REPORT

ESR WESTLINK

KEMPS CREEK

AIR QUALITY ASSESSMENT
RWDI # 2101343
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SUBMITTED TO

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1 INTRODUCTION

RWDI was retained by ESR Australia to conduct an air quality assessment for the proposed warehouse and distribution facility known as the 'ESR Kemps Creek Logistics Park 'located on the corner of Abbotts Road and Aldington Road, Kemps Creek.

The following report forms part of the State Significant Development Application for a proposed warehouse and distribution development located across three separate allotments: 290-308 Aldington Road, 59-62 Abbotts Road, and 63 Abbotts Road (the Site).

This report addresses the Secretary's Environmental Assessment Requirements (SEARs) relevant to the development (SSD 9138102) issued September 2020.

The Department of Planning, Industry and Environment have issued the Secretary's Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement for the proposed development.

The relevant section of the SEARs is reproduced below:

> *"**Air Quality** – including an assessment of air quality impact at sensitive receivers during construction and operation in accordance with NSW Environment Protection Authority guidelines and details of mitigation, management and monitoring measures"*

This assessment forms part of an Environmental Impact Assessment (EIS) for the project.

2 SITE LOCATION

The site is located at 290-308 Aldington Road, 59-62 Abbotts Road, and 63 Abbotts Road as shown in **Figure 2-1** below. Currently, the Site includes scattered residential dwellings (within a rural setting), vacant land and ancillary farm buildings.

Surrounding land uses currently comprise a predominantly rural typology, with a variety of rural dwellings, rural land, farm dams and scattered vegetation. Beyond this, the Oakdale South industrial estate is located approximately 2.2km to the northeast of the site, and the established large lot residential housing community of Mount Vernon is located to the south east.

Mamre Road is a major arterial road that is located to the west of the Site and this road is planned to be upgraded in the near future in two stages. Investigations for the concept design for Stage 1 (M4 to Erskine Park Road) started in early 2020. Stage 2 will deliver the upgrade in the vicinity of the Site (Erskine Park Road to Kerrs Road); however, a definitive timeline is currently not known.

There are also several infrastructure projects currently being investigated including the Southern Link Road to the north of the Site, the proposed Western Sydney Freight Line and potential Intermodal Terminal located to the west and north-west of the Site along Mamre Road.

Of the many current projects being constructed in the area, the Western Sydney Airport and Aerotropolis will result in increased traffic movements and introduce aircraft movements in the area. This in turn will impact the noise levels in this region.

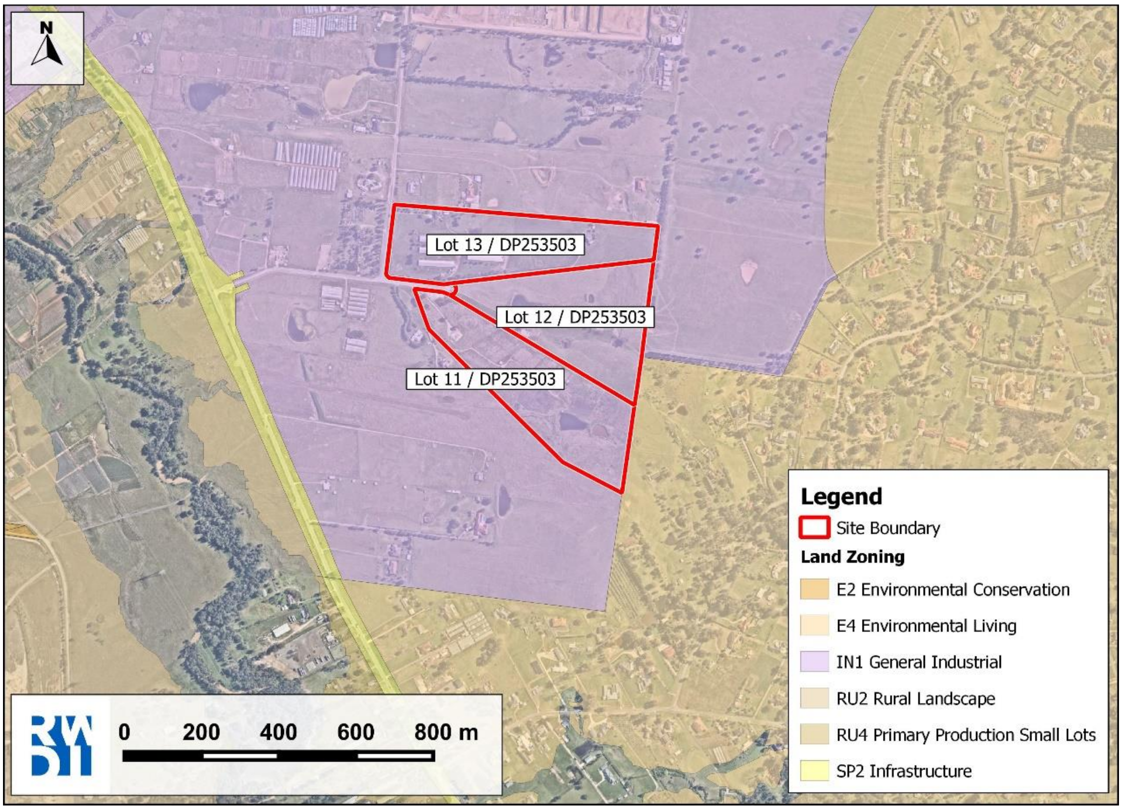

Figure 2-1: Site Aerial

3 PROJECT DESCRIPTION

3.1 Masterplan

The Development Site is located within the Western Sydney Employment Area (WSEA) and is currently zoned IN1 General Industrial under the WSEA State Environmental Planning Policy (SEPP).

This application seeks approval for the following development:

Site preparatory works, including:

  - Demolition and clearing of all existing built form structures and vegetation
  - Bulk earthworks including 'cut and fill' to create flat development platforms for the proposed buildings, and topsoiling, grassing and site stabilisation works
- Subdivision of the site into 4 individual lots
- Construction of a new industrial estate at the site comprising 2 industrial allotments and a total gross leasable area of 83,480 m^2 including:
  - 2 new industrial warehousing buildings with ancillary offices across 6 allotments, comprising:
    - 77,943 m^2 of warehousing floorspace
    - 3,386 m^2 of ancillary office and other floorspace
  - Fitout of Lot 1 and Lot 4 warehouses
- Construction of a new internal road layout and parking for 338 vehicles
- Associated site servicing works and ancillary facilities, including OSD detention basin
- Association site landscaping
- Works-in-kind (WIK) arrangements through a Voluntary Planning Agreement (VPA) for external road upgrades including to Aldington and Abbots Road, and a new signalised intersection at Mamre and Abbots Road.

3.2 Development Layout

The location of the development and surrounding receivers categorised in assessment areas (AAs) are shown in **Figure 3-1**. Masterplan and the proposed layout are presented in **Figure 3-2**.

It is important to note that with reference to the State Environmental Planning Policy (Industry and Employment) – Mamre Road Precinct – Land Zoning Map, that the immediate area surrounding the site is identified as *IN1 General Industrial* with the exception of the south-eastern corner of the Site.

Sensitive receivers located in the vicinity of the development are located on the eastern boundary on Mt Vernon Road, Kerrs Road, and Bowood Road and are presented as assessment areas AA1, AA2 and AA3, respectively. The receivers in AA4 and AA5 are existing residential houses within the industrial zoning.

The residential receivers in AA1, AA2 and AA3 are located within 150m to 600m from the site. The isolated residential receivers in AA4 and AA5 are located within 40m to 50m from the site.

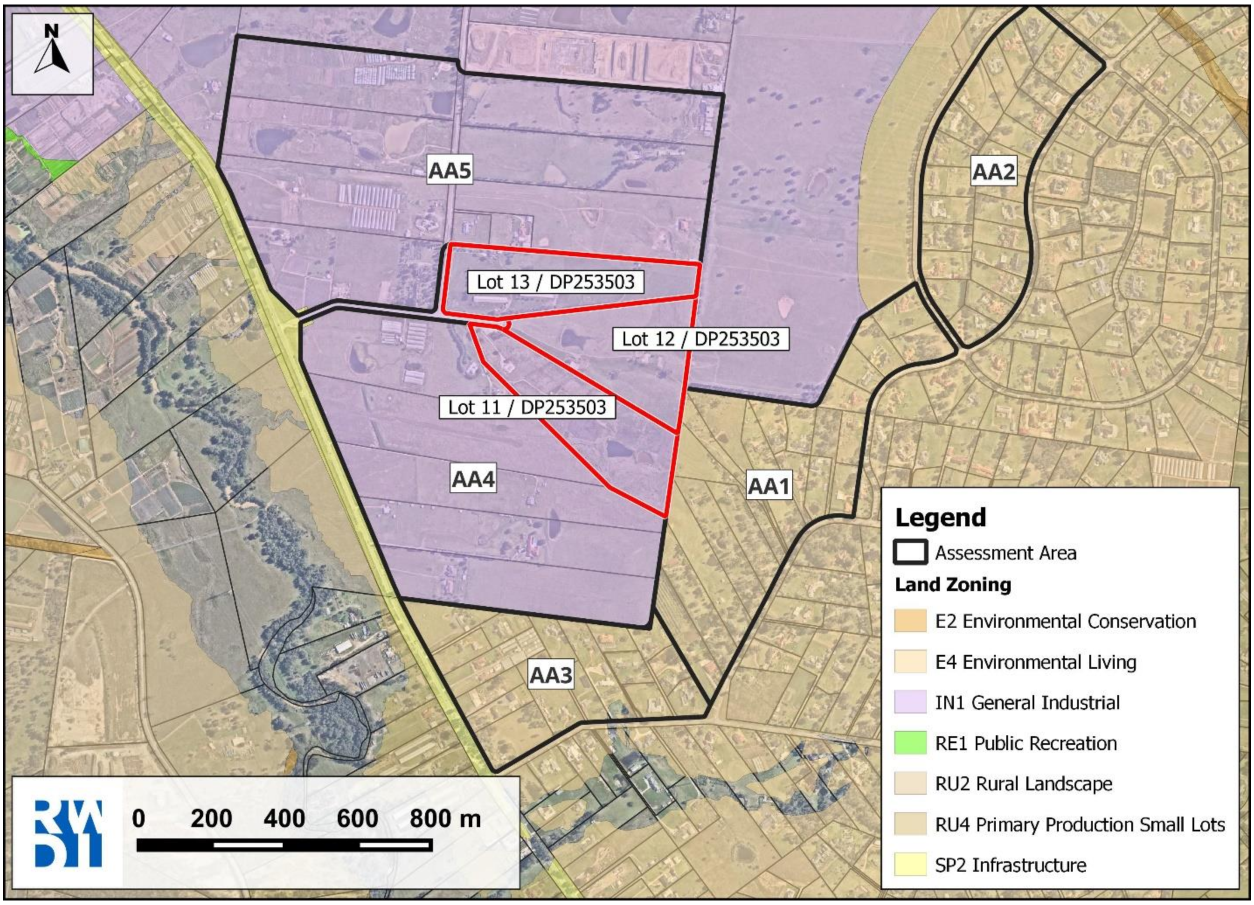

Figure 3-1: Site location and assessment areas

Figure 3-2: Site Layout

3.3 Potential Sources of Air Emissions Associated with the Development

Air emissions are likely during both the construction and the operation of the warehouse and distribution facility development. The operational air quality assessment will consider Lots 1 and 4 for the site and the construction air quality assessment will consider the subdivision into 5 lots, construction of internal road, and construction of warehouses on Lots 1 and 4. The most likely air quality sources for construction and operation are summarised in the following sections.

3.3.1 Sources during construction

At the time of preparing this assessment a detailed construction programme was not developed, however the following stages and typical activities can be expected from this project:

Demolition:

- Likely to the shortest and of least impact.
- Small number of structures to be removed using trucks, excavators, and hand tools.

Earthworks:

- Likely to the longest stage of works and of most impact.
- Significant earthworks required that will involve a large number of trucks, excavators, dozers, graders, and associate equipment.

Construction of Warehouses:

- Given the staging it is likely to be of a short duration with less impact than earthworks.
- Building works likely to involve a high number of truck movements, cranes, and power tools.

During the temporary phase of construction earthwork activities including moving of material and truck movements along haul roads (wheel generated dust) is likely to lead to short-term elevate levels of particulate Matter (PM_{10} and $PM_{2.5}$).

3.3.2 Sources during operation

At the time of preparing this assessment the end users were not known, however based on typical warehouse usage, the following activities can be expected from this project.

- Off-site and on-site vehicular movements including trucks idling.
- Forklift movements.

These operations will result in wheel-generated dust from vehicles travelling (on sealed roads) within the complex and on the local road network as well as from vehicle exhaust and may result in the elevation of:

- Particulate Matter (PM_{10} and $PM_{2.5}$).
- Oxides of Nitrogen (NO_x) and in particular as Nitrogen Dioxide (NO_2).

4 AIR QUALITY CRITERIA

4.1 Introduction

The NSW EPA's Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (the Approved Methods) sets out applicable impact assessment criteria for a number of air pollutants.

4.2 Impact Assessment Criteria

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. The sections below identify the pollutants of interest in this study and the applicable air quality criteria for each pollutant.

The criteria presented in the Approved Methods are consistent with the National Environment Protection Council's (NEPC), National Environment Protection (Ambient Air Quality) Measure, 2016 (NEPM).

Table 4-1 summarises the air quality goals for NO_2 and particulate matter that are relevant to this study. The air quality goals relate to the total concentrations of dust and particulate matter in the air and not just that from the project. Therefore, some consideration of background levels needs to be made when using these goals to assess impacts.

Table 4-1: Impact assessment criteria – dust and particulate matter

Pollutant	Averaging period	Criteria
Total suspended particulates (TSP)	Annual	90 µg/m³
Particulate matter ≤10 µm (PM_{10})	Annual	25 µg/m³
	24-hour	50 µg/m³
Particulate matter ≤2.5 µm ($PM_{2.5}$)	Annual	8 µg/m³
	24-hour	25 µg/m³
NO_2	1-hour	246 µg/m³
	Annual	62 µg/m³

5 EXISTING ENVIRONMENT

5.1 Local Climate

Meteorological conditions strongly influence air quality. Most significantly, with respect to wind speed and wind direction.

Observations of wind speed and direction from the Office of Environment and Heritage (OEH) air quality monitoring station (AQMS) at St Marys have been selected to represent typical wind patterns in the area surrounding the site. The St Marys AQMS is located approximately 6 kilometres north north-west from the centre of the site. The AQMS is located on a residential property approximately 160m from Mamre Road.

Figure 5-1 presents annual and seasonal "wind rose" plots for the St Marys AQMS, averaged for the period 2015 to 2019, inclusive. As can be seen from the plots, winds from the south to south-west and north-west to north octants are most common in all four seasons.

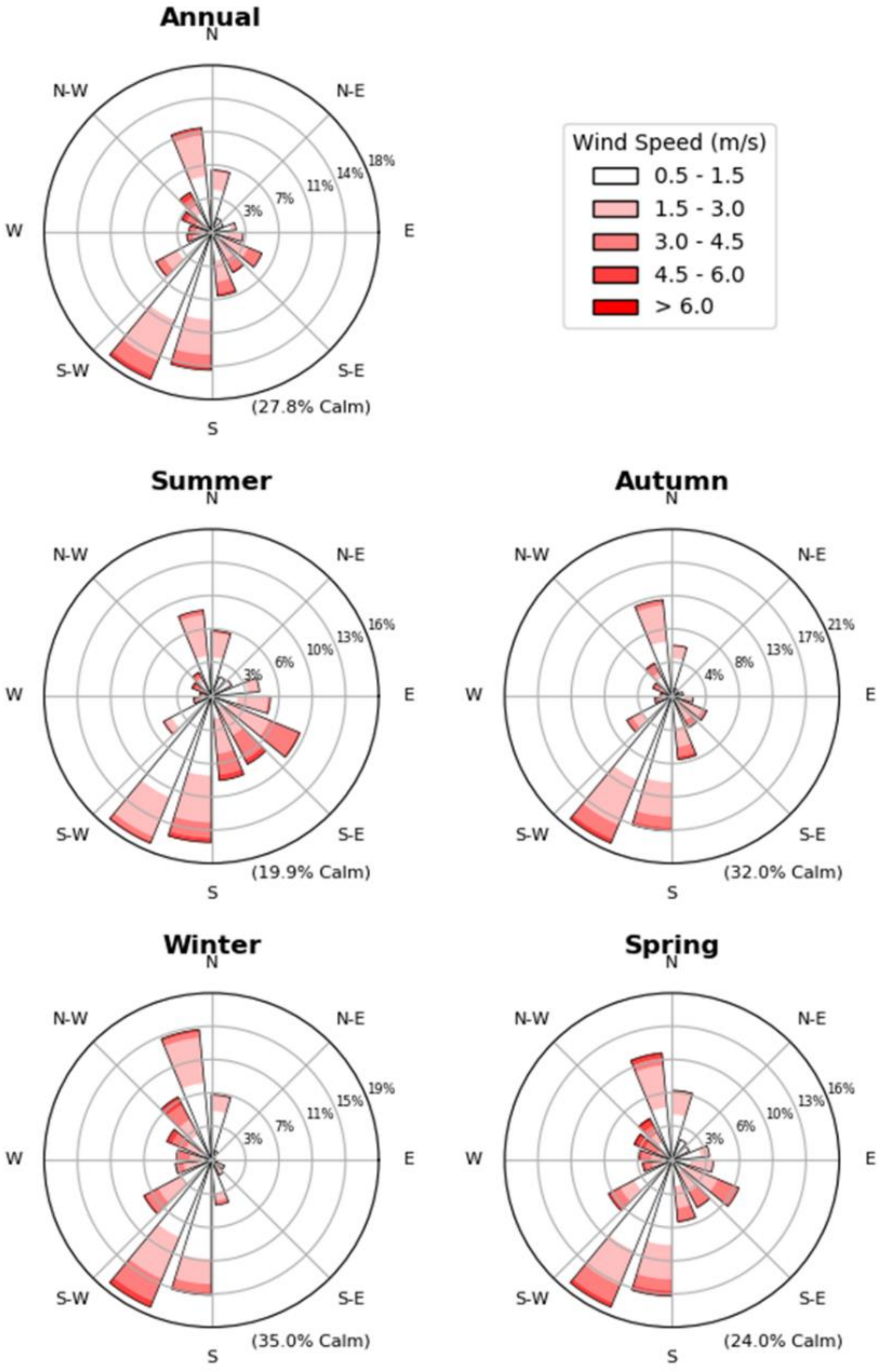

Figure 5-1: Windrose Plot – St Marys OEH AQMS, 2015-2019

5.2 Ambient Air Quality Data

Data from the St Marys AQMS has been used to establish typical ground level concentrations of the main airborne pollutants of interest. A summary of these pollutants over a seven year period 2014 – 2020 is presented in Table 2 together with the average and impact criteria.

Table 5-1: Air Quality monitoring results from St Marys – annual averages

Year	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	NO_2 (µg/m³)
2014	16.7	Note 1	-
2015	15.0	Note 1	8.3
2016	16.1	Note 2	7.5
2017	16.2	7.0	8.7
2018	Note 2	7.8	10.3
2019	24.6	9.9	7.6
2020	18.9	7.6	7.6
Average	17.9	8.1	8.3
Impact Criteria	25	8.0	62

Note 1: Observations of $PM_{2.5}$ at the St Marys AQMS began in 2016.

Note 2: Less than 75% valid data collected.

It should be noted that elevated particulate levels were measured in 2019 compared to the previous years. The elevated levels on the whole were due significant bushfires and dust storms in NSW from October to December. However, to be conservative the 2019 data has been used to establish existing background levels. A review of the data from St Marys and comparison to the impact criteria indicates the following:

PM_{10}

- Measured annual average has been steady between 15.0 and 16.2 µg/m3 with the exception of a sharp rise to 24.6 µg/m3 for the 2019 year. The 2019 data is impact by bushfires and local dust storms contributing to this sharp rise particulate levels.
- Considering this data period, the annual impact criteria of 25 µg/m3 has not been exceeded and the arithmetic average of the period is calculated to be 17.9 µg/m3 which is at **72%** of the annual impact criteria.

$PM_{2.5}$

- Measured annual average has ranged between 7.0 and 9.9 µg/m3. The higher 2019 level is due to bushfires and local dust storms.
- Considering this data period, the annual impact criteria of 8 µg/m3 was exceeded for the 2019 year. The arithmetic average of the period is calculated to be 8.1 µg/m3 which is slightly above (**101%**) the criteria.

NO_2

- Measured annual average has been quite steady between 7.5 and 8.7 µg/m3 with an increase in 2018 to 10.3 µg/m3.
- Considering this data period, the annual impact criteria of 62 µg/m3 is easily achieved and the arithmetic average of the period is calculated to be 8.3 µg/m3 which is at **13%** of the annual impact criteria.

5.3 Emissions within Kemps Creek Airshed

The NSW Environment Protection Authority (EPA) has produced an air emissions inventory for both human-made and natural sources in NSW. The inventory extends to the greater metropolitan region (GMR) which is further categorised into three urban regions (Sydney, Newcastle and Wollongong).

Kemps Creek is within the Sydney region and the general airshed around Kemps Creek is currently controlled by human-made sources including road traffic noise from the many arterial roads, general industry (mostly warehouse distribution) as well as a small number of quarry and manufacturing sites. Wood burning and earthworks/construction are also contributors (particle pollution) to the general airshed.

The most current inventory report is for the 2013 calendar year, the previous report covered 2008. For this project, the following information from these reports has been summarised for the Sydney region and can be used to approximate the proportion within Kemp Creek.

Table 5-2: **Proportion of total estimated annual emissions (%)**

Year	PM_{10}		$PM_{2.5}$		NO_x [1]	
	Natural	Human	Natural	Human	Natural	Human
2008	19.1	80.9	8.1	91.9	1.7	98.3
2013	27.3	72.7	27.7	72.3	4.3	95.7

Note 1: It has been conservatively assumed that 100% of the NO_X emissions are NO_2.

For the three pollutants, **Table 5-2** shows a reduction in the proportion of human-made emissions between the 2008 calendar year and 2013 calendar year.

The inventory further provides the proportion of total emissions by human-made source type (refer **Table 5-2** for 2013 data). Considering this data and the proportions within **Table 5-2, Table 5-3** summarises the contribution from road traffic.

Table 5-3: Proportion of total estimated annual emissions – road traffic (%)

Year	PM10	PM2.5	NO_x[1]
2008	10.4	13.2	60.7
2013	8.7	9.3	53.0

Note 1: It has been conservatively assumed that 100% of the NO_X emissions are NO_2.

The table shows a reduction in the proportion of emissions from road traffic between the 2008 calendar year and 2013 calendar year despite an increase in traffic.

It is critical to note that since 2013 there have been many additional measures to improve exhaust emissions from road traffic including emission controls for new vehicles (Euro 5 standards to all light vehicles manufactured from November 2016) and improvements in fuel quality standards (February 2019). Furthermore, Australia is currently reviewing vehicle emission controls further, considering Euro 6 for light vehicles and Euro VI for heavy vehicles.

On this basis, it is considered conservative to assume the road traffic emissions for 2013 as per **Table 5-3** apply to the current environment.

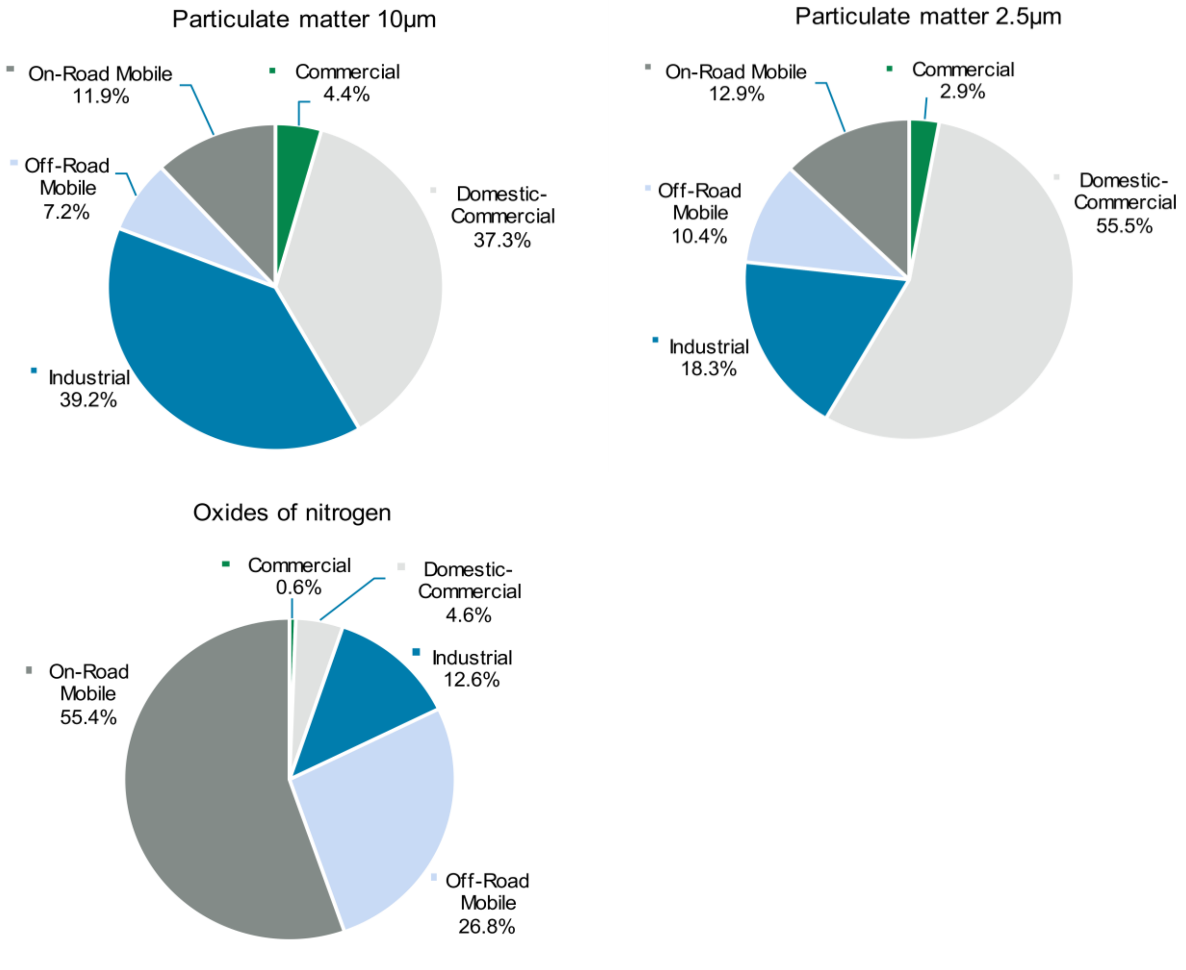

Figure 5-2: Proportions of total estimated annual emissions for human-made source types (PM10, PM2.5 and NOx) – Sydney Region – 2013

6 ASSESSMENT OF AIR QUALITY DURING CONSTRUCTION WORKS

6.1 Assessment Methodology

The EPA does not at this stage have specific guidelines to consider dust from construction sites in terms of a risk assessment and management approach. It has developed a guideline entitled 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW'" (2017), however, this guideline considers detailed modelling approaches and is not specifically relevant to construction dust impacts. A detailed modelling approach is not necessary for short term construction impacts that can be managed.

A risk-based approach has however been developed in the United Kingdom by the Institute of Air Quality Management (IAQM). The guideline is entitled "IAQM Guidance on the Assessment of Dust from Demolition and Construction" (IAQM, 2014).

This approach has been widely used for performing qualitative assessments of dust emissions from construction sites and has been used in NSW by RWDI and other consultants.

Furthermore, it has been accepted as a suitable approach in the absence of any guidance by Australian regulatory authorities.

This section presents a qualitative assessment of potential air quality impacts associated with the proposed Stage 1works and has been conducted in general accordance with the methodology described in the previously IAQM Guideline.

This approach presents the risk of dust soiling and human health impacts associated with four types of activities that occur on construction sites (demolition, earthworks, construction and trackout) and involves the following steps:

- Step 1: Screen the need for a detailed assessment;
- Step 2: Assess the risk of dust impacts arising, based on:
  - The potential magnitude of dust emissions from the works; and
  - The sensitivity of the surrounding area.
- Step 3: Identify site-specific mitigation; and
- Step 4: Consider the significance of residual impacts, after the implementation of mitigation measures.

For this project, the process outlined above will be applied to the worst-case on-site and off-site activities that will result in the likely highest generation of dust. This approach will result in a conservative assessment of the potential risks for human health and dust soiling impacts.

For this project, the earthworks phase (and associated trackout) is considered the greatest potential to generate short-term high levels of dust. On this basis, this report has focused on the assessment of this worst-case scenario.

6.2 Risk Assessment of Dust Impacts from Proposed Construction Works

The following qualitative risk assessment of potential dust impacts has been conducted for the proposed construction works.

6.2.1 Step 1 – Screen the need for a detailed assessment

The IAQM guidance recommends that a risk assessment of potential dust impacts from construction activities be undertaken when human receptors are located within:

- 350m of the boundary of the site; or,
- 50m of the route(s) used by construction vehicles on public roads up to 500m from the site entrance(s).

As can be seen in Figure 3-1, the nearest isolated receivers in AA4 and AA5 are located within 50m of the proposed site and closed residential receivers in AA1, AA2 and AA3 are located within 150m to 600m from the site. Therefore, an assessment of dust impacts is considered necessary under the guideline.

6.2.2 Step 2A – Potential dust emission magnitude

In accordance with the IAQM guidance (Section 7, Step 2: Assess the Risk of Dust Impacts), dust emission magnitudes from earthworks may be defined as:

- Large: total site area >10,000 sqm, potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100,000 tonnes;
- Medium: total site area 2,500 sqm – 10,000 sqm, moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4m – 8m in height, total material moved 20,000 tonnes – 100,000 tonnes; and,
- Small: total site area <2,500 sqm, soil type with large grain (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height, total material moved <20,000 tonnes.

The areas affected by the proposed earthworks are in excess of 10,000 sqm and the material to be removed would exceed 100,000 tonnes.

Regarding dust "trackout" associated with haulage activities, dust emission magnitudes may be defined as:

- Large: >50 heavy vehicle outward movements per day, potentially dusty surface material, unpaved road length >100m;
- Medium: 10 – 50 heavy vehicle outward movements per day, moderately dusty surface material, unpaved road length 50m – 100m; and,
- Small: <10 heavy vehicle outward movements per day, surface material with low potential for dust release, unpaved road length <50m

Earthworks will result in the highest number of heavy vehicle movements, expected to be more than 50 heavy vehicle movements per day leaving the site (this would not occur for the entire duration), and all on-site haulage would include unpaved sections of road more than 100m long.

The dust emission magnitude is therefore:

- **Large** for earthworks.
- **Large** for trackout.

6.2.3 Step 2B – Sensitivity of surrounding area

The sensitivity of the surrounding area to dust impacts considers a number of factors, including:

- Specific receptor sensitivities;
- The number of receptors and their proximity to the works;
- Existing background dust concentrations; and,
- Site-specific factors that may reduce impacts, such as trees that may reduce wind-blown dust.

The IAQM guideline provides the following description for sensitivities to **dust soiling effects**:

High sensitivity receptor:

- *Users can reasonably expect an enjoyment of a high level of amenity; or*
- *The appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected a to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.*
- *Indicative examples include dwellings, museum and other culturally important collections, medium and long term car parks and car showrooms.*

Medium sensitivity receptor:

- *users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or*
- *The appearance, aesthetics or value of their property could be diminished by soiling; or*
- *The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.*
- *Indicative examples include parks and places of work.*

The IAQM guideline provides the following description for sensitivities to **human health effects**:

High sensitivity receptor:

- *Locations where members of the public are exposed over a time period relevant to the air quality objective for PM10 (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).*
- *Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.*

Medium sensitivity receptor:

- *locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM10 (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).*

- *Indicative examples may include office and shop workers, but will generally not include workers occupationally exposed to PM10, as protection is covered by Health and Safety at Work legislation.*

In accordance with the IAQM guideline, the following receptor sensitivity has been determined:

6.2.3.1 Residential Receivers in all AAs

- **High** sensitivity to dust soiling.
- **High** sensitivity to human health.

Considering the above receptor sensitivities, **Table 6-1** and **Table 6-2** have been reproduced from the IAQM (only showing the "high and medium" receptor sensitivity) so that the sensitivity of the area can be determined.

For human health impacts, the mean background PM10 concentration of below 24 $\mu g/m^3$ has been used given the local ambient air quality measured.

Table 6-1: Area sensitivity decision matrix – dust soiling

Receptor sensitivity	Number of receptors	Distance from the source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	> 1	Medium	Low	Low	Low

Residential receivers in AA4 and AA5 (1-10, <50: Low)

Residential receivers in AA1, AA2, and AA3 (10-100, <350: Low)

Table 6-2: Area sensitivity decision matrix – human health

Receptor sensitivity	Annual Mean PM_{10} concentration	No. of receptors	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	> 32 µg/m³	>100	High	High	High	Medium	Low
		10-100	High	High	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	< 24 µg/m³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	> 32 µg/m³	> 10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m³	> 10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m³	> 10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	< 24 µg/m³	> 10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low

Residential receivers in AA4 and AA5

Residential receivers in AA1, AA2, and AA3

The sensitivity of the surrounding area for all residential areas has been determined to be:

- For earthworks:
  - Low sensitivity to dust soiling.
  - Low sensitivity to health impacts.
- For trackout:
  - Low sensitivity to dust soiling.
  - Low sensitivity to health impacts.

6.2.4 Step 2C – Define the risk of impacts

To define the risk of impacts, the dust emission magnitude ("**large**" for this site) is combined with the sensitivity of the area, as per **Table 6-3** and **Table 6-4** for earthworks and trackout, respectively.

Table 6-3: Risk of dust impacts – earthworks

Sensitivity of area	Dust emission magnitude		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 6-4: Risk of dust impacts – trackout

Sensitivity of area	Dust emission magnitude		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

In accordance with Table 6-3 the proposed earthworks are considered to have a low risk of both dust soiling and human health impacts. In accordance with Table 6-4, the haulage activities are considered to have a low risk of both dust soiling and human health impacts.

It is important to note that the above risks assume that dust mitigation measures are not implemented.

6.2.5 Step 3 – Site-specific mitigation

The IAQM guidance document identifies a range of appropriate dust mitigation measures that should be implemented as a function of the risk of impacts. These measures are presented in Section 8.

6.2.6 Step 4 – Significance of residual impacts

In accordance with the IAQM guidance document, the final step in the assessment is to determine the significance of any residual impacts, following the implementation of mitigation measures. To this end, the guidance states:

> *For* almost *all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be "not significant".*

Based on the proposed works, and the advice in the IAQM guidance document, it is considered unlikely that these works would result in unacceptable air quality impacts, subject to the implementation of the mitigation measures outlined in Section 8.

7 ASSESSMENT OF AIR QUALITY DURING OPERATION

7.1 Assessment Methodology

The operational air quality assessment will consider Lots 1-6 located within the site. As mentioned previously in this assessment, in terms of air quality, the operation of this warehouse will generate additional traffic movements that will travel along Mamre Road.

The emissions would be of a similar nature to those already emitted by road traffic along the nearby road network, although at a much lower level and is therefore considered a low risk to the nearby receivers. Furthermore, the nearest residential receivers will, in the near future be developed into developments more compatible with the Mamre Road Precinct requirements. It is therefore likely that the receptor sensitivity in the future will reduce from High to Medium for these nearby receivers.

Similar to the assessment of construction dust (refer Section 6), an approach developed by the Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) has been referenced following an estimate of the contribution of the three main pollutants from the operation of the Project. The guideline is entitled "Land-Use Planning & Development Control: Planning for Air Quality" (EPUK & IAQM, 2017).

In particular Table 6.3 from the guideline has been referenced and reproduced as **Table 7-1**.

Table 7-1 : Impacts descriptors for individual receptors

Long term average concentration at receptor in Assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Explanation:

1. AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an 'Environmental Assessment Level (EAL)'
2. The Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5%, will be described as Negligible.
3. The Table is only designed to be used with annual mean concentrations.
4. Descriptors for individual receptors only; the overall significance is determined using professional judgement (see Chapter 7). For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has significant effect. Other factors need to be considered.
5. When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.
6. The total concentration categories reflect the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.
7. It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

7.2 Operational Assumptions

All the additional traffic associated with the Project will travel along Mamre Road and eventually onto other arterial roads (such as Elizabeth Drive) and toll roads (such as M4). On this basis, we have conservatively assumed that the road traffic portion of the emissions within the Kemps Creek airshed is exclusively controlled by the traffic on Mamre Road. This is clearly not the case given the many other roads in this region however allows a conservative assessment.

The typical annual average daily traffic (AADT) of the above mentioned three roads is:

- Mamre Road 18,818 (including 14% heavy vehicles) – 2017 RMS counts.
- Elizabeth Drive 25,296 (including 19% heavy vehicles) – 2017 RMS counts.
- M4 59,284 (estimate of > 10% heavy vehicles) – 2016 RMS counts.

The calculated total number of vehicle trips per day for the project is 1,779 from the Mamre Road Precinct identified in the TMAP. The traffic generation estimated is considered to be conservative.

The additional movements result in an approximate increase to the overall traffic movements on Mamre Road of 9% in the area.

7.3 Estimate of Increase in Pollutants

Considering the main three pollutants, PM_{10}, $PM_{2.5}$ and NO_2, and assuming a worst case 9% increase in traffic, **Table 7-2** presented the estimated increase in pollutant concentration due to the operation of the Project.

Table 7-2: Increase in concentration (ug/m^3) due to the Project.

Pollutant	Existing concentration (average)	Estimated[1] concentration (existing traffic)	Estimated[2] increase in concentration (the Project operational traffic)
PM10	17.9	1.6	0.15
PM2.5	8.1	0.75	0.07
NO_2	8.3	4.4	0.42

Note 1: Applied correction to *Existing Concentration (average)* as per Table 5-3 for year 2013.

Note 2: Applied 23% correction to *Estimated Concentration (Existing Traffic)* considering worst case increase in traffic.

Considering the EPUK & IAQM, 2017 guideline, the impact and significance of the Project's operation for each pollutant is defined as:

- PM_{10} - Negligible impact and not significant.
- $PM_{2.5}$ - Moderate impact as the existing concentration is slightly above criteria and not significant due to the conservatism of the assessment.
- NO_2 - Negligible impact and not significant.

8 RECOMMENDED MITIGATION AND MANAGEMENT

8.1 Dust Mitigation Measures

The assessment of potential dust impacts from the proposed works indicates the proposed project is considered to have a low risk of both dust soiling and human health impacts for earthworks and for haulage (trackout) activities if dust mitigation measures are not implemented. The potential risk for the other stages of construction will be of either low or negligible given that the worst-case scenario (earthworks and associated haulage) has been considered.

To ensure best practice management, the following mitigation measures are recommended so that construction dust impacts are minimised and remain low risk.

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Develop and implement a Dust Management Plan (DMP) that considers, as a minimum, the measures identified herein.

Site management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to relevant authorities (Council, EPA, etc).
- Record any exceptional incidents that cause dust and/or air emissions, either on or off site, and the action taken to resolve the situation in the logbook.

Monitoring

- Undertake daily on-site and off-site inspection, where receptors are nearby, to monitor dust. Record inspection results and make available to relevant authorities. This should include regular dust soiling checks of surfaces such as street furniture, cars and window. Specific real-time dust monitoring is not necessary for this project.

Preparing & Maintaining the Site

- Plan site layout so that machining and dust generating activities are located away from receptors, as far as possible.
- Avoid site runoff of water or mud.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If being re-used, keep materials covered.
- Cover, seed or fence stockpiles to prevent wind erosion.

Construction vehicles and sustainable travel

- Ensure all vehicles switch off engines when stationary – no idling vehicles.

- Impose and signpost a maximum-speed-limit of 25km/h on surfaced and 15km/h on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided).

Measures for general construction activities

- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Measures specific to haulage

- Use water-assisted dust sweeper(s) on the access and local roads, as necessary.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site logbook.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10m from receptors where possible.

8.2 Operational Mitigation Measures

Although no specific mitigation measures have been triggered, it would be sensible to:

- Limit unnecessary idling of truck engines on-site.
- Ensure truck maintenance is up to date.

9 CONCLUSION

RWDI has prepared an air quality impact assessment to form part of a State Significant Development Application (SSDA) for the warehouse development at the corner of Abbotts Road and Aldington Road, Kemps Creek.

The application seeks approval for the subdivision of the site into 4 lots, construction of a new internal road and two new industrial warehouse buildings.

The assessment concludes:

- The construction phases can be adequately managed so that the short-term and temporary dust related impacts will be low risk.
- Operational phase (Masterplan) will result in a negligible to moderate impacts. In accordance with the EPUK & IAQM guideline, the moderate to negligible impacts are likely to be insignificant.

APPENDIX A: GLOSSARY OF AIR QUALITY TERMINOLOGY

Air Pollution – The presence of contaminants or pollutant substances in the air that interfere with human health or welfare, or produce other harmful environmental effects.

Air Quality Standards – The level of pollutants prescribed by regulations that are not to be exceeded during a given time in a defined area.

Air Toxics – Any air pollutant for which a national ambient air quality standard (NAAQS) does not exist (i.e. excluding ozone, carbon monoxide, PM-10, sulphur dioxide, nitrogen oxide) that may reasonably be anticipated to cause cancer; respiratory, cardiovascular, or developmental effects; reproductive dysfunctions, neurological disorders, heritable gene mutations, or other serious or irreversible chronic or acute health effects in humans.

Airborne Particulates – Total suspended particulate matter found in the atmosphere as solid particles or liquid droplets. Chemical composition of particulates varies widely, depending on location and time of year. Sources of airborne particulates include dust, emissions from industrial processes, combustion products from the burning of wood and coal, combustion products associated with motor vehicle or non-road engine exhausts, and reactions to gases in the atmosphere.

Area Source – Any source of air pollution that is released over a relatively small area, but which cannot be classified as a point source. Such sources may include vehicles and other small engines, small businesses and household activities, or biogenic sources, such as a forest that releases hydrocarbons, may be referred to as nonpoint source.

Concentration – The relative amount of a substance mixed with another substance. Examples are 5 ppm of carbon monoxide in air and 1 mg/l of iron in water.

Emission – Release of pollutants into the air from a source. We say sources emit pollutants.

Emission Factor – The relationship between the amount of pollution produced and the amount of raw material processed. For example, an emission factor for a blast furnace making iron would be the number of pounds of particulates per ton of raw materials.

Emission Inventory – A listing, by source, of the amount of air pollutants discharged into the atmosphere of a community; used to establish emission standards.

Flow Rate – The rate, expressed in gallons -or litres-per-hour, at which a fluid escapes from a hole or fissure in a tank. Such measurements are also made of liquid waste, effluent, and surface water movement.

Fugitive Emissions – Emissions not caught by a capture system.

Hydrocarbons (HC) – Chemical compounds that consist entirely of carbon and hydrogen.

Hydrogen Sulphide (H_2S) – Gas emitted during organic decomposition. Also, a by-product of oil refining and burning. Smells like rotten eggs and, in heavy concentration, can kill or cause illness.

Inhalable Particles – All dust capable of entering the human respiratory tract.

Nitric Oxide (NO) – A gas formed by combustion under high temperature and high pressure in an internal combustion engine. NO is converted by sunlight and photochemical processes in ambient air to nitrogen oxide. NO is a precursor of ground-level ozone pollution, or smog.

Nitrogen Dioxide (NO_2) – The result of nitric oxide combining with oxygen in the atmosphere; major component of photochemical smog.

Nitrogen Oxides (NOx) – A criteria air pollutant. Nitrogen oxides are produced from burning fuels, including gasoline and coal. Nitrogen oxides are smog formers, which react with volatile organic compounds to form smog. Nitrogen oxides are also major components of acid rain.

Mobile Sources – Moving objects that release pollution; mobile sources include cars, trucks, buses, planes, trains, motorcycles and gasoline-powered lawn mowers.

Particulates; Particulate Matter (PM-10) – A criteria air pollutant. Particulate matter includes dust, soot and other tiny bits of solid materials that are released into and move around in the air. Particulates are produced by many sources, including burning of diesel fuels by trucks and buses, incineration of garbage, mixing and application of fertilizers and pesticides, road construction, industrial processes such as steel making, mining operations, agricultural burning (field and slash burning), and operation of fireplaces and woodstoves. Particulate pollution can cause eye, nose and throat irritation and other health problems.

Parts Per Billion (ppb)/Parts Per Million (ppm) – Units commonly used to express contamination ratios, as in establishing the maximum permissible amount of a contaminant in water, land, or air.

PM10/PM2.5 – PM10 is measure of particles in the atmosphere with a diameter of less than 10 or equal to a nominal 10 micrometers. PM2.5 is a measure of smaller particles in the air.

Point Source – A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution; e.g. a pipe, ditch, ship, ore pit, factory smokestack.

Scrubber – An air pollution device that uses a spray of water or reactant or a dry process to trap pollutants in emissions.

Source – Any place or object from which pollutants are released.

Stack – A chimney, smokestack, or vertical pipe that discharges used air.

Stationary Source – A place or object from which pollutants are released and which does not move around. Stationary sources include power plants, gas stations, incinerators, houses etc.

Temperature Inversion – One of the weather conditions that are often associated with serious smog episodes in some portions of the country. In a temperature inversion, air does not rise because it is trapped near the ground by a layer of warmer air above it. Pollutants, especially smog and smog-forming chemicals, including volatile organic compounds, are trapped close to the ground. As people continue driving and sources other than motor vehicles continue to release smog-forming pollutants into the air, the smog level keeps getting worse.