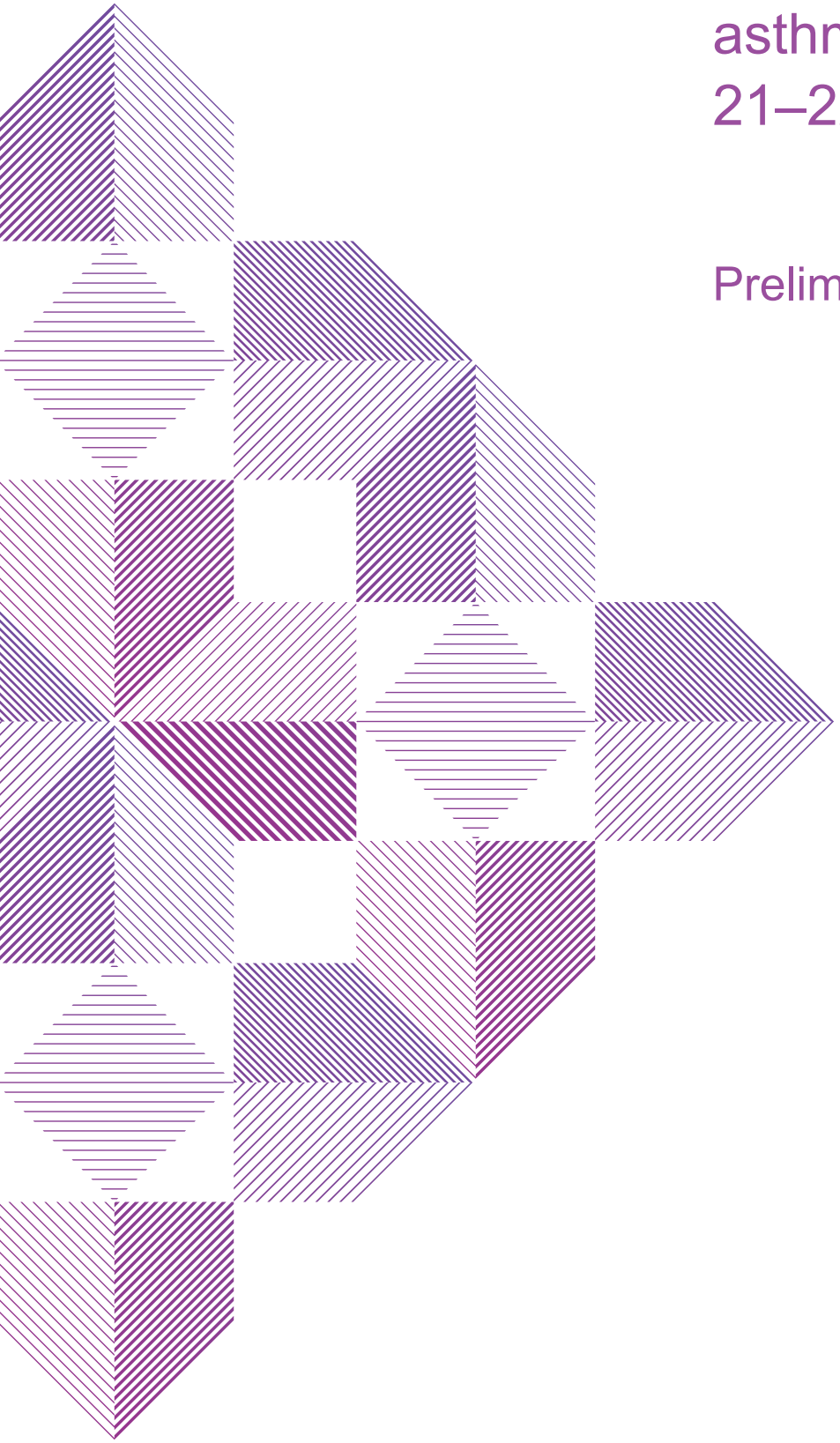
Review of response to the thunderstorm asthma event of 21–22 November 2016

Preliminary Report



Inspector-General for Emergency Management

VICTORIA State Government

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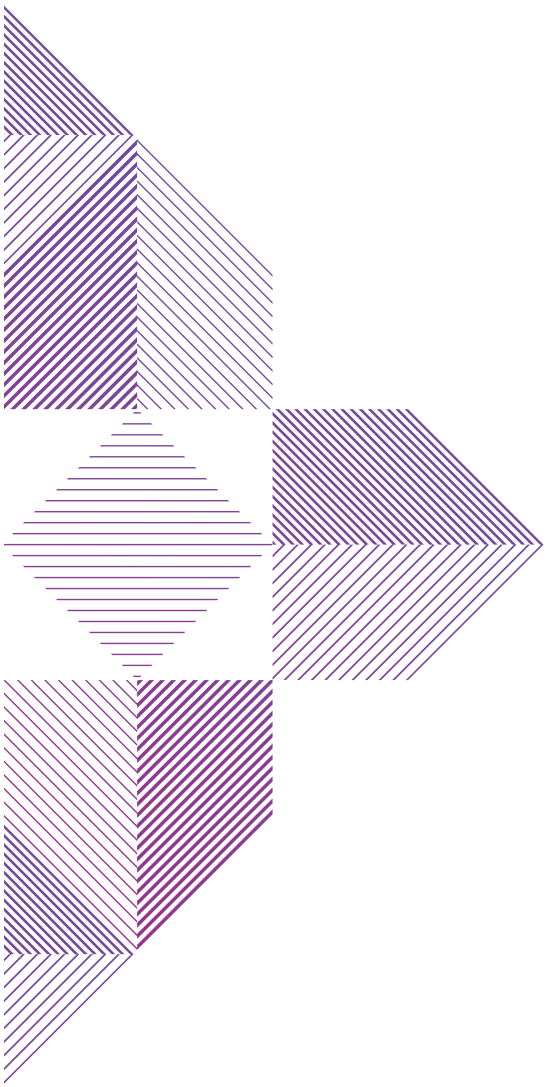
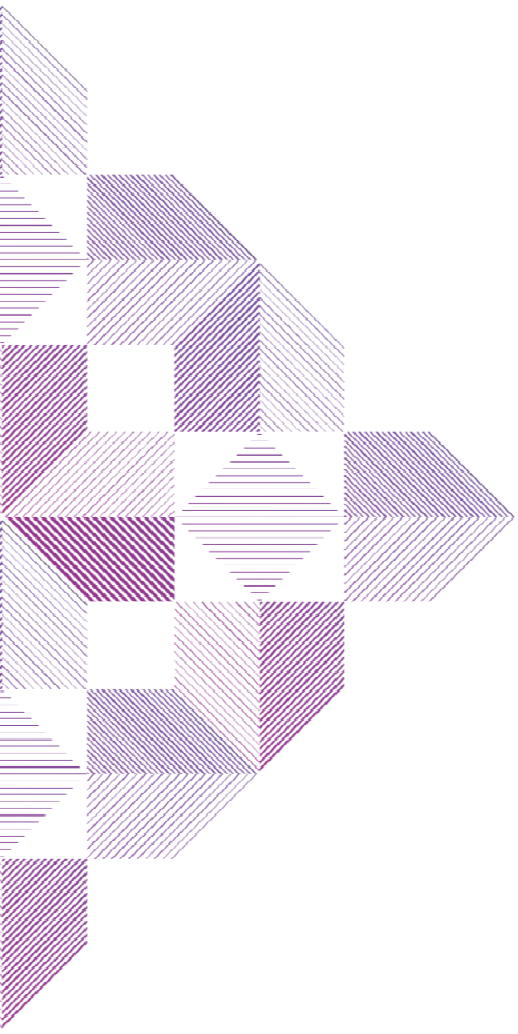


Preface



One of the legislated roles of the Inspector-General for Emergency Management (IGEM) under the *Emergency Management Act 2013* is to provide assurance to government and the community in respect of emergency management arrangements in Victoria.

The thunderstorm asthma event that occurred on 21–22 November 2016 affected the health of thousands of Victorians and sadly, is thought to have contributed to the death of nine people.

While the deaths attributed to this event will be investigated by the State Coroner, the Minister for Emergency Services, and Minister for Health and Minister for Ambulance Services have asked me to review the emergency response to the event.

The objective of this review is to identify opportunities to learn from this event in order to improve future preparedness and response arrangements and performance. This includes my recommendations, where required, for potential improvements to future public health emergency planning and response arrangements.

The rapid onset of this emergency and the scale of its consequences were unprecedented. The event tested the ability of Victoria's emergency management system to consider and respond to Class 2 emergency health consequences arising from a Class 1 emergency – in this case, a storm.

While thunderstorm asthma is known to have occurred in Victoria in the past, the events of 21 November 2016 were unprecedented in scale.

Never before have the Emergency Services Telecommunications Authority (ESTA), Ambulance Victoria (AV) or Victorian hospitals experienced this level of demand in such a condensed time period and dispersed over such a large geographical area.

Based on the evidence analysed to date, ESTA, AV and hospitals acted swiftly to increase the scale of their respective operations. I commend the work of all involved in the emergency response – including the assistance of the Metropolitan Fire Brigade, Victoria Police and other agencies – in responding quickly, flexibly and professionally to the unforeseen circumstances commencing on the evening of 21 November 2016.

An early observation is that thunderstorm asthma is not well understood. Similarly, nor are the factors that enable thunderstorm asthma to be predicted.

This ‘Review of response to the thunderstorm asthma event of 21-22 November 2016’ documents some of what is known about thunderstorm asthma and the facts relating to the emergency response, and includes my preliminary observations. The predictability of this event is also a focus of this review, particularly in the context of triggers for the provision of public information and warnings.

My final report to be provided to government in late April will explore these matters in greater depth and provide recommendations to support improved preparedness and response to future rapid onset, time critical health emergencies.

Tony Pearce

Inspector-General for Emergency Management

Image courtesy Adam Cressler

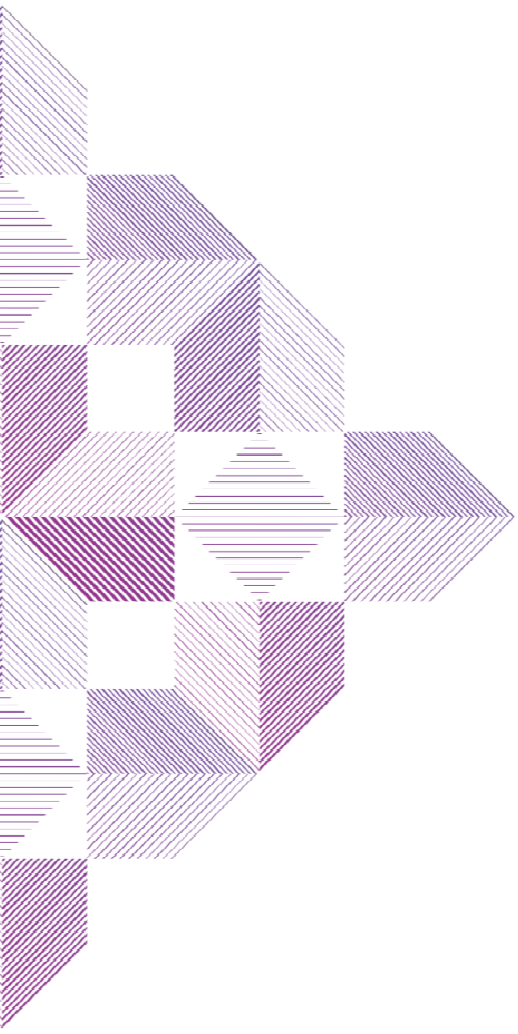
Contents

Acronyms

ABC	Australian Broadcasting Corporation
AEOC	Ambulance Emergency Operations Centre
AFL	Australian Football League
AIIMS	Australasian Inter-service Incident Management System
AMA	Australian Medical Association
AMPDS	Advanced Medical Priority Dispatch System
AR	Allergic Rhinitis
AV	Ambulance Victoria
BoM	Bureau of Meteorology
CAD	Computer Aided Dispatch System
CEO	Chief Executive Officer
CFA	Country Fire Authority
CHO	Chief Health Officer
CIRP	Critical Incident Response Plan
COO	Chief Operations Officer
DHHS	Department of Health and Human Services
ED	Emergency Department
EMC	Emergency Management Commissioner
EM-COP	Emergency Management Common Operating Picture
EMJPIC	Emergency Management Joint Public Information Committee
EMMV	Emergency Management Manual Victoria
EMR	Emergency Medical Response
EMT	Emergency Management Team
EMV	Emergency Management Victoria
EPA	Environment Protection Authority (Victoria)
ERP	Emergency Response Plan
ESTA	Emergency Services Telecommunications Authority
FEMO	Field Emergency Medical Officers
GP	General Practitioner
HAZMAT	Hazardous Materials
IC	Incident Controller
IGEM	Inspector-General for Emergency Management
IMT	Incident Management Team
JSOP	Joint Standard Operating Procedure
LGA	Local Government Area
MFB	Metropolitan Fire Brigade
MICA	Mobile Intensive Care Ambulance

PIO	Public Information Officer
PIW	Public Information Warnings
SCC	State Control Centre
SCOT	State Coordination Team
SCRC	State Crisis and Resilience Council
SECC	State Emergency Communications Centre
SEMC	State Emergency Management Centre
SEMT	State Emergency Management Team
SERP	State Emergency Response Plan
SHERP	State Health Emergency Response Plan
SHERA	State Health Emergency Response Arrangements
S-HIMT	State Health Incident Management Team
SOP	Standard Operating Procedures
SRC	State Response Controller
VBRC	Victorian Bushfires Royal Commission
VicPol	Victoria Police
VICSES	Victoria State Emergency Service

Executive Summary



Monday 21 November 2016 was Victoria's hottest day since March.

As the temperature in Melbourne reached 35°C, the Bureau of Meteorology (BoM) issued a severe thunderstorm warning at 1.58pm for damaging winds, heavy rainfall and large hailstones in Victoria's Mallee, South West, Wimmera and Northern Country (parts of) forecast districts.

The State Control Centre (SCC) was operating at a Tier 2 readiness level in response to the declaration of a Total Fire Ban for the Mallee region and in preparation for the potential heat impacts and the forecast thunderstorm.

At 4.00pm the BoM extended its warning to other parts of Victoria, including Geelong and Melbourne.

The gust front reached Geelong at 5.00pm and during the next hour moved rapidly eastwards across metropolitan Melbourne, as many people were making their way home after work.

Although the line of thunderstorms, which comprised several small cells, and the associated gust front swept through quickly, the BoM stated there was nothing remarkable about this storm.

There was no evidence to suggest that this storm and other non-meteorological factors would result in a health emergency of unprecedented scale and consequences.

On the evening of 21 November, the Emergency Services Telecommunications Authority (ESTA), Ambulance Victoria (AV) and hospital emergency departments across Melbourne experienced an unprecedented surge in people with asthma and respiratory distress (Figure 1, page 7 shows requests for assistance via ESTA).

Initially, the cause was unknown.

The peak of calls to Triple Zero (000) gradually decreased, however between 9.00pm and midnight ESTA still answered calls for emergency ambulance at volumes of 147 per cent above forecasted levels.

At approximately 7.00am on Tuesday 22 November, Triple Zero emergency ambulance calls dropped below forecast numbers for the first time in 13 hours.

A high number of people with breathing problems continued to present at hospitals and other health providers.

The Department of Health and Human Services (DHHS) received reports of deaths that might be attributable to respiratory problems associated with the storm of the previous evening.

At 11.00am on 22 November the Chief Health Officer recognised the event as a public health emergency under the *Public Health Control Plan 2012*.

Prior to this recognition, ESTA, AV and hospitals increased the scale of their respective operations within business-as-usual processes, supported by partner agencies.

From 11.00am on 22 November, DHHS implemented an incident management structure and operated from the DHHS State Emergency Management Centre in Melbourne. This structure coordinated the response and analysed the impacts on the health sector. Fortunately, no subsequent escalation of demand occurred.

It is possible that nine deaths may be attributed to this event and Victoria's State Coroner is investigating those circumstances.

The number of people affected and the severity of the consequences, suggest this thunderstorm asthma event was without international precedent.

While thunderstorms have previously been linked to asthma epidemics, none have had the severity of consequences associated with Melbourne's thunderstorm asthma event of 21 November 2016.

Elsewhere in Australia, epidemic thunderstorm asthma has occurred in Wagga Wagga and Tamworth (New South Wales) and Canberra (Australian Capital Territory).

Of the globally-documented episodes of epidemic thunderstorm asthma, fatalities appear rare. One death was recorded in the United Kingdom in 2002.

The review

The Victorian Government requested the Inspector-General for Emergency Management (IGEM) to review the emergency response to the thunderstorm asthma event of 21–22 November 2016. The letter of request, outlining the review's terms of reference, is provided at Appendix 1.

The government requested that IGEM provide an interim report to the Deputy Premier/Minister for Emergency Services and the Minister for Heath and Minister for Ambulance Services by 30 January 2017. The final report is due 21 April 2017.

The review is being undertaken under Section 64(1)(c) of the *Emergency Management Act 2013* which provides for IGEM to prepare advice and reports at the request of the Minister for Emergency Services.

The objective of this review is to identify opportunities to learn from this event in order to improve future preparedness and response arrangements and performance. This includes the provision of recommendations, where required, about improvements to public health emergency planning and response arrangements.

IGEM is grateful for the assistance of all individuals and organisations that contributed to this review to date. In particular, the immediate, open and honest communication of key stakeholders has greatly assisted IGEM in rapidly progressing the development of this report.

IGEM acknowledges that everyone involved in managing and responding to this event did a remarkable job under pressure in dealing with unexpected and unprecedented demand.

Without knowing how many people in the community were affected or why, individuals demonstrated their willingness and flexibility to remain on duty or return to work to care for those affected, or in other ways support the management of this strain on emergency resources. Similarly, emergency response agencies and hospitals supported each other without question.

Victoria's emergency management reforms have sought to encourage and enable government departments and agencies to 'work as one', and there were many signs of this in practice on 21 and 22 November 2016.

The identified risks, plans and processes of organisations and the sector more broadly were not developed with such a scenario in mind.

IGEM is aware that multi-agency work commenced immediately following the emergency to better understand the factors that caused this event as a basis for predicting and improving the response to future emergencies.

Organisations have been reviewing their operations of 21 and 22 November 2016 to identify opportunities for improving their ability to escalate their response to such circumstances.

IGEM has made ten preliminary observations in this preliminary report but in doing so, is mindful that Victoria had no known experience of a rapid-onset event of this scale, with such little understanding of the cause.

IGEM will now focus in greater depth on several lines of enquiry pertinent to the review's terms of reference in preparing its final report.

Preliminary observations

Understanding the occurrence and impact of thunderstorm asthma

PRELIMINARY OBSERVATION 1

The incidence of thunderstorm asthma is not commonly recognised as a routine consequence of thunderstorms by the health and emergency management sectors.

Epidemic thunderstorm asthma resulting in significantly increased demand on ambulance and hospital services is a rare event. Thunderstorm asthma events have been documented globally since 1983. Seven episodes of epidemic thunderstorm asthma have been documented in Australia during that time. Only one death has been reported internationally from previous events.

Affected people are likely to experience severe respiratory symptoms and asthma resulting in increased emergency calls, emergency department presentations, hospital and intensive care unit admissions, general practitioner consultations and demand for pharmaceutical products.

Accordingly, the Inspector-General for Emergency Management notes that the scale of the 21-22 November 2016 event in Melbourne was unprecedented in the number of affected people, the demand for urgent healthcare, and the subsequent consequences.

Monitoring and predicting thunderstorm asthma

PRELIMINARY OBSERVATION 2

The phenomenon of thunderstorm asthma is not fully understood, although it is accepted that two factors – extreme levels of grass pollens and the occurrence of a thunderstorm – are common in many of the thunderstorm asthma incidents documented since 1983.

Although the Bureau of Meteorology is able to predict thunderstorms and their paths with some accuracy, identifying meaningful indicators for predicting thunderstorm asthma remains a key priority for the sector and partners.

Pollen counting only takes place in three sites across Victoria by university researchers however it is not publicly funded, the measurement methodologies are not consistent and results are not distributed under a planned strategy.

The Inspector-General for Emergency Management notes the significant effort by a range of stakeholders in Victoria and across Australia to build the knowledge base and improve the evidence upon which a reliable monitoring and forecasting system can be established.

Managing the initial surge in emergency calls during the evening of 21 November 2016

PRELIMINARY OBSERVATION 3

The Inspector-General for Emergency Management (IGEM) notes the dedication and effort of Emergency Services Telecommunications Authority (ESTA) management, call-takers and dispatchers; Ambulance Victoria (AV) management and paramedics; partner response agencies (including but not limited to the Metropolitan Fire Brigade and Victoria Police); Department of Health and Human Services staff, and all hospitals and hospital staff involved in the initial emergency response to the thunderstorm asthma event on the evening of 21 November 2016.

It is important to note that at the time of the event occurring, there was no formal/approved system for predicting and/or warning that the storms and non-meteorological factors could create a public health emergency. The rapid onset, escalation and scale of the event created unprecedented demand on the pre-hospital and hospital system.

While demand for ESTA, AV and hospitals stretched or exceeded capacity, IGEM commends the commitment and flexibility of the emergency management sector and the health system in responding to the event and minimising adverse impacts on the community.

Communicating and sharing situational information

PRELIMINARY OBSERVATION 4

The Inspector-General for Emergency Management notes that agencies were operating in an environment characterised by an extremely rare event, with minimal warning, rapidly escalating impacts and considerable uncertainty. However, limited communication and information sharing within and across agencies prevented a shared understanding of the emerging situation and the potential consequences.

The normal out-of-hours communications processes for the management of routine business were inadequate for managing an effective response to a large scale thunderstorm asthma event. Communications were linear, between two parties only, or email based, rather than group meetings and/or conference calls.

Key personnel working on the response were doing so remotely and the opportunity to rapidly share information, discuss issues, recognise triggers and develop intelligence in order to inform decision-making was not available.

Small pieces of information about the initial impact and consequences of the thunderstorm were known by some of those responding, but were not shared consistently or widely across agencies. There was early speculation by some personnel that the asthma was a consequence of the thunderstorm, however this was not widely disseminated.

As a result, and given a lack of activation of formal incident management arrangements that would have included a situational intelligence function, there was limited capacity to rapidly piece together and share a common operating picture of the developing situation.

Response escalation and management

PRELIMINARY OBSERVATION 5

Emergency Services Telecommunications Authority (ESTA), Ambulance Victoria (AV) and hospitals acted swiftly to put surge capacity strategies in place for their respective operations.

However, the Inspector-General for Emergency Management (IGEM) notes the emergency response plans of ESTA, AV and relevant hospitals were not fully activated. It is also noted that these plans were not designed for this type of scenario, particularly one in which many people were suddenly affected across such a wide geographic area.

IGEM's initial investigation considers that appropriate surge capacity strategies were put in place by AV and ESTA as soon as the surge in demand was recognised.

Despite ESTA taking many actions in accordance with its Critical Incident Response Plan, it did not escalate its plan but declared an incident at 7.45pm on 21 November 2016. Similarly, IGEM notes that AV did not formally escalate but took actions in accordance with, and over-and-above, its Emergency Response Plan.

At approximately 8.00pm on 21 November, elements of the State Health Emergency Response Plan (SHERP) were operating, however state-level management and functional resourcing was only commensurate with a simple incident of less complexity. Notably, one person from Department of Health and Human Services (DHHS) performed the dual role of State Health/Medical Commander and State Health Coordinator, supported by DHHS executives (working in their normal business, non-emergency roles). The State Health Commander (AV) also performed functions in accordance with the SHERP.

Additionally, the co-located DHHS State Emergency Management Centre (SEMC) and Ambulance Emergency Operations Centre (AEOC) were not activated on 21 November 2016, and the event was managed remotely through linear (single point to point) telecommunications.

IGEM notes there was an opportunity for DHHS at the state-level to escalate the emergency response level, activate the SEMC and AEOC, or request to utilise the State Control Centre (SCC).

All these facilities would have supported a coordinated response to the event on the evening of 21 November 2016. Evident triggers, in line with the SHERP, included the volume and nature of Triple Zero (000) calls for ambulance services, multi-agency dispatch requests, AV's initiation of escalation protocols and volume of presentations to public hospitals.

IGEM considers that had the thunderstorm asthma event been protracted, the demand on pre-hospital and hospital response would have become increasingly difficult to sustain. In this regard, a conservative and early escalation of response levels based on available triggers and information should be considered. Response levels, management coordination and control centres can all be scaled down as appropriate.

In identifying opportunities for continuous improvement, IGEM notes that the benefits of earlier activation and escalation of incident management arrangements would have enabled:

- the establishment of an incident management structure commensurate to the scale and complexity of the event
- increased resourcing and functional delegation of tasks to staff on the evening of 21 November 2016
- enhanced information flows and visibility within and between relevant agencies on the evening of 21 November 2016
- earlier consideration regarding the management of consequences
- earlier consideration regarding provision of public information and warnings and health advice, potentially easing demand on the pre-hospital and hospital system
- earlier consideration for leveraging the resources and systems of the SCC.

Notwithstanding this, IGEM notes the efforts of those individuals at the state level managing the significant surge on the pre-hospital and hospital system on the evening of 21 November 2016. As noted previously, this was with limited warning, emergency management structures, resources and systems available to them at the time, especially considering the scale and rapid onset of the event. One positive example of this was DHHS approving the use of private hospital beds, where available, for public patients (at no cost to patients) to assist with demand overflow from the public hospital system.

IGEM encourages further consideration of these factors, and any relevant others as part of the DHHS led review of the State Health Emergency Response Arrangements (SHERA).

Overall response management from 22 November 2016

PRELIMINARY OBSERVATION 6

The Inspector-General for Emergency Management (IGEM) notes that from 22 November 2016, the state-level incident management structures implemented, coordination and support efforts, and focus on the management of consequences as a result of the thunderstorm asthma event, were appropriate and adequate.

In addition, IGEM notes that development of a formal consequence management plan commenced on 22 November 2016 and was published on 24 November 2016. The plan is comprehensive in assessing risks and consequences resulting from the thunderstorm asthma event and identifies mitigating measures and responsibilities.

Effectiveness of Triple Zero (000) and ambulance response

PRELIMINARY OBSERVATION 7

The Inspector-General for Emergency Management (IGEM) recognises that Emergency Services Telecommunications Authority (ESTA) and Ambulance Victoria (AV) were under enormous pressure on the evening of 21 November 2016 due to the unanticipated and unprecedented surge in demand for emergency ambulances.

IGEM notes that once a rise in demand was recognised, ESTA and AV both significantly increased resource availability to address the surge. However, as the demand was not anticipated, and due to the sheer volume of calls and events, the performances of ESTA and AV fell short of some performance target times.

IGEM notes that ESTA and AV are currently working towards a procedure for ambulance call-takers to implement an ‘urgent disconnect’ function during periods of high demand to enable greater volumes of calls to be answered, by shortening call duration.

Public information, emergency warnings and health advice

PRELIMINARY OBSERVATION 8

The obligations, roles and responsibilities for the emergency management sector to issue public information, emergency warnings and health advice – before, during and after an emergency are described in a range of legislation, policy, guidelines and procedural documents.

The Inspector-General for Emergency Management notes a lack of clarity and consistency relating to some of the designated roles and responsibilities in this documentation.

During periods other than emergencies, public information, warnings and health advice are issued in accordance with agency/departmental procedures.

During periods of emergency, the activation of incident management arrangements triggers the appointment of individuals to operational roles who are then charged with the responsibility for issuing public information, emergency warnings and health advice to inform the community, allowing them to make decisions and take appropriate action.

PRELIMINARY OBSERVATION 9

The Inspector-General for Emergency Management (IGEM) commends the efforts that Ambulance Victoria (AV) made to issue information to the community in response to the significant demand being made on their resources on 21 November 2016.

This is especially noteworthy given AV is not a control agency for any emergency, regardless of classification or nature. Nor does AV have immediate access to the platforms and networks that would have been available to a designated control agency responding to a Class 1 emergency through the State Control Centre (such as fire, flood, storm, earthquake, and tsunami).

Further, IGEM notes that as formal (Class 2 emergency) incident management arrangements were not put in place on the evening of 21 November 2016, this hampered the overall response to the event including the timely development and distribution of appropriate messaging to the community.

Accordingly, IGEM considers that there are inconsistencies with the development and delivery of public information and warnings dependent on the nature of emergency experienced.

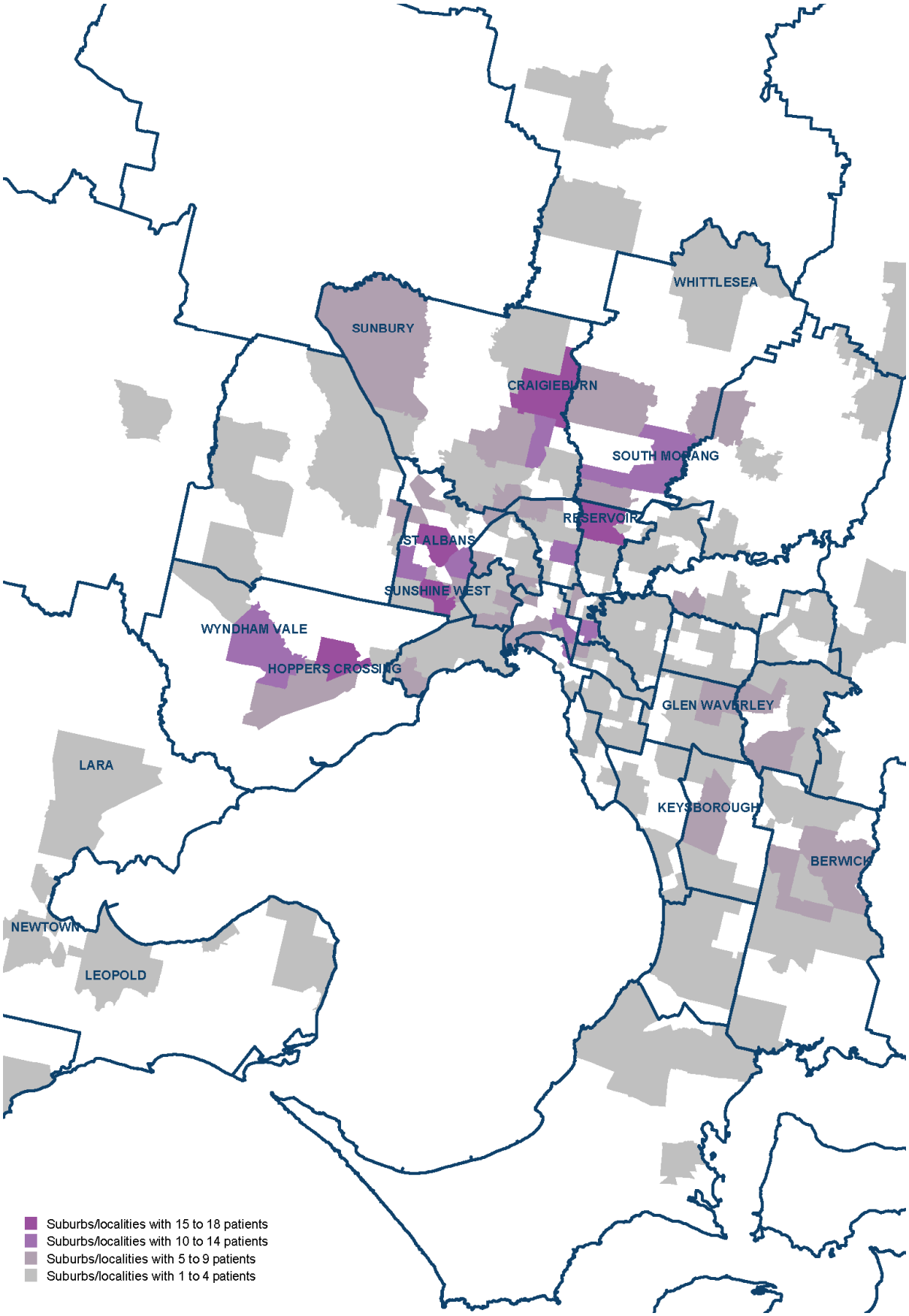
PRELIMINARY OBSERVATION 10

The Inspector-General for Emergency Management (IGEM) notes that little public information, emergency warnings or health advice were issued on 21 November 2016 during the thunderstorm asthma event.

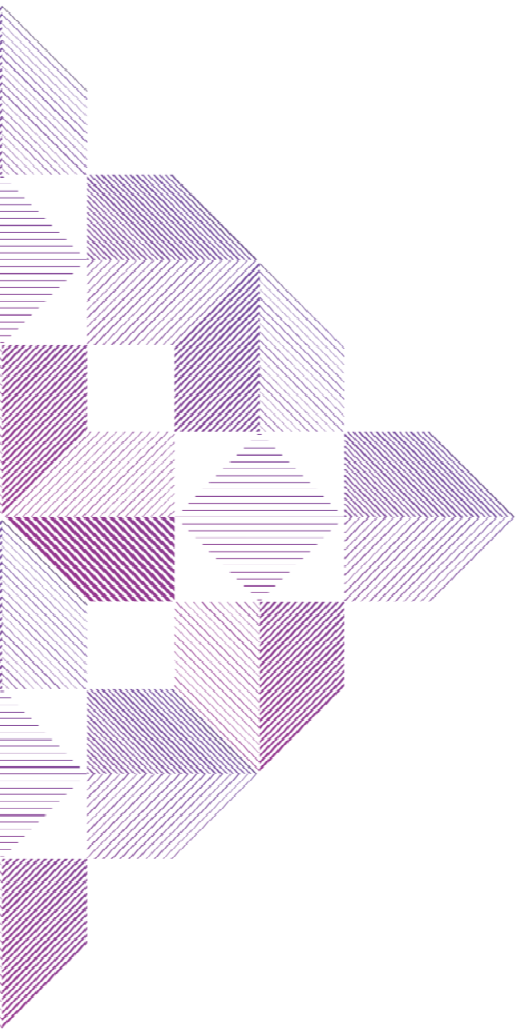
This was a direct result of the initial impacts not being fully understood nor broadly shared and considered; and incident management arrangements not being formally activated or rapidly escalated during the initial response to the rapid surge in demand for urgent healthcare.

However, IGEM notes formal incident management arrangements were activated on 22 November 2016 and subsequently, media releases, health advice and emergency warnings in relation to thunderstorm asthma were issued in accordance with the arrangements.

Figure 1: Concentration of breathing-problem events by suburb/locality of greater Melbourne and Geelong from 3.00pm on 21 November 2016 to 6.00am on 22 November 2016 requesting assistance via ESTA.



1 Introduction



On the evening of 21 November 2016, the Emergency Services Telecommunications Authority (ESTA), Ambulance Victoria and hospital emergency departments across Melbourne experienced an unprecedented surge in people with asthma and respiratory distress. Initially, the cause was unknown.

While thunderstorms have been linked to asthma epidemics, none have had the severity of consequences associated with Melbourne's thunderstorm asthma event of 21-22 November 2016.

The Victorian Government requested the Inspector-General for Emergency Management (IGEM) to review the emergency response to the thunderstorm asthma event of 21–22 November 2016. The letter of request, outlining the review's terms of reference, is provided at Appendix 1.

The government requested that IGEM provide an interim report to the Deputy Premier/Minister for Emergency Services and the Minister for Heath and Minister for Ambulance Services by 30 January 2017. The final report is due 21 April 2017.

The review is being undertaken under Section 64(1)(c) of the *Emergency Management Act 2013* (the Act) which provides for IGEM to prepare advice and reports at the request of the Minister for Emergency Services.

1.1 IGEM's role

IGEM is a legislated appointment established under the Act to:

- provide assurance to the government and the community in respect of emergency management arrangements in Victoria
- foster continuous improvement of emergency management in Victoria.

Supporting the achievement of these objectives, IGEM undertakes system-wide reviews under the provisions of Section 64(1)(b) of the Act, and prepares advice and reports at the request of the Minister for Emergency Services under the provisions of Section 64(1)(c) of the Act.

1.2 Objective of the review

The objective of this review is to identify opportunities to learn from this event in order to improve future preparedness and response arrangements and performance. This includes the provision of recommendations, where required, about improvements to public health emergency planning and response arrangements.

1.3 Scope of the review

In accordance with the government's request, the review addresses the following aspects of the emergency response to the Melbourne thunderstorm asthma event of 21–22 November 2016:

- The appropriateness and adequacy of the response under the Public Health Response Plan during the events of 21 and 22 November, including the speed of escalation.
- The role of, and coordination between, the Emergency Management Commissioner, the Department of Health and Human Services, and other relevant agencies in respect of this public health event, and the adequacy of support provided to emergency and public health services.
- Consideration of the triggers for, and provision of, public warnings and information and health advice, taking account of predictability, preventive steps and methods of distribution available for this type of emergency.
- The identification of any other relevant matters or opportunities for improvement.

This review is focused on identifying opportunities to improve public health and emergency management systems and processes in Victoria, as opposed to examining individual compliance or the apportionment of blame.

1.4 Approach

IGEM gathered information and analysed data from a number of sources to prepare this preliminary report and form its preliminary observations. These included:

- incident management records including incident logs and situation reports,
- emergency response plans and protocols
- interviews with relevant government departments, agencies and individuals
- interviews with subject matter experts with relevance to thunderstorm asthma
- a literature review undertaken by disaster research and development centre Risk Frontiers – based at Macquarie University New South Wales.

IGEM interviewed representatives of the following bodies and individuals in preparing this report:

- Ambulance Victoria
- Australian Medical Association
- Asthma Australia
- Bureau of Meteorology
- Country Fire Authority
- Deakin University
- Department of Health and Human Services, including the Chief Health Officer
- Emergency Management Victoria including the Emergency Management Commissioner
- Emergency Services Telecommunications Authority
- Environment Protection Authority Victoria
- Metropolitan Fire Brigade
- Minister for Health and Minister for Ambulance Services
- University of Melbourne
- Victoria Police
- Victoria State Emergency Service.

From 15 December 2016 to 30 January 2017, IGEM invited public comments and submissions in response to this review, its scope and lines of enquiry to inform its final report to government.

The views and experiences provided through submissions help IGEM identify opportunities for:

- improving the state's emergency management arrangements
- building stronger connections with communities
- enabling our communities to be better prepared to respond to the consequences of emergencies.

IGEM promoted the call for submissions through online channels (including igem.vic.gov.au, myviews.justice.vic.gov.au and vic.gov.au), social media, print and broadcast media outlets. Appendix 2 reproduces the advertisement calling for written submissions placed in select metropolitan and regional print outlets.

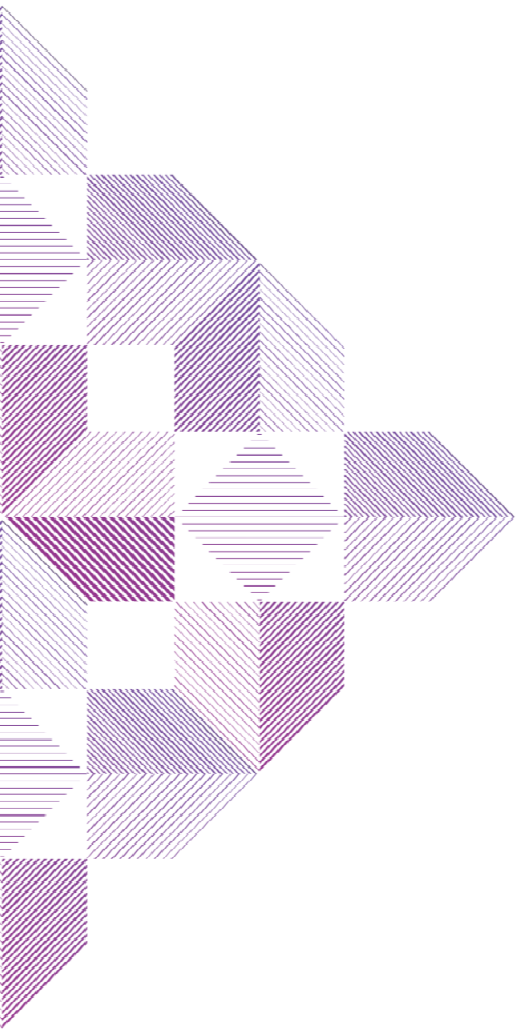
1.5 Acknowledgement

IGEM is grateful for the assistance of all individuals and organisations that are contributing to this review, in particular, the immediate, open and honest communication from key stakeholders has greatly assisted IGEM in rapidly progressing the development of this report.

The interviews with representatives from the health and emergency management sector were crucial in building understanding of the events, knowledge and decisions on 21–22 November 2016.

The willingness and commitment to providing insight, information and evidence to support this review is paramount to supporting continuous improvement of the emergency management arrangements in Victoria.

2 Background



2.1 Rapid-onset thunderstorm sweeps Geelong and Melbourne

Monday 21 November 2016 was Victoria's hottest day since March.

As the temperature In Melbourne reached 35°C, the Bureau of Meteorology (BoM) issued a severe thunderstorm warning at 1.58pm for damaging winds, heavy rainfall and large hailstones in Victoria's Mallee, South West, Wimmera and Northern Country (parts of) forecast districts.

At 4.00pm BoM extended its warning to other parts of Victoria, including Geelong and Melbourne. In those warnings, the Victoria State Emergency Service (VICSES) – as the control agency – provided advice on the actions people should take to protect themselves and their properties, including:

- to move vehicles under cover, or away from trees
- not to drive, ride or walk through flood water
- to keep clear of fallen power lines
- to stay indoors, if possible
- to listen to the radio for storm updates.

The gust front reached Geelong at 5.00pm and during the next hour moved rapidly eastwards across metropolitan Melbourne, as many people were making their way home after work. ESTA received a moderate surge in calls for VICSES assistance, answering 523 calls for the day[a], particularly in the Hobsons Bay and Wyndham municipalities in Melbourne's west.

ESTA answered the vast majority of these calls after 4.00pm. The thunderstorm front comprised several small cells, and although the storm front swept through quickly, BoM stated there was nothing remarkable about this storm.

There was no evidence, nor advice provided, to suggest that this storm would result in a health emergency of unprecedented scale and consequences.

2.2 Demand surges for urgent healthcare

As the storm moved east across Geelong and Melbourne, a vastly different form of emergency emerged, compared to the consequences usually associated with severe weather, such as fallen trees, roof damage and flash flooding.

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[a] *ESTA typically answer less than 100 calls for VICSES assistance on a typical day. A major surge in calls for VICSES is upward of 1000 calls.*

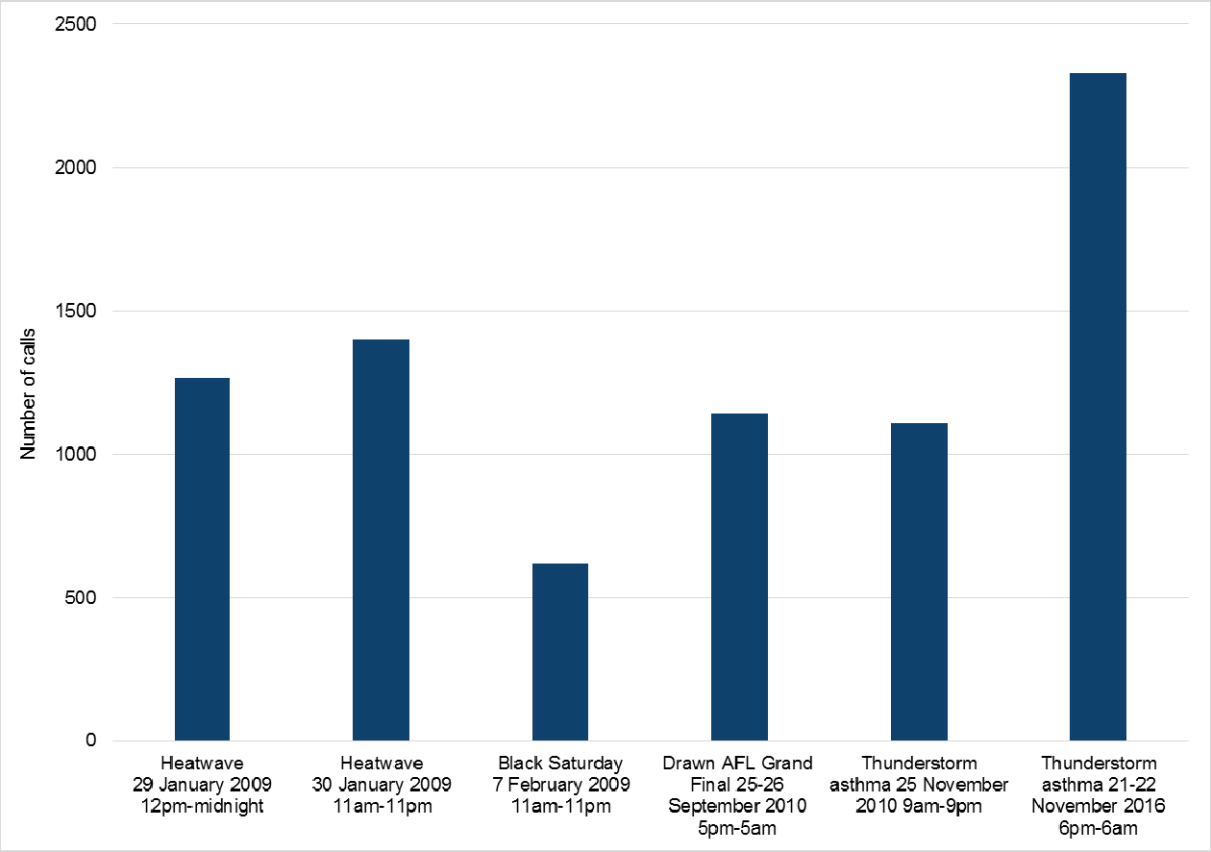
From 6.00pm on 21 November 2016, ESTA experienced an increase in Triple Zero (000) calls requesting ambulance services. Specifically, ESTA answered a large number of calls in which patients complained of breathing problems and asthma attacks.

The number of Triple Zero calls continued to escalate and from 6–7.00pm, ESTA answered 510 emergency ambulance calls. During that one hour period, ESTA had forecast 110 emergency ambulance calls.

During the 12 hours to 6.00am on 22 November 2016, ESTA answered 2332 emergency ambulance calls.

This was an unprecedented level of demand for ambulance, surpassing the number of emergency ambulance calls received during previous call surges, including heatwaves in 2009, the 2009 Black Saturday bushfires, or the surge in ambulance calls on 25 September 2010 after the drawn AFL Grand Final – the largest previous non-forecast event (as shown in Figure 2).

Figure 2: Comparison of six twelve-hour surge periods of emergency ambulance calls to ESTA



As a consequence of the Triple Zero call surge, ESTA was unable to meet its emergency ambulance call answer speed performance target time of five seconds for most calls.

The longest call answer delay to Triple Zero, was requesting an ambulance at 6.49pm on 21 November 2016. This call waited four minutes and nine seconds for an available ESTA call-taker to answer[b].

The peak demand for ambulances occurred during the 15 minutes from 7–7.15pm during which ESTA answered 201 emergency ambulance calls.

In response to this level of demand, Ambulance Victoria (AV) and ESTA implemented a number of management strategies – as it would on any busy night. It also requested support from key partner organisations outside of normal protocols.

These included Metropolitan Fire Brigade (MFB), who attended some Code 1 (lights and sirens) ambulance cases without ambulance support, and Victoria Police (VicPol), who attended some locations where people were waiting for an ambulance, but whom ambulance communications staff had been attempting to call back via telephone for a welfare check and received no answer.

By 8.00pm AV had more than 150 events pending dispatch, including close to 100 Code 1 cases. AV reported that in the absence of any defined trigger or hazard, it managed the overall surge in demand as 'business as usual', albeit at an extreme response level.

The volume of calls to Triple Zero gradually decreased, however between 9.00pm and midnight, ESTA still answered calls for emergency ambulance at volumes of 147 per cent above forecasted levels.

[b] *Measured from when the Telstra Triple Zero service first attempts to connect the caller to an available ESTA call-taker.*

At approximately 7.00am on 22 November, Triple Zero emergency ambulance calls dropped below forecast numbers for the first time in 13 hours.

Between 3.00pm on 21 November and 6.00am on 22 November 2016, ESTA processed 2666 emergency and non-emergency ambulance events, of which 962 related to breathing problems. As shown in Figure 1 (page 7) requests for assistance via ESTA were dispersed across 299 suburbs/localities. Only 20 of these events occurred between 3–6.00pm on 21 November 2016.

This level of demand for ambulance services, combined with the many additional people who self-presented to hospitals for urgent medical care, had an effect on hospitals and other healthcare providers.

By 7.00pm on 21 November, hospital emergency departments, particularly in Melbourne's west and north, experienced an unprecedented level of demand – estimated by some hospitals to be at least 50 per cent greater than for the same period in the previous week. This demand resulted in hospitals implementing escalation actions to maximise the flow of patients and free-up ambulances to attend other urgent events.

On 22 November, a high number of people with breathing problems continued to present at hospitals and other health providers. The Department of Health and Human Services (DHHS) subsequently received reports of deaths that might be attributable to the effects of the storm of the previous evening.

At 11.00am on 22 November 2016, the Chief Health Officer recognised the event as a public health emergency under the Public Health Control Plan 2012. DHHS implemented an incident management structure and operated from the DHHS State Emergency Management Centre (SEMC) in Melbourne. This structure coordinated the response and analysed the impacts on the health sector. Fortunately, no subsequent escalation of demand occurred on 22 November.

2.3 Thunderstorm asthma identified

IGEM examined documents and conducted interviews with relevant emergency management sector representatives and found that, as the surge in demand began to unfold, there was little understanding of the cause and scale of this rapid increase in demand for urgent healthcare.

At 7.45pm on 21 November 2016, individual AV and ESTA executives separately suspected that the cause of the increase in breathing problems may be the rare and little-understood phenomenon – thunderstorm asthma.

Victoria had limited experience of epidemic thunderstorm asthma or the potential consequences, and had no way of predicting the extent and duration that the level of demand might continue.

Epidemic thunderstorm asthma last occurred in Victoria in 2010. Over 30 years, the following[c] epidemics of thunderstorm asthma have been recorded in Victoria, all in November:

- 8 November 1987
- 29 November 1989
- 25 November 2010
- 21 November 2016.

Although thunderstorm asthma is known to have occurred in Victoria prior to 2016, it has been so rare and at such a small scale that it was not an identified risk in the state's emergency management plans.

Emergency Risks in Victoria[1] is a state-level emergency risk assessment to enable decision-makers and other stakeholders to understand, mitigate, plan and prepare for the credible major emergency scenarios that could occur in Victoria.

The risks are based on recent experience of emergencies in Victoria and Australia and on technical knowledge within the sector. These are risks that have potentially very severe consequences if realised. For example, heatwave is recognised as one of the state's top risks as it is the leading cause of weather-related deaths in Australia.

Thunderstorms are recognised as a risk for their potential to cause loss of life or serious injury, as well as damage to property, infrastructure, business, agriculture and the environment.

The intensity and sudden impact of severe storms is known for causing significant spikes in the number of Triple Zero calls and requests for emergency service attendance.

Given the lack of broad awareness and understanding of epidemic asthma induced by specific thunderstorm events, epidemic asthma is not identified as a potential consequence of thunderstorms.

2.4 The international incidence and understanding of thunderstorm asthma

Global experience of thunderstorm asthma is limited. It has been reported in academic literature since the 1980s, with epidemics identified in:

- Australia[2] [3]
- Canada[4]
- Greece[5]
- Iran[6]
- Italy[7] [8]
- United Kingdom (UK)[9] [10]
- United States of America[11].

Before November 2016, two of the largest thunderstorm asthma epidemics worldwide appear to have occurred in the UK and Iran.

[c] *Independently verified instances known at this time*

In June 1994, there were 640 asthma cases in hospital emergency departments – nearly 10 times the expected number – and 104 hospital admissions in the 30 hours following a thunderstorm in London, UK[12].

In 2013, 2000 asthma attacks were triggered during and following a thunderstorm in Ahvaz, Iran. Most patients were aged 20–40 years, and had no history of asthma. For most patients, symptoms began while outdoors[13].

Of the globally-documented episodes of epidemic thunderstorm asthma, fatalities appear rare, with the only death recorded in the UK in 2002.

Other than the Victorian occurrences listed previously in this report, epidemic thunderstorm asthma in Australia has occurred in Wagga Wagga and Tamworth (New South Wales) and Canberra (Australian Capital Territory).

As a result of Victoria's November 2016 epidemic thunderstorm asthma event, estimates are that approximately 9,900 people presented at hospitals in metropolitan Melbourne and Geelong. Of these approximately 4,000 were respiratory related.

It is possible that nine deaths may be attributed to this event and Victoria's State Coroner is investigating those circumstances.

The number of people affected and the severity of the consequences, suggest this thunderstorm asthma event was without international precedent.

There are a number of uncertainties about how epidemic thunderstorm asthma occurs – reflecting its rarity – and the difficulty of collecting and testing evidence to support an understanding of the precise mechanisms by which thunderstorms and other environmental factors may contribute to epidemics of asthma/respiratory distress.

Although much remains to be discovered about the relationship between asthma attacks and thunderstorms, there is reasonable evidence of a causal relationship between the two[14].

How thunderstorms develop, mature, and subside is well-understood. BoM is able to forecast and track thunderstorms with some accuracy – although acknowledges it is a difficult process.

However, while much data about thunderstorms is available, identifying meaningful and specific indicators for predicting thunderstorm asthma remains a key priority for the sector and partners.

2.5 Situational awareness of the emergency

IGEM's interviews and examination of the available evidence indicates that emergency managers had a fragmented understanding of what was occurring in the community and across Victoria's health system on 21 November 2016, both during and following the thunderstorm.

The State Control Centre (SCC) was operating at a Tier 2 readiness level in response to the declaration of a Total Fire Ban for the Mallee region and in preparation for the potential heat impacts and the forecast thunderstorm. In accordance with Victoria's emergency management arrangements[15], major emergencies relating to fire and storm are examples of Class 1 emergencies. These emergencies each have a specific emergency management 'control agency' to manage the appropriate response, which includes that agency typically assuming the role of Incident Controller.

The situation that had been unfolding in the evening would be considered a health emergency, categorised as a Class 2 emergency, whereby DHHS would assume the role of control agency and appoint controllers as per Section 39 of the *Emergency Management Act 2013* and as described in the State Emergency Response Plan (SERP).

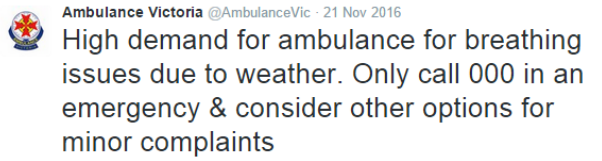
2.6 Public information, warnings and health advice

The first information released publicly relating to this health emergency was issued at 8.40pm on 21 November 2016, when AV issued the tweet through the social media platform Twitter, *"we've seen a rise in breathing probs tonight following the weather. Follow your asthma plan or see here for advice…"* (Figure 3) referencing advice from the Better Health Channel – a DHHS-managed health information website.

Figure 3: Ambulance Victoria tweet from 8.40pm on 21 November 2016

As shown below, AV posted a subsequent tweet at 10.08pm and conducted a number of media interviews between 9.40pm and 11.00pm.

Figure 4: Ambulance Victoria tweet from 10.08pm on 21 November 2016



3 Understanding thunderstorm asthma

The thunderstorm asthma event of 21–22 November 2016 had consequences that were not typical of a thunderstorm.

The unique characteristics that differed from the more commonly occurring emergencies such as bushfire, flood and thunderstorm included:

- being largely invisible
- being geographically dispersed and widespread
- having a rapid onset
- being unfamiliar or unknown, with less practiced response protocols.

Allergy, asthma and allergic rhinitis (AR) are different conditions that often co-occur, and research is ongoing to fully understand the immune system interaction with allergens.

In simple terms, allergies result from hyper-sensitivity to an allergen (for example dust, pollen, mould) whereas AR is associated with inflammation of the nose in response to an allergen.

Asthma on the other hand is a chronic inflammatory condition located in the lower airways. There are several types of asthma, among which allergic asthma is the most common[16].

Notwithstanding the rarer occurrence of epidemic thunderstorm asthma, as occurred in Melbourne on a much smaller scale in 2010, many people with asthma are regularly affected by the combination of elevated pollens and thunderstorms. The numbers of people affected, and the severity of their asthma are not well documented.

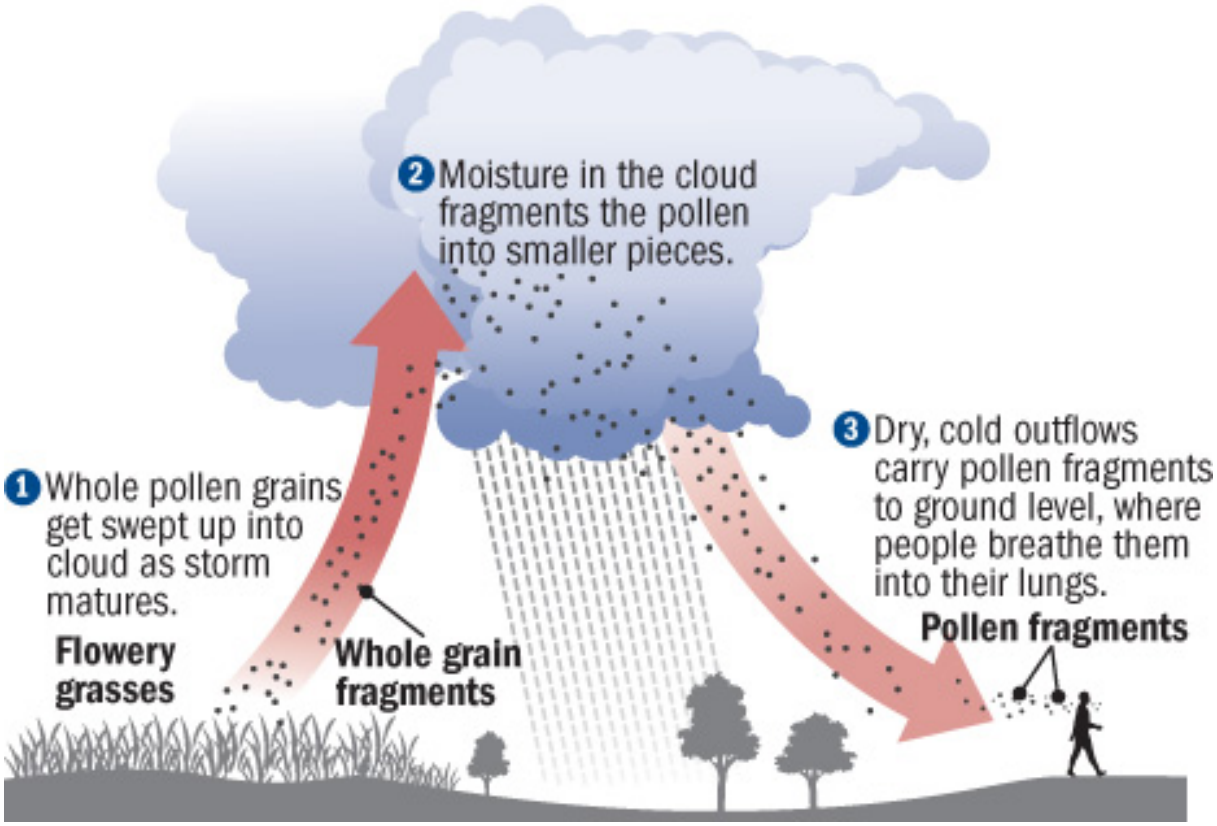
Although there are uncertainties about the specific mechanisms involved, thunderstorm asthma is likely triggered by small sized airborne allergens, such as those from pollen and mould spores that are carried by thunderstorm downdrafts and outflows and then inhaled by allergen-sensitive individuals (see Figure 5, page 15).

Some of these small-sized allergens are caused by rupturing pollen grains as a result of climatic conditions associated with the storm activity.

There are four proposed conditions for a thunderstorm asthma epidemic:

- high concentrations of allergenic material (for example grass pollen or fungi)
- thunderstorm outflow that sweeps up bio-aerosols and suspends them near ground level in population centres
- formation of respirable-sized particles (<10 µm) via rupturing pollen grains or germinating fungal spores (see Figure 6, page 16)
- exposure of people that are sensitive to the relevant allergen and/or people that have (a propensity for) asthma to the air mass carrying allergenic particulate matter.

Figure 5: Visual representation of one hypothesis for the mechanism of thunderstorm asthma (Illustration courtesy Alex Gonzalez)



3.1 Exposure of allergen-sensitive individuals

Thunderstorm asthma epidemics occur when allergen-sensitive individuals inhale air that is carrying a high concentration of airborne allergens. Notably, not all asthmatics are affected by thunderstorm asthma, and many people affected do not have a known history of asthma[17].

Where allergy testing of thunderstorm asthma subjects has occurred, many have had hyper-sensitivity to certain types of fungi and/or pollen[18 19]. In addition, many thunderstorm asthma subjects have reported a history of hay fever, but not asthma[20 21 22].

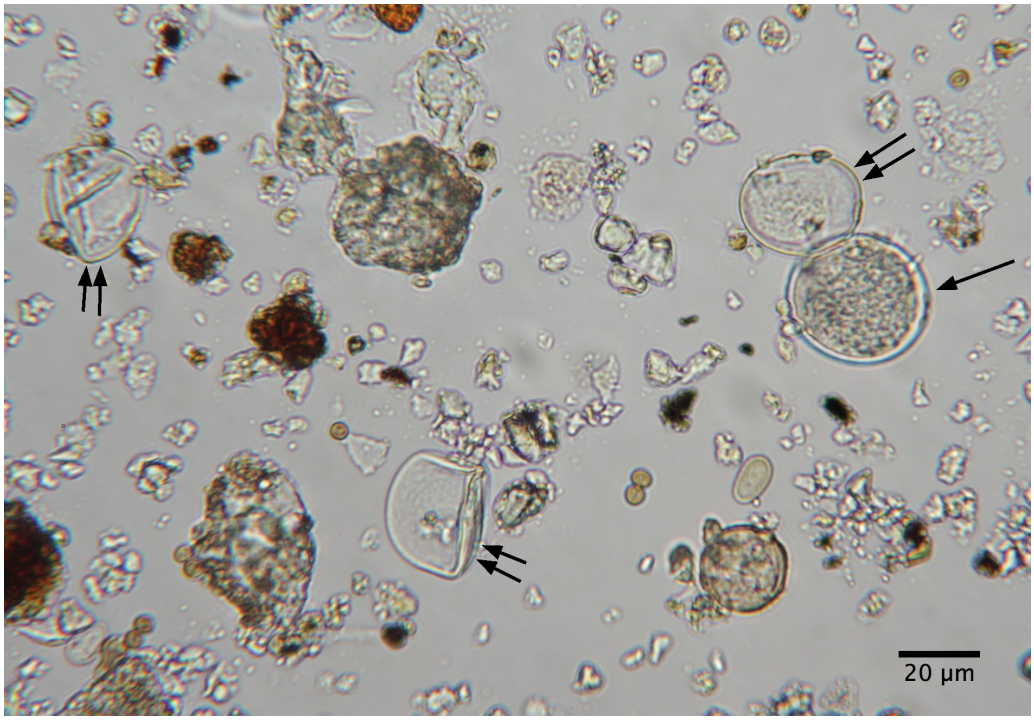
It is hypothesised that sensitive individuals are 'primed' by environmental factors prior to the thunderstorm so that their airways are already hyper-responsive, and that this causes the acute and severe reaction to the amount of allergens carried by the thunderstorm[23 24].

A potentially key priming factor is exposure to airborne allergens such as pollen or fungal spores prior to the thunderstorm.

Other priming factors that may be relevant include exposure to air pollution, viral infections (particularly respiratory)[25 26] and weather factors that are known to affect asthmatics more generally, such as sudden temperature changes and high humidity[27].

Figure 6: Microscope image of Burwood (Victoria) air sample at 6:30 pm on 21 November 2016[28].
Single arrow points to intact pollen; double arrow points to ruptured pollen

(Image courtesy of Dr Philip Taylor and Associate Professor Cenk Suphioglu, Deakin AIRwatch)



3.2 The impact of thunderstorm asthma

Thunderstorm asthma is a significant public health issue because of its potential to affect large numbers of people (including those with no known history of asthma), and to overwhelm emergency department (ED) resources and pharmaceutical suppliers. The most severe impact of thunderstorm asthma is the sudden increase in asthma cases to the point of an epidemic. This includes general practitioner (GP) visits, ED presentations, and in extreme severe acute cases, hospital admissions.

For example:

- During the June 1994 thunderstorm asthma epidemic in the United Kingdom, GP consultation rate was six times higher than normal, and an estimated 1500 people requested a GP visit for asthma[29 30].
- In Melbourne, 5 to 10-fold increases in asthma cases at EDs and increased ambulance calls for asthma have been observed in previous thunderstorm asthma events in 1987 and 1989[31].
- In October 1997, there were 215 asthma-related ED cases, 41 of whom required admission, following a thunderstorm in Wagga Wagga[32].

Knowledge of who has been affected in each event is generally limited to the most severe cases as studies tend to rely on data from hospitals or GPs[33]. It is possible that subjects with well-managed asthma are also affected by the thunderstorm, but are able to effectively resolve their symptoms alone.

Managing space, staffing, and resources within EDs during asthma epidemics is also a significant issue[34] and there have been reports of EDs running out of medication or equipment during severe events[35].

Acute and severe acute asthma are the most extreme medical impacts of thunderstorm asthma.

When the highly concentrated allergenic material is inhaled by sensitive (primed) individuals, it is deposited throughout their airway. Initial symptoms of an allergic asthma reaction include airway constriction and inflammation[36 37].

If left untreated, continued and increasing inflammation leads to mucous secretion within the airways. This mucous, along with other damaged cells and the continued inflammatory response, causes smaller airways to become blocked[38 39]. Breathing becomes progressively more difficult due to airway narrowing and air becoming trapped in the airways.

These events cause respiratory muscle fatigue, uneven lung ventilation, and low oxygen concentration in the blood. Prolonged asthma can also cause high levels of carbon dioxide[40].

Deterioration from an untreated asthma attack, or if unresponsive to treatment, can progress rapidly and cause respiratory failure.

Beyond these medical impacts, thunderstorm asthma can be a particularly frightening experience for both the

patient and carer, especially if access to medication or treatment is not immediately available. Indirect costs associated with missed work and additional resourcing requirements for health and emergency services for this event are likely to be significant, but as yet are unquantified.

PRELIMINARY OBSERVATION 1

The incidence of thunderstorm asthma is not commonly recognised as a routine consequence of thunderstorms by the health and emergency management sectors.

Epidemic thunderstorm asthma resulting in significantly increased demand on ambulance and hospital services is a rare event. Thunderstorm asthma events have been documented globally since 1983. Seven episodes of epidemic thunderstorm asthma have been documented in Australia during that time. Only one death has been reported internationally from previous events.

Affected people are likely to experience severe respiratory symptoms and asthma resulting in increased emergency calls, emergency department presentations, hospital and intensive care unit admissions, general practitioner consultations and demand for pharmaceutical products.

Accordingly, the Inspector-General for Emergency Management notes that the scale of the 21-22 November 2016 event in Melbourne was unprecedented in the number of affected people, the demand for urgent healthcare, and the subsequent consequences.

3.3 Predicting thunderstorm asthma

Thunderstorm asthma involves interactions between meteorological factors, airborne allergens, and human factors, therefore prediction is complex. Four conditions must be considered in order to understand the potential for thunderstorm asthma prediction[41]:

- High concentrations of allergenic material

  Pollen monitoring in Australia is currently sparse, with data typically collected once per day or week. In some locations data is only collected during what is considered to be the main pollen season. In addition, not all species that produce pollen are currently monitored (and in some locations only grass pollen is quantified), with fungal spores perhaps less monitored than pollens. Weather conditions on the day, and in the preceding days and weeks are also likely to be important. For example, pollen production requires adequate rain during winter and warm, dry days prior to the thunderstorm to support elevated levels of airborne pollen.

- Thunderstorm outflows

  Understanding of how thunderstorms develop, mature, and subside is relatively well developed, and the BoM is able to predict thunderstorms and their paths with considerable accuracy. While much data about thunderstorms is available, identifying meaningful indicators for predicting thunderstorm asthma remains a key priority.

- Respirable-sized aeroallergens

  The formation of respirable-sized (small enough to be inhaled) airborne allergens is much harder to predict and monitor, particularly as pollen fragments, broken fungal spores, and other allergenic matter is often not revealed in current pollen monitoring. In addition, real-time monitoring of airborne allergens is not currently undertaken and would likely require significant investments and trialling of new technology.

- Exposure of sensitive people

  Using automatically generated data from emergency departments that is monitored by public health officials, a rise in asthma cases can be used to generate an alert and trigger a public health intervention[42]. This may allow earlier identification of asthma epidemics and facilitate appropriate resourcing and management.

Factors that appear important for predicting thunderstorm asthma include:

- **seasonal factors:** rainfall during winter, pollen season (start, peak, and end)
- **in the preceding days:** temperature, humidity, pollen count, fungal spore count
- **on the day:** temperature, humidity, wind direction, wind speed, pollen forecast
- **about the thunderstorm:** thunderstorm type, direction of movement, wind speed
- **exposure:** time of day, location of the gust front.

It is important to note that there are likely other variables involved and that thresholds and triggers (for example required pollen count) are unknown.

As others have observed[43] [44], predictions based on current knowledge are likely to have high rates of false alarms. It may, therefore, be worthwhile distinguishing between ‘predictions’ that an event will occur, and ‘warnings’ based on certain criteria and conditions that are known to be associated with thunderstorm asthma.

3.4 Current monitoring and forecasting in Melbourne

Victoria has three pollen monitoring stations that operate during the pollen season.

Although the season can vary in onset and duration, long-term data shows that the majority of high and extreme pollen days occur between October and December.

The Melbourne Pollen Count and Forecast service operates through the School of Biosciences at the University of Melbourne, under the AusPollen Australian Pollen Allergen Partnership[45] [46].

The service operates during Melbourne's peak allergy period of 1 October to 31 December. The service offers a daily pollen count and a six-day forecast.

The forecast ratings are from 'low' to 'extreme'. The daily 4pm count is made available on the website (melbournepollen.com.au), and the forecast updated and distributed through the Asthma Australia website and networks. An App for mobile devices is available free-of-charge.

The Deakin AIRwatch service is operated by Deakin University for staff and students, and made available to the public on their website[47].

This service has pollen and spore counting stations at the Burwood and Waurn Ponds campuses of Deakin University and operates between 1 September and 1 February, providing a daily pollen count, a 24-hour pollen forecast and a 24-hour thunderstorm asthma forecast. The latter is based on an 'extreme' 24-hour pollen forecast combined with an extreme thunderstorm forecast from the BoM.

Since the November 2016 thunderstorm asthma event, BoM, DHHS, Environment Protection Authority Victoria (EPA), the University of Melbourne and Deakin University have formed a thunderstorm asthma interagency working group to share knowledge and experience of thunderstorm asthma-associated events and discuss ways to enhance the prediction of future events.

PRELIMINARY OBSERVATION 2

The phenomenon of thunderstorm asthma is not fully understood, although it is accepted that two factors – extreme levels of grass pollens and the occurrence of a thunderstorm – are common in many of the thunderstorm asthma incidents documented since 1983.

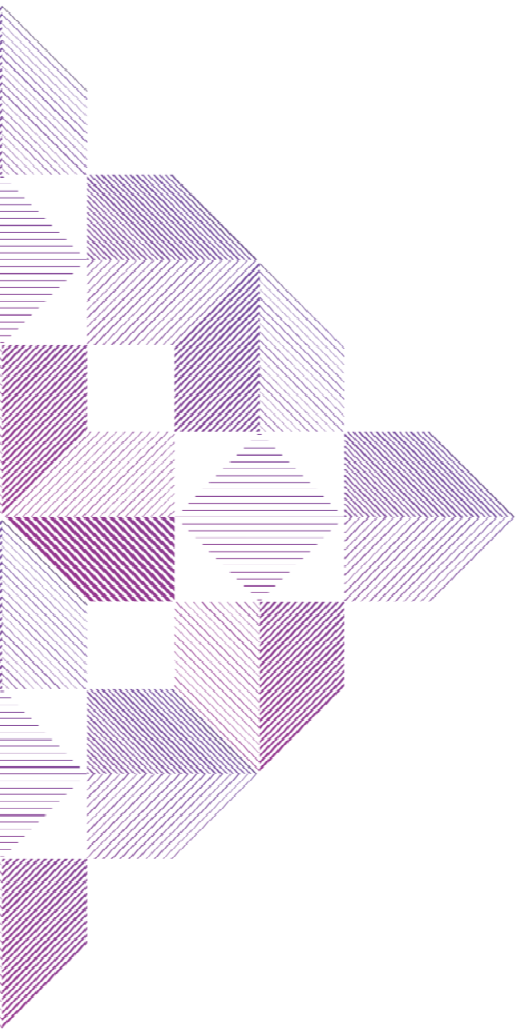
Although the Bureau of Meteorology is able to predict thunderstorms and their paths with some accuracy, identifying meaningful indicators for predicting thunderstorm asthma remains a key priority for the sector and partners.

Pollen counting only takes place in three sites across Victoria by university researchers however it is not publicly funded, the measurement methodologies are not consistent and results are not distributed under a planned strategy.

The Inspector-General for Emergency Management notes the significant effort by a range of stakeholders in Victoria and across Australia to build the knowledge base and improve the evidence upon which a reliable monitoring and forecasting system can be established.

Storm clouds over Melbourne CBD (Image courtesy Donald Yip/Shutterstock.com)

4 Response



This unprecedented health emergency posed unique challenges for emergency response.

IGEM notes a number of factors associated with the thunderstorm asthma event that impacted on response, including that:

- the health impacts were not predicted or foreseen
- it had a very rapid onset
- it had broad geographic reach
- there were no previous instances of the event of the scale or impact experienced on 21–22 November 2016.

IGEM has considered these factors in assessing the appropriateness and adequacy of response to the thunderstorm asthma event.

4.1 Emergency response arrangements

Emergency response includes actions taken immediately before, during, and after an emergency to reduce the effect and consequences of emergencies on people, their livelihoods and wellbeing, property and the environment, and to meet basic human needs[48].

Victoria's emergency response arrangements are guided by the Act and a number of key plans. The following are key state level plans relevant to the thunderstorm asthma event:

- the *State Emergency Response Plan* (SERP)
- the *State Health Emergency Response Plan* (SHERP) – sub plan to the SERP
- the *Public Health Control Plan 2012*.

Refer to Appendix 3 for further detail on the Act and the key plans.

IGEM notes that DHHS commenced a review of the State Health Emergency Response Arrangements (SHERA) in July 2016. The first draft of the revised arrangements is expected to be completed by March 2017. This work aims to consolidate the SHERP and the *Public Health Control Plan 2012* to progress an all hazards model within a single set of arrangements for health events.

The intended outcome will be a set of contemporary arrangements to meet the communities' health needs and address consequences of emergencies that reflect developments in the emergency management, health and security sectors.

4.2 Emergency response - key concepts

Emergency response management is based on the functions of command, control and coordination, consequence management and communications.

Coordination – bringing together of agencies and resources to ensure effective response to and recovery from emergencies.

Control – overall direction of response activities in an emergency, operating horizontally across agencies.

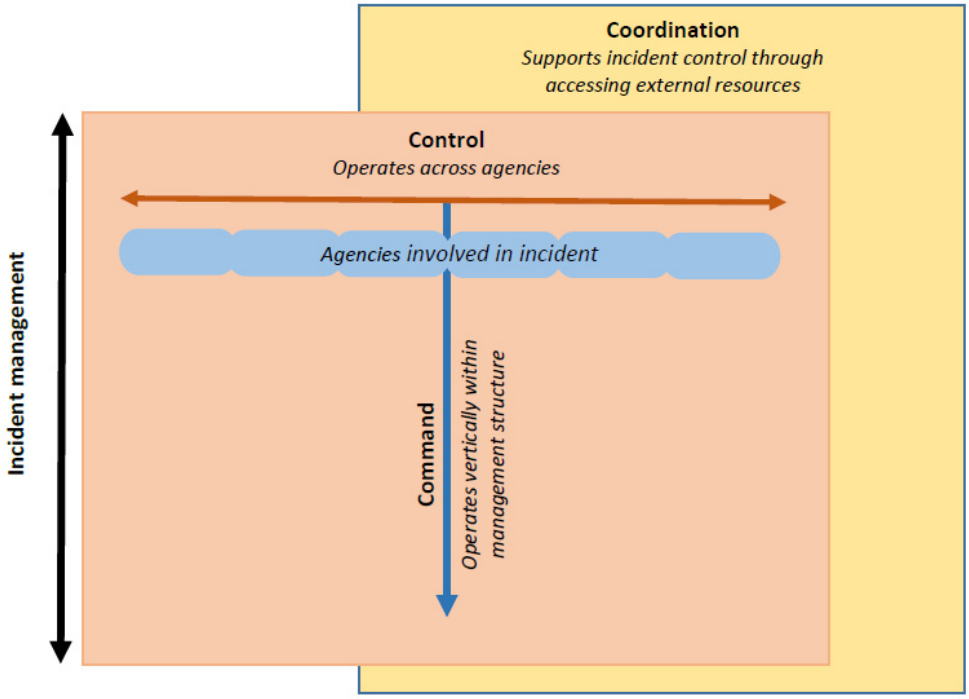
Command – internal direction of personnel and resources, operating vertically within an agency. Functional command is the integrated command of associated activities, resources and capabilities that may normally exist across a number of organisations.

Consequence management – coordination of the activities of agencies to minimise the adverse consequences of emergencies on the community.

Communications – communicating to the public, reporting to government and communicating with stakeholder agencies during emergencies.

Figure 7 shows the relationship between control, command and coordination in emergency response.

Figure 7: Relationship between command, control and coordination in emergency response
(Source: The Australasian Inter-service Incident Management System, Australasian Fire and Emergency Service Authorities Council, Fourth edition, 2013)



4.3 Overview of key response arrangements for the thunderstorm asthma event

A major thunderstorm is classified as a Class 1 emergency, with VICSES typically undertaking the role of the control agency in accordance with the SERP. VICSES would take the lead role in responding to requests for assistance with the 'Line of Control' in place (Incident, Region, State).

The thunderstorm asthma event was unique due to the significance of the health consequences it posed, rather than the usual consequences from a thunderstorm, such as flooding or building damage.

Therefore, under the Act the thunderstorm asthma event would be a Class 2 emergency. It has also been referred to as a public health emergency.

Each type of emergency event has an assigned control agency or primary agency responsible for responding to that specific form of emergency. The *Emergency Management Manual Victoria* (EMMV) lists the responsible agency according to each type of emergency. For example, DHHS is the control agency for human disease/epidemics, food/drinking water contamination and incidents involving radiological substances and biological releases.

As the thunderstorm asthma epidemic event was considered a human disease event, DHHS was the designated control agency.

The Chief Health Officer was the Class 2 State Controller, which is a designation of the role. The Class 2 State Controller was responsible for managing and leading the overall operational response of the thunderstorm asthma event.

Health incident responses may be structured around the three tiers of control – state, regional, and incident. The tiers at which the health response operates will vary according to the impact on the health system and the tiers where control is exercised. The thunderstorm asthma event was managed only at the state tier.

Table 1 depicts the key state tier roles and functions for a public health emergency in accordance with the Act, the SERP and the SHERP.

Table 1: Key roles and functions for a public health emergency in accordance with the Act, the SERP and the SHERP

ROLE	AGENCY	KEY FUNCTIONS
Emergency Management Commissioner	n/a	• Ensure control arrangements are in place, including for Class 2 emergencies • Response coordination • Consequence management • Communication (supported by DHHS)
Chief Health Officer (Class 2 State Controller)	DHHS	• Establish control structure for the Class 2 emergency as appropriate and monitor to ensure it suits the circumstances • Consider and apply the State emergency management priorities (including the protection and preservation of life and issuing of community warnings) • Issue warnings and information to the community in relation to the Class 2 emergency
State Health and Medical Commander	DHHS	• Direct state health and medical resources • May form a State Health Incident Management Team to coordinate a whole-of-health response to an emergency at a strategic level • Ensure functional command is established and operating effectively through the State Health Incident Management Team when an incident is likely to overwhelm the Victorian health sector • Maintain strategic oversight of health consequences and contributes to the State Risk and Consequence Plan[4] via the Class 2 State Controller
State Health Coordinator	DHHS	• Resource and implement the State Health Incident Management Team • Advise the Class 2 State Controller on health sector readiness, capability and operational activity • Brief the State Health and Medical Commander on health sector response, capability and potential vulnerabilities • Approve requests for additional clinical and physical resources • Ensure regular and appropriate health-related communication with internal and external stakeholders
State Health Commander	AV	• Provides regular situation reports to the Class 2 State Controller, State Health and Medical Commander, and the State Health Coordinator • Assumes command of the pre-hospital function of the emergency at the state tier • Contributes to the State Risk and Consequence Plan through the development of the health plan

4 *This plan identifies the high level consequences associated with an emergency event and appropriate risk management strategies to mitigate the flow on affects to communities, businesses or the economy of Victoria*

4.4 Emergency response to the thunderstorm asthma event

Surge during the evening of 21 November 2016

Thunderstorms were forecasted on 21 November 2016, however there was no expectation that they would generate a major health emergency with an impact of this scale.

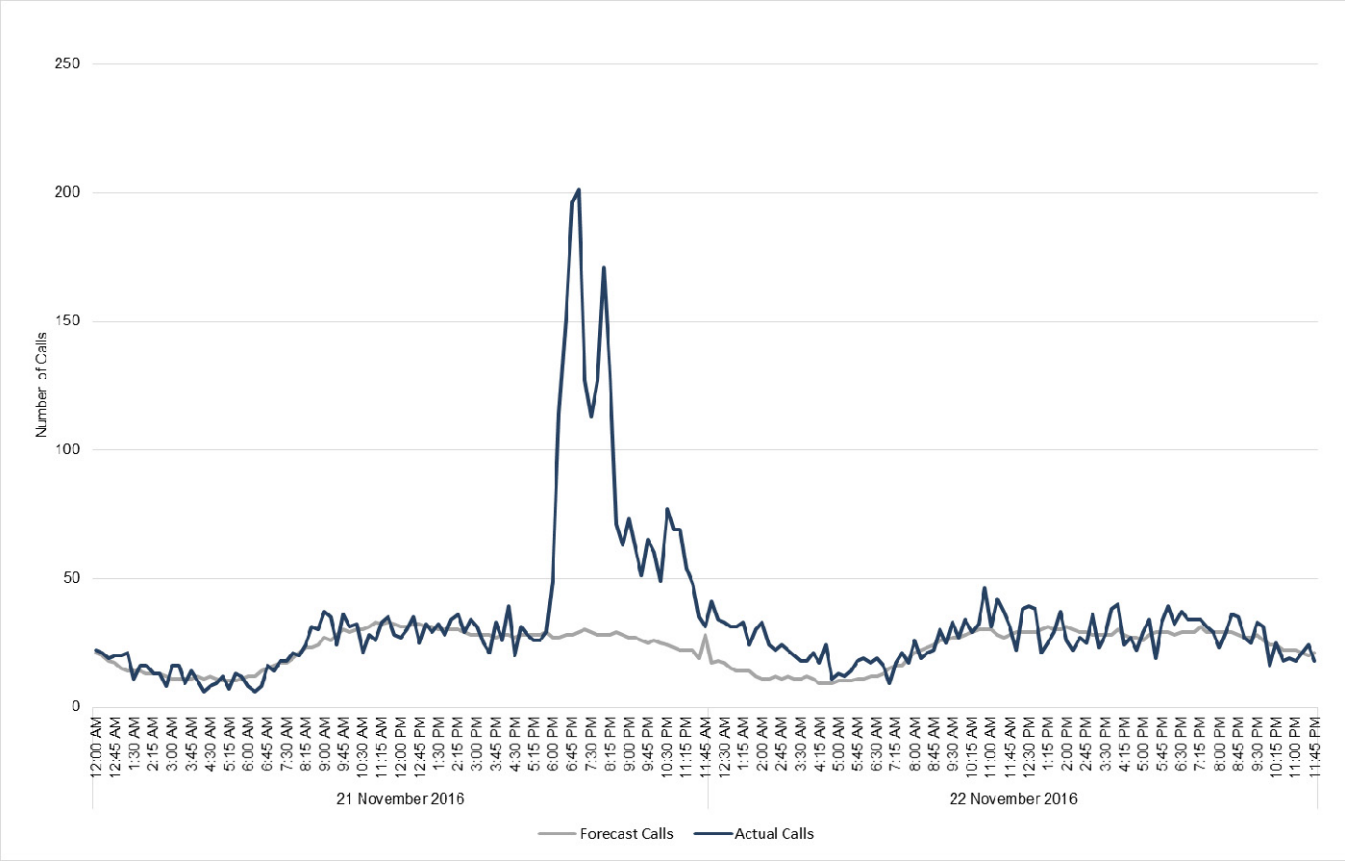
A surge in Triple Zero calls occurred at approximately 6.00pm on 21 November 2016, predominantly for respiratory-related illness and cardiac arrest.

As shown in Figure 8, this surge peaked from 7–7.15pm, during which time Telstra presented to ESTA 201 emergency ambulance calls.

This is an increase of 593 per cent compared to the number of emergency calls that ESTA had forecast (29 calls).

ESTA rapidly responded to the surge by increasing its ambulance call-taking resources by 28 per cent during the first hour of the surge (6–7.00pm). This increased to 94 per cent by the second hour (7–8.00pm).

Figure 8: Triple Zero (000) emergency ambulance calls presented to ESTA for 21–22 November 2016



ESTA continued to maintain its ambulance call-taker numbers well above its scheduled numbers until 1.00am on the morning of 22 November.

This resource supplementation was achieved through overtime arrangements for day shift staff, reallocating resources based on need, recalling staff from breaks, postponing breaks, and team leaders engaging in ambulance call-taking and dispatch duties.

As the number of emergency calls increased, ambulance resources became increasingly stretched and were unable to immediately attend most new cases. ESTA and AV continued to review and reprioritise resources to ensure that ambulances were dispatched to the highest priority cases with minimal delay.

The list of emergency ambulance cases pending dispatch peaked at approximately 8.00pm, with over 150 cases. Almost 100 of these cases required urgent paramedic and hospital care (Code 1 cases[e]). By 9.30pm, the number of pending cases had reduced to 40, with no Code 1 cases pending.

At that point, AV decided no further escalation of resources was required and routine arrangements were sufficient to manage remaining cases.

Overall, AV had 2036 cases on 21 November, with 1268 of these being Code 1.

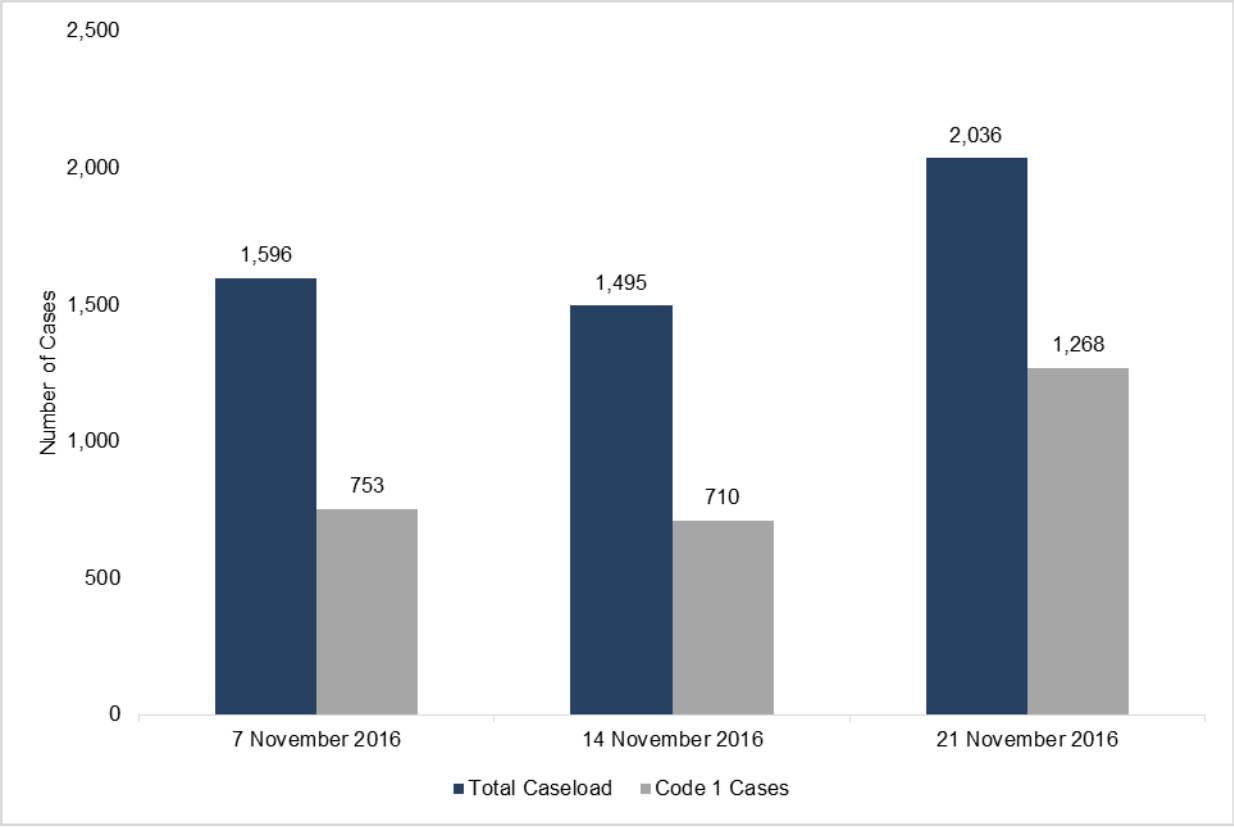
[e] *Code 1 emergency ambulance cases are those that require a 'lights and sirens' response.*

Figure 9 shows the caseload figures for 21 November and the two preceding Mondays in November 2016.

On 21 November there were:

- increases in total number of ambulance emergency cases of 27.5 per cent and 36.2 per cent compared to 7 November and 14 November 2016, respectively
- increases in Code 1 cases of 68.4 per cent and 78.6 per cent compared to 7 November and 14 November 2016, respectively.

Figure 9: Ambulance Victoria caseloads for 7 November, 14 November and 21 November 2016



In order to continue serving the community under such significant demand pressures, AV deployed additional resources and sought assistance from partner agencies.

Table 2 summarises the number of additional resources AV deployed on 21 November in response to the thunderstorm asthma event, based on evidence to date.

Table 2: Additional resources deployed by Ambulance Victoria on 21 November 2016

TYPE OF RESOURCE	DETAILS
Ambulance Victoria	79 additional resources deployed comprised of: • 74 additional advanced life support paramedics • 5 additional Mobile Intensive Care Ambulance (MICA) units.
Ambulance Victoria non-emergency contractors	17 additional non-emergency resources deployed comprised of: • 1 St John Ambulance resource • 6 Royal Flying Doctor Service resources • 5 Health Select resources • 4 Paramedic Services Victoria resources • 1 Wilson Medic One resource
Field Emergency Medical Officers (FEMOs)	5 metropolitan FEMOs provided medical support to AV

Both the MFB and VicPol provided support to AV outside usual response criteria but within scope of training, under arrangements agreed to during the evening of 21 November[f].

MFB attended 11 Code 1 cases in addition to its normal responses under the Emergency Medical Response (EMR) program.

VicPol attended 17 cases related to people suffering shortness of breath, with breathing or asthma related symptoms. Officers primarily performed welfare checks, which resulted in transporting one patient to hospital.

During the surge on 21 November, AV transported 381 patients to public hospitals and 25 patients to private hospitals.

According to DHHS, ambulance arrivals typically make up around 24 per cent of emergency department attendances.

While arrivals to emergency departments during 21 November were significantly increased in overall volume, the proportion of arrivals by ambulance remained at approximately one quarter of all arrivals as shown in Figure 10.

To manage the surge in demand, public hospitals undertook a number of activities, such as:

- arranging for additional staff
- clearing of and making available any beds
- rapid decanting of emergency department patients awaiting admission to ward areas
- creating additional triage and treatment spaces
- establishing respiratory/asthma assessment and management clinics.

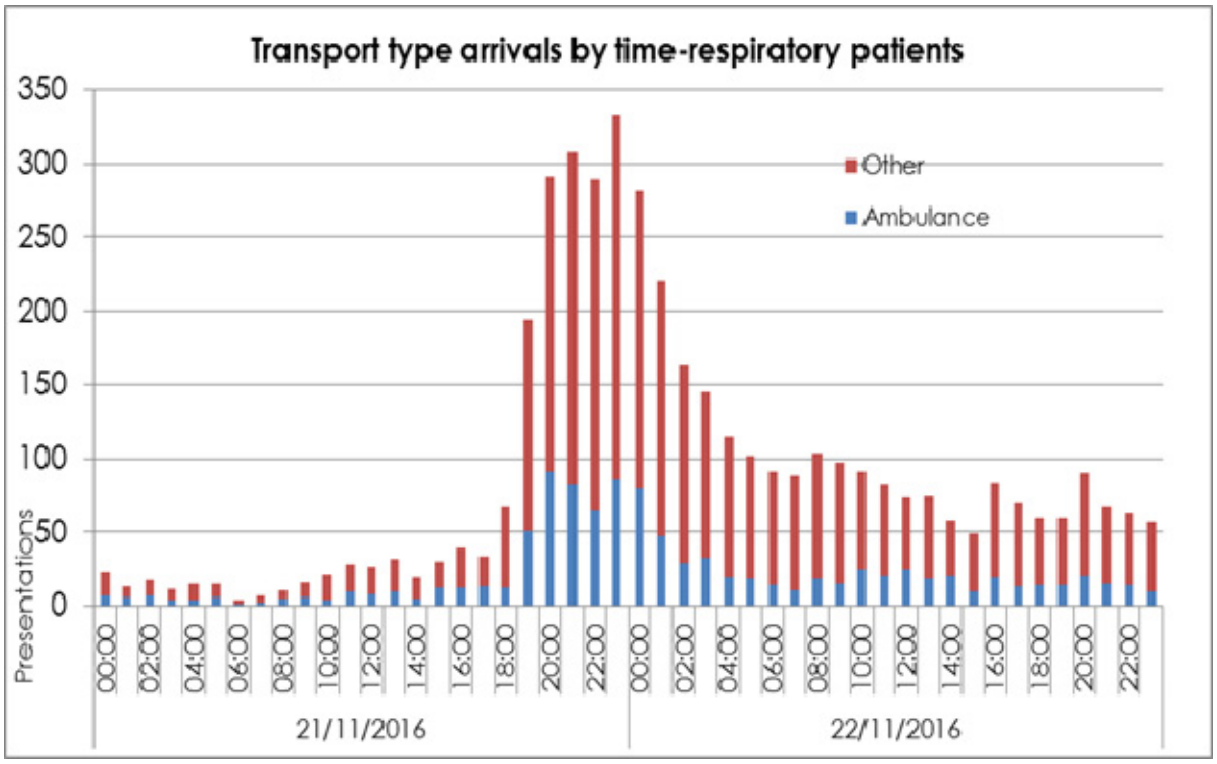
There were varied levels of communications between DHHS and hospitals on the evening of 21 November.

As part of its business-as-usual function, DHHS utilised its existing relationships with health services to directly contact hospital Chief Executive Officers to gather information and improve situational awareness.

DHHS communicated with individuals from hospitals through mobile text messages, phones calls and emails, rather than broader scale communication methods to multiple hospitals simultaneously.

As such, comprehensive broadcasts were not made to hospitals on 21 November to inform them of the surge in people requiring medical attention relating to the thunderstorm asthma event.

Figure 10: Transport type arrivals at emergency departments (Source: DHHS)



f *Metropolitan Fire Brigades Act 1958* Section 7AA Duty to assist in major emergency (1) In addition to any other of its duties and function under this Act, the Board must assist in the response to any major emergency occurring within Victoria

IGEM understands that there was strong communication between DHHS and the hospitals in the northern and western parts of metropolitan Melbourne. However, engagement with hospitals was more limited in the south and east.

There was also inconsistency in the level of information provided by hospitals to DHHS, due to the differences in communication methods.

This highlights the need to explore methods for establishing rapid, consistent, accurate, and comprehensive information and intelligence sharing between hospitals and DHHS, and between DHHS and the broader emergency management sector, particularly during rapid onset, time critical health emergencies.

IGEM recently received more comprehensive data on the total number of presentations at hospitals as well as further information on how hospitals responded to the event.

This will be included in IGEM's final report, which will explore these matters further.

Management and decision-making during the evening of 21 November 2016

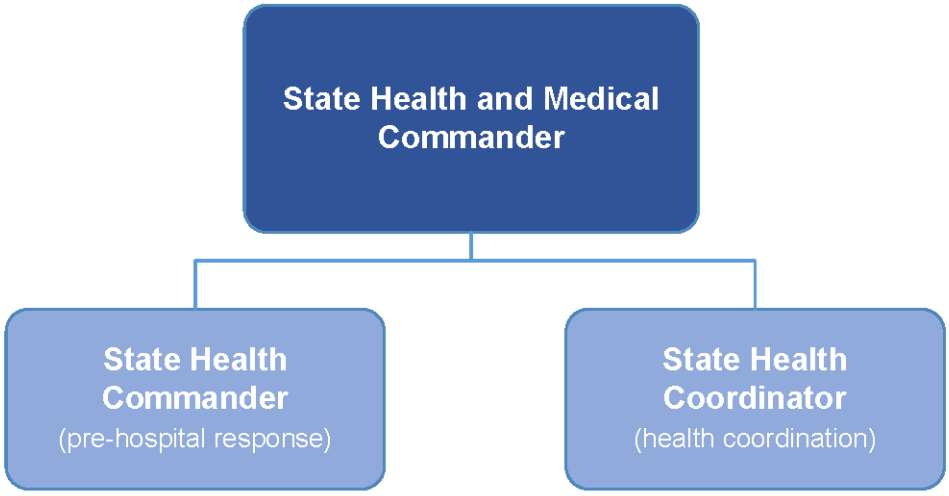
Under state health emergency arrangements, DHHS and AV worked to manage the event on 21 November 2016.

DHHS was responsible for ensuring that the health system continued to operate as effectively as possible under the demand pressure while AV's key responsibility was responding to members of the public seeking pre-hospital medical assistance.

The key decision-makers on the evening of 21 November were the State Health and Medical Commander (DHHS), State Health Coordinator (DHHS) and the State Health Commander (AV) as shown in Figure 11.

IGEM notes that the roles of the State Health and Medical Commander and the State Health Coordinator were undertaken by one person. DHHS advised that since 31 December 2015 the roles have been assigned to one person.

Figure 11: State Health Incident Management Team roles on 21 November 2016



Management and decision-making between DHHS and AV on the evening of 21 November occurred remotely through telecommunications and emails.

Table 3 (page 26) provides a summary of the key management actions undertaken by DHHS and AV to manage the thunderstorm asthma event on the evening of 21 November.

Based on evidence collected by IGEM to date, AV's State Health Commander concluded their role for the night at 12.22am on 22 November citing that the demand was settling for AV and that the role would resume in the morning.

The State Health and Medical Commander / State Health Coordinator (DHHS), two roles being performed by one individual, continued to monitor the capacity of hospitals until 12.56am on 22 November.

Table 3: Key management actions undertaken during the thunderstorm asthma event on 21 November 2016

TIME	ACTION
6.30pm	AV Duty Managers began coordinating the response to address the increase in demand. This included recalling clinicians, referral service staff, communications staff, 27 metropolitan crews, 20 rural crews, extra NETCOM resources*[g], as well as regional directors, and group managers for hospital management.
7.00pm	AV Duty Managers notified the AV Metropolitan Health Commander of over 70 pending cases as available resources had been exhausted. The AV Metropolitan Health Commander subsequently advised the State Health Commander (AV) of the situation and discussed actions that were being undertaken to manage the surge.
7.37pm	AV requested VicPol's assistance to conduct welfare checks.
7.48pm	AV's State Health Commander was advised that the total number of pending cases had increased to in excess of 120 and was requested by AV's Chief Operations Officer to assist with the coordination of the response.
7.51pm	AV's State Health Commander contacted MFB to request assistance above the standard EMR[h] protocols. MFB responded by deploying resources to support the emergency response.
7.54pm	AV's State Health Commander advised the Emergency Management Commissioner of the current situation and how AV was managing the surge in calls, communicated plans to contact the State Health and Medical Commander / State Health Coordinator (DHHS) and communicated plans to contact media through AV's usual process.
8.10pm	AV's State Health Commander contacted the State Health and Medical Commander / State Health Coordinator (DHHS) to provide information on the surge event and requested DHHS inform hospitals to clear ambulance crews quickly to enable them to attend pending cases.
8.20pm	The EMC directed the SCC remain operating beyond the planned 9.00pm closure to provide any required support or action.
8.30pm	AV's State Health Commander contacted the Field Emergency Management Coordinator to request activation of the Field Emergency Medical Officer program to provide additional medical support to AV.
8.33pm	The State Health and Medical Commander / State Health Coordinator (DHHS) contacted the Chief Health Officer to alert him of AV demand issues and actions taken so far.
8.46pm	DHHS sent a group text message to metropolitan hospital Chief Executive Officers (excluding Peninsula Health and Western Health) informing them of the demand surge on AV and seeking their assistance to clear ambulance crews quickly.
8.52pm	DHHS sent a text message (same message as the group text at 8.46pm) to Peninsula Health and Western Health.
9.00pm	The Chief Health Officer and State Health and Medical Commander / State Health Coordinator (DHHS) discussed and agreed not to change advice to the community regarding Triple Zero calls.
9.53pm	The State Health and Medical Commander / State Health Coordinator (DHHS) received health service/public hospital information on the impact of the incident on their hospitals.
10.06pm	The State Health and Medical Commander / State Health Coordinator (DHHS) was contacted by AV's State Health Commander, notifying that demand on AV was settling and was no longer increasing.
10.52pm	DHHS approved the use of private hospital beds, if available, for public patients (at no cost to patients).

g *Non-emergency responses using contracted providers of non-emergency patient transport (NEPT).*

h *The Emergency Medical Response (EMR) program was established to improve the outcome of patients in sudden cardiac arrest. This program allows MFB to respond to Priority 0 cases.*

PRELIMINARY OBSERVATION 3

The Inspector-General for Emergency Management (IGEM) notes the dedication and effort of Emergency Services Telecommunications Authority (ESTA) management, call-takers and dispatchers; Ambulance Victoria (AV) management and paramedics; partner response agencies (including but not limited to the Metropolitan Fire Brigade and Victoria Police); Department of Health and Human Services staff, and all hospitals and hospital staff involved in the initial emergency response to the thunderstorm asthma event on the evening of 21 November 2016.

It is important to note that at the time of the event occurring, there was no formal/approved system for predicting and/or warning that the storms and non-meteorological factors could create a public health emergency. The rapid onset, escalation and scale of the event created unprecedented demand on the pre-hospital and hospital system.

While demand for ESTA, AV and hospitals stretched or exceeded capacity, IGEM commends the commitment and flexibility of the emergency management sector and the health system in responding to the event and minimising adverse impacts on the community.

4.5 Speed of escalation of response level

Decisions to escalate the response level of an event are based on its complexity, including factors such as size (for example, number of patients), resources (for example, field resources needed for patient care and management), or risk (for example, political sensitivities, media interest, location).

At the state tier, the State Health Incident Management Team (S-HIMT) may escalate the response level at which to manage an event.

At the organisational level, AV, ESTA and public hospitals also have internal escalation processes to meet the surge in demand on their services.

Speed of escalation – Emergency Services Telecommunications Authority

On 21 November 2016, ESTA managers and the AV Communications Duty Manager quickly recognised that the surge in Triple Zero calls had the potential to negatively affect service delivery.

Evidence suggests that managers from ESTA and AV worked collaboratively and implemented appropriate surge capacity strategies as soon as a rise in demand was recognised.

ESTA's internal lines of communication, command and control, capacity, and escalation assisted deployment of as many emergency ambulance call-taking and dispatch resources as possible. This helped to address the enormous demand across a relatively short period of time.

ESTA's ability to more than double its emergency ambulance call-taking resources within a short timeframe was linked, to a large degree, with the surge coinciding with ESTA's shift change-over and access to a limited number of multi-skilled operators.

Despite ESTA managers proceeding to complete many of the actions described in its Critical Incident Response Plan (CIRP), including a range of steps to supplement call-taking and dispatch resources, it did not escalate its plan but declared an incident at 7.45pm on 21 November.

Under the CIRP, there is a requirement for ESTA to provide notification to external agencies as per pre-formatted templates and distribution groups. IGEM notes that ESTA did issue some notifications to stakeholders, such as to the Emergency Management Commissioner (EMC) and IGEM, however it did not occur in the manner described in the CIRP.

Additionally, ESTA did not request Telstra to activate a pre-recorded voice announcement for callers to Triple Zero, which is used to manage call volumes during periods of extreme call activity.

Speed of escalation – Ambulance Victoria

At 7.48pm, AV's State Health Commander was advised that the total number of pending cases had increased to over 120 and was requested by AV's Chief Operations Officer to assist with the coordination of the response.

In the evening of 21 November, AV's State Health Commander decided early on to not activate the Ambulance Emergency Operations Centre (AEOC), co-located at the SEMC within DHHS. This decision was based on the timing of the event; elimination of the travel time associated with recalling staff; as well as the availability of AV's information technology systems that enable remote access to AEOC systems.

For the remainder of the evening of 21 November, AV's State Health Commander managed the event remotely.

AV's State Health Commander contacted MFB at 7.51pm to request assistance to respond to selected Code 1 cases that normally fall outside of the agreed EMR protocols. MFB agreed, and deployed EMR resources to respond to 11 Code 1 cases without AV support on the evening.

VicPol further supplemented emergency response by responding to 17 cases related to persons with breathing or asthma related symptoms. This was primarily in the form of welfare checks and transport of one non-critical person to hospital.

AV's State Health Commander advised the EMC of the situation at approximately 8.00pm on 21 November, and conveyed how AV was managing the surge in calls and that AV would provide information to the community.

AV's State Health Commander then immediately notified the State Health and Medical Commander / State Health Coordinator (DHHS) of over 120 pending Priority 1 AV cases, who commenced development of actions for

hospital coordination and triggered the operation of elements of the SHERP.

At 8.30pm, AV's State Health Commander contacted the Field Emergency Management Coordinator to request activation of the FEMO program to provide additional medical support – primarily in-field assessment and triage – to AV.

Support from the FEMO program concluded at around 8.00pm on 22 November 2016.

Throughout the evening of 21 November, AV also deployed staff to assist in a number of hospital emergency departments, allowing the hospitals to better manage the flow and discharge of patients from multiple ambulances.

Similar to ESTA, IGEM notes that AV did not formally activate its internal escalation plan, the Emergency Response Plan (ERP), but took actions over and above the plan to coordinate response.

In addition to its ERP, AV had drafted an escalation plan for its communications staff to use when managing periods when demand outstripped resource availability. Although AV had not yet approved and implemented this into normal business practices, AV senior management agreed to use this plan from approximately 7.00pm to manage the developing surge in demand.

Speed of escalation – state level

The call from AV's State Health Commander to the State Health and Medical Commander / State Health Coordinator (DHHS) at 8.00pm preceded the commencement of DHHS coordination activities at the state level by providing support to the operations of AV and hospitals across metropolitan Melbourne and Geelong. By this time, one hospital had already activated Code Brown.

CODE BROWN

Code Brown plans are internal, self-activated hospital-owned plans based upon Australian Standard (AS) 4083 - 2010 Planning for emergencies – Health care facilities, that are used for external emergencies that may result in an influx of patients. The plans include triggers for escalation and outline the response activities to provide additional capacity and for hospitals to manage a surge in patients. It can also serve as an indicator that a hospital is experiencing high demand and to divert incoming patients to another nearby hospital.

There were varied levels of Code Brown activation across the state on 21 and 22 November 2016. Barwon Health activated its Code Brown plan on 21 November 2016 at approximately 7.00pm and Northern Health activated its Code Brown plan on the morning of 22 November 2016. The Royal Children's Hospital, Northern Health, St Vincent's Hospital, and Austin Health were all on Code Brown stand-by, without formally activating Code Brown. DHHS advised that no private hospitals activated Code Brown plans.

Other public hospitals (Melbourne Health, Western Health, Eastern Health, Alfred Health, Peninsula Health, Mercy Werribee, and Monash Health) escalated their response but did not activate Code Brown.

Hospitals which did not activate Code Brown cited the following factors with respect to not formally activating:

- being aware of the immense pressure that AV and the broader system were under and not wanting ambulances to be diverted to another hospital unnecessarily
- feeling confident that it would be able to manage the increase in demand without activating Code Brown
- not being fully aware of the severity of the event due to lack of identification by internal staff and adequacy of communication from DHHS and AV about the broader system impact.

The variation in Code Brown activation across the hospitals indicates that further consideration could be given to widespread Code Brown activation and the implications of this as part of the revision of the SHERA.

At 8.30pm, the State Health and Medical Commander / State Health Coordinator (DHHS) contacted the Chief Health Officer to alert him of the issues and actions related to the event.

Around this time, the EMC spoke with the State Health and Medical Commander / State Health Coordinator (DHHS) and offered the support of the SCC, and instructed the SCC to remain active on the evening of 21 November.

By 10.00pm on 21 November, AV's State Health Commander informed the State Health and Medical Commander / State Health Coordinator (DHHS) that demand was no longer increasing. However, hospitals continued to manage a significant surge in demand from both ambulance and self-presenting patients.

Overall, on the evening of the 21 November 2016, the State Health and Medical Commander / State Health Coordinator (DHHS), supported by remotely located DHHS personnel in normal business (non-emergency) roles, focused on:

- informing hospitals on the pressures on the health system due to the surge in Code 1 cases
- requesting hospitals to assist in clearing ambulance crews quickly to allow them to attend to pending cases
- ascertaining the demand on and capacity of hospital emergency departments and intensive care units.

In addition to collecting information to understand the demand on the health system, the State Health and Medical Commander / State Health Coordinator (DHHS), supported by relevant DHHS staff, also called upon the assistance of private hospitals to assist with demand overflow from the public hospital system.

This resulted in DHHS approving access to private hospital beds, where available, to public patients at no cost. As there are no formal arrangements to facilitate this type of activity, the change to procedure was authorised informally.

IGEM notes this is a positive outcome which may benefit from more formalised arrangements in future.

In examining whether timely escalation occurred for the response to the thunderstorm asthma event, IGEM relied on the criteria outlined in the relevant state level response plans.

The incident management level required in response to an emergency event is dependent on its complexity. There are three classification levels outlined in the *Public Health Control Plan 2012* as shown in Table 4.

Given its size and complexity and based on the criteria outlined in the *Public Health Control Plan 2012*, IGEM considers that the thunderstorm asthma event was commensurate with that of at least a Level 2 incident, and would have benefited from being resourced accordingly on the evening of 21 November.

IGEM notes that the incident was managed as a Level 2 incident from the morning of 22 November.

Table 4: Incident management classification levels (Source: Public Health Control Plan 2012)

CLASSIFICATION	CRITERIA	MANAGEMENT
Level 1: Small, simple with minimal threat / impact	• Simple incident with minimum complexity • Local Government Area/regional resources sufficient to manage • Generally small in impact/duration • Minimal threat/impact to the community • Managed within normal business operations • Overall risk rating 'minor consequences'	• Management can generally be effectively undertaken by one or two people ensuring all functional elements of incident management are addressed
Level 2: Larger in area, complex, involves multiple agencies and resources, media management is required and moderate – major consequences are possible	• Is more complex in either size, control and/or risk factors • Inter-regional resources and extended operations required • A specific incident management facility will be established • Multi-agency response and coordination • Media management is required • Overall risk rating 'moderate – major consequences'	• A management structure will generally be required with functional delegation of tasks to section leaders • Resources may be required across multiple shifts and an action plan outlining objectives and strategies and resource allocation will be required • Representation on an Emergency Management Team is likely • Liaison officers may be deployed to other emergency service management centres
Level 3: High level of complexity, is long in duration, involves significant resources and agencies and may have major – catastrophic consequences	• High levels of complexity in terms of size, risk factors and/or difficulty to control • Escalating inter-regional resource requirements • Long-term operations • Expanded incident management structure • Numerous agencies will be involved • Threat or impact to the community will be large • High media interest/management • Overall risk rating 'major – catastrophic consequences'	• A full incident management structure will be established with all functional sections delegated • Resources will extend across multiple shift periods with potential for 24 hour operation • An action plan will be required outlining objectives, strategies and resource allocations • Liaison offers will be deployed to other emergency service management centres • Representation on an Emergency Management Team is required

Based on evidence, triggers for escalation including changes to the risk environment (as described within the SHERP) were present on the evening of the 21 November 2016, however key decision-makers on the night were not presented with all the information in a simple, cohesive manner.

Within the system as a whole, the known triggers included:

- the nature and volume of metropolitan emergency ambulance calls to Triple Zero[9]
- multi-agency dispatch requests
- AV's initiation of escalation protocols
- volume of presentations to public hospitals[10]

IGEM notes that although some elements of the SHERP were operating at around 8.00pm on 21 November, state-level management and functional resourcing was commensurate with a simple (Level 1) incident of less complexity.

This was reflected in all incident management functions being undertaken by the State Health and Medical Commander / State Health Coordinator (DHHS) and AV's State Health Commander, as well as the State Health Incident Management Team being operated remotely through telecommunications.

If key decision-makers were in possession of all available intelligence and triggers, escalating the thunderstorm asthma event to a Level 2 incident on the evening of 21 November may have enabled:

- earlier establishment of a management structure commensurate to the scale and complexity of the event
- increased resourcing and functional delegation of tasks to staff
- enhanced information flows and visibility between and within relevant agencies
- earlier consideration regarding management of consequences of the thunderstorm asthma event
- earlier consideration regarding provision of public information and warnings and health advice, to ease demand on the pre-hospital and hospital system
- earlier consideration around leveraging the resources and systems of the SCC

PRELIMINARY OBSERVATION 4

The Inspector-General for Emergency Management notes that agencies were operating in an environment characterised by an extremely rare event, with minimal warning, rapidly escalating impacts and considerable uncertainty. However, limited communication and information sharing within and across agencies prevented a shared understanding of the emerging situation and the potential consequences.

The normal out-of-hours communications processes for the management of routine business were inadequate for managing an effective response to a large scale thunderstorm asthma event. Communications were linear, between two parties only, or email based, rather than group meetings and/or conference calls.

Key personnel working on the response were doing so remotely and the opportunity to rapidly share information, discuss issues, recognise triggers and develop intelligence in order to inform decision-making was not available.

Small pieces of information about the initial impact and consequences of the thunderstorm were known by some of those responding, but were not shared consistently or widely across agencies. There was early speculation by some personnel that the asthma was a consequence of the thunderstorm, however this was not widely disseminated.

As a result, and given a lack of activation of formal incident management arrangements that would have included a situational intelligence function, there was limited capacity to rapidly piece together and share a common operating picture of the developing situation.

[9] *The highest volume of metropolitan emergency ambulance calls to Triple Zero on record over a four-hour period.*

[10] *Subsequently known to be in excess of 9,900 hospital presentations over 21–22 November 2016.*

PRELIMINARY OBSERVATION 5

Emergency Services Telecommunications Authority (ESTA), Ambulance Victoria (AV) and hospitals acted swiftly to put surge capacity strategies in place for their respective operations.

However, the Inspector-General for Emergency Management (IGEM) notes the emergency response plans of ESTA, AV and relevant hospitals were not fully activated. It is also noted that these plans were not designed for this type of scenario, particularly one in which many people were suddenly affected across such a wide geographic area.

IGEM's initial investigation considers that appropriate surge capacity strategies were put in place by AV and ESTA as soon as the surge in demand was recognised.

Despite ESTA taking many actions in accordance with its Critical Incident Response Plan, it did not escalate its plan but declared an incident at 7.45pm on 21 November 2016. Similarly, IGEM notes that AV did not formally escalate but took actions in accordance with, and over-and-above, its Emergency Response Plan.

At approximately 8.00pm on 21 November, elements of the State Health Emergency Response Plan (SHERP) were operating, however state-level management and functional resourcing was only commensurate with a simple incident of less complexity. Notably, one person from Department of Health and Human Services (DHHS) performed the dual role of State Health/Medical Commander and State Health Coordinator, supported by DHHS executives (working in their normal business, non-emergency roles). The State Health Commander (AV) also performed functions in accordance with the SHERP.

Additionally, the co-located DHHS State Emergency Management Centre (SEMC) and Ambulance Emergency Operations Centre (AEOC) were not activated on 21 November 2016, and the event was managed remotely through linear (single point to point) telecommunications.

IGEM notes there was an opportunity for DHHS at the state-level to escalate the emergency response level, activate the SEMC and AEOC, or request to utilise the State Control Centre (SCC).

All these facilities would have supported a coordinated response to the event on the evening of 21 November 2016. Evident triggers, in line with the SHERP, included the volume and nature of Triple Zero (000) calls for ambulance services, multi-agency dispatch requests, AV's initiation of escalation protocols and volume of presentations to public hospitals.

IGEM considers that had the thunderstorm asthma event been protracted, the demand on pre-hospital and hospital response would have become increasingly difficult to sustain. In this regard, a conservative and early escalation of response levels based on available triggers and information should be considered. Response levels, management coordination and control centres can all be scaled down as appropriate.

In identifying opportunities for continuous improvement, IGEM notes that the benefits of earlier activation and escalation of incident management arrangements would have enabled:

- the establishment of an incident management structure commensurate to the scale and complexity of the event
- increased resourcing and functional delegation of tasks to staff on the evening of 21 November 2016
- enhanced information flows and visibility within and between relevant agencies on the evening of 21 November 2016
- earlier consideration regarding the management of consequences
- earlier consideration regarding provision of public information and warnings and health advice, potentially easing demand on the pre-hospital and hospital system
- earlier consideration for leveraging the resources and systems of the SCC.

Notwithstanding this, IGEM notes the efforts of those individuals at the state level managing the significant surge on the pre-hospital and hospital system on the evening of 21 November 2016. As noted previously, this was with limited warning, emergency management structures, resources and systems available to them at the time, especially considering the scale and rapid onset of the event. One positive example of this was DHHS approving the use of private hospital beds, where available, for public patients (at no cost to patients) to assist with demand overflow from the public hospital system.

IGEM encourages further consideration of these factors, and any relevant others as part of the DHHS led review of the State Health Emergency Response Arrangements (SHERA).

4.6 Response on 22 November 2016

As previously outlined, while demand for ambulance services was no longer increasing late in the evening on 21 November 2016 (Figure 12), hospitals continued to manage above average levels of ambulance-borne and self-presenting patients overnight and into 22 November 2016.

IGEM will analyse hospital response in further detail in the final report.

The Ambulance Emergency Operations Centre co-located at the SEMC within DHHS, was activated at 7.00am on 22 November 2016.

AV continued response activities on 22 November. For comparative purposes, AV reported 519 breathing problem cases on 22 November and 565 cases on 21 November[49].

AV developed a Health Incident Action Plan which captured the situation, objectives and response activities for the thunderstorm asthma event. The AV Health Incident Action Plan was circulated to the SCC at 2.41pm.

At 4.30pm, AV's State Health Commander approved the AV situation report which noted that there were no more pending cases at that time. The AV situation report also detailed the additional rostering plans for a potential surge in cases. These rostering plans included additional staff, extended rostered hours, and a list of available paramedics to be recalled if required.

4.7 Formalisation of control and command arrangements on 22 November 2016

Control and command arrangements for the thunderstorm asthma event were formalised on 22 November 2016.

DHHS response and recovery operations of medium to larger-scale emergencies are normally managed from the SEMC.

At approximately 8.00am on 22 November, DHHS activated the SEMC.

To support the functions of the State Health and Medical Commander (DHHS), a leadership group established comprising the Chief Health Officer, Deputy Chief Health Officer, State Health and Medical Commander / State Health Coordinator (DHHS) and AV's State Health Commander.

A functional command structure was then established with specific roles for planning, operations, communications, and logistics functions as shown in Figure 13.

Figure 12: Time sequence of Ambulance Victoria activity on 21 November 2016

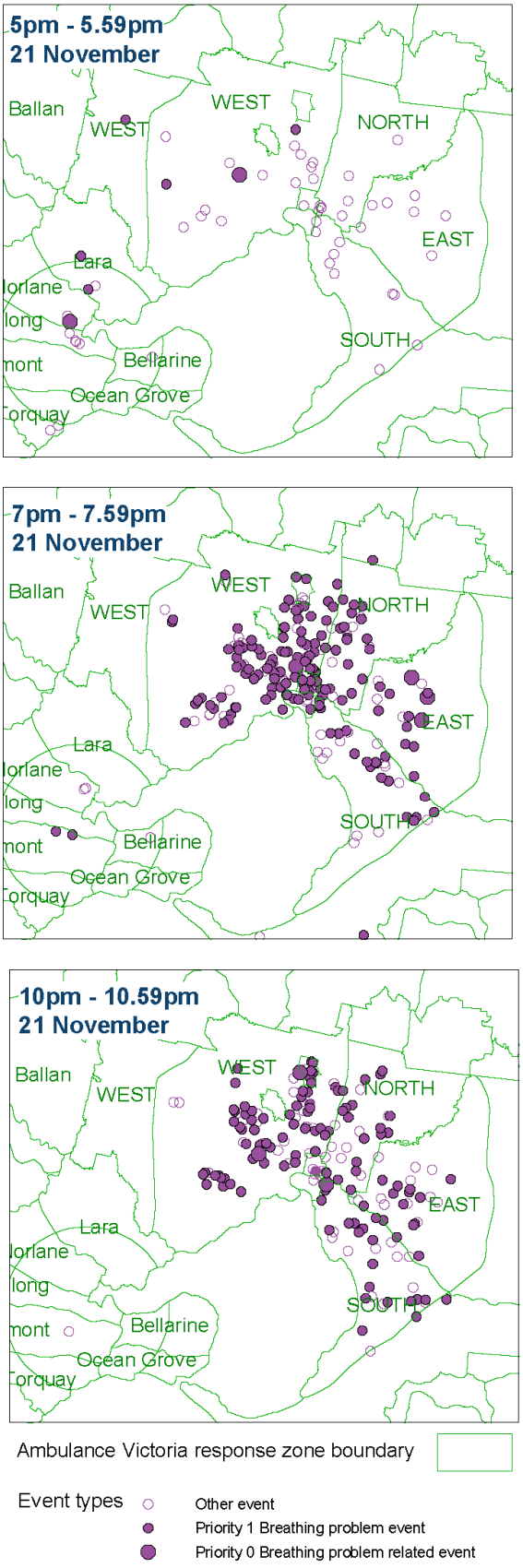
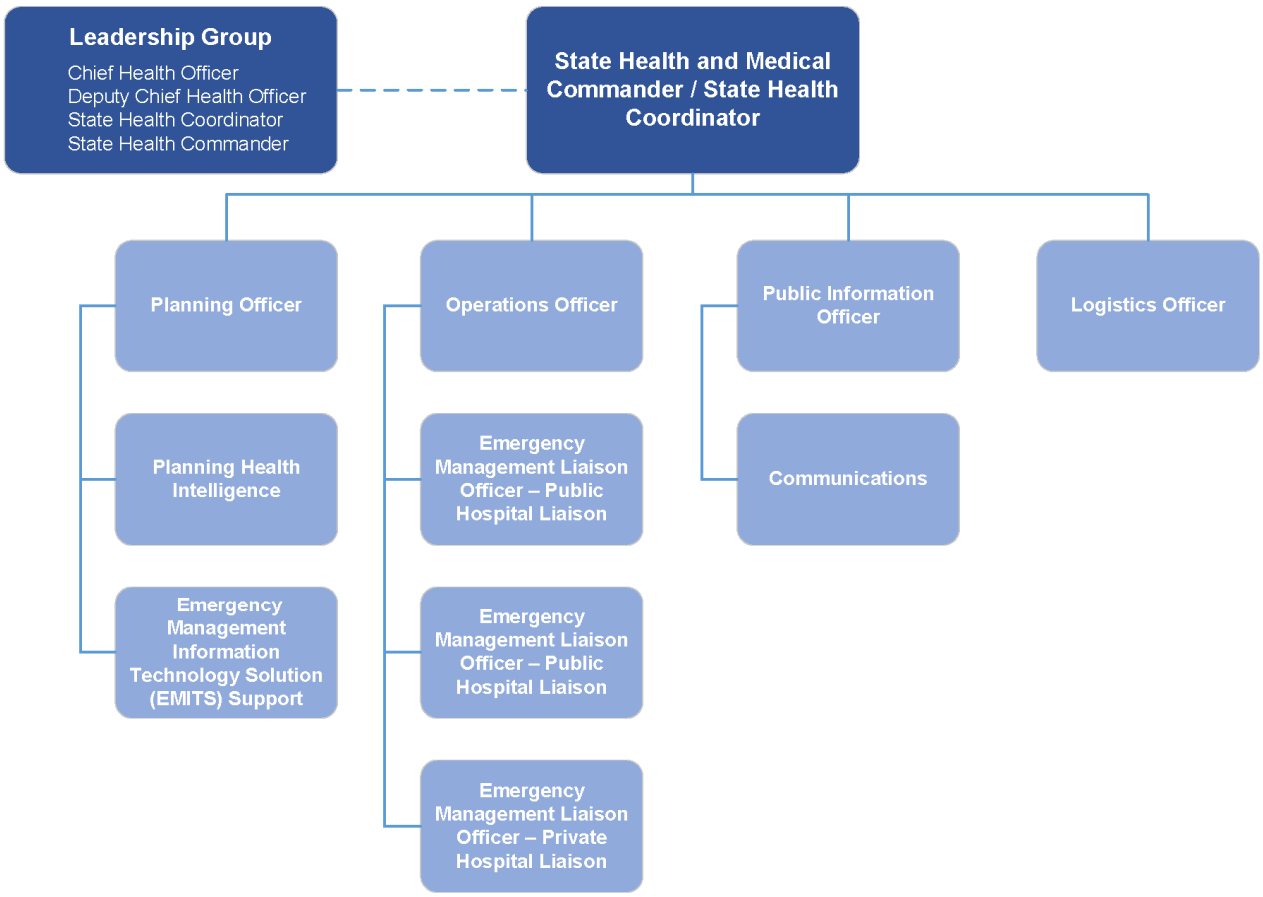


Figure 13: State health operations structure as at 22 November 2016 to manage the thunderstorm asthma event



DHHS played a role in ensuring that improvements were made quickly and mitigation strategies were put in place in relation to the thunderstorm asthma response. DHHS also took the lead in commencing the development of a communications plan.

Relief and recovery activities also began to be considered from 22 November.

At 9.48am, the EMC requested a State Coordination Team (SCoT) meeting following the EMC becoming aware that two deaths had been attributed to thunderstorm asthma, and the potential requirement for ongoing response, consequence management and recovery coordination

Given the awareness of the impacts of this event, the EMC has a legislated responsibility for Coordination, Consequence Management and Recovery Coordination.

The SCoT supports state coordination and the functions of the EMC as necessary. The objective of the SCoT is to set the strategic context of the readiness for, response to, and recovery from major emergencies.

SCoT meetings are chaired by the EMC and include state-tier managers responsible for the coordination, control, consequence management, communications and recovery functions for major emergencies that are anticipated or are occurring.

An outcome of this SCOT meeting was the development of a State Risk and Consequence Plan.

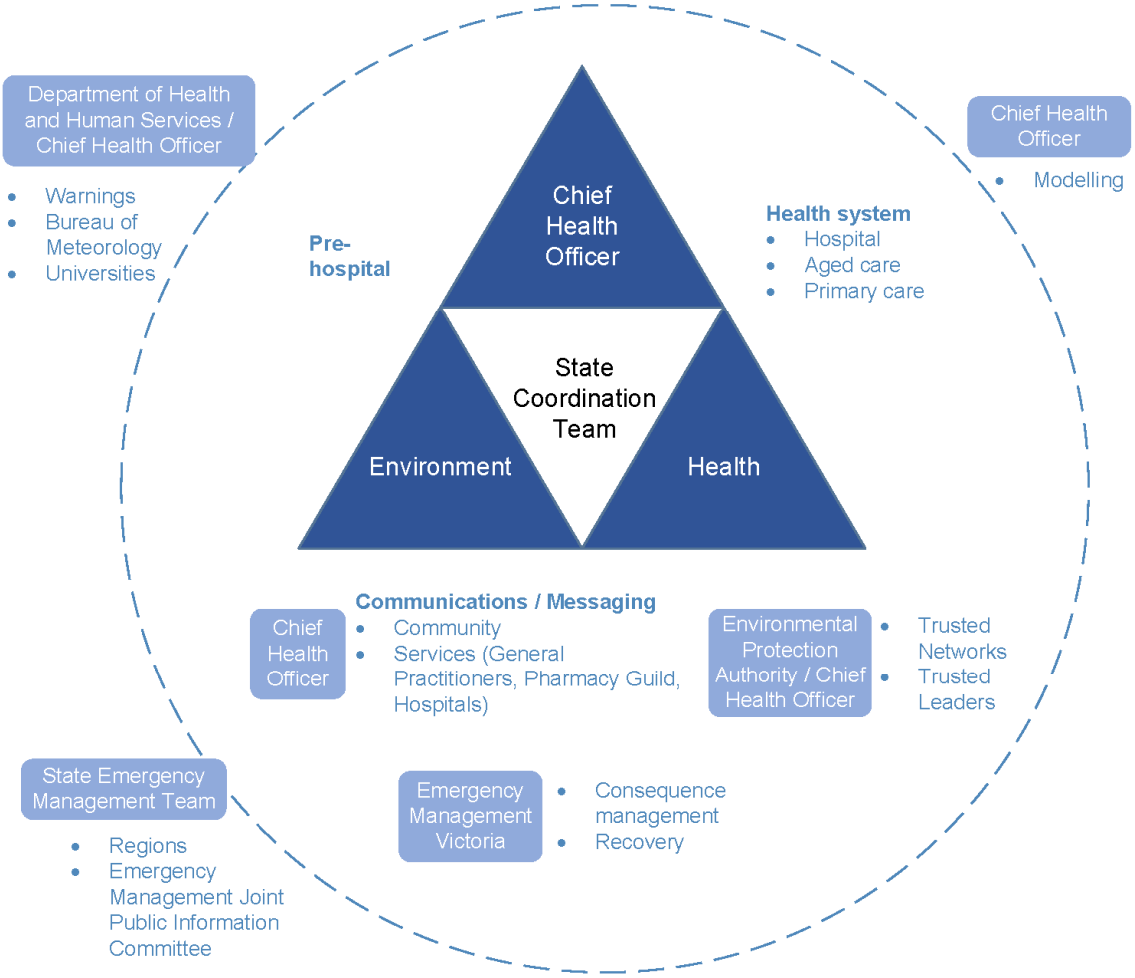
At 11.00am on 22 November, the Chief Health Officer assumed the role of Class 2 State Controller for the thunderstorm asthma event and announced that it was a public health emergency.

At 1.30pm on 22 November, the EMC chaired the SCOT meeting to discuss the health impacts of the thunderstorm asthma event. The purpose of the meeting was to set the strategic context of the readiness for, response to, and recovery from the event.

There was also engagement between the SEMC and SCC on 22 November. This enabled access to resources and expertise from the SCC and EMV.

Figure 14 (page 34) describes the management structure for the thunderstorm asthma event that was established at the SCoT meeting.

Figure 14: Summary of thunderstorm asthma management structure
(Adapted from minutes of the State Coordination Team meeting held on 22 November 2016)



4.8 Consequence management

Consequence management aims to minimise the adverse consequences of an emergency event. It focuses on the level of coordination between the agencies responsible for managing the event to minimise impacts on the community[50]. The EMC is responsible for consequence management of major emergencies[51], including Class 2 emergencies.

There is evidence that some aspects of consequence management were considered during the evening of the 21 November 2016. As noted in the logs provided by DHHS, at 10.00pm on 21 November, the large surge in emergency department presentations had resulted in a shortage of hospital beds in public hospitals. However the information in the DHHS logs was not provided to the EMC by DHHS at that time.

By 10.30pm, the State Health and Medical Commander / State Health Coordinator (DHHS) had managed the issue by obtaining authorisation to use private hospitals beds where available, for public use (at no cost), both in the intensive care and in-patient setting.

Another consequence of the event was the shortfall in medication – such as Ventolin – at health services which started to occur around 10.50pm on 21 November.

At around 8.00am the following day, the State Health and Medical Commander / State Health Coordinator (DHHS) began organising supplementary supplies of medication to be distributed to health services. They confirmed through the Pharmacy Guild that health services and community pharmacies had adequate medication supplies from 11.30am on 22 November.

When the incident was declared a public health emergency at 11.00am on 22 November, the S-HIMT met to discuss consequences and ongoing operations.

Formal and comprehensive consequence management commenced following the SCOT meeting on 22 November. The State Consequence Manager coordinated with DHHS to develop a State Risk and Consequence Plan for the thunderstorm asthma event.

The purpose of the plan was to provide assurance that there is a functional and effective whole-of-government approach in place to manage the consequences of significant risks associated with the current forecasts.

The plan contained a comprehensive consequence management assessment for the thunderstorm asthma event and assigned a 'high' risk rating.

The assessment identified a number of different impacts and their associated consequences relating to the thunderstorm asthma event, such as:

- injured people and fatalities
- poor community understanding of critical health risk/ issues which may delay action
- unsustainable demand on hospital system
- potential loss of community confidence in the health system to manage large scale events
- impact on medical supply chain.

Assigned as the Primary Risk Coordinator, the Chief Health Officer was responsible for facilitating and leading planning and reporting on the program of work to address the risk, outlining the agencies and organisations with lead mitigation responsibilities. The Primary Risk Coordinator was responsible for overseeing the status report on the treatment of each element of risk.

The consequence management assessment outlines a broad range of mitigation actions in place or planned and specifies the organisations responsible for implementing those actions. Furthermore, the assessment assigned a confidence rating for the mitigation actions against the risk of consequence.

Overall, the State Risk and Consequence Plan demonstrates a robust multi-agency approach for consequence management of the thunderstorm asthma event which recognises the risk and complexity of the event. However IGEM notes that had formal control and incident management structures been in place earlier (21 November 2016), mitigation strategies may have been implemented earlier, and some of the impacts associated with the event may have been reduced.

The initial plan was published on 24 November 2016 by Emergency Management Victoria, with subsequent revisions during the following weeks.

PRELIMINARY OBSERVATION 6

The Inspector-General for Emergency Management (IGEM) notes that from 22 November 2016, the state-level incident management structures implemented, coordination and support efforts, and focus on the management of consequences as a result of the thunderstorm asthma event, were appropriate and adequate.

In addition, IGEM notes that development of a formal consequence management plan commenced on 22 November 2016 and was published on 24 November 2016. The plan is comprehensive in assessing risks and consequences resulting from the thunderstorm asthma event and identifies mitigating measures and responsibilities.

4.9 Effectiveness of the Emergency Services Telecommunications Authority's response

The following provides further analysis of the performance of ESTA during the thunderstorm asthma event.

Section 29 of the *Emergency Services Telecommunications Authority Act 2004* provides for the establishment of 'administrative arrangements'. In consultation with emergency service organisations, ESTA created the *Administrative Arrangements pursuant to the Emergency Services Telecommunications Authority Act 2004 (2005)* (Administrative Arrangements).

These arrangements detail:

- how ESTA will provide services
- the responsibilities and accountabilities for delivery of services by ESTA to the emergency service organisations
- the standards determined by the IGEM, pursuant to section 30 of the *Emergency Services Telecommunications Authority Act 2004.*

Call-taking

The performance standard benchmark for metropolitan emergency ambulance speed of call answer is that ESTA answers 90 per cent of calls within five seconds per calendar month. Overall, for the month of November 2016, ESTA met its metropolitan emergency ambulance call answer speed performance benchmark with 92.2 per cent of calls answered within five seconds.

On 21 November 2016, ESTA answered emergency ambulance calls significantly below its target time where it answered only 66.4 per cent of state-wide emergency ambulance calls within five seconds. During the sudden call surge from 6–6.15pm, ESTA's call answer performance reduced by more than 50 per cent. Between 6.15pm and 6.30pm, ESTA did not answer any of the 60 emergency ambulance calls that presented within five seconds.

The longest call wait time for an emergency ambulance connection to ESTA during the thunderstorm asthma event was four minutes and nine seconds at 6.49pm on 21 November. This does not include the time that Telstra may have taken to answer the initial Triple Zero call before attempting to connect it to ESTA.

In some cases, ESTA ambulance call-takers remained on the telephone with Triple Zero callers for longer than 30 minutes, constantly re-assessing the changing condition of patients, and providing callers with first aid advice, including cardiopulmonary resuscitation instructions.

Despite deploying 12 additional call-takers for the hour commencing 8.00pm on 21 November, ESTA would have required 30 additional emergency ambulance call-takers above schedule, in order to have answered 90 per cent of calls within the performance target time for that period.

This demonstrates the large gap in call resource availability compared to the call demand ESTA experienced during the thunderstorm asthma event.

ESTA's emergency ambulance call answer speed performance improved substantially on 22 November when 96.2 per cent of calls were answered within the target time.

ESTA has the capability to employ an 'urgent disconnect' workflow, to shorten the length of time its call-takers spend on the telephone with each caller, allowing them to answer waiting Triple Zero calls.

In February 2016, ESTA advised IGEM it was working with AV to develop the triggers, workflows, and scripts, in order to employ the use of 'urgent disconnect' during surges of calls.

At the time of this event, AV had not approved ESTA to use this option but discussed the possibility of employing 'urgent disconnect' during the call surge of 21 November. However this did not occur due to a lack of workflows, and training for emergency ambulance call-takers to employ this function.

Dispatch

ESTA's metropolitan Code 1 dispatch speed benchmark is that it dispatches 90 per cent of Code 1 (lights and sirens) ambulance cases within 150 seconds per calendar month.

When measuring dispatch performance, measurement begins when ESTA creates a new event in its Computer Aided Dispatch (CAD) system and ends when it either dispatches the first ambulance resource or identifies there is no ambulance available for dispatch within a defined distance. Other measures include holding of emergency ambulance events or referring events to other AV staff for action.

In the three months prior to November 2016, ESTA dispatched 82.3 per cent of Code 1 cases within 150 seconds.

For the month of November 2016, ESTA dispatched 82.6 per cent of metropolitan Code 1 cases within 150 seconds, which was 7.4 per cent below the performance benchmark.

With AV, ESTA has been implementing a range of strategies to improve its compliance against the benchmark.

On 21 November 2016, ESTA dispatched 71.3 per cent of metropolitan Code 1 cases within the performance target time, well below its monthly benchmark of 90 per cent. However performance improved on 22 November, when it dispatched 86.2 per cent of cases within the target time in the metropolitan area, in line with previous months.

ESTA calls this function 'no nearby unit' or nominal dispatch.

ESTA ambulance dispatchers must use the 'no nearby unit' process to 'stop the clock' on performance target measurement and to refer the event to AV communications staff for direction on how AV wants to address this area of resource need.

This process 'stops the clock' on ESTA performance measures as it is outside of its control to meet a performance target time if there are no resources to dispatch.

ESTA emergency ambulance dispatchers did utilise the 'no nearby unit' function on the night of 21 November.

However it is important to note that at 7.30pm, demand for ambulances far exceeded resource availability, with 140 emergency ambulance cases pending dispatch. Consequently, compliance with this process became impractical and AV agreed to ESTA suspending its use. A result of this is that ESTA's reported dispatch performance for the evening of 21 November 2016 will be negatively impacted.

Effectiveness of Ambulance Victoria response

The following provides further analysis of the performance of AV during the thunderstorm asthma event.

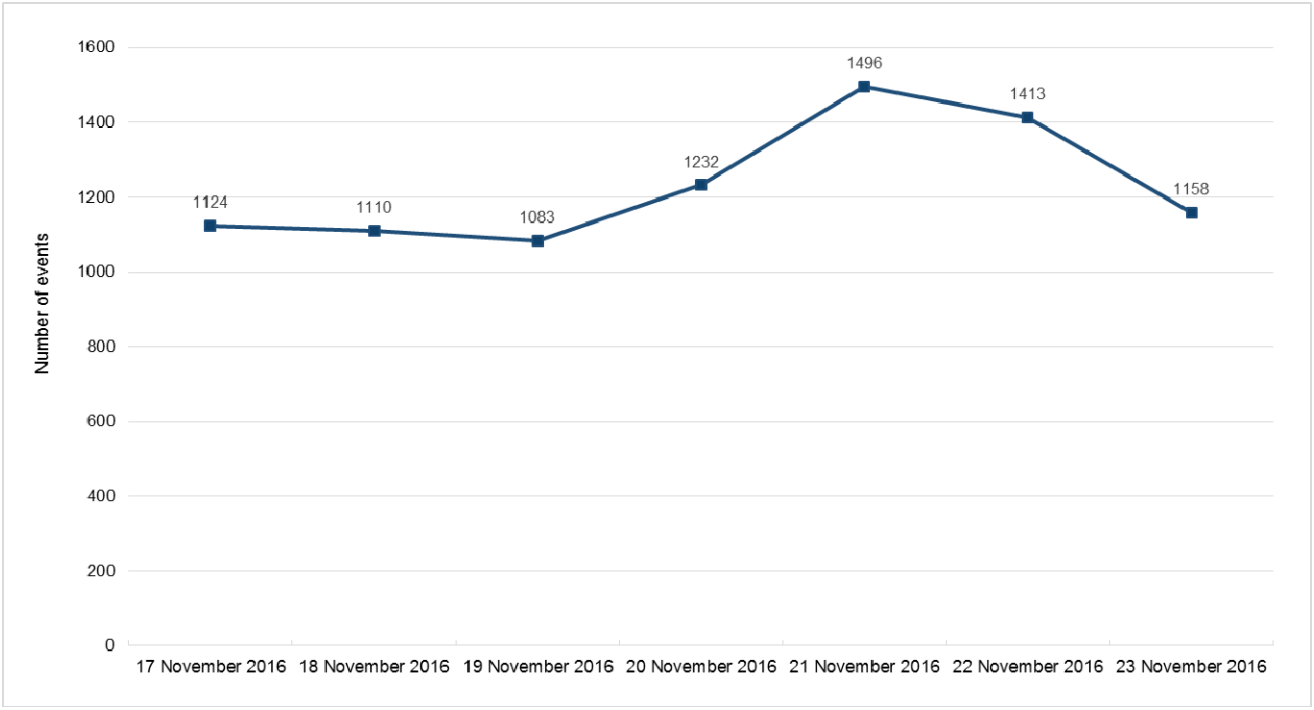
AV has a range of government and internal key performance indicators and targets that IGEM considered in assessing the effectiveness of its response to the thunderstorm asthma event. A number of these indicators and targets relate to timeliness of response.

IGEM found AV's performance against a number of these metrics degraded during the thunderstorm asthma event due to the significant demand on resources. The demand for emergency ambulance resources climbed to over 1400 on 21 November 2016 as shown in Figure 15.

In analysing AV performance metrics, IGEM considered data from the five weeks between 17 October and 20 November 2016 to establish average daily performances for a number of measures. IGEM then used this as a basis for comparison against AV's performances on 21 and 22 November 2016.

IGEM focused on key metrics and data for metropolitan ambulance cases, given the majority of Triple Zero calls to ambulance on 21 and 22 November were for the Melbourne metropolitan area.

Figure 15: Number of metropolitan emergency ambulance cases between 17 and 23 November 2016



AV received significantly more metropolitan ambulance cases on 21 and 22 November, in comparison to daily average numbers of cases received in the preceding five weeks.

On 21 November it received approximately 436 more emergency cases (41.2 per cent) than the average.

On 22 November it received fewer metropolitan emergency cases to attend to than it did on the previous day. However AV received 353 more cases (33.4 per cent) than the average.

With respect to the number of ambulances arriving at Code 1 cases within 15 minutes (performance target of 85 per cent) during the preceding five weeks, AV was five per cent below the performance target time on average.

However, on 21 November, AV only managed to attend 57.1 per cent of Code 1 cases within 15 minutes, due to the unprecedented demand. This improved to 70.6 per cent on 22 November.

AV achieved an average time at hospital of 54 minutes and 42 seconds between 21 and 22 November 2016.

Compared to the preceding five weeks, ambulance resources spent an average of only two minutes and 24 seconds longer at hospitals during the thunderstorm asthma event.

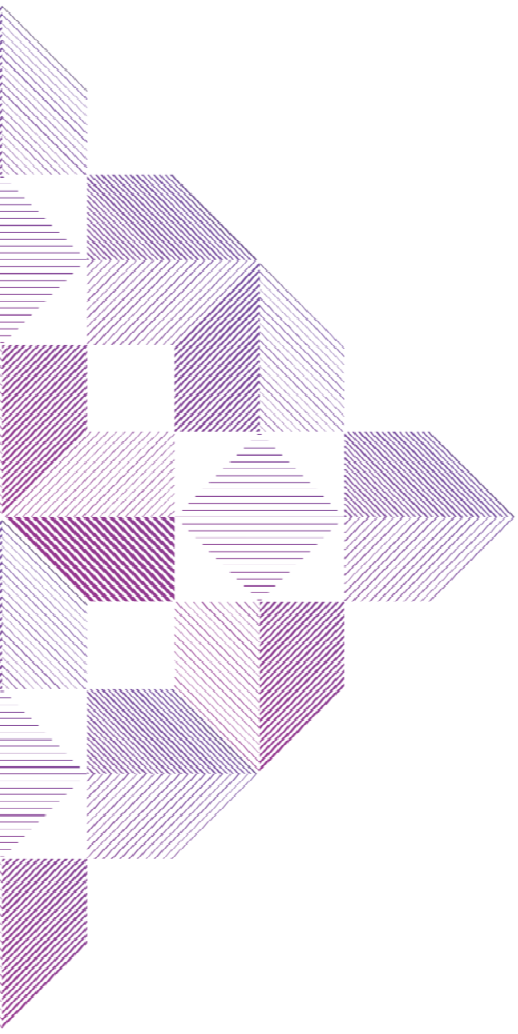
PRELIMINARY OBSERVATION 7

The Inspector-General for Emergency Management (IGEM) recognises that Emergency Services Telecommunications Authority (ESTA) and Ambulance Victoria (AV) were under enormous pressure on the evening of 21 November 2016 due to the unanticipated and unprecedented surge in demand for emergency ambulances.

IGEM notes that once a rise in demand was recognised, ESTA and AV both significantly increased resource availability to address the surge. However, as the demand was not anticipated, and due to the sheer volume of calls and events, the performances of ESTA and AV fell short of some performance target times.

IGEM notes that ESTA and AV are currently working towards a procedure for ambulance call-takers to implement an ‘urgent disconnect’ function during periods of high demand to enable greater volumes of calls to be answered, by shortening call duration.

5 Knowledge and information



Information, warnings and health advice that is prepared and provided to communities before, during and after emergencies enable people to make informed decisions and take appropriate action.

Generally, the trigger to issue a warning is when the control agency identifies a threat or risk to person, property, environment and/or infrastructure and decides that emergency information or a warning (possibly both) needs to be issued to the community and other agencies.

As thunderstorm asthma is not well understood, lack of knowledge and uncertainty created an additional challenge in the provision of warnings, information and health advice in response to the event on 21 November 2016.

5.1 Methods for issuing public information and warnings

Warnings should be timely, tailored and relevant, allowing community members to make informed decisions based on the available information.

A variety of methods exist for the issuing of public information and warnings in Victoria. These include:

- warnings issued through the Emergency Management Common Operating Picture (EM-COP) to the VicEmergency App and website, social media channels, email, and media outlets
- media conferences
- media releases
- health alerts
- social media, websites and email distribution
- community information hotlines, such as NURSE-ON-CALL and VicEmergency Hotline
- emergency broadcasters (based on formal arrangements between the Victorian Government and media outlets)
- Emergency Alert phone messaging
- spokesperson interviews across print, electronic and digital media
- face-to-face contact such as doorknocks
- trusted local networks and leaders who can distribute information within communities.

Launched on 8 November 2016, EM-COP is the primary common platform for issuing warnings and activating community alerting sirens.

EM-COP has pre-prepared templates available for a range of emergency types – such as fire, flood and storm events.

Health advice, in the form of generalised smoke warning messages, has been incorporated into the fire and HAZMAT (Hazardous Materials) templates.

Also launched in November 2016, the VicEmergency Hotline, provides a single point of contact for community access to information in an emergency.

This hotline brings together three previously separate emergency hotlines:

- Victorian Bushfire Information Line
- Victorian Relief and Recovery Information Line
- VICSES Flood and Storm Information Line.

5.2 Legislation governing the provision of emergency information

A range of legislation governs the provision of emergency information to the Victorian community.

- The *Emergency Management Act 2013* requires the Emergency Management Commissioner to ensure the community is both informed or warned about fires in order to protect life and property (s42(1)(2)).

  Section 55 of this Act requires agencies with a role and responsibility to comply with the SERP. The SERP specifies the State Emergency Response Priorities that include the issuing of information and warnings.

  DHHS is required to deliver information and health advice as part of an emergency response in accordance with the roles, responsibilities and protocols detailed in the SERP, the Victorian Warning Protocol and other relevant policies and guidance documents.

- The *Public Health and Wellbeing Act 2008* has general requirements on those administering this Act to provide the public with information to help facilitate an understanding of public health issues (s.8(2)(a)). In addition, the DHHS Secretary must promote awareness for health and wellbeing issues to the community (s.17(a)).

  IGEM notes there is no specified legislative requirement in this Act on DHHS officers or the DHHS Secretary to provide the community with any information during an emergency.

  This Act also describes the functions and powers of the CHO (s.21(a)-(d)) however none of these relate specifically to the provision of information before, during or after emergencies. It does require the development of strategies to promote and protect public health and wellbeing (s.21(a)).

  DHHS delivers health advice as part of an emergency response in accordance with the roles, responsibilities and protocols detailed in the SERP, the Victorian Warning Protocol and other relevant policies and guidance documents.

  DHHS provides advice to Victoria through the Better Health Channel, NURSE-ON-CALL, social media, health alerts and media through programs such as the heatwave strategy, prevention programs and in response to many health, medical or environmental conditions.

- The *Meteorology Act 1955 (Commonwealth)* details the functions of the Bureau of Meteorology to issue warnings and information relating to meteorological conditions (s.6(c) to (g)). This includes gales, storms and other conditions likely to endanger life or property or weather conditions likely to lead to floods or bushfires.

- BoM – the federally-funded national meteorological and hydrological agency that provides forecasts and weather warnings to community members through various channels, such as its public website (bom.gov.au), and to the emergency management sector through a variety of methods, such as briefings, individual weather intelligence products and email notifications.

- The Environment Protection Authority Victoria (EPA) has responsibility for the state of the environment, including air quality measurement and management.

  The relevant policies for air quality sit beneath the *Environmental Protection Act 1970*. Under the State Environment Protection Policy the EPA is required to inform the community on air quality issues – including timely and accessible air quality forecasts (s.14(1)(2)(a)(e)(h) and (j)).

  Further, the EPA must establish and operate an air quality forecasting system, with scientifically derived alert levels.

  The elevated amounts of fine airborne (PM10) particles detected in the early evening on 21 November 2016 were monitored and reported in accordance with this obligation.

  There are no requirements in the environment protection legislation and subordinate policies relating specifically to emergencies. However, there are clearly times when the level of pollution measured can arise from an emergency situation or can become an emergency in itself.

5.3 Protocols and plans

The obligations on emergency management organisations, derived from the legislation, are implemented through the following protocols and plans:

- State Emergency Management Priorities
- Incident Command Systems such as the Australasian Inter-service Incident Management System (AIIMS)
- Victorian Warning Protocol
- State Emergency Response Plan (SERP)
- State Health Emergency Response Plan (SHERP)
- Public Health Control Plan 2012

Table 5 provides a summary of the key roles and their functions during emergency response regarding provision of public information, warnings and health alerts.

Table 5: Key roles and functions during emergency response (public information, warnings and health alerts)
(Source: SERP and JSOP J03.14)

ROLE	AGENCY	FUNCTIONS
Emergency Management Commissioner (EMC)		• Ensure warnings are issued and information is provided to the community in relation to fires in Victoria for the purposes of protecting life and property. • Lead the development of a state media/communications strategy for major emergencies, including the development of key messages to targeted segments of the community • Ensure the coordination, collection, collation and reporting of incident data and impact assessment processes as required.
Chief Health Officer (Class 2 Controller)	DHHS	• One of the principal responsibilities of the Chief Health Officer (CHO), as outlined in the Public Health Control Plan 2012, is focussed around strategies to provide community information and community warnings if required. • The role also has a focus on ensuring timely information and warnings are provided to the community and support agencies.
Incident Controller (IC)	DHHS	• Management of media by ensuring the timely issue of warnings and information to the community or refer these to the Regional Controller (RC), where appointed, or where the RC has not been appointed, the State Response Controller (SRC) or Class 2 state controller • The IC ensures the timely flow of information to the: ▪ RC (if appointed) or the SRC or Class 2 state controller ▪ control and support agencies ▪ Municipal Emergency Response Coordinator ▪ Incident Emergency Management Team ▪ Municipal Recovery Manager
Public Information Officers (PIO)	DHHS	• Responsible for the provision of warnings, information, and advice to the public, and liaison with the media and affected communities.
State Health Coordinator and State Health Commander	DHHS & AV	• When the SHERP arrangements have been activated and the health roles are in place, the State Health Coordinator (DHHS) and State Health Commander (AV) have the role of providing information on health and medical issues to the State Health and Medical Commander (DHHS) and the CHO
State Controller (SC)	DHHS	• Issue warnings and information to the community in relation to the Class 2 emergency, if regional or incident tier controllers are unable to do so in a timely manner

PRELIMINARY OBSERVATION 8

The obligations, roles and responsibilities for the emergency management sector to issue public information, emergency warnings and health advice – before, during and after an emergency are described in a range of legislation, policy, guidelines and procedural documents.

The Inspector-General for Emergency Management notes a lack of clarity and consistency relating to some of the designated roles and responsibilities in this documentation.

During periods other than emergencies, public information, warnings and health advice are issued in accordance with agency/departmental procedures.

During periods of emergency, the activation of incident management arrangements triggers the appointment of individuals to operational roles who are then charged with the responsibility for issuing public information, emergency warnings and health advice to inform the community, allowing them to make decisions and take appropriate action.

5.4 Public information, warnings and health advice issued for thunderstorm asthma

21 November 2016

This section focuses on the public information and warnings and health alerts issued on 21 and 22 November 2016. The overview commences with the storm warning issued by BOM prior to and during the incident, followed by various media messages coordinated by AV and DHHS during this period.

Bureau of Meteorology

As outlined previously, BOM is a federally-funded weather forecasting and meteorological agency which provides public forecasts and weather warnings to communities as well as intelligence via various methods to the emergency management sector.

BoM noted that thunderstorms are difficult to predict precisely in terms of location and timing. However, once thunderstorms have formed BoM can more accurately track and provide warnings of possible consequences.

The following warnings were provided by the BOM on 21 November:

- **1.58pm** – Severe Thunderstorm Warning (damaging winds, heavy rainfall and large hailstones) – Mallee, South West, Wimmera and parts of the Northern Country forecast districts
- **4.00pm** – Severe Thunderstorm Warning (damaging winds, heavy rainfall and large hailstones) – Central, Mallee, Northern Country, North Central, Wimmera and parts of the South West forecast districts
- **5.13pm** – Severe Thunderstorm Warning – Melbourne Area (damaging winds, heavy rainfall and large hailstones) – Port Phillip, Inner, Western, Geelong and Bellarine Peninsula and parts of the Inner East, Mornington Peninsula, South East and Northern local warnings areas
- **5.19pm** – Severe Thunderstorm Warning – Melbourne Area (damaging winds, heavy rainfall and large hailstones) – Port Phillip, Inner, Northern, Western, Geelong and Bellarine Peninsula and parts of the Inner East, Mornington Peninsula and South East local warning areas
- **6.00pm** – Severe Thunderstorm Warning – Melbourne Area – (damaging winds, heavy rainfall and large hailstones) – Port Phillip, Western Port, Inner East, Mornington Peninsula, Inner, South East, Northern, Western and parts of the Outer East and Geelong and Bellarine Peninsula local warnings areas
- **6.42pm** – Severe Thunderstorm Warning– (damaging winds, heavy rainfall and large hailstones – Northern Country, North East, West and South Gippsland and parts of the Central, East Gippsland, Mallee and North Central forecast districts. Included cancellation for South West and Wimmera district
- **6.43pm** – Cancellation of Severe Thunderstorm Warning – Melbourne Area

Ambulance Victoria

As the incident unfolded on 21 November 2016, AV was coordinating resources to meet escalating public demand for assistance. During the evening, AV provided some public information through social media and other news outlets.

As AV is not a control agency, it did not have access to its own emergency warnings infrastructure and the emergency broadcaster network, however it could have used the SCC to issue public information and warnings.

AV issued two tweets on the evening of 21 November. The first occurred at 8.40pm and the second at 10.08pm. The first was retweeted 51 times and reached a combined audience of 283,481 people including the Minister for Health and the Minister for Ambulance Services, the EMC and a range of journalists and news organisations.

The first tweet read as follows:

'*We have seen a rise in breathing probs tonight following the weather. Follow your asthma plan or see here for advice ow.ly/R9x306mSKw*'

The second tweet was seen by 20,600 people and retweeted 35 times. This message was more directive and read as follows:

'High demand for ambulance for breathing issues due to weather. Only call 000 in an emergency and consider other options for minor complaints'

AV's Director Emergency Management, who undertook the role of State Health Commander on 21 November, spoke to a number of news agencies on the evening of 21 November including the Herald Sun, The Age and the Australian Associated Press (a news service that has links across major metropolitan newspapers, radio and television). This resulted in the following online news stories:

- an article on the Australian Associated Press site at 10.45pm
- an online article published by Herald Sun at 11.09pm

There were also a number of attempts made by AV's media unit to obtain interviews with broadcast media outlets on 21 November. However some broadcasters did not wish to interrupt scheduled broadcasting arrangements.

There was uncertainty during the initial escalation period around the cause of the event, and a lack of clarity around responsibilities for public messaging, in particular issuing messages with health advice.

PRELIMINARY OBSERVATION 9

The Inspector-General for Emergency Management (IGEM) commends the efforts that Ambulance Victoria (AV) made to issue information to the community in response to the significant demand being made on their resources on 21 November 2016.

This is especially noteworthy given AV is not a control agency for any emergency, regardless of classification or nature. Nor does AV have immediate access to the platforms and networks that would have been available to a designated control agency responding to a Class 1 emergency through the State Control Centre (such as fire, flood, storm, earthquake, and tsunami).

Further, IGEM notes that as formal (Class 2 emergency) incident management arrangements were not put in place on the evening of 21 November 2016, this hampered the overall response to the event including the timely development and distribution of appropriate messaging to the community.

Accordingly, IGEM considers that there are inconsistencies with the development and delivery of public information and warnings dependent on the nature of emergency experienced.

22 November 2016

Initial public information message

The Incident Management Team established at 11.00am on 22 November, included the Public Information Officer (PIO) position.

Subsequently, the PIO prepared asthma advice based on the activities stemming from the event of the evening of 21 November.

The message describes the seriousness of asthma related issues, the potential threat of death, signs that are associated with asthma attacks as well as instructions on the actions that one can take in an emergency.

Evidence from DHHS incident logs show that drafting of general asthma key messages took place at approximately 9.22am on 22 November and were approved by the CHO at 10.15am.

These key messages were also sent to the SCC Media and Public Information Unit for inclusion in its key messages.

At 9.34am the PIO made a request for general asthma information to be published on the Better Health Channel and health.vic websites, while general asthma information was to be posted through social media.

Chief Health Officer alert

At 10.25am on 22 November discussions were held regarding the necessity of a CHO alert, as it was believed that the incident might be easing.

Discussions from the previous evening between AV's State Heath Commander and AV's Chief Operations Officer also noted that the workload was slowing and under control. The decision to issue a CHO alert was ultimately made at the 10.30am CHO briefing.

The CHO alert was completed by 2.14pm and sent to the CHO and the Deputy CHO for approval. The alert was then approved by 3.55pm and sent for publishing.

At 5.10pm the CHO alert was published on health.vic, promoted on the health.vic home page and distributed via email to the relevant subscription list and NURSE-ON-CALL. DHHS' social media channels posted links to the alert.

Ambulance Victoria updates

Following the media activity that AV had initiated the previous evening, AV Executive Director of Emergency Operations (Executive Director) participated in interviews with radio stations 3AW, 774 ABC, Gold FM, ABC national breakfast radio and Nova/Smooth from 7–9.00am on 22 November 2016.

They also held a press conference at 9.00am to provide an update on the thunderstorm asthma event.

Health warnings

An analysis of evidence available from 21–22 November show that AV and DHHS were the only agencies to release information pertaining specifically to the thunderstorm asthma event – both on 22 November after the event had occurred.

An AV press release was provided at 9.00am on 22 November while a DHHS CHO alert was published and shared on social media at 5.10pm, and distributed via email to the DHHS subscription list and NURSE-ON-CALL at approximately 6.10pm.

An incident-specific webpage was drafted at 10.30am, in tandem with the development of the CHO alert. The webpage was not compete until after 22 November 2016.

Nevertheless, information about thunderstorm asthma was provided through the Better Health Channel and health.vic homepages, which updated pre-existing generic asthma advice, and information from the CHO alert was published at approximately 5.59pm.

IGEM has reviewed and assessed multiple documents from DHHS and AV pertaining to the public information warnings and health alerts that were available on the night of the event through to the following evening.

Using this information, it has been possible to recreate a concise timeline of all the relevant communication events that took place over this period.

Some of the key events on the timeline include the timing of the CHO alert, media interviews and AV's tweets through social media (see Figure 16, page 44). The evidence used included:

- media activity reports
- communications logs
- incident management logs
- emails log entries
- operations logs
- situation reports.

It is clear from the evidence gathered that existing arrangements for DHHS warnings did not include thunderstorm asthma events, only generic asthma advice.

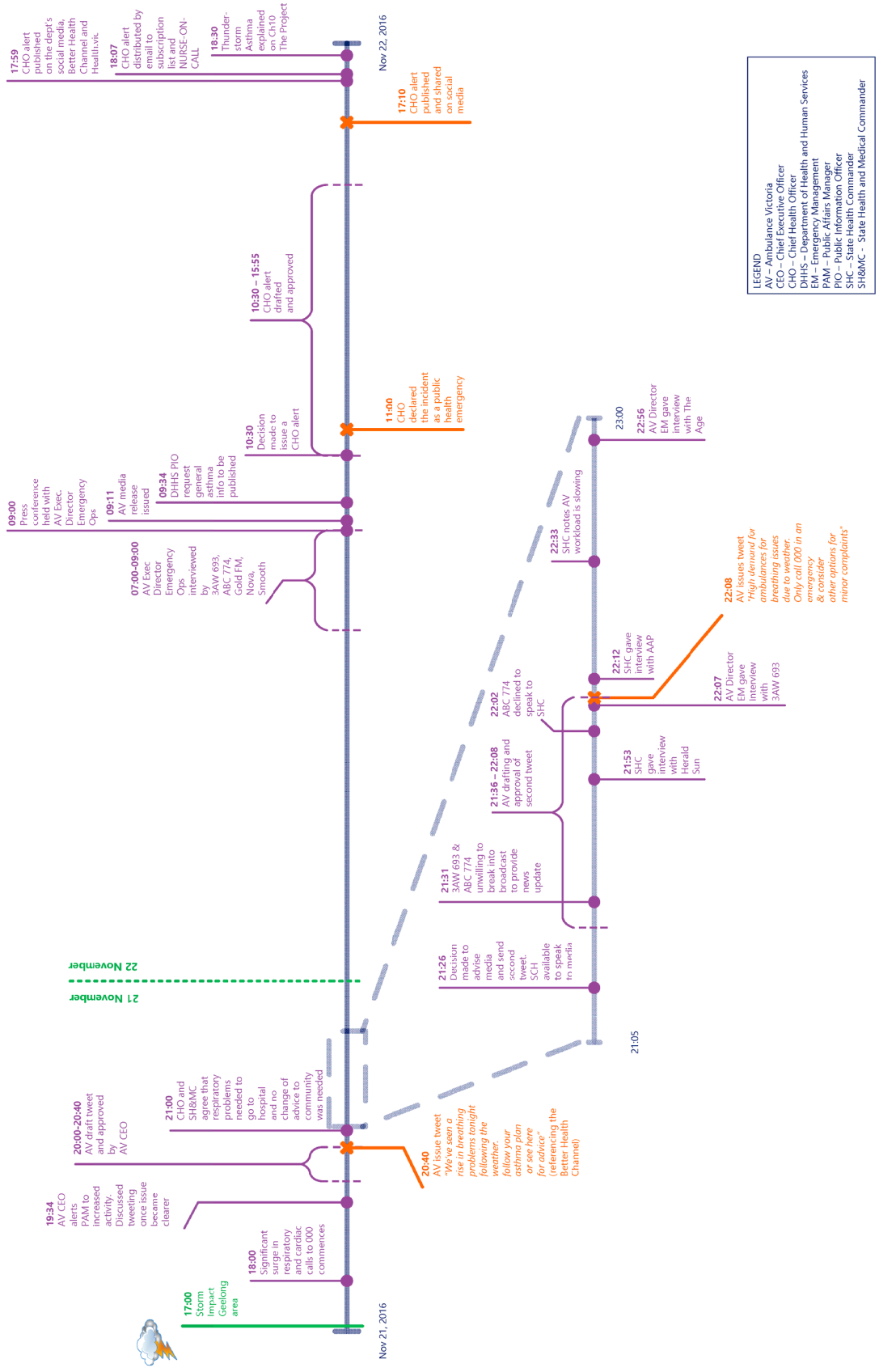
PRELIMINARY OBSERVATION 10

The Inspector-General for Emergency Management (IGEM) notes that little public information, emergency warnings or health advice were issued on 21 November 2016 during the thunderstorm asthma event.

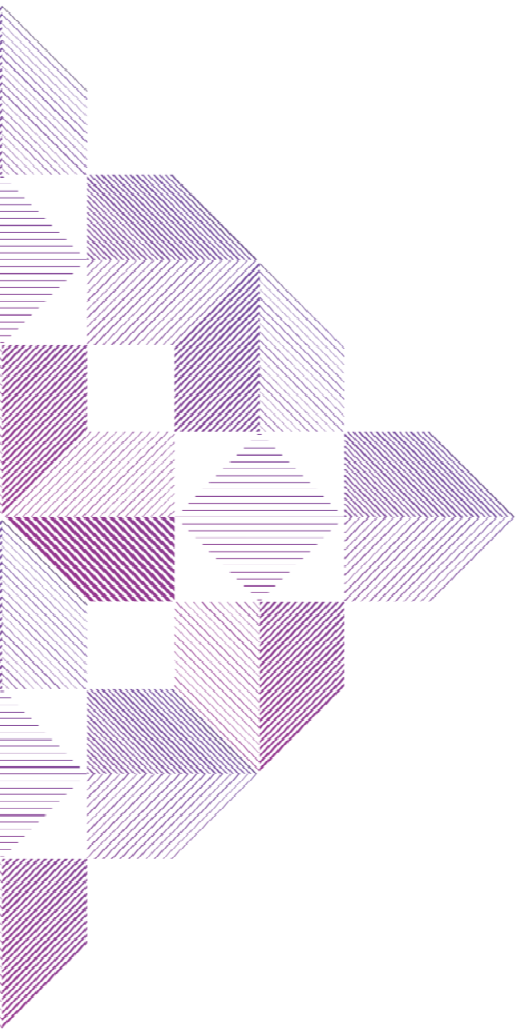
This was a direct result of the initial impacts not being fully understood nor broadly shared and considered; and incident management arrangements not being formally activated or rapidly escalated during the initial response to the rapid surge in demand for urgent healthcare.

However, IGEM notes formal incident management arrangements were activated on 22 November 2016 and subsequently, media releases, health advice and emergency warnings in relation to thunderstorm asthma were issued in accordance with the arrangements.

Figure 16: Timeline of health advice, public information and warnings during the Melbourne thunderstorm 21 and 22 November 2016



6 Future considerations



Through the conduct of this preliminary report, IGEM has made a number of preliminary observations and identified a number of matters for further consideration and analysis as part of its final report to government.

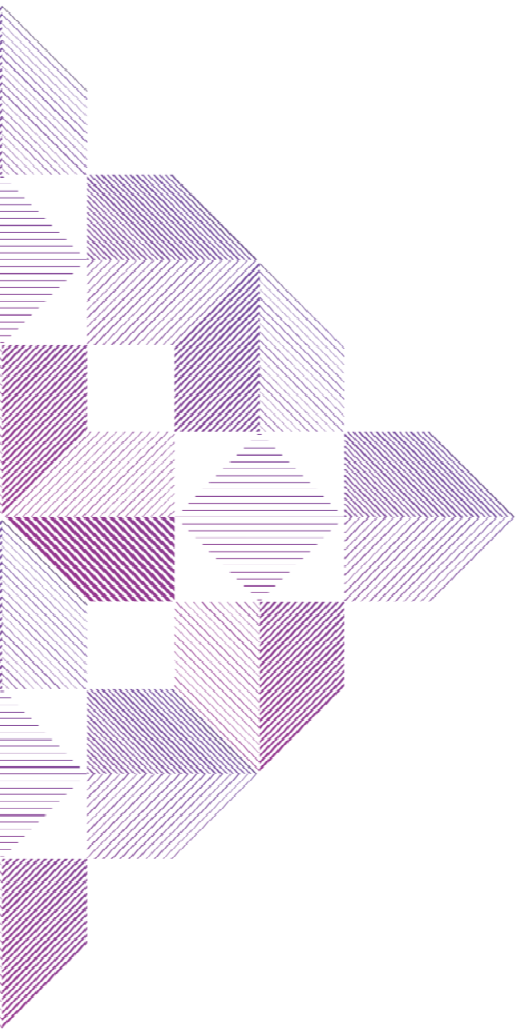
While these matters are of relevance to the thunderstorm asthma event, they also have system-wide implications. As outlined in this preliminary report, rapid onset and geographically widespread emergencies pose unique challenges for the emergency sector.

IGEM will further examine system-wide matters, including but not limited to:

- a focus on management of consequences using all available resources, regardless of hazard type or classification of emergency, particularly during rapid onset emergencies (such as use of Class 1 systems and infrastructure for Class 2 emergencies)
- factors that have the potential to impact timely access to all available resources during rapid onset and widespread emergencies to enable immediate assistance to meet community needs (such as existing enterprise agreements, current policies, and existing operating procedures)
- sharing of information, including that of a personal or sensitive nature, between agencies that is essential for timely and effective decision-making, situational awareness, and consequence management.

In its final report to government, IGEM will also provide further analysis with respect to Code Brown, impacts on and adequacy of support provided to health services, including hospitals and selected primary care services.

7 Summary and concluding remarks



IGEM acknowledges that everyone involved in managing and responding to the thunderstorm asthma event of 21 and 22 November 2017 did a good job – under pressure – in dealing with the unexpected and unprecedented demands of this health emergency.

The Victorian emergency management sector had no known experience of a rapid-onset event of this scale. Subsequently, the identified risks, plans and arrangements for response, were not developed with a rapid onset, time critical health emergency in mind.

Sector organisations immediately commenced reviews into their operations for the period 21 and 22 November 2016, in order to identify opportunities for improving their future response to similar circumstances.

In conducting this review, IGEM has observed initial areas for closer scrutiny relating to Victoria's public health emergency planning and response arrangements:

- understanding the thunderstorm asthma phenomenon
- surge capacity strategies for emergency response
- sharing of operational communication and information
- provision of public information, warnings and health advice
- effectiveness of Triple Zero (000) and ambulance response.

In its final report to government, IGEM will provide a comprehensive review of the event, with the aim of improving the state's emergency management arrangements; and enabling our communities to be more resilient and prepared to respond to the consequences of all emergencies.

Glossary

Australasian Inter-service Incident Management System	A nationally adopted management framework for organisations working in emergency management, providing a common language and consistent approach for the effective and efficient control of incidents.
Australia's Emergency Warning Arrangements	The document that provides a high level overview of the framework governing the delivery of emergency warnings to the Australian public.
Chief Health Officer alert	Information provided by the CHO about health issues with the potential to affect the community's health and safety.
Class 1 emergency	(a) a major fire or (b) any other major emergency where MFB, CFA or VICSES is the control agency under Part 7 of the Emergency Management Manual Victoria.
Class 2 emergency	A Class 2 emergency is a major emergency which is not: • a major fire • any other major emergency for which the MFB, CFA or VICSES is the control agency under the SERP • a warlike act or act of terrorism • a hi-jack, siege or riot.
Code 1 emergency (AV)	Code 1 incidents require urgent paramedic and hospital care, based on information available at time of call. Code 1 incidents include Priority 0 and Priority 1.
Control Agency	The agency, defined in Part 7 of the EMMV, assigned to control the response activities to a specified type of emergency.
Emergency Medical Response	The Emergency Medical Response (EMR) program was established to improve the outcome of patients in sudden cardiac arrest. This program allows MFB to respond to Priority 0 events.
Health Advice	Safe, practical health information to maintain public health, rather than targeted medical advice. Health advice is general advice, not tailored to individuals.
Incident Controller	The individual appointed to be accountable for the overall direction of response activities at an incident.
Incident Management Team	The team assembled to assist the Incident Controller perform the control function, applied using the principles of the Australasian Inter-service Incident Management System.
PM10	Airborne particles are sometimes referred to as 'particulate matter' or 'PM'. Particles can be classified on the basis of their size, referred to as their 'aerodynamic diameter'. 'Coarse particles' are those between 10 and 2.5 micrometres (μm) in diameter; 'fine particles' are smaller than 2.5 μm; and 'ultrafine particles' are smaller than 0.1 μm.
Priority 0	Priority 0 are the highest priority incidents, including non-breathing and suspected cardiac arrests. They require a 'lights and sirens' response and usually involve sending additional resources such as a Mobile Intensive Care Ambulance (MICA). Priority 0 incidents are a subset of Code 1 incidents.
Priority 1	Priority 1 incidents are high-priority and time-critical, requiring a 'lights and sirens' response. Priority 1 incidents are a subset of Code 1 incidents.
State Response Controller	The person appointed by the EMC to exercise control over the response to a Class 1 emergency. The EMC may appoint more than one State Response Controller.
Triple Zero (000)	Telephoning Triple Zero (000) is the most common way members of the community request emergency assistance from police, fire and ambulance.
Victorian Warning Protocol	The Victorian Warning Protocol provides emergency response agencies with coordinated and consistent direction on advice and/or warnings to inform the Victorian community of a potential or actual emergency event.
Warnings	A message signalling an imminent hazard, which may include advice on protective measures.

Appendix 1 – Letter of request

The Hon James Merlino MP

Deputy Premier
Minister for Education
Minister for Emergency Services

1 Treasury Place
Melbourne Victoria 3002
Telephone: +613 9651 1222

Our ref: CD/16/590169

Inspector-General for Emergency Management
09 DEC 2016
RECEIVED

Mr Tony Pearce
Inspector General of Emergency Management
17/121 Exhibition Street
MELBOURNE VIC 3000

Dear Mr ~~Pearce~~ Tony

Review of Response into Thunderstorm Asthma Event of 21-22 November

This letter is to request you, under section 64(1)(c) of the **Emergency Management Act 2013**, to review the emergency response to the Melbourne thunderstorm asthma event of 21-22 November 2016.

Your review should consider:

- The appropriateness and adequacy of the response under the Public Health Response Plan during events of 21 and 22 November, including the speed of escalation;
- The role of, and coordination between, the Emergency Management Commissioner, the Department of Health and Human Services, and other relevant agencies in respect of this public health event, and the adequacy of support provided to emergency and public health services;
- Consideration of the triggers for, and provision of, public warnings and information and health advice, taking account of predictability, preventive steps and methods of distribution available for this type of emergency; and
- The identification of any other relevant matters or opportunities for improvement.

Background

From 6pm on 21 November 2016, Ambulance Victoria and hospital emergency departments across Melbourne saw an unprecedented surge in patients with asthma and in respiratory distress. This was most likely associated with the late evening thunderstorms and high pollen levels.

Thunderstorms have been linked to epidemics of asthma, especially in late spring and summer. The conditions occurring at the onset of a thunderstorm might expose susceptible people to a rapid increase in concentrations of pollen fragments in the air that can readily deposit in the lower airways and initiate respiratory conditions such as asthma.

Review Rationale

There is a need to review the overall effectiveness of preparedness and response activities in relation to this event.

The primary goal of this review is to identify opportunities to learn from this event in order to improve future preparedness and response arrangements and performance. This includes the provision of recommendations, where required, about potential improvements to future public health emergency planning and response arrangements.

Review Requirements

The Department of Health and Human Services, Ambulance Victoria and Emergency Management Victoria are all key stakeholders in this review and will support the collection and provision of information to inform the data analysis phase of the review.

The review process should include a consideration of all relevant documentation, and discussions with key stakeholders.

You are requested to provide an interim report by 30 January 2017. The interim report will form part of your final report.

Your final report should be delivered by 21 April 2017.

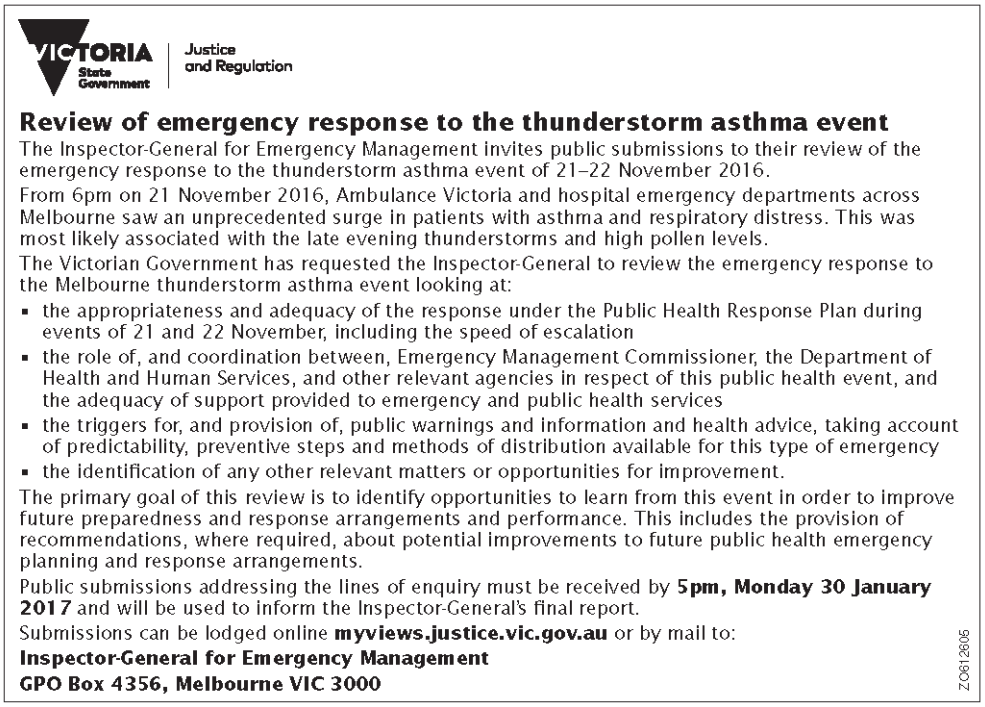
We look forward to receiving your review of this important issue.

Yours sincerely

Hon James Merlino MP
Deputy Premier
Minister for Emergency Services

Hon Jill Hennessy MP
Minister for Health
Minister for Ambulance Services

Appendix 2 – Advertisement calling for public submissions



VICTORIA State Government | Justice and Regulation

Review of emergency response to the thunderstorm asthma event

The Inspector-General for Emergency Management invites public submissions to their review of the emergency response to the thunderstorm asthma event of 21–22 November 2016.

From 6pm on 21 November 2016, Ambulance Victoria and hospital emergency departments across Melbourne saw an unprecedented surge in patients with asthma and respiratory distress. This was most likely associated with the late evening thunderstorms and high pollen levels.

The Victorian Government has requested the Inspector-General to review the emergency response to the Melbourne thunderstorm asthma event looking at:

- the appropriateness and adequacy of the response under the Public Health Response Plan during events of 21 and 22 November, including the speed of escalation
- the role of, and coordination between, Emergency Management Commissioner, the Department of Health and Human Services, and other relevant agencies in respect of this public health event, and the adequacy of support provided to emergency and public health services
- the triggers for, and provision of, public warnings and information and health advice, taking account of predictability, preventive steps and methods of distribution available for this type of emergency
- the identification of any other relevant matters or opportunities for improvement.

The primary goal of this review is to identify opportunities to learn from this event in order to improve future preparedness and response arrangements and performance. This includes the provision of recommendations, where required, about potential improvements to future public health emergency planning and response arrangements.

Public submissions addressing the lines of enquiry must be received by **5pm, Monday 30 January 2017** and will be used to inform the Inspector-General's final report.

Submissions can be lodged online **myviews.justice.vic.gov.au** or by mail to:

Inspector-General for Emergency Management
GPO Box 4356, Melbourne VIC 3000

ZO612605

Appendix 3 – Victoria's emergency response arrangements

Emergency Management Act 2013

The *Emergency Management Act 2013* (the Act) defines categories of emergencies, outlines responsibilities for establishing control of response activities and outlines the roles and responsibilities for the preparation, approval and updating of the SERP.

Section 39 of the Act outlines the responsibilities for establishing and/or transferring control for a Class 2 emergency.

Section 32(1)(b) of the Act states that the Emergency Management Commissioner (EMC) is responsible for ensuring that control arrangements are in place during a Class 2 emergency and section 40 empowers the EMC, where considered necessary, to direct the officer in charge of an agency to appoint one or more controllers or assistant controllers for the Class 2 emergency.

State Emergency Response Plan (SERP)

The *State Emergency Response Plan* (SERP) forms Part 3 of the Emergency Management Manual Victoria (EMMV) and outlines the Victorian arrangements for the coordinated response to emergencies by all agencies with a role or responsibility in relation to emergency response. It was approved by the State Crisis and Resilience Council (SCRC) on 24 March 2016 and took effect on 1 August 2016.

It is the EMC's responsibility to prepare and update the SERP as required. The SERP is written in accordance with section 54 of the *Emergency Management Act 2013*. This includes details around emergency response context, operational roles and responsibilities, collaboration across agencies, community involvement, and state and agency capability.

Particular sub-plans are also developed to detail arrangements for managing specific emergencies. This is typically where complex arrangements apply and more detail is required.

State Health Emergency Response Plan (SHERP)

The *State Health Emergency Response Plan* (SHERP) is the key state plan for pre-hospital and hospital response for emergency incidents and is a sub-plan of the SERP. The SHERP provides guidance at state, regional and incident tiers by outlining the arrangements for coordination of the health response to emergency incidents that go beyond day-to-day business arrangements.

The SHERP also outlines DHHS' key emergency management responsibilities which are to:

- act as the control agency for the protection of health
- manage pre-hospital and hospital responses to emergency incidents.

The primary aim of the SHERP is to reduce preventable death and permanent disability, and to improve patient outcomes by matching the needs of injured patients to an appropriate level of treatment in a safe and timely manner.

The SHERP scope is defined as the "principles, command and coordination arrangements, and roles and responsibilities for a health emergency response". This includes pre-hospital care, patient transport, receiving hospitals and other healthcare facilities.

Escalation of response levels within the SHERP is triggered when information is received about an incident or potential incident that is likely to impact normal operations of the health system or any agency that operates within SHERP. Escalation levels apply to each tier of incident management, and each tier can operate at a different level of escalation.

Information can be received through various channels such as:

- Triple Zero (000) calls received by Ambulance Victoria
- multi-agency dispatch requests to Ambulance Victoria
- warnings and advice issued by other Control Agencies
- information disseminated by Victoria Police Emergency Response Coordinators
- planning arrangements for major public events.

As noted above, health incident responses are structured around the three tiers of control, state, regional and incident. Within each tier, the Health Commander determines the escalation level at which to manage the incident.

The SHERP is currently under review as part of the review of State Health Emergency Response Arrangements being undertaken by DHHS.

Department of Health Public Health Control Plan 2012

The *Public Health Control Plan 2012* provides internal guidance for the management of public health incidents and emergencies by DHHS.

The *Public Health Control Plan 2012* lists potential public health incidents and emergencies, and the business units that are responsible for initiating and managing a response. Although there is no specific reference to large-scale allergy-related emergencies, the plan does recognise incidents and emergencies arising from natural events.

It is important to note that the *Public Health Control Plan 2012* reflects the former Department of Health structure. On 1 January 2015, the Victorian Government established the Department of Health and Human Services (DHHS) bringing together the former Department of Health, Department of Human Services, and Sport and Recreation Victoria.

As such, the *Public Health Control Plan 2012* is currently under review as part of the review of State Health Emergency Response Arrangements.

Appendix 4 – Signatories to the Victorian Warning Protocol

Country Fire Authority

Department of Health (now Department of Health and Human Services)

Department of Human Services (now Department of Health and Human Services)

Department of Environment and Primary Industries (now Department of Environment, Land, Water and Planning)

Emergency Services Telecommunications Authority

Metropolitan Fire and Emergency Services Board

Office of the Emergency Services Commissioner

Victoria Police

Victoria State Emergency Service

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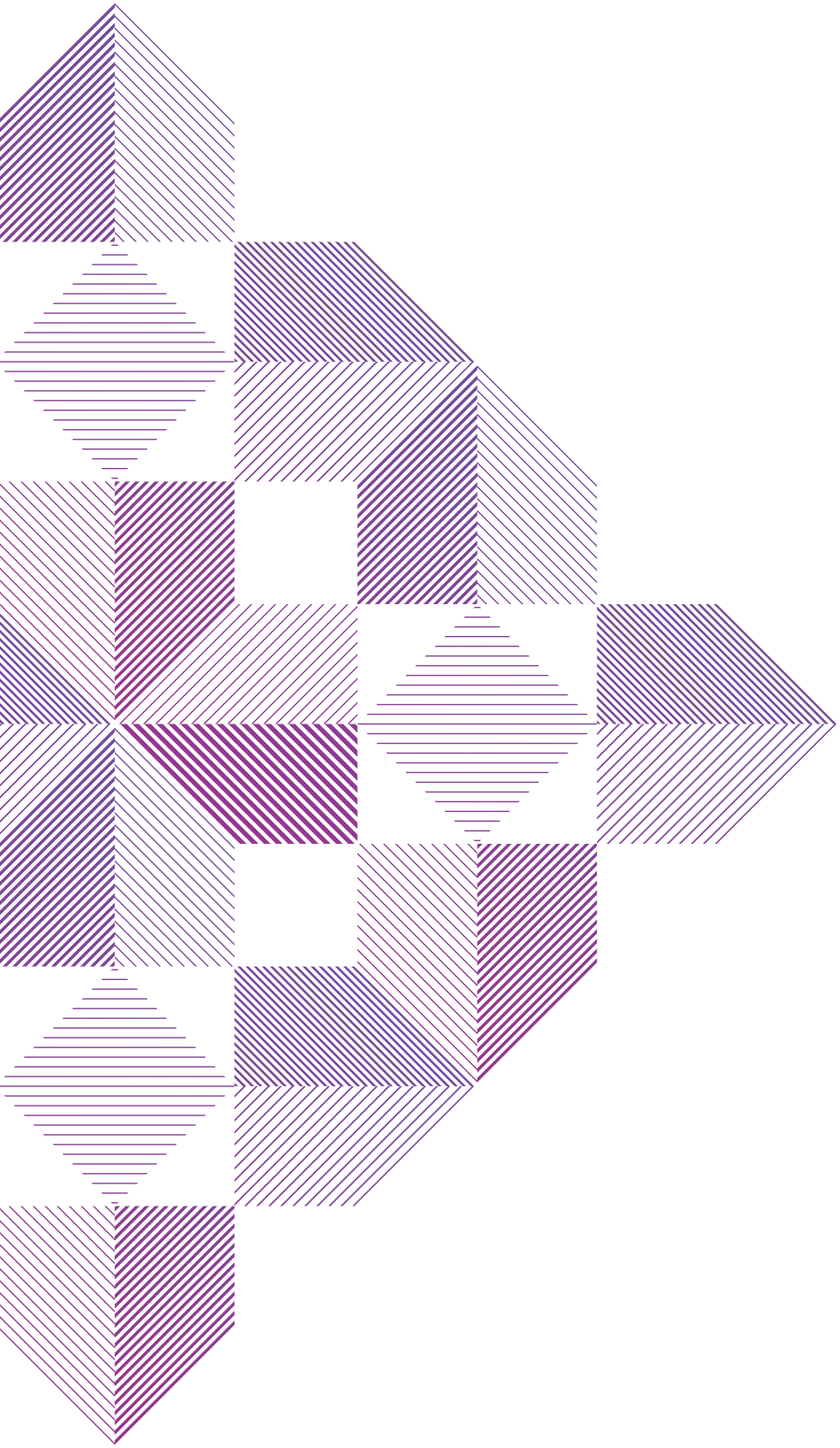

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