# CASANZ19 CONFERENCE, QUEENSTOWN, NZ

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## Regulatory Requirements and Odour Management: The Innovative Odour Guideline of Western Australia

The Department of Water and Environmental Regulation of Western Australia (DWER) assesses applications for prescribed premises under the Western Australian *Environmental Protection Act 1986*. In assessing these applications for new facilities or changes to existing facilities, DWER considers the likely risk of impacts of odour to the amenity of sensitive receptors using various tools.

To facilitate this assessment, a new Odour Guideline has been developed which guides the proponent in providing information on the nature of the activity and proposed odour control measures, activity location, distances to sensitive receptors, existing ambient odour impacts.

This paper presents the Department's new Odour Guideline, which includes a two-tiered analysis approach (screening and detailed analysis) and associated tools that can provide the information needed to assess the odour risk of the proposed application. The paper also shows how some of the tools included in the Guideline can be used by the proponent as management tools for the activity.

*Keywords*: odour, risk assessment, management, tools.

## 1. Introduction

### 1.1. Background

The Department of Water and Environmental Regulation of Western Australia (DWER) *Guideline: Odour emissions* (Guideline) was published in June 2019. This paper outlines the innovative approach in the Guideline to provide tools with the dual purpose of informing the odour risk for DWER and providing internal management support for the proponent.

### 1.2. Purpose

The purpose of the Guideline is to provide clarity, certainty and transparency for proponents (applicants), decision-making authorities and the community on what information is considered by DWER when assessing applications for proposed activities that emit odour under the *Environmental Protection Act 1986 (*EP Act) of Western Australia (WA). The Guideline also facilitates the efficient and effective assessment of applications and transparent decision making in line with DWER's *Guideline: Decision-making* (DWER, 2019) and *Regulatory best practice principles (*DWER, 2018). Other related documents that comprise the DWER regulatory framework can be found on the DWER website.

### 1.3. Scope

The Guideline is not a mandatory requirement, but assists applicants to provide information that will facilitate the risk assessment by DWER.

The Guideline should be used for applications for new premises or changes to existing premises and activities regulated under the EP Act that emit odour.

Odour can be emitted by point sources and can also be the result of fugitive emissions from surface area and volume sources.

Typical odour-emitting activities that the Department investigates and regulates include:

- composting, solid waste and wastewater facilities;
- bitumen and asphalt plants;
- abattoirs and rendering premises;
- animal livestock and stockyards;

A detailed list of prescribed premises regulated by DWER is provided in Schedule 1 of the *Environmental Protection Regulations 1987*.

The Guideline does not discuss the method used by DWER to review the applicant's information, which follows its regulatory risk assessment framework with a transparent process that will be reflected in a decision report that accompanies the assessment outcome.

The Guideline only deals with odour impacts as an amenity or nuisance issue. It does not consider air toxics and impacts on human health.

The Guideline should not be applied to land-use planning applications for odour-sensitive land uses situated near existing or planned odour-generating activities.

A strong emphasis of the Guideline is the protection of sensitive receptors and sensitive land-uses in the vicinity of the odour generating activity. In the Guideline, sensitive receptors and sensitive land-uses are defined as:

'*Places where people live or regularly spend time, and which are therefore sensitive to emissions from industry with implications for human health or amenity. They include, but are not limited to, residences, health care establishments, places of accommodation, places of study, childcare facilities, shopping centres, places of recreation, and some public buildings. Commercial, industrial and institutional land uses that require high levels of amenity, or are sensitive to particular emissions, may also be considered sensitive land uses'.*

### 1.4. Context

This Guideline has been developed with specific consideration of the format, value and limitations of the information that historically was provided to DWER in applications. A review of other Australian and international jurisdictional approaches to odour risk assessment also provided insights during the development of the Guideline.

This Guideline:

- specifies the types and levels of information that DWER uses in its assessment of the odour risk related to the application.
- includes a number of tools that together provide multiple independent lines of evidence upon which the odour risk will be assessed.
- clearly indicates that odour criterion modelling which in the past was the single line of evidence provided for odour assessments, is not accepted.
- values empirical results above theoretical approaches.
- is not prescriptive for any activities.
- includes tools that provide information demonstrating the applicant's minimum level of understanding of the odour–emitting operations/sources and odour management of the activity.
- includes tools that have been designed in such a way that they can be used by the applicant for internal management purposes in addition to providing information related to an application.

## 2. Odour analysis procedure

A risk-based and site-specific approach is used to assess applications, including a range of factors such as:

- distance to receptors;
- sensitivity of receptors to odour;
- community information;
- impacts from other odour sources in the vicinity;
- local topography and meteorology;
- odour controls proposed to mitigate the risk;
- future sensitive receptors;
- comparison with similar Australian facilities;
- special case factors; and
- Activity location in relation to specific land-use types.

DWER's primary reference for risk assessments is *Guidance Statement: Risk Assessments* (DER, 2017).

The odour Guideline has a two-tier process comprising a screening analysis and a detailed analysis. The screening analysis is designed to screen out any application with a low odour impact risk. Applications failing the screening analysis undergo a detailed analysis.

An overview of the odour analysis procedure is shown in Figure 1.

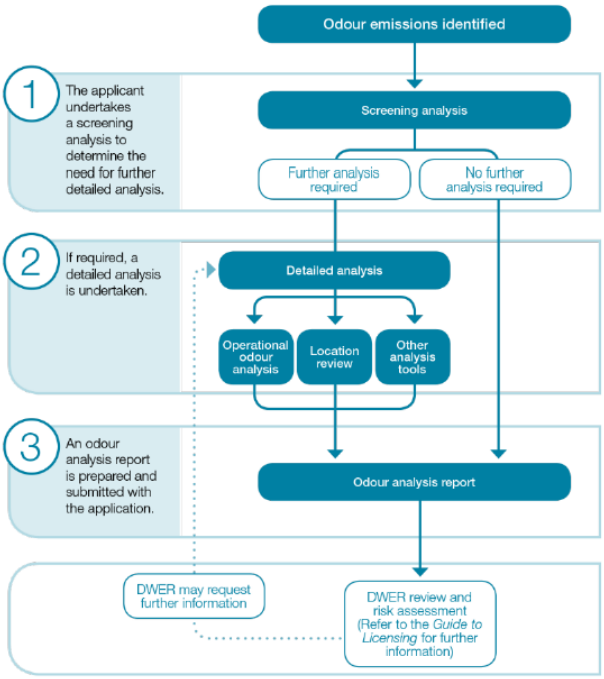


Figure 1. Overview of odour analysis procedure

### 2.1. Screening analysis

Screening distances and special case factors are the main parameters considered during the screening

analysis. Screening distances should not be confused with separation distances as they are not fixed distances but rather a trigger to indicate that further information to assess the odour risk is needed. In the Guideline, screening distances are not designed for land-use planning purposes. Special cases factors are those factors which can increase the risk of odour impacts, despite the screening distance being met.

The special case factors are:

- existing odour impacts from existing nearby odour sources;
- presence of elevated background odour levels;
- complex terrain and topography that can affect odour dispersion;
- unusually large or complex facility when compared with other Australian operations;
- unusual configuration of odour sources or odour abatement technologies compared with other Australian operations ;
- the location of the proposed activity in a Strategic Industrial Area (SIA);
- multiple industry categories that emit odour are present on the same site.

The screening analysis for changes to existing premises requires additional considerations compared to new premises, for example, history of impacts or complaints and whether the modification will likely result in an increase in emissions. Templates for questionnaires and flowcharts for both new premises and changes to existing premises are provided in the Guideline to help the applicant to undertake the screening analysis. Screening analysis protocols are detailed below.

### *2.1.1. New premises*

Figure 2 illustrates the screening analysis process for new premises.

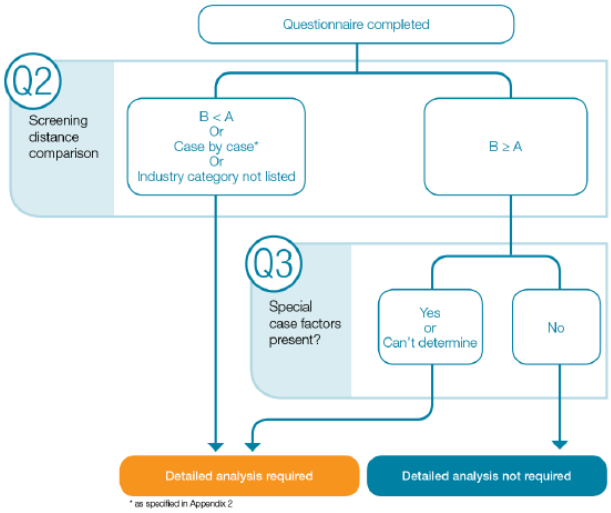


Figure 2. Screening analysis for new premises.

For new premises, if the screening distance is met and there are no special case factors then the proposal is considered to be low risk for odour impacts and the analysis is complete.

However, if the screening distance is:

- not met;
- met but special case factors exist;

Then a detailed analysis (as specified in Section 2.2) is undertaken.

### *2.1.2. Changes to existing premises*

Figure 3 illustrates the screening analysis process for changes to existing premises.

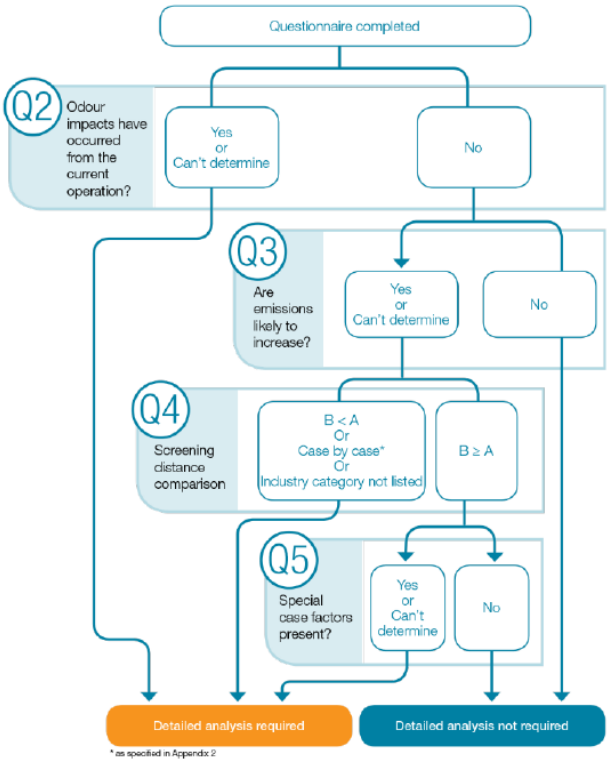


Figure 3. Screening analysis for existing premises

In summary, if there are no existing odour impacts from the premises and:

- the proposed modification will not result in any likely increase in odour emissions; or
- even though the proposed modification will result in a likely increase in odour emissions, the screening distance is met and there are no special case factors,

then the assessment is complete.

However, if there are:

- existing odour impacts from the premises; or
- no existing impacts, but there will be a likely increase in odour emissions and the separation distance is not met; or

- there are no existing odour impacts, but there will be a likely increase in odour emissions and even though the screening distance is met, there are special case factors,

then a detailed analysis will be undertaken.

## 2.2. Detailed Analysis

The detailed analysis requires the use of various tools, as discussed in Section 2.2.1, to provide evidence in support of the application.

### *2.2.1. Tools*

The tools specified in the Guideline can be used by applicants to provide supporting information for their applications. Some tools are considered to be priority tools as they provide the minimum information needed to inform the review process, while other tools are optional. The two priority tools are the Operational Odour Analysis (OOA) and the Location Review. Each optional tool has its own strengths and limitations and therefore the use of multiple tools provides multiple independent lines of evidence and stronger support for the application.

Tools that use observational/empirical data are considered to be of higher value than theoretical approaches.

- *Operational Odour Analysis (OOA)*

The OOA is a priority tool in a detailed analysis.

Odour controls and management in place for an activity are the most important factors that affect the outcome of a residual risk assessment. The OOA identifies all major odour operations and sources along with controls, monitoring conditions, surrogate parameters and triggers which are used to mitigate the risk of higher emissions. The OOA also details the corrective actions to be implemented should a trigger be reached, the method of assessment of the effectiveness of the corrective action and the contingency actions should the corrective action be not successful in fixing the issue.

An OOA:

- is site-specific and risk-based. Generally, higher risk sites will require more stringent controls than lower risk sites;
- include normal and foreseeable abnormal conditions;
- may include outcomes and / or management based measures.

A map of the site showing the location of the sources and operations, and their size or geometry should be attached to an OOA.

A residual risk assessment in accordance with the Department's *Guidance Statement: Risk Assessment*, is also part of an OOA. This residual risk assessment uses a matrix of the likelihood of odour impacts and their consequences and determines the residual risk level in consideration of the odour management that will be implemented.

Although an OOA is a priority tool for the DWER odour risk assessment, it is primarily intended as a management tool for the applicant. It has been designed in such a way that it can be used as a proactive tool by the applicant for the management the major odour sources on his premises, for example, in the development of site operational procedures.

- *Location Review*

The location review is a priority tool in a detailed analysis.

The location review considers the distance from the existing or future activity to receptors, the types and sensitivity of receptors to odours and the local topography and meteorology that can affect odour dispersion.

Maps showing the distances of sensitive receptors from the activity boundary (the envelope including all odour sources), and how these compare with the screening distances are compiled as part of the location review. Discussions about the local topography and meteorology and how these may affect the dispersion of odour are also included.

Wind roses from the nearest Bureau of Meteorology (BOM) or DWER monitoring site showing long-term wind data (not 9am and 3pm average conditions), can be used. Proponents may use their own data (site specific data), provided it can be demonstrated to be valid.

- *Odour Field Assessment (OFA)*

The OFA is a program of targeted field surveys and analysis designed to characterise ambient odour for new and existing facilities.

Ambient odour measured in the vicinity of an existing facility prior to changes under specific operational and meteorological conditions provide information about the current odour footprint. For new premises, these measurements describe the current odour background due to existing odour sources in the vicinity. For both situations, OFA can be used for ongoing odour management purposes.

OFA is carried out with regard to clearly established objectives and a methodology that is based on the purpose of the assessment.

Australian standards have not been developed for this type of assessment. Instead, sections of European standards are used for OFA in Australia (i.e. EN 16841-1.2016 – Grid measurement and 16841-2.2016 – Plume measurement). The plume measurement method is most commonly applied for the provision of information for an application in Australian jurisdictions.

The odour intensity measurement method currently adopted in the Guideline follows the recommendations of the VDI 3940 Part 3 (VDI 3940-3.2006). This scale is considered to be unclear and can be interpreted in different ways, resulting in a lack of consistency in OFA results submitted to DWER. Therefore, an addendum is currently under development by DWER to adopt an odour intensity scale of three levels as depicted in Figure 4.

| | | |
|---|---|---|
| **0** | - No odour<br>- Odour cannot be described | |
| **FAINT** | Odour is<br>- recognisable<br>- can be described<br>- can be attributed to a source | You need to focus to smell it |
| **STRONG** | | You can easily smell it without any focus or effort |

Figure 4. Proposed odour intensity scale for WA

A similar scale has been used by the Environment Protection Agency Victoria (VEPA) since 2008 and was formally adopted in 2010 (PR-SP-33). Through the Odour Special Interest Group of the CASANZ, odour specialists have been working since late 2018 to develop a guideline for OFA in Australia and New Zealand. The three-level odour intensity scale has been co-proposed for this CASANZ guideline by DWER and VEPA to replace the VDI 3940 Part 3.2006 scale.

Presence or absence of odour, the intensity levels and the percentage of time at which the location is impacted under various meteorological conditions and different operational conditions (for an existing facility) are the parameters that will inform the odour impact risk.

The size of the investigated area, local access conditions, number of panellists and surveys, targeted conditions related to meteorology (worst-case conditions) and emissions (source types, variability, volumes of odorous air emitted, etc.) are considered in OFA planning. Previous odour field assessments or a review and analysis of complaints can also help to design the OFA. Review of the wind patterns in the area correlated to odour complaints can identify worst-case periods of the year when OFA should be carried out.

Frequently repeated OFAs can provide information for ongoing odour performance (in-house management) and may also be used in an application for future changes to an existing premises.

- *Complaints data analysis*

Complaints data are associated with loss of amenity and annoyance due to unacceptable odour impacts.

Complaints data provide an indication of existing odour issues in the area, noting the usual caution when considering complaints data. When interpreting complaints data, several factors may influence complainant behaviour, and the extent of odour impact inferred from these data may be over or underestimated. For example, the absence of complaints does not mean that no odour impacts have occurred, because people may have been living in the vicinity of the facility for a long period and have stopped complaining or are reluctant to complain.

When considering applications for existing premises, DWER considers the history of complaints and the management action taken to address these complaints.

Complaints data could be obtained from the local council or DWER (de-identified). DWER will also refer to its complaints database when assessing applications.

- *Community survey and diary study analysis*

Like complaints data, results of community surveys or records of odour impacts kept by community members in odour diaries can provide an indication of existing odour impacts and gauge the existing level of community dissatisfaction with odour in their environment. Diaries may be a useful tool as they provide more detailed/accurate information of odour impacts as incidents are recorded as they happen. The proponent may choose to conduct surveys or provide odour diaries to community members to obtain information on odour issues in the area or refer to published reports which contain this information. The design, execution and analysis of surveys requires highly specialised knowledge, and should be undertaken by those with demonstrated expertise in this field. If a survey is conducted as part of the application, details of the design, questionnaire and implementation should be discussed with DWER to assess the validity of the survey.

The proponent may also refer to studies that have been conducted in the area that involved the use of odour diaries by the community.

Outputs from this tool can be used to support other tools such as complaints data analysis or odour field assessment outcomes.

- *Odour source assessment (OSA)*

An odour source assessment (OSA) is a program of targeted source sampling and analysis designed to characterise odour sources at an existing premises by assessing the odour concentration from the sample (according to the ASNZS 4323.3.2001) and the volumetric flowrate of the source.

For changes to existing premises, odour emission rates obtained from an OSA carried out under current conditions (prior to modification) can inform a source hierarchy or be used as a benchmark in

comparative dispersion modelling (described below).

For new facilities, OSA can be performed at sources at another facility that has been assessed as being representative of sources at the new premises.

Under the Guideline, recommendations to use odour emission rates for benchmarking and trend analysis alleviates the inherent significant uncertainty attached to the sampling and the measurement of odour concentration. Notwithstanding this consideration, the design and implementation of a sampling program should ensure as much reproducibility as possible. The Guideline provides guidance in designing an OSA.

If sampling is performed under conditions that are reproducible, the trend of odour emission rates measured at specific sources can be used as a performance indicator for in-house management. This trend data can also inform any future application to DWER.

- *Comparative dispersion modelling*

Comparative dispersion modelling refers to the comparison of two or more modelling scenarios (e.g. using different pollution control equipment) without specific reference to ambient air (odour unit) criteria.

'Criterion modelling', which compares the predicted odour concentrations at sensitive receptor locations against regulatory criteria, is not accepted in Western Australia for odour impact assessment purposes owing to the large associated uncertainties.

Comparative modelling can be valuable in estimating changes in odour emissions due to changes in the production process or how sources should be configured or managed to inform the most cost-effective strategy to limit impacts.

DWER's general guidance on dispersion modelling is contained in the Air Quality Modelling Guidance Notes (DOE, 2006). This modelling guidance should be followed to the extent that it applies to comparative odour modelling and this Guideline.

- *Comparison with similar operations*

This tool allows for information from similar facilities to be used in support of an application. Knowledge of the extent of odour impacts and source characteristics from similar facilities can be useful to assess likely impacts from a proposed facility or changes to an existing premises. However, the applicant will be required to demonstrate that such information is fit for purpose, including consideration of characteristics such as size and throughput, odour sources and controls, local meteorology and topography, separation distances to receptors and sensitivity of surrounding sensitive receptors. Outputs from this tool may be incorporated into or used to support other tools of the detailed analysis, such as the location review and the OOA. Information can also be used as a benchmark for internal performance and management post-commissioning before the site collects enough data to develop its own performance benchmarks.

## 3. Conclusion

The WA DWER Guideline: Odour Emissions is intended to provide clarity, certainty and transparency for applicants, decision-making authorities and the community on what information is considered by DWER when assessing applications with odour emissions under the EP Act of WA. The Guideline achieves this by specifying the information types and formats that facilitate transparent decision making in line with DWER's risk assessment and decision-making policies.

The Guideline's analysis process allows for low risk applications to be screened out and granted approval, with higher risk applications undergoing a detailed analysis. The detailed analysis will allow proponents to gather evidence to support the application through the use of various tools.

Finally, this Guideline was drafted with a strong emphasis on the quality of information and its presentation using specific tools which can also be used by the applicant for internal odour management purposes.

## Acknowledgments

This Guideline represents significant efforts by a number of DWER officers over a substantial period of time, including David Griffiths of DWER's Air Quality Branch. The contribution of other Australian and international jurisdictions through a review of their odour assessment approaches and comments provided during the external consultation is also acknowledged.

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