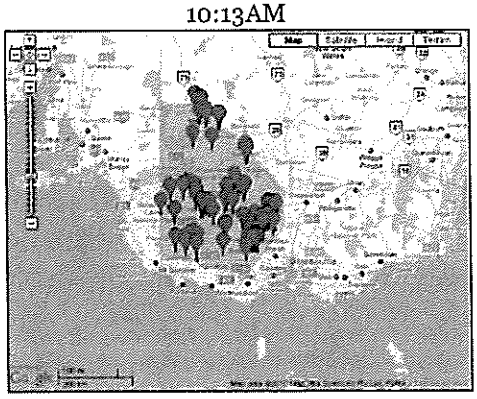


*GNIS Geographical notification and Information System

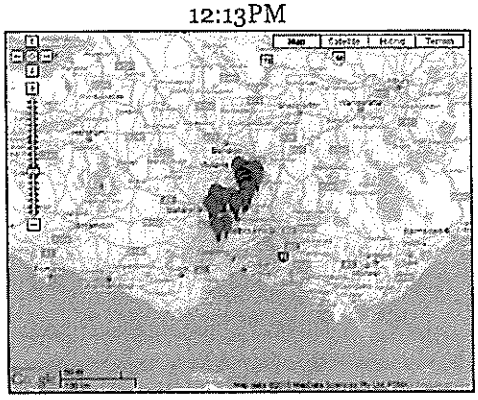
Phone: [redacted] email support@ewn.com.au

The following maps are delivery reports from Saturday March 6 2010. Icons below represent members of a specific group (Not all members). This is only a small part of the delivery report. Due to privacy reasons we are unable to show the full report.

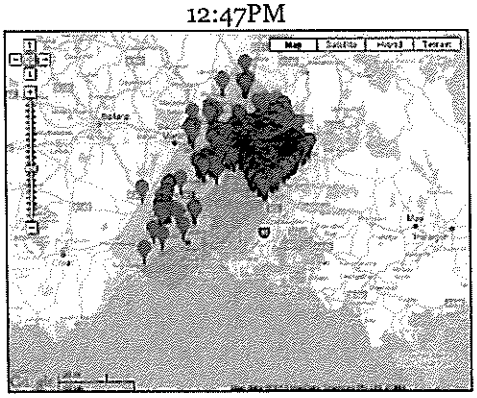
10:13AM



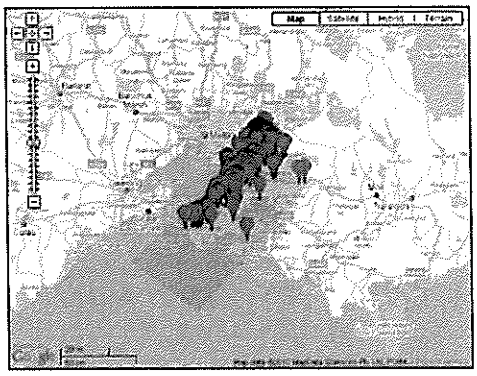
12:13PM



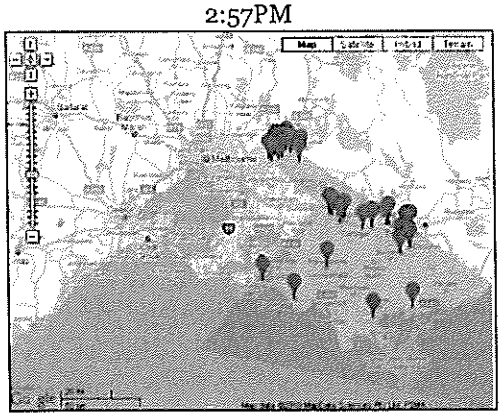
12:47PM



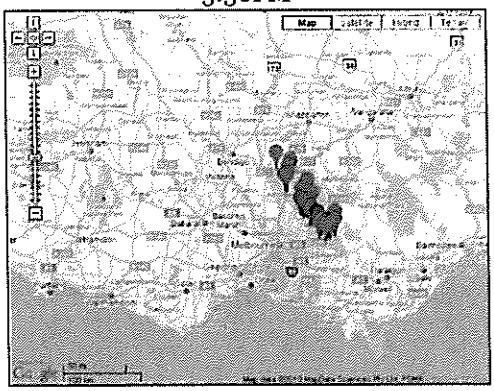
2:11PM



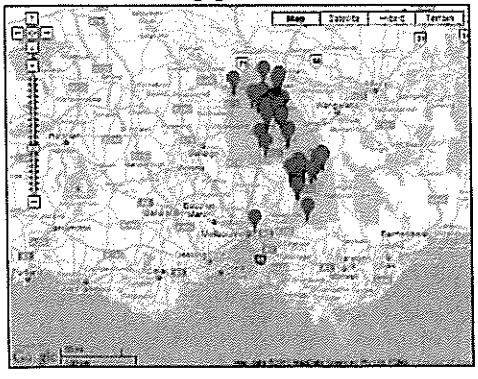
2:57PM



3:36PM

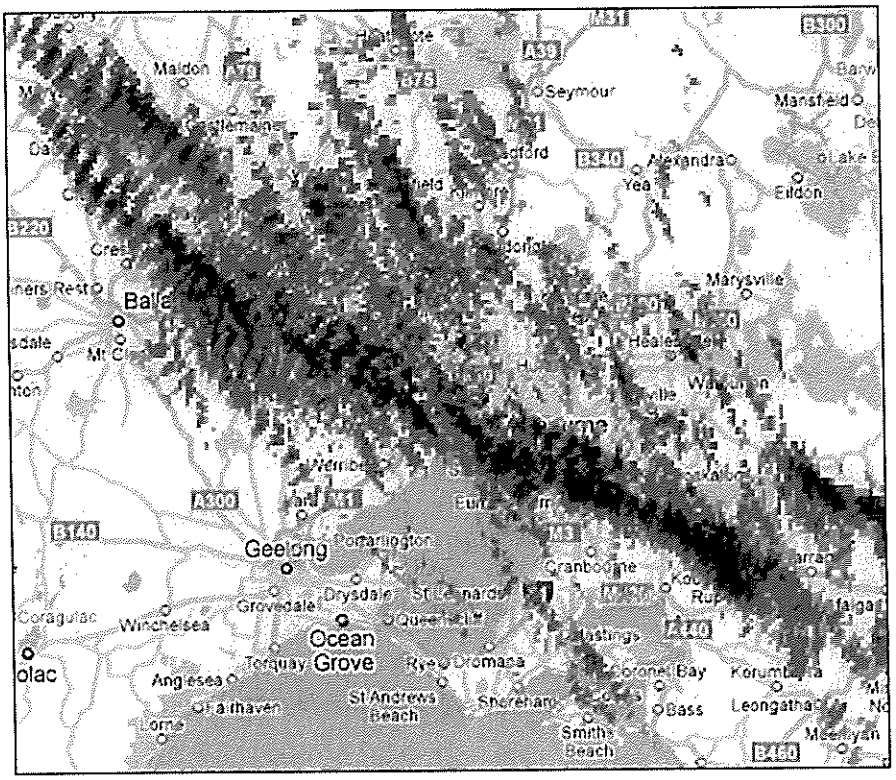


3:56PM

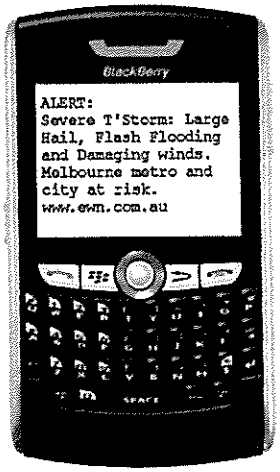


Phone: [redacted] email support@ewn.com.au

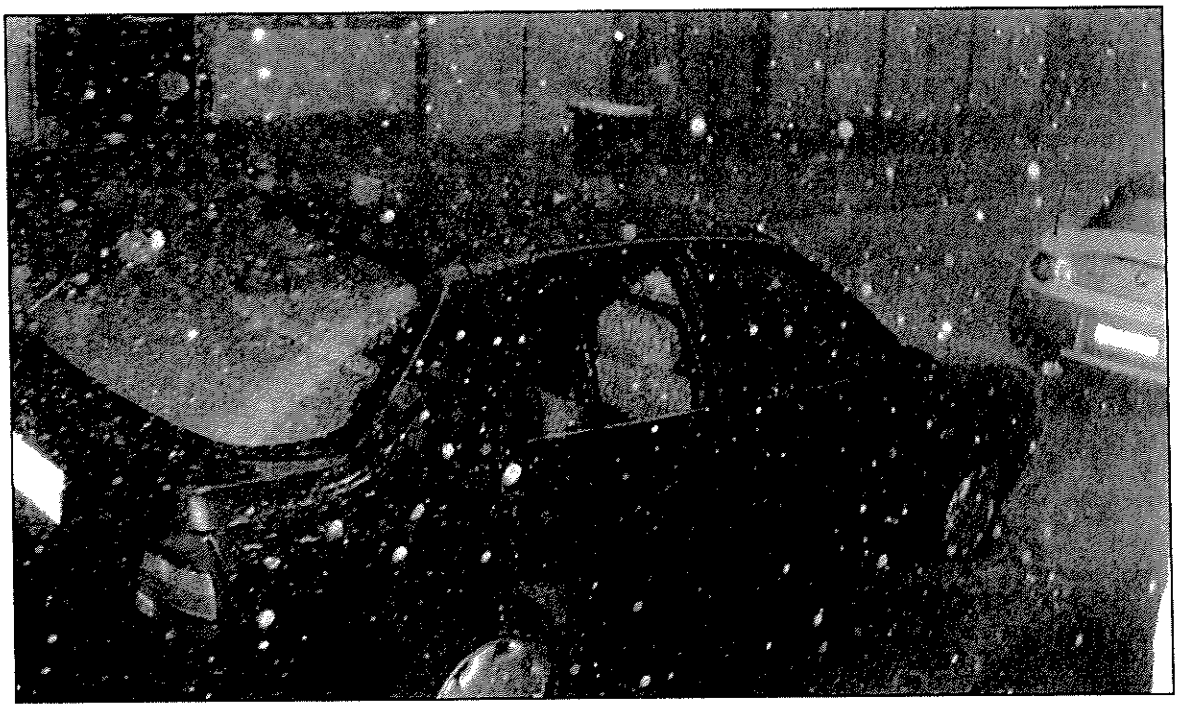
Radar track from the day



"SMS Message sent to mobile



"Thank you for the warning I put my car in the carport and left the misses out, hers is totalled many thanks"



Phone: [redacted] email support@ewn.com.au

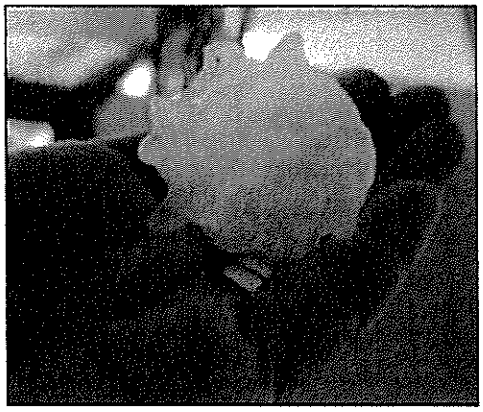
Member Experiences

Hi [redacted], because of the early warning alert I went straight onto the Bureau of Meteorology and checked out our area.....could see it coming and new it was going to be bad (Shepparton was in the direct path) and our town a little off the direct path. This enabled us to sandbag all the doors to our hotel and our damage because of this was fairly minimal. Would have been completely flooded out like a few business.'s in our town if we were not warned in time.
Thanks for the service. [redacted] Tatura. Vic.

Our next door neighbours, who don't have a garage, have had their car written off by their insurance company due to hail damage. Because of your early warning system we drove our car in off the street and parked it in the garage. It was completely undamaged during the storm.

We have also found the warnings valuable for less important things like picking up kids from school instead of letting them walk home and bringing in washing - small stuff in the scheme of things but useful in daily life.

Many thanks,
[redacted]



My early warning sms for the pending storms on 6th March 2010 in Melbourne arrived on my phone a number of hours prior, whilst I was out and about. With this information, I looked in to the details of the warning and saw it was going to be a big one although I never imagined it to be anywhere near as big as it was. I went home and prepared my property, moving cars undercover, pulling down external blinds, bringing in the more fragile things and making sure my dogs were properly secured and their shelter was ready.

I left the house to continue on with my day including visiting some relatives on the other side of town.
I was on the road near the city when the storm first roled in. I never saw any hail. Watching the news websites intently, i hear reports coming back that Ferntree gully (where i live) and Rowville have been hit by tennis ball sized hail with a lot of damage being caused.
I was dreading heading back home. I knew i prepared, but surely with this degree of hail i would have some damage somewhere.
I had spoken to some neighbors before i left for home and they confirmed the tennis ball sized hail had hit our court. As i drove up my court in the dark i was looking around at the parked cars, window after window smashed, panels made to resemble the surface of a golf ball. I got home. First, check the cars, no visible damage (in the dark), then up on to the roof to check my solar panels which i had covered in a blanket, no damage. My roof is a flat metal roof so i didn't expect any damage here. I checked the Plastic roof section, got lucky here, no damage, shed, no damage, house windows, no damage.
After this initial survey and another look in daylight the following day, i found only 2 very minor dents on one vehicle which are not the sort worth fixing (i have been quoted $200)
If i had not prepared, i would have ended up like many of my neighbors with tens of thousands of dollars damage and the inconvenience of living with waiting for repairs and dealing with insurance claims.
I would not have known to prepare without the SMS from "The early warning network"
A car yard nearby had nearlly their entire stock damaged and the rumor is that they only had partial

insurance. Had they had an early warning, they could have fitted the majority of their stock in to the mechanical workshop avoiding much of the damage they have.
Thankyou EWN. Keep up the good work. [redacted] - Ferntree Gully

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Your EWN helped me because I got to my work site just before the rains and hail could come down. Infact I made sure my car was covered up too. All in good time.
[redacted]

I would like to thank you for the Early Warning SMS - I was out shopping, when I received the Warning SMS,and so, I immediately left what I was doing and drove home - parked my car securely in the garage and locked the door... I was safe and so was my car...

Unfortunately, my husband does not get the SMS's directly from the Early Warning Network (as I forward the SMS's I receive, to him). For some unknown reason this time he did not get my SMS either, and as a result, his car was badly damaged - looks like it will be a write off - with the car dinted all over (the dints the size of oranges) and a cracked window...

We are glad though, that at least one of our main possessions was spared on this occasion, as we weren't so lucky 7 years ago when one of these Hail Storms hit, and unfortunately damaged both our cars. I had a convertible with a soft top, and the roof was shredded to pieces at that time. (Perhaps, we would have been spared on that occasion also, had we had the Early Warning Network SMS's in place back then).

I live in Rowville and we suffered a lot of damage from the hailstorm. I was able to close our garage door (saved two cars from damage) and pull all my washing in off the clothesline (3 loads on a Saturday) before the storm struck – my clothesline is having to be replaced as it was damaged! We kept an eye on the storm via Bureau of Metreology as well,. We were home and had the dog inside before it hit. I appreciate the alerts, I actually signed up more for alerts while I am at work as my workplace sells stock that needs to be weighted down on windy days, not knowing it would affect me at home as well. Thanks - [redacted]

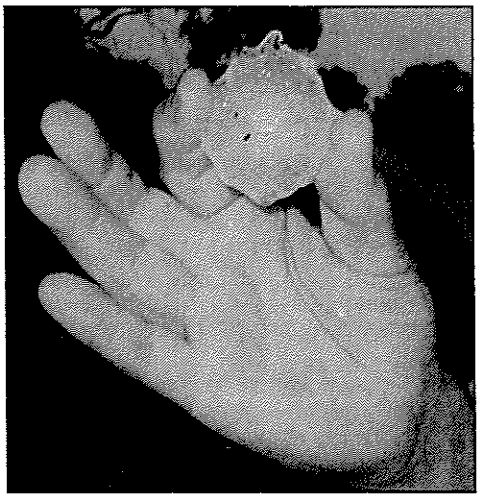
I'm [redacted] got caught in the storm at Belgrave. The EWN tip was helpful enough that when I got the message We got under cover at the Belgrave Convention Centre Hall and it didnt come for bout another 10 minutes. Here is 3 pictures, one is of the stairs with all the hail, another is a piece of hail that hit me in the head and another that hit me in the eye.

The hand that is holding the hail is big (cause the hail in my hand was the size of my whole palm).

But thought I'd give you this . . . I got a couple video clips but not sure if you wanted them. If you do let me know and I can send em to ya.

[redacted]xx

I greatly appreciate the early warning system and so do the staff where I work. The recent rain storm that flooded Elizabeth Street in Melbourne occurred around going home time (this seems to be the trend in Melbourne) was a good case in point. I asked my staff to put the warning on the intranet and they forgot to so many staff were caught out when they went home - myself included. I was drenched.



A previous episode was maybe three years ago when thousands of homes and traffic lights were without power in Melbourne due to a substantial storm. That was also around going home time. It allowed some staff to leave early and miss most of the traffic chaos.

The Melbourne hail storm was on a Saturday but I received the message just after I had removed most of the weatherboards of the western side of my house (the most exposed side). I was able to get cover up in time to prevent serious damage to the house and to my friend and me from golf-ball sized hail (no exaggeration – this is the first time I have seen such a thing). The [redacted] buildings sustained minor damage but nothing that could we could not handle.

The service is great, accurate and useful. Thank you so much

[redacted]

I was one of the extremely fortunate folk who receive extreme weather warnings from the EWN, thus giving me precious time to move my brand-new car into the garage before the recent hail storm in Victoria. Considering the carnage wreaked upon our neighbourhood, and the extensive hail damage my other vehicles sustained, I cannot praise this service enough!

Kind regards,

[redacted]
Sassafras, VIC.

I live in the western suburbs of Melbourne. I can only say how grateful I've been to have your email/text message service available to me. A property has been under construction next door to me now for over 7 months. I have had endless problems with flooding of my property from lack of stormwater connection and blockages in their stormwater connection. Had I not had your text message on Saturday 6 March, I would have been away from my home and unable to take some action to protect my property. I also forwarded your message on to my son who was about to travel from West Footscray into the CBD for Moomba. He told me later that had it not been for the message, he and his girlfriend would have been "in the thick of it" in the Melbourne CBD.

Thanks again for what is a wonderful service.
[redacted]

Thankyou for the great work you do. We got your report of the hailstorm coming and tried to act on it! We didn't quite make it home and got some hail damage to the car. But we did make it home in time to stop our house flooding from the huge amount of water that was coming down the street. We Thankyou Very much. Keep up the good work.
Regards [redacted]

This is [redacted] from Melbourne. I believe this service is really helpful.

I received the email and SMS that day and cancelled my trip even though I didn't realize the hail storm was that ferocious. I also moved my car to the car port. Thanks a lot for the great service.
Regards, [redacted]

Thank you for the warning I put my car in the carport and left the misses out, hers is totalled many thanks
[redacted]XXXXX (EWN edited for privacy reasons)

I think the EWN service is amazing, we were caught up in the severe storms that lashed the Goulburn Valley a few weekends ago and getting an email and text message with a warning gave me enough time to protect my assets and as a result have minimal damage.

I am a SES volunteer and am quite surprised and amazed that your warnings ALWAYS beat the ones we get on our pagers by at least 45 minutes. Good Job.

[redacted]

Very useful program. Diverted my car under a sheltered overhang as the storm hit. Thanks.
[redacted]

Just a quick note to say how useful it was to have the prior warning about the recent severe weather, via SMS and email. I was able to warn others (who were not on the net at the time) and they were able to get their vehicles under cover before the hail arrived. Unfortunately, there were a number of other friends who weren't aware that the wild weather was coming, and paid the price through their vehicles being written off due to the damage that was sustained.
[redacted]

Whilst away on holidays i got the message regarding the damaging winds and large hail stones.
I phoned home to inform the rest of the family there, they then packed up any loose items in the yard and moved the new car from the driveway to the garage... saving it from damage.

Brilliant service... Keep up the great work.

We have been signed on to EWN now for quite some time. Even prior to the devastating bushfires of last year we have been well warned in all events. Our friends and family are also signed up which was a relief as the bushfires were a real threat for many of them as well.
I am now convinced EWN is crucial. On the Saturday of the hail storms my family and I were having a lovely bbq with friends at their home in the hills. No possible sign of a storm. Out of no where the terrifying storm arrived. We were completely helpless as we watched all four vehicles be destroyed to the point of write off by hail stones the size of tennis balls. When the storm passed and I returned to the car I remembered the nappy bag in the back seat, complete with my mobile phone, the one the warning came on. Had I had it with me we would have had sufficient time to have us all out of harms way! We are just grateful no one was hurt. If this helps to illustrate how important such a service is then I am happy to lend my support. My mobile is now permanently attached! 20 minutes of mahem and weeks later we are still looking for cars and are thousands of dollars out of pocket! Thanks EWN.
Yours faithfully,
[redacted]

On 6 March 10 my husband and I drove our Kombi van down to Doveton to watch my brother play cricket. Our two small children, and my friend, were with us.

We all got an early warning text at about the same time, warning of dangerous storms approaching. We decided to pack up our picnic and leave for home to avoid the storm.

As it happened, we didn't avoid the storm - we got stuck in the middle of it. Fortunately we were

driving our Kombi and not our other car, which would likely have been destroyed.

We are all extremely supportive of the EWN network and believe that on the 6 March 2010 it probably saved lives. Picnic-ers, motor cyclists, hikers...anyone hit on the head by one of those hail stones (we saw one the size of a cricket ball) could have been badly hurt or killed.

Regards
[redacted]

Thanks for the alert. We were able to move the car out of range. [redacted]

I failed to take advantage of the warning. As a result I suffered 15K of damage. (Perhaps the cars could have been put undercover).
Regards
[redacted]XXXXX (EWN edited for privacy reasons)

This service has been hugely beneficial and potentially saved our brand new car from being hail damaged in the recent Melbourne hail storms. We were able to delay going out until the storm had passed as a precautionary measure and take all messages received very seriously - thank you!!
[redacted]

Your warnings have been extremely helpful to me and my family. Recently members of the family were in Mildura, Vic. and were able to locate to a safer place due to my passing on your warning to me about that area. They had been camped by the river for water skiing races!

Also just before the hail storms in Melbourne, I was about to leave home to go shopping when your alert came through to my mobile phone. I heeded it as your warnings are spot on so even although the sun was shining brightly, I left my car in the garage and me safely in the house and any likely missiles from the garden were secured. Fortunately there was no damage to me or my property although my suburb did bear a fair share of the ferocity of the hail storm.

Thank you so much for this very much valued service

Regards
[redacted]

Conclusion

It is quite clear the system saved people (and insurance companies) from considerable loss during the March 6 Melbourne hail event.

Detailed in this report is some of the feed back we have received for the Melbourne hail event.. We have a lot more feedback a lot of which reveals the behavior of those receiving warnings...and those who did not. Evident is that:

1. Many people were either entirely unaware of the approaching storm or its nature
2. EWN members took heed of our warnings and successfully acted to protect property
3. Many more people other than EWN members were alerted as a result
4. Significantly more property could have been protected if assistance were provided to EWN

Borne out by this feedback is confirmation from previous survey results that in addition to taking action to protect property, recipients (83%) when they are able to log on to BOM website to continue to monitor the event and 92% tell others. It is is not unusual for one warning to be distributed to hundreds of others. (*I have received back emails that have done the rounds with hundreds on the distribution list*)

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This is one example of many. For more such reports please contact the author [redacted] at the address provided or [redacted] on mobile [redacted] or phone [redacted]

Doc 5

The billion-dollar hailstorms

Nature took a shotgun to insurance companies in March 2010.

Left barrel, a Melbourne thunderstorm on 6 March like nothing in living memory, a billion-dollar assault by hail.

Right barrel, just 16 days later, when Perth suffered one of the costliest natural disasters in its history, also with a billion-dollar insurance estimate.

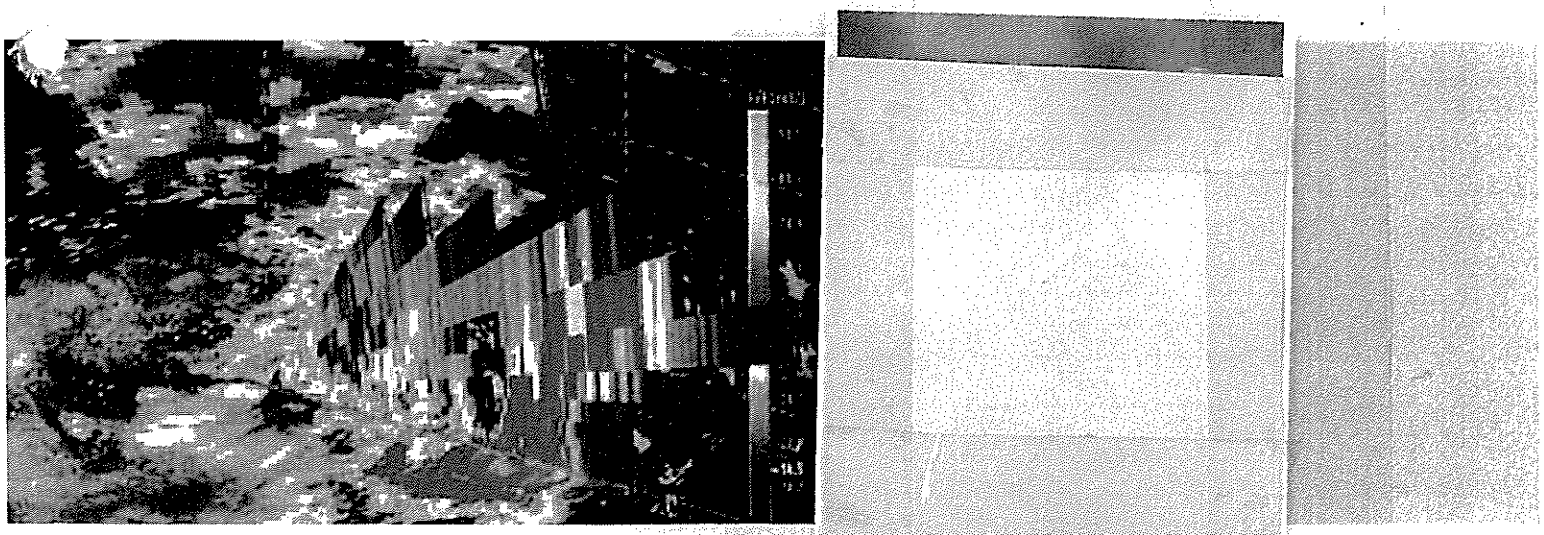
In WA, there were severe thunderstorms on the afternoon and evening of 22 March in the Central West, Lower West, and adjacent parts of the Southwest, Great Southern and Central Wheat Belt districts. In particular, severe storms moved through the Perth metropolitan area between 3.30 and 6.00 pm, causing large hail, heavy rain, flash flooding and severe winds that resulted in damage estimated at more than a billion dollars.

This storm produced the largest hail known to have occurred in Perth. It was the most significant weather event in terms of power outages (over 150,000 properties without power at the peak) and requests for assistance from emergency services (over 3000) since the May 1994 wind storm.

In Melbourne, those on-duty folk able to take brief time off from answering calls from storm spotters or the media, or indeed getting out the severe thunderstorm warnings and routine forecasts, gazed in awe from the RFC on the 6th floor overlooking Docklands, unaware of flooding on the upper two floors of their building at 1010 Latrobe St.

The media would no doubt have loved an objective thunderstorm rating, ideally something like a Category 5 tropical cyclone. A HP Supercell (for High Precipitation Supercell thunderstorm) doesn't have the same public impact.

[redacted] Victoria's Severe Weather senior met, recalls a wild ride at VRO: 'As the day's convection forecaster, [redacted] started his shift at 9.30 am, the aviation forecaster,



3.12 pm on 6 March: this radar imagery includes a vertical cross section of data as the storm hits Melbourne's southeastern suburbs. Forecasters never rest: [redacted] keep a wary eye on a thunderstorm [redacted].

[redacted] told him he might want to check thunderstorms in the NW of the state. By 10 am [redacted] issued the first of many Severe Thunderstorm Warnings for damaging wind, flash flooding and large hailstones ...

'A pool of low-level moist and warm, tropical air that had made its way south from further north over the previous few days, combined with an approaching upper low from the west, to produce a day of quite awesome thunderstorm activity over Victoria, culminating in the massive Melbourne hailstorm that developed that afternoon.

[redacted] 12.36 pm update to the Severe Thunderstorm Warning included the first specific mention of Melbourne. At 1.25 pm he followed with the first cell-based warning for the Melbourne area, again warning of the potential for damaging wind, flash flooding and large hailstones, possibly reaching a line from Melton to Geelong by 2.20 pm, for several storms near Daylesford and Ballan, to the northwest of Melbourne. The first storm spotter report was rung in at 1.45 pm by two of the Bureau's well-known spotters, who reported trees down and flash flooding near Maldon in central Victoria.

'By 2 pm [redacted] was seeing severe thunderstorm radar signals that he had only read about before. The Doppler showed that a storm west of Melton was rotating and had become supercellular; and the guidance for hail size was giving values way over the severe criteria. He issued another cell-based warning for Melbourne at 2.02 pm, using the phrase 'very dangerous', the first time he had ever done this. This sparked a chain reaction with a flood of calls from the media and spotters, including a Melton spotter advising at 2.45 pm that 40.4 mm of rain had fallen in 15 minutes, golf-ball-sized hail and "force 8" winds.

'The rest of the afternoon became very intense. The radar was closely monitored; warnings were updated, SES people were briefed, media interviews given and spotter reports taken as the main storm intensified further and moved across the Melbourne CBD, right next to the Victoria Regional Office, and out into the eastern suburbs. Forecasting staff still had to prepare and send out the routine afternoon official forecasts. The cell-based Severe Thunderstorm Warnings for Melbourne were finally cancelled at 8pm, after many reports of flash flooding and giant hail. Quite a few of the telephoned reports were from Bureau staff whose homes had suffered hail damage. Some of the reports were quite unbelievable with hail up to 10 cm across, whole inner city main streets under metres of water, and parts of Etihad Stadium and Southern Cross railway station near the Regional Office severely damaged.

'The final Severe Thunderstorm Cancellation Warning at 9.38 pm brought some respite to the office's frenetic activity. Even though the duty forecasters wondered if they could have done more, the warning service for the event was first rate and a credit to the skill and professionalism of staff.'

The Melbourne extremes: 46 mm of rain at Maribyrnong in between 15–30 minutes; hail measuring 10 cm at Ferntree Gully at 3.30 pm; wind reaching 96 km/h at Melbourne airport. The SES had 3200 requests for help between noon and 11 pm.

In Perth, severe weather forecasters [redacted] and [redacted] had a hectic day: 'We realised from early analyses that we faced a special day, with conditions likely to trigger strong convection. We were so sure of this that at 9.45 am we put out warnings without a cloud visible ... sometimes known as a "blue sky" warning. The first Severe Thunderstorm Warning

DOC 6

P8.27 TWO RECORD BREAKING AUSTRALIAN HAILSTORMS: STORM ENVIRONMENTS, DAMAGE CHARACTERISTICS AND RARITY

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Insurance Australia Group, Sydney, Australia

1. INTRODUCTION

Historically the eastern capital cities of Sydney and Brisbane (see Figure 1) have experienced impacts from severe hailstorms on numerous occasions, including one of Australia's most devastating natural disasters, April 14, 1999 hailstorm (Buckley et al (2001)) that produced $AUD 1.7 billion damage (original cost – ICA 2010) across Sydney. However, the more southern and western capital cities of Melbourne and Perth, both with weather records dating back close to 150 years, had never reported major damage from giant hail. This changed for both cities in March 2010 when, within the space of 16 days, both experienced their largest natural disaster on record - from giant hail producing severe thunderstorms. These two storms are described more fully in the following sections.

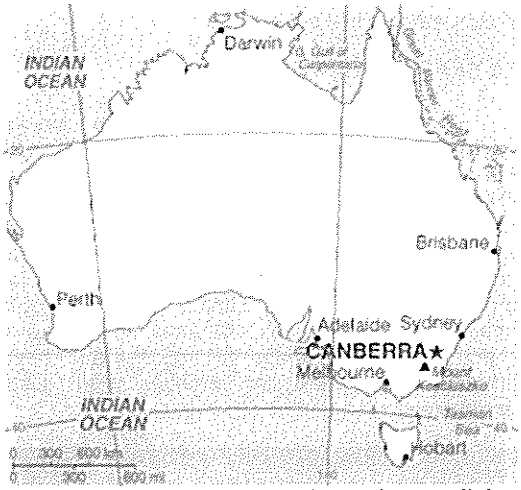

Figure 1: Map showing locations of Australia's capital cities.

2. MELBOURNE SEVERE HAILSTORM

Australia's second largest city, Melbourne (Population 4.0 million in June 2009), experienced its worst hailstorm in 156 years of weather records during Saturday afternoon on March 6, 2010.

The thunderstorm complex formed over the northwest of the state early in the afternoon and became severe as it tracked over high ground approximately 100km northwest of the city. During the initial intense phase the first cell tracked over the rural town of Melton, located around 30km to the west of Melbourne, dropping 4cm diameter hail on the region before collapsing over the western suburbs of the city.

During this phase a new thunderstorm cell formed on the northeastern flank of the original cell, moved towards the southeast across the central business district of the city then became a left moving supercell as it tracked towards the east southeast across the eastern and outer eastern suburbs of the city. There were multiple thunderstorm cells associated with this event although the main damage was caused by a single thunderstorm that could be continuously tracked across the greater Melbourne region.

The storm track is best illustrated through the use of radar data as this storm was well monitored by weather watch radar throughout its life cycle. The aggregated volumetric radar data for this event, presented here as a Vertically Integrated Liquid (VIL) field using reflectivities capped at 60dBZ that has been found to be useful to highlight intense phases of thunderstorms for damage analysis, based upon raw data from the Australian Bureau of Meteorology's Melbourne (Laverton) Doppler weather watch radar (1° beam width M1500-S1 S Band Doppler radar) at six minute volumetric scan intervals, is shown in Figure 2.

2.1 *Historical perspective*

Industry wide insurance claims for damage associated with this event, the most expensive natural disaster to affect Melbourne, (Insurance Council of Australia 2010) totaled $AUD 1,044 million ($USD 1 billion) but this figure excludes damage to public infrastructure, community disruption and uninsured or uninsurable property. A total of 129,292 insurance claims were lodged for this event, the largest number of claims ever received for any event across the state. Fortunately no one was killed during this event and reported injuries were relatively minor.

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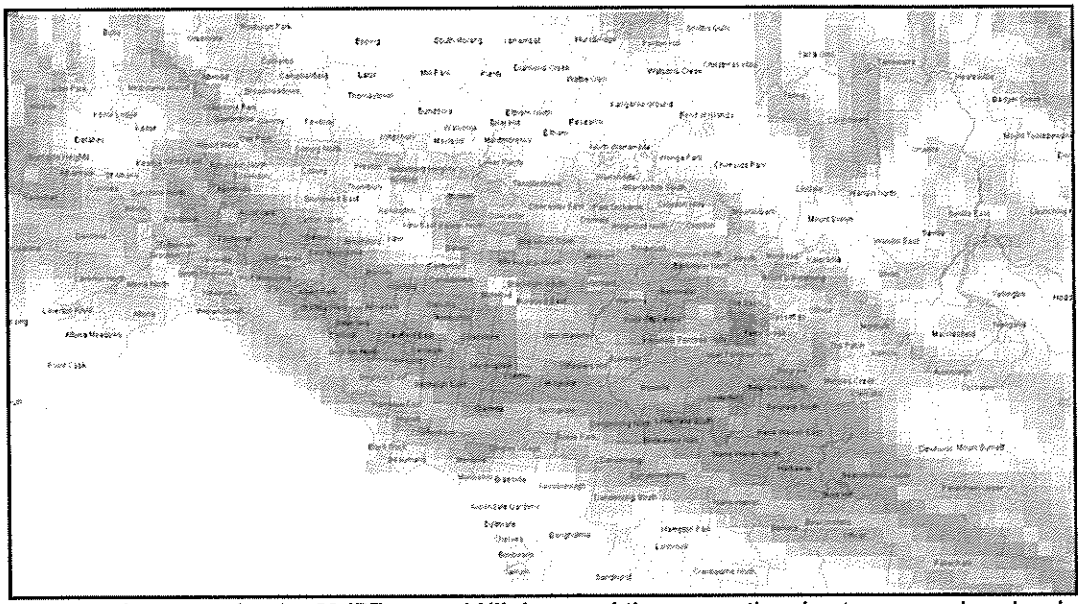

Figure 2: Aggregated radar 60dBZ capped VIL image of the severe thunderstorm complex showing the structure and path of the severe thunderstorm complex across the north and east of Melbourne. Highest values of VIL were near 97 kg/m^2 with the lower threshold used in this image near 20 kg/m^2.

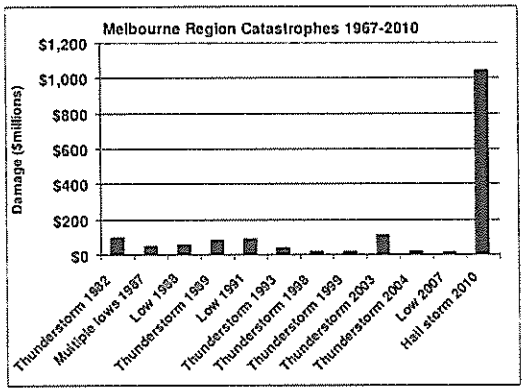

Table 1: Comparison of historical insured damage costs for weather related events affecting Melbourne from 1967 to 2010 (Data source Insurance Council of Australia 2010).

To illustrate the extreme nature of this storm relative to historical storm events, damage statistics from the Insurance Council of Australia since1967 show the largest and costliest thunderstorm related weather event for Melbourne prior to this event occurred in 1982 with $AUD 98 million (adjusted to 2007 dollars) damage.

In Table 1 the scale of this event compared to historical catastrophes that have affected the Melbourne area over the 45 years since 1967, based upon statistics held by the Insurance Council of Australia, is shown. It is an order of magnitude greater than any previously experienced weather related natural disaster for this part of Australia. Although there are no statistics for the pre-1967 period, weather records do not indicate there have been any hailstorms of this magnitude since Melbourne was first settled.

2.2 *Severe Characteristics.*

In the early stages of the severe thunderstorm large quantities of small hail (see Figure 4) and very heavy rainfall were produced. The heaviest recorded rainfalls included 5.6mm in 2 minutes at Essendon and 46mm in 15 minutes at Maribyrnong, which is a 1 in 5 year Average Recurrence Interval (ARI). Both suburbs are to the northwest of the city centre. The strongest measured wind gust was 102 km/h at Melbourne Airport, although damage to housing and trees indicates there were far stronger wind gusts elsewhere.

Figure 3: Flash flooding along a main street in central Melbourne illustrating the severe disruption to traffic caused by the storm.

The damage during this phase of the storm was exacerbated by the large quantities of small hail and hail produced debris blocking roof gutters and storm water drainage systems, causing water to back up into the roof spaces of houses and also exacerbate the flow of runoff down the roadways and into buildings. Flash flood depths down urban roadways reached 1 meter in depth through many suburbs (see Figure 3).

Figure 4: Large quantities of small hail fell across the northwestern and central suburbs of Melbourne.

Once the storm changed into a left moving supercell the size of the hail increased with 3 to 4cm hail typically experienced through the inner eastern and southeastern suburbs. The largest and most catastrophic hail damage was experienced through the outer eastern suburbs of Roweville, Lysterfield and Ferntree Gully where 6 to 10cm hail was reported. The largest hail in the storm, which was solid, nearly spherical and at least 10cm in diameter, fell over the east of Ferntree Gully, severely damaging houses and cars.

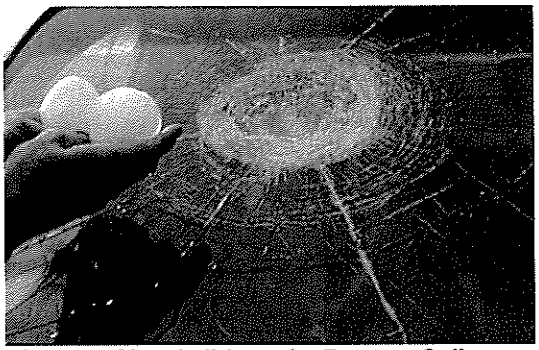

Figure 5: Giant hail from the Ferntree Gully area of Melbourne with typical windscreen damage in the background.

The extreme damage produced by this storm was so great due to the very rare coincidence of several factors. These include: heavy short duration rainfall (1:5 year ARI) with large quantities of small hail, severe wind squalls across a significant proportion of the urban area and, over the outer eastern suburbs, giant (>5cm diameter) hail. The extremely large physical size of the storm footprint coupled with a storm path that encompassed some of the most densely built areas of Melbourne was also a key factor in increasing the magnitude of the total storm damage. as the storm path took it over the most heavily populated parts of Melbourne. Post analyses of the storm involving alternative positions of the storm track showed that even relatively slight reductions to any one of the severe storm characteristics or changes to the path followed by the storm would have significantly reduced the total damage produced by this severe thunderstorm event.

2.3 *Meteorological Setting*

The severe thunderstorm complex formed on a mobile prefrontal trough (Figure 6) over elevated ground to the northwest of Melbourne. Climatologically the low level moisture is insufficient for high precipitation supercells to form in these troughs. On this occasion near surface moisture from a 120 year ARI flood event over one thousand kilometers to the north was drawn southwards into this trough (see climate data section of the Australian Bureau of Meteorology http://www.bom.gov.au/cgi-bin/climate/).

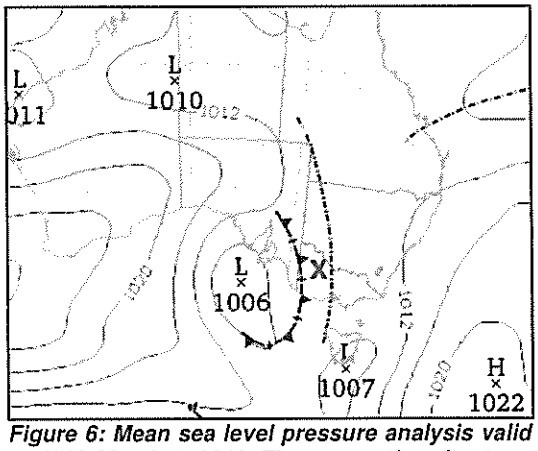

Figure 6: Mean sea level pressure analysis valid 00 UTC March 6, 2010. The severe thunderstorm formed on the prefrontal trough with the approximate genesis location shown by the red cross. Map courtesy of the Australian Bureau of Meteorology.

A mature upper level cut-off low, uncommonly strong for March, completed the meteorological picture, producing a rarely seen storm environment for the Melbourne region. In the upper levels there was a split jet stream with wind speed maxima over 125 knots. The upper level flow was also very meridional in this region with the severe thunderstorm complex forming ahead of the

main frontal cloud band in a transition region between mid and upper level dry air to the east and very moist air to the west, as can been seen from the MT-SAT1 water vapor image in Figure 7.

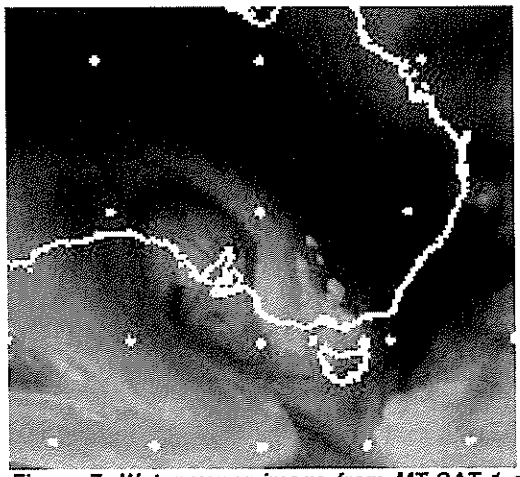

Figure 7: Water vapor image from MT-SAT 1 at 06 UTC March 6, 2010. Image courtesy of the Japanese Meteorological Agency and the University of Dundee.

The morning temperature trace (00:00 UTC or 11:00 Eastern Daylight Savings Time) from Melbourne Airport, which is located within 50km of the location where the thunderstorm formed, is shown in Figure 8. The Total Totals Index was 51, a pointer towards likely severe convection later that day, although there were low level temperature inversions that had to be overcome. The Lifted Index (LI) from this radiosonde flight was near zero although a Lifted Index analysis spanning the prefrontal trough region indicated LI values in the severe thunderstorm genesis area were close to -4.

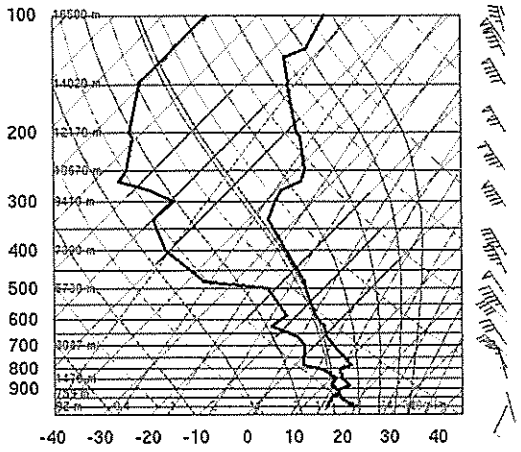

Figure 8: Vertical temperature and humidity profile for Melbourne Airport for 00 UTC March 6, 2010. Image courtesy of the University of Wyoming.

Convection occurred when the surface temperature reached 28°C, indicating some destabilization of the temperature profile probably occurred on the prefrontal trough, although orographic lift on the ranges to the northwest of Melbourne would also have played an important role.

2.4 *Damage Distribution*

The changing nature of the damage produced by the storm throughout its lifecycle is illustrated by the Victorian State Emergency Service's descriptions of the storm impacts associated with its responses to emergency call outs following the storm event. These are depicted in Figure 9. The dominance of flood / flash flood related damage during the early part of the storm life cycle can clearly be seen with increased damage to housing as the hail size increased further to the east. Most wind related damage appeared to occur on the northern side of the main storm cell with the wind damage continuing well after the giant hail had ceased falling from the thunderstorm complex.

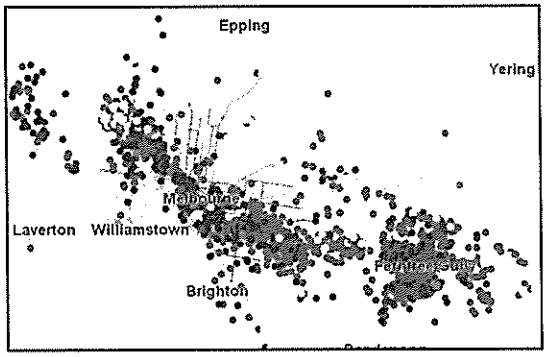

Figure 9: Victorian State Emergency Service storm damage types for the emergency callouts following this storm. Red relates to building damage, blue to flooding, yellow to falling tree related damage and green to other causes.

A post-event damage survey revealed that the giant hail damage was greatest along several narrow, parallel swathes, 50 to 100m wide and around 3 km long with extensive hail damage to cars and major roof and window damage to houses.

3. PERTH SEVERE HAILSTORM

Climatologically Perth (Population 1.665 million in June 2009) is considered a very low risk for giant hail damage, based upon the historical record with no major hail damage ever being reported from this city or its suburbs. However, sixteen days after the Melbourne severe hailstorm on March 22, the Western Australian capital city

experienced its most damaging weather event in 135 years of official weather records. Further studies of Perth newspaper records extending back to 1848 have not identified any other comparable severe hailstorm.

This storm formed over a sparsely populated area around 170km north of the city and tracked southwards. Part of the track of this multi-cellular thunderstorm complex is shown in Figure 10. This image is a combination of the aggregated radar derived VIL from the 10 minute update frequency volumetric scans from the Serpentine weather radar (EEC TVDR2500C C band), located approximately 50km south of the city, insurance claims and manually drawn storm cell ellipses that define regions with similar damage characteristics, drawn with the benefit of extensive on ground post event damage surveys. The weather radar lost power as the storm approached, which is the reason for the abrupt cessation of the radar based VIL data at the southern end of this image.

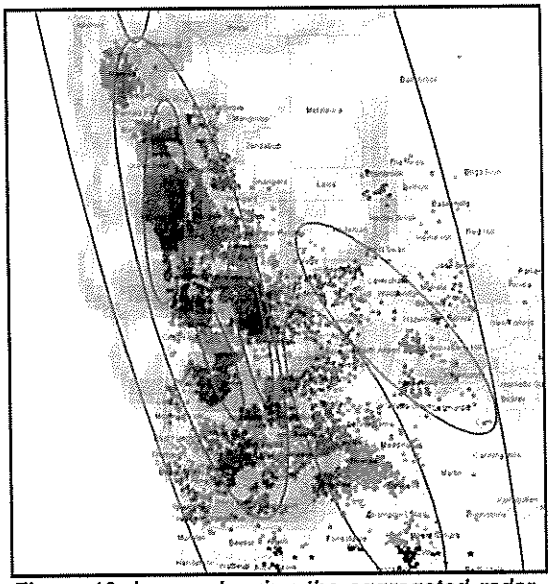

Figure 10: Image showing the aggregated radar derived VIL pattern of the severe thunderstorm complex from the Serpentine weather radar, insurance claims and storm cell ellipses based upon post event damage surveys.

3.1 *Historical perspective*

Historically Perth has had no major damaging hailstorms. Prior to this storm the two most damaging weather events producing insurance claims (2007 dollars) of $AUD218 million (TC Alby,1978) with a 1994 winter-time low producing $AUD117 million damage (see Table 2). Over 156,000 damage claims were received for the Perth hailstorm event and the industry wide insurance damage bill has reached $AUD1,056 million (approximately $USD1 billion).

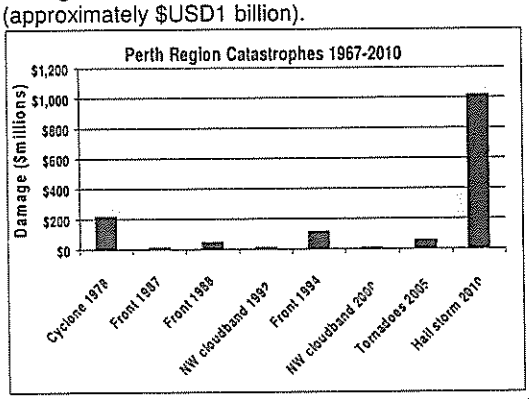

Table 2: Comparison of historical insured damage costs for weather related events affecting Perth from 1967 to 2010 (Data source Insurance Council of Australia 2010).

An analysis of climate and newspaper records dating back 150 years have not revealed the occurrence of any other hailstorms close to the same magnitude as this storm. Perth has been inhabited across the area affected by the largest hail from this storm for over 180 years. These records have identified major weather events, including extreme bushfires, severe winter storms, other severe thunderstorms and tropical cyclones back into the 1800s, so some historical indication of storms of the size and intensity of this severe hailstorm would be expected.

3.2 *Severe Characteristics.*

The severe thunderstorm initially produced a combination of large volumes of small hail and very heavy rain across the northern suburbs with local and narrow wind downbursts. The main thunderstorm cell then encountered the coastal sea breeze and regenerated as a left moving supercell, During this phase it produced giant hail to 8cm diameter in the Perth inner northern suburb of Osborne Park, although large hail to 6cm diameter was reported over the next 5km to the south of this suburb, passing over the heavily populated inner western suburbs of the city (see damage at the University of Western Australia in Figures 11 and 12). Severe hail and flash flood damage occurring in this area with land slides reported in the steep slopes of Kings Park, a large natural bush land reserve surrounded by high density urban and commercial developments.

Extensive flash flooding continued across large parts of the east and southeastern metropolitan area associated from secondary thunderstorm cells that formed on the eastern flank of the main cell. The most severe and extensive wind damage occurred over southeastern suburbs where down burst strengths were estimated to have reached near 150km/h, based upon the damage to

power poles in this region. The strongest measured wind gust was 128km/h at the township of Cunderdin, 135km to the east of Perth, from a thunderstorm to the east of the storm complex that passed over Perth.

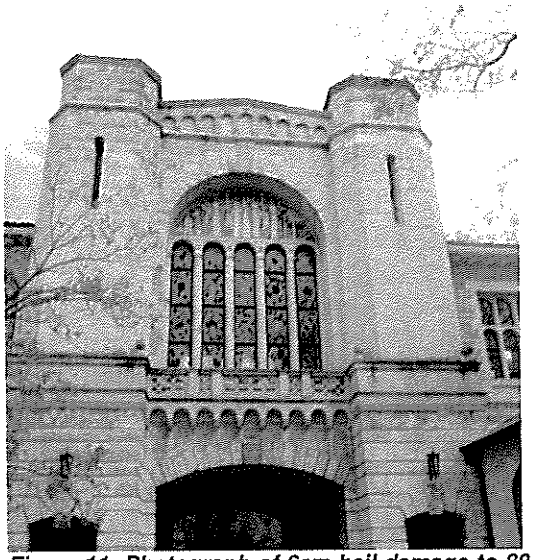

Figure 11: Photograph of 6cm hail damage to 80 year old stained glass windows at Winthrop Hall at the University of Western Australia.

The heaviest rainfall reports, all in excess of the 1:100 year ARI for this region, included 28mm in 10 minutes at the northern suburb of Wanneroo, 54mm in one hour at the southeastern township of Jarrahdale, around 50km southeast of Perth, highlighting the long lived nature of the storm complex.

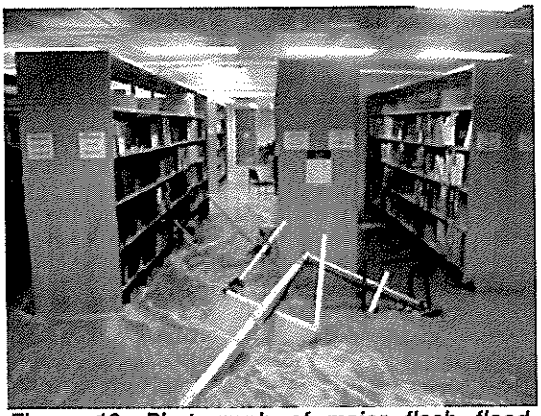

Figure 12: Photograph of major flash flood damage to a library in the University of Western Australia.

As was the case for the Melbourne severe storm, it was a combination of extreme rainfall, large quantities of small hail and destructive wind gusts over a very large part of Perth, as well as a region of giant hail over the inner suburbs of Perth centered on some of the most vulnerable property in the city that lead to the very high total damage bill for this storm. Post analyses investigating potential storm tracks for a severe thunderstorm complex of this type revealed that this storm track was close to the optimum for maximizing damage across Perth.

3.3 *Meteorological Setting*

The Perth event was a multi-cellular severe thunderstorm outbreak. The synoptic weather pattern was a surface west coast trough (Figure 13) with a well developed middle level low centered to the west (See Figure 14), an unusual combination of features for the west coast of Australia in March. The presence of the middle level cut off low was essential to the development of this hailstorm as it produced the middle level northerly steering winds that pushed the storm southwards parallel to the coast, rather than steering the storm inland which is normally the case.

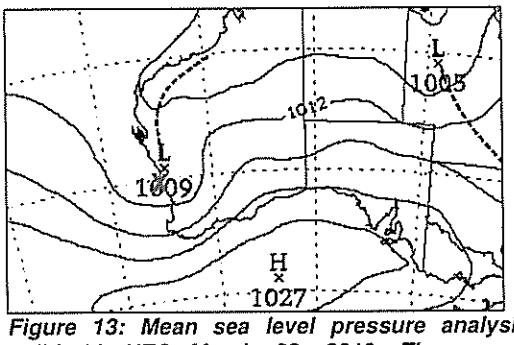

Figure 13: Mean sea level pressure analysis valid 06 UTC March 22, 2010. The severe thunderstorm formed on the west coast trough with the genesis location shown by the red cross. Map courtesy of the Australian Bureau of Meteorology.

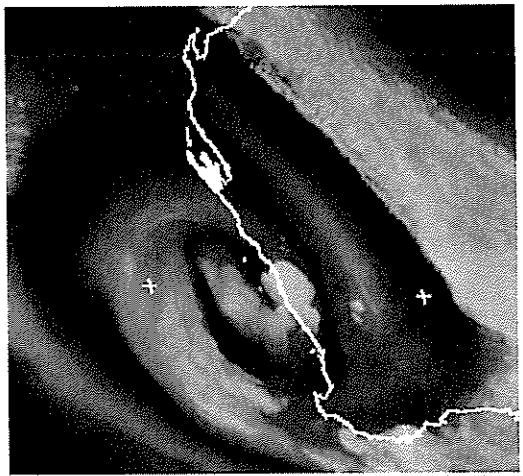

Figure 14: Water vapor image from MT-SAT 1 at 06UTC March 22, 2010 showing thunderstorm development on the mid west coast. Image

courtesy of the Japanese Meteorological Agency and the University of Dundee.

Another important factor that contributed to the rarity of this storm was the heavy antecedent rain that fell in the region immediately over and northeast of its genesis area over the week leading up to this event. This rainfall was a one in 20 year event for this region and lead to surface dew points around 19°C in this region rather than near 10°C, which is a more typical value in west coast troughs.

This combination of factors provided the necessary instability, as indicated by the morning stability indices from the most representative radiosonde station of Geraldton (Figure 15) - a Lifting Index of -4.1 and CAPE of 477 J/kg. Northerly steering winds, rare for Perth, were around 40 knots in the storm layer with a NNW jet stream maximum at 250 hPa of close to 100 knots.

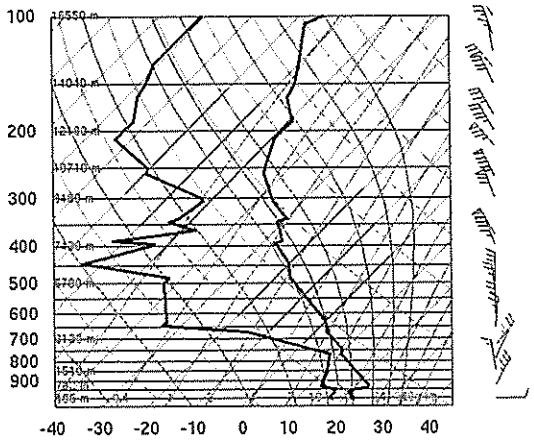

Figure 15: Vertical temperature and humidity profile for Geraldton Airport for 00 UTC March 22, 2010. Image courtesy of the University of Wyoming.

The convection was triggered by strong daytime heating with temperatures reaching 33°C in the thunderstorm genesis area, and low level convergence into the trough. As mentioned earlier, surface dew points in this area were abnormally high with reported values near 19°C, assisting in the formation of what was to become a high precipitation supercell. The lead thunderstorm was the most intense, tracking southwards - first across a market garden region where crops were severely damaged, then across the densely populated northern suburbs. Here the storm had similar characteristics to the first stage of the Melbourne storm. Large quantities of small hail stripped trees and blocked drains and roof gutters. Then very heavy rain produced deep flash floods with water related damage being the major feature in this part of Perth. The storm then encountered a coastal sea breeze convergence zone and transitioned into a left moving supercell.

During this phase of its life it reached its greatest intensity and continued to move southwards across the inner northwest then west of Perth. Largest hail fell over car dealerships in Osborne Park with hail to 8cm diameter, severely damaging thousands of cars and buildings. Giant hail continued to fall across western Perth and Nedlands, severely damaging one of Perth's largest hospitals and the state's oldest university. Stained glass windows over 80 years old were destroyed by hail of up to 6cm diameter. Extreme flash flooding produced land slides in the nearby Kings Park area with extensive damage being experienced at a university library and to a block of apartments.

Once the storm complex moved over the south and southeast of the Perth metropolitan area the hail rapidly vanished from the storm, although severe wind squalls and major flash flooding continued for the next couple of hours of the storm complex's life.

4. Role of Natural Variability and Climate Change

The key issue relating to the rarity of the two severe hailstorms is the identification of the critical meteorological factors that produced the severe storm environments that occurred on these occasions. Previous research work investigating the effects of natural variability and climate change on severe hailstorms affecting the greater Sydney area (Leslie et al 2008) showed that severe thunderstorm activity is prone to large natural variability on decadal scales near Sydney (Figure 16).

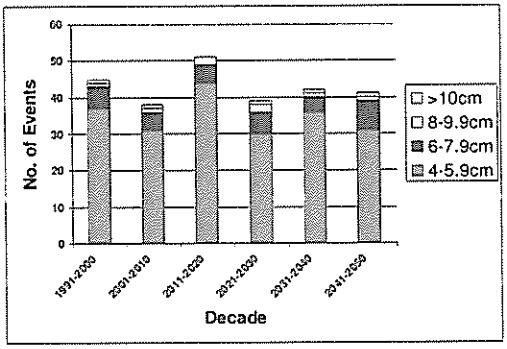

Figure 16: Decadal distribution of giant hail sizes under the "natural variability" scenario for the greater Sydney region (see Leslie et al 2008).

As the key severe storm environment factors were not individually beyond the realms of current climate capability, it is possible to argue that the storm environments could be produced by natural variability alone, although the coincidence of these factors is very rare.

However the influence of climate change cannot be ruled out. Leslie et al 2008 (see Figure 17 for the Sydney severe hailstorm enhanced greenhouse gas study results) found that the key

factors for severe thunderstorm activity in Sydney included increasing afternoon warm season temperatures, increased availability of low level moisture, the availability of mid-level dry layers in the atmosphere and increased low level convergence into surface heat troughs.

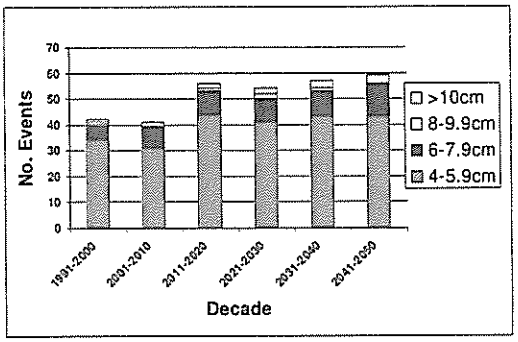

Figure 17: Decadal distribution of giant hail sizes under a "business as usual" enhanced greenhouse gas scenario for the greater Sydney region (see Leslie et al 2008).

These are also known to be important factors for severe hailstorm formation near Melbourne and Perth. All of these were found to be present or increase in the case of the Sydney climate change research and hence there is reason to believe they may also increase for the Melbourne and Perth regions. It is important to note that some areas of Australia could potentially see a decline in the coincidence of these factors and hence subsequent hailstorm occurrence e.g. south east Queensland could be one such region. None-the-less, from an insurance perspective the fact that both the hailstorms to impact upon Melbourne and Perth happened to follow tracks that almost optimized damage would intuitively point to a low probability of a similar magnitude of damage occurring given future severe hailstorms of this intensity and size.

A research proposal has been prepared to investigate these factors, although the research is yet to commence.

5. REFERENCES

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Leslie, L.M., Leplastrier M., and Buckley B.W., 2008: Estimating Future Trends in Severe Hail Storms over the Sydney Basin: A Climate Modelling Study. *Atmos. Res.*, 87, 37-51.

DOC 7

[redacted]

From: [redacted]
Sent: Thursday, 9 September 2010 2:55 PM
To: [redacted]
Subject: March 6th Hailstorm - Draft SES Report for Brochure [SEC=UNCLASSIFIED]
Attachments: Melbourne_Hailstorm_SES_Draft.pdf

Hi [redacted]

After much delay to which I apologize, I have finally completed a draft version of the 6th March 2010 Melbourne hailstorm report as requested by the SES. I have attempted to make the report more of a "story-line" type description while incorporating facts and escaping from meteorological jargon as much as possible without losing the meteorological essence. The information that I was provided by [redacted] from the SES was that they were after approximately 2 A4 pages with images outlining the event for production of a pamphlet/brochure. As such, I have restricted the text to 2 pages at 12 point font (brochure should be less) and have even attached a number of images that they may consider using for the brochure. I have compressed the report as a PDF to allow sending via the internal email system as the original Microsoft Word document was quite large with the images. If you could please review the draft and let me know of any corrections/comments/criticisms or suggestions and I shall make the appropriate changes before sending to [redacted]

Thank you,

[redacted]

DOC 7A

Severe Thunderstorms in Melbourne, 6 March 2010

Overview

Severe thunderstorms occurred across the State during the period of 5 – 7th March 2010, resulting in the Victoria State Emergency Service (VICSES) receiving over 7600 Requests For Assistance (RFAs). Thunderstorms affected parts of the Mallee, Wimmera, Northern, North Central, Central and West and South Gippsland districts during the late morning through to the early evening of Saturday 6 March 2010. In particular, a severe thunderstorm cut a swathe of damage through the greater Melbourne area, extending from Melton in the outer west, through the central business district, to Belgrave and Emerald in the outer east, between 2:00 and 4:00pm EDT.

The severe thunderstorm produced record size hail, rainfall rates equivalent to a 1 in 100 year event and damaging winds, which proved to be one of Australia's most costly natural disasters with insurable damages of $1044 million. The VICSES received over 6300 RFAs across the Central district while the VICSES Knox unit, located in the worst affected area of the eastern suburbs of Melbourne, recorded the highest number of RFAs in its history with over 2700 requests for assistance.

Meteorological Description

A combination of meteorological conditions aligned on the 6th March 2010 to produce an atmospheric environment highly conducive to severe thunderstorms. Preceding the event, prolonged precipitation over southern Queensland and northern New South Wales, associated with a topical low pressure system, increased low-level moisture over the region. This warm, moist tropical air mass, characterised by surface temperatures in the mid to high 20s and surface dewpoint temperatures in the mid to high teens, was directed southward over Victoria by northerly winds ahead of a surface low pressure trough. Meanwhile, a developing low pressure system to the west of the Victoria provided unstable conditions and strong winds aloft that would enhance thunderstorm development. Over southern Victoria, the combination of the sea breeze and the surface trough resulted in convergence that assisted in the development and intensification of the severe thunderstorm that impacted Melbourne, while a complex interaction between the sea breeze and upper level winds allowed the thunderstorm to be long-lived and generate large hail.

Thunderstorms initially developed over the northwest of the State during the morning of the 6th March 2010 and moved towards the southeast. Some of these storms had already become severe, with reports of damaging winds causing trees to fall and block roads. The southern-most thunderstorm situated near Bacchus Marsh, approximately 55km west northwest of Melbourne at around 1:30pm EDT, intercepted the sea breeze and intensified and began propagating toward the east southeast along the leading edge of the sea breeze. The storm entered the metropolitan area via the western suburbs at approximately 2:15pm EDT, and the Central Business District (CBD) at around 2:40pm EDT bringing large hailstones, heavy rainfall and strong winds that dented cars, broke windscreens and flooded the CBD. Rockbank in the city's outer west recorded 36mm of rainfall in 18 minutes while closer to the city, Maribyrnong

recorded 46mm in 30 minutes (21.6mm in just 6 minutes) and the Docklands recorded 41mm in just 18 minutes; all of which exceed the 1 in 100 year Average Recurrence Interval (ARI). Meanwhile, Melbourne Airport situated to the north of the CBD, recorded a maximum wind gust of 102 km/h. Hailstones with a diameter between 2 and 4 cm were reported in the city's western and northern suburbs, while hail as large as 6 cm was reported within the CBD.

The severe thunderstorm continued moving toward the east southeast where it further intensified and cut a swathe of extensive hail damage and flash flooding through the eastern suburbs. It reached the worst affected area of Knox at around 3:00pm EDT where very large hail, ranging between 4 and 8 cm, further dented cars, broke windscreens, windows, skylights and roof tiling, while hail accumulation over roads and in gutters increased flooding and water inundation which lead to ceiling collapses. Arguably the largest hailstone recorded in Victoria's history was observed at Ferntree Gully, approximately 35km east southeast of Melbourne, with a diameter measuring 10cm. Other hailstones as large as 8 – 9 cm were also reported in Lysterfield.

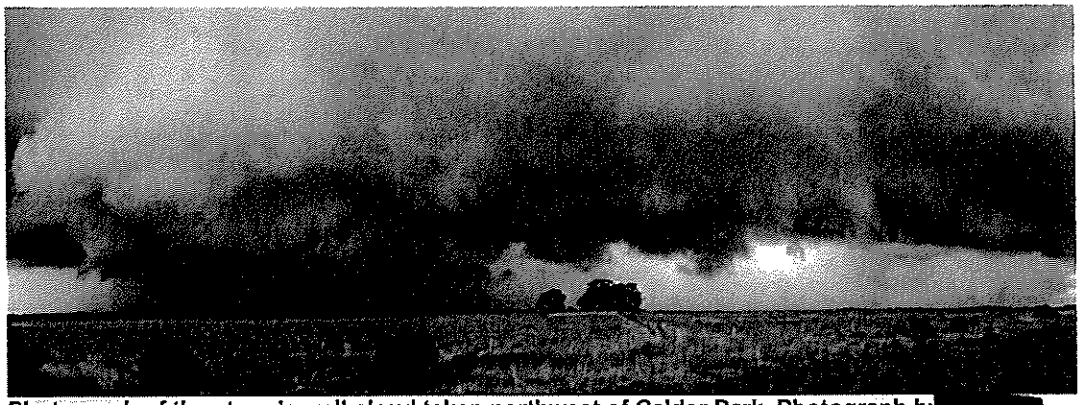
The thunderstorm gradually weakened but remained severe as it continued moving toward the east southeast, progressing through the outer eastern suburbs and into West Gippsland after 4:00pm EDT. Another severe thunderstorm developed near Noojee (northwest West Gippsland) during the afternoon and tracked through the Latrobe Valley resulting in further flash flooding and strong winds in Warragul and Traralgon. The Latrobe Valley regional airport automatic weather station, located near Traralgon, recorded a peak wind gust of 94 km/h and recorded 29mm of rainfall in 13min at around 5:15pm EDT.

Further severe thunderstorms affected the north of the State and the Melbourne metropolitan area the following day resulting in further damage. A particularly severe thunderstorm impacted the Shepparton area where a maximum wind gust of 156 km/h was reported before the weather station was damaged by the storm. Large hail measuring between 2 and 4 cm were also reported in the State's north.

Impact

The Insurance Council of Australia declared the 6th March 2010 Melbourne severe thunderstorm as a catastrophe two hours after it impacted the Melbourne CBD. As of the 7 July 2010, the insurable damages bill stood at $1044 million, with 99% of building and vehicle claims processed, making it one of the nation's most costly natural disaster in history. Over 131,000 claims had been reported with 131 properties deemed unliveable and 285 properties vacated due to repairs. The majority of RFAs related to building damage due to hail, water inundation and trees on roofs. Hail damaged 41 schools and 21 preschools while there was significant damage to council infrastructure including town halls, libraries, sporting facilities and roads.

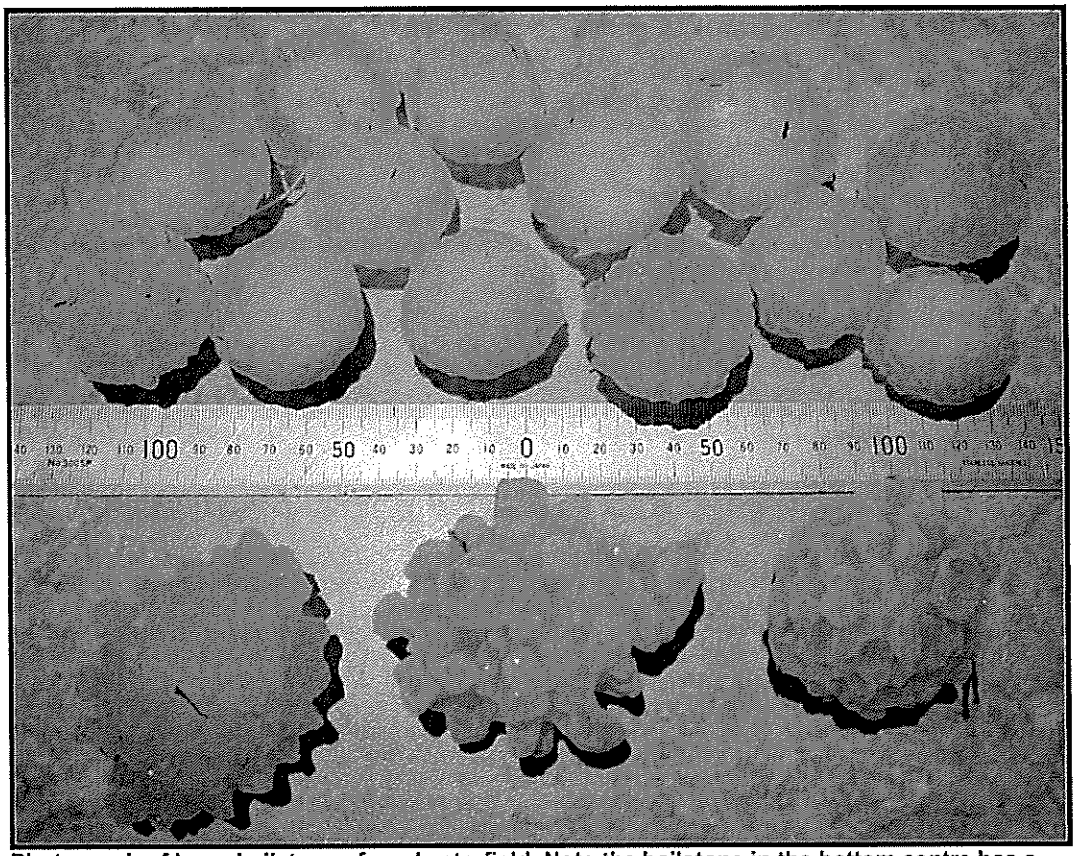
Possible Images to accompany brochure



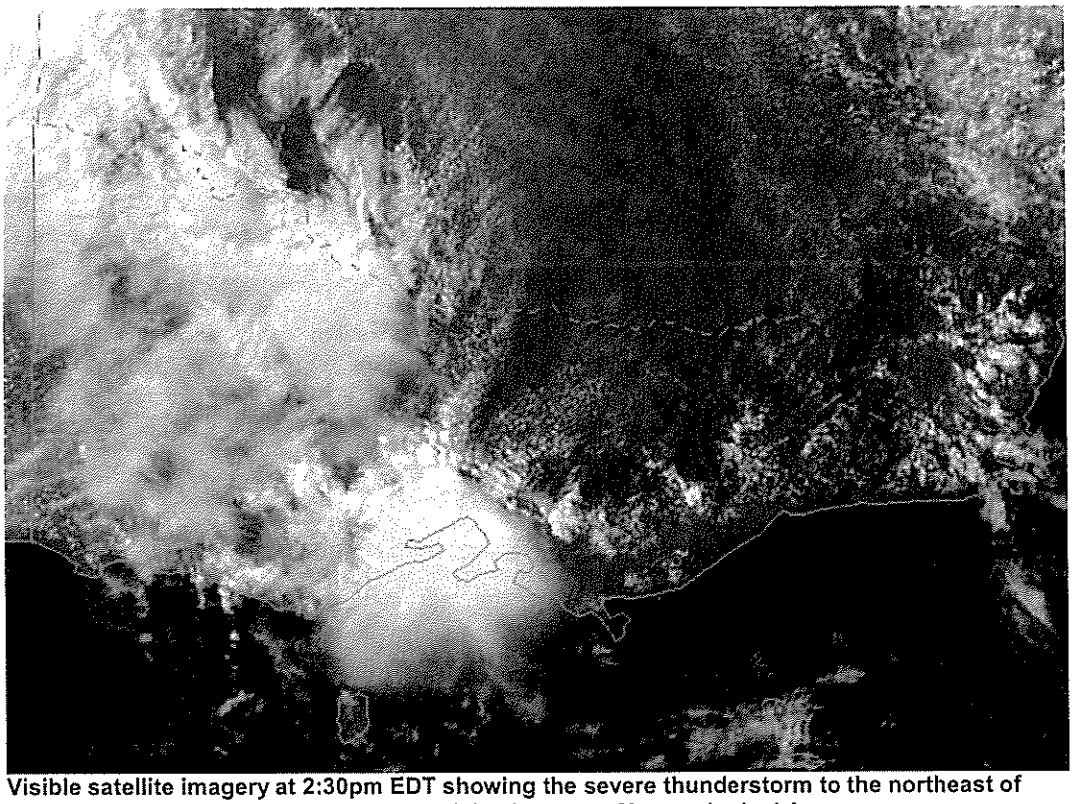
Photograph of the storm's wall cloud taken northwest of Calder Park. Photograph by [redacted]

Photograph of the storm's wall cloud taken northwest of Calder Park. Photograph by [redacted]

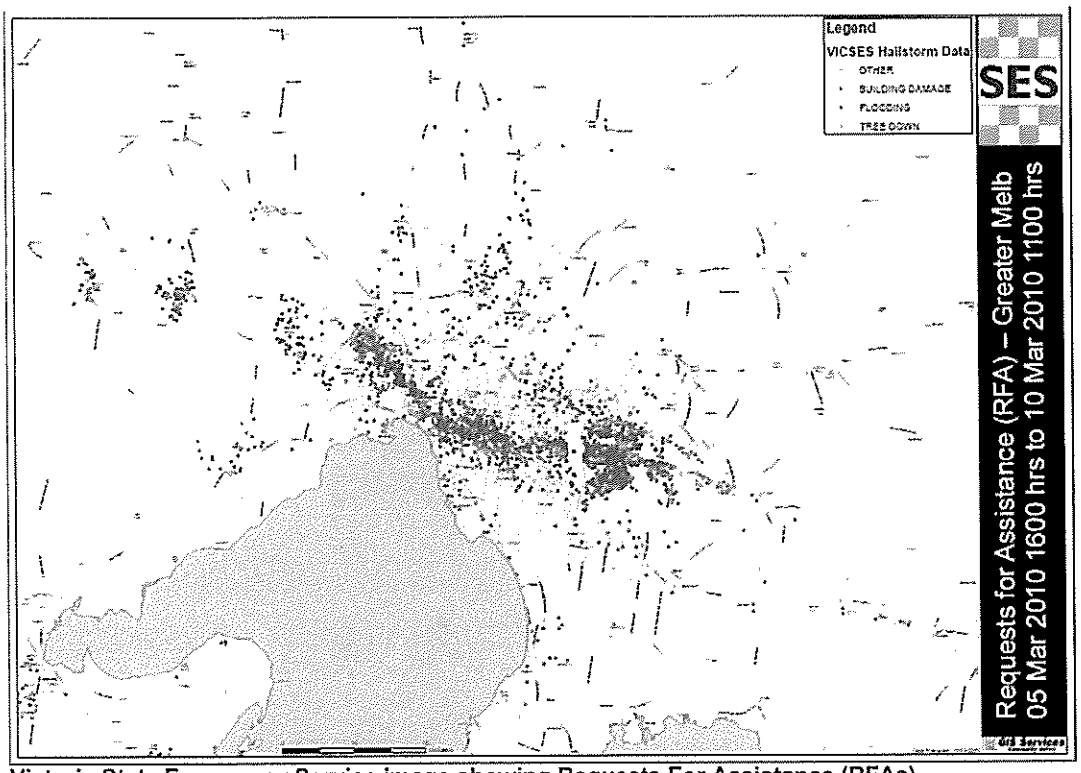
(High resolution images are available)



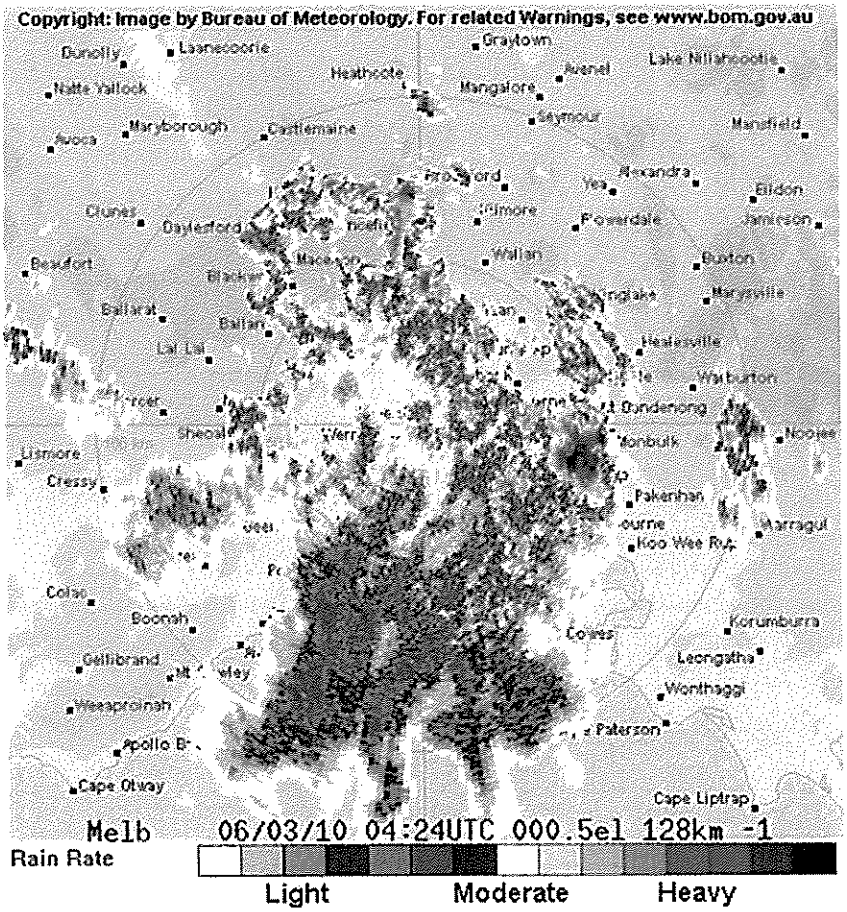
Photograph of large hailstones from Lysterfield. Note the hailstone in the bottom centre has a diameter of approximately 9.5cm.



Visible satellite imagery at 2:30pm EDT showing the severe thunderstorm to the northeast of Melbourne. MTSAT-1R image courtesy of the Japanese Meteorological Agency.



Victoria State Emergency Service image showing Requests For Assistance (RFAs).



Radar reflectivity image from the Melbourne (Laverton) weather radar at 3:24pm EDT 6th March 2010.

DOC 8

[redacted]

From: [redacted]
Sent: Friday, 12 March 2010 3:38 PM
To: [redacted]
Subject: VICSES Situation Report and Damage Map [SEC=UNCLASSIFIED]
Attachments: 20100310_Greater_Melb_A0.pdf; SITREP 9 - Storm Operations _Hail storm_ 12 March 2010 - 0800hrs.pdf

VICSES have received over 7000 calls for assistance.

The Damage Map is very useful and clearly denotes the path of the storm. SES also have a presentation showing damage reports and weather radar, essentially showing the synchronicity between the two data sets. They are also experimenting with Google, which is becoming a standard platform for displaying spatial data, where damage reports are loaded into Google as a kml file.

The attached documents are for internal use.

Cheers...[redacted]

[redacted]
Senior Meteorologist
State Control Centre

Victoria Regional Office
Bureau of Meteorology
http://www.bom.gov.au

Level 6, 1010 Latrobe St
Docklands, VIC, 3008
Phone: [redacted]

DOC 8A

VICSES Situation Report

State Headquarters: 168 Sturt Street, Southbank, Victoria, 3006 Ph: [redacted] Fax: [redacted] email: [redacted]

Operation: Storm Operations (Hail Storm) **As at:** 12 Mar 10 – 0700 hrs **Number:** 9

Situation *(One or two sentences describing the situation, time first notified and anything unusual - past)*

VICSES has received over 7609 Request For Assistance (RFAs) across the State since storms impacted on the Bendigo area on Friday afternoon 5th March 2010. The majority of tasks relate to building damage (69%), flash flooding (18%) and trees down (9%).

Damage resulting from severe thunderstorm activity, in particular hail stones and associated heavy rainfall, has seen building damage ranging from minor to significant with broken windows, ceiling collapse, damaged roofs and skylights.

The Bureau of Meteorology (BoM) has advised that Saturday's storm event was the largest hailstorm event in Melbourne's recorded history with up to 10cm hail having fallen in some areas. A series of thunderstorms developed in the north on Sunday and moved across the North East and then southerly in and across the Melbourne Metropolitan area resulting in further damage. The BoM have also advised that at Shepparton, winds of 156km/h were recorded during the peak of the Super Cell that hit the area, with rainfall at a rate of 3mm per minute.

The majority of RFAs were from residents located in Central Region in and around the eastern suburb of Knox, which remains the worst affected area. The VICSES Knox Unit has recorded the highest number of RFAs to date, currently in excess of 2775 RFAs. Other Central Region Units to record high volumes of RFA's during this event have been, Essendon – 677, Malvern – 615, Footscray – 328, Waverley – 353, Emerald 345 and in North East Region, Tatura - 497.

A further 2 RFAs have been received since 2300 hrs last night. There are currently over 116 RFAs outstanding across the Central Region as at 0700 hrs today, and all RFAs are completed in the Shepparton area. Based on current clearance rates, the majority of the RFAs in Central Region are expected to be cleared by end of shift Friday the 12th March 2010.

Current Status *(Describe what is being done – present)*

Central Region

Today there will be 32 vehicles with crews working within the Knox incident sectors within the Knox municipality.

- Knox Sector – open
- Boronia Sector – closed
- Rowville Sector - closed

Interstate & Interagency Support

- New South Wales - 10 Crews are in the field today. Crews will complete duty today and return home on Saturday 13th March.
- SA Crews have completed their last shift yesterday. Some members flew out yesterday with the remaining taskforce members departing today, Friday 12th March.
- Tasmania Crews have completed their last shift yesterday and depart today, Friday 12th March.
- WA Teams will be completing their last shift today and depart Saturday 13th March.
- Interagency assistance has now ceased at Mulgrave ICC and Knox Division.

Rapid Impact Assessment (RIA) has now been completed and 2,039 assessments conducted.

Central Region Level 3 ICC began to scale down operations with Thursday's night shift concluding at 0100hrs and reverting to RDO notifications. This was the final night shift. Day shift operating 0800hrs – 2000hrs will continue over Saturday and Sunday to carry out demobilisation of interstate and VICSES resources and to assist Units with stocktaking and resupply of consumables and equipment.

Knox MECC will be operational today with an SES EMLO allocated.

North East

- Benalla ICC closed yesterday and has reverted to Regional duty Officer arrangements.

Inter Region Support

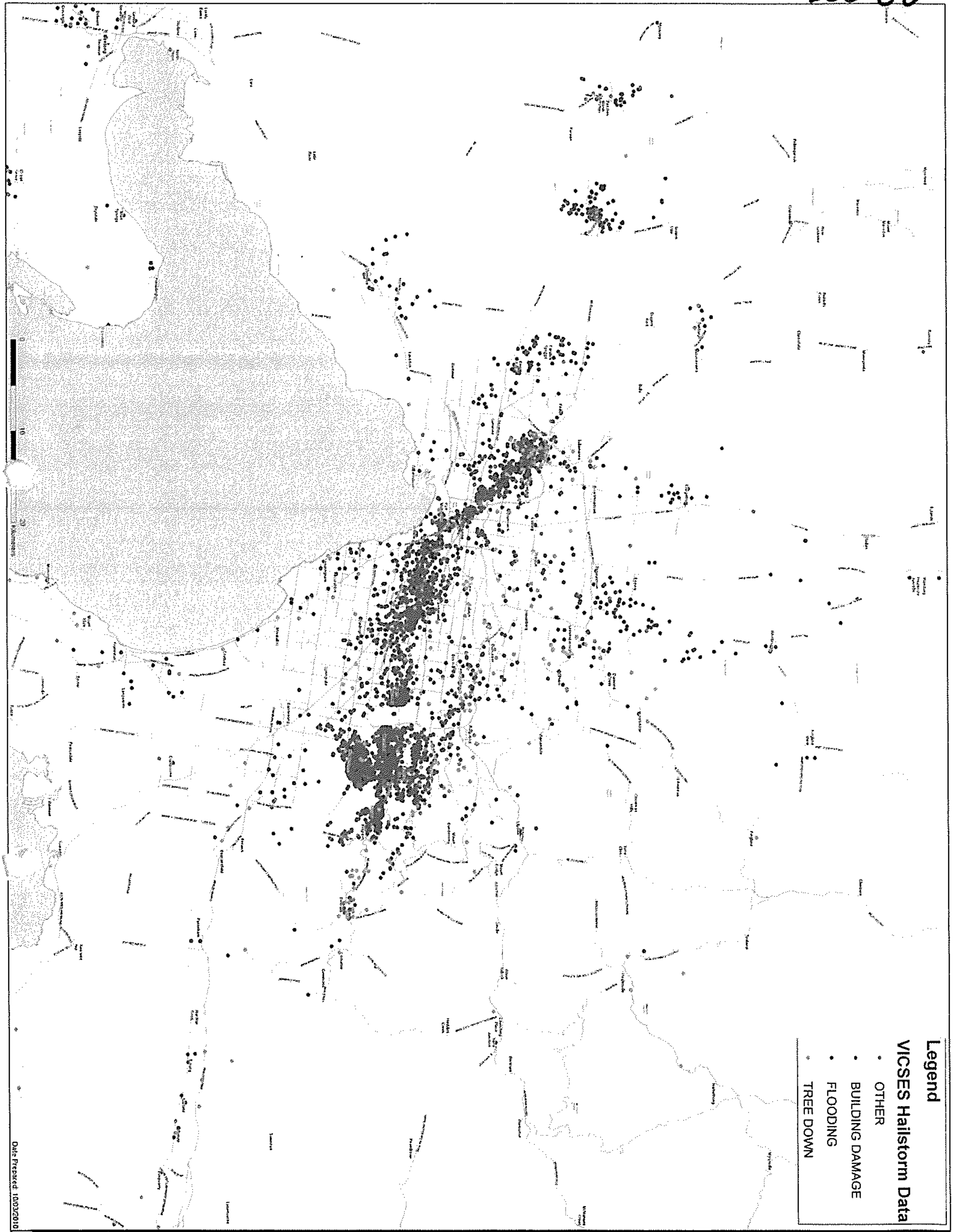
- Central Region continues to be supported with volunteers, staff and response vehicles from other Regions.

- VICSES CEO and Parliamentary Secretary, [redacted] and SES volunteers from each state that had a part in this emergency will attend the Eureka Tower at 0930 hours today as an opportunity to recognise the work efforts of SES volunteers over the last seven (7) days.
- VICSES received no requests for information or radio interviews from the media overnight at the State Control Centre.
- The Mulgrave ICC Information Officer worked with the SCC Info Unit on development of key messages in case future storms affect the impacted area before permanent repairs can be made. The brochure also provides advice to people on how they can deal with storm damage.
- Key messages:
  - This has been a significant storm event with over 7600 requests for assistance received from the public.
  - SES crews have worked hard to get through the backlog of requests, these are close to all being completed however we ask those who are still affected to be patient.
  - Additional SES crews from WA and NSW are assisting VICSES crews in clearing these outstanding jobs.
  - If you no longer require emergency assistance from the SES please call 132 500
  - SA and Tasmanian crews have been stood down and will return home today after enjoying a free trip to the Eureka Skydeck.
  - Property owners are encouraged to contact their insurer to seek additional assistance. An insurance hotline is available 1300 728 228
  - Where properties have been significantly damaged by storms, make checks of wiring and other electrical installations before appliances are connected and turned on. Such checks must be carried out by a licensed electrician or licensed electrical inspector.
  - Stay clear of any storm debris.
  - The SES is aiming to clear outstanding tasks by the early weekend.
  - For recovery information, contact your local council who will be able to assist you in accessing the services. There is support available, including available grants. Please Contact your local Council or access www.dhs.vic.gov.au for recovery advice
  - Please Contact your local Council or access www.dhs.vic.gov.au for recovery advice.

Contact Details *(Who produced this State Situation Report and how to contact them)*

Authorised by: [redacted] State Duty Officer. Contact – SCC – [redacted] or email: [redacted]

DOC 8B



GIS Services
Community Safety

Requests for Assistance (RFA) – Greater Melb
05 Mar 2010 1600 hrs to 10 Mar 2010 1100 hrs

SES