



WATER SERVICES
ASSOCIATION OF AUSTRALIA

QUICK START GUIDE

GUIDELINES FOR POTENTIALLY EXPLOSIVE ATMOSPHERES

Overview

This project, led by WSAA on behalf of participating Australian water utilities, delivered a national guideline for classification of potentially explosive atmospheres in municipal wastewater infrastructure, with a specific focus on linear or network infrastructure.

This guideline is structured in the following way:

- Chapter 1 introduces the guideline, its intent, some legislative background and a discussion of issues not discussed by the guideline as they are covered elsewhere.
- Chapter 2 discusses flammable atmospheres which could be present in the wastewater system and their likely sources, providing some examples of lower flammability limit (LFL) events.
- Chapter 3 provides guidance and recommendations on monitoring instruments and sampling campaigns.
- Chapter 4 discusses how this guideline interacts with current Australian standards and provides guidance and interpretation for the water industry.
- Chapter 5 provides a framework for generating a classification for wastewater conveyance linear infrastructure.
- Chapter 6 provides guidance and advice on common wastewater treatment processes and a suggested minimum classification or suggested classification logic for use in detailed zoning exercises.
- Chapter 7 provides commentary on zoning extents for linear infrastructure and wastewater treatment plants and the importance of well-designed ventilation.
- Chapter 8 discusses mitigation measures and emergency responses to a flammable atmosphere, including guidance on implementation.
- Chapter 9 provides selected case studies for reference, using the guidelines to classify them.
- Chapter 10 provides zoning diagrams for some common cases in network applications.
- The appendices cover supplementary information to assist in the use of the guideline. These include information on ventilation, trade waste and further detail on sampling technologies.

Method Summary

The method provided in Chapter 5 is one of the key outcomes of the guideline. The method is summarised in the table below (Table 5-5 in the guidance document), with a subsequent table (Table 5-6 in the guidance document) which describes what score corresponds to what classification. The threshold value is initially set at 25% of the LFL of the most abundant substance in the air space of the asset. Chapter 9 provides several worked examples.

Each criterion is given a score out of three, with 1 being associated with a low likelihood of contributing to flammable vapour build-up in the atmosphere and 3 being associated with a high likelihood of the same. The maximum score is 100% (all categories High Likelihood, or 3), and the minimum score is 33% (all categories Low Likelihood, or 1).

Section	Area	Likelihood of atmosphere exceeding threshold value			Weight	Score	Out of	%
		3	2	1				
5.4.1	Hydraulic features (Note 1)	High	Medium	Low	40%	X	3	XX
5.4.2	Catchment composition				40%	X	9	XX
5.4.2.1	Chance of flammable liquid discharge from a trade waste connection (Note 2)	High	Medium	Low	30%	X	3	XX
5.4.2.2	Stormwater infiltration	High	Medium	Low	5%	X	3	XX
5.4.2.3	Local ground conditions (Note 3)	High	Medium	Low	5%	X	3	XX
5.4.3	Security				10%	X	6	XX
5.4.3.1	Location	High	Medium	Low	5%	X	3	XX
5.4.3.2	Security of site	High	Medium	Low	5%	X	3	XX

5.4.4	Abnormal operation				10%	X	18	XX
5.4.4.1	Power failure	High	Medium	Low	2%	X	3	XX
5.4.4.2	Plant/equipment failure	High	Medium	Low	2%	X	3	XX
5.4.4.3	Varying load cases	High	Medium	Low	2%	X	3	XX
5.4.4.4	Blockage or leakage	High	Medium	Low	2%	X	3	XX
5.4.4.5	Flood	High	Medium	Low	2%	X	3	XX
5.4.4.6	Foreseeable misuse	High	Medium	Low	2%	X	3	XX
							Total	
							Classification Here	

Note 1 – If the asset has a rising main retention time of >12 h on average, a minimum rating of Zone 2 should be used to reflect the high likelihood of methane present during low flow periods unless otherwise controlled for instance through chemical dosing.

Note 2 – If there is a confirmed history of flammable immiscible liquids being discharged into the asset or confirmed odours of a sickly sweet, solvent, or non-sewage nature, then the minimum classification should be Zone 2 and a sampling campaign should be undertaken.

Note 3 – If a permeable asset, such as a pipeline, is upstream of the asset in question and within an area of higher geological risk, then further sampling is recommended to determine if there is an impact on the asset.

The initial zonal rating is then based on the score. The initial zonal rating is provided in the table below (Table 5-6 in the guidance document).

Total Score	Initial zonal rating (subject to sampling)
<55%	Non-Hazardous
<70%	Zone 2
<90%	Zone 1
>90%	Zone 0

A summary of criteria is below:

Hydraulic features

This looks at the likelihood of methane development in the asset leading to an explosive atmosphere. This should be checked for the worst case time, including any future cases. Refer to this table (Table 5-2 in the guidance document).

Gravity main infrastructure (maintenance holes, wet wells, gravity vent shafts)		Rising main infrastructure (pipelines, air release valves, discharge maintenance holes, receiving wet wells)	
Residence Time	Likelihood	Residence Time	Likelihood
0 – 12 h	Low	0 – 6 h	Low
12 – 24 h	Medium	6 – 12 h	Medium
24 h ⁺	High	12 h ⁺	High

Catchment composition

This looks at the likelihood of a high proportion of trade waste, the effect of stormwater ingress and the effect of local ground conditions leading to an explosive atmosphere. The tables below (Table 5-3 and Table 5-4 in the guidance document) provide guidance in these areas.

Percentage of flow from sources (Note 2)	Likelihood of trade waste to produce an explosive atmosphere		
	Low likelihood trade waste quality	Medium trade waste quality	High likelihood trade waste quality Note 1
< 10% of flow from trade waste sources	Low	Low	Medium
10 – 25% of flow from trade waste sources	Low	Medium	High
25% ⁺ of flow from trade waste sources	Low	High	High

Note 1: If any emitter is from a high-likelihood source without source control such as a trade waste agreement, consider the likelihood of trade waste forming an explosive atmosphere high, regardless of flow contribution.

Note 2: Flow is at the critical time and is therefore instantaneous flow.

Rate of measured or suspected infiltration	Catchment potentially contributing stormwater to asset		
	Low industry	Medium industry	High industry
No infiltration	Low	Low	Low
Low infiltration	Low	Low	Medium
Medium infiltration	Low	Low	High
High infiltration	Low	Medium	High
Combined system	Medium	High	High

Security

The first criterion under this heading looks at the likelihood of the location leading to illegal dumping or foreseeable misuse causing an explosive atmosphere, such as being in an industrial zone in a high crime area. The second criterion under this heading looks at the likelihood of the site itself being vulnerable to foreseeable misuse and causing an explosive atmosphere, e.g., if the site has poor site security, such as no fencing or no lid.

Abnormal operation

These scoring criteria look at abnormal operations leading to an increased likelihood of an explosive atmosphere. The criteria are:

- Power failure, for example where the loss of power leads to high residence times and methanogenesis in rising mains or accumulation of waste streams causing a build-up of flammable atmosphere.
- Varying load cases, for example where an asset is in an area with a seasonally variable population that can lead to methane generating low flow periods in the off-season, increasing build-up of flammable vapour in the atmosphere.
- Blockage or leakage, for example where frequent build-up of rags chokes up a sewer and increases the concentration of flammable vapour in the atmosphere.
- Flood risk, for example where a flood could destroy a fan which is ventilating a space and therefore cause a build-up of flammable vapour in the atmosphere.
- Foreseeable misuse, for example where illegal dumping is likely to occur.

Once the assessment table (Table 5-5 in the guidance document) is filled, and the initial zonal allocation (Table 5-6 in the guidance document) is made, the zone can then be modified based on the level of ventilation provided. Ventilation, and its effect on classifications, is provided in Chapter 5.5.3 and is largely based off the Australian Standard 60079.10.1.

The extent of the resulting zonal classification is then provided in Chapter 7.

Chapter 5 of the guidance document provides more details on each of the criteria, with Chapter 9 providing worked examples.