

Somerton Tip Fire:

Operational Application of the Smoke Framework

2016



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1 Executive Summary

The application of the Smoke Framework at the Somerton Tip Fire was reviewed through analysis of incident documentation and interviews with key incident and emergency management personnel. The Review focused on incident tier arrangements during the first three days of the fire.

The fire began in the early hours of 20th November 2015 at Ecotec Solutions refuse facility in Patullos Lane Somerton. The potential of the Somerton Tip Fire to produce smoke and other emissions that could compromise responder safety and impact on the community was recognised early. Arrangements were put in place to minimise impact on responders through carbon monoxide monitoring, and work practices that limited exposure through use of appropriate PPE and shift rotations.

Rehabilitation services were organised promptly, but there was a delay in provision of effective health monitoring with personnel electing not to participate in the 'optional' service during Day 1 and part of Day 2. Health monitoring was made compulsory in the evening of Day 2 and a number of firefighters and plant operators returned elevated readings, with one contractor sufficiently affected to warrant exclusion from the job.

There was a strong focus in the Incident/Emergency Management Team (I/EMT) on potential smoke impacts, with the appointment of a Deputy Incident Controller – Smoke who managed the atmospheric monitoring, prediction and community information functions. The Environment Protection Authority (EPA) and the fire services conducted

atmospheric monitoring in the community using a range of equipment, and collaborated in analysing data and providing information to Department of Health and Human Services (DHHS).

Weather conditions were largely favourable to smoke dispersal, which limited impact on the community and there were no significantly elevated carbon monoxide or PM2.5 readings beyond the immediate fire area.

Community engagement was proactive and regular, using a variety of media and face-to-face contacts. A suite of community advice messages utilising One Source One Message (OSOM) were agreed with DHHS early in the fire and used extensively. Industry adjacent to the fire was identified as being most affected and were engaged directly by the I/EMT, which minimised disruption to their businesses.

The State Smoke Framework contains multiple detailed requirements, the vast majority of which were implemented at the Somerton Tip Fire. Of the 112 requirements for full implementation of the Smoke Framework, 88 were met in full at the Somerton Tip Fire and 7 partially. Only 2 requirements were not met, and one of these was outside the control of the emergency and support services. Of the remainder, 13 were considered not applicable to Somerton and 2 remain unknown.

It is important to recognise that the Smoke Framework and supporting documents were relatively new at the time of the fire and most personnel had

received extremely limited training in their application. It was also apparent that most agencies were still developing supporting procedures to operationalise the Framework.

Application of the Framework at Somerton was aided by the experience many personnel had of the Hazelwood Mine Fire and/or their involvement as subject matter experts in the development of the Framework.

The difficulty in the Incident Management Team (IMT) managing for potential health impacts during the 24-hour period before DHHS can provide definitive advice concerned a number of respondents, as did responsibility of the IMT for smoke impacts a long distance from the fire itself.

Future application of the Framework would be assisted by finalisation of agency procedures; development of systems to better manage atmospheric monitoring data; provision of training to emergency responders and incident/emergency management personnel; and the conducting of multi-agency exercises focusing on smoke management.

All personnel interviewed as part of this Review credited the Framework for greatly increased cooperation and common understanding compared to the Hazelwood Mine Fire, with the work of EPA being particularly acknowledged by the fire services. Whilst most respondents suggested improvements to the Framework and its application, they recognised that the Framework defined clear roles for each agency and guided interactions between them; to provide an

effective and coordinated focus on smoke management and to reduce the potential for harm to responders and the community.

Acknowledgements

Terramatrix would like to acknowledge the contribution of the eleven people interviewed during this Review. Their willingness to devote considerable time, discuss matters candidly and provide their insight into the Somerton Tip Fire and how application of the Smoke Framework could be enhanced into the future, was essential to the completion of the Review.

2 Introduction

2.1 Background

The State Smoke Framework aims to support a more collaborative and coordinated approach to managing the short and long-term risk of smoke and other hazardous emissions. The Framework comprises a number of related policy documents:

- State Smoke Framework
- Community Smoke Air Quality and Health Protocol
- Standard for Managing Significant Carbon Monoxide Emissions
- Rapid Deployment of Air Monitoring for Community Health

The Framework was developed in response to the recommendations of the Hazelwood Mine Fire Board of Inquiry, and is to be continually reviewed (EMV, 2015a).

2.2 The Somerton Tip Fire

At 02:36 on 20th November 2015, the Country Fire Authority (CFA) and Metropolitan Fire Brigade (MFB) responded to a fire at Ecotec Solutions, a private refuse facility located in Patullos Lane Somerton (see Map 1 and Map 2). The fire, reportedly started by lightning, spread through 8,000-10,000m³ of compacted building waste on site, burning both on the surface and within the heap. Smoke management and carbon monoxide protocols were activated, with a management and monitoring plan established for the fire ground, identified exposures and areas of the surrounding community.

There was limited impact on the community due to the smoke column being blown northeast across open grassland for much of the time. Overnight inversion layers caused some smoke pooling, but at times when most people were asleep indoors. Smoke production was periodically more intense due to suppression activities.

The State Smoke Framework was released in July 2015, with an update in September 2015. The Somerton Tip Fire was one of the first fires at which it was applied. This report documents what was done to address smoke and air quality impacts on responders and the surrounding community, and distills the thoughts of key participants at the fire in regards to the ongoing operational application of the Framework.

2.3 The State Smoke Framework

The State Smoke Framework provides guidance in the management of significant smoke events that impact air quality and the health of communities. It establishes the framework for an integrated approach to managing the emergency and the short- and long-term risks of smoke and other hazardous emissions (EMV, 2015a).

The Framework applies to smoke or emissions from extended bushfires, large-scale planned fuel reduction burning, landfill and waste facility fires, open-cut coal mine fires, industrial and hazardous materials fires, or emissions from chemical fires and spills (EMV, 2015a).

Emergency Management Victoria (EMV), DHHS, MFB, CFA, Department of Environment Land, Water and Planning (DELWP) and EPA developed the State Smoke Framework in response to recommendations of the independent Board of Inquiry into the Hazelwood Mine Fire (EMV, 2015a).

The purpose of the State Smoke Framework is to:

- Integrate Victoria's emergency management services and planning across the sector;
- Respond to community concerns and manage the consequence of large, extended or complex events, including the public health impacts of exposure to smoke or emissions;
- Recognise that each extended smoke event is unique, involving different air pollutants that may pose public health risks and specific community concerns; and
- Identify potential smoke-related scenarios and the overarching arrangements for managing the impact of smoke and other emissions on air quality and community health, particularly for events occurring close to populations (EMV, 2015a).

The Framework aims to ensure:

- Incident Controllers (ICs) and the DHHS receive the most accurate, timely and relevant information about air quality measurements, assessments and forecasts from the EPA so they can conduct proactive and comprehensive assessments of potential public health risks associated with events in or near communities;

- There are clear triggers for actions during an event for emergency services, agencies (such as EPA and DHHS) and the community (including workplaces);
- Agencies and personnel involved in the response to an incident have the capacity (equipment) and the capability (technical expertise) to undertake monitoring and produce meaningful data;
- Public health messages are revised so they convey clear, action-oriented information; and
- Knowledge of different communities informs decisions about the delivery and preparation of information and monitoring how this is received (EMV, 2015a).

A range of protocols and standards has been, or is being, developed to support management of such fires (EMV, 2015a). Standards and protocols that were in place at the time of, and relevant to, the Somerton Tip Fire are described in Table 1.

The Smoke Framework provides a decision matrix to inform which components of the Smoke Framework are likely to be applicable (the relevant extract is provided in Table 2) and a list of considerations for ICs in determining what action should be taken. The IC should consider:

- Nature of the fire/event (what are we dealing with?)
- Scale (how big is it now, will it grow?)
- Predictions on estimated duration (how long will it run for?)
- Meteorological forecast (what is the weather doing, will this change?)

- Time to activate protocols within this matrix (what is the time from decision to operational deployment, to receipt of valid data on which to base decisions?)
- Engagement of appropriate key agencies at incident, region and state level I/EMTs (are the right agencies engaged and represented?)
- Community (what is the nature of the community being or likely to be impacted?)
- Activation and issuing of community warnings and information (what message and information does the community need?) (EMV, 2015a).

Table 1 - Protocols and Standards relating to the Smoke Framework.

Reference	Purpose
<i>Standard for Managing Exposure to Significant Carbon Monoxide Emissions</i> July 2015 Version 2.0 (EMV, 2015b)	To provide a framework for decision making to assist IC and agency commanders manage the health and safety of responders and affected communities during large complex incidents with the capacity to produce significantly elevated levels of CO in the outdoors.
<i>Community Smoke, Air Quality and Health Protocol</i> 29 July 2015 Version 2.0 (DHHS & EPA, 2015)	To support the Chief Health Officer (CHO) in providing health protection messages due to poor air quality from fires by detailing the basis upon which decisions are expected to be made from initial response, during monitoring and escalation; the arrangements between EPA and DHHS for the provision of forecast and actual fine particle data; and the process for communicating community health protection messages and advice.
<i>Rapid Deployment of Air Quality Monitoring for Community Health</i> October 2015 Version 1.0 (EMV, EPA & DHHS, 2015)	To address how the State will ensure rapid deployment for air monitoring for community health purposes will occur during an emergency incident and to provide guidance to ICs in exercising their judgment in assessing the need for rapid deployment of air monitoring.
<i>Protective Action Decision Guide for Emergency Services during Outdoor Hazardous Atmospheres</i> (MFB, 2011)	To provide emergency services with a standard approach to community protective actions during a chemical incident or fire by providing a strategy for ICs to follow, including advice on how and when to initiate and terminate SIP protective actions.

Table 2 - Extract from the Decision Matrix in State Smoke Framework (EMV, 2015a).

Tools	Landfill or Waste Facility
Carbon Monoxide (CO) - Community	Consider if appropriate
Carbon Monoxide (CO) - Worker	Should be deployed
PM2.5	Should be deployed
Smoke Behaviour	Consider if appropriate
Shelter Indoors	Should be deployed
Detection, Analysis & Monitoring	Should be deployed
Plume Modelling	Should be deployed

2.4 Scope of the Review

EMV commissioned Terramatrix to review the application of the State Smoke Framework at the Somerton Tip Fire. The Review Plan lists the following matters as in scope:

- The operational application of the State Smoke Framework, particularly in relation to the safety of responders and community;
- Operational activities directly related to the response to the Somerton Tip Fire with regards to the application of the State Smoke Framework, primarily during the first three days of the incident (20-23 November 2015); and
- Activities undertaken at incident tier will be the focus, although region and state level activities may be considered (EMV, 2015c).

The following matters are out of scope:

- Individual performance of personnel;
- Tactical decisions not related to the management of smoke and emissions management;

- Internal agency issues that did not impact on the response (e.g. human resources);
- Relief and recovery activities;
- Legislative or legal issues arising from the incident; and
- The scientific basis of the State Smoke Framework and related documents (EMV, 2015c).

Safety outcomes for responders and/or the community were not examined.

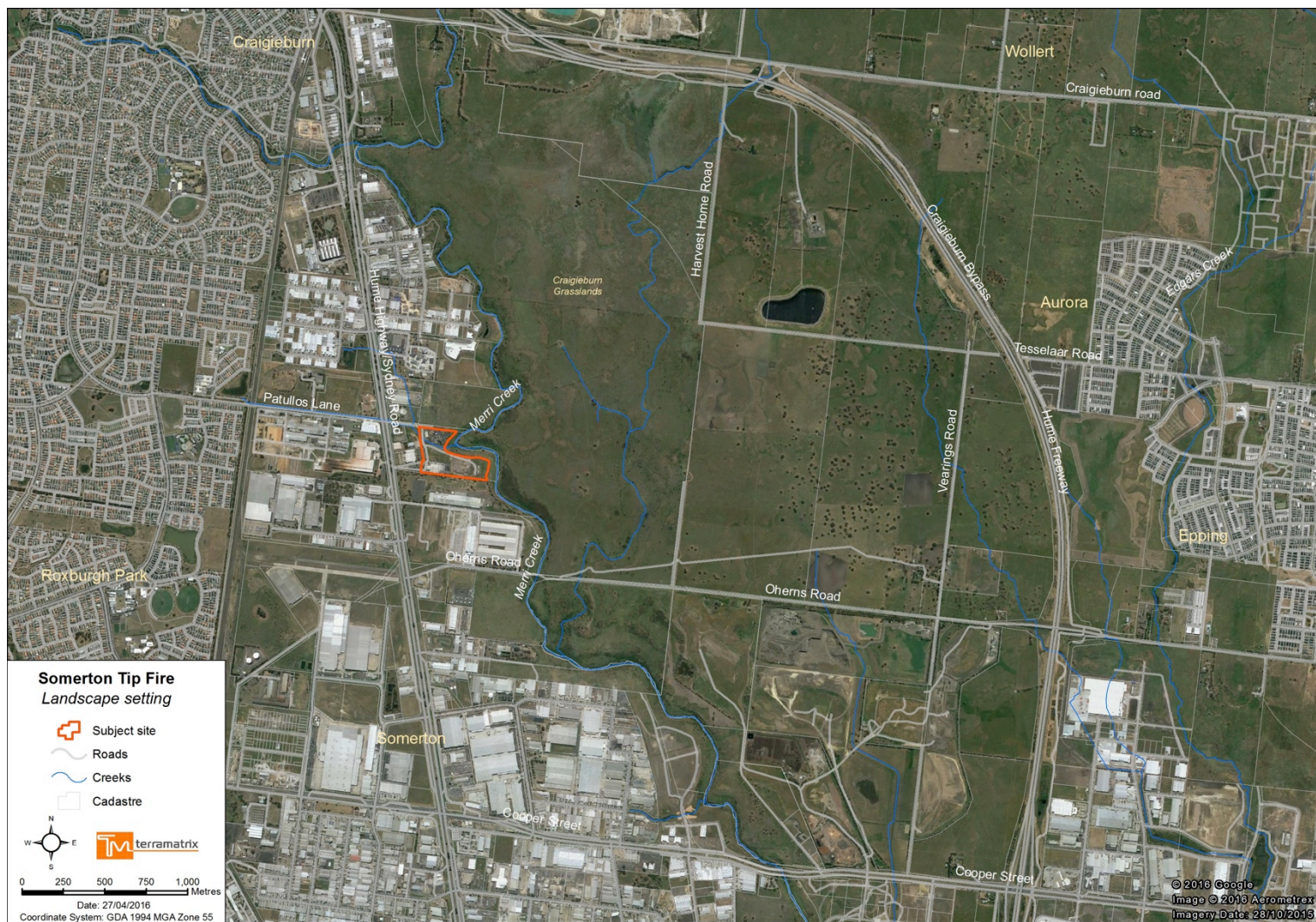
Any information obtained during the course of the Review that fell outside the scope of the project, but which was considered to likely be of interest to EMV and emergency services was provided separately.

2.5 Acronyms used in this Report

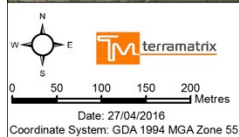
Acronym	
ADR 1500	Area dust monitor that can provide continuous monitoring of PM2.5
Area RAE's	Portable multi-gas monitors
AV	Ambulance Victoria
BoM	Bureau of Meteorology
CAD	Computer Aided Dispatch
CAFS	Compressed Air Foam System
CFA	Country Fire Authority
CHO	Chief Health Officer
CO	Carbon monoxide
COHb	Carboxyhaemoglobin
DEECD	Department of Education & Early Childhood Development
DELWP	Department of Environment, Land, Water and Planning

Acronym	
DHHS	Department of Health & Human Services
D/IC	Deputy Incident Controller
EMC	Emergency Management Commissioner
EMLO	Emergency Management Liaison Officer
EMT	Emergency Management Team
EMV	Emergency Management Victoria
EPA	Environment Protection Authority
Hazmat	Hazardous Materials
HC	Health Commander
HMT	Health Monitoring Team
HumeCC	Hume City Council
IAP	Incident Action Plan
IC	Incident Controller
ICC	Incident Control Centre
ICS	Incident Control System
I/EMT	Incident Emergency Management Team
IMT	Incident Management Team
MFB	Metropolitan Fire Brigade
NWMR	North & West Metro Region
OSOM	One Source One Message web based community messaging system
PIO	Public Information Officer
PIR	Preliminary Incident Report
PM2.5	Particulate matter in the atmosphere that is smaller than 2.5 micrometres
PPE	Personal Protective Equipment
ppm	Parts per million
RC	Regional Controller
RCT	Regional Control Team
RDO	Regional Duty Officer
REMT	Regional Emergency Management Team

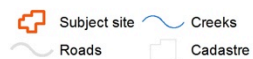
Acronym	
RTPM	Real Time Performance Monitoring
SAC	State Agency Controller
SCBA	Self Contained Breathing Apparatus
SCC	State Control Centre
SciAdv	MFB Scientific Adviser
SciOff	EPA Scientific Officer
SES	State Emergency Service
SIP	Shelter Indoors Protocol
SME	Subject Matter Expert
VEMTC	Victorian Emergency Management Training Centre
VFRR	Victorian Fire Risk Register
VicPol	Victoria Police



Map 1 – Landscape setting of the Somerton Tip Fire.



Somerton Tip Fire Local setting



Map 2 - Location of the Somerton Tip Fire.

3 Methodology

The Review process was consistent with the principles of the IGEM *Monitoring and Assurance Framework for Emergency Management* (IGEM, 2015) as it:

- Supported a culture of continuous improvement by sharing results and focusing on systems of work rather than individuals;
- Leveraged shared information via a collaborative review process;
- Added value by providing evidence-based, meaningful and timely information; and
- Limited the burden on agencies by being conducting in as efficient a manner as possible.

3.1 Evaluation Questions

The key evaluation questions listed in the EMV Review Plan were:

- How were the elements of the State Smoke Framework applied in the context of the Somerton Tip Fire?
- What was put in place to address the impacts to responders of exposure to smoke or emissions?
- What was put in place to address the public health impacts of exposure to smoke or emissions?
- What was learnt at this incident that would support the application of the State Smoke Framework into the future and in other emergencies? (EMV, 2015c).

3.2 Review of Framework Documents

The following Smoke Framework documents were reviewed:

- DHHS & EPA (2015) *Community Smoke, Air Quality and Health*

Protocol 29 July 2015 Version 2.0. Department of Health and Human Services & Environment Protection Authority Victoria, Melbourne.

- EMV (2015a) *State Smoke Framework September 2015 – update Version 2.0.* Emergency Management Victoria, Melbourne.
- EMV (2015b) *Standard for Managing Exposure to Significant Carbon Monoxide Emissions July 2015 Version 2.0.* Emergency Management Victoria, Melbourne.
- EMV, EPA & DHHS (2015) *Rapid Deployment of Air Quality Monitoring for Community Health Guideline October 2015 Version 1.0.* Emergency Management Victoria, Environment Protection Authority Victoria and Department of Health and Human Services, Melbourne.

The potential 'requirements' of a full implementation of the Smoke Management Framework were distilled from these documents. This resulted in a list of one hundred and twelve (112) actions, although it should be noted that some actions were contingent on particular environmental conditions occurring (e.g. levels of CO in atmosphere reaching a pre-determined trigger point, or personnel with elevated COHb readings). In addition, many of the requirements for CO monitoring in an operational responder and in a community safety context were the same.

3.3 Primary Sources

The data required to address the key evaluation questions in the EMV Review Plan were obtained from three main sources:

- Statements from key operational and support personnel identified by EMV and collected via face-to-face interviews and follow up email and/or telephone discussion if required; and
- Operational documents created in the process of managing the fire (i.e. created by I/EMT, SCC etc.).

Eleven face-to-face interviews were conducted with key incident and emergency management personnel. Interviews occurred during the period 4th February to 24th March 2016.

Each respondent was asked a series of open and closed ended questions, tailored to their role at the Somerton Tip Fire. Questions were designed to explore implementation of the Smoke Framework at the Somerton Tip Fire, the respondent's level of familiarity with the Framework prior to the fire, and their professional opinion on what worked well and any opportunities for improvement.

Each interview lasted between 1 and 2.5 hours.

Table 3 – Details of personnel interviewed in relation to the Somerton Tip Fire.

Role at fire and agency	Designation used in this report	Date interviewed
Regional Controller (CFA)	RC	11/02/2016
Incident Controller (CFA)	IC1	18/02/2016
Incident Controller (CFA)	IC2	18/02/2016
Deputy Incident Controller (MFB)	D/IC	04/02/2016
Fire Service Scientific Adviser (MFB)	SciAdv	17/02/2016
Public Information Officer (CFA)	PIO	11/02/2016
Health Monitoring Team Manager (CFA)	HMTMgr	08/02/2016
Health Commander (AV)	HC	10/02/2016
State Emergency Management Liaison Officer (EPA)	EPA EMLO	04/03/2016
Scientific Officer (EPA)	EPA SciOff	18/03/2016
Smoke framework SME (EMV)	SME	24/03/2016

Documents produced during the fire and that were provided to Terramatrix included:

- North and West Metropolitan Region Regional Strategic Plan, 20 November 2015;
- Regional Emergency Management Team teleconference minutes, 20-24 November 2015;
- Incident CAD comments, 20 November – 2 December 2015;
- Real Time Performance Monitoring Team report, 20 November 2015;
- State teleconference minutes, 20 November 2015;
- Preliminary incident reports and incident messages, 20-26 November 2015;
- Incident Action Plans, 20-21 November 2016;
- Deputy IC log, 20-21 November 2015;
- Smoke, Carbon Monoxide and Asbestos Management Plan, 21 November 2015;
- Results of smoke plume modelling, 21 November 2015;
- Public Information / Community Engagement Strategy, 21 November 2015;
- Public Information Strategy - Industry Engagement, 22 November 2015;
- Community Information Newsletter, 22 November 2015;
- Public Information Officer log, 20-24 November, 2015; and
- OSOM (One Source One Message) records, 20-26 November 2015.

Terramatrix were also provided with results of atmospheric CO monitoring by the fire services using Area RAEs, 20-26 November 2015.

3.4 Secondary Sources

Terramatrix were provided with records of Incident Level and Regional Level debriefs conducted after the fire; and a time line of EPA involvement constructed after the fire by the EPA EMLO.

An internet search was made for media reports dealing with the Somerton Tip Fire. Nothing was found that had not already been discovered in the primary sources, and no analysis was undertaken.

3.5 Analysis

The actions taken during the first three days of the fire were compared against the 112 'requirements' of the Smoke Framework documents. This provided a high level qualitative audit of the application of the Framework at the Somerton Tip Fire.

For each requirement the source(s) of information were listed, allowing triangulation to validate the data. In most instances consistent data were obtained from multiple sources (see Appendix 1).

The analysis identified those parts of the Smoke Management Framework that were fully implemented, and what enabled this implementation; identified any 'gaps' in implementation and explored reasons why they occurred; and assessed the strength of the evidence in relation to each reported action (i.e. triangulated the data from multiple sources).

4 Findings and Discussion

The key evaluation questions listed in the EMV Review Plan were:

- How were the elements of the State Smoke Framework applied in the context of the Somerton Tip Fire?
- What was put in place to address the impacts to responders of exposure to smoke or emissions?
- What was put in place to address the public health impacts of exposure to smoke or emissions?
- What was learnt at this incident that would support the application of the State Smoke Framework into the future and in other emergencies? (EMV, 2015c).

These questions are addressed below.

The impact of smoke from the Somerton Tip Fire on the surrounding community was quite limited, and some elements of the Smoke Framework were not applicable. In practice, a number of actions were taken due to the potential for smoke impacts arising in the future, rather than in response to actual conditions. All tools listed in the decision matrix of the State Smoke Framework for landfill or waste facility fires (EMV, 2015a) were deployed at Somerton.

4.1 Application of the Smoke Framework at Somerton

4.1.1 Findings

At 02:36 on 20 November 2015, CFA and MFB responded to a fire at Ecotec Solutions, a private refuse facility located in Patullos Lane Somerton (see Map 1 and Map 2).

Initial appreciation

The potential size, duration and complexity of the fire were identified early. The RDO and RC were notified within 14 and 44 minutes respectively, and at 03:27 the RC instructed that smoke protocols and community messaging be put in place.

This resulted in progressive implementation of the Smoke Framework, including work practices and health monitoring to ensure the safety of responders; and monitoring and prediction of smoke impact on the surrounding community to underpin a proactive public information program.

The role of the RC, with a wider view of the fire and, in particular, the potential off-site consequence, appears to have been important in this early initiation of the Smoke Framework.

Also of importance was CFA and EPA's existing knowledge of the Ecotec Solutions facility having been involved in regulatory issues with the business previously, and having pre-planned for a fire at the site. This provided a working knowledge of the type of materials within the pile.

Incorporation of the Smoke Framework into incident & emergency management

The IMT structure was expanded during Friday morning (Day 1) as the scale and complexity of the fire became apparent.

The IAPs and PIRs document the I/EMT's immediate commitment to implementing the Smoke Framework.

The input of the RTPM Team, who attended the scene during the morning of Day 1, appears to have been significant. The RTPM Team, which included the EMV smoke SME, facilitated access to smoke plume modelling and planning for the effect of the forecast overnight inversion layer on smoke pooling in the surrounding areas.

Planning for smoke impact was reinforced by the appointment, during Friday morning (Day 1), of a D/IC with specific focus on smoke and its potential impact on the community.

This structure recognised that smoke was a major issue for the community, and provided a focal point for the various fire service and other agency personnel involved in monitoring, analysing and communicating to the public about smoke.

There appears to have been a close and effective relationship between the I/EMT and the REMT, with the REMT able to take a wider view of potential community consequences and utilise existing networks to coordinate the multiagency response.

Incident prediction

The likely duration of the fire, and hence its impact on the surrounding community, was recognised and communicated early.

The IMT regularly accessed spot weather forecasts from the BoM and smoke plume modelling by CFA, to help understand the likely behaviour (direction and pooling) of the smoke plume, and hence the time and location of potential impact on the community. These predictions were used

to inform atmospheric monitoring and proactive messaging to the community.

A number of concerns were expressed in relation to the smoke plume modelling. These included technical limitations (real or perceived) in predicting the height of the plume above the ground, the concentration of gases within the plume, and the distance at which particulate matter will begin to fall out of the plume. The limited capacity (one officer) within the fire services to undertake the modelling was also highlighted.

Conversely, the SciAdv stated that the plume modelling could be extremely useful, and that the limitation may be in the familiarity of the IMT with the outputs and how to interpret them.

Familiarity with the Smoke Framework

The level of familiarity with the Smoke Framework varied considerably between respondents.

The Somerton Tip Fire involved a number of personnel from various agencies who had been involved in the development of the Framework and supporting standards and protocols. Their level of knowledge, at least of the parts they had worked on, was very high.

The exposure of most others was limited to a short presentation of the Framework during the pre-summer briefings, and these respondents generally reported understanding the intent but not the detail of the Framework.

Draft JSOPs for *Managing Significant Exposures to Carbon Monoxide in the Community* and *Managing Significant*

Community Exposures to Fine Particles from Smoke were provided to the IMT by the RTPM Team on the morning of Day 1. These had not been seen prior to the fire, but were utilised by the D/IC – Smoke during the fire.

It was also notable that a number of key I/EMT personnel had considerable experience from the Hazelwood Mine Fire and stated that they did the things that they had found to work at Hazelwood. This pool of experienced personnel was important to the effective management of potential smoke impacts, and assisted an appropriate response in the absence of well-established agency procedures.

4.1.2 Promoting good practice

Respondents to this Review identified a number of opportunities to improve existing practice. Some of these are already being developed by the responsible agencies.

Managing regional level impacts

Smoke can potentially impact a large geographic area, far removed from the location of the fire itself. A number of respondents discussed the challenges of an I/EMT managing off site impacts as well as the fire itself, and highlighted the role of the REMT in off site consequence management.

Smoke Technical Unit

The role of a Smoke Technical Unit should be formalised within the ICS structure.

The Smoke Technical Unit could comprise a suitably senior and experienced fire service leader (at Somerton an Assistant Chief Fire Officer was D/IC - Smoke), Scientific Officer(s), EPA EMLO(s), Hazmat

Crew Leader, BoM forecaster, EPA air quality forecaster and plume modeller (the latter three working remotely).

At incident level the Smoke Technical Unit would require close relationships with the Planning Unit and Public Information Unit as both would utilise predictive plume modelling, and smoke is the predominant impact on the community. A close relationship with Operations would also be required as operational tactics will influence smoke generation, whilst real-time fire ground atmospheric monitoring data will inform PPE requirements and suppression tactics.

As predictive services (weather forecasting, air quality forecasting and plume modelling) are provided at State level and some elements of consequence management are best coordinated at Regional level, the Smoke Technical Unit would require cohesive links with these two tiers of management. The current bushfire predictive services arrangements may provide a useful model for the Smoke Technical Unit.

Smoke plume modelling was seen as having great potential but not yet fit for purpose. Increasing modelling capability and capacity, and familiarising IMT personnel with the outputs, their uses, strengths and limitations, will be necessary to gain the most benefit from this emerging capability.

JSOPs, training and exercising

The draft JSOPs for CO and PM2.5 should be finalised and distributed.

Additional training should be provided on application of the Smoke Framework. A

range of training may be required; from recognition of the need to implement the framework for first responders, through to managing or working within the Smoke Technical Cell for senior operational staff and technical experts.

Most respondents advocated multi-agency exercises focused on implementation of the Smoke Framework, which would involve key personnel at incident, regional and state levels. Over time, the exercises could explore the differences between campaign fires with chronic exposure issues (e.g. Hazelwood Mine Fire) and sudden onset fires with potentially acute impacts (e.g. hazmat in a densely populated area).

4.2 Addressing Impacts to Responders

4.2.1 Findings

Hot zone and PPE

A hot zone was established and maintained throughout the fire. The size of this zone varied through the duration of the fire in line with fire conditions.

Crews working downwind of the fire and potentially in smoke wore SCBA. Other personnel in the hot zone, who were not working in smoke, employed P2 masks¹.

Operators of private plant (e.g. bull dozers and graders) working in smoke did not wear SCBA, however their cabs were air-conditioned and rated for work in mines.

¹ P2 masks provide protection from mechanically or thermally generated particles but not from vapours such as CO.

CO monitoring

A MFB SciAdv was notified of the fire at approximately 04:45 and attended the scene at approximately 11:00.

Personal CO monitors were assigned to a number of crews working in the hot zone, but the completeness of their coverage over time (i.e. the proportion of crews in the hot zone issued with monitors) has not been established by this Review.

Spot atmospheric monitoring of CO on the fire ground was initially undertaken using hand held equipment from three CFA heavy pumpers. This was expanded late morning on Day 1 with Area RAEs (portable multi-gas detector responded with Hallam Hazmat) providing continuous monitoring at the hot zone entry, in a dozer working the fire and at VEMTC just north of the fire ground.

When additional Area RAEs were deployed from the CFA Protective Equipment depot at Geelong, they were placed in fire service appliances, private plant and in businesses in the surrounding area.

The data from the Area RAEs showed that the highest CO readings were experienced in the private plant working in or very close to the smoke. A few readings in excess of 100ppm were recorded for very short periods in a number of the dozers and excavators (n.b. the Exposure to CO for Firefighters standard requires SCBA or withdrawal at 100ppm (EMV, 2015b)). Readings above 30ppm (SCBA required if exposed for more than 1 hour (EMV, 2015b)) or 60ppm (SCBA required if exposed for more than 30 minutes (EMV, 2015b)) were more common but again

generally only for a few minutes at a time. By contrast the fire service aerial appliances had no readings above 10ppm.

It was reported that a small number of contractors operating private plant at the fire deliberately compromised CO monitoring, by removing Area RAEs from their vehicles or shielding personal CO monitors, possibly to prevent any potential for elevated readings preventing them from completing the contract. These people also returned high COHb levels and one was removed from the fire ground. It was suggested by multiple respondents that the CO readings were elevated, in part at least, by smoking cigarettes in the cab of their machines, but this has not been verified with the individuals involved.

Analysis of the CO data was undertaken by the fire service SciAdv and EPA SciOff, and provided to the D/IC – Smoke for consideration by the IC. A primary role of the fire service SciAdv is to enhance fire fighter safety by identifying hazardous conditions. A number of respondents highlighted the effective working relationship between fire service and EPA scientific staff.

Shift rotation

Work shifts in the hot zone were limited to 2 hours to reduce the potential exposure of personnel to CO.

Health monitoring

Mernda fire brigade was responded early in the fire (04:07) to provide firefighter rehabilitation services. This unit also had the capability to perform health monitoring under the supervision of the

AV HC, assuming appropriately qualified CFA personnel were available.

At 06:55 AV were requested to attend for health monitoring. Initially monitoring was not mandatory, and some fire ground personnel elected not to participate. AV cannot force people to accept any medical treatment, and this includes proactive health monitoring.

The health monitoring was progressively expanded and by late afternoon on Day 1 was reported to be functioning effectively, whilst still being voluntary. Fire ground CO readings during this period were below those requiring action according to the Occupation Exposure Standard (EMV, 2015b) and it was suggested that health monitoring might not have strictly been required.

The HMT was located near the 'gateway' to and from the hot zone making it more likely that personnel working in the hot zone were tested at the start of shift, on breaks, and at the end of shift as required by the Smoke Framework.

Health monitoring was made mandatory during Saturday evening (Day 2) in response to elevated CO readings in the private plant working in the smoke. Three contractors returned elevated COHb readings (2 at <10% and 1 at 12%, which after a 30 minute break had dropped to 2 at 7% and 1 at 10%, with the person with the 10% reading referred to AV). Two firefighters returned levels of approximately 5%.

The situation of fire fighters electing not to undergo voluntary health monitoring shows the importance of providing clear

direction to the HMT, and to fire ground personnel who may require testing, as to whether health monitoring is voluntary or mandatory. If there are issues with compliance the HC should alert the IC so that appropriate instructions can be issued via the chain-of-command.

4.2.2 Promoting good practice

CO monitoring

It was apparent that CO monitoring was conducted using a variety of equipment at different times. Spot measurements were available from first response using hand held monitors from the CFA heavy pumpers, whilst continuous monitoring required the arrival of Area RAEs from Hallam. In addition, some crews working in the hot zone were equipped with personal CO monitors, and individual COHb readings were collected via the health monitoring process.

It did not appear, however, that data was compiled into a single authoritative repository, with the source, location and accuracy of readings clearly expressed. Consideration should be given to how atmospheric and personal monitoring data could be collated, stored in a single repository, have basic analysis conducted automatically (e.g. rolling multi-hour averages, peak readings, exceedances of pre-defined thresholds etc.) and be accessible on demand to authorised personnel at incident, regional and state levels.

It is likely that continuous monitoring of atmospheric CO will be required at any fire where the Smoke Framework is applicable. Consideration should be given to responding Hazmat technicians with Area RAEs (or equivalent) plus a fire

service SciAdv as soon as it has been determined that the Smoke Framework will be applied at a fire or incident.

Health monitoring

It would seem to be a sensible OHS precaution to implement mandatory health monitoring at any fire at which the Smoke Framework has been applied. Clear direction from the IC is needed to empower the HC, who does not have the authority to require personnel to undergo health monitoring.

A default position of implementing health monitoring would have the advantages of:

- Simplifying a decision that the IC is required to make in the initial stages of a complex fire;
- Health monitoring would commence as soon as practicable after exposure of personnel had commenced, without waiting for CO monitoring data to become available to determine that health monitoring was required; and
- Adding value to the firefighter rehabilitation service that could be implemented concurrently.

The health monitoring could be scaled back or discontinued if atmospheric and personal CO monitoring indicated that it was not required.

The HMT should be positioned as 'gate keeper' to the hot zone to increase take up of a voluntary service and to reduce the time impost on crews going on and off shift.

4.3 Addressing Public Health Impacts

4.3.1 Findings

Impact of smoke on the community

For much of the fire conditions were favourable for smoke dispersal, with good burning conditions allowing smoke to rise with the convective column, and the breeze pushing smoke northeast over grassland and away from populated areas.

Inversion layers overnight trapped smoke closer to the ground, but people were generally indoors and nearby businesses were unoccupied at this time of night, and there were few reports or complaints about smoke or odour.

Smoke generation increased at times depending upon the suppression tactics employed.

Disruption to adjacent businesses was minimised through proactive engagement by the I/EMT.

Atmospheric monitoring

Two of the Area RAEs initially deployed were assigned to monitoring CO in the community immediately adjacent to the fire ground; at the Close The Loop factory immediately south of the fire (first reading 11:39) and at VEMTC to the north of the site (first reading 12:11). Prior to this, CO monitoring with hand held instruments from the CFA heavy pumpers was confined to the fire ground itself on the basis that CO levels would be highest closest to the smoke.

The EPA Smoke Tracker mobile monitoring vehicle was deployed before 11:00 on Day 1 and took a series of spot

readings of PM2.5 at various locations in the surrounding area, with the first data becoming available at 12:10. A mobile ADR 1500 area dust monitor was deployed shortly before 21:00 on Day 1 and provided continuous monitoring at the Craigieburn Fire Station to the north west of the incident. This response time was well within the 24-hour time limit set by the *Rapid Deployment of Air Quality Monitoring for Community Health Guideline*. Smoke Tracker worked periodically for the next 2 days.

Data from the CO monitoring by the fire service (first data provided at 15:37 on Day 1) and PM2.5 monitoring by EPA were collated by EPA and provided to their air quality forecaster in head office, and to DHHS for analysis of public health implications.

Predicting impact on the community

The likely duration of the fire, and its potential impact on the surrounding community, was recognised and communicated early.

The potential for overnight inversions to cause smoke to pool in nearby areas was recognised, and the community were advised of this possibility in advance. Geographic areas that could be impacted in the near future were identified using spot weather forecasts and smoke plume modelling, and were included in proactive messaging to the community.

Health assessment

A set of standard smoke health messages were approved at State level late morning of Day 1, and were included in Watch and Act and Advice messages from 12:43 onwards.

Due to the low level of CO and PM2.5 readings beyond the immediate fire ground, there was no requirement for escalation of health messaging beyond the initial approved OSOM messages.

IMT personnel, however, stressed the need for 'nil results' from the atmospheric monitoring to be fed back to the IMT with the assurance that no additional action was required to protect the community. It was suggested that having a DHHS public health messaging EMLO at the incident scene would have been helpful, and would allow the HC (acting as DHHS representative on scene) to focus on health monitoring and emergency medical services.

A number of respondents also questioned the requirement of DHHS to have 24 hours of atmospheric monitoring data before being able to advise on potential public health impacts. Whilst not an issue at the Somerton Tip Fire, it was generally felt that this could put ICs in an untenable position, where they had smoke impacting the community but were unable to tell people anything definitive for a considerable period of time. The *Community Smoke, Air Quality and Health Protocol* (p6) states that 'given that the quantity and quality of information and data will generally increase over time as the incident unfolds, the CHO will form their advice on the best available information at any point in time' (DHHS & EPA, 2015).

It was also noted that shelter indoors was only effective for up to 8 hours, meaning that an evacuation may be required as a precaution before health advice was available from DHHS.

Community engagement

The early appreciation of the potential smoke impacts resulted in an Advice message being issued at 03:40 that included advice to shelter indoors. This was a precautionary action taken in the absence of data indicating that smoke was a threat, but sensible as, during the hours of darkness and prior to atmospheric monitoring being in place, it would have been hard to establish with confidence that there was no immediate threat to the community.

A Watch and Act was issued at 08:25, and a further five times during Day 1. It was downgraded to an Advice message during the evening of Day 1. A total of 17 Watch and Act or Advice messages were issued during the first three days, advising on the current and predicted situation, fire suppression strategies, health precautions, and road closures.

A Public Information / Community Engagement Strategy was developed on Day 1 by the PIO. Tools such as VFRR and the Vulnerable Person Register were consulted. A broad range of mediums were used, including OSOM, radio, television, media releases, press, web, social media, letter boxing, community meetings, community information point, and newsletters.

OSOM messages were targeted to specific geographic areas, clearly defined in the messages, based on an assessment of the direction and distance of smoke impact.

It was determined that the main impact of smoke would be on industry close to the fire ground, rather than residential areas further afield.

The IMT worked closely and proactively with the immediate neighbouring businesses to allow them to keep operating throughout the fire. This included facilitating access of guests to the Mirage Reception Centre, immediately west of the fire ground, to enable it to continue business throughout the fire, and altering the location of appliances to clear access to Close The Gap and Honda Australia immediately south of the fire. An Area RAE atmospheric monitor was located at one factory, both to provide data to the IMT and reassurance to the nearby businesses.

Two industry meetings were held, on Sunday (Day 3) and Tuesday (Day 5). Local businesses were actively invited to attend via letter boxing and door knocking. An industry newsletter was also produced.

A Community Information Point was established at Global Learning on Sunday (Day 3). Whilst there was little take up of its services, it was in place if smoke logging had of gotten worse and the broader community had a greater need for information.

The PIO commended the input of EPA staff and DHHS (CHO) who provided input to OSOM messages and attended public meetings.

4.3.2 Promoting good practice

Atmospheric monitoring

It was suggested that 'rapid deployment' of EPA air monitoring equipment was a misnomer in an emergency management context, when the performance requirement is deployment within 24-

hours. It was held that this terminology was likely to lead to unrealistic expectations about how quickly monitoring could be implemented.

Several respondents raised the limited ability of EPA to resource rapid or sustained deployment of atmospheric monitoring equipment, or to provide sufficient EMLOs to a prolonged incident. EPA reports that these issues are being actively addressed.

It was suggested that fires with significant community exposure to smoke might require the attendance of two fire service SciAdvs, one focusing on fire fighter safety and the other on community impact. Likewise, where there are multiple environmental hazards (e.g. smoke and fire water run off at Somerton) more than one EPA EMLO or SciOff may be required.

Incident prediction

Potential enhancements to smoke plume modelling have been discussed in Section 4.1.2.

Health assessment

Consideration needs to be given to the actions that will be required from ICs during the 24-hours before authoritative health advice is available from DHHS. The IC is not able to refrain from providing advice to impacted communities, and under some circumstances generic messages may be inadequate to community need. The IC will be required to make the best decision possible with the limited information available, and EPA and DHHS need to be in a position to provide the best advice they can, acknowledging that they might not have

the data required for definitive statements.

key OSOM and health messages available in languages other than English.

Of particular concern to ICs, was what happens in a 'shelter indoors' scenario after 8 hours, when smoke levels inside the building have reached equilibrium with the external atmosphere. Application of the Framework could require a precautionary evacuation to be conducted in the absence of definitive advice from DHHS as to the health impacts of exposure to that particular smoke.

The health assessment process also needs to be responsive to allow timely approval of tailored messages in response to fire- or community-specific issues that were not included in the pre-approved message templates. An example of this issue at Somerton, albeit not in relation to smoke, was the time required to gain approval for a message advising against fishing in the Merri Creek during a period of potential contamination by fire water run off.

Community engagement

It was suggested that messaging in multi-agency incidents could be streamlined if all agencies were able to update the Emergency Vic website directly.

The PIO would also benefit from pre-planned smoke fact sheets on fire service, EPA and DHHS web sites that could be linked to or downloaded for inclusion in community messaging.

All of the OSOM messaging was in English. Whilst there was limited smoke impact on residential areas, the linguistic and cultural diversity of the Somerton area suggests there would be benefit in having

4.4 Compliance with the Requirements of the Framework

Full implementation of the Smoke Framework could require emergency services and support agencies to implement one hundred and twelve (112) actions stipulated in the four key documents (DHS & EPA, 2015; EMV, 2015a; EMV, 2015b; EMV, EPA & DHHS, 2015). Albeit some are contingent on certain conditions being met and others are called up twice.

This Review of application of the Smoke Framework at the Somerton Tip Fire found that the 6 requirements of the *State Smoke Framework September 2015 – update Version 2.0* were all met in full.

Forty nine requirements were identified in the *Standard for Managing Exposure to Significant Carbon Monoxide Emissions July 2015 Version 2.0* in relation to managing CO exposure of responders. Of these, 37 were met in full, five in part, three were judged not applicable to the Somerton Tip Fire, two remain unknown and two were not met. The partially met requirements mainly related to the delay in establishing effective health monitoring of responders. Of the two requirements not met, only one was in the control of emergency services, which was to declare the incident a 'non-smoking' work place. The other non-compliance was the owners of Ecotec Solutions not providing support to the emergency services.

There were 33 requirements identified in relation to CO exposure of the community, some of which were the same as for responders. The Review

found that 29 of these requirements were met. The remaining four were judged not to be applicable to the Somerton Tip Fire as CO exposure levels did not reach trigger points for escalated messaging or relocation of community members.

Twenty one requirements were identified in the *Community Smoke, Air Quality and Health Protocol 29 July 2015 Version 2.0*. Fifteen were judged to have been fully met at the Somerton Tip Fire. Five were considered not applicable. These related to smoke modelling by DELWP, evacuation and relocation arrangements that were not required, and implementation of procedures for Unhealthy to Hazardous air quality not required as these thresholds were not reached, and one requirement that related to State level arrangements that were outside the scope of this Review.

It was found that the three requirements distilled from the *Rapid Deployment of Air Quality Monitoring for Community Health Guideline October 2015 Version 1.0* were all met in full or in part. The two partial findings were for Tier 1 monitoring by the fire services that may not have commenced within the first hour of the fire, and the decision guide for rapid deployment that was not used although the decision to deploy is considered correct.

5 Conclusion

Application of the Smoke Framework at the Somerton Tip Fire was reviewed through analysis of incident documentation and interviews with key incident and emergency management personnel.

Of the 112 requirements distilled from the five policy documents that constitute the Smoke Framework, 88 were found to have been applied in full and seven in part at the Somerton Tip Fire. Of the others, 13 were deemed not applicable to Somerton and two remain unknown. Only two requirements were not met, and one of these, relating to the support desired from the owners/operators of the waste facility, was outside the control of the fire and emergency services.

All personnel interviewed as part of this Review credited the Framework for greatly increased cooperation and common understanding compared to the Hazelwood Mine Fire, with the work of EPA being particularly acknowledged by the fire services. Whilst most respondents suggested improvements to the Framework and its application, they recognised that the Framework defined clear roles for each agency and guided interactions between them; to provide an effective focus on smoke management and reduce the potential for harm to responders and the community.

Future application of the Framework would be assisted by finalisation of agency procedures; development of systems to better manage atmospheric monitoring data, provision of training to emergency responders and incident/

emergency management personnel; and the conducting of multi-agency exercises focusing on smoke management. Further guidance is required by I/EMT on managing community health impacts during the first 24-hours when limited advice may be available from DHHS, and on responsibility for managing off site consequences during large smoke events.

6 References

DHHS (2015) *Somerton Waste Facility Fire 20 November 2015*. Department of Health and Human Services, Melbourne.

DHHS & EPA (2015) *Community Smoke, Air Quality and Health Protocol 29 July 2015 Version 2.0*. Department of Health and Human Services & Environment Protection Authority Victoria, Melbourne.

EMV (2015a) *State Smoke Framework September 2015 – update Version 2.0*. Emergency Management Victoria, Melbourne.

EMV (2015b) *Standard for Managing Exposure to Significant Carbon Monoxide Emissions July 2015 Version 2.0*. Emergency Management Victoria, Melbourne.

EMV (2015c) *Review Plan: Review of the Operational Application of the State Smoke Framework to the Somerton Tip Fire*. Emergency Management Victoria, Melbourne.

EMV (2015) *Sydney Rd – Somerton, Estimated Smoke Concentration and Dispersion 1200-2000hrs 21/11/2015*. IMT Document. Emergency Management Victoria, Melbourne.

EMV (2015) *Sydney Rd – Somerton, Estimated Smoke Dispersion 0000-0800hrs 22/11/2015*. IMT Document. Emergency Management Victoria, Melbourne.

EMV (2015) *North and West Metropolitan Region Regional Strategic Plan 20 November 2015*. Incident Name:

Somerton – Sydney Rd. Emergency Management Victoria, Melbourne.

EMV (in prep a) *Managing Significant Exposures to Carbon Monoxide in the Community Draft Joint Standard Operating Procedure*. Emergency Management Victoria, Melbourne.

EMV (in prep b) *Managing Significant Community Exposures to Fine Particles from Smoke Draft Joint Standard Operating Procedure*. Emergency Management Victoria, Melbourne.

EMV, EPA & DHHS (2015) *Rapid Deployment of Air Quality Monitoring for Community Health Guideline October 2015 Version 1.0*. Emergency Management Victoria, Environment Protection Authority Victoria and Department of Health and Human Services, Melbourne.

IGEM (2015) *Monitoring and Assurance Framework for Emergency Management*. Inspector-General for Emergency Management, Department of Justice and Regulation, Melbourne.

IMT (2015) *Somerton – Sydney Road Fire: Smoke, Carbon Monoxide and Asbestos Management Plan V1 21/11/2015*. IMT Document.

IMT (2015) *Community Information Newsletter Somerton – Sydney Road Sunday 22 November 2015*. IMT Document.

MFB (2011) *Protective Action Decision Guide for Emergency Services during*

Outdoor Hazardous Atmospheres: Shelter-in-Place Report. Metropolitan Fire and Emergency Services Board, Melbourne.

REMT (2015) NWM REMT Teleconference Minutes 20/11/15 - 24/11-15. North West (Metro) Regional Emergency Management Team, Melton.

PIO (2015) *Public Information / Community Engagement Strategy Somerton – Hume Hwy 21/11/2015.* IMT Document.

PIO (2015) *Public Information Strategy of Industry Engagement 22/11/2015.* IMT Document.

Appendix 1 Implementation of the State Smoke Framework

N.b. Acronyms used to identify sources of information regarding implementation are explained at the end of this Appendix.

State Smoke Framework September 2015 – update v2.0

Framework intent or requirement and page reference	Implementation	Comments	Source
Events include smoke or emissions from extended bushfires, large-scale planned fuel reduction, landfill and waste facility fires, open-cut coalmine fires, industrial and hazardous materials fires, or emissions from chemical fires and spills. P4.	Y	Somerton Tip fire qualified as a landfill or waste facility fire.	RC, IC1, IC2, D/IC, CAD, PIR, SME
The purpose of the State Smoke Framework and associated planning is to: Integrate Victoria's emergency management services and planning across the sector; respond to community concerns and manage the consequences of large, extended or complex events, including the public health impacts or exposure to smoke or emissions; recognise that each extended smoke event is unique, involving different air pollutants that may pose public health risks and specific community concerns; and identify potential smoke-related scenarios and the overarching arrangements for managing the impacts of smoke and other emissions on air quality and community health, particularly for events close to populations. P5.	Y	Emphasis on management of potential consequences of smoke over extended duration. Integrated approach by multiple agencies.	RSP, RC, IC1, IC2, D/IC, HC, SciAdv, HMTMgr, IAP, REMT, RLAAR, SME, SMP

Specifically the Framework will ensure: ICs and DHHS receive the most accurate, timely and relevant information about air quality measurements, assessments and forecasts from EPA so they can conduct proactive and comprehensive assessments of public health risks associated with events in or near communities; there are clear triggers for actions during an event for emergency services, agencies (such as the EPA and DHHS) and the community (including workplaces); agencies and personnel involved in the response to an incident have the capacity (equipment) and the capability (expertise) to undertake monitoring and produce meaningful data; public health messages are revised so they convey clear, action-oriented information; and knowledge of different communities informs decisions about the delivery and preparation of information and monitoring how this is received. P5.	Y	Meaningful air quality monitoring and forecasts provided. Public health messages reflected nature of the fire. Dissemination of community information was tailored to key audiences.	RC, IC1, D/IC, SciAdv, PIO, PIO log, PIS, PISIE, OSOM
Application of Shelter indoors (shelter-in-place) guide. P11.	Y	SIP recommended for those experiencing symptoms.	OSOM
Under the State Smoke Framework, the community and emergency workforce will be provided with clear, consistent information, which is based on validated intelligence and data. P13.	Y	Community provided with clear, consistent information based on actual and predicted fire conditions.	OSOM, PIO, PIO log, PIS, PISIE, HMTMgr, ILAAR
Appreciation undertaken in line with Table 1: Decision matrix and Figure 2: Ready reckoner. P14.	Y	Tools were not used, but appreciation was in line with the considerations for IC listed in the Framework.	RC, IC1

Standard for Managing Exposure to Significant Carbon Monoxide Emissions - Responder

Framework intent or requirement	Implementation	Comments	Source
This standard should be used to inform agency-specific protocols, SOPs, training procedures and decision support tools. P5.	In part	Fire service JSOPs draft at time of fire and IMT had little familiarity with them. Very limited 'training' provided via pre-summer briefings. AV and CFA had health monitoring procedures.	IC1, D/IC, PIO, ILAAR, RLAAR, HC, SME, SMP
If the first responder agency assesses that CO levels represent a possible OHS risk but there is no nearby community, implement appropriate procedures to protect responder health and safety. P26.	Y	Procedures for responder safety implemented.	IC1, IC2, HMTMgr, HC, IAP, SME
Industry should activate the appropriate technical staff. P26.	N	Eco Tech Solutions was not operating at time of fire and was subject of legal proceedings.	RC, IC1, IC2, RTPM
Hazmat specialists and fire service scientific officers should be activated. P26.	Y	MFB SciAdv(s) and Hallam Hazmat responded morning of Day 1.	RC, IC1, IC2, D/IC, SciAdv, CAD, PIR, SME
In addition to CO monitoring, when, responded fire services Hazmat technicians and Scientific Advisors will determine the potential for significant concentrations of other atmospheric contaminants in smoke based on risk assessment of the fuel source. P8.	In part	Site known to EPA and CFA. EPA advised on nature of fuel. Pre-planning in place for a fire at the facility. No evidence obtained of a formal risk assessment by I/EMT of the fuel source. Full scientific site analysis was available.	RC, IC1, D/IC, SciAdv, RSP, PIR, EPA EMLO

The scope of gases includes combustible gases, oxygen, hydrogen sulphide, carbon monoxide, carbon dioxide, hydrogen cyanide, sulphur dioxide, nitrogen dioxide, total volatile organic compounds, chlorine and ammonia. P8.	Y	Hand held detectors and Area RAEs are multi-gas detectors.	SciAdv, EPA SciOff, SMP, AR data
Where there is a risk of exposure to the public from other atmospheric contaminants (e.g. PM2.5) EPA may be engaged to monitor atmospheric contaminants in the adjacent community. P8.	Y	EPA conducted PM monitoring.	RC, IC1, IC2, D/IC, SciAdv, CAD, SMP, RTPM, EPA EMLO, EPA SciOff, SME
In the event of a long duration incident, where the use of SCBA has been deemed impractical, an occupational hygienist may be engaged to monitor additional atmospheric contaminants based on risk assessment. P8.	Y	SCBA was deployed for firefighters working in smoke. Hygienist attended to test equipment for asbestos prior to release.	IC1, SciAdv, SME
CO atmospheric monitoring results will need to be interpreted and scientific advice obtained. P8.	Y	SciAdv and EPA staff on scene provided interpretation and advice.	IC1, D/IC, SciAdv, SME
CO monitoring options - Hand-held Atmospheric; Fixed Atmospheric; Personal Atmospheric; Personal Biological (Health) monitoring. P9.	Y	All options utilised during the fire, other than EPA fixed stations which were too far away.	IC1, IC2, D/IC, SciAdv, HMTMgr, HC, IM, SME
Listed Exposure Standards are mandatory under the Victorian OHS Regulations 2007. They establish a maximum upper limit for worker exposure, therefore all reasonably practicable steps must be taken to eliminate or minimise exposure to a level well below the exposure standard. P11.	Y	PPE (inc. SCBA) and work practices minimised exposure for firefighters. Plant withdrawn when threshold reached.	IC1, IC2, IAP, SME
Figure 1 Thresholds for exposure to CO for firefighters. P13.	Y	PPE (inc. SCBA) and work practices minimised exposure for firefighters. Plant withdrawn when threshold reached.	IC2, AR data, SME

The IC will be supported and receive advice from an Incident Safety Officer and Safety Advisors and other specialist resources as required. P14.	Y	Safety Officer appointed, Hygienist & SciAdvs attended.	D/IC, HMTMgr, SciAdv
Hazmat Technicians and SciAdvs will undertake continuous atmospheric monitoring during an incident. P14.	Y	Monitoring (spot and continuous) occurred on fire ground (inc. in plant), immediate surrounds and downwind of the site.	RC, IC1, IC2, D/IC, SciAdv, AR data, IM, SME
Personal CO atmospheric monitors will be utilised by each team in potential high exposure events. P14.	Y	08:00 20/11 IAP states CO monitoring in all sectors. Personal CO monitors deployed with some teams. Concern expressed that additional monitors were slow to arrive.	IAP, SciAdv, HMTMgr, SME
Responders must adhere to agency SOPs and safety directions issued by the IC. P14.	In part	No reports of non-compliance with instructions by emergency service personnel, inc. health monitoring after it was made mandatory. Non-compliance by some private plant operators.	RC, IC1, IC2, ILAAR
HMTs will conduct health checks in accordance with the principles outlined in Attachment 4 - Standard Approach for CO Health Monitoring Process. P14.	Y	Some delay reported in implementing effective health monitoring, and longer delay in it being made mandatory.	HC, HMTMgr, RC, IC1, IC2, RLAAR, RTPM
All personnel will enter through the staging area and be directed to the health monitoring area for biological COHb monitoring. P35.	Y	Some delay reported in implementing effective health monitoring, and longer delay in it being made mandatory.	HC, HMTMgr, ILAAR

A HMT member records: COHb reading, time, name, organisation and appliance/location point, smoker on non-smoker status, previous activity with the fire in the last 24 hours, pre-existing medical conditions/pregnancy or possibility of pregnancy. P14.	Y	Requisite data collected.	HC, HMTMgr
Crew leaders will ensure crews are rotated on a two-hourly basis and undertake entry, exit and re-entry health monitoring protocols. P14.	Y	2 hourly crew rotations. Some delay in establishing effective health monitoring.	IC1, IC2, ILAAR, RTPM
All health and safety incidents are to be reported and this information will be shared on an ongoing basis with responders to improve risk awareness. P14.	N/A	No OHS incidents reported.	IC1
There is a requirement for identified incidents and dangerous occurrences to be notified to WorkSafe Victoria. P14.	N/A	No OHS incidents reported.	IC1
It is the responsibility of all responders to disclose all pre-existing conditions that may put them in one of the above categories (i.e. pre-existing conditions that may exacerbate health impacts). P14.	Y	No reports of responders not disclosing relevant pre-existing conditions. Issues that didn't affect immediate fitness for duty remained confidential.	HC, HMTMgr
Ideally, crews previously involved in other fire incidents should have 24 hours of "clear time" prior to being deployed to a large and complex fire producing significant amounts of CO. P14.	N/A	Significant amounts of CO were not detected, other than in contracted plant.	AR data, SME
On shift change, strike teams are to be given a specific briefing on health and CO exposure issues. P34.	Y	Briefing provided once health monitoring in place.	HMTMgr
Ensure there is at least one personal CO detector per crew while working at the site. P34.	In part	Personal CO monitors deployed with some teams in high exposure roles. Concern expressed that additional monitors were slow to arrive.	SciAdv, HMTMgr

Readings should be noted as follows: log the detector CO reading every 15 minutes on the attached sheet; provide average and peak readings and map grid/location reference of location to the Operations Point every hour via radio. P34.	Not known	Data from personal CO monitors not provided to Terramatrix.	
Where any results of health observations do not meet the criteria established personnel are not to be deployed. P15.	Y	One plant operator was referred to medical care due to excessive COHb reading.	IC2, HC, HMTMgr
Crew deployment shift times are to be monitored and recorded to ensure they do not exceed the maximum timeframes. P15.	Y	N.b. evidence of recording of shift times not sought.	IC1, ILAAR
There will be personal biological monitoring for carboxyhaemoglobin (COHb) pre-shift, at breaks and post-shift. P15.	Y	Some delay reported in implementing effective health monitoring, and longer delay in it being made mandatory.	HC, HMTMgr, IC1, IC2, ILAAR, RTPM
Crew health observations are to be recorded in accordance with the Health Monitoring Process. Crew health observations may be undertaken by an advanced first aider under the supervision of a health professional. P15.	Y	Mernda Rehab crew working with AV under supervision of HC.	HC, HMTMgr
All CO health monitoring results are to be logged, reported to communications and maintained by HMT. P15.	Y	Records completed and maintained by HMT. Records retained by AV and CFA.	HC, HMTMgr
All crew members must be checked by health monitoring personnel prior to entering the hot zone, at breaks and post-shift when established. P34.	Y	Health monitoring of all personnel occurred once process fully implemented.	HC, HMTMgr, ILAAR, IC1, IC2
The incident is to be deemed a non-smoking incident to reduce the impact of CO build up in individuals. P15.	N	Not implemented.	IC1, IC2, HMTMgr, SME

Personnel will not be permitted to leave the site without appropriate clearance provided by the health monitoring personnel. P34.	Y	Pre-release health monitoring occurred once process fully implemented.	HC, HMTMgr
Results that exceed 8% are to be investigated as an OHS breach to ensure crew welfare is not placed at risk and appropriate control strategies are in place. P15.	In part	No evidence provided that plant operator who recorded >10% after 30 minute break was investigated <u>formally</u> . Several respondents declared they believed he was smoking in cab.	HMTMgr, IC2
Community engagement and public information officers when engaged will be issued personal biological COHb monitors. P15.	Y	PIOs covered by health monitoring once process fully implemented.	PIO, HMTMgr
All crew with COHb >5% must have a clear 24 hour break prior to next tour to allow sufficient time for natural clearance of accumulated low levels of CO from the body. P15.	Not known	Couple of firefighters with readings >5%. 3 plant operators with readings >5%.	RC, HMTMgr
All crew with COHb >8% must be referred for further health assessment to a doctor or hospital and have a clear 48 hour break prior to next tour to allow sufficient time for natural clearance of accumulated low levels of CO from the body. P15.	Y	One plant operator excluded from fire due to COHb >8%.	HC, IC2
Personal protective clothing is to be worn at all times in accordance with agency procedures. P15.	Y	No reports of non-compliance.	IC1, IAP
Crews are to use SCBA in accordance with Standard Approach for CO Health Monitoring Process. P15.	Y	SCBA used by fire crew working in smoke.	IC1, IAP, RTPM, CAD
Crews not wearing SCBA are to use a P2 particulate respirator for protection from particulates in smoke (not CO). P15.	Y	P2 masks in use by crews working in Hot Zone but not in smoke.	IC1, SciAdv, IAP
SCBA cylinders must be refilled and maintained in an area with the least amount of atmospheric CO present. P16.	Y	Cylinders filled on scene but in Cold Zone.	IC1, RSP

Crews can only work for 2 hours and then must have a 2 hour break. P16.	Y		IC1, ILAAR
Shift arrangements should be regularly reviewed and modified based on additional risks identified such as extreme heat, cold or wet conditions; heavy smoke logging, work activity, work rate, on the advice of the relevant Medical Officer or HC. P16	Y	Shift arrangements varied with level of exposure and nature of work.	IC1
If in any one hour period there are two measurements greater than 60ppm workers must relocate/withdraw immediately or don BA to remain working in the location. This must be reported immediately to the Operations Point. P34.	Y	Operations suspended overnight 21-22/11/15 as CO levels increased.	REMT, AR data
At any time a CO reading of greater than 100ppm is recorded BA must be donned or workers must withdraw immediately. This must be reported immediately to the Operations Point. P34.	Y	Operations suspended overnight 21-22/11/15 as CO levels increased.	REMT, AR data
Prior to end of shift crew members should be made aware of the symptoms of CO exposure and advised to present to hospital should these occur. P16.	Y	Briefing provided once health monitoring fully implemented.	HMTMgr
Aircrew working overhead the defined area are subject to the Standard. P16.	Y	Personal CO monitor placed in aircraft.	HMTMgr

Standard for Managing Exposure to Significant Carbon Monoxide Emissions - Community

Framework intent or requirement	Implementation	Comments	Source
For the purposes of exposure to CO in emergency situations, long-term exposure is defined as being periods of 24 hours or longer. P19.	Y	Fire was predicted to, and did, exceed 24 hours but community exposure was limited for much of that time.	REMT, RSP, CAD, AR data
EPA should be activated and asked to initiate monitoring in the community area. P26.	Y	EPA notified early and EMLO attended scene ~ 06:45 Day 1.	RC, IC1, D/IC, SciAdv, EPA EMLO, CAD, CU, DHHS release, SMP
If there is a delay to the establishment of EPA community atmospheric monitoring, first responder monitoring equipment should be deployed into community areas impacted by the smoke plume to assess the extent and severity of CO risk to the community. P26.	Y	Fire service Area RAEs deployed in community areas by mid-morning Day 1, along with EPA Smoke Tracker.	SciAdv, IM, SMP, SME, EPA EMLO
Atmospheric monitoring should be continuous to enable interpretation of results. If continuous monitoring is not available, "spot" monitoring should be repeated at frequent intervals at the same monitoring point in order to provide averaged results or trends in data, The frequency of monitoring should be at not more than 5 minute intervals. P26.	Y	Area RAEs undertook continuous monitoring at key locations from mid-morning Day 1. Some spot monitoring had occurred prior to this.	IC2, D/IC, SciAdv, AR data, SME
CO monitoring results need to be reviewed and verified and reported as either a graph or a time series including all results with time and location of measurement. P27.	Y	No evidence provided of this particular form of analysis, but elevated readings were investigated and compared against trigger thresholds by SciAdv and EPA.	SciAdv, AR data

CO monitoring results need to be interpreted with supporting information including maps of affected community specifying monitoring positions, plume modelling of smoke dispersion, and predictions of local weather for next 12 to 24 hours. Maps should identify facilities with vulnerable people, such as childcare facilities, schools, health services and residential aged care facilities. P27.	Y	Maps of affected area produced. Plume modelling conducted and maps produced showing facilities and populations potentially exposed. Incident prediction utilised weather forecasts.	IC1, D/IC, SciAdv, PIR, ESCD, SMP
...exposure and associated health effects become more chronic than acute. If that situation arises, then consideration should be given to the use of a CO concentration in air equivalent to 2.5% COHb which is a blood concentration at which there are no observed adverse effects on health. P19.	N/A	Exposure levels not reached.	D/IC, AR data, SME
CO monitoring continues until fires are sufficiently controlled to ensure that community health is protected. P19.	Y	Monitoring continued until 26 November.	AR data
Options to protect the community from prolonged exposure to high levels of CO include: advice about increased levels of CO and the need to minimise physical activity and stay aware of further alerts; warning with instructions to take shelter indoors until conditions improve or further advice is received; emergency warning to relocate or instruct to take shelter indoors; evacuation with specific instructions on where to go, how to get there and what to take. P19.	N/A	Exposure levels not reached.	D/IC, AR data, SME
Figure 2 Thresholds for exposure to CO for public. P22.	Y	Close the Loop and VEMTEC average readings did not require action. Readings from NW paddock would have required action but no community in that vicinity.	AR data

The duration of exposure (plume movement) is predicted based on advice from BoM and available plume modelling, taking into account the current and forecast fire status and the size and proximity of the community to the fire. P22.	Y	Plume modelling conducted. Incident prediction utilised weather forecasts.	PIO log, PIR, ESCD, SMP
BoM should be requested to provide advice on local weather conditions. P26.	Y	Spot weather forecasts obtained.	D/IC, RLAAR, CAD, IAP
If hourly averaged CO concentrations reach the trigger level of 27ppm (i.e. AEGL 2 8 hour average) for 3 consecutive hours then fire status and weather conditions will be reviewed to estimate the likely duration of community exposure to this concentration. Where weather conditions and plume modelling indicate that the community may be exposed to average CO concentrations \geq 27ppm for less than 8 consecutive hours then appropriate community advice may be issued. If the plume is predicted to extend for a period beyond 8 hours then the community may be advised to shelter indoors. P23.	Y	Trigger levels not reached.	AR data, SME
If hourly averaged CO concentrations reach the trigger level of 33ppm (i.e. AEGL 2 4 hour average) then fire status and weather conditions will be reviewed to estimate the likely duration of community exposure to this concentration. Where weather conditions and plume modelling indicate that the community may be exposed to average CO concentrations $>$ 33ppm for less than 4 consecutive hours then appropriate community advice may be issued. If the plume is predicted to extend for a period of 4-10 hours then the community may be advised to shelter indoors. If the plume is predicted to extend for a period of $>$ 10 hours then formal evacuation of the community will be considered. P23.	Y	Trigger levels not reached.	AR data, SME

If the half hour average CO concentration reaches the trigger level of 70ppm (i.e. AEGL 2 1 hour average with a safety factor applied) then fire status and weather conditions will be reviewed to estimate the likely duration of community exposure to this concentration. Where weather conditions and plume modelling indicate that the community may be exposed to average CO concentrations > 70ppm for up to 4 hours, Emergency Warnings may be issued advising the community to shelter indoors. For an exposure period between 4 and 6 hours, Emergency Warnings may be issued to advise the community to relocate. If the plume is predicted to extend for a period of 6 hours (i.e. the time for indoor CO concentrations to equilibrate with outdoor CO concentrations), then formal evacuation of the community will be considered. P23.	Y	Trigger level not reached except for afternoon of 21 November in the NW paddock where no community was exposed.	AR data, SME
Close monitoring of potential public health risk will be triggered by an elevation of the CO concentration at or above the National Environment Protection Measures of 9ppm which is based on COHb concentrations of 2.5%. P24.	Y	Monitoring undertaken, but no elevated readings beyond the immediate fire area.	AR data
The IC will provide information to the EPA and DHHS on first responder assessment of any CO impacts from incident. P24.	Y	IC provided information to EPA and DHHS.	RC, IC1, SciAdv, EPA EMLO
The IC will continue to provide qualitative assessment and any available data from equipment deployed by first responders to EPA for their assessment and advice back. EPA will provide assessments to DHHS. P25.	Y	IC provided information to EPA and DHHS. EPA provided assessments to DHHS.	RC, IC1, SciAdv, SMP, EPA EMLO, EPA SciOff
EPA will request BoM and other organisations to provide advice on predicted weather conditions for affected communities for use by the EPA and other agencies. P25.	Y	Incident prediction utilised weather forecasts.	EPA EMLO, EPA SciOff

EPA has fixed and mobile air monitoring stations in Melbourne, Geelong and Latrobe Valley, as well as capacity to deploy mobile air monitoring equipment in other parts of Victoria. P25.	Y	Mobile equipment deployed. Fixed stations were not of use at Somerton due to their location.	EPA EMLO, SME
In the event of actual or predicted adverse conditions, EPA may undertake or be requested by the IC (or DHHS via the IC) to initiate continuous monitoring to determine CO concentrations in potentially impacted communities. EPA will provide DHHS with interpreted data for public health assessment. P25.	Y	Continuous monitoring initiated. EPA provided DHHS with interpreted data.	IC1, D/IC, SciAdv, REMT, EPA EMLO, SME
CFA and MFB may support the IC by undertaking predictive modelling of the smoke plume. P25.	Y	CFA provided predictive modelling of the smoke plume.	RC, IC1, IC2, D/IC, SciAdv, IAP, PIR, ESCD, ST
The IC will advise the CHO of the predicted fire duration and suppression strategies. P25.	Y	IC advised CHO.	IC1, IC2
CO monitoring results and supporting information should be provided to DHHS for analysis. The CHO will assess the risk to the public health of the community and provide advice to the IC. P27.	Y	Discussion of results between CHO and IC, and at State level.	ST
The CHO will assess the advice received from the EPA and IC. The CHO will determine the risk to public health of impacted communities, and provide advice to the IC regarding appropriate actions. P25.	Y	CHO approved standard messaging templates. CHO attended fire scene & public meeting.	ST, PIO, PIO log
The IC will lead the EMT in their consideration of whether an evacuation of a community or part of a community is required. P25.	Y	Evacuation not required due to low level of exposure.	D/IC, AR data
Given that the quantity and quality of information and data will generally increase over time as the incident unfolds, the CHO will form their advice on the best available information at any point in time. P25.	Y	Geographic reach of messaging refined to reflect limited and low level exposure to smoke and CO.	PIO, OSCOM
The IC will determine an appropriate strategy for protection of the community including the issuing of information to the community	Y	Community protection strategy articulated in messaging to	RC, IC1, IC2, D/IC, PIO, PIO log, PIS

regarding CO as required. P25.		community.	
For long duration events consideration should be given by the IC in consultation with the CHO and the EMC to a communications strategy to keep the community informed of the hazard of CO and potential health concerns. P27.	Y	Public information strategy documented and implemented.	RC, PIO, PIS
The IC will provide warnings and information to the community. P27.	Y	Watch & Act and Advice messages issued to affected areas as required.	RC, IC1, CAD, PIO, PIO log, OSOM, PIR
VicPol will prepare a staged evacuation plan for communities likely to be impacted by smoke from fires with the greatest CO producing potential at the request of the IC. Such plans should be prepared as early in the emergency as feasible. Staged evacuation will remove those community members and building occupants with greatest proximity to the source of CO first. P25.	N/A	Evacuation not required due to low level of exposure.	D/IC, AR data
EPA will provide advice on CO levels at locations nominated by DHHS as potential places for relocated communities. P25.	N/A	Not required due to low level of exposure.	REMT
DHHS in conjunction with local government will coordinate relief and recovery arrangements for relocated communities. P25.	Y	3 relief centres were pre-planned by HumeCC but not required due to low level of exposure.	RSP, REMT, PIO log

Community Smoke, Air Quality and Health Protocol

Framework intent or requirement	Implementation	Comments	Source
The IC will provide information to the EPA and DHHS on first responder assessment of any smoke and related air quality impacts from the incident. P6.	Y	IC provided information to EPA and DHHS.	RC, IC1, SME
The IC will continue to provide qualitative assessment and any available data from equipment deployed by first responders to EPA for their assessment and advice back. EPA will provide assessments to DHHS. P6.	Y	Continuous monitoring initiated. EPA provided DHHS with interpreted data.	IC1, D/IC, SciAdv, EPA EMLO, EPA SciOff
EPA will request BoM and other organisations to provide advice on predicted weather conditions for affected communities for use by the EPA and other agencies. P6.	Y	Incident prediction utilised weather forecasts.	CAD, EPA EMLO
EPA has fixed and mobile air monitoring stations in Melbourne, Geelong and Latrobe Valley, as well as capacity to deploy mobile air monitoring equipment in other parts of Victoria. P6.	Y	Mobile equipment deployed. Fixed stations were not of use at Somerton due to their location.	EPA EMLO
In the event of actual or predicted adverse conditions, EPA may undertake or be requested by the IC (or DHHS via the IC) to initiate continuous monitoring to determine appropriate air quality parameters (e.g. PM2.5) in potentially impacted communities. EPA will provide DHHS with interpreted air quality data for public health assessment. P6.	Y	Continuous monitoring initiated. EPA provided DHHS with interpreted data.	IC1, D/IC, SciAdv, EPA EMLO, EPA SciOff
DELWP may support the IC by undertaking predictive modelling of the smoke plume. P6.	N/A	CFA provided smoke plume modelling.	RC, IC1, IC2, D/IC, ESCD, SciAdv, IAP, PIR
The IC will advise the CHO of the predicted fire duration and suppression strategies. P6.	Y	IC advised CHO.	IC1, IC2
The CHO will assess the advice received from the EPA and IC. The CHO will determine the risk to public health of impacted communities, and	Y	CHO approved standard messaging templates. CHO attended fire scene.	DHHS brief, PIO, PIO log

provide advice to the IC regarding appropriate actions. This could include the temporary relocation of the most vulnerable members of the community (i.e. sensitive groups). P6.			
Given that the quantity and quality of information and data will generally increase over time as the incident unfolds, the CHO will form their advice on the best available information at any point in time. P6.	Y	Evidence of CHO working with SCC and I/EMT on messaging.	PIO
The IC will determine an appropriate strategy for protection of the community including, on advice of the CHO, the issuing of information to the community regarding PM2.5 as required. P6.	Y	Community protection strategy articulated in messaging to community.	RC, IC1, IC2, D/IC, PIO, PIO log, PIS, CU
The IC will lead the EMT in their consideration of whether an evacuation of a community or part of a community is required. P6.	Y	Evacuation not required due to low level of exposure.	D/IC, AR data
Victoria Police will prepare a staged evacuation plan for communities likely to be impacted by smoke from fires with the greatest CO producing potential at the request of the IC. Such plans should be prepared as early in the emergency as feasible. Staged evacuation will remove those community members and building occupants with greatest vulnerability and greatest proximity to the source of smoke first. P6.	N/A	Evacuation not required due to low level of exposure.	D/IC, AR data
DHHS in conjunction with local government will coordinate relief and recovery arrangements for relocated communities. P6.	Y	Relief centres were pre-planned by HumeCC but not required due to low level of exposure.	PIO log
EPA also forecasts air quality on a daily basis and communicates this via its webpage. P7.	Y	Archival data show that Somerton Tip Fire did not adversely affect reported air quality.	AirWatch
During a significant fire or smoke event, EPA may be requested by the IC to rapidly deploy monitoring equipment to the incident. P7.	Y	Rapid deployment undertaken at IC request.	RC, IC1, IC2, D/IC, EPA EMLO, SME

For the purposes of evaluating and implementing risk management options to protect the community from exposure to PM2.5 during smoke events, timeframes can be defined as follows: short term - generally 1 hour to 24 hours and up to a few days; medium term - days to a few weeks; long term - anything greater than a few weeks. P8.	Y	Likely duration of fire was assessed and periodically reviewed as short-medium term, 'a few days'.	RC, IC1, IC2, D/IC
There are four specific procedures based on air quality categories as follows: Procedure for Unhealthy - Sensitive to Very unhealthy - All air quality categories; Procedure for Hazardous air quality category; Procedure for issuing temporary relocation advice; Procedure for lifting temporary relocation advice. P8.	N/A	Temporary re-location not required.	D/IC
Procedure for Unhealthy - Sensitive to Very Unhealthy - All air quality categories. P10.	N/A	Trigger not reached.	No evidence sought
Procedure for Hazardous air quality category. P11.	N/A	Two days of Hazardous (Extreme) air quality not recorded.	No evidence sought
Table C: PM response procedures between EPA and DHHS for Hazardous Air Quality. P14.	Not known	Communication between EPA and DHHS occurred at State level but was not investigated in this Review.	EPA EMLO, SME
Annex 3 - Hazardous air quality decision tree. P22.	Y	Very unhealthy (all) threshold not reached, so ongoing EPA monitoring was appropriate response.	No evidence sought

Rapid Deployment for Air Quality Monitoring for Community Health

Framework intent or requirement	Implementation	Comments	Source
Matrix to guide decision making for deployment. P7.	In part	IMT did not use the decision matrix, but their response was appropriate to the score they would have got (i.e. High rating to trigger deployment).	RC
Tiered Response Model. P9.	Y	Fire service provided Tier 1 although it is unclear whether spot monitoring commenced within the first hour. Tier 2 response by EPA provided within allowed timeframe.	RC, CAD, SciAdv, D/IC, SME
State Resource Request Process Flow/Tiered Response Model/Deployment Process/Information Management. P8-10.	Y		RC, CAD, SciAdv, EPA EMLO

Note on Sources, in alphabetical order:

- AirWatch – Archived reports on EPA AirWatch web site for midday November 20 and 21
- AR data – Area RAEs data (Days 1-6) - Excel spread sheet
- CAD = Incident CAD Comments Detail (Days 1-12) - document
- CU – Community Update (various days) – various documents released by IMT and/or agencies
- D/IC = Deputy Incident Controller (Days 1-2) - interview
- EPA EMLO – Environment Protection Authority Emergency Management Liaison Officer (Days 1-6) – interview
- EPA SciOff - Environment Protection Authority Senior Applied Scientist (Day 3) - interview
- ESCD – Estimated Smoke Concentration and Dispersion Analysis (Days 2-3) - document
- HC = Health Commander (Day 1) - interview
- HMTMgr = Manager CFA Health Monitoring Team (Day 2) - interview
- IAP = Incident Action Plans (Days 1-2) – documents
- IC1 = Incident Controller (Day 1) - interview
- IC2 = Incident Controller (Days 2-4) - interview
- ILAAR = Incident Level After Action Review – document
- IM = Incident Messages (Days 2-7) - document
- OSOM = One Source One Message for Somerton Hume Hwy (Days 1-6) - document
- PIS = Public Information/Community Engagement Strategy (Day 2) – document
- PISIE = Public Information Strategy for Industry Engagement (Day 3) - document
- PIO = Public Information Officer (day shift Days 1-3) – interview
- PIO log = Public Information Officer log (day & night shift) - document
- PIR = Preliminary Incident Reports (Day 1) - documents
- RC = Regional Controller (Days 1-6) - interview
- REMT = Regional Emergency Management Team teleconference minutes (Days 1-5) - documents
- RLAAR = Region Level After Action Review – document
- RSP = North and West Metropolitan Region Regional Strategic Plan 20 November 2015: Somerton – Sydney Road - document
- RTPM – Real Time Performance Monitoring Team Report – document
- SciAdv = Scientific Adviser (Days 1-2) – interview
- SME = EMV Smoke Management Subject Matter Expert (Days 1-4) - interview
- SMP = Smoke, Carbon Monoxide and Asbestos Management Plan 21/11/15 – document
- ST = Somerton State teleconference 18:30 20 November 2015 minutes - document

Appendix 2 Summary of Community Messaging Relevant to Smoke Framework

Date	Time	Type	Geographic Area	Summary of Message relevant to Smoke Framework
Fri-20-Nov-15	03:40	Advice	Somerton	Smoke issuing. Shelter indoors. Currently no threat. Seek medical advice if any symptoms.
Fri-20-Nov-15	08:25	Watch & Act	Craigieburn & Somerton	Smoke beginning to impact on houses & businesses between Craigieburn Rd, Hume Hwy, Bridgewater Rd/Donald Cameron Rd and Somerton Rd. Shelter indoors. Atmospheric monitoring occurring. Seek medical advice if any symptoms.
Fri-20-Nov-15	08:43	Watch & Act	Craigieburn & Somerton	As per 08:25 Watch & Act
Fri-20-Nov-15	12:43	Watch & Act	Craigieburn & Somerton	As per 08:25 Watch & Act. Additional advice for vulnerable people.
Fri-20-Nov-15	13:36	Watch & Act	Craigieburn & Somerton	As per 12:43 Watch & Act. Amended coverage area – Applies to those in area surrounded by Craigieburn Rd and Craigieburn Rd East to the north, Merri Creek to the east, Somerton Rd and Cooper St to the south, and Bridgewater Rd down to Donald Cameron Dr on the west.
Fri-20-Nov-15	15:30	Watch & Act	Somerton	As per 12:43 Watch & Act. Amended coverage area - Thick smoke no longer impacting west of train line between Craigieburn Rd and Somerton Rd. Smoke continues to impact east of train line between Craigieburn Rd and Somerton Rd, and Merri Creek to the east.
Fri-20-Nov-15	17:51	Watch & Act	Somerton	As per 15:30 Watch & Act.
Fri-20-Nov-15	20:24	Advice	Somerton, Lalor & Epping	Smoke visible & may drift towards Somerton, Epping & Lalor. Shelter indoors if suffering respiratory distress. Atmospheric monitoring occurring. Seek medical advice if any symptoms. Additional advice for vulnerable people.

Date	Time	Type	Geographic Area	Summary of Message relevant to Smoke Framework
Fri-20-Nov-15	22:31	Advice	Somerton, Lalor & Epping	Smoke visible & may drift towards Somerton, Epping & Lalor. Shelter indoors if suffering respiratory distress. Atmospheric monitoring occurring. Seek medical advice if any symptoms. Additional advice for vulnerable people.
Sat-21-Nov-15	06:31	Advice	Somerton, Epping, Lalor & Wollert	As per 22:31 Advice. Wollert added to geographic coverage. Re-worded re atmospheric monitoring.
Sat-21-Nov-15	11:31	Advice	Somerton, Epping, Lalor & Wollert	As per 06:31 Advice.
Sat-21-Nov-15	13:58	Advice	Somerton & Craigieburn	Smoke visible and may drift towards Craigieburn Nth. The areas of Epping, Wollert & Lalor are no longer experiencing any significant smoke. Shelter indoors if suffering respiratory distress. Atmospheric monitoring occurring. Seek medical advice if any symptoms. Additional advice for vulnerable people.
Sat-21-Nov-15	18:01	Advice	Somerton & Craigieburn	Predictive modelling & BoM forecast of wind change & lower cloud. Smoke may travel towards Craigieburn tonight and tomorrow. Shelter indoors if suffering respiratory distress. Atmospheric monitoring occurring. Seek medical advice if any symptoms. Additional advice for vulnerable people. Community Information Point will be at Hume Global Learning, Craigieburn 10:00-16:00 with agency representatives.
Sat-21-Nov-15	22:06	Advice	Somerton & Craigieburn	As per 18:01 Advice.
Sun-22-Nov-15	01:00	Community Update	Somerton & Craigieburn	Expected to burn for several days, low level smoke in the Craigieburn & Somerton. Shelter indoors. Community Information Point details. Atmospheric monitoring occurring. Asbestos testing occurring as OHS precaution, not a hazard to community. Seek medical advice if any

Date	Time	Type	Geographic Area	Summary of Message relevant to Smoke Framework
				symptoms. Additional advice for vulnerable people.
Sun-22-Nov-15	06:31	Advice	Somerton & Craigieburn	As per 18:01 Advice.
Sun-22-Nov-15	22:59	Advice	Craigieburn & Somerton	Smoke plume has decreased but still visible. Smell of smoke may also be present in surrounding area. Shelter indoors if suffering respiratory distress. Atmospheric monitoring occurring. Seek medical advice if any symptoms. Additional advice for vulnerable people.
Mon-23-Nov-15	05:14	Community Update	Somerton & Craigieburn	Expected to burn for several days, plume decreased but still visible, may be smell of smoke in surrounding areas. Predictive plume modelling show smoke may be visible in Epping and surrounding areas 3-6am Monday 23 rd . Details of information session for businesses. Atmospheric monitoring occurring – EPA rapid air monitoring equipment on site and surrounding communities. Asbestos testing occurring as OHS precaution, not a hazard to community. Seek medical advice if any symptoms. Additional advice for vulnerable people.
Mon-23-Nov-15	05:33	Advice	Somerton & Epping	As per 22:59 Advice. Details of information meeting for affected businesses to be held at 10:00 at La Mirage.
Mon-23-Nov-15	05:34	Community Update	Somerton & Craigieburn	As per Community Update 05:14
No date	No time	Community Update	Somerton & Craigieburn	As per 05:14 Community Update. No mention of business information session.
Tues-24-Nov-15	03:41	Advice	Somerton	Plume decreased but still visible, may be smell of smoke in surrounding areas. Shelter indoors if suffering respiratory distress. Atmospheric monitoring occurring. Seek medical advice if any symptoms. Additional advice for vulnerable people. Preparations being made in anticipation of

Date	Time	Type	Geographic Area	Summary of Message relevant to Smoke Framework
				warm weather on Wednesday.
Tues-24-Nov-15	05:31	Advice	Somerton & Epping	As per 03:41 Advice. Due to wind change may smell smoke in Epping and surrounding areas.
Tues-24-Nov-15	11:18	Community Update	Somerton	Expected to burn for several days, plume decreased but still visible. Due to predicted westerly winds residents and industry between patullos Lne Somerton & Epping may smell smoke. Shelter indoors if suffering respiratory distress. Atmospheric monitoring occurring. Seek medical advice if any symptoms. Additional advice for vulnerable people. Preparations being made in anticipation of warm weather on Wednesday.
Tues-24-Nov-15	16:05	Advice	Somerton & Epping	As per 05:31 Advice. Weather predictions indicate a possible wind change to the north some time around 2am tomorrow morning which will change smoke direction to the south of the fire possibly impacting on areas between Patullos Lane and Coopers St Somerton.
Tues-24-Nov-15	17:49	Community Update	Somerton	As per 11:18 Community Update. DHHS recommends avoiding any usual fishing or recreational activities in the Merri Creek until EPA advises otherwise. Avoid contact with dead or dying fish, Melbourne Water & EPA monitoring situation.
Tues-24-Nov-15	21:00	Advice	Somerton & Epping	As per 16:05 Advice.
Tues-24-Nov-15	22:16	Community Update	Somerton	As per 17:49 Community Update. Details of industry information session to be held Wednesday 23 rd 09:30 at La Mirage.
Wed-25-Nov-15	03:50	Advice	Somerton, Campbellfield & Epping	Smoke plume has increased due to operations. Due to a change in wind direction smoke will be present in Somerton, Epping, Campbellfield and surrounding areas. Shelter indoors if suffering respiratory distress. Atmospheric monitoring occurring & EPA have reported no concerns.

Date	Time	Type	Geographic Area	Summary of Message relevant to Smoke Framework
				Seek medical advice if any symptoms. Additional advice for vulnerable people. Additional aircraft on standby due to forecast severe fire weather.
Wed-25-Nov-15	05:12	Advice	Somerton, Campbellfield & Epping	As per 03:50 Advice.
Wed-25-Nov-15	06:53	Community Update	Somerton	As per 22:16 Community Update. Smoke plume has increased due to operations. Due to a change in wind direction smoke will be present in Somerton, Epping & Campbellfield
Wed-25-Nov-15	12:46	Community Update	Somerton	As per 06:53 Community Update. Minus industry information session that had already occurred.
Wed-25-Nov-15	16:45	Advice	Somerton, Campbellfield & Epping	As per 05:12 Advice. Due to strong northerly winds smoke will be present in Somerton, Campbellfield and surrounding areas. There is an expected westerly wind change estimated around 7pm which will change the smoke direction to the east towards Epping.
Thur-26-Nov-15	01:30	Advice	Somerton, Campbellfield & Epping	Fire has been extinguished. Shelter indoors if suffering respiratory distress. Atmospheric monitoring occurring & EPA have reported no concerns. Seek medical advice if any symptoms. Additional advice for vulnerable people.