Environment Protection Authority

Draft Approved Methods for the Modelling and Assessment of Air Pollutants in NSW – Consultation Summary

NSW GOVERNMENT

Acknowledgement of Country

The NSW Environment Protection Authority acknowledges the Traditional Custodians of the land on which we live and work, honours the ancestors and the Elders both past and present and extends that respect to all Aboriginal people.

We recognise Aboriginal peoples' spiritual and cultural connection and inherent right to protect the land, waters, skies and natural resources of NSW. This connection goes deep and has since the Dreaming.

We also acknowledge our Aboriginal and Torres Strait Islander employees who are an integral part of our diverse workforce and recognise the knowledge embedded forever in Aboriginal and Torres Strait Islander custodianship of Country and culture.

Aboriginal artwork by Worimi artist Gerard Black

Contents

Summary **4**
What we did **5**
What we heard **6**
General feedback **7**
Why the Approved Methods was updated 7
Perceived additional burden on assessments 7
Core principles **8**
Minimising harmful pollutants to the maximum extent achievable 8
Impact assessment criteria are not goals the activities or plant should pollute up to 9
Assessment scenarios must reflect reasonable worst case 10
Method overview **11**
Assessment approaches 11
Emissions inventory **12**
Estimation techniques 12
Measures to mitigate pollution 13
Source types 14
Meteorological data 15
Background air quality 19
Dispersion modelling 21
Impact assessment criteria 25
Post processing 29
Mitigation options analysis 30
Fugitive dust 32
Other 34
Bibliography **38**

Summary

The *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (the Approved Methods) is a technical document that lists the statutory methods for modelling and assessing the impacts of emissions of air pollutants from stationary sources in NSW. The Approved Methods are a critical component of NSW's air pollution regulatory framework and is referred to in the *Protection of the Environment Operations (Clean Air) Regulation 2022*.

Although there have been key updates when the National Environment Protection Measures (NEPM) Ambient Air standards changed, the Approved Methods has not undergone a full detailed review since 2005 and no longer reflects current scientific practice, industry technology or regulatory expectations. Modernising the air assessment framework by updating the Approved Methods is identified in the NSW Clean Air Strategy 2021–30 as an action to improve outcomes for air quality and health.

The updates to the Approved Methods are expected to strengthen environmental regulation and protection by:

- being based on the most recent science, particularly for toxics criteria and modelling method
- promoting increased uptake of air pollution controls and use of best-practice measures
- reducing assessment cost for low-risk proposals
- protecting areas that already have good air quality from significant degradation
- updating assessment requirements for high-risk proposals to demonstrate more robust assessment of impacts
- providing clarity on fugitive dust assessments and requirements, including strengthening the link between assessment findings and licence conditions to support compliance and enforcement
- aligning with and reinforcing the objectives of the POEO Act through a more robust assessment framework.

The updated version modernises modelling methods, strengthens requirements for all industries to demonstrate air emissions are minimised to the maximum extent practicable, simplifies assessment approaches to support improved emissions performance, and provides clearer, more contemporary guidance to ensure transparent air quality assessments are undertaken. The consultation package of the updated draft Approved Methods was released on the EPA's *Have Your Say* website to enable stakeholders, subject matter experts, industry, local government and the community to provide informed feedback.

We considered all the submissions received during public consultation. This document summarises the common or critical feedback received and outlines how we responded. The finalised Approved Methods and supporting Technical Note are now available on the EPA website.

What we did

The EPA undertook public consultation on the draft Approved Methods from 23 March to 4 May 2026, inviting submissions via a dedicated mailbox and the *Have Your Say – Approved Methods for the Modelling and Assessment of Air Pollutants* webpage.[1] During this period, plus a three-week extension, the EPA received 40 submissions – 26 written submissions and 20 survey responses (some respondents provided both). These came from individuals and community groups, industry and businesses, local government, air quality professionals and professional peak bodies (Figure 1).

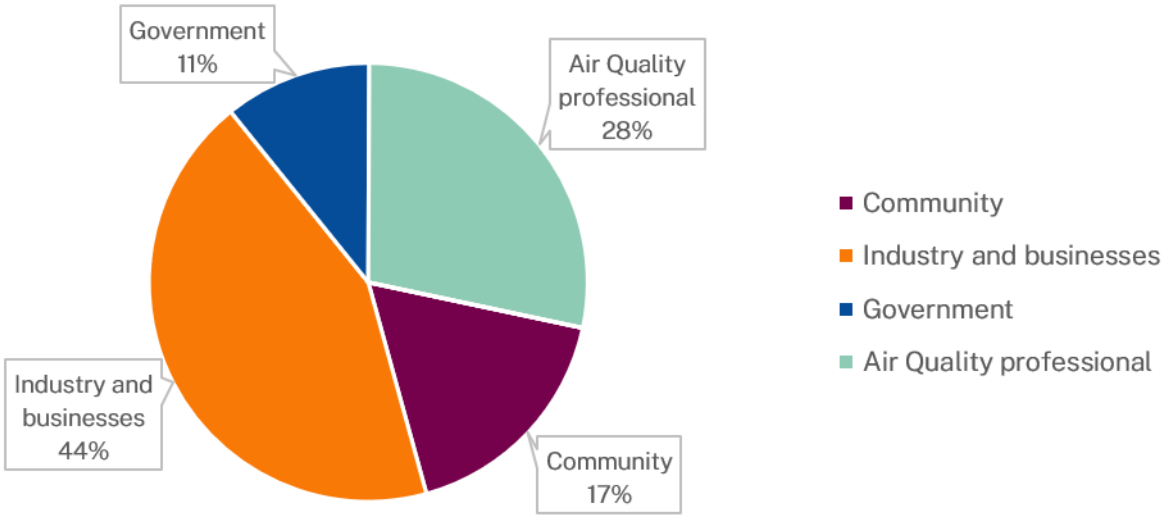

Figure 1 Submissions by sector

While developing the draft Approved Methods, we also:

- engaged consultants to provide reports on reviewing national and international approaches to targeted sections of the Approved Methods
- held two open round-table discussions with numerous air quality practitioners to discuss issues and the proposed new framework
- met with NSW Health to discuss updated air quality criteria and the proposed new framework
- undertook research, literature reviews and extensive data analysis to develop and support the proposed new framework
- engaged an independent health expert to review the method used to support the updated toxics criteria (included as **Attachment A**)
- reviewed the document for alignment with legislation
- engaged with a number of peak bodies before and during consultation.

[1] The NSW EPA *Have Your Say* webpage links to a range of documents related to the consultation, including resources referred to in this report.

What we heard

Submissions received reflected a wide range of perspectives on the updates to the Approved Methods. While views differed, feedback consistently focused on a small number of common issues.

Submissions from community groups, local government, industry, air quality practitioners, professional bodies, business and industry peak bodies recognised and emphasised the importance of updating the Approved Methods as changes in practice and technology meant that the document is no longer considered contemporary and will soon be unfit for purpose.

Community and environment groups supported the update of the Approved Methods and suggested stronger action on emissions reduction, greater transparency, and earlier implementation of mitigation measures, while also highlighting the importance of accessible information and accountability.

Local councils supported the intent of the updates in strengthening the consistency, transparency and scientific rigour of air quality impact assessments across New South Wales. There was strong support for emphasis on robust emissions inventories, representative meteorological data and reasonable worst-case assessment scenarios.

Air quality practitioners supported the update and introduction of the dispersion model AERMOD. They sought clarification on some of the technical aspects where gaps or ambiguities in interpretation may arise. They also requested that alternative models be listed; that the peak-to-mean ratio calculation method be reviewed and updated; and that additional guidance documents for meteorological models and dispersion models be updated or developed.

Submissions from professional bodies also supported the updated Approved Methods. Feedback was generally similar to those received from air quality practitioners, focusing on the technical aspects of the updates.

A collaborative submission was received from the mining industry, requesting clarification and recommendations on the interpretation ‘maximum extent achievable’, the tiered model period, sensitive receptors, thresholds, fugitive dust assessment and land acquisition. The cement industry shared concerns regarding the requirement to minimise fine particulate matter to the maximum extent achievable.

The intensive livestock and agriculture industry generally was not in support as the updates focused on industrial point sources rather than fugitive odour sources that are frequently associated with intensive agriculture. The industry requested clarification about the requirements for on-site weather stations and the number of years to be modelled depending on the type of meteorology used. Key concerns were raised regarding the method for determining non-urban odour impact assessment criteria and the definition of sensitive receptors.

The following sections discuss these issues in more detail and how we have responded.

General feedback

Why the Approved Methods was updated

What we heard

Submissions supported the need to update the Approved Methods, with agreement that the document should reflect current scientific knowledge and modelling techniques, and contemporary regulatory practice. While feedback on specific provisions varied across sectors, stakeholders consistently raised a number of common themes, particularly relating to model period, odour criteria and sensitive receptors.

Our response

The EPA acknowledges the strong support for updating the Approved Methods and value the detailed feedback provided. Submissions from air quality practitioners, industry, and professional bodies have provided important insights into areas where the framework is working well, as well as identifying opportunities to improve clarity, reduce unnecessary burden and address gaps in guidance.

This feedback has informed targeted refinements to the Approved Methods to ensure the framework remains scientifically robust and fit for purpose while maintaining its primary objective of protecting air quality and public health.

Perceived additional burden on assessments

What we heard

Some industry submissions raised concerns that the updates to the Approved Methods have the potential to increase the burden of assessment through higher costs, longer time frames and greater technical complexity. Key themes included the potential for increased modelling requirements (e.g. a tiered model period based on meteorological data), expectations around on-site data collection, and uncertainty regarding mitigation obligations. These concerns were most pronounced for lower-risk and agricultural projects, where stakeholders considered some requirements may be disproportionate to the level of risk.

Two submissions specifically requested that a regulatory impact statement (RIS) be undertaken to accompany the updated Approved Methods. These submissions emphasised the importance of evaluating both the health benefits and economic impacts of the proposed changes, particularly in relation to Environment Protection Licence (EPL) regulated activities and their contribution to air quality and public health outcomes in NSW. One submission wanted to ensure the framework does not impose undue burden on meat processing, or undermine environmental circularity.

Our response

The EPA does not consider that a RIS is appropriate for the update to the Approved Methods. We have addressed individual issues identified during submissions. In response, we have carefully

considered these concerns and made targeted refinements to reduce any perceived burden while aligning with the core principles detailed in section 1. These refinements include the following.

- The core principle 'harmful pollutants must be minimised to the maximum extent achievable' has been amended to more clearly articulate that best practice applies to principal air toxics and $PM_{2.5}$, and that decisions regarding achievable mitigation must consider technical, logistical and financial factors. The terminology has also been aligned with the mitigation chapter to ensure internal consistency and reinforce a proportionate, risk-based approach to emission management.
- We have updated section 4.1 to accept one year of assessment for site-representative observational data to be combined with diagnostic meteorological modelling (e.g. CALMET) that can robustly represent local conditions (including terrain and land-use influences). This must be supported by a clear demonstration of model performance within the air quality impact assessment (AQIA). As most assessments in NSW adopt the use of the CALMET/CALPUFF modelling suite, especially for odour-related agricultural projects, and use site-representative data, few assessments would change from current practice. Additional years of modelling would be limited to those that rely on prognostic data only and is a desktop-based task.
- We have clarified that the Approved Methods does not mandate the installation of an on-site weather station. Requirements for on-site monitoring are determined through other regulatory mechanisms, such as the Secretary's Environmental Assessment Requirements (SEARs), Conditions of Approval, or Environment Protection Licences (EPLs).
- SILs are not mandatory requirements but rather an optional screening tool that proponents may use to demonstrate that impacts are not significant and therefore do not warrant further cumulative assessment. We consider that this approach improves efficiency and transparency while maintaining alignment with the core principles.

Core principles

Minimising harmful pollutants to the maximum extent achievable

What we heard

Various submissions were supportive of the inclusion of the core principle relating to minimising harmful pollutants to the maximum extent achievable. However, a number of submissions raised concerns around the inclusion of this core principle and the terminology used. Broadly speaking, the concerns were:

- The terminology of 'maximum extent achievable' does not consider practical considerations, such as cost, and proportionality (cost relative to air quality benefit).
- Inconsistencies with Chapter 9, which explicitly states that technical, logistical and financial factors are to be considered.
- The terminology of 'harmful pollutants', which could mean application of the principle to a broad range of air pollutants.

Our response

The Approved Methods already includes requirements for the application of best-practice emission control and/or management practices. These existing requirements are for emissions of principal air toxics and also where existing ambient air pollutant concentrations exceed the impact assessment criteria. We have updated the Approved Methods to apply to $PM_{2.5}$ the same provisions that are applied to principal air toxics. Reasons for the change are explained below.

There is an increasing body of health evidence that there is no safe threshold for exposure to $PM_{2.5}$. Given the increasing health evidence, the application of best practice to $PM_{2.5}$ emissions aligns with the object of the POEO Act to use mechanisms that promote 'the reduction to harmless levels of the discharge of substances likely to cause harm to the environment' (s 3(d)(iii)).

The POEO Act also requires that activity be undertaken, and plant operated by such practical means as may be necessary to prevent or minimise air pollution if neither a standard of concentration nor a rate has been prescribed (s 128 (2)). The Clean Air Regulation does not prescribe a standard of concentration or a rate for $PM_{2.5}$. On that basis, minimising $PM_{2.5}$ through the application of best practice is an important guiding principle.

The submissions we received seem to indicate stakeholders are concerned that the revised Approved Methods requires all air emissions to be minimised regardless of cost. The intent of this core principle was to reflect existing requirements for best practice to be applied to principal air toxics, and the new requirement for best practice to be applied to $PM_{2.5}$. To address issues raised, this core principle has been amended to:

- be clearer that best practice is applied to $PM_{2.5}$ and principal air toxics
- include terminology to indicate that, when determining best-practice mitigation for $PM_{2.5}$ and principal air toxics, 'maximum extent achievable' includes considering practical elements (such as cost). The terminology has been aligned with section 9 and is consistent with previous versions of the Approved Methods.

Impact assessment criteria are not goals the activities or plant should pollute up to

What we heard

Various submissions supported including this core principle. However, it appears that some stakeholders are concerned that the proposed amendments to the Approved Methods represents a significant increase in the regulatory requirements for industry. Themes running through the submissions were:

- All air emissions are required to be minimised.
- The requirement for minimising air emissions could be inconsistent with other regulatory requirements, such as the standards of concentration in the Protection of the Environment Operations (Clean Air) Regulation.

Our response

The following summary should clarify the changes to requirements for minimising emissions.

- Principal air toxics and $PM_{2.5}$ must be minimised using best management practice. The requirement for application of best management practice to principal air toxics remains consistent with previous versions of the Approved Methods. The requirement for application of best management practice to $PM_{2.5}$ is a new requirement for the Approved Methods.
- In areas where existing air pollution exceeds ambient air standards, best management practice must be applied to those air pollutants. This requirement is consistent with previous versions of the Approved Methods.
- The Approved Methods have introduced the new concept of the DPT (Degradation Prevention Threshold). Where off-site impacts exceed the DPT, a mitigation options analysis must be undertaken to justify the level of mitigation proposed. The DPT criterion are not compliance criteria, and no mitigation option is mandated through the application of the DPT and supporting mitigation options analysis. In these instances, the EPA expects that where practicable mitigation options are available they should be implemented to minimise degradation of the environment. The impact assessment criteria remain as the compliance criteria.

The POEO Act includes the object to 'prevent the degradation of the environment' (s3(d)) by the use of various mechanisms, including 'the making of progressive environmental improvements, including the reduction of pollution at source' (s3(d)(iv)). The intent of the core principle relates to the assessment criteria not being goals to pollute up to, and to articulate the purpose of the new concepts of the DPT and mitigation options analysis. After reviewing submissions, we have improved the wording of this core principle:

- to make clearer the core principle's aim
- to explain further the EPA's expectations around this principle.

Assessment scenarios must reflect reasonable worst case

What we heard

Some submissions commented on assessment scenarios and asked for clarification about what constitutes reasonable worst case. Specifically, they asked:

- How is 'reasonable worst case' defined?
- A clearer definition of 'worst case' is required.
- The terminology 'all foreseeable operating scenarios' means that atypical scenarios need to be assessed (startup, shutdown, maintenance, emergency releases).

Our response

We understand that stakeholders want clear, concise definitions; however, it is not always practical to provide clear definitions without limiting usability. The Approved Methods covers a range of industry sectors that the EPA regulates, and plant and activities with different operational regimes. Given the variation in industry and emission types, 'reasonable worst case' also varies. The EPA expects that assessment scenarios adequately capture periods of peak emissions during periods of poor dispersion conditions. This is to ensure that reasonable worst-case impacts are adequately captured in the modelling predictions. Peak emissions can depend on many factors. Emission guarantees from manufacturers for a point source can set a suitable upper-bound emission estimate. Peak emissions for fugitive sources can depend on the parameters or data used to

estimate emissions. Any data, or parameters used to estimate emissions for fugitive sources, needs to represent worst case. Poor dispersion conditions depend on the source type. For example, calm/low wind speed conditions typically result in higher impacts for ground-level fugitive emissions. The EPA expects air quality practitioners to apply professional judgement in constructing assessment scenarios, and justify that any assessment has adequately captured periods of peak emissions during poor dispersion conditions.

To address the submissions received, we have amended the core principle to articulate that emission scenarios must adequately capture periods of peak emissions during periods of poor dispersion conditions. We have also amended section 3.4.5 on variable emission rates.

Some submissions raised concerns that including this principle means that all atypical scenarios would need to be assessed. The following comments should make clearer our expectations.

The POEO Act includes regulatory provisions, that:

- plant and equipment must be operated in a proper and efficient manner, and maintained in an efficient manner
- materials must be dealt with in a proper and efficient manner.

Where the Approved Methods is used for planning decisions, the EPA expects that the assessed scenarios include the typical envelope within which the proposal intends to operate. Such scenarios should reflect the operation of plant or equipment in accordance with the provisions in the POEO Act. On that basis the EPA would not expect some atypical scenarios. However, there could be some instances where assessment scenarios for emergency releases, startup or shutdown periods could be warranted to understand potential impacts to air quality. This would need to be determined on a case-by-case basis. When constructing typical operating scenarios, consideration would need to be given to the specifics of what a particular proposal is seeking approval for. In reviewing the submissions, the EPA understands that some of the terminology could mean that all atypical scenarios are to be assessed for all source/industry sectors. We have made some amendments to this core principle to address the issues raised.

Method overview

Assessment approaches

What we heard

Some submissions commented on the approaches for assessing potential air quality impacts (screening and refined). Some stakeholders asked when a screening approach would be appropriate, and suggested additional guidance is needed. Other stakeholders suggested that there are additional methods beyond the approaches listed (screening and refined), where there is a large amount of data available for conducting an assessment.

Our response

The previous versions of the Approved Methods listed the approaches as level 1 and level 2 assessments. The screening methods contained in the updated Approved Methods are akin to the level 1 approach in the previous Approved Methods. These screening approaches generally use

synthetic meteorological data. We find that screening approaches are far less common, and generally used for small-scale sites and/or sources. We expect that screening assessments are likely to continue to be less common; however, they still have a place in assessing potential impacts for smaller operations, particularly those in more remote areas. We have made minor amendments to clarify their use.

We are of the view that the two approaches (screening and refined) are adequate to cover the type of assessment methods used for regulatory approaches. Where a large amount of data is available for a refined assessment, then that assessment is likely to be better characterised, with reduced uncertainty.

Emissions inventory

Estimation techniques

What we heard

Stakeholders raised several comments around the emission estimation techniques. The key comments provided were around:

- use of other emission factor databases.
- terminology for when emission factors should be used
- use of 'first principles' techniques.

Our response

The updated Approved Methods references US EPA AP-42, and National Pollutant Inventory Emission Estimation Technique manuals for databases of emission factors. These are the most common and most-used emission factor databases used in NSW. It is not the intent of the Approved Methods to list all available emission factor databases. Other emission factor databases could be used; however, they would need to be justified having regard to the scientific robustness of the emission factors, and supporting peer reviews for the development of such factors.

Previous Approved Methods included the following terminology relating to the use of emissions factors: 'Emission factors are generally used when there is no other information available or when emissions can reasonably be demonstrated to be negligible'. The EPA has retained this terminology. Various submissions raised suggestions regarding this terminology. The EPA is of the view that the retained text is suitable.

In regard to the use of 'first principles' techniques, some submissions suggested that these techniques should be a last resort. The EPA is of the view that such techniques do have a place in air quality assessments. In some instances, these techniques can be a useful tool – for example, in estimating SO_2 emissions for fuel combustion sources, where the sulfur content and fuel usage rates are known.

Measures to mitigate pollution

What we heard

Stakeholders raised several comments and concerns around the terminology describing mitigation measures for the purposes of constructing the emissions inventory. Key comments and concerns were:

- The terminology in some areas implies that mitigation measures are required for minor sources.
- It may not be appropriate to use EU Best Available Technique Reference (BREF) and Best Available Techniques Conclusion (BATC) documents; they may not apply to Australian conditions.
- The terminology in some areas implies that emission control must be implemented for all sources, including agricultural sources.

Our response

The following summary should clarify the proposed changes to the requirements for mitigation measures.

- Principal air toxics and $PM_{2.5}$ must be minimised using best management practice. The requirement for application of best management practice to principal air toxics remains consistent with the previous Approved Methods. The requirement for application of best management practice to $PM_{2.5}$ is a new requirement for the Approved Methods.
- In areas where existing air pollution exceeds ambient air standards, best management practice must be applied to those air pollutants. This requirement remains consistent with the previous Approved Methods.
- The Approved Methods introduced the concept of the DPT. Where off-site impacts exceed the DPT, a mitigation options analysis must be undertaken to justify the level of mitigation proposed. The DPT criterion are not compliance criteria, and no mitigation option is mandated through the application of the DPT and supporting mitigation options analysis. In these instances, the EPA expects that, where practicable mitigation options are available, they should be implemented to minimise degradation of the environment.
- Compliance with the impact assessment criteria in section 7 must be demonstrated. This can mean the implementation of mitigation measures to achieve compliance. This is consistent with the approach in the previous Approved Methods.

Section 3.2 of the Approved Methods includes various references (including the BACT and BREF documents in Europe) where information on the available management techniques can be obtained. This information is provided to guide practitioners on what mitigation options could be suitable for a particular industry, and could be useful in crafting emissions inventories and/or undertaking any required mitigation options analysis. Where a particular reference is not directly transferrable to Australian conditions, we recognise that other sources of information maybe more useful. We have made some minor textual edits to acknowledge this.

A number of submissions raised concerns around the following text in the draft Approved Methods: ‘The emissions inventory must identify the emissions control technology and techniques that will be implemented for each source of air emissions’. Stakeholders were concerned that this statement

implied mitigation measures were required for all sources. The above bullet points should clarify this. To address comments and concerns, we have amended the text.

Source types

What we heard

Some stakeholders raised comments around source parameters in reference to the preparation of an emission inventory. Specific comments addressed:

- the level of detail regarding source parameters, in particular area and volume sources and how they are represented within dispersion model
- using assumptions where some data (such as moisture and oxygen content) for point sources are not available.

Our response

Some submissions suggested that more detail should be included on how to represent sources, particularly area and volume sources, within dispersion models. In section 3.3 we have now included references to other guidance material on how to represent specific sources within dispersion model applications.

Some submissions pointed out that source parameters such as moisture and oxygen concentration are not always available at concept design phase. The EPA can set site-specific emission limits in Environmental Protection Licences. These limits will typically have nominated reference conditions. To ensure that site-specific emission limits are appropriate, the air quality impact assessment must clearly articulate the reference conditions for the particular operation. The EPA is of the view that reference condition data should be readily available. Where assumptions are made, they must be justified.

Emission variability

What we heard

Various submissions provided comments and/or raised concerns around accounting for emission variability when undertaking impact assessments. Concerns fell into three general areas:

- The Approved Methods is primarily focused on point sources and does not thoroughly consider fugitive sources.
- Requirements for worst-case emissions and worst-case meteorology could overestimate impacts.
- The Approved Methods doesn't adequately consider the variable nature of some industry sources/sectors.

Our response

The EPA uses the information in an air quality impact assessment to inform licensing decisions such as the setting of point-source emissions limits in an Environment Protection Licence. An important aspect of the Approved Methods is to ensure that the air quality impact assessment includes sufficient information for the EPA to set such limits. The impact assessment has to demonstrate that

emissions at or below any site-specific limit do not cause adverse impacts under any meteorological condition.

The Approved Methods outlines that, in cases where emissions do not follow a clearly defined cycle, the maximum emission rate must be used. This was to gather the information needed to inform any appropriate site-specific emission limits, and to ensure that off-site impacts are not under-predicted. In some instances, the EPA may request proponents undertake a regulatory worst-case scenario: that is, emissions are assumed in the modelling at a suitable upper-bound level that reflects a site-specific emission limit.

The Approved Methods recognises that variable emissions may be considered for some processes or activities that operate through a clearly defined emission cycle. This was aimed at recognising those industry sectors where there are clear operational cycles, such as those found in some parts of the agricultural sector.

Stakeholders raised concerns around the requirements in the Approved Methods to use maximum emission rates. These concerns were particularly raised around fugitive odour sources, which don't typically operate in a similar manner to steady-state point sources. *The EPA's Technical Framework: Assessment and management of odour from stationary sources in NSW* (EPA, 2006) (the Technical Framework) provides some guidance when considering constant versus variable odour emissions. The document notes that:

- **point sources** generally emit odour at a relatively constant rate, called a steady state
- **fugitive odours** are often emitted intermittently at intense levels because of the nature of their sources (for example, irrigation of effluent or pond cleaning). A risk assessment should be undertaken to identify the materials, plant, equipment or activities likely to generate intermittent odour as well as the likely timing, frequency, duration, intensity and character of the emissions.

When assessing impacts from fugitive odour sources, proponents should consider the EPA's Technical Framework.

To address stakeholder feedback, we have amended section 3.4.5 of the Approved Methods. The changes should make our expectations clearer. They include:

- distinguishing between point and fugitive sources, recognising that site-specific emission limits for points sources can be set in environment protection licences
- recognising that where large amounts of data are available (such as data from continuous emission monitoring systems), alternative emissions estimates can be considered, provided:
  - the emission rates reflect reasonable worst case

    and
  - a regulatory worst-case scenario is included in addition to any typical operating scenarios.

Meteorological data

Tiered model period

What we heard

We received mixed feedback from air quality practitioners, community organisation and industry on the model period based on tiered meteorological data requirements presented in section 4.1.

General support was received from air quality practitioners, government and some industry bodies.

Concerns were raised that this requirement increases complexity and reporting requirements and is not warranted for low-risk assessments. The tiered approach may also unintentionally oversimplify the trade-off between local realism and using statistics to demonstrate that meteorological data is representative of a site..

Two air quality practitioners highlighted that in some instances prognostic data performs better than poorly run weather stations.

Submissions recommended that meteorological data, and the numbers of years to be assessed, should be chosen according to the scale and risk of the project.

Submissions also questioned the role of the additional years for prognostic data and whether it would improve accuracy, given the inherent under- and over-prediction of wind speeds in these simulated datasets.

Our response

The requirement in section 4.1, that more than one year of data be assessed, is not novel. Since 2013, Victoria has required five years of assessment, and both the US and Canada have tiered requirements (U.S. Environmental Protection Agency, 2024; Ministry of Environment and Climate Change Strategy 2022). The modelling of multiple years for site-representative or prognostic data reduces some uncertainty in model predictions by accounting for year-to-year meteorological variability, ensuring the assessment accounts for worst-case and typical weather patterns, particularly along the Australian east coast where such year-to-year variability is observed (DPE, 2022; Ulpiani 2021). This approach can also help in facility design as a single year of data may lead to over-regulation or under-protection of public health.

Comparing representative datasets with long-term climate averages and extreme weather events ensures that the modelling period reflects conditions that could lead to maximum pollutant concentrations.

Meteorological conditions vary year to year. We acknowledge that this may not cause large differences in the ground-level concentrations. However, such variability is important for projects where marginal compliance has been demonstrated. Additional years of assessment will reduce the uncertainty in the predictions. We have added text in section 4.1 to support such instances. The use of additional years of assessment will help us be more certain about decisions and improve transparency. We consider that the air quality practitioner is responsible for evaluating the risk of a project and deciding when more than one year of modelling would support the assessment.

In introducing the tiered model period, we don't intend to prefer data from poorly run and non-compliant weather stations over site-representative or prognostic data; such an approach would have further implications. We do, however, intend to encourage the use of sufficient-quality site-specific and representative data. We have refined the terminology, with emphasis on 'sufficient quality' data.

We have also allowed for just one year of data to be assessed when robust, site-representative data is combined with a diagnostic meteorological model. The Approved Methods are the minimum requirements. If the air quality practitioner considers a project to be high-risk, more than one year (and preferably five) can be used to reduce the uncertainty in the predictions.

If only prognostic data are relied upon, then all five years must be used to assess pollutant impacts. It is not acceptable to review five years of prognostic data and select only one year of data for assessment.

Sometimes site-representative observational data can be combined with diagnostic meteorological modelling within CALMET to account for terrain and land-use influences on wind fields, and so provide a robust representation of local site conditions. In such situations, the EPA will accept the use of one year of data. The air quality impact assessment needs to demonstrate that the representation is robust.

Site-representative data

What we heard

We heard from air quality practitioners and industry that section 4.1 needs to clarify what defines 'site-representative' meteorological data to be used in modelling. One air quality practitioner raised whether geographical bounds could be introduced, such as the 5 km boundary used by Victoria.

Several practitioners raised concerns about when site-representative data is used and whether, depending on the CALMET settings, the observations will have an influence on the winds at the site or if the prognostic simulation will be unaffected. It was highlighted that this could affect whether three years or five years of data should be assessed.

Our response

Section 4.1 sets out the factors an air quality practitioner needs to consider when determining if a weather station is site-representative. They are:

- the proximity and relevance of the meteorological station to emission sources and within modelling domain
- the complexity of the local terrain and the exposure of the meteorological monitoring site
- whether the data has been obtained over a long enough period to capture seasonal variations and extreme weather events.

We have intentionally kept the interpretation open in section 4.1, to allow air quality practitioners to use professional judgement. The decision is to be made on a project-by-project basis. It may not always be relevant to apply a geographical limit, particularly in areas of complex terrain, where the terrain may influence the pathway from source to receptor.

We have added to text section 4.1 to close the issue as to whether site-representative data used in CALMET would require one, three or five years of assessment. One year of site-representative data is allowed, but the assessment must include a robust demonstration of model performance.

We have specified the inclusion of extreme weather events within a meteorological dataset to prevent data being removed from a file for convenience.

On-site weather stations

What we heard

Industry submissions were primarily concerned with the recommendation in section 4 that an on-site weather station be established as soon as practicable.

Several submissions commented on the prescriptive minimum wind speed requirements in sections 4.1 and 4.3.1 for on-site weather stations and the potential for increased cost to the proponent. Across the submissions received there was confusion as to whether the wind speed thresholds support the use of ultrasonic anemometers or cup and vane anemometers.

The compliance level required to meet *AS/NZS 3580.14 Methods for Sampling and Analysis of Ambient Air: Meteorological Monitoring for Ambient Air Quality Monitoring Applications* was also raised, with one air quality practitioner concerned about the limited compliance of the DECCW weather station and other industrial weather stations.

One submission noted that the draft Approved Methods is not consistent with the *Ambient air monitoring guidance note* (EPA, 2022).

Another industry submission suggested alignment with the World Meteorological Organisation weather station requirements.

Our response

As stated in section 4, the EPA considers an on-site weather station to be an invaluable tool for obtaining site-specific meteorological information used in dispersion modelling. The EPA recommends that an on-site weather station is established as soon as practicable, so that at least one year of sufficient-quality on-site data is available to include in the air quality impact assessment.

We clarify that it is not the remit of the Approved Methods to require the installation of an on-site weather station. This would be prescribed in Secretary's Environmental Assessment Requirements (SEARs), Conditions of Approval or an Environmental Protection Licence (EPL).

We also clarify that the minimum wind speed threshold of 0.5 m/s stipulated in section 4.1 was designed to allow for use of ultrasonic as well as cup and vane anemometers. As per section 4.3.1, the EPA prefers on-site weather stations to use an ultrasonic anemometer with a minimum threshold of 0.2 m/s to capture low wind speeds, which are important for stagnation events. However, we recognise there are existing weather stations that require flexibility with regard to this requirement – for instance, the Bureau of Meteorology has weather stations across Australia that currently use cup and vane anemometers.

As per section 4, professional judgement from experienced air quality practitioners and meteorologists is required when compiling and processing meteorological information. This includes the quality of the data and the assertion that the data is of 'sufficient quality'. Good-practice measures would include reviewing the siting of the weather station, calibration and compliance records.

The *Ambient air monitoring guidance note* (EPA, 2022) specifically states 'the EPA recommends that, as far as is reasonably practicable, meteorology monitoring that is used for air quality assessment and management comply with the requirements of AS 3580.14'. This requirement is consistent with the expectations outlined in the Approved Methods under section 4.3.1.

Representative year for modelling and model evaluation

What we heard

Several air quality practitioners requested additional clarification on the definition and determination of a representative year for modelling and whether guidance can be provided to quantify this determination in some way. Clarification was also requested on whether EPA consider years from El Niño, La Niña and a neutral year for assessment.

Our response

Section 4.2 of the draft Approved Methods states that 'a representative year must be demonstrated to adequately describe the expected meteorological patterns, and to be comparable to long-term weather conditions for a period of no less than five years'.

The EPA prefers that five years of consecutive data be used in analysis. The selection of years based on the El Niño Southern Oscillation (ENSO) cycle would not likely be rejected if adequately justified and meets all other requirements. As per section 4.1, site-specific and site-representative data must be accompanied by at least five years of evaluation.

The EPA considers five years of data evaluation adequate for most projects, unless the air quality practitioner were of the opinion that additional years would be of benefit for EPA in the decision-making process. This would be at the discretion of the air quality practitioner, but may on occasion be requested by the EPA if necessary.

Metrics to be evaluated are listed in section 10.4 and include wind speed, wind direction, ambient temperature, atmospheric stability class, inversion conditions and katabatic drift. The EPA has not quantified the metrics used for determining a quantitative year because such prescriptions can become cumbersome and become an additional burden, and may not be relevant.

Background air quality

Application of background data

What we heard

Several submissions have requested clarification on the application of background data and the duration required for assessment provided in section 5. This includes whether there is the requirement for the background dataset to be 90% complete as required for meteorological datasets, a definition of contemporaneous assessment and when it is to be applied, and if it is to be applied to five years when assessed.

Review and clarification were also sought on:

- the definition of exceptional events in the context of particulate matter
- exclusion of exceptional events
- whether treatment should be consistent with Clause 18 of the National Environment Protection (Ambient Air Quality) Measure.

One submission raised the use of low-cost sensors and whether EPA would accept this type of monitor for use as background in isolated area in the absence of any other data.

Our response

The draft Approved Methods does not state that 90% data retrieval for the background dataset is required. Section 5.1 does state '… when background data is limited, alternative sources are permitted to supplement this period'. When more than one year is modelled, then all years modelled are required to be assessed, with results presented accordingly. In situations where not all years of data are available, professional judgement should be applied and adequate justification included in the air quality impact assessment. For example, the air quality practitioner may want to select a different year to model, or supplement data with another site-representative background dataset.

In accordance with the core principles introduced in section 1.3, the impact assessment report must be transparent and enable all steps of the process to be replicated. When exceptional days are excluded from the assessment, and this action is not adequately justified, this creates uncertainty, and makes the assessment less suitable for decision-making. If exceptional days are removed from a dataset, the ambient concentration presented will not reflect the exposure that people will experience should the project be approved.

The EPA has defined 'contemporaneous data' in the glossary as 'background monitoring data that are representative of the period being assessed in the modelling, taking into account the temporal alignment with the meteorological dataset and representativeness of current emissions and environmental conditions'.

The EPA considers that direct alignment of Clause 18 of the National Environment Protection (Ambient Air Quality) Measure (NEPM) with the Approved Methods is not required, as the purpose of a regulatory air quality impact assessment differs from that of compliance reporting under the NEPM. Specifically:

- NEPM provisions relate to assessment of compliance with ambient standards
- AQIAs are intended to assess project-related impacts.

The EPA acknowledges submissions regarding the potential use of low-cost sensors, particularly in remote or data-sparse environments. The EPA position is that high-quality monitoring data obtained using instruments compliant with relevant Australian Standards (or equivalent recognised standards) remains the preferred basis for background characterisation. Low-cost sensors are not considered a substitute for compliant reference-grade monitoring. However, low-cost sensors may be used to:

- supplement existing datasets
- provide additional spatial coverage
- support qualitative understanding of spatial variability.

The EPA is concerned that broad acceptance of low-cost sensors without appropriate constraints may disincentivise the use of higher-quality monitoring methods. Accordingly, low-cost sensor use will remain conditional and supplementary and must be adequately justified.

Accounting for future likely sources in dispersion modelling

What we heard

Two submissions from air quality practitioners sought clarification on section 5.3 in regard to future sources to be included in the modelling as background. It was requested that EPA define 'nearby sources', especially possible future sources. Additional guidance was also sought for when there is no publicly available information on the future sources. The submissions suggested the definition be limited to where there is sufficient information.

Clarification was also sought for the definition of nearby sources when accounting for non-project sources.

Our response

EPA acknowledges that cumulative modelling of future likely sources can be onerous on the air quality practitioner completing the assessment when suitable publicly available information is not

sufficient. These situations can arise when new nearby projects are introduced in the planning system or where land has been rezoned. The EPA advises that information is sought from the Planning Portal, from council approvals, or from a similar facility (with adequate justification).

In practice, there is no change in the EPA's position on including nearby sources that comprise future background. For example, it is common practice for coal mine assessments to model other nearby mines with consideration of future production rates and mine progression. For projects located in in semi-urban areas, we acknowledge the potential for land-use conflicts with the encroachment of urbanisation on rural and agricultural areas. The remit of the Approved Methods is not to solve these issues but rather to provide a clear approach for assessment.

Section 5.3 specifies that '[w]hen nearby sources within the domain are not captured by ambient monitoring, they must be explicitly included in the dispersion modelling'. This is best determined on a project-by-project basis, rather than by one overarching definition.

Dispersion modelling

Update of peak-to-mean ratios

What we heard

Several air quality practitioners are concerned that the peak-to-mean ratio information included in the draft Approved Methods is out of date and requires review.

Our response

We acknowledge the concerns raised. This chapter will be reviewed and updated as part of future work.

Approved and alternative models

What we heard

There was overall support for the introduction of the AERMOD dispersion model, replacing the Ausplume model. We heard concerns from air quality practitioners that the requirements in section 6.1 for model selection for Gaussian plume models, with consideration of the now approved model AERMOD (section 6.2.1), were overly restrictive and less relevant than to its predecessor Ausplume. AERMOD's modules can deal with elevated terrain, buoyant line plume emission sources and model very low wind speeds through setting the anemometer-specific stall threshold.

Conversely, we also heard from air quality practitioners that there needs to be specific situations where AERMOD is not suitable and should not be used. The modelling of odour was specifically raised as a situation where AERMOD is not appropriate.

The alternative model requirements in section 6.2.3 received multiple submissions from air quality practitioners seeking approval of specific models when CALPUFF and AERMOD aren't suitable. Models identified included Graz Lagrangian Model (GRAL), Roadside air quality screening tool (RAQST), Community Multiscale Air Quality (CMAQ) and Comprehensive Air quality Model with extensions (CAMx). Submissions also proposed that a supplementary list include when models are appropriate or inappropriate for use, rather than being justified case by case.

Also raised regarding section 6.2.3 was the need for the sensitivity analysis requirement when using the alternative model. It was highlighted that model comparisons (i.e. the sensitivity analysis) have little benefit, and discussion on the limitation of the model may be of more use. Feedback on timing of approval and method for obtaining approval for the use of alternative models was requested and raised as an issue that has occurred in the past.

Submissions also requested updated or model guidance be developed for CALPUFF/CALMET, AERMOD, WRF and TAPM.

Our response

Specific models

The EPA acknowledges stakeholder concerns that section 6.1 may be overly restrictive on the use of AERMOD. We have updated the wording to ensure that any limitations applied to AERMOD are appropriate to its capabilities and reflect contemporary understanding of model performance. Where restrictions remain, these will be clearly linked to known limitations rather than general issues derived from Gaussian plume models. We have also introduced in section 6.2.2 text that specifies that CALPUFF is the preferred model for odour.

Alternative models

The inclusion of alternative models as 'approved alternative models' (e.g. GRAL, RAQST, CMAQ/CAMx) will not be revised in section 6.2.3. The intent of this section is to acknowledge that alternative models may be appropriate in specific circumstances, rather than to provide an endorsed list of approved models that can be used when AERMOD or CALPUFF are not suitable. The terminology has been intentionally left open to allow for any other suitable model to be used when it meets the requirements specified in section 6.2.3. We note that the Approved Methods is a statutory document that specifically addresses emissions from stationary sources. There are other regulatory instruments that look at non-stationary sources (for example, fuel quality standards and vehicle standards). For complex projects where photochemical models are considered appropriate the *Tiered Procedure for Estimating Ground-Level Ozone Impacts from Stationary Sources* (EPA 2011b) is available for technical guidance.

We acknowledge concerns regarding delays and lack of clarity in obtaining approval to use alternative models. We encourage early engagement with the EPA air technical team to reduce delays and uncertainty in model approval.

Model sensitivity

The EPA has taken on board feedback that the model sensitivity requirements in section 6.2.3 may provide limited value in some cases and have removed the requirement accordingly. As a result, the EPA expects that the assessment clearly demonstrate a detailed knowledge of model limitations, assumptions, and uncertainties to provide us with a clear and transparent understanding of the consequences of using the alternate model rather than one of the EPA-approved models. Our expectations for justification of model selection is proportionate to project risk and complexity. A simple project with well-documented use for the application in question may only require reference to supporting information.

Guidance for commonly used models

We recognise the need to maintain up-to-date guidance for commonly used models. The existing *Generic Guidance and Optimum Model Settings for the CALPUFF Modeling System for Inclusion into the*

'Approved Methods for the Modeling and Assessments of Air Pollutants in NSW, Australia' (EPA 2011a) and *Tiered Procedure for Estimating Ground-Level Ozone Impacts from Stationary Sources* (EPA 2011b) have been identified for updates. No additional guidance documents have been identified for update at this time. Air quality practitioners are encouraged to refer to the extensive documentation that is already available, many sources of which are listed in the bibliography of the updated Approved Methods. We note that detailed model configuration is highly technical and evolves rapidly. Our formal guidance will therefore focus on principles and minimum expectations, rather than attempting to replicate model manuals.

Need for professional judgement

As discussed in section 6.1, the EPA emphasises that the selection, configuration, and interpretation of air quality models require a high level of professional judgement. While guidance documents provide a framework, it is the responsibility of practitioners to ensure they are competent in the use of any model they apply. Training courses are available through organisations such as CASANZ and other providers, at both introductory and advanced levels. The EPA considers that practitioner capability is best supported through use of these resources, rather than through prescriptive guidance that may rapidly become outdated.

Receptors

What we heard

Submissions noted that there could be further advice included regarding:

- receptor placement and density (i.e. whether receptors should be located at building centroids, facades, site boundaries, etc.)
- treatment of elevated receptors and defining background concentrations for such receptors
- grid spacing and validation requirements (e.g. against measured data).

Our response

The EPA considers that receptor placement, treatment of elevated receptors and grid configuration are modelling inputs that require a level of professional judgement, so the air quality practitioner must document and justify their approach.

When determining receptor placement and densities, practitioners should consider the distribution of sensitive receptors and the potential for exposure and/or amenity impacts. Receptors should be positioned to adequately characterise areas where the highest ground-level concentrations are expected and where people may reasonably be exposed. The treatment of elevated receptors and the configuration of receptor grids should be selected to ensure that the assessment appropriately captures potential impacts and provides sufficient spatial resolution for decision-making.

Sensitive receptors

What we heard

Concerns were raised over the broadening of the definition of sensitive receptors from 'work or reside' to 'likely to be present'. It was noted that the draft Approved Methods included a non-exhaustive list of sensitive receptors, allowing additional categories to be included at the EPA's

discretion. It was also noted that the addition of 'culturally significant sites' is undefined and overly broad.

Feedback on this point included that:

- there is a lack of clarity regarding exposure duration, frequency and population vulnerability
- recreational and transient-use areas are treated as sensitive receptors, despite exposure being probably only short in duration
- the definition of 'sensitive receptors' should include a reference to 'off-site' locations for completeness
- workplaces (e.g. factories, offices and farms) are inappropriately classified as sensitive receptors, given that most workplaces factories, or workshops in industrial settings are (it was suggested) occupied by healthy adult workers
- the future receptor concept ('known and likely') is unclear and may capture speculative developments
- the expanded definition of sensitive receptors will disproportionately impact rural and agricultural land uses, due to the inclusion of temporary accommodation and speculative or intermittent uses
- interaction with odour criteria and peak-to-mean ratios may produce overly conservative outcomes.

It was suggested that the definition and guidance be updated to ensure that rural worker dwellings and caretaker residences associated with intensive livestock agriculture or rural industries are not considered sensitive receptors.

Our response

Definition of sensitive receptors

The EPA has modified the definition to ensure that it is both protective and sufficiently practical. The updated definition of sensitive receptors focuses on locations where people work or reside, to realign with the current Approved Methods. The definition now also includes further guidance regarding locations that **may** be classed as a sensitive receptor – that is, where the assessment identifies a potential exposure or amenity risk, considering factors such as exposure duration, frequency and expected visitation. Examples may include:

- recreational spaces such as public parks, gardens, playgrounds and gyms
- places of worship
- sites of cultural significance
- temporary accommodation.

Future sensitive receptors

'Future sensitive receptors' have been further defined for clarity. An air quality impact assessment must consider future sensitive receptors, including those known and reasonably foreseeable.

Proponents should consult with relevant local councils to identify any planned or approved developments (including rezoning) likely to be affected by the activity. They should seek advice about the likelihood of the preferred land use in the area changing in the short, medium and long

term. If the likelihood of change is high and the probable change in land use is expected to create compatibility issues for the activity, this should be factored into the assessment.

Workplaces

With specific regard to the comments received about workplaces: sensitive receptors are locations where people work or reside. Workplaces are considered sensitive receptors; this is consistent with previous versions of the Approved Methods. The EPA does not support the assumption that all workplaces contain healthy workers.

Odour

We have included further guidance for assessing odour when receptors may be less sensitive. With respect to odour, some receptors may be deemed less sensitive where the receiving environment is consistent with or comparable to that of the proposed activity. However, the requirement for no 'offensive odour' to be emitted from EPA-licensed activities still applies under section 129 of the POEO Act.

Impact assessment criteria

Significant Impact Levels (SILs)

What we heard

We received positive feedback from all air quality professionals regarding the inclusion and purpose of SILs in the Approved Methods. Common feedback was that they wanted more information on the development of the SILs and what NOx transformation methods were applicable for use with SILs.

A small number of air quality professionals requested clarification on whether the SILs step could be skipped and which receptors they applied to. One industry peak body requested a name change to 'Screening Impact Levels'.

One community response was concerned about the use of SILs in already constrained airsheds that exceed impact assessment criteria.

We received mixed feedback on the SILs from some industry responses, ranging from positive support for genuinely low-risk proposals to avoid a full cumulative assessment, to concern about the SILs being compliance criteria and incurring a cost to comply with. One industry respondent commented: 'The purpose of the SIL is clearly articulated and well justified in the Technical Note. The linkage to air quality variability and international precedent is sound.'

Other industry respondents asked for more information about how the SILs were developed and how specific areas and industry were considered.

Survey responses to the question 'How clear are the purpose and application of the SILs?' were mixed (Figure 2). However, government respondents and air quality professionals identified that they generally had a clear understanding of the application of the SILs.

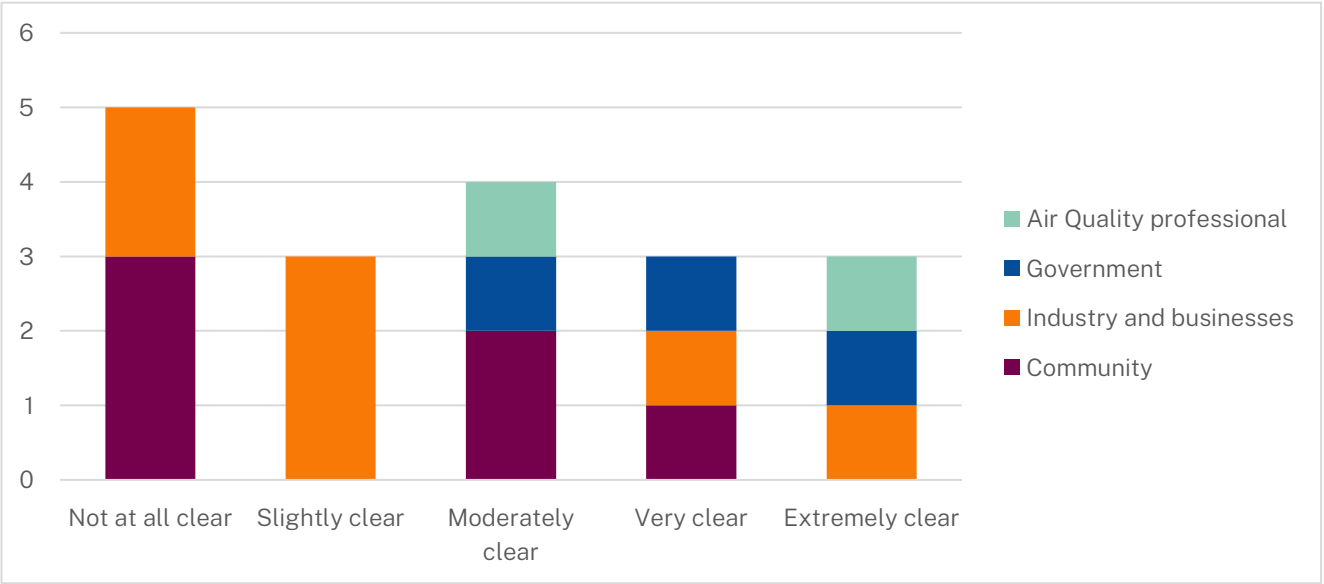

Figure 2 Sector group breakdown of SILs question

Our response

As outlined in the Technical Note, the EPA followed the US EPA Air Quality Variability Method (US EPA 2018) to derive the SILs. The method uses a well-established and robust statistical approach to determine significance, and we believe the terminology is appropriate. The development of the SILs for the Approved Methods relied on 25 years of air quality data from all government monitoring stations across NSW. This monitoring data covers a range of airsheds across the state and includes measurement of extreme events such as bushfires and dust storms. The EPA presented more detailed analysis at the 2026 CASANZ conference for air quality professionals and in a peer-reviewed scientific paper.

The EPA considers it common logic that the SILs step can be skipped where the SILs are not relied on for assessment purposes. The SILs provide a pathway to quantitatively demonstrate a project is a low risk to air quality and a cumulative assessment is not required. There are no additional requirements to assess against SILs but, where they are relied on, they must be clearly presented for each relevant pollutant and all averaging periods in air quality impact assessments. The use of SILs, even in already constrained airsheds, does not contradict the core principles, as they are statistically defined levels of significance.

We have updated section 7.2.1 in the Approved Methods to clarify that the SILs apply at receptors as defined in section 6.3.5.

We have added a note to the SILs table (Table 7) that incremental NO_2 must be determined using one of the methods in section 8.1.

Degradation Prevention Thresholds

What we heard

We received positive feedback from all air quality professionals regarding the inclusion of DPTs in the Approved Methods. Common feedback was similar to that for the SILs – that is, it asked for more information on how the DPTs were developed and which NOx transformation methods are applicable for use with DPTs.

One comment from industry was that the DPTs are excessively stringent relative to existing national and international benchmarks.

Survey responses to the question ‘How clear are the purpose and application of the DPTs?’ were mixed (Figure 3). However, government respondents and air quality professionals identified that they generally had a clear understanding of the purpose and application of the DPTs.

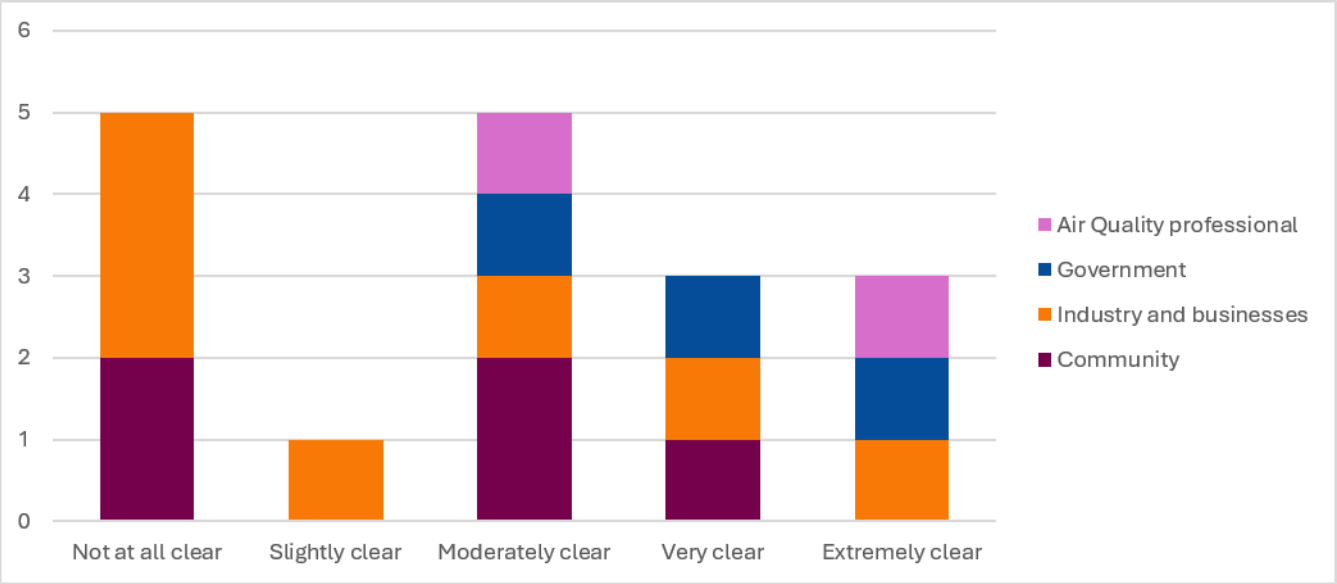

Figure 3 Sector group breakdown of DPTs question

Our response

As outlined in the Technical Note, short-term DPT values align with those used by international environment agencies (20–27% for Class 2 US PSD increments) and the NEPM acceptance of ambient concentrations not requiring monitoring (75%). DPTs for annual time periods align with the thorough evaluation of the health evidence by WHO and specifically the risk values for $PM_{2.5}$ (Capon and Wright, 2019).

The DPTs are not compliance criteria but are thresholds that trigger a mitigations options analysis. They are not comparable to US NAAQS (National Ambient Air Quality Standards) and Australian Worksafe criteria. The existing cumulative framework remains and the compliance criteria remain the values adopted from NEPM.

We have updated the Approved Methods to clarify that the DPTs apply at receptors as defined in section 6.3.5.

We have added a note to the DPTs table (Table 8) that incremental NO_2 must be determined using one of the methods in section 8.1.

Selection of principal and individual toxics criteria

What we heard

We received lots of supportive feedback, particularly from air quality professionals, regarding the update of the toxics criteria and that they now reflect current health-based evidence and include chronic exposure criteria.

Feedback was received on specific toxics criteria selection, that some criteria have been relaxed and that chronic criteria should apply at sensitive receptors, not at and beyond the boundary.

One comment from industry was to reinstate the 99.9th percentile for toxics criteria rather than the 100th percentile.

Our response

The toxics criteria development method has been independently reviewed by a health expert (Attachment A).

The annual criteria for toxic air pollutants in the Approved Methods have been updated to apply at receptors, rather than at and beyond the boundary of the premises. The toxics criteria have been updated to reflect current evidence-based public health risks and impacts, and therefore should be assessed on a 100th percentile basis to ensure they are suitably protective.

Reference temperatures

What we heard

Several air quality professionals raised concerns over the inclusion of the 0°C reference temperature in the footnotes of the common pollutant tables (Table 7, 8 and 9) and the inconsistency with the reference temperature for the toxic pollutants (Tables 10, 11 and 12) of 25°C.

Our response

The reference conditions, including temperature, noted under the criteria tables are to identify the temperature at which the criteria were converted across units. The 0°C temperature for the common pollutants (Tables 7, 8 and 9) is to align with the source of the criteria: the Ambient Air Quality NEPM (NEPC 2021), which defines µg/m^3 as 'microgram per cubic metre referenced to a temperature of 0 degrees Celsius and an absolute pressure of 101.325 kilopascals'.

The reference temperature for the toxics (Tables 10, 11 and 12) remains consistent with that of the previous Approved Methods.

Model results are not subject to temperature, but background data (e.g. from DCCEEW, which reports gases in pphm) needs to be converted at the reference temperature.

We have further clarified the use of reference temperatures in the background section (Chapter 5) of the Approved Methods.

Retain the risk assessment criteria

What we heard

One comment from industry was to retain the risk assessment criteria.

Our response

The toxics criteria have been updated to reflect current evidence-based public health impacts, and so the risk assessment levels (1 in 100,000) have been incorporated into their development.

What to do if criteria are exceeded

What we heard

Several air quality professionals raised the wording in section 7.6, which implied exceedances should be treated as a modelling exercise.

Our response

We have updated the wording in section 7.6 to clarify that exceedances of criteria should lead the proponent to consider revising the proposal. Modelling presented in an air quality impact assessment should be based on a final design that does not cause exceedance of criteria.

Odour assessment

What we heard

The draft Approved Methods adopted a 1 ou contour to be used as the perimeter from which population is calculated to establish appropriate odour assessment criterion (section 7.5). We received many submissions about this, from industry, peak bodies and air quality practitioners. Stakeholders also asked us to clarify whether the assessment of the affected population is to be based on incremental or cumulative impacts, and if uniform criteria apply across mixed land uses.

One submission recommended that unlisted land uses apply a default 7 ou. Conversely, another submission recommended removing the 6 ou and 7 ou criteria and putting a limit of 5 ou.

We also received submissions asking us to clarify marginal compliance and the robustness of mitigation. One industry submission sought clarification on how risk is assessed with respect to odour from a different industry.

Our response

We acknowledge the potential limitations of the 1 ou contour for establishing odour impact assessment criteria. After extensive consultation with industry and other relevant government departments, we have revised the 1 ou contour and instead adopted a 2 ou contour. This has been extensively used and accepted for assessments in NSW for the past decade. The 2 ou contour applies to cumulative impacts, which include 'future likely sources' as per section 5.3 of the draft Approved Methods.

The odour criteria in section 7.5 align with and are supported by the *Technical Framework: Assessment and management of odour from stationary sources in NSW* (EPA 2006a) and the *Technical notes: Assessment and management of odour from stationary sources in NSW* (EPA 2006b).

In situations where there is marginal compliance with the odour criterion, the EPA will often ask the project proponent to provide more information to support the application and make odour risk more transparent. Section 7.5.1 of the *Technical Framework: Assessment and management of odour from stationary sources in NSW* (EPA 2006a) lists the information that must be included in an air quality (odour) impact assessment report; it includes information that informs the odour risk of an activity. One important piece of information that informs the odour risk of an activity is the availability and performance of odour mitigation measures. Data used to support the anticipated performance of odour mitigation measures must be scientific data and not based on anecdotal information.

Post processing

New NOx conversion method

What we heard

Air quality professionals welcomed the new NOx conversion method (ARM).

Some air quality professionals asked about the ordering and preference of NOx conversion methods.

One air quality professional asked for more information about how the ARM equation was developed and the use of only six years of background monitoring data (from government monitors). This air quality professional also raised an issue regarding the application of the method to modelled (incremental) results only.

Our response

EPA has ordered the methods in order of complexity (based on data requirements and chemistry) and conservatism, not necessarily in order of preference. Selection of a method is left to professional judgement and data availability.

We appreciate the scientific rigour of the air quality professional regarding the ARM method; however, we stand by the proposed method and approach, which has been developed and peer-reviewed for use in a regulatory setting. We are aware of the technical limitations in predicting hourly incremental NO_2. Even the most advanced US EPA Tier 3 methods (Appendix W) are considered screening rather than refined model techniques for NO_2. As outlined in the core principles of the Approved Methods, where there is uncertainty with any assumption or method, a conservative approach must be applied to ensure impacts are not underestimated.

The EPA has expanded the data analysis to encompass 10 years of ambient NOx data (2016–25 inclusive) to derive the ARM equation. Unlike the US EPA, which has a 98th percentile three-year average NO_2 one-hour criterion, the NSW EPA adopts the Ambient Air NEPM for NO_2 criteria, which are 100th percentile. Therefore, we determined the empirical equation for ARM to capture the upper bound of the NO_2/NOx ratio, only excluding the small number of outlier hours (0.15%) from the determination of the ARM equation that would be prohibitive to its use.

We have updated Chapter 8 to provide additional clarification on background, in-stack ratios and the annual approach with the ARM method.

We have removed the Janssen method, as it is no longer considered fit for purpose for unrestricted use. The Janssen method was developed as an empirical equation for estimating the oxidation rate, and was based on an aircraft study of NO in power-plant stack plumes in Europe (Janssen 1988). Should an air quality practitioner need an NOx conversion method other than those in the Approved Methods, they can discuss this with the EPA on a case-by-case basis, as Chapter 8 notes.

Mitigation options analysis

General

What we heard

Various general comments and suggestions were received, on topics that included:

- the level of detail for a mitigation options analysis
- conflicting information on the need for a mitigation options analysis for $PM_{2.5}$
- requirements for investigating mitigation options for principal air toxics being based on the presence of these pollutants rather than on incremental risk
- what to do if compliance with the DPT cannot be achieved.

Our response

The EPA acknowledges the conflicting information in the draft Approved Methods regarding the need for a mitigations options analysis for $PM_{2.5}$. We have updated the Approved Methods to require a mitigation options analysis for $PM_{2.5}$ if the incremental ground-level concentration is above the SIL, and have amended the text to improve clarity.

Regarding comments received on the level of detail for the mitigation options analysis: in some instances the mitigation options analysis may be qualitative in nature, but in other instances we would expect a much more detailed quantitative assessment. It is the responsibility of the air quality practitioner to compile the necessary evidence to justify the level of the detail within the mitigation options analysis, and to present the case for selected mitigation options. In some instances, such as where best-practice mitigation measures for a particular industry are well understood and defined, the mitigation options selected for detailed analysis may be limited and focus on key options.

Guidance is not needed for when the DPT cannot be achieved. The DPT is not a compliance criterion; it is a trigger level for when the impact assessment report must include a mitigation options analysis to justify the proposed mitigation measures. The impact assessment criteria remain as the compliance criterion.

Some submissions commented that mitigation options for principal air toxics are based on the presence of these pollutants rather than the incremental risk. We acknowledge that in some instances principal air toxics maybe present but in insignificant quantities. We expect consultants and proponents/licensees to apply professional judgement when implementing the Approved Methods. We have updated the Approved Methods to:

- remove the requirement for a mitigations options analysis for all emissions of principal air toxics and
- include that a mitigations options analysis should be used to demonstrate that principal toxic air pollutants have been minimised to the maximum extent achievable.

Methods for reducing emissions

What we heard

Various submissions raised comments on the examples in Table 15 of methods for reducing air emissions. A number of submissions commented that acquiring land or sensitive receptors was not the same as PPE (as could be inferred from the examples provided). Other submissions raised minor textual comments and suggested including offsets in the mitigation options.

Our response

Table 15 gives some high-level examples of mitigation options as guidance. The table is not an exhaustive list, and provides guidance on how to apply risk-reduction principles. The inclusion of acquiring land or sensitive receptors was to highlight that, where options are limited, land acquisition is an option. To avoid confusion, and any conflict with other government policies such as the VLAMP, we have amended this table of examples. In relation to offsets, we consider that the mitigation options analysis is aimed at understanding feasible and reasonable mitigation options for the premises being assessed. The options analysis should focus on emission reduction options at the source(s) for the site being assessed.

Considerations when preparing a mitigation options analysis

What we heard

Some submissions commented on the types of information that is to be considered when preparing a mitigation options analysis. They included comments such as:

- The mitigation options analysis should take into account various environmental aspects, including air emissions, greenhouse gas emissions, energy recovery benefits and water quality outcomes.
- Guidance should be provided on how to consider costs.

Our response

The EPA recognises that there can be environmental trade-offs when considering mitigation options: for example, thermal treatment of air pollutants results in emissions of other air pollutants. Evaluating mitigation options can include quantifying new or additional options, or quantifying changes in environmental impacts that may arise from a particular mitigation option. Section 9.2.5 of the Approved Methods lists factors that should be taken into account when such evaluations are being done; they include recognising and considering environmental trade-offs that may be associated with some mitigation options. When justifying the selection of mitigation options, proponents should present the appropriate level of information on environmental trade-offs, including the advantages and disadvantages of the selected option.

Some comments asked us to clarify how to consider costs. These comments referenced other guidance materials such as the US EPA BACT guidance. Where proponents are considering costs to justify their selected mitigation options, they can follow other detailed guidance, such as the US EPA BACT guidance, provided they can show it is fit for purpose.

Fugitive dust

What we heard

Some stakeholders asked us to clarify the requirement to use negative data to model the decline in emissions from other sources. They recommended that this requirement be aligned with the Approved Methods for Sampling and the EPA/NEPC guidelines for measurement.

In other feedback, stakeholders noted:

- some mines sit outside the range of data that was used to develop the AP-42 equations
- the relationship between surface moisture content and dust suppression effectiveness does not consistently represent current haul road construction standards, traffic loads, and contemporary dust suppression practices
- the fugitive dust section (section 12) should explicitly distinguish between licensable fugitive dust sources and temporary construction activities, and recognise appropriate assessment approaches for each
- there should be more stringent requirements for construction air quality management plans
- the requirement to assess air toxics in fugitive dust does not define any screening threshold to distinguish between ubiquitous background metal concentrations in soils and project-related emissions

- the restriction on using prognostic data alone for mining projects without reasonable justification is overly limiting.

Our response

Using negative data

Applying negative data in dispersion modelling is not necessarily equivalent to reporting negative data from a measurement instrument. We recommend that background air quality data be obtained from monitoring data, ideally collected at the proposed site. Baseline monitoring should be established as soon as practicable to allow for one year of data to be used in the assessment. Where the background air quality data is not based on a single monitor, the method for determining background air quality must be clearly outlined.

Where site-specific data cannot be used to estimate fugitive dust, emission factors can be used. They include:

- US EPA's AP-42 Emission Factors
- National Pollutant Inventory Emissions Estimation Technique Manuals.

Additional requirements for fugitive dust

The fugitive dust chapter outlines additional requirements that apply to the assessment, mitigation and documentation of fugitive dust, including dust from metalliferous and other mines and quarries. The additional requirements for fugitive dust are intended to address the gaps between assessment on the one hand and planning and licence conditions on the other, for mining, metalliferous mining and the silica industry. The intent is to enable the EPA to more transparently set regulatory requirements so that auditable control measures applied in the air quality impact assessment are transferred to approval and EPL conditions. This section of the document does not cover temporary construction activities.

Principal air toxics

The Approved Methods states that where dust could include principal air toxics this must be specifically considered, modelled and assessed. Cumulative assessment is not necessarily required in all cases; however, professional judgement should be used to determine when assessment and modelling of principal air toxics is required. Where an assessment of principal air toxics is not required, evidence should be provided to demonstrate this.

Meteorological data

Regarding meteorological data, the EPA prefers that site-specific or site-representative data be used for mining projects. Prognostic data can be provided for mining projects where it can be reasonably justified.

Other

Odour from agriculture/intensive livestock

What we heard

We received seven submissions from the agriculture/intensive livestock industry and a government department dealing with agriculture. The submissions covered a wide range of topics, many of which have been addressed in other sections of this document. The others can be summarised as follows.

- The draft was seen as too focused on industrial point-source emissions, failing to reflect the fugitive, variable nature of agricultural emissions. Stakeholders asked for a tailored approach recognising realistic operating conditions and emission profiles.
- One submission recommended a standard odour criterion of 6 ou for receptors within RU1, RU2, and RU3 zones, recognising legitimate agricultural activity. More stringent criteria and current derivation methods should apply only to receptors outside these rural zones, based on the 2 ou contour.
- Submissions sought greater flexibility and certainty in accepting site-representative or prognostic data. They considered that the requirements in the draft document (e.g. 12 months of on-site data) were costly, unclear, and might delay projects unnecessarily. They recommended clear definitions of 'representative data' and proportionate, risk-based data requirements.
- The expanded definition of sensitive receptors is considered overly broad and unclear, particularly for workplaces, temporary accommodation, and cultural sites in rural areas. Industry recommends restricting receptors to locations with regular, meaningful human occupancy and excluding farm-related dwellings and workplaces.
- Some submissions proposed that odour modelling not be required for developments within designated agricultural precincts that meet predefined capacity and separation criteria, to streamline approvals for low-risk operations.
- Simultaneously modelling worst-case emissions and worst-case meteorology is considered unrealistic and likely to overestimate impacts. Industry recommends modelling based on representative or reasonable worst-case conditions aligned with actual farm operations.
- Expanding assessment to 1 ou contours is considered overly conservative, potentially sterilising agricultural land and creating artificial cumulative impacts. Retaining the 2 ou approach or separate rural criteria is recommended.
- Industry recommends additional literature review, data analysis, and a full regulatory impact statement to ensure the framework is evidence-based and proportionate.
- Some submissions raised concerns about consistency with the Namoi Region Jobs Precinct (NRJP) – specifically, that the Approved Methods would undermine the intent of the NRJP by rendering unviable much of the land mapped for intensive livestock agriculture.

Our response

Nature of agricultural emissions

We acknowledge that agricultural emissions are often fugitive and variable, and have updated the Approved Methods to better reflect these characteristics through guidance on variable emission

rates and scenario development. The framework retains flexibility for different source types, while ensuring assessments appropriately capture worst-case impacts using professional judgement.

Statewide framework retained

We have considered the recommendation for zoning-based odour criteria, but have retained a consistent statewide framework. However, the approach to determining criteria has been revised to retain the 2 ou contour, which better reflects accepted practice and addresses concerns about overly conservative outcomes of using the 1 ou contour in rural areas.

Meteorological data

The selection of meteorological data should be based on sufficient quality and representativeness rather than a single prescribed approach. We have updated section 4.1 to allow for an additional approach. This is for one year of data to be assessed where the assessment can provide a robust representation of local site conditions – i.e. where site-representative observational data is combined with diagnostic meteorological modelling using CALMET.

Sensitive receptors

We acknowledge the need for further clarity and have updated the definition of sensitive receptors accordingly under section 6.3.5. The updated definition clarifies that sensitive receptors are locations where people work or reside, aligning with the existing definition in the Approved Methods. The revised definition does, however, specify that some locations may be considered as 'less sensitive' to odour when the receiving environment is consistent with or comparable to that of the activity. Other locations may also be considered sensitive receptors where an assessment identifies a potential exposure or amenity risk, taking into account factors such as exposure duration, frequency and expected visitation. The revised definition is intended to be clearer, while recognising that the application and treatment of sensitive receptors should be transparent, and supported by professional judgement and evidence.

Low-risk projects

The EPA does not support a blanket exemption from odour modelling for low-risk projects. Appendix A does provide the methods for the completion of a screening assessment. We also direct the reader to the detailed and widely adopted information available in the *Technical framework Assessment and management of odour from stationary sources in NSW* (EPA, 2006a) and *Technical notes Assessment and management of odour from stationary sources in NSW* (EPA, 2006b).

The EPA has clarified that assessments must reflect reasonable worst-case conditions, rather than unrealistic combinations of extremes. Practitioners are expected to use professional judgement to ensure scenarios capture periods of elevated emissions under worst-case meteorological conditions to demonstrate compliance with a worst-case scenario.

Retention of the 2 ou contour

We have updated the method to retain the 2 ou contour for determining odour criteria in non-urban areas, recognising its longstanding use, and to avoid overly conservative and impractical outcomes associated with a 1 ou contour.

Construction dust/mobile/temporary sources

What we heard

SEARs typically require construction phase emissions; however, the Approved Methods do not outline the requirements for construction phase emissions.

Our response

It is not within the remit of the Approved Methods to provide guidance on construction assessments.

Interaction with other policies/criteria – e.g. VLAMP or NEPM goals

What we heard

We received a small number of comments from air quality professionals regarding the interaction of the Approved Methods with other government policies and criteria – specifically, the Department of Planning, Housing and Infrastructure's (DPHI) VLAMP and the Australian Government's NEPM goals.

Our response

The Approved Methods are referred to in legislation administered by the EPA and are used by the EPA to assess the impacts from air emissions by current or potential licensed premises. The Approved Methods contains the criteria we will require assessment against for licensing matters in accordance with the POEO Act (section 45). We have adopted the numerical value of the Ambient Air NEPM (NEPC 2021) standards for $PM_{2.5}$, PM_{10} and NO_2 (including 1-hour and 24-hour) as impact assessment criteria. We adopt NEPM standards of concentration when they are finalised and update the Approved Methods accordingly.

Where other agencies have different criteria used for other purposes (such as VLAMP), that is beyond the EPA's jurisdiction.

Risk of retrospective application

What we heard

Stakeholders raised concerns regarding the retrospective application of the impact assessment criteria – specifically, that new requirements might be applied to existing lawful operations, and be triggered through complaints or licence reviews.

Our response

The requirements set out in the updated version of the Approved Methods (including updated impact assessment criteria) apply once the relevant version has been formally gazetted. Application of the updated Approved Methods is generally triggered when:

- a licensee seeks a modification or development approval (e.g. EPL variation, DA or major project change), or
- the EPA undertakes an investigation, compliance action or review based on identified environmental risk.

Blasting

What we heard

One community group response raised concerns specifically about modelling and impacts from blasting. The key areas were:

- blasting not considered as part under the EPA's modelling requirements
- short-term impacts from blasting, annualised emission inventory and yearly criteria
- appropriate air quality model for assessing blasting
- ambient monitoring and model validation
- NO_2 transformation method for blasting.

Our response

While the submission related to multiple sections of the draft Approved Methods, the issues all relate to blasting, so we have provided a consolidated response here.

Blasting from extractive activities is required to be included in an air quality assessment where it will occur as an ongoing activity at a premises. The Approved Methods do not specifically identify blasting. However, modelling and impacts from blasting are not ignored as the EPA regularly reviews proposals that model and predict impacts from blasting, including particulates and NOx.

Emission rates for blasting are derived from the US EPA's AP-42 emission factors for western surface coal mining (US EPA, 2025). The information to calculate emissions incorporates the area to be blasted and is relevant for blasts with a depth of less than 21 metres.

The air quality consultant is free to choose an appropriate model to simulate blasting. Currently, almost all mining projects adopt CALPUFF. CALPUFF can model sub-hourly time periods, but this can be computationally intensive and for blasting may not yield more accurate results than when using one-hour averaging periods. The model is typically run for one-hour periods, using the time of day that blasting would be most likely to be done. The air quality impacts from the blast are then assessed against the one-hour, 24-hour or annual assessment criterion prescribed by the Approved Methods.

The monitoring of air quality from a blast must be completed in accordance with relevant standards under the *Ambient air monitoring guidance note* (EPA. 2022). The transformation methods for the oxides of nitrogen (NOx) emission from a blast (i.e. NOx to NO_2) are described in detail in section 8. It should be noted that all methods are valid as they do not distinguish source but are based on the atmospheric chemistry of the local airshed.

Prescribed burns

What we heard

One submission questions the double standard in that prescribed burns are allowed but excluded from regulatory scrutiny while industry that releases a relatively lower quantify of emissions is strongly regulated.

Our response

Prescribed burns are regulated under *Division 4 of the Protection of the Environment and Operations Regulation* (2022).

Bibliography

Capon and Wright, 2019. An Australian incremental guideline for particulate matter (PM2.5) to assist in development and planning decisions. Public Health Res Practi. 29(4); e2941298

Department of Planning and Environment, 2022. Upper Hunter Air Quality Monitoring Network 5-Year Review, https://www.environment.nsw.gov.au/sites/default/files/upper-hunter-air-quality-monitoring-network-5-year-review-220343.pdf

EPA 2011a, Generic Guidance and Optimum Model Settings for the CALPUFF Modeling System for Inclusion into the 'Approved Methods for the Modeling and Assessments of Air Pollutants in NSW, Australia', prepared by TRC Environmental Corporation, Lowell MA, USA.

EPA 2011b, *Tiered Procedure for Estimating Ground-Level Ozone Impacts from Stationary Sources*, prepared by Environ Australia Pty Ltd.

Ulpiani G., Ranzi G., Santamouris M. 2021. Local synergies and antagonisms between meteorological factors and air pollution: A 15-year comprehensive study in the Sydney region. Science of the Total Environment 788 (2021) 147783

U.S. Environmental Protection Agency (US EPA), 2024a. Guideline on Air Quality Models (40 CFR Part 51, Appendix W). Office of Air Quality Planning and Standards, Research Triangle Park, NC. Available at: https://www.epa.gov/scram/clean-air-act-permit-models [Accessed 7 Oct. 2025].

Ministry of Environment and Climate Change Strategy 2022, British Columbia Dispersion Modelling Guideline 2022, British Columbia Ministry of Environment and Climate Change Strategy, Victoria, British Columbia, Canada.

U.S. Environmental Protection Agency (US EPA), 2025b, AP 42: Compilation of Air Emission Factors from Stationary Sources. Available at: https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors-stationary-sources [Accessed 7 Oct. 2025].

EPA 2006a, Technical Framework: Assessment and Management of Odour from Stationary Sources in NSW, NSW Environment Protection Authority, Sydney.

EPA 2006b, Technical Notes: Assessment and Management of Odour from Stationary Sources in NSW, NSW Environment Protection Authority, Sydney.

Published by NSW Environment Protection Authority

Visit:
6 Parramatta Square
10 Darcy Street
Parramatta NSW 2150

Mail:
Locked Bag 5022,
Parramatta NSW 2124

Phone:
+61 2 9995 5000 (switchboard)

TTY users:
Phone 133 677, then ask for 131 555

Speak and listen users:
Phone 1300 555 727, then ask for 131 555

Email:
info@epa.nsw.gov.au

Website:
epa.nsw.gov.au

Report pollution and environmental incidents

Environment Line:
131 555 (NSW only) or
info@epa.nsw.gov.au

ISBN 978 1 923328 71 6
EPA 2026P4705
September 2026

© 2026 State of NSW and the NSW Environment Protection Authority

With the exception of photographs, the State of NSW and the NSW Environment Protection Authority (EPA) are pleased to allow this material to be reproduced in whole or in part for educational and non-commercial use, provided the meaning is unchanged and its source, publisher and authorship are acknowledged. Specific permission is required for the reproduction of photographs.

All content in this publication is owned by the EPA and is protected by Crown Copyright, unless credited otherwise. It is licensed under the Creative Commons Attribution 4.0 International (CC BY 4.0), subject to the exemptions contained in the licence. The legal code for the licence is available at Creative Commons.

The EPA asserts the right to be attributed as author of the original material in the following manner: © State of New South Wales and the NSW Environment Protection Authority 2026.

NSW GOVERNMENT