SC6.2 Air quality planning scheme policy

Contents

1 Introduction

1.1 Relationship to planning scheme

1.2 Purpose

1.3 Terminology

2 Air quality impact report

2.1 Variation to modelling methods

3 Emissions inventory

3.1 General

3.2 On-site emission sources

3.3 Off-site emission sources

3.4 Emission parameters

3.5 Estimating emission rates

3.6 Air emission prevention and control measures

4 Modelling assessment method

4.1 Air dispersion model selection

4.1.1 AUSPLUME

4.1.2 CALPUFF

4.1.3 TAPM

4.1.4 AERMOD

4.1.5 Fluids modelling

4.1.6 Specialised models

4.2 Meteorological data

4.2.1 Selection of data

4.2.2 Siting and operating meteorological monitoring equipment

4.2.3 Stability class

4.2.4 Mixing height

4.2.5 Developing site-representative meteorological data using numerical meteorological models

4.3 Sensitive uses and sensitive zones

4.4 Selection of terrain data

4.5 Accounting for building wake effects

4.6 Consideration of rain hats and other obstructions

4.7 Consideration of stack tip downwash

4.8 Modelling of deposition

5 Air quality impact assessment method

5.1 Requirements for an air quality impact assessment

5.2 Accounting for chemical transformations of oxides of nitrogen

5.3 Cumulative air quality assessment

5.3.1 Existing background air quality

5.3.2 Cumulative impacts

5.3.3 Traffic sources

5.4 Reporting of dispersion modelling results

6 Odour impact assessment method

6.1 Requirements for an odour impact assessment

6.2 Estimating odour emissions

6.3 Cumulative odour assessment

6.4 Reporting of odour impact assessment results

7 Health risk assessment method

7.1 Requirement for a health risk assessment

7.2 Assessment methodology

7.2.1 Screening health risk assessment

7.2.2 Full health risk assessment

7.3 Existing background pollutant concentrations

7.4 Selection of model parameters

7.5 Reporting of health risk assessment results

1 Introduction

1.1 Relationship to planning scheme

This planning scheme policy:

1. provides information the Council may request for a development application;
2. provides guidance or advice about satisfying an assessment benchmark which identifies this planning scheme policy as providing that guidance or advice;
3. states a standard for the assessment benchmarks identified in the following table.

|  |  |  |
| --- | --- | --- |
| Column 1 –  Section or table in the code | Column 2 –  Assessment benchmark reference | Column 3 –  Standard in the planning scheme policy |
| Extractive resources overlay code | | |
| Table 8.2.10.3.A | PO4 note | Section 2 |
| Table 8.2.10.3.B | Note | Table 2 |
| Industrial amenity overlay code | | |
| Table 8.2.13.3.A | PO2 note | Section 2, Section 6, Section 7 |
| Table 8.2.13.3.B | Note | Table 1 |
| Table 8.2.13.3.B | Note | Table 2 |
| Table 8.2.13.3.D | Note | Section 7 |
| Transport air quality overlay code | | |
| Table 8.2.23.3.A | PO3 note | Section 2, Section 5 |
| Table 8.2.23.3.A | PO4 note | Section 2, Section 5 |
| Table 8.2.23.3.C | Note | Table 1 |
| Caretaker’s accommodation code | | |
| Table 9.3.2.3.A | PO2 note | Section 2; Section 5, Section 6, Section 7 |
| Table 9.3.2.3.C | Note | Table 1 |
| Table 9.3.2.3.C | Note | Table 2 |
| Table 9.3.2.3.E | Note | Section 7 |
| Centre or mixed use code | | |
| Table 9.3.3.3.A | PO3 note | Section 2; Section 5, Section 6 |
| Table 9.3.3.3.A | PO4 note | Section 2, Section 5, Section 6 |
| Table 9.3.3.3.I | Note | Table 1 |
| Table 9.3.3.3.I | Note | Table 2 |
| Child care centre code | | |
| Table 9.3.4.3.A | PO11 note | Section 2, Section 5, Section 6 |
| Community facilities code | | |
| Table 9.3.5.3.A | PO3 note | Section 2; Section 5, Section 6 |
| Table 9.3.5.3.A | PO4 note | Section 2, Section 5, Section 6 |
| Table 9.3.5.3.D | Note | Table 1 |
| Table 9.3.5.3.D | Note | Table 2 |
| Dual occupancy code | | |
| Table 9.3.6.3.A | PO18 note | Section 2, Section 5, Section 6 |
| Extractive industry code | | |
| Table 9.3.9.3.A | PO5 note | Section 2; Section 5 |
| Table 9.3.9.3.B | Note | Table 1 |
| Table 9.3.9.3.B | Note | Table 2 |
| Industry code | | |
| Table 9.3.12.3.A | PO1 note | Section 2; Section 5, Section 6, Section 7 |
| Table 9.3.12.3.B | Note | Table 1 |
| Table 9.3.12.3.B | Note | Table 2 |
| Table 9.3.12.3.D | Note | Section 7 |
| Multiple dwelling code | | |
| Table 9.3.14.3.A | PO40 note | Section 2, Section 5, Section 6 |
| Table 9.3.14.3.G | Note | Table 1 |
| Residential care facility code | | |
| Table 9.3.18.3.A | PO6 note | Section 2, Section 5, Section 6 |
| Rooming accommodation code | | |
| Table 9.3.19.3.A | PO11 note | Section 2, Section 5, Section 6 |
| Short-term accommodation code | | |
| Table 9.3.22.3.A | PO4 note | Section 2, Section 5, Section 6 |
| Special purpose code | | |
| Table 9.3.24.3.A | PO2 note | Section 2, Section 5, Section 6 |
| Table 9.3.24.3.A | PO25 note | Section 2, Section 5, Section 6 |
| Table 9.3.24.3.E | Note | Table 1 |
| Table 9.3.24.3.E | Note | Table 2 |
| Specialised centre code | | |
| Table 9.3.25.3.A | PO3 note | Section 2, Section 5, Section 6 |
| Table 9.3.25.3.E | Note | Table 1 |
| Table 9.3.25.3.E | Note | Table 2 |
| Tourist park and relocatable home park code | | |
| Table 9.3.27.3.A | PO12 note | Section 2, Section 5, Section 6 |

1.2 Purpose

This planning scheme policy provides information required for a development application, guidance and advice for satisfying assessment benchmarks and standards for:

1. the preparation of an air quality impact report;
2. the air quality, odour and health risk assessment methodologies to be used to assess the potential air quality impacts of development;
3. the achievement of air quality (planning) criteria, odour criteria and health risk assessment criteria.

Note—The scope of this planning scheme policy is for ambient (outdoor) air quality at sensitive uses and sensitive zones. It does not apply to indoor air quality or to workplace health and safety.

1.3 Terminology

In this planning scheme policy, unless the context or subject matter otherwise indicates or requires, a term has the following meaning:

ppm: the concentration of pollutant in parts per million, expressed as volume/volume

µg/m3: the concentration of pollutant in micrograms per cubic metre, referenced to 0oC and 1 atmosphere pressure

HRA: health risk assessment

2 Air quality impact report

1. An air quality impact report is to:
2. describe the impact of air emissions by the development, if the development emits air pollutants;
3. describe the impact of air quality on the development, if the development is a sensitive use and exposed to air pollutants.
4. An air quality impact report is to describe the existing air environment, present the predicted air quality, odour or health risk impacts and assess impacts using direct comparisons to the air quality (planning) criteria, odour criteria and/or health risk criteria.
5. An air quality impact report is to contain the following information as relevant to the specific assessment, although there may be circumstances that warrant further content:
6. the author of the report and the company preparing the report;
7. a description of the configuration, location, site zoning relevant licences and current approvals for the development;
8. description and location of sensitive uses and sensitive zones, including future sensitive uses which may be affected by air emissions from the development and existing air emission sources if the development is a sensitive use;
9. a site and locality plan to scale showing the zoning of the subject site and surrounding sites, location of the air emission sources, site boundary, locations of sensitive uses and sensitive zones evaluated in the report and a north point;
10. an emissions inventory of all air emission sources relevant to the application, undertaken in accordance with section 3 of this planning scheme policy;
11. where the development emits air pollutants, a description of the air emission prevention and control measures which will be applied by the development and description of the management plan for maintenance of emissions performance, in accordance with section 3 of this planning scheme policy;
12. a description of background air quality or odour in the area of the development application and justification for the source of this information, in accordance with section 5.3 or section 6.3 of this planning scheme policy;
13. a description of the impact assessment methodology, including the justification for the choice of models, sources and reliability of data and methodologies used for generating meteorological data files, in accordance with section 4 of this planning scheme policy;
14. a detailed justification of all departures from the methods outlined in this planning scheme policy and the default settings of models used in accordance with section 4 of this planning scheme policy;
15. a description of the uncertainties and assumptions associated with the air quality impact assessment, odour impact assessment or health risk assessment input data and methodology, in accordance with sections 3 to 7 of this planning scheme policy;
16. the results of the air quality impact assessment, odour assessment or health risk assessment, including comparison to air quality (planning) criteria, odour criteria and/or health risk criteria at sensitive uses or sensitive zones and graphical representation of results at ground level and elevated gridded receptors, in accordance with section 5, 6 or 7 of this planning scheme policy;
17. detailed description of the methodology used for health risk assessment, if relevant, including justification for the choice of model, model parameters and input data, in accordance with section 7 of this planning scheme policy;
18. results of the health risk assessment, if relevant, including comparison to health risk criteria at sensitive uses or sensitive zones, in accordance with section 7 of this planning scheme policy;
19. adequate detail (including provision of relevant electronic data files) of the methodology and data sources used for air quality, odour or health risk assessments to enable peer review and replication of the methodology, in accordance with sections 5 to 7 of this planning scheme policy;
20. conclusions;
21. recommendations, in particular summarising the assumed air quality control measures applied to the development;
22. references.

2.1 Variation to modelling methods

1. Where the air quality impact report will be based on significant variations to the methods identified in this planning scheme policy, a modelling proposition is to be submitted for discussion and approval by Council before the work is undertaken.
2. The modelling proposition is to include sufficient information on the project, assessment methodology and data to justify the choices made for Council to assess the appropriateness of the proposed methodology.
3. A modelling proposition is required for the following:
4. air quality models or model options that are not included or supported in section 4.1, or the use of fluids modelling or specialised models;
5. including data for wind parameters measured at a height lower than 10m above ground (section 4.2.2);
6. using alternative numerical meteorological models to provide meteorological data for the assessment (section 4.2.5);
7. using a building wake method other than PRIME (section 4.5);
8. chemically transforming pollutants (section 4.1);
9. transforming NOx to NO2 using a ratio other than 100% (section 5.2);
10. including or omitting other sources of air pollution in the vicinity of the development, including traffic sources (sections 5.3.2 and 5.3.3);
11. using pollutant emission rates that are less than the maximum emission rate (section 3.4);
12. omitting air emission control measures where the development emits air pollutants (sections 3.5 and 6.2);
13. using an alternative odour assessment approach based on odour intensity (section 6.4);
14. releasing a hazardous air pollutant that is not listed in Table 5 or the air quality (planning) criteria in the referring code (section 7.1).

3 Emissions inventory

3.1 General

1. An air quality impact report is to include a comprehensive and representative emissions inventory of proposed and existing industrial uses relevant to the development which:
2. identifies all proposed and existing sources of air pollution, including existing activities which are not part of the development application but are part of the same site operation;
3. identifies the air emission control measures to be implemented;
4. identifies the air emissions from each source;
5. identifies the emission parameters for each source.
6. The emission data is to be used in dispersion modelling to determine off-site impacts of the pollutants released from the development.
7. The following information is to be included in the emissions inventory:
8. a list of compounds emitted to the atmosphere, from the list of pollutants in the air quality (planning) criteria in the referring code, list of pollutants for odour assessment in Table 3 or from the list of pollutants for health risk assessment in Table 5;
9. a detailed list of sources which emit to the atmosphere and the methods used to derive emissions, in accordance with section 3.2 of this planning scheme policy;
10. a detailed list of air emissions from each source, including release type and location (in metres relative to a fixed origin), elevation and discharge geometry;
11. the operating hours and hourly and annual production capacity for normal and worst-case conditions;
12. the peak emission conditions such as start-up and shut-down of plant and equipment, including time, duration and frequency;
13. the emission parameters, such as estimated or measured pollutant emission concentrations, flow rates and exhaust temperatures, for normal and worst-case conditions, (for variable production sources) and the range of variability of each, in accordance with section 3.3 of this planning scheme policy;
14. for area sources, justification of the method used to derive emissions with reference to the conditions within flux chambers and the influence on emissions;
15. the air emission prevention or control measures that are present or proposed that reduce air emissions and/or affect air emission parameters, in accordance with section 3.5 of this planning scheme policy;
16. licence or approval limits and requirements, where they exist;
17. a copy of the laboratory report results of source monitoring and relevant operational activities used to derive emissions, if available.
18. The emissions data is to be representative of the potential activities at the site. Where variations in the industrial operation are known or anticipated, such as the type and amount of feedstock or product, the emissions inventory is to include data for the potential worst-case operation of the site.

Note—The information provided in the air quality impact report may be used to guide the drafting of approval conditions and also emission limits where the development is an environmentally relevant activity. The air quality impact report is to identify all potential sources of air emissions. The development proponent should be confident that the upper bound air emissions and control measures stated in the air quality impact report are achievable and that it is consistent with the design, competent operation and maintenance of the development.

3.2 On-site emission sources

1. The air quality impact report is to identify all actual or potential on-site emission sources including:
2. point sources, such as stacks, vent outlets or baghouse exhausts that release air pollutants forcefully at a fixed height;
3. tall point sources, such as point sources over 30 to 50m tall which may protrude out of the surface boundary layer and are unaffected by building wakes (see (2) below);
4. wake-affected point sources, such as point sources where nearby buildings interfere with the trajectory and growth of the plume;
5. area sources, such as a source with a large surface area such as a large pond or lagoon, a landfill surface or uncovered stockpile;
6. volume sources and fugitive emission sources, such as diffuse fugitive emissions from open buildings or multiple windows in a building;
7. line sources, such as a long, thin area source. A line source is deemed to become an area source if the breadth exceeds 20% of the length;
8. intermittent and continuous sources, such as batch processes or vehicle use.
9. A point source is deemed to be wake affected if the stack height is less than or equal to 2.5 times the height of the building located within a distance of 5L from each release point (where L is the lesser of the height or width of the building). See United States Environmental Protection Authority (USEPA) Guideline for determination of good engineering practice stack height for further guidance on wake-affected sources.

3.3 Off-site emission sources

1. The air quality impact report is to identify all off-site emission sources (existing uses that have off-site air emissions) under the Industrial amenity overlay code (where applicable) using the following methodology:
2. conduct land use survey to determine the off-site emission sources that are closer than the distances specified in Table 8.2.13.3.G of the Industrial amenity overlay code;
3. emissions to air are to be estimated using the methodology in Section 3.4 to 3.6 for the off-site emission sources identified, assuming that no or minimum air emission control measures are in place unless site specific information is available.
4. Where an existing use is not an off-site emission source or is further than the distances specified in Table 8.2.13.3.G of the Industrial amenity overlay code, no further investigation of that existing use is required.

3.4 Emission parameters

1. The air quality impact report is to contain emission parameter information and any other relevant data including:
2. emission rates, emission concentrations and methodology for determining emission rates and concentrations;
3. the source of emission data used, any assumptions and uncertainties associated with the emission data and an indication of the reliability of the emission data;
4. for point sources – stack height, stack diameter, temperature, discharge velocity, flow rate at stack conditions and at standard conditions, moisture content, pressure and where relevant in-stack carbon dioxide concentration and oxygen concentration;
5. for area sources – surface area, side length and release height;
6. for volume sources – side length, release height, and initial horizontal and vertical plume spread (sigmay and sigmaz).
7. The emission concentrations of air pollutants which are specified in the air quality impact report are to be referenced to 0o C and 101.3kPa and to a standard oxygen concentration (for combustion plant).
8. The emission parameters used are to represent the worst case emissions performance of the plant and equipment when it is maintained and operated in a proper and efficient manner.

3.5 Estimating emission rates

1. There are a number of methods which can be used to estimate the emission rate of air pollutants from each source. The following hierarchy is to be followed when sourcing emissions data for industry relevant to the development:
2. licence or approval emission limits for existing plant;
3. published emission factors (such as the National Pollutant Inventory Emissions Estimation Technique Manuals or USEPA’s AP-42 Emission Factors, if it is directly relevant to the industry under investigation. If emission factors are used, the source of emission factors is to be stated and a detailed justification provided for their use;
4. site-specific historical and current emissions measurement data for existing sources may be used to determine emission rates, emission concentrations and source release parameters. All sampling of source emissions and analysis of air pollutants is to be in accordance with the DEHP Air Quality Sampling Manual or current versions of Australian Standard methods. The measurement sample size, operating conditions (including feedstock type, rate and volume and production rate) and range of measurement results are to be stated;
5. mass balance analysis if appropriate;
6. manufacturers’ design specifications or performance guarantees for each source and process. Manufacturers’ design specifications or performance guarantees can provide a means of determining the upper limit of the emission rate or concentration of air pollutants provided the sources and emission control equipment are maintained and operated in a proper and efficient manner;
7. measurements taken from a comparable plant and process that is reasonably considered to be equivalent to the industry under investigation.
8. The highest emission rates and/or emission concentrations from the methods outlined in 3.4 (1) are to be used to estimate emission rates, unless a detailed justification is provided for use of other results.
9. In circumstances where not all the required information is available for the assessment, such as when using the Industrial amenity overlay code to evaluate the impacts from an industry on development for a sensitive use, the limitations of the emissions data are to be discussed in the report.
10. The air quality impact report is to contain a detailed justification for the choice of method for estimating emission rates with sufficient detail to enable the replication of the methodology and results of the emissions estimation by the Council or third parties.
11. Post-commissioning testing may be required as a condition of a development approval and/or emission limits to establish that sources comply with the stated air emissions performance.
12. Emissions of polycyclic aromatic hydrocarbons are to be evaluated as benzo(a)pyrene-equivalent using the potency equivalency factors in Table 1. Emissions of dioxins, furans and dioxin-like polychlorinated biphenyls are to be evaluated as a toxic equivalency factor using the factors in Table 2.

Table 1—Potency equivalency factors for polycyclic aromatic hydrocarbons (OEHHA guidelines)

|  |  |  |  |
| --- | --- | --- | --- |
| PAH or derivative | PEF | PAH or derivative | PEF |
| Benz[a]anthracene | 0.1 | Dibenzo[a,l]pyrene | 10 |
| Benzo[a]pyrene | 1 | 7-H-dibenzo[c,g]carbazole | 1 |
| Benzo[b]fluoranthene | 0.1 | 7,12-dimethylbenzathracene | 65 |
| Benzo[j]fluoranthene | 0.1 | 1,6-dinitropyrene | 10 |
| Benzo[k]fluoranthene | 0.1 | 1,8-dinitropyrene | 1 |
| Chrysene | 0.01 | Indo[1,2,3-c,d]pyrene | 0.1 |
| Dibenz[a,h]anthracene | 1 | 3-methylcholanthrene | 6 |
| Dibenzo[a,e]pyrene | 1 | 5-methylchrysene | 1 |
| Dibenzo[a,h]acridine | 0.1 | Naphthalene | 0.03 |
| Dibenzo[a,h]pyrene | 10 | 5-nitroacenapthene | 0.03 |
| Dibenzo[a,i]pyrene | 10 | 6-nitrochrysene | 10 |
| Dibenzo[a,j]acridine | 0.1 | 2-nitrofluorene | 0.01 |
| Dibenzo[a,l]pyrene | 1 | 4-nitropyrene | 0.01 |

Table 2—Toxic equivalency factors for dioxins and dioxin-like polychlorinated biphenyls (World Health Organization)

|  |  |  |
| --- | --- | --- |
| Compound | Abbreviation | TEF |
| Polychlorinated dibenzodioxins | | |
| 2,3,7,8-Tetrachlorodibenzodioxin | TCDD | 1 |
| 1,2,3,7,8-Pentachlorodibenzodioxin | 1,2,3,7,8-PeCDD | 1 |
| 1,2,3,4,7,8-Hexachlorodibenzodioxin | 1,2,3,4,7,8-HxCDD | 0.1 |
| 1,2,3,6,7,8-Hexachlorodibenzodioxin | 1,2,3,6,7,8-HxCDD | 0.1 |
| 1,2,3,7,8,9-Hexachlorodibenzodioxin | 1,2,3,7,8,9-HxCDD | 0.1 |
| 1,2,3,4,6,7,8-Heptachlorodibenzodioxin | 1,2,3,4,6,7,8-HpCDD | 0.01 |
| Octachlorodibenzodioxin | OCDD | 0.0003 |
| Polychlorinated dibenzofurans | | |
| 2,3,7,8-Tetrachlorodibenzofuran | 2,3,7,8-TCDF | 0.1 |
| 1,2,3,7,8-Pentachlorodibenzofuran | 1,2,3,7,8-PeCDF | 0.03 |
| 2,3,4,7,8-Pentachlorodibenzofuran | 2,3,4,7,8-PeCDF | 0.3 |
| 1,2,3,4,7,8-Hexachlorodibenzofuran | 1,2,3,4,7,8-HxCDF | 0.1 |
| 1,2,3,6,7,8-Hexachlorodibenzofuran | 1,2,3,6,7,8-HxCDF | 0.1 |
| 1,2,3,7,8,9-Hexachlorodibenzofuran | 1,2,3,7,8,9-HxCDF | 0.1 |
| 2,3,4,6,7,8-Hexachlorodibenzofuran | 2,3,4,6,7,8-HxCDF | 0.1 |
| 1,2,3,4,6,7,8-Heptachlorodibenzofuran | 1,2,3,4,6,7,8-HpCDF | 0.01 |
| 1,2,3,4,7,8,9-Heptachlorodibenzofuran | 1,2,3,4,7,8,9-HpCDF | 0.01 |
| Octochlorodibenzofuran | OCDF | 0.0003 |
| 'Non-ortho' polychlorinated biphenyls | | |
| 3´,4,4´-Tetrachlorobiphenyl (PCB 77) | 3,3´,4,4´-TCB | 0.0001 |
| 3,4,4´,5,-Tetrachlorobiphenyl (PCB 81) | 3,4,4´,5-TCB | 0.0003 |
| 3,3´,4,4´,5-Pentachlorobiphenyl (PCB 126) | 3,3´,4,4´,5-PeCB | 0.1 |
| 3,3´,4,4´,5,5´-Hexachlorobiphenyl (PCB 169) | 3,3´,4,4´,5,5´-HxCB | 0.03 |
| 'Mono-ortho' polychlorinated biphenyls | | |
| 2,3,3´,4,4´-Pentachlorobiphenyl (PCB 105) | 2,3,3´,4,4´-PeCB | 0.0003 |
| 2,3,4,4´,5-Pentachlorobiphenyl (PCB 114) | 2,3,4,4´,5-PeCB | 0.0003 |
| 2,3´,4,4´,5-Pentachlorobiphenyl (PCB 118) | 2,3´,4,4´,5-PeCB | 0.0003 |
| 2,3´,4,4´,5’-Pentachlorobiphenyl (PCB 123) | 2,3´,4,4´,5´-PeCB | 0.0003 |
| 2,3,3´,4,4´,5-Hexachlorobiphenyl (PCB 156) | 2,3,3´,4,4´,5-HxCB | 0.0003 |
| 2,3,3´,4,4´,5´-Hexachlorobiphenyl (PCB 157) | 2,3,3´,4,4´,5´-HxCB | 0.0003 |
| 2,3´,4,4´,5,5´-Hexachlorobiphenyl (PCB 167) | 2,3´,4,4´,5,5´-HxCB | 0.0003 |
| 2,3,3´,4,4´,5,5´-Heptachlorobiphenyl (PCB 189) | 2,3,3´,4,4´,5,5´-HpCB | 0.0003 |

Note—

* PAH: polycyclic aromatic hydrocarbons
* PCB: polychlorinated biphenyls
* PEF: potency equivalency factors
* TCDD: polycyclic aromatic hydrocarbons
* TEF: toxic equivalency factors

3.6 Air emission prevention and control measures

1. An air quality impact report for a development involving new premises or existing premises for an industrial use is to include a description of the prevention and control measures which will be implemented by the development to avoid or minimise air emissions.
2. The air quality impact report is to include the following:
3. a description of the measures which avoid or minimise the generation of air emissions, or reduce the toxicity of air emissions, through process design or air emission controls;
4. a discussion of the availability and effectiveness of air emission control measures relevant to the industry and justification of the measures selected for the site;
5. a description of any altered emission characteristics of a source due to the proposed air emission control measures, for example a reduced exit temperature or velocity;
6. a quantification of the pollutant emission rates and emission characteristics expected using the proposed air emission control measures;
7. a description of the ongoing maintenance and testing requirements which maintain effective air pollution control to ensure that air emissions do not exceed the stated emissions from the site.
8. The proposed air emission control measures are to be included in the emissions inventory for each source and subsequent dispersion modelling for air quality, odour and/or health risk assessment.

4 Modelling assessment method

1. The assessment of air quality, odour and/or health risk impacts are to comply with the methods listed in this section, unless a justification is made to and accepted by the Council for any departure from the identified methods. This section outlines the common requirements for conducting an air quality, odour or health risk assessment.
2. The air quality impact report is to include a comprehensive description of the impact assessment methodology and sufficient detail to enable replication of the methodology and results of the impact assessment by the Council or third parties.
3. The air quality impact report is to include the following:
4. model selected and justification for the model selection;
5. model configuration and justification for the model configuration;
6. pollutants assessed and criteria used in the assessment;
7. model input data, representativeness and reliability of input data;
8. meteorological data source, and methodologies used for generating meteorological data files and reliability of data;
9. background air quality data source and methodologies used for generating air quality statistics and reliability of data;
10. assumptions and uncertainties.
11. Specific requirements for the assessment of air quality, odour or health risk are described in sections 5, 6 and 7 respectively.

4.1 Air dispersion model selection

1. Air dispersion modelling is to be used to predict air pollutant concentrations at sensitive uses and/or sensitive zones, using an air dispersion model which is suitable for the task. Dispersion models that may be used in preparing an air quality impact report are AUSPLUME, CALPUFF, TAPM, AERMOD, fluid models and specialised dispersion models.
2. The air quality impact report is to justify why the dispersion model was selected for the particular application and the features of the model which make it appropriate for the application, taking into account whether the plume can be best represented by steady-state or non-linear behaviour and whether the model can adequately treat the situation to be modelled, including coastal effects, terrain and building wakes.
3. In the event that more than 1 model is required to fulfil all the requirements of the assessment, the justification is to be provided for each model selected.

4.1.1 AUSPLUME

1. The most recent official version of the EPA Victoria model AUSPLUME can be used for simple, near-field applications where an assumption of steady-state plume behaviour is valid.
2. AUSPLUME is specifically not to be used in the following applications:
3. complex terrain;
4. complex built environments (see section 4.5);
5. non steady-state conditions;
6. buoyant line plumes, such as hot roof vent emissions;
7. coastal effects such as fumigation;
8. high frequency of stable calm night-time conditions;
9. high frequency of calm conditions;
10. inversion break-up fumigation conditions.
11. Unless otherwise stated, the default options specified in the AUSPLUME Technical User’s Manual are to be used with AUSPLUME, unless a justification is made to and accepted by the Council, for any departure from the default options.
12. The following settings are to be used when using AUSPLUME:
13. Egan half-height approach to account for terrain effects;
14. PRIME method to account for building wake effects;
15. Horizontal dispersion curves are to use:
16. Sigma theta values or Pasquill–Gifford curves for stacks less than or equal to 100m high;
17. Briggs rural curves for stacks greater than 100m high;
18. Vertical dispersion curves are to use:
19. Pasquill–Gifford curves for stacks less than or equal to 100m high;
20. Briggs rural curves for stacks greater than 100m high;
21. Enhance plume spreads for buoyancy for both the horizontal and vertical dimensions;
22. Adjust Pasquill–Gifford formulae for roughness height;
23. AUSPLUME defaults for plume rise parameters;
24. AUSPLUME defaults for wind speed categories;
25. Irwin rural wind profile exponents for rural areas, that is areas zoned rural or rural residential;
26. Irwin urban wind profile exponents for urban areas, that is areas not zoned rural or rural residential.
27. A single-point meteorological data file which is representative of the location is to be developed following the data selection and analysis methodologies outlined in section 4.2 for use in AUSPLUME.
28. The use of a generic meteorological data file for Brisbane is not suitable for determining compliance with air quality (planning) criteria, odour criteria or health risk assessment criteria.

4.1.2 CALPUFF

1. The most recent official USEPA version of CALPUFF can be used to simulate the effects of time- and space-varying meteorological conditions on pollutant transport and to account for a variety of effects such as spatial variability of meteorological conditions, causality effects, dry deposition and dispersion over a variety of spatially varying land surfaces, plume fumigation, low wind speed dispersion, pollutant transformation and wet removal. The use of an unofficial or beta-testing version of the model is not suitable unless approved by Council prior to submission of the air quality impact report.
2. Unless otherwise stated, the USEPA default options for CALPUFF are to be used, unless a justification is made to and accepted by the Council for any departure from the default options. The following default settings are to be used when using CALPUFF:
3. three-dimensional mode using meteorological data file from CALMET;
4. ISC rural wind speed profile;
5. no chemical transformation unless justified in the Air quality impact report;
6. no gaseous or particulate pollutant deposition unless justified in the Air quality impact report;
7. transitional plume rise;
8. stack tip downwash;
9. partial plume penetration;
10. dispersion coefficients using Pasquill–Gifford coefficients or turbulence calculated from micro-meteorology;
11. no adjustment of dispersion curves for roughness;
12. partial plume path adjustment method for terrain using default coefficients;
13. PRIME method to account for building wake effects, if applicable.
14. The most recent official version of CALMET is to be used to generate three-dimensional meteorological data files for CALPUFF. CALPUFF is not to be used where single-point meteorological data, such as an AUSPLUME-compatible data file, is used. The CALMET data files are to be representative of the location, following the data selection and analysis methodologies outlined in section 4.2 of this planning scheme policy. The use of numerical meteorological model data as input to CALMET is discussed further in section 4.2.5 of this planning scheme policy.
15. Unless otherwise stated, the USEPA default options for CALMET are to be used, unless a justification is made to and accepted by the Council for any departure from the default options. The following model options are to be used when using CALMET:
16. cell face heights and all prognostic data used in the model inputs are to extend to at least 2,000m to allow for the growth of the boundary layer;
17. default parameters used for the mixing height equation;
18. similarity theory used for surface wind extrapolation.
19. Non-default CALMET and CALPUFF model settings selected are to be discussed and justified in the air quality impact report. The use of numerical meteorological model data as input to CALMET is discussed further in section 4.2.5 of the planning scheme policy.

4.1.3 TAPM

1. The most recent official version of TAPM can be used for dispersion modelling situations if neither AUSPLUME nor CALPUFF are appropriate and to simulate three-dimensional meteorology and pollution dispersion in areas where meteorological data are sparse or non-existent. TAPM can be used to allow for plume rise and building wake effects and wet and dry deposition.
2. TAPM is not to be used for the evaluation of ground-level industrial releases, odorous or agricultural sources.
3. The default options for TAPM are to be used, unless a justification is made to and accepted by the Council for any departure from the default options. Pollutants are to be modelled in TAPM using tracer mode unless a justification is included for the use of chemical transformations or deposition.
4. Meteorological data for use in TAPM is an integral part of the model. Any site-representative observational data that is incorporated into the model is to meet the requirements of section 4.2 of the planning scheme policy.
5. A discussion of the use of TAPM to generate meteorological data for use in air quality assessments is contained in section 4.2.5 of the planning scheme policy.

4.1.4 AERMOD

1. The most recent official version of the USEPA AERMOD modelling system may be used for dispersion modelling only where an assumption of steady-state plume behaviour is valid. The use of an unofficial or beta-testing version of the model is not suitable unless approved by Council prior to submission of the air quality impact report.
2. AERMOD is specifically not to be used in the following applications:
3. complex terrain;
4. complex built environments (see section 4.5);
5. non steady state conditions;
6. buoyant line plumes, such as hot roof vent emissions;
7. coastal effects such as fumigation;
8. diverse land use within a 5km radius of the site:
9. where the meteorological data shows significant wind direction shear with height.
10. A single-point meteorological data file which is representative of the location is to be developed following the data selection and analysis methodologies outlined in section 4.2 and EPA Victoria guideline Construction of Input Meteorological Data Files for EPA Victoria's Regulatory Air Model (AERMOD).
11. Model options should use the settings proposed in the EPA Victoria Guidance notes for using the regulatory air pollution model AERMOD in Victoria or, if insufficient guidance is available, the USEPA User’s Guide for the AMS/EPA Regulatory Model – AERMOD and AERMOD Implementation Guide unless otherwise justified for the site.
12. The use of the following model options should include a detailed justification in the air quality impact report:
13. NOx conversion to NO2 using the ARM, ARM2 or PVMRM options;
14. dry and wet particle deposition;
15. capped stacks and horizontal sources;
16. open pit sources;
17. air toxics.

4.1.5 Fluids modelling

1. Fluids modelling is to be undertaken where:
2. any of the following apply:
3. dispersion modelling is conducted in complex built environments (see section 4.5) or complex terrain environments; or
4. air quality impacts are to be predicted close to the source; or
5. air quality impacts need to include building wake influences within the tunnel ventilation stack subcategory (as identified on the Transport air quality corridor overlay);
6. dispersion modelling scenarios including and excluding building wake influences following the methodology in section 3 and section 4 show a difference in maximum predicted impact at sensitive uses or sensitive zones of more than 40%; or
7. an exceedance of the air quality (planning) criteria, odour criteria or health risk criteria is predicted at sensitive uses or sensitive zones, including elevated balconies or air conditioning intakes.
8. The selection of approach for the fluids modelling assessment is to be justified in the air impact report for the use of either:
9. a physical model and/or;
10. a computational fluid dynamic model.
11. The selection of computational fluid dynamic model is to be justified as to the suitability for its application in predicting ambient air quality impacts. Using a physical model may be required to validate the use of the computational fluid dynamic model.
12. Model parameters should follow an appropriate peer-reviewed guidance or methodology such as the COST best practice guideline for the CFD simulation of flows in the urban environment or the US EPA Guideline for Fluid Modeling of Atmospheric Diffusion.
13. Model scenarios to be evaluated should include winds from any orientation of particular relevance to the site under evaluation.
14. A range of wind speed and atmospheric stability conditions should be considered to ensure that worst-case impacts at the sensitive use and/or sensitive zone have been modelled.

4.1.6 Specialised models

1. Certain circumstances may require the use of specialised models, such as for assessment of vehicle pollution from an extensive network of roads. The most recent official version of the Caline4 or CAL3HQCR models are suitable for road traffic assessments.
2. Where alternative models are proposed, a justification is to be included outlining the issue that requires the alternative model and the suitability of the alternative model for the situation.
3. Where the selected model requires the use of meteorological data, this should meet the requirements of section 4.2.

4.2 Meteorological data

4.2.1 Selection of data

1. Meteorological data used in dispersion modelling is to be representative of the development location. The air quality impact report is to include a justification for the choice of meteorological data used.
2. Surface measurements may be used to obtain site-specific information on wind speed, wind direction, temperature, humidity, atmospheric pressure and solar radiation. However, some critical parameters needed for dispersion modelling, such as atmospheric stability class, mixing height or cloud cover may need to be calculated.
3. Air quality impact assessments are to be conducted using at least 1 year of site-specific meteorological data. The meteorological data are to be at least 90% complete; that is, for 1 year, there can be no more than 876 hours of data missing. If site-specific meteorological data is not available, at least 1 year of meteorological data which is representative of the site is to be used. The site representative data is to be as follows:
4. collected at a meteorological monitoring station, with wind speed and wind direction measured at a height of at least 10m above ground level. If measured data are unavailable or are of insufficient quality for dispersion modelling purposes, a meteorological data file may be generated using a prognostic meteorological model such as TAPM. Meteorological data collected at less than 10m height may be used if it correlates well with the prognostic data, and the height of measurement and a suitable data quality flag are included in the model;
5. correlated against a longer-duration site-representative meteorological database of at least 5 years; preferably 5 consecutive years. It is to be clearly established that the data adequately describes the expected meteorological patterns at the site under investigation, such as wind speed, wind direction, ambient temperature, atmospheric stability class and inversion conditions.
6. The appropriateness and representativeness of the meteorological data used in dispersion modelling are to be discussed in the air quality impact report.

4.2.2 Siting and operating meteorological monitoring equipment

1. The following methods are to be used for establishing, siting, operating and maintaining meteorological monitoring equipment:
2. AS/NZS 3580.1:2007 Methods for sampling and analysis of ambient air - Guide to siting air monitoring equipment Standards Australia;
3. either:
4. AS 3580.14-2011 Methods for sampling and analysis of ambient air - Meteorological monitoring for ambient air quality monitoring applications; or
5. Meteorological Monitoring Guidance for Regulatory Modeling Applications, United States Environmental Protection Agency, where the Australian Standard does not contain sufficient guidance.
6. All meteorological stations used to collect data for dispersion modelling purposes are to use an anemometer which has a stall speed of 0.5m/s or less. Wind speed and wind direction are to be measured at least 10m above ground level to be suitable for use in dispersion modelling, unless otherwise justified.

4.2.3 Stability class

1. In order of preference, the following methods outlined in the Meteorological Monitoring Guidance for Regulatory Modeling Applications are to be used to determine stability class:
2. Turner’s 1964 method: This requires information on solar altitude or zenith angle, cloud cover, cloud ceiling height and wind speed. Solar altitude can easily be calculated, but cloud cover and ceiling height are generally determined through visual observations;
3. solar radiation–delta temperature method: This retains the basic structure and rationale of Turner’s 1964 method but eliminates the need for observations of cloud cover and ceiling height. The method uses the surface-layer wind speed measured at 10m, in combination with measurements of total solar radiation during the day and a low-level vertical temperature difference; that is, at 2m and 10m, at night;
4. sigma theta method: The standard deviation of the horizontal wind direction fluctuation is usually determined by meteorological monitoring stations.
5. Hourly stability class is to be estimated using the USEPA meteorological pre-processor for regulatory models or a processor which includes similar techniques.
6. Data required for input to the AERMET model should follow specific guidance in the EPA Victoria draft guideline Construction of Input Meteorological Data Files for Regulatory Air Model (AERMOD).

4.2.4 Mixing height

1. Morning and afternoon mixing heights are to be estimated using vertical temperature profiles otherwise known as ‘upper air data’ and surface temperature measurements.
2. Hourly mixing heights are to be estimated from the twice-daily mixing height values, sunrise and sunset times, and hourly stability categories by using the USEPA meteorological pre-processor for regulatory models or a processor which includes similar techniques.
3. Data required for input to the AERMET model should follow specific guidance in the EPA Victoria draft guideline Construction of Input Meteorological Data Files for Regulatory Air Model (AERMOD).

4.2.5 Developing site-representative meteorological data using numerical meteorological models

1. Where neither site-specific nor site-representative meteorological data are available or adequate for use in dispersion modelling, numerical meteorological models may be used to supplement the site-specific data where appropriate.
2. TAPM is the preferred numerical meteorological model and can be used in a meteorology-only mode to generate meteorological data for use in AUSPLUME, CALMET and AERMET.
3. The selected model is to be configured to provide sufficient vertical information to represent the growth of the boundary layer (to a minimum height of 2,000m) for subsequent use in AUSPLUME, CALPUFF and AERMOD dispersion modelling.
4. The model should be set up with nested grids to a spatial resolution of no greater than 500m for the innermost grid.
5. TAPM is only to be used with the CALPUFF modelling system in the following ways:
6. extraction of data for a single location representative of the site for the innermost grid, either to provide surface and upper air data files for input to CALMET or to provide supplementary data for missing surface observations;
7. using TAPM data as a numerical pre-processor for input to CALMET in the no-observations mode;
8. using a hybrid of TAPM numerical data and site-specific surface observations for input to CALMET.
9. TAPM is only to be used with the AERMOD modelling system using TAPM-generated data for the innermost grid for the following parameters:
10. 10m wind speed;
11. 10m wind direction;
12. screen level temperature;
13. screen level relative humidity;
14. net radiation;
15. daytime mixing height is only to be used when there are no upper air station/s in the region of interest;
16. upper air profile data containing wind speed, wind direction and temperature at multiple levels, with sigma theta and sigma-w parameters at each level set to 99.0 to represent missing data.
17. Where TAPM is used with the AERMOD modelling system, other surface parameters such as Bowen Ratio may be dependent on land use and meteorology and need to be estimated for the site following the methodology in the EPA Victoria publication Construction of input meteorological data files for EPA Victoria’s regulatory air pollution model (AERMOD).
18. Alternative numerical meteorological models may be used, including MM5 (developed by Pennsylvania State University and US National Center for Atmospheric Research) and WRF (developed by US National Center for Atmospheric Research, the US National Oceanic and Atmospheric Administration and others). These models are only to be used to provide pre-processed data for input to CALMET using a suitable conversion tool. A justification for using alternative numerical models is to be included in the air quality impact report.

4.3 Sensitive uses and sensitive zones

1. The predicted air quality, odour or health risk impacts are to be determined at sensitive uses and/or sensitive zones in accordance with the requirements in the referring code.
2. Receptor files are to be developed which include the location and height in metres relative to a fixed origin for existing and likely future sensitive uses or to represent the boundary of sensitive zones.
3. For evaluation of impacts on sensitive uses (including balconies, roof tops and ventilation air intakes) and/or at sensitive zones up to the maximum building height for the zone, elevated receptors (also known as flagpole receptors) are to be used in the model.
4. The receptor locations presented in the modelling should represent all heights of sensitive uses and sensitive zones and ensure that peak impacts are represented both horizontally and vertically.
5. Receptor locations used for determining compliance with the air quality (planning) criteria, odour criteria and health risk assessment criteria should not be located within the initial horizontal or vertical spread of a volume source.

4.4 Selection of terrain data

1. Terrain data files are to be developed which include the receptor location and height in metres for sites that contain elevated terrain. The resolution of the terrain data is to be sufficient to represent the topographical features of the site and receptor locations, particularly for odour where near-field impacts are important.
2. Electronic data for terrain elevation are to be sourced from site-specific survey data and/or publicly available databases such as the Geoscience Australia Digital Elevation Model.
3. Where the elevation differences in the terrain surrounding the site are significant or the modelled area includes a valley, a sensitivity analysis should be conducted by comparing the model run both with and without terrain.

4.5 Accounting for building wake effects

1. Building wake effects are to be included in the dispersion model if appropriate for point sources, for buildings which are located within a distance of 5L (where L is the lesser of the height or width of the building) from each release point and with a stack height less than or equal to 2.5 times the height of the building.
2. The USEPA’s Guideline for Determination of Good Engineering Practice Stack Height is to be taken into account when designing new stacks to avoid building wake effects. PRIME is to be used as the building wake algorithm for dispersion modelling unless a justification is included in the air quality impact report.
3. The results of modelling using building wake effects should consider section 4.1.5 to determine whether more detailed fluids modelling is required.
4. A location is considered to be within a complex built environment where a sensitive use and/or sensitive zone is within 200m of the emission source and where:
5. the height of the sensitive use exceeds the lowest release height and is less than 2.5 times the highest release height; or
6. any building located between the source and the sensitive use exceeds the lowest release height and is less than 2.5 times the highest release height.
7. Odour guidelines that refer to building wakes are to be interpreted as follows:
8. tall stacks consider a stack of at least 30m height and free of building wake effects to be a tall stack;
9. wake-affected plumes from short stacks consider a building of more than 0.4 times the stack height to influence the plume behaviour from the stack.

4.6 Consideration of rain hats and other obstructions

Stack sources which have an impeded vertical discharge due to rain hats or other obstructions are to be modelled as either a volume or area source unless the dispersion model can include the rain hat as a model option.

4.7 Consideration of stack tip downwash

The model is to include stack tip downwash if appropriate for the source setup.

4.8 Modelling of deposition

1. Particle deposition is to be considered for inclusion in the dispersion model results in relevant circumstances, for example where particulate matter is modelled.
2. A compound-specific deposition velocity is to be included where appropriate.
3. The deposition rate is to be determined for an averaging period consistent with subsequent comparison to air quality (planning) criteria or use in health risk assessment.
4. Specific meteorological parameters such as precipitation data that may be required for the evaluation of wet or dry deposition are to be included in the meteorological data set.

5 Air quality impact assessment method

5.1 Requirements for an air quality impact assessment

1. An air quality impact assessment can be used to demonstrate that a development meets the air quality (planning) criteria in a referring code.
2. The air quality impact assessment is to follow the methodologies outlined in sections 3 and 4 for determining emissions of air pollutants and modelling the impacts at sensitive uses and/or sensitive zones.
3. Specific issues for air quality impact assessment are outlined in this section.

5.2 Accounting for chemical transformations of oxides of nitrogen

1. Assessment of the chemical transformation of oxides of nitrogen (NOx) to nitrogen dioxide (NO2) at sensitive uses and/or sensitive zones is to be undertaken when NOx is released from an industrial source under investigation. The following methods can be used:
2. Conversion of 100% of NOx to NO2. This assumes that NOx is converted to NO2, irrespective of the distance to the receptor or atmospheric conditions. The estimated concentration of NO2 is to be combined with a representative background concentration of NO2 for comparison to the air quality (planning) criteria.
3. For road-related air pollution only, conversion of a constant proportion of NOx to NO2. This assumes that a known constant proportion of NOx is converted to NO2 irrespective of atmospheric conditions. The estimated concentration of NO2 is to be combined with a representative background concentration of NO2 for comparison to the air quality (planning) criteria. The ratio of NO2 to NOx is to be assumed as follows:
4. at 0m from the kerb, the greater of the initial NO2/NOx ratio as released from the vehicle exhaust or 10%;
5. linearly increasing from (i) at 0m from the kerb to 30% for free-flowing freeway conditions (vehicle speeds above 90km/hr) or 45% for congested or urban road conditions at 60m from the kerb;
6. linearly increasing from (ii) at 60m from the kerb to 100% at 100m.
7. Ozone limiting method. This estimates the limited conversion of NOx to NO2 which is dependent on ambient concentrations of NO2 and Ozone (O3). The ozone limiting method is to be used as follows:
8. obtain the predicted 1 hour average ambient concentrations of NOx at each receptor location (NOx-pred in equation below);
9. obtain site-representative continuous 1-hour average measurements of NO2 and O3 for the same period as the dispersion modelling predictions (NO2-bkgd and O3-bkgd in equation below);
10. obtain the initial NO2/NOx ratio in the plume or vehicle exhaust at the point of release;
11. determine the total ground-level concentration of NO2 (NO2-total in equation below) by estimating according to the following equation, for each hour of the modelling results;
12. apply the following equation to estimate the predicted concentration of NO2 at the sensitive and/use or sensitive zone -  
    NO2-total=(k\*NOx-pred)+min{(1-k)\*NOx-pred or 46/48 O3-bkgd}+ NO2-bkgd where:
13. k is the initial NO2/NOx ratio in the plume or vehicle exhaust at the point of release or 0.1, whichever is greater;
14. all concentrations are reported in µg/m³;
15. 46/48 represents the molecular weight of NO2 divided by the molecular weight of O3.
16. determine the frequency with which the 1-hour average air quality (planning) criteria for NO2 is exceeded at each sensitive use and/or sensitive zone with and without the development.
17. In cases where any of the above methods imply that the air quality (planning) criteria for NO2 would be exceeded, regional photochemical modelling should be undertaken using a relevant regional emissions database and the predicted cumulative impacts compared to the air quality (planning) criteria. The model selected, the data sources used and the methodology used for the photochemical assessment are to be justified in the air quality impact report.

5.3 Cumulative air quality assessment

Cumulative impacts of pollutants at sensitive uses and/or sensitive zones are assessed for compliance with the air quality (planning) criteria by adding the predicted site impacts to either the representative background air quality monitoring data or to modelled impacts from other sources of air pollutants.

5.3.1 Existing background air quality

1. Background air quality monitoring data is to be used to determine the cumulative impacts from general sources of air pollution, such as existing industries and residential sources and the development.
2. The air quality impact report is to consider all available monitoring data and make an assessment as to why data should either be included or excluded. Ambient air quality data is to be obtained from the closest or most representative air quality monitoring station and used in the following manner:
3. ambient air quality data for at least 3 years of monitoring is to be used in the assessment, with the highest measured air quality data used in the assessment. The data should include the same year as the meteorological data used in the assessment. Where less than 3 years of data is available, the use of this data is to be justified in the air quality impact report;
4. the monitoring location is to be representative of the types and amounts of pollutants that the site would be exposed to;
5. where monitoring data does not adequately represent the existing air quality at the site, cumulative air quality modelling should be included (see section 5.3.2);
6. the 70th percentile of the hourly average monitoring data is to be used for pollutants that have a guideline of 1-hour average;
7. For pollutants which have an 8-hour or 24-hour average guideline, 2 approaches are available:
8. use a concurrent (time-varying) background concentration for the same time period as the days modelled, or if concurrent data are not available;
9. use the 70th percentile of the monitoring data for the same averaging period.
10. The maximum annual average of the monitoring data is to be used for pollutants which have a guideline with averaging time greater than 24 hours.
11. In the absence of suitable publicly available monitoring data, site-specific ambient monitoring data can be used. Site selection, instrumentation and sample analysis are to be conducted using methods outlined in the Department of Environment and Heritage Protection Air Quality Sampling Manual or relevant updated Australian Standards. Monitoring is to be conducted for a minimum of 12 months to cover seasonal changes across the warmer and cooler months or longer if variability in climatic conditions or industrial emissions is of concern. Statistical analysis of the data should be consistent with (2) above.
12. In circumstances where the background concentrations of air pollutants may exceed the air quality (planning) criteria, for example elevated PM10 concentrations due to natural events such as bushfires or dust storms, these data are to be presented in the air quality impact report with the incremental contribution from the development and cumulative impact, preferably on a time series plot. The report should include a discussion of the elevated concentrations, the days affected by natural events and implications for management of air impacts from the industrial source.
13. The air quality impact report is to include a discussion of pollutants which do not have a suitable background concentration for inclusion in the cumulative assessment.

5.3.2 Cumulative impacts

1. Cumulative impacts due to other land uses are to be considered in air quality modelling when background ambient air quality data is either not available or not sufficient to include the impacts of other nearby land uses. The assessment of off-site emissions sources should follow the methodology outlined in sections 3 and 4 of this planning scheme policy to determine site emission rates and parameters for modelling, and these should be included in dispersion modelling.
2. The air quality impact report is to discuss off-site emissions sources of air pollutants in the vicinity of the development and justify their inclusion or omission as part of the cumulative impact assessment.

5.3.3 Traffic sources

1. Emissions from vehicles on roads are to be included in the emissions inventory if:
2. the development is located within 80m of a road with greater than 20,000 annual average daily traffic volume:
3. when NOx, particulate matter or benzene are emitted from the industrial use being assessed.
4. Traffic data are to include forecast traffic volumes for at least a 10 year horizon from the commencement of use. Modelling is to be based on emission estimates that incorporate heavy vehicle use, traffic congestion, traffic flow and road gradient. Current and forecast traffic data are available from Council.
5. The air quality impact report is to justify the inclusion or omission of nearby roads in the cumulative impact assessment.

5.4 Reporting of dispersion modelling results

1. Reporting dispersion modelling results is to include a comparison with the air quality (planning) criteria in the referring code. Compliance with air quality (planning) criteria is determined by adding the estimated background concentration of the pollutant to the concentration predicted by dispersion modelling at sensitive uses and/or sensitive zones.
2. The following methodology is to be used when reporting the results of the dispersion modelling:
3. Averaging times of 1 hour or less are to be presented using the 99.9th percentile concentration of the total site impact and background concentration or the maximum concentration from dispersion modelling if no background concentration is available.
4. Averaging times of greater than 1 hour are to be presented using the maximum concentration of the total site impact from dispersion modelling and background concentration.
5. Where a concurrent background concentration has been used for 8-hour or 24-hour average data, the impacts due to the development, the background data and the cumulative impact should be shown on a time series plot to determine the frequency of any additional exceedences of the air quality (planning) criteria.
6. The top 20 results at all sensitive uses and/or sensitive zones modelled (ranked by both cumulative and incremental impact) should be presented where either the concurrent background concentration or ozone limiting method is used.
7. Dust deposition is the maximum allowable level from new and existing sources as total insoluble solids, calculated from annualised modelling data.
8. The air quality (planning) criteria are to be applied at sensitive uses at ground level, elevated locations such as balconies and air intakes of building mechanical ventilation systems and/or at sensitive zones up to the maximum building height for the zone.
9. The air quality impact report is to present the results for the cumulative impact at gridded receptors as contour maps overlaid on aerial photographs or maps. Graphical results are to be presented at ground level and at heights where the worst case impacts are predicted.
10. The predicted results for the cumulative impact at sensitive uses and/or sensitive zones are to be presented as tabular results. Tabular results are to be presented at ground level and at all heights of the receptors modelled.
11. Results may be presented as the incremental impact due to the development where this assists in interpreting the significance of the results of the air quality assessment.
12. The air quality impact report is to ensure that peak air quality impacts are captured on the model domain and on contour maps presented in the air quality impact report.
13. The air quality impact report is to clearly identify, for all pollutants emitted from the site, the compliance with the relevant air quality (planning) criteria at sensitive uses and/or sensitive zones.
14. If the air quality (planning) criteria cannot be met with the proposed air quality control measures, a health risk assessment is to be conducted in accordance with section 7.

6 Odour impact assessment method

6.1 Requirements for an odour impact assessment

1. An odour impact assessment can be used to demonstrate that a development meets the odour criteria in a referring code, and is required when the facility emits odorous compounds, as listed in Table 3.
2. The assessment methodology is to follow the emissions inventory and modelling assessment method outlined in sections 3 and 4 of this planning scheme policy for the assessment of individual odorous compounds or total odour.

Table 3—Pollutants that require an odour assessment

|  |  |
| --- | --- |
| Pollutant | Pollutant |
| Acetaldehyde | Methyl ethyl ketone |
| Acetic acid | Methyl isobutyl ketone |
| Ammonia | Methyl mercaptan |
| Butyl acrylate | Methyl methacrylate |
| Butyl mercaptan | Methyl styrene |
| Carbon disulfide | Methylamine |
| Chlorobenzene | n-Butanol |
| Cumene (isopropyl benzene) | n-Butyl acetate |
| Cyclohexanone | Nitrobenzene |
| Diacetone alcohol | n-Propanol |
| Diethylamine | Odour |
| Dimethylamine | Phenol |
| Diphenyl ether | Phosphine |
| Ethanol | Pyridine |
| Ethyl acetate | Styrene |
| Ethyl acrylate | Tetrachloroethylene (perchloroethylene) |
| Formaldehyde | Toluene |
| Hydrogen sulfide | Triethylamine |
| Methanol | Xylenes (as a total of ortho-, meta- and para-isomers) |

6.2 Estimating odour emissions

1. Odour emissions from new or existing sources are to be evaluated using the emissions estimation hierarchy listed in section 3.5. Emissions of individual odorants listed in Table 3 and a measured or estimated odour emission rate (representing the total odour emission for all odorous pollutants from each source) are to be determined.
2. Measurement of complex mixtures of odour emissions from existing sources are to be determined in accordance with AS/NZS 4323.3:2001 Stationary source emissions - Determination of odour concentrations and AS/NZS 4323.4:2009 Stationary source emissions - Area source sampling - Flux chamber technique or emission estimation techniques compatible with these methods. Odour measurements are to be performed in duplicate with a discussion of the variability in sampling results. Odour emissions are to be reported in odour units (OU) as an odour emission rate (OU.m³/s) or an in-stack odour concentration (OU).
3. Where the development will emit odour, the air quality impact report is to state the air emission control measures that will be used (such as the use of biofilter, afterburner, scrubber or activated carbon odour reduction technology), to minimise odour emissions as far as practicable and the performance limitations of the air emission control measures. The air quality impact report is to include justification if air emission control measures for controlling odours (as listed above), will not/cannot be used.
4. Odour emission and assessment methodologies that have been published for specific industries, such as for meat chicken farms, may be used in the air quality impact report with a justification of the suitability of the methodology.
5. The air quality impact report is to contain a detailed description of the methodology and calculations used to derive odour emission rates, with sufficient detail to enable replication of the methodology and results of the emissions estimation by Council or third parties.

6.3 Cumulative odour assessment

1. Cumulative impacts of odour are to be determined for known odorous sources within 1km of the development. The impacts from existing odour sources can be determined by qualitative evaluation of background odour using a combination of odour surveys and diaries, complaint analysis, field odour observations and compliance history (see Department of Environment and Heritage Protection Guideline – Odour Impact Assessment from Developments for details). These qualitative methods are to be used to determine whether existing operations have caused odour nuisance historically, but are not to be used to determine existing or future compliance with odour criteria or relevant air quality (planning) criteria.
2. The cumulative impacts from existing and future odour sources are to be determined by odour impact modelling. Emissions from the existing odour sources should be estimated following the methodologies in section 3. The combined impact of the development with the existing odour sources is to be evaluated for compliance with the odour criteria or relevant air quality (planning) criteria. Other information, such as community complaint data, should be considered in an assessment of cumulative impacts of the development.

6.4 Reporting of odour impact assessment results

1. Impacts of individual odorous compounds are to be evaluated against the relevant air quality (planning) criteria in the referring code, following the modelling assessment methodology in section 4. Odour impacts for mixtures of odorous compounds are to be compared to the odour criteria in the referring code and evaluated using the 99.5th percentile 1-hour average concentration.
2. The Department of Environment and Heritage Protection Guideline – Odour Impact Assessment from Developments allows the use of industry-specific odour intensity measurements to determine an alternative odour guideline. The use of odour intensity is to be approved by Council before inclusion in the air quality impact report and detailed supporting evidence is to be provided.
3. The air quality impact report is to present the results for the cumulative impact at gridded receptors as contour maps overlaid on aerial photographs or maps.
4. The predicted results for the cumulative impact at sensitive uses and sensitive zones are to be presented as tabular results.
5. Results may be presented as the incremental impact due to the development where this assists in interpreting the significance of the results of the air quality assessment.
6. The air quality impact report is to ensure that peak odour impacts are captured on the model domain and on contour maps presented in the air quality impact report.
7. The air quality impact report is to identify the compliance with the odour criteria or relevant air quality (planning) criteria at sensitive uses and/or sensitive zones.

7 Health risk assessment method

7.1 Requirement for a health risk assessment

1. A health risk assessment can be used to demonstrate that a development meets the health risk criteria in a referring code.
2. A screening health risk assessment is required where development:
3. involves an industry listed in Table 4; or
4. involves emission to the air of any of the pollutants listed in Table 5.
5. A full health risk assessment is required where a screening health risk assessment shows that:
6. any of the pollutants exceed the ambient air quality (planning) criteria in the referring code, inclusive of background concentration; or
7. any of the pollutants exceed 80% of the air quality (planning) criteria in the referring code without background concentration; or
8. any pollutant exceeds the short-term or long-term screening concentration in ambient air in Table 5 at a sensitive use and/or sensitive zone.

Table 4 —Industries that require a health risk assessment

|  |
| --- |
| Industry |
| Fuel burning for power generation with an installed capacity of 10 MW or greater |
| Fuel burning for power generation burning coal or coal products |
| Manufacturing asbestos products |
| Manufacturing chemicals, poisons and explosives |
| Metal refining or smelting |
| Oil refining and processing facility |
| Polyvinyl chloride plastic manufacturing works |
| Producing, quenching, cutting, crushing or grading coke |
| Pulp or paper manufacturing |
| Tobacco processing |
| Waste incinerator |

Table 5 — Screening predicted ambient air quality concentrations for pollutants that require a health risk assessment

| Pollutant | Short-term screening concentration (1-hour average, µg/m³) | Long-term screening concentration (annual average, µg/m³) |
| --- | --- | --- |
| Acetaldehyde | 15 | 45 |
| Acetamide | 320 | 32 |
| Acrylamide | 0.3 | 0.03 |
| Acrylonitrile | 40 | 4 |
| Allyl chloride | 30 | 3 |
| Aniline | 80 | 8 |
| Arsenic and compounds, inorganic | 3 (as PM10) | 0.067 (as PM10) |
| Arsenic and compounds, organic | 5 (as PM10) | 0.5 (as PM10) |
| Asbestos | 0.03 | 0.003 |
| Benzal chloride | 20 | 2 |
| Benzene | 170 | 4.5 |
| Benzo(a)pyrene (as marker for PAH) | 0.03 (as PM10) | 0.003 (as PM10) |
| Benzotrichloride | 8 | 0.8 |
| Benzoyl chloride | 28 | 2.8 |
| Benzyl chloride | 50 | 5 |
| Beryllium and compounds | 0.02 | 0.002 |
| Bromine and compounds | 7 | 0.7 |
| 1,3-butadiene | 510 | 9.9 |
| Cadmium and compounds | 0.1 (as PM10) | 0.01 (as PM10) |
| Chlorinated paraffins | 100 | 10 |
| 1-chloro-2,3-epoxypropane | 20 | 2 |
| Chloromethane | 1030 | 103 |
| Chromium VI compounds | 0.1 (as PM10) | 0.01 (as PM10) |
| p-cresidine | 50 (as PM10) | 5 (as PM10) |
| Di(2-ethylhexyl)phthalate | 50 | 5 |
| Diaminotoluene mixture (as 2,4-diaminotoluene) | 50 | 5 |
| 1,2-dibromo-3-chloropropane (DBCP) | 0.1 | 0.01 |
| 1,2-dibromoethane | 4 | 0.4 |
| Dichlorobenzene, all isomers (as p-dichlorobenzene) | 600 | 60 |
| 3,3-dichlorobenzidine | 1 | 0.1 |
| 1,1,-dichloroethane | 4,000 | 400 |
| 1,2 dichloroethane | 160 | 4 |
| Dichloroethyl ether | 290 | 29 |
| Dichloromethane | 3,600 | 350 |
| Dichloromethyl ether | 0.05 | 0.005 |
| Dichloropropenes all isomers | 45 | 4.5 |
| p-dimethylaminoazobenzene | 0.3 | 0.03 |
| Dinitrotoluene, all isomers | 2 | 0.1 |
| 1,4-diethylene dioxide | 900 | 90 |
| Dioxins and furans (as TCDD I-TEQs) | - | 3.0x10-8 |
| Ethylbenzene | 740 | 570 |
| Ethylene oxide | 20 | 2 |
| Ethylene thiourea | 50 (as PM10) | 5 (as PM10) |
| Formaldehyde | 15 | 3.3 |
| Hexachlorobenzene | 0.25 | 0.025 |
| Hexachlorocyclohexanes (mixed) | 5 | 0.5 |
| Lead and compounds (inorganic) | - | 0.5 |
| Methyl t-butyl ether (MTBE) | 450 | 180 |
| 4,4'-methylene bis (2-chloroaniline) (MOCA) | 1 | 0.1 |
| 4,4'-methylene dianiline (and its dichloride) | 8 | 0.8 |
| Nickel and compounds | 0.33 (as PM10) | 0.059 (as PM10) |
| Pentachlorophenol | 5 | 0.5 |
| Polychlorinated biphenyls (PCB) | 0.1 | 0.01 |
| Propylene oxide | 70 | 7 |
| 1,1,2,2-tetrachloroethane | 70 | 7 |
| Tetrachloroethylene | 2,000 | 26 |
| Tetrachloromethane | 130 | 13 |
| Toluene-2,4-diisocyanate | 0.4 | 0.04 |
| Toluene-2,6-diisocyanate | 0.4 | 0.04 |
| Trichlorobenzene, all isomers | 50 (as PM10) or 400 (as vapour) | 5 (as PM10) or 40 (as vapour) |
| 1,1,2-trichloroethane | 550 | 55 |
| Trichloroethylene | 540 | 54 |
| Trichloromethane (chloroform) | 100 | 10 |
| 2,4,6-trichlorophenol | 20 | 44 |
| Urethane | 5 (as PM10) | 0.5 (as PM10) |
| Vinyl chloride monomer | 20,000 | 1.2 |

Note—

* Short-term screening concentration is based on the predicted maximum 1-hour average ambient concentration.
* Long-term screening concentration is based on the predicted annual average ambient concentration.
* For screening concentrations for hazardous compounds emitted to air that are not shown in the table, please contact Council.

7.2 Assessment methodology

7.2.1 Screening health risk assessment

1. The screening health risk assessment methodology is to follow the emissions inventory and modelling assessment methods outlined in sections 3 and 4 for the prediction of ambient air concentrations and deposition rates.

7.2.2 Full health risk assessment

1. The full health risk assessment is to include the following key steps:
2. hazard identification;
3. dose–response assessment;
4. exposure assessment;
5. risk characterisation;
6. evaluation of results;
7. risk management options.
8. The full health risk assessment is to quantify the risks from the relevant exposure pathways of air emissions, that is, inhalation, ingestion and dermal exposure, as identified in the hazard identification step.
9. The health risk assessment is to be undertaken in accordance with the methodologies and data contained in:
10. Air Toxics Hot Spots Program Risk Assessment Guidelines, California Air Resources Board (referred to as the Hot Spots Guidelines);
11. Environmental Health Risk Assessment: Guidelines for Assessing Human Health Risks from Environmental Hazards, Department of Health and Ageing and enHealth Council (referred to as the enHealth guidelines)

Note—Equivalent alternative methods presented in a modelling proposition (section 2.1) may be used where approval is obtained from Council.

1. Software packages are available to assist in the health risk assessment process. Any software package used is to be consistent with the methodologies identified above and tailored to use model parameters which are relevant for the scenarios studied and Australian conditions where possible. The choice of software and the model parameters assumed in the model are to be justified in the air quality impact report.
2. The full health risk assessment is to assess lifetime cancer risk, lifetime chronic health risk, and acute health risk, for comparison to the incremental health risk criteria.
3. Where significant background sources are present that would have the same health endpoint, the background pollutant concentrations are to be evaluated following the method in section 7.3. The cancer risk and hazard index results are to be summed and compared to the cumulative health risk criteria.
4. Where more than 1 pollutant emitted from the development has the same health endpoint, the cancer risk and hazard index results are to be summed and compared to the cumulative health risk criteria.
5. Lifetime cancer risk is the theoretical probability of contracting cancer when continually exposed for a life time (70 years) to a given concentration of a pollutant. The probability for lifetime cancer risk is to be calculated as an upper confidence limit, unless otherwise justified.
6. The chronic hazard index is the potential non-cancer health impact resulting from exposure to toxic pollutants usually lasting from 1 year to a lifetime. It includes the sum of hazard indices for pollutants with non-cancer health effects that have the same adverse health effects (endpoints). A chronic hazard index is to be calculated by dividing the annual average concentration of a toxic pollutant by the chronic reference exposure level for that pollutant.
7. The acute hazard index is the potential non-cancer health impact resulting from a 1-hour exposure to toxic pollutants. It includes the sum of hazard indices for pollutants with non-cancer health effects that have the same adverse health effects (endpoints). An acute hazard index is to be calculated by dividing the hour concentration of a toxic pollutant by the acute reference exposure level for that pollutant.
8. Risk management options are to be identified in each assessment to preferentially avoid the release of pollutants or to identify measures to reduce the impacts at sensitive uses and/or sensitive zone.

7.3 Existing background pollutant concentrations

1. Background concentrations of pollutants in air, soil and water should be considered if relevant to the requirements of the study.
2. Where benzene, 1.3-butadiene and/or polycyclic aromatic hydrocarbons are released from the development, the contribution of these pollutants from major roads are to be considered where these may also impact at a sensitive use and/or sensitive zone.
3. The existing soil levels of pollutants at residential uses are to be included if previous or existing site contamination is likely.
4. The background concentrations of airborne pollutants that are relevant to the health risk assessment are to be determined following the methodology outlined in section 5.3.1.
5. Existing levels of pollutants in soil are to be determined using the enHealth guidelines for sampling at potentially affected sensitive uses and on the subject site.
6. Evaluation of health risk due to the cumulative impact of the development in conjunction with background concentrations is to be compared to the cumulative health risk criteria in the referring code.

7.4 Selection of model parameters

1. The air emission inputs for health risk assessment modelling, including emission concentrations, emission rate and emission duration are to be based on the worst-case scenario for the industry relevant to the investigation.
2. The key exposure variables required to conduct a health risk assessment are to be based on the following hierarchy:
3. Australian Exposure Factor Guide, enHealth;
4. Australian data available from other sources;
5. Hot Spots Guidelines, California Environmental Protection Agency.
6. The exposure variables used in the health risk assessment modelling are to be listed in the air quality impact report. The uncertainties and assumptions relating to key exposure variables are to be stated in the air quality impact report.
7. The health risk assessment is to include speciation of polycyclic aromatic hydrocarbons as benzo(a)pyrene equivalent using the potency equivalency factors in Table 1 and dioxins, furans and dioxin-like polychlorinated biphenyls as tetrachlorodibenzodioxin equivalent using the toxic equivalency factors as noted in Table 2.

7.5 Reporting of health risk assessment results

1. The air quality impact report is to contain a description and results of the screening health risk assessment undertaken. This is to document the data sources, emission rates, predicted impacts and comparison to the air quality (planning) criteria and short term and long-term screening concentrations.
2. The reporting of full health risk assessment results is to document the data used to prepare the risk assessment and the source of the data, including:
3. cancer unit risk factors and health endpoint;
4. acute and/or chronic reference exposure level for all pathways assessed, health endpoint and parameters used to derive the hazard index;
5. deposition parameters and deposition rates of pollutants;
6. common health endpoints between pollutants or combined pollutants from different sources used for the cumulative health risk assessment.
7. The reporting of full health risk assessment results is to include a comparison with the incremental health risk criteria at sensitive uses or sensitive zones. Comparison with the cumulative health risk criteria at sensitive uses or sensitive zones may be required if identified during the full health risk assessment.
8. The air quality impact report is to present the full health risk assessment results at gridded receptors as contour maps overlaid on aerial photographs or maps.
9. The full health risk assessment results at sensitive uses and sensitive zones are to be presented as tabular results.
10. Time-series plots of predicted pollutant impacts, background sources of pollutants and the cumulative impact may assist in interpreting the significance of the results of the health risk assessment at sensitive uses and/or sensitive zones.
11. The measures proposed to manage the health risk associated with the development are to be clearly stated in the report. In particular, where any of the health risk criteria are exceeded, detailed justification of why the risk cannot be reduced further is required.