



Australasian Fire and Emergency  
Service Authorities Council

# **Responding to incidents involving landfill gas leaching**

## **Discussion paper**

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## Purpose

1. This paper proposes a national guideline for responding to and treatment of incidents involving gases that have migrated from landfill sites. This is based on learnings from the Brookland Greens Estate incident in Victoria in 2008, when landfill gases infiltrated a nearby subdivision provoking a large scale emergency response. The agreement of a national guideline based on lessons learned from that incident will allow fire services to deal with any future such incidents on the foundation of agreed best practice.

## Background

2. Landfill sites exist in States and Territories around Australia. A known by-product of landfill is landfill gas, a mixture of methane and CO<sub>2</sub>. In the right conditions, landfill gas can travel from the site where it is generated to nearby properties, with the potential to accumulate in confined spaces until the lower flammable limit (LFL) of the methane component is reached. The document at Appendix 1 (the Action Guidelines) lists international cases in which explosions, deaths and injuries have resulted from ignition of landfill gas.
3. The Brookland Greens Estate in Cranbourne, Victoria was the site of Australia's most serious landfill gas incident. Over the objections of the local council, permission had been given to develop a subdivision in close proximity to a former landfill site. In 2008, incidents occurred of landfill gas entering homes and causing widespread alarm among residents, with parts of the Estate being evacuated at one stage. CFA was involved in a long-running emergency response to this incident.
4. The Victorian State Ombudsman issued a report into the Brookland Greens incident. It was complimentary of the emergency response but critical of the failures of the Environmental Protection Agency and the City to work together to manage the issue.
5. An ongoing theme of the Brookland Greens incident was 'when does a landfill gas incident become an emergency'? Although emergency response and management is mandated where levels of landfill gas pose an imminent danger to life and property, it is not the fire service's responsibility to manage the causes of, and long term solutions to these incidents.
6. The *Action Guideline Levels for Methane produced from Landfill, CFA/MFB, 2010* were prepared following review of the lessons learned from the Brookland Greens incident. They are attached to this paper as Appendix 1 ('The Action Guidelines'). The Action Guidelines are written from a Victorian perspective and are based on the decisions made in the specific context of the Brookland Greens incident, but the general learnings in that document are of broader application.

## Issues

7. This paper deals with the issues that arise when there is known to be a landfill gas problem at a location, and monitoring is taking place.
8. Fire services may of course be called where a problem has not previously been identified, for example to smells or even explosions caused by landfill gas. Response will be in accordance with agencies' protocols for such calls. However, if the problem is identified as being related to landfill gas, ongoing management will be required.

## Management of landfill gas incidents

9. The starting point for consideration of this topic is that management of landfill gas is fundamentally an environmental protection issue that in the long term, Environmental Protection Agencies (EPA), local councils and property owners need to manage. Solutions may be behavioural, such as regular ventilation of confined spaces to avoid gas buildup, or structural, such as construction of dedicated pathways for landfill gas to follow from where it can be collected and safely flared off or used. These solutions are not the ongoing responsibility of fire services.
10. Where a fire service responds to a call for assistance, and it is suspected that a previously unaddressed landfill gas problem may be involved, the incident controller will need to notify and hand over the scene to EPA once the initial hazard has been mitigated. It will be for the EPA and other relevant authorities to decide on the ongoing mitigation measures.

## Monitoring and alarms

11. One strategy that may be used for ongoing hazard mitigation is the use of landfill gas detectors in locations that are vulnerable to landfill gas accumulation. These will typically be calibrated to provide an alarm at a set proportion of the lfl.
12. International standards state that evacuation of premises should be considered where methane from landfill gas is present in proportions of 20% (UK) to 25% (USA) of lfl<sup>1</sup>. Accordingly, monitors will typically be set to go into alarm at around 20% lfl (an initial alarm at a lower level may also be provided for).
13. These monitors pose challenges for fire services in that, where there is an existing tendency for landfill gases to accumulate, the monitors may frequently go into alarm if ventilation is for whatever reason inadequate. Fire services may wish to differentiate between a proportion of lfl at which response under emergency conditions is not considered necessary, and a 'trigger point' beyond which emergency response is required.

## Responding to alarms: preplanning

14. It is assumed that, where monitors and alarms are being installed in properties to combat a threat from landfill gas, the fire authority will be notified and involved in discussions about how alarms should be responded to.
15. As discussed above, internationally, evacuation is considered to be indicated where methane levels of 20-25% lfl are present. Some form of fire service response may therefore be assumed to be appropriate to levels of  $\geq 20\%$  lfl.
16. At Brookland Greens, following the risk assessment of the control agency a non-emergency response (normal road rules) level of 20% lfl and emergency response (lights and sirens) level of 80% lfl was settled upon. This would have reflected an assessment of the rate at which %lfl might be expected to increase, and the rapidity with which a response could be mounted.
17. Discussion among the AFAC Hazardous Materials Sub Group arrived at a consensus *starting point* of 50% lfl for an emergency response. This would in most cases provide time for an emergency response, while still representing a significant proportion of lfl.
18. We stress that a risk assessment must be done in each case where a decision is being made about what proportion lfl calls for an emergency response; and repeat that this is only in the context of a known problem where monitoring is occurring. Incident controllers and fire

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<sup>1</sup> Relevant guidance is cited in the Action Guidelines at Appendix 1

services may choose to increase or decrease the 50% figure in light of their own risk assessment.

19. The emergency incident response plan prepared for the Brookland Greens incident is attached to this paper as Appendix 2. This document is not intended as a template to be followed uncritically: some of the acronyms and procedures are Victorian in application, and the 80% lfl value for emergency response was the outcome of the specific risk assessment for that incident. However as an example of an incident response plan this document illustrates some of the considerations to be taken into account in managing an incident of this nature.

### **Responding to alarms: action by Incident Controller**

20. It has already been discussed above that where involvement of landfill gas is suspected in an emergency, but the EPA has not yet been involved, it must be notified and the scene handed over when the initial hazard has been mitigated to the satisfaction of the incident controller.
21. In the context of an ongoing incident, an assessment of the % lfl that requires a fire service response should have been carried out in accordance with this guideline. It would be reasonable for the incident controller for such a response to consider it safe once ventilation has reduced flammable gas concentrations to a level that is steady (or falling) and below the predetermined response level.
22. Where despite sustained efforts to ventilate, it proves impossible to reduce concentrations of methane below the level determined for fire service response, this indicates substantial ongoing accumulation and evacuation/imposition of an exclusion zone is indicated.
23. Incident controllers should be aware of Workplace Health and Safety legislation that may make different provision for flammable gas concentrations in confined spaces. From 1 January 2012 national WHS legislation is expected to make specific provision for flammable gas concentrations in confined spaces and emergency responders will need to act in compliance with that legislation.
24. It is predictable that in some cases, particularly early in an ongoing incident, gas concentrations might continually increase in the absence of regular ventilation such that repeated alarms to a location are received. This risk may be mitigated by advising occupiers on ventilation pending necessary structural solutions to the problem. Ultimately, it will be a matter for the fire service to take up with occupiers and the EPA if repeat alarms are received.

### **Recommendation**

25. AFAC should formally adopt a guideline for responding to and treatment of incidents involving gases that have migrated from landfill sites, covering the following points:
  - a. Long-term management of incidents of gas migrating from landfill sites is the responsibility of the local Environmental Protection Agency and local authorities.
  - b. Fire authorities that are notified of a landfill gas incident where ongoing monitoring is taking place should work with the EPA and local authorities to identify
    - i. a % lfl at which a fire service response will be provided
    - ii. a % lfl at which this response should be under emergency conditions
  - c. A *starting point* for assessing the concentration of landfill gas that calls for a fire service response is 20% lfl and a *starting point* for response under emergency conditions is 50% lfl, but in each individual case a risk assessment must be carried out which takes into account the rate at which gas concentrations change, the response time, and risk

associated with specific locations. The outcome of the risk assessment may be setting a lower or a higher benchmark for emergency response.

- d. Reasonable action to take in relation to emergency calls involving landfill gas monitors detecting in excess of the predetermined % lfl is to ventilate until steady readings below the level that has been determined to warrant a fire service response are achieved.

#### Appendices

1. *Action Guideline Levels for Methane produced from Landfill, CFA/MFB, 2010*
2. *Emergency Incident Response Plan*