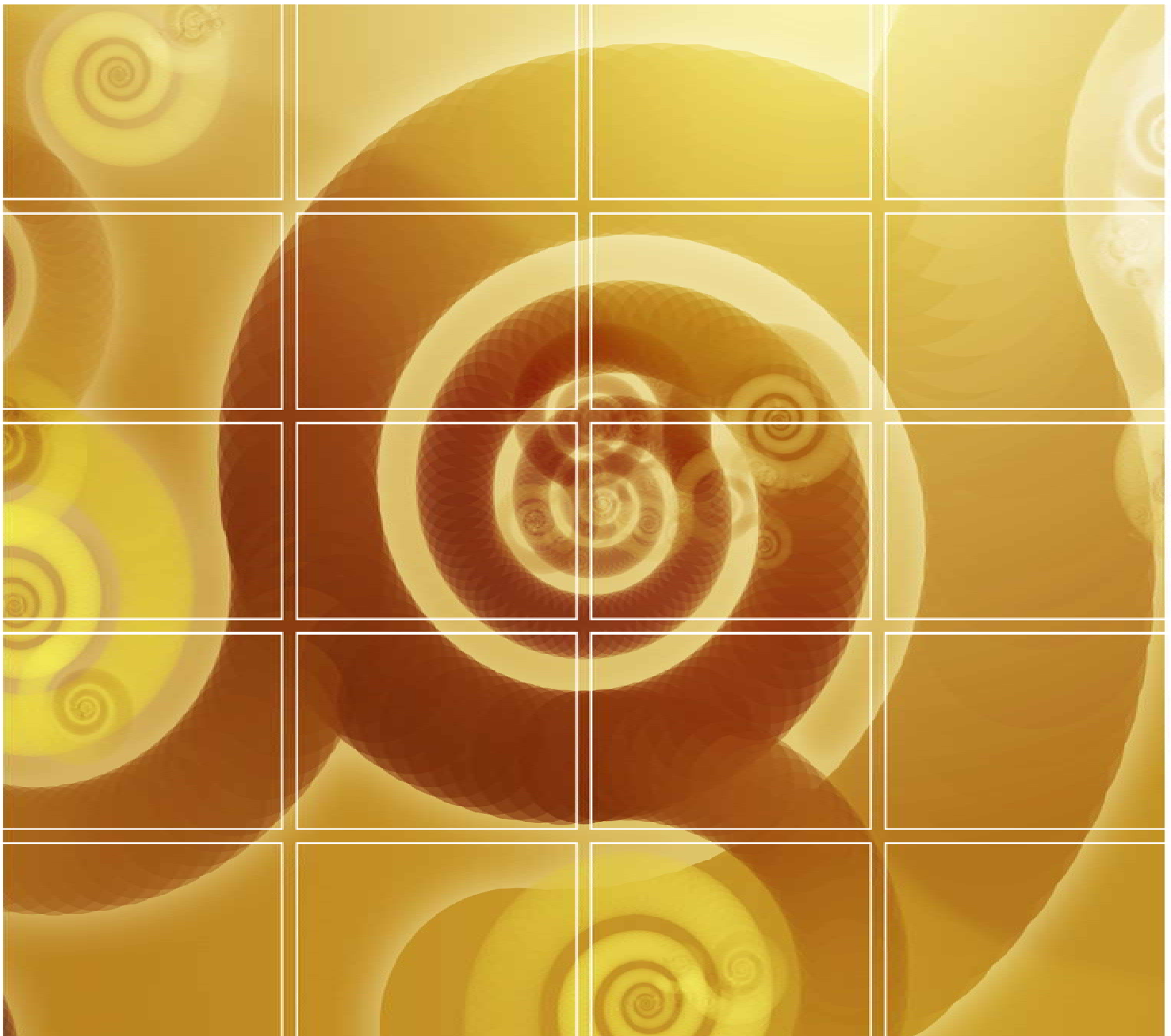




Waste Metal Recovery, Processing
and Recycling Facility Expansion -
45 and 23-43 Tattersall Road, Kings
Park, Blacktown

Air Quality Assessment

For Sell and Parker

July 2014

0226308_FINAL

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Waste Metal Recovery, Processing and Recycling Facility Expansion - 45 and 23-43 Tattersall Road, Kings Park, Blacktown

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Air Quality Assessment

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Environmental Resources Management Australia Pty Ltd Quality System

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Sell and Parker Pty Ltd

Waste Metal Recovery,
Processing and
Recycling Facility
Expansion - 45 and 23-43
Tattersall Road, Kings Park,
Blacktown
Air Quality Assessment

July 2014

Reference: 0226308_AirQual_Rp02

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Sell and Parker Pty Ltd (Sell and Parker) currently operate a waste metal recovery, processing and recycling facility at 45 Tattersall Road, Kings Park, Blacktown (the "Site"). Environmental Resources Management Australia Pty Ltd (ERM) was commissioned by Sell and Parker to prepare an air quality assessment as part of the Environmental Impact Statement (EIS) to increase the capacity of the existing waste metal recovery, processing and recycling facility at 45 Tattersall Road (Lot 5 DP 7086), Kings Park, from the approved 90,000 tonnes per annum (tpa) to 350,000 tpa. The increase in the processing capacity of the waste metal recovery and processing business would result in the expansion of the facility to encompass the adjoining lot to the east (Lot 2 DP 550522 or 23-43 Tattersall Road). Both Lot 5 DP 7086 and Lot 2 DP 550522 are collectively referred to as 'the site' within this air quality assessment.

The main site at 45 Tattersall Road is currently used by Sell and Parker as a waste metal resource recovery, processing and recycling facility involving the shearing, fragmenting and shredding of industrial scrap metal, demolition material and car bodies. 23-43 Tattersall Road is currently occupied by 'Dexion', a manufacturing business, which intends to cease operations at this site and relocate offshore.

1.1**SITE ACTIVITIES**

The operational process on site post-upgrade is required to be understood in detail when assessing impacts to air quality. In operations like metals recycling, there are many opportunities for dust to be emitted including:

- truck delivery/removal of materials;
- truck dumping of materials onto stockpiles;
- material handling (pick up and drop off activities with front end loaders/mobile material handlers with grapples, conveyor drop points onto stockpiles etc.);
- conveying and conveyor transfer points;
- wet scrubber outlet vents of the hammer mill;
- manual metal cutting; and
- dust from wind erosion off the stockpiles.

A comprehensive understanding of the processes that occur on-site allows the development of a full emissions inventory and the selection of appropriate sources to be included in air dispersion modelling, with the proposed controls and mitigation measures taken into account. The following process description for the proposed handling capacity has informed the emissions inventory and mitigation measures applied. The mass of materials handled is considered to be the upper limit for each piece of equipment discussed.

1.1.1 *Process Description*

A simplified process diagram showing the proposed metal recycling process is provided in *Figure xx* of the main EIS document.

Petrol tanks will be emptied and liquefied petroleum gas (LPG) cylinders will be removed from cars before they are fed through the facility. LPG cylinders will be stored in a quarantined area before being removed offsite for decommissioning. Petrol and oil will be drained from tanks and collected in an above ground storage tanks and removed offsite for processing. Scrap metal that are too large in size to fit on a conveyor will be cut manually in the unloading zone.

Cars and scrap metal are lifted onto a heavy-duty feed conveyor (C1) by an electric scrap handler. The operator of the mobile material handler will also check the feed material while loading it onto the conveyor. The materials will pass the control cabin, where an operator will also check incoming materials. The control cabin is an enclosed structure with sound proofing and air conditioning for operator comfort.

The feed conveyor transports raw material into the hammer mill which shreds the metal into fist-sized pieces.

The fragmented raw material is carried upwards by an incline conveyor and will then be dropped into a 'cascade' chute, hitting against its corners and therefore loosening any dirt and dust. Air from the cascade will be extracted by an induced draft fan and passed into the cascade cyclone, which will drop out particulates. Cleaned air will then pass through a wet scrubber to remove fine dust.

The cleaned fragmented material will then pass under drum magnets, which will pick up ferrous metals and drop them onto the picking conveyor (C2), where operators will remove remaining non-ferrous materials. The ferrous metals will continue up a conveyor (C3) which offloads the ferrous product into the product stockpile, that is contained in a designated area.

The non-ferrous materials will drop beneath the drum magnets to a conveyor which runs perpendicular to the ferrous product. This conveyor carries non-ferrous metals and wastes such as plastic and glass. The material is conveyed beneath another magnet, which picks up any small remaining quantities of ferrous metals and drops them into a skip for collection. Non-ferrous materials will continue through a pan feeder and trommel which will separate the materials into size streams for sorting.

The streams pass through an eddy-current separator, which collects aluminium, copper and brass into a skip. The streams then join and pass beneath a final eddy-current separator to win any remaining aluminium.

After passing through these stages, the remaining materials are waste products, which will be conveyed to a enclosed building. The new Post Shredder will involve a confidential proprietary arrangement of sizing, screening, eddy currents and induction sorters.

This section provides a description of the environmental setting of the Site in the context of air quality and provides a description of:

- climate;
- existing ambient air quality; and
- additional sources of emissions.

2.1

CLIMATE

The Site is located in a temperate environment, with the local climate generally mild. *Table 2.1* provides an overview of the climatic extremes as recorded by the Bureau of Meteorology between the years 1965 - 2014. Overall, the local area is characterised by:

- annual average rainfall of 760.6 mm;
- average maximum daytime temperature of 29.8°C in January;
- average minimum daytime temperature of 5.9°C in July;
- average maximum humidity of 81% in March; and
- average minimum humidity of 42% in both August and September.

2.1.1

Typical wind conditions

Figure 2.1 provides wind roses showing the frequency of strength and direction of winds for the past five years (2008-2012 inclusive) at Horsley Park, NSW. The data has been divided to show seasonal and annual trends. The data shows that:

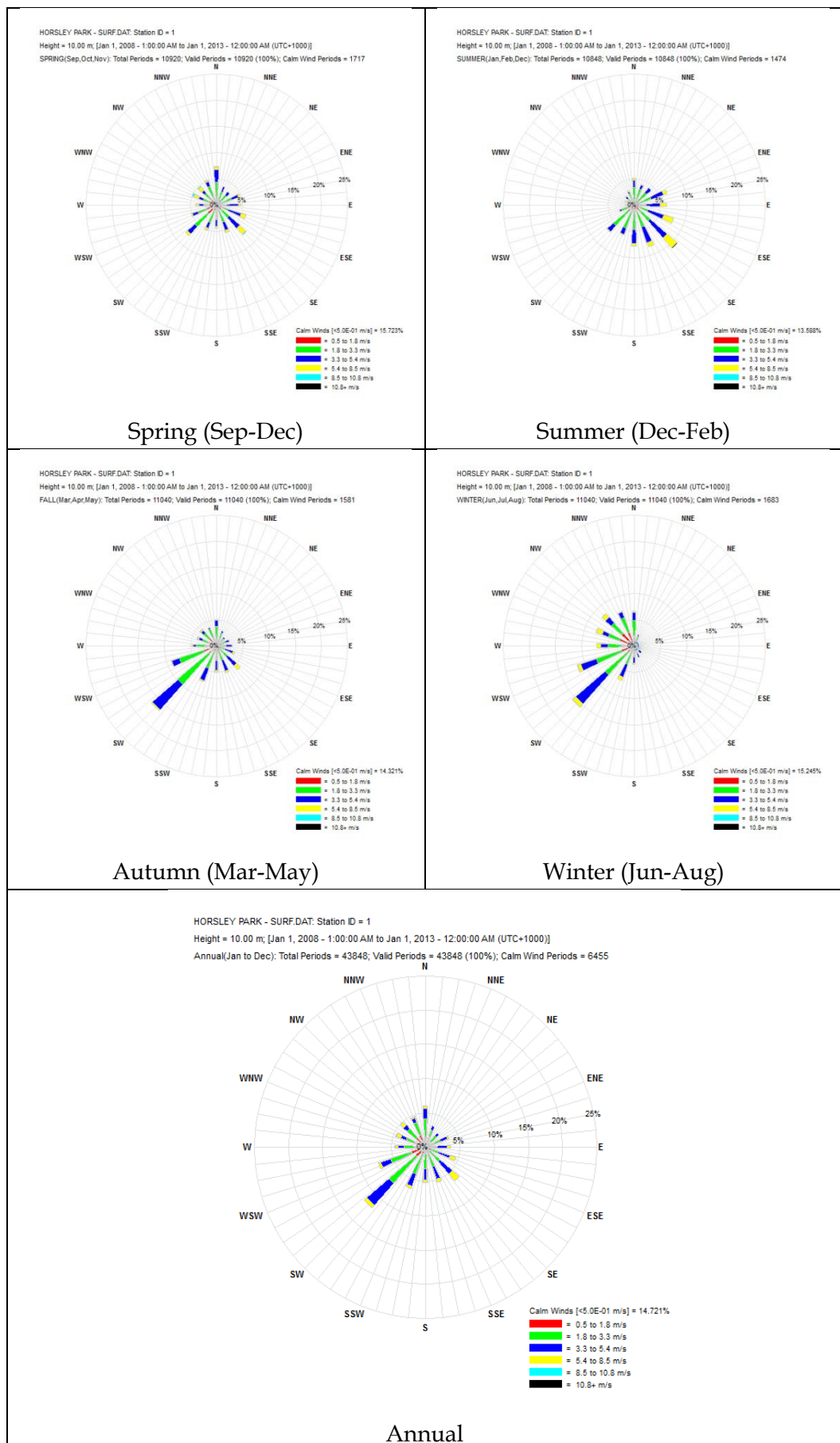
- Strong (5.4 – 8.5 m/s) south-easterly winds predominant in the summer and spring months
- South-westerly winds predominant (15%) in autumn and winter
- Annually, south-west is the predominant wind direction however the strongest winds originate from the south-east.

Table 2.1 Mean climatic conditions for nearest Bureau of Meteorology observation station at Horsley Park, NSW

Statistic Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Start Year	End Year
Mean maximum temperature (°C)	29.8	28.7	26.7	23.6	20.3	17.6	17.1	19	22.3	24.3	26.2	27.9	23.6	1997	2013
Mean minimum temperature (°C)	17.7	17.8	15.9	12.7	8.9	6.9	5.9	6.5	9.3	11.6	14.4	16.1	12	1997	2013
Mean rainfall (mm)	66.9	119.2	72.3	70.6	50.2	69.8	40.3	32.3	37.3	57.1	84.9	58.8	760.6	1997	2014
Mean number of clear days	12.6	11.7	11.7	8	9.5	8.3	6.6	6.3	7.1	9.2	10.6	10.5	112.1	1968	2001
Mean number of cloudy days	6.6	5	6.7	8.8	9	10	11.3	13.2	11.4	8.3	6.8	7.1	104.2	1968	2001
Mean daily evaporation (mm)	5.5	4.7	3.9	3	2	1.6	1.7	2.5	3.6	4.4	4.9	5.7	3.6	1965	2013
Mean 9am temperature (°C)	22	21.5	19.4	17.5	13.8	11.1	10.3	12	15.6	18.1	19.2	20.9	16.8	1997	2010
Mean 9am relative humidity (%)	73	77	81	76	77	80	78	70	65	61	70	71	73	1997	2010
Mean 9am cloud cover (oktas)	4.8	4.9	4.5	3.7	3.8	3.6	3.2	2.9	3.2	4	4.4	4.5	4	1965	2010
Mean 9am wind speed (km/h)	10.1	9.7	8.9	10.5	10.7	10.3	10.8	11.7	12.2	12.5	11.8	10.7	10.8	1997	2010
Mean 3pm temperature (°C)	28.2	27.1	25.3	22.2	19.2	16.6	16.1	17.8	20.8	22.5	24.2	26.5	22.2	1997	2010
Mean 3pm relative humidity (%)	49	53	54	53	52	55	50	42	42	45	50	48	49	1997	2010
Mean 3pm cloud cover (oktas)	4.8	5	4.8	4.2	4.3	4.2	3.9	3.8	3.9	4.4	4.8	4.6	4.4	1968	2001
Mean 3pm wind speed (km/h)	19.4	17	14.8	14.4	13	12.9	13.9	16.1	18.1	19.8	19.5	19.9	16.6	1997	2010

1. Mean cloudy days, mean clear days, mean daily evaporation, mean 9am cloud cover, and mean 3pm cloud cover have been taken from Prospect Reservoir [067019], 6.2 km away from Horsley Park.

Figure 2.1 Seasonal and annual wind roses for the past five years 2008-2012 at Horsley Park, NSW



Atmospheric stability is one of the key parameters that effects dispersion and dilution of emissions away from source. In essence it describes the degree of thermal and mechanical mixing of the atmosphere that occurs due to wind and thermal heating. Higher stability of the atmosphere typically results in poor dispersion conditions and higher ground level concentrations, whilst unstable atmospheres typically have the opposite impact.

Atmospheric stability is described by the Pasquill-Gifford classification where:

- Category A describes a very unstable atmosphere;
- Category B describes an unstable atmosphere;
- Category C describe a moderately unstable atmosphere;
- Category D describes a neutral atmosphere;
- Category E describes a stable atmosphere;
- Category F describes a very stable atmosphere; and
- Category G describes a very, very stable atmosphere.

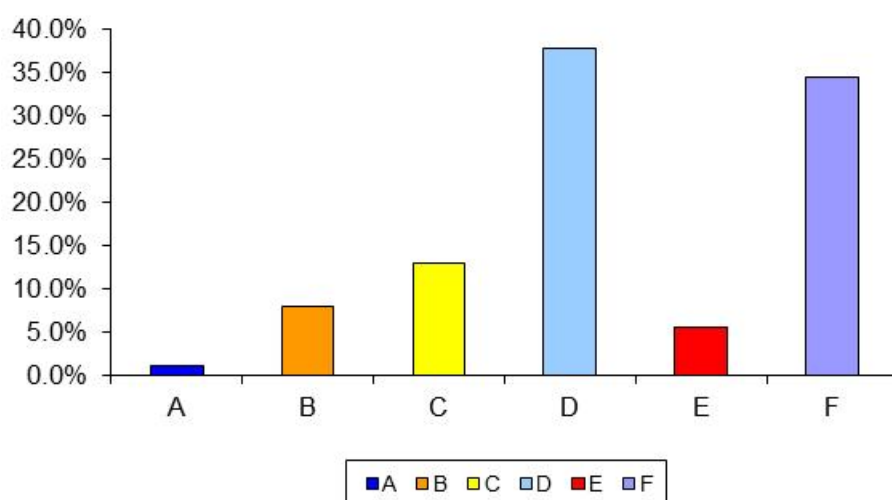
Usually, categories F and G are combined when describing the frequency of these categories.

Typically, these atmospheric conditions occur under the following conditions:

- Category A – very sunny and very windy conditions;
- Category B – Very sunny but less windy conditions;
- Category C – Moderately sunny and moderately windy conditions;
- Category D – Cloudy conditions;
- Category E, F and G – Mostly clear or clear night time conditions with decreasing wind speed.

Figure 2.2 shows the predicted frequency of stability categories at the Site. Stability categories have been predicted using the methodology outlined in Section 4.3.

Figure 2.2 *Frequency of atmospheric stability categories predicted for the Site*



The highest frequency of atmospheric stabilities for the 5 years of predicted meteorological data indicate that category D and F dominate the model domain. This reflects the prevalence of relative neutral day time conditions followed by clear and calm night time conditions.

2.2 *EXISTING AMBIENT AIR QUALITY*

Existing ambient air quality provides the basis on to which emissions from the project are projected. It is the cumulative concentration, resulting from existing air quality plus project contribution, which forms the prediction that is tested against the adopted assessment criteria.

2.2.1 *PM₁₀ Background*

The nearest measurements of ambient air quality are undertaken by the Department of Environment and Heritage (DEH)¹ in William Lawson Park, Myrtle Street, Prospect, 5 km south to south-east of the Site. The maximum 24-hour average and the annual average per year for PM₁₀ are presented in Table 2.2.

Table 2.2 *Ambient Background Air Quality PM₁₀ Concentrations*

Ambient Background Air Quality Concentration (µg/m ³)	2008	2009	2010	2011	2012
24-hour average	41.8	1680.3	40.1	41.5	38.7
Annual Average	17.8	25.9	15.4	15.8	17.2

¹ Data downloaded from <http://www.environment.nsw.gov.au/AQMS/search.htm>

2.2.2 TSP Background

Ambient air quality monitoring does not exist for TSP in the local environment, however it is commonly found in the ambient atmosphere. No measurements of existing ambient air quality exist for TSP within the surrounding area. This assessment has taken an average of the 5 years of annual average PM₁₀ background concentrations of 18.4 µg/m³ and multiplied by two (2). It is commonly assumed that the particle size distribution ratio between PM₁₀ and TSP is 0.5. This provides a typical annual average background concentration for TSP of 36.8 µg/m³.

2.2.3 PM_{2.5} Background

PM_{2.5} concentrations are not measured at the Prospect monitoring station. The closest monitoring station to the Site that measures PM_{2.5} is located at the University of Western Sydney in Richmond. Richmond is approximately 26 km north-west of Blacktown and provides an indicative background concentrations for the local area. Table 2.3 shows the background concentrations for this measurement location

Table 2.3 *Ambient Background Air Quality PM_{2.5} Concentrations*

Ambient Background Air Quality Concentration (µg/m ³)	2008	2009	2010	2011	2012
24-hour average	17.7	148.9	20.8	42.9	116.7
Annual Average	7.3	5.7	4.2	4.7	5.3

2.2.4 Nitrogen Dioxide (NO₂) Background

The nearest measurements of NO₂ are undertaken at the Prospect monitoring site by the DEH, 5 km south to south-east of the Site. The maximum annual average per year for NO₂ are presented in Table 2.4. Hourly averages are not available on the DEH website; as a result, daily averages were converted to an hourly average using the conversion factor of 1/0.59 (Environment Agency of England and Wales, 2011).

Table 2.4 *Ambient Background Air Quality NO₂ Concentrations*

Ambient Background Air Quality Concentration (µg/m ³)	2008	2009	2010	2011	2012
1-hour average	35.6	39.4	40.4	36.3	36.1
Annual Average	-	22.7	24.5	20.7	20.7

2.3

ADDITIONAL SOURCE OF EMISSIONS

Additional sources of emitted species within the modelled area include emissions from vehicular traffic and possible sources from other industry in the immediate vicinity of the site. These sources are implicitly included through the use of ambient monitoring to supply background air quality concentrations.

2.4

SENSITIVE RECEPTORS

Sensitive receptors are locations where the general population is likely to be exposed to the resultant ground level concentrations from the atmospheric emissions. These locations include:

- Residential housing;
- Hospitals;
- Schools;
- Aged care facilities; and
- Child day care facilities.

A review of the modelled area identified the sensitive receptors identified in *Figure 2.3*. It should be noted that the ten (10) selected sensitive receptors are in residential areas and have been selected on the basis of proximity to Site. These sensitive receptors are intended to be representative of the general residential area. The modelled grid will provide assessment for all other residential addresses not specifically included in the dispersion model.

Figure 2.3 *Modelled sensitive receptor locations*



This section defines the legislative context of the project in relation to air quality impacts, and discusses the adopted assessment criteria.

3.1

EMISSION CONCENTRATIONS

The *Protection of the Environment Operations (Clean Air) Regulation 2002* (the 'Regulation') provides the framework for the protection of the air environment in NSW and has been enacted under the *Protection of the Environment Operations Act 1997* (POEO Act). The Regulation:

- sets emission concentration standards and rate for certain activities;
- sets certain requirements in respect of domestic solid fuel heaters and motor vehicles; and
- establishes a framework for controlling where and what type of substances may be burnt.

Division 2 of the POEO Regulation states standards for scheduled premises and sets standards of concentrations for air impurities for stack or vent emissions. Schedule 4 provides a specific standard of concentration for Total solid particulate (TSP) for any crushing, grinding, separating or materials handling activity of 20 mg/m³ (Group 6). The emissions from the wet scrubber onsite must comply with this in-stack concentration of TSP. The manufacturer's guarantee is limited at 2 mg/m³ of TSP from the wet scrubber vent and so the standard of concentration is met.

3.2

IMPACT ASSESSMENT CRITERIA

Part 4: Emission of Air Impurities from Activities and Plant in the Regulation refers to the *Approved Methods for Modelling and Assessment of Air Pollutants in NSW* ('Approved Methods') (Department of Environment and Conservation, 2005). The Approved Methods lists the statutory methods for modelling and assessing emissions of air pollutants from stationary sources in the state. Industry has an obligation to ensure compliance with the requirements specified in the Regulation.

The NSW EPA prescribes impact assessment criteria, which are outlined in the Approved Methods (Department of Environment and Conservation, 2005). The impact assessment criteria refer to the total pollutant load in the environment and impacts from new sources of these pollutants must be added to existing background levels for assessment of compliance. In accordance with the guidance document, ERM has adopted the assessment criteria shown in Table 3.1 for particulate matter, nitrogen dioxide (NO₂) and individual toxic air pollutants (metals).

In addition to health impacts, airborne dust also has the potential to cause nuisance impacts by depositing on surfaces. *Table 3.1* also shows the maximum acceptable increase in dust deposition over the existing dust levels (2 g/m²/month) and the maximum total deposited dust level (4 g/m²/month). Given that there are no ambient dust deposition levels for the local area, this assessment will be compared to the maximum increase in deposited dust level. These criteria for dust deposition levels are set to protect against nuisance impacts.

Odour nuisance impact has been included in the impact assessment. The impact assessment criteria for complex mixtures of odours have been designed to take into account the range of sensitivity to odours within the community and to provide additional protection for individuals with a heightened response to odours. This is achieved by using a statistical approach, dependent upon population size.

The assessment criteria for particulate matter and NO₂ were applied, in accordance with the requirements of the Approved Methods, as follows:

- at the nearest existing or likely future off-site sensitive receptor;
- the incremental impact (predicted impacts from the site alone) for each pollutant must be reported;
- background concentrations must be included; and
- total impact (incremental impact plus background) must be reported as the 100th percentile and compared with the relevant impact assessment criteria.

The assessment criteria for individual toxic air pollutants were applied, in accordance with the requirements of the Approved Methods, as follows:

- at and beyond the boundary of the facility;
- the incremental impact (predicted impacts from the site alone) for each pollutant must be reported in concentration units consistent with the criteria (mg/m³ or ppm), for an averaging period of 1 hour and as the:
 - 100th percentile of dispersion model predictions for Level 1 (screening-level dispersion modelling technique using worst-case input data) impact assessments; and
 - 99.9th percentile of dispersion model predictions for Level 2 (refined dispersion modelling technique using site-specific input data) impact assessments.

However, the assessment criteria for toxic air pollutants within the Approved Methods are taken from the Victorian State Environment Protection Policy for Air Quality Management (SEPP (AQM)) (Government of Victoria, 2001). In developing the design criteria contained within the SEPP (AQM), exposure was considered to occur to sensitive populations 24 hours a day, 365 days a year for an entire life time. The Site is, however, located within an industrial estate; thus the working population surrounding the site are not exposed 24 hours a day, 365 days a year for an entire lifetime, typically they will be exposed eight to ten hours a day, five to six days a week for a working life time. It is therefore considered that the application of the toxic air pollutant criterion in an industrial setting is unduly restrictive. Rather, it is considered that a more appropriate criteria within the industrial setting is the Safe Work Australia Time-Weighted Average² should apply at or beyond the site boundary rather than the human health impact assessment criterion in *Table 3.1*.

Consequently, the human health criterion for individual toxic air pollutants (as shown in *Table 3.1*) applies where there are sensitive receptors (residential) with potential to be exposed to such pollutants from metals cutting on a long-term basis, although it is noted that these pollutants are only emitted up to 8 – 10 hours when metals cutting at the Site takes place. The Safe Work Australia Time-Weighted Average (adjusted to 10 hours to account for maximum metals cutting duration and for 100th percentile) has been used for assessment within the industrial area, and is presented in *Table 3.1*.

The assessment criteria for complex mixtures of odorous air pollutants were applied, in accordance with the requirements of the Approved Methods, as follows:

- at the nearest existing or likely future off-site sensitive receptor;
- the incremental impact (predicted impacts from the site alone) must be reported in units consistent with the impact assessment criteria (odour unit (OU)), as peak concentrations (i.e. approximately 1 second average) in accordance with the requirements of Section 6 of the Approved Methods and as the:
 - 100th percentile of dispersion model predictions for Level 1 impact assessments; and
 - 99th percentile of dispersion model predictions for Level 2 impact assessments.

² Time weighted average can be found on <http://hsis.safeworkaustralia.gov.au>

Table 3.1 **Adopted Assessment Criteria**

Species	Averaging Period	Criteria	Units
Particulate matter and nitrogen dioxide			
Total suspended particulate matter (TSP)	Annual mean ^{1,4}	90	µg/m ³
Particulate matter <10 µg in diameter (PM ₁₀)	Annual mean ^{2,4} 24-hour maximum ^{3,4}	30 50	µg/m ³ µg/m ³
Nitrogen dioxide (NO ₂)	1 hour ^{3,4} Annual mean ^{3,4}	246 62	µg/m ³ µg/m ³
Individual toxic air pollutants			
Iron oxide fumes	1 hour ⁵	0.09	mg/m ³
Manganese and compounds	1 hour ⁵	0.018	mg/m ³
Copper dusts and mists	1 hour ⁵	0.018	mg/m ³
Safe Work Australia TWA (adjusted to 10 hours)			
Iron oxide fumes	10 hours	4	mg/m ³
Manganese and compounds	10 hours	0.8	mg/m ³
Copper dusts and mists	10 hours	0.8	mg/m ³
Dust deposition			
Maximum increase in deposited dust level	Annual ⁴	2	g/m ² /month
Maximum total deposited dust level	Annual ⁴	4	g/m ² /month
Odorous air pollutants (complex mixtures) ^{4,6}			
Population of affected community	Impact assessment criteria for complex mixtures of odorous air pollutants (OU) (nose-response-time average, 99 th percentile)		
Urban (≥~2000) and/or schools and hospitals	2.0		
~500	3.0		
~125	4.0		
~30	5.0		
~10	6.0		
Single rural residence (≤~2)	7.0		
1. National Health and Medical Research Council (National Health and Medical Research Council, 1996) 2. Environment Protection Authority (NSW Environment Protection Authority, 1998) 3. National Environment Protection Council (National Environment Protection Council, 1998) 4. Department of Environment and Conservation (Department of Environment and Conservation, 2005) 5. State Environment Protection Policy (Air Quality Management) (Government of Victoria, 2001) 6. Environment Protection Authority (NSW Environment Protection Authority, 2001)			

In order to determine the predicted ground level concentrations that result from the project, the following approach was adopted:

- dispersion model selection;
- emission estimation;
- meteorological modelling;
- dispersion modelling;
- post processing; and
- assessment.

4.1

DISPERSION MODEL SELECTION

Several different dispersion models are routinely used in Australia for the assessment of air quality impacts from industrial releases. These include:

- AERMOD;
- CALPUFF; and
- Ausplume.

Ausplume is the approved dispersion model for use in most simple, near field applications in NSW. The Approved Methods states, however that Ausplume version 6.0 or later as specifically not approved in the following applications:

- complex terrain, non-steady-state conditions;
- buoyant line plumes;
- coastal effects such as fumigation;
- high frequency of stable calm night-time conditions;
- high frequency of calm conditions; and / or
- inversion break-up fumigation conditions (Department of Environment and Conservation, 2005).

Consideration of *Figure 2.1* and *Figure 2.2* show that over the five years of data:

- calm winds (< 0.5 m/sec) occur for approximately 14% of the time; and
- stable night time conditions occur for approximately 35% of all hours.

Consequently, as determined by the Approved Methods, the CALPUFF model has been used for this assessment.

CALPUFF was selected as a multi-layer, multi-species non-steady state puff dispersion model that can simulate the effects of time- and space-varying meteorological conditions on pollutant transport, transformation and removal (Scire, et al., 2000).

CALPUFF is a highly versatile and widely-used model which can be run in three-dimensional or two-dimensional mode with respect to meteorology. The three-dimensional mode allows spatially varying wind fields, for example, to be incorporated: this can be important in coastal regions with seabreeze effects. CALPUFF also allows plumes to be tracked through time as they are transported by regional winds: in coastal regions recirculation of pollutants due to seabreeze and landbreeze cycles can also be important.

CALPUFF contains algorithms for near-source effects such as building downwash, partial plume penetration, sub-grid scale interactions as well as effects such as pollutant removal, chemical transformation, vertical wind shear, a Probability Distribution Function for dispersion in the convective boundary layer and coastal interaction effects (e.g. sea-breeze recirculation and fumigation within the Thermal Internal Boundary Layer).

Meteorological data used to drive CALPUFF are processed by the CALMET meteorological pre-processor (Scire, et al., 2000). CALMET includes a wind field generator containing objective analysis and parameterised treatments of slope flows, terrain effects and terrain blocking effects. The pre-processor produces fields of wind components, air temperature, relative humidity, mixing height and other micro-meteorological variables to produce the three-dimensional meteorological fields that are used in CALPUFF. CALMET uses measured and/or modelled meteorological inputs in combination with land use and geophysical information for the modelling domain to predict gridded meteorological fields for the region of interest.

CALPUFF is an USEPA regulatory model and is widely used in Australia.

Estimates of emissions provide the basis for atmospheric dispersion modelling. Consideration of the processes on site has concluded that the dominant species to be emitted are:

- Total Suspended Particulate matter (TSP);
- Particulate Matter of less than 10 µm in aerodynamic diameter (PM₁₀); and
- Particulate Matter of less than 2.5 µm in aerodynamic diameter (PM_{2.5})

The only combustion processes that occur on site are from vehicle engines, with the conveyors, hammermill, sheer and shredder powered by mains electricity. As discussed previously, the change in vehicle movement is expected to be less than 5%, and the change in emissions as a result of vehicle use is not considered to be a significant contribution to overall site emissions. The assessment has therefore concentrated on emissions of particulate matter from the handling and processing that occurs on site.

Table 4.1 shows the sources identified from the understanding of the process together with the source name used within the modelling. Table 4.2 and Table 4.3 include a summary of pollutant emission rates included in the dispersion modelling. The sources WSS01, TRKD01, TRKD02, C1 – C2 and WE01-WE06 are discussed in detail in Annex A. WSS01, TRKD01, TRKD02 and WE01 – WE06 have variable TSP/PM₁₀/PM_{2.5} emission rates dependent on wind speed, rainfall, or temperature, or a combination thereof, and are discussed further in Annex A.

Table 4.1 *Source identification and process description*

Source Name	Process Description
MH01	Non-ferrous material is transferred to the non-ferrous processing building
MH02	Transfer of raw material directly to the inspected stockpile of scrap metal (bypass pre-shredder)
MH03	
MH04	
MH05	Transfer of raw material from stockpile to pre-shredder
MH06	Transfer of pre-shredder output to a truck to convey to the inspected stockpile of scrap metal close to the conveyor into the hammer mill
MH07	
MH08	
MH09	Transfer of the inspected stockpile of scrap metal close to the conveyor onto the hammer mill conveyor
MH10	Ferrous metals are collected from the stockpile by front end loader and loaded into trucks.
MH11	
TP01	Pre-shredder drop point

Source Name	Process Description
TP02	The cleaned fragmented material (on a conveyor C1) passes under a drum magnet, where ferrous metals are dropped onto the picking conveyor (C2)
TP03	Ferrous metals transferred from C2, where operators remove remaining non-ferrous materials, to C3.
TP04	Ferrous metals are conveyed onto the product stockpile.
TP05	Non-ferrous materials drop beneath the drum magnet to a conveyor (C4) that runs perpendicular to the ferrous product.
TP06	Transfer point at conveyor bend 1
TP07	Transfer point at conveyor bend 2
TP08	Transfer point at conveyor bend 3
CV01 - CV03	Material from the stockpiles is conveyed into the hammer mill
CV04	Material from hammer mill is carried upwards by an incline conveyor and dropped into chute.
CV05	The cleaned fragmented material from the cascade chute passes under the drum magnet and ferrous metals are removed
CV06 - CV07	Operators remove remaining non-ferrous materials.
CV08 - CV09	Ferrous materials are taken and dropped onto a conveyor, which are conveyed to the product stockpile.
CV10 - CV11	Non-ferrous materials are dropped onto a conveyor, which transports material to the conveyor before the non-ferrous processing building.
CV12	Conveys non-ferrous material into the non-ferrous recovery plant.
CV13 - CV15	Floc product is transferred onto conveyor.
CV16 - CV33	Conveyor transports floc product to the post shredder processing building. Conveyor is enclosed.
TRKD01	Truck dumping at raw material delivery
TRKD02	Truck carries pre-shredder output to the inspected stockpile of scrap metal close to the conveyor into the hammer mill
C1	Metals cutting at scrap unloading area
C2	
WE01	Scrap stockpile
WE02	Scrap stockpile
WE03	Post pre-shredder stockpile 1 - at pre-shredder
WE04	Post pre-shredder stockpile 2 - at hammer mill
WE05	Ferrous product stockpile
WE06	Ferrous product stockpile
WSS01	Wet scrubber stack
1.	Emission rates for sources WSS01, TRKD01, TRKD02, C1 – C2 and WE01-WE06 are discussed in detail in Annex A.

Table 4.2 *Mass emission rates by volume source*

Source Name ¹	Source Type	Throughput (tonnes/day)	Operation ² (hours/day)	Units	TSP	Species PM ₁₀	PM _{2.5}
MH01	Volume	50	15	g/sec	0.0012	0.0029	0.0004
MH02	Volume	750	14	g/sec	0.017	0.043	0.0056
MH03	Volume	750	14	g/sec	0.017	0.043	0.0056
MH04	Volume	300	14	g/sec	0.0069	0.017	0.0022
MH05	Volume	300	14	g/sec	0.0069	0.017	0.0022
MH06	Volume	300	14	g/sec	0.0069	0.017	0.0022
MH07	Volume	300	14	g/sec	0.0069	0.017	0.0022
MH08	Volume	1050	14	g/sec	0.024	0.061	0.0078
MH09	Volume	1050	14	g/sec	0.024	0.061	0.0078
MH10	Volume	790	14	g/sec	0.018	0.046	0.0059
MH11	Volume	790	14	g/sec	0.018	0.046	0.0059
TP01	Volume	300	14	g/sec	0.0069	0.017	0.0022
TP02	Volume	790	14	g/sec	0.018	0.046	0.0059
TP03	Volume	790	14	g/sec	0.018	0.046	0.0059
TP04	Volume	790	14	g/sec	0.018	0.046	0.0059
TP05	Volume	40	14	g/sec	0.0009	0.0023	0.0003
TP06	Volume	240	14	g/sec	0.0056	0.014	0.0018
TP07	Volume	240	14	g/sec	0.0056	0.014	0.0018
TP08	Volume	240	14	g/sec	0.0056	0.014	0.0018
CV01 - CV04	Volume	1050	14	g/sec	0.024	0.061	0.0078
CV05 - CV09	Volume	790	14	g/sec	0.018	0.046	0.0059
CV10 - CV12	Volume	40	14	g/sec	0.0009	0.0023	0.0003
CV13 - CV15	Volume	220	14	g/sec	0.0015	0.0038	0.0005
CV16 - CV33	Volume	240	14	g/sec	0.0017	0.0042	0.0005

1. Sources WSS01, TRKD01, TRKD02, C1 - C2 and WE01-WE06 are discussed in detail in Annex A. WSS01, TRKD01, TRKD02 and WE01 - WE06 have variable emission rates dependent on wind speed, rainfall, or temperature, or a combination thereof.

2. Sources have been modelled as occurring between the hours of 6am-9pm (15 hours/day) or 6am-8pm (14 hours/day).

Table 4.3 *Mass emission rates by point source (C1, C2 and WSS01) for NO_x, odour and toxic air pollutants*

Source Name ¹	Source Type	Operation ² (hours/day)	Odour (OU/s)	NO _x (g/s)	Species Iron oxide fumes (g/s)	Manganese and compounds (g/s)	Copper dusts and mists (g/s)
C1	Point	10	0.018	0.33	1.15	0.12	0.016
C2	Point	10	0.018	0.33	1.15	0.12	0.016
WSS01	Point	14	4445.2	-	-	-	-

1. Sources WSS01, TRKD01, TRKD02, C1 - C2 and WE01-WE06 are discussed in detail in Annex A. WSS01, TRKD01, TRKD02 and WE01 - WE06 have variable emission rates dependent on wind speed, rainfall, or temperature, or a combination thereof.

2. Metals cutting take place from 7am to 5 pm (10 hours/day) . Hammer mill is proposed to operate from 6am to 8pm (14 hours/day).

Annex A provides a description of the methodology used to derive the emission estimates for each of the sources, together with the input data used in the emission estimation.

The proposed expansion is likely to result in a decrease in emissions of particulate matter from the site whilst increasing in the throughput from the approved 90,000 tonnes/annum to 350,000 tonnes/annum. This reduction will be achieved through effective dust control measures and operational efficiencies.

Efficiencies and mitigation measures proposed for the expansion that reduce the level of particulate matter emitted on site include:

- The site will be totally sealed. A sealed surface provides a paved road for truck movement on and off site. This eliminates a large source of particulate matter emissions compared to an unpaved road (Department of Sustainability, Environment, Water, Population and Communities, 2012). Unpaved roads emit particulate matter as the force of the wheels on the road surface pulverise the surface material into fine particles. These fine particles are lifted by and dropped from the rolling wheels of vehicles and are removed by traffic through re-entrainment into the atmosphere. The road surface is also exposed to strong air currents in turbulent shear with the surface. The turbulent wake that is left behind the vehicle continues to act on the road surface after the vehicle has passed, resulting in further emissions of particulate matter. Therefore, paving the road surface reduces the emission of particulate matter on site significantly, assuming the silt loading on the surface of the road is maintained at an acceptable level.
- A sealed surface also reduces the emission of particulate matter from the mobile materials handling equipment due to a more consistent driving surface and the ability to select more direct routes across the site.
- The new site design no longer requires trucks to enter the site twice but allows for one main entrance and exit point, reducing the kilometres travelled by trucks. This reduces the emissions of particulate matter from the exhaust and reduces any potential emissions from wheel generated dust. Emissions from vehicle exhaust are not considered significant unless a change in net annual average daily traffic (AADT) or peak traffic flows are greater than $\pm 5\%$ or $\pm 10\%$ (Environmental Protection UK, 2010). The proposed expansion will not result in a change in traffic conditions of more than 5% net across the expanded site (accounting for existing Dexion operations) and hence vehicle emissions have not been considered in this assessment.
- Additional equipment purchased for the upgrade will conform to the standards of the latest technology.

In dispersion modelling, meteorology drives dispersion and dilution of emissions and therefore determines the predicted concentrations at ground level. It is important, therefore, that meteorology used in the dispersion modelling provides a reasonable representation of Site meteorology.

In order to provide the dispersion model with appropriate meteorological information, the following approach was taken:

- Meteorological model selection;
- Year selection;
- Meteorological model setup; and
- Meteorological model validation.

4.3.1

Meteorological Model Selection

Meteorological modelling conducted for this assessment included The Air Pollution Model (TAPM) and CALMET (a three dimensional micro-meteorological model). Insufficient site specific meteorological data was available for the site to adequately describe the local wind flows given the complex nature of the terrain in the model domain. TAPM was selected as an industry standard method able to create a 3-dimensional data file of gridded meteorological parameters by predicting airflow important to local scale air pollution from large scale meteorology provided by synoptic analyses. The TAPM outputs can be converted to file compatible with CALMET using CALTAPM and used as an initial estimated wind field in CALMET.

CALMET is the meteorological pre-processor for the chosen dispersion model and considers the initial estimated wind fields together with any observational data from further afield, terrain and land use information to produce a three-dimensional micro-meteorological model for use in dispersion modelling.

4.3.2

Year Selection

The most recent five years with available meteorological data at the time of preparing the assessment (2008-2012) were selected as the meteorological model years in accordance with international standard practice for dispersion modelling.

4.3.3

Meteorological Model Setup

Meteorological modelling was conducted in accordance with the 'Generic Guidance and Optimum Model Settings for the CALPUFF Modeling System for Inclusion into the 'Approved Methods for the Modelling and Assessments of Air Pollutants in NSW, Australia'' (Barclay & Scire, 2011). The following sub-sections detail the adopted methodology.

TAPM

Meteorological data was prepared for the dispersion modelling using TAPM developed by CSIRO. TAPM v4 solves the fundamental fluid dynamics and scalar transport equations to predict meteorology and (optionally) pollutant concentrations. It consists of coupled prognostic meteorological and air pollution concentration components. The model predicts airflow important to local scale air pollution, such as sea breezes and terrain induced flows, against a background of larger scale meteorology provided by synoptic analyses. The Technical Paper by Hurley (2008a) describes technical details of the model equations, parameterisations, and numerical methods. A summary of some verification studies using TAPM is also given in Hurley (2008b).

A meteorological dataset for 2008-2012 was created using meteorological information and terrain data inherent to TAPM. TAPM v4 has a tendency to over-predict the incidence of light winds in some situations. However, this tendency is considered to lend a conservative bias as low wind speeds are conducive to higher ground level concentrations.

TAPM was configured with the following information:

- centre grid point: 306580mE, 6263617mN (UTM Grid Zone 56S);
- grid points $NX \times NY \times NZ = 35 \times 35 \times 25$;
- 4 grid resolutions (nests) were defined: 30,000, 10,000, 3,000, 1,000; and
- 4 spin up days were allocated and meteorology was output after 2 days.

CALTAPM

CALTAPM was developed to provide users of the TAPM model the ability to create an hourly, 3-dimensional data file of gridded meteorological parameters of the type 3D.DAT for direct use in the CALMET diagnostic meteorological model. When used this way the TAPM data can be used in CALMET to determine the initial guess wind field, prior to the weighting of true observations or even to run CALMET in no-observation mode. The TAPM output file was converted to a 3D.DAT file using CALTAPM for input into CALMET as an initial guess wind field.

CALMET

CALMET is a meteorological pre-processor that includes a wind field generator containing objective analysis and parameterised treatments of slope flows, terrain effects and terrain blocking effects. The pre-processor produces fields of wind components, air temperature, relative humidity, mixing height and other micro-meteorological variables to produce the three-dimensional meteorological fields that are used in the CALPUFF dispersion model.

CALMET requires several datasets in order to resolve the surface and upper air meteorology occurring for each hour of the year:

- surface observations
 - wind speed
 - temperature
 - cloud cover amount
 - precipitation amount and type
 - base cloud height.
- upper air observations
 - height of observation
 - wind speed and direction at each height
 - temperature at each height
 - barometric pressure at each height.
- land use data
- topographical data.

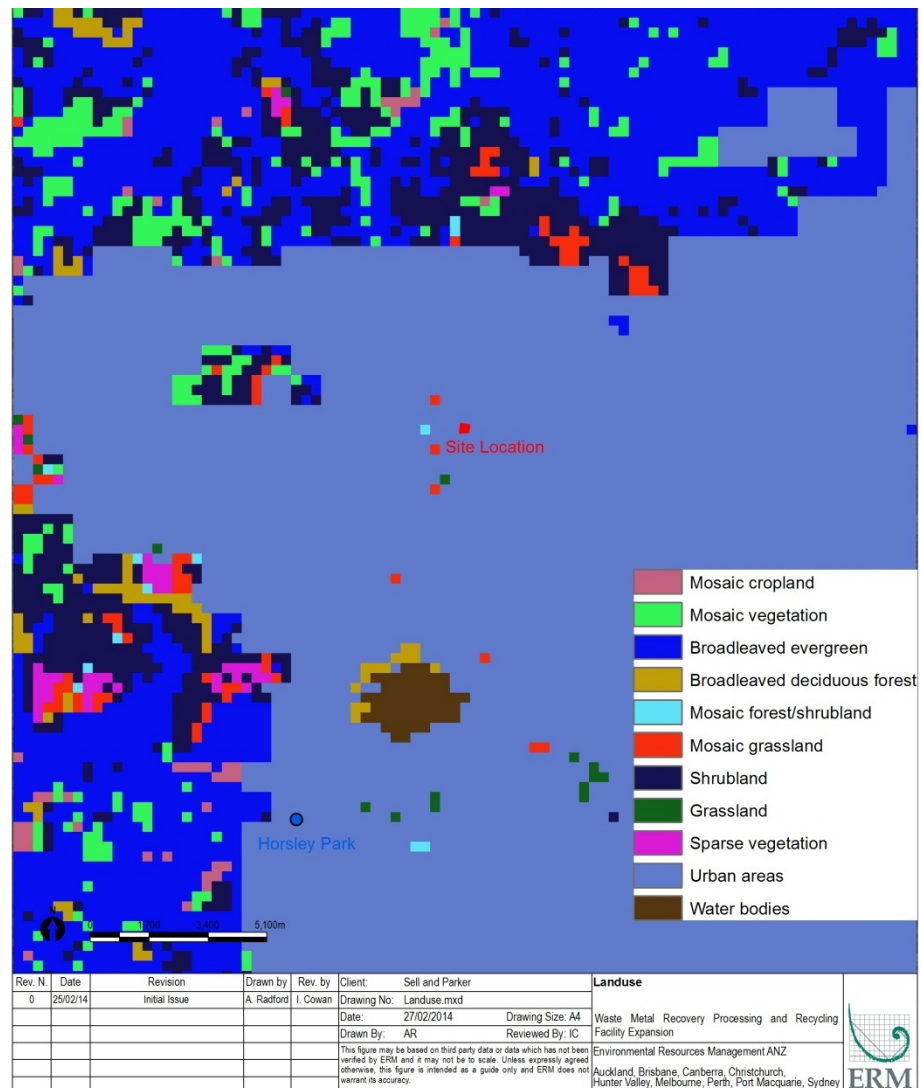
Surface observation data in the surrounding area was available from a Bureau of Meteorology (BoM) meteorological station at Horsley Park, NSW. A precipitation file was also generated from observations at Horsley Park. CALTAPM provided a 3D.DAT file containing surface and upper air observations at every grid point in the model domain. CALMET was run with a grid resolution of 0.2 km covering a 24 km by 24 km model domain. The vertical resolution incorporated 12 cell face heights up to 2000 m. The grid origin was located at 294580 mE, 6251617mN (UTM Zone 56S).

Land Use

The land use for the Project area was obtained from European Space Agency (ESA) GlobCover Portal. ESA delivers global composites and land cover maps using as input observations from the 300 m MERIS sensor on board the ENVISAT satellite mission. The land use maps were generated from observations taken during January - December 2009.

The model domain is mainly characterised by the urban landuse category given the location in the north-western suburbs of Sydney.

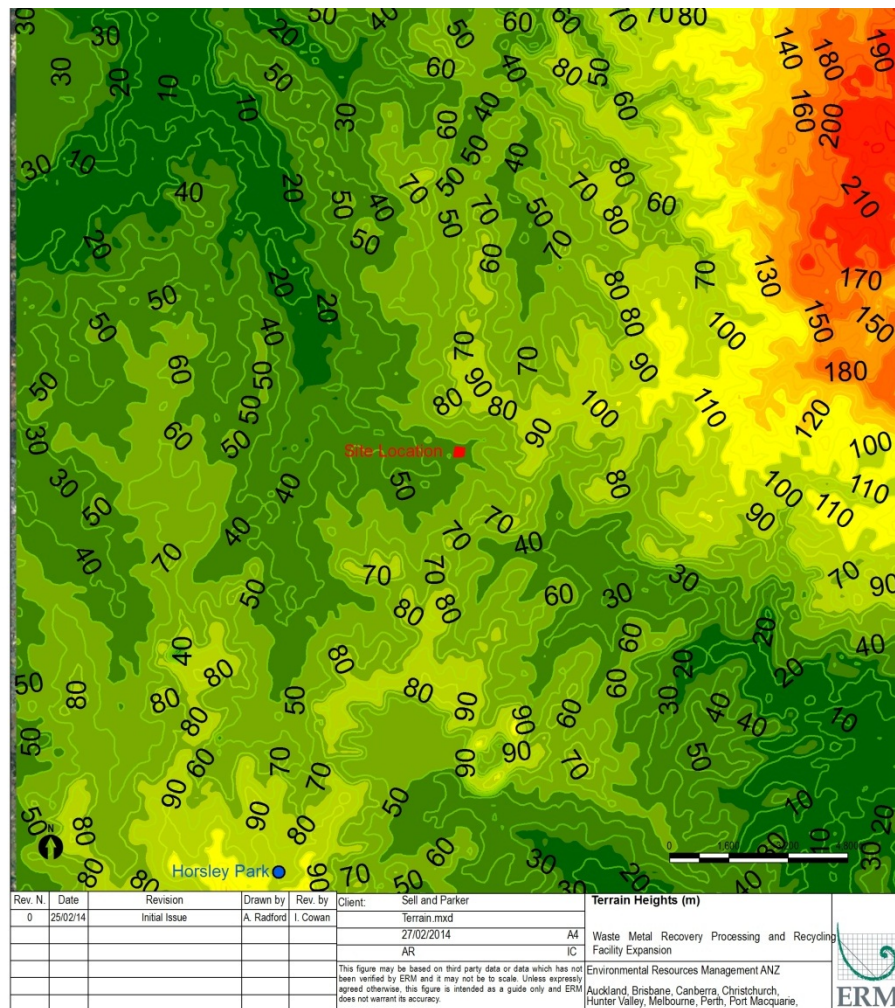
Figure 4.1 Landuse used in the meteorological modelling



Terrain

The terrain for the Project area was obtained from the NASA SRTM Mission at a 90 m spatial resolution. The terrain close to the site is quite uniform with a change in height of less than 40 m within 5 km of the site. The landscape could be described as gentle rolling hills with some larger terrain features to the north-east of the site. Horsley Park in the south-west of the modelling domain is likely to experience significantly different local wind flows than that at the site. Horsley Park is an elevated location is dominated by wind flows from the south-west. Given the undulating hills surrounding the site, wind directions are likely to channel through the valleys to the west-south-west. Both sites will be influenced on a local scale by drainage flows characterised by mountain-valley interactions.

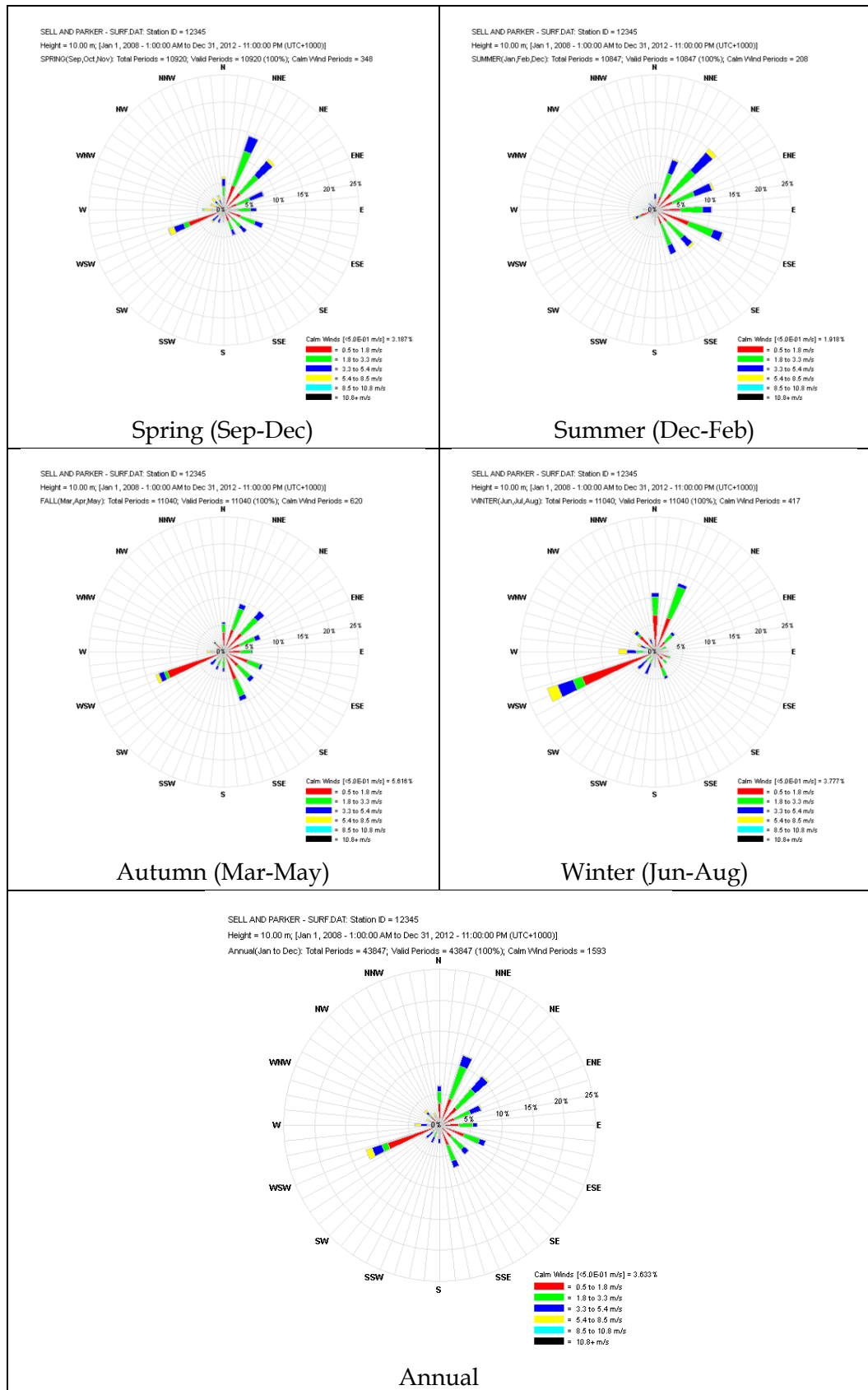
Figure 4.2 *Terrain used in the meteorological modelling*



4.3.4 *Meteorological model validation*

Figure 4.3 shows the wind roses predicted for the Site by CALMET including the data from TAPM and observation location at Horsley Park as described above.

Figure 4.3 Predicted wind roses for the site



Comparison of *Figure 4.3* with *Figure 2.1* indicates similarities between the datasets with almost no windflow from the west or north-west. Comparison of the wind roses predicted for the site (*Figure 4.3*) with the local terrain (*Figure 4.2*) shows that the wind flows for both sites are likely to align with their local shallow valley system. It is considered that the decrease in calm conditions at the Site compared to Horsely Park is reflective of local drainage in a shallow valley system at the Site compared to the position of the BoM monitor at the base of a hill at Horsely Park. The calm conditions demonstrated at Horsely Park are likely to be reflected in the higher frequency of 0.5 m/sec to 1.0 m/sec winds predicted at the Site as a result of cool air drainage.

4.4 DISPERSION MODELLING

Dispersion modelling was undertaken using the CALPUFF dispersion model. The emission sources were configured in the dispersion model using the parameters shown in *Table 4.4* together with the rates shown in 4.3 below.

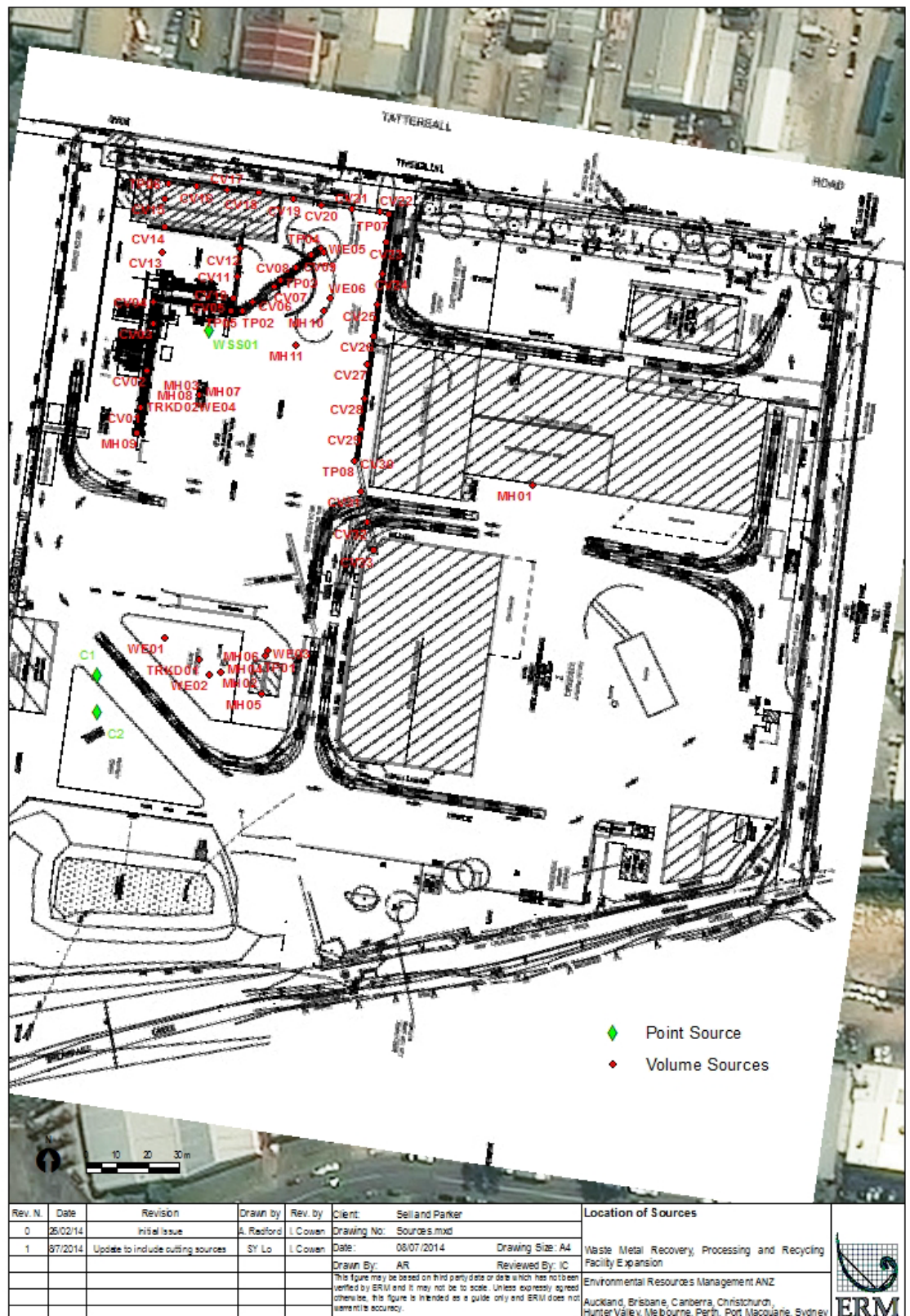
Table 4.4 *Emission parameters used in dispersion model*

Source Name ^{1,2}	Source Type	Diameter (m)	Release velocity (m/sec)	Release Height (m)	py (m)	pz (m)
WSS01	Point	0.56	11.28	3	-	-
TRKD01	Volume	-	-	2.5	1.16	2.33
TRKD02	Volume	-	-	2.5	1.16	2.33
MH01	Volume	-	-	4	1.02	0.37
MH02	Volume	-	-	3.5	1.02	2.16
MH03	Volume	-	-	4	1.02	0.37
MH04	Volume	-	-	3.5	1.02	2.16
MH05	Volume	-	-	4	1.02	0.37
MH06	Volume	-	-	2	1.02	2.16
MH07	Volume	-	-	4	1.02	0.37
MH08	Volume	-	-	2	1.02	2.16
MH09	Volume	-	-	2	1.02	0.37
MH10	Volume	-	-	3.5	0.84	2.21
MH11	Volume	-	-	4	0.84	0.37
TP01	Volume	-	-	7	0.47	0.23
TP02	Volume	-	-	1.0	0.47	0.09
TP03	Volume	-	-	1.0	0.47	0.09
TP04	Volume	-	-	7.0	0.47	0.23
TP05	Volume	-	-	1.0	0.47	0.09
TP06	Volume	-	-	3	0.70	0.09
TP07	Volume	-	-	3	0.70	0.09
TP08	Volume	-	-	3	0.70	0.09
CV01	Volume	-	-	2	1.40	0.47
CV02	Volume	-	-	2	1.40	0.47
CV03	Volume	-	-	2	1.40	0.47
CV04	Volume	-	-	3.5	0.47	0.81
CV05	Volume	-	-	1	0.47	0.23

Source Name ^{1,2}	Source Type	Diameter (m)	Release velocity (m/sec)	Release Height (m)	py (m)	pz (m)
CV06	Volume	-	-	1	0.47	0.23
CV07	Volume	-	-	1	0.47	0.23
CV08	Volume	-	-	3.5	0.47	0.81
CV09	Volume	-	-	3.5	0.47	0.81
CV10	Volume	-	-	1	0.47	0.23
CV11	Volume	-	-	1	0.47	0.23
CV12	Volume	-	-	1	0.47	0.23
CV13	Volume	-	-	3	0.70	0.70
CV14	Volume	-	-	3	0.70	0.70
CV15	Volume	-	-	3	0.70	0.70
CV16	Volume	-	-	3	0.70	0.70
CV17	Volume	-	-	3	0.70	0.70
CV18	Volume	-	-	3	0.70	0.70
CV19	Volume	-	-	3	0.70	0.70
CV20	Volume	-	-	3	0.70	0.70
CV21	Volume	-	-	3	0.70	0.70
CV22	Volume	-	-	3	0.70	0.70
CV23	Volume	-	-	3	0.70	0.70
CV24	Volume	-	-	3	0.70	0.70
CV25	Volume	-	-	3	0.70	0.70
CV26	Volume	-	-	3	0.70	0.70
CV27	Volume	-	-	3	0.70	0.70
CV28	Volume	-	-	3	0.70	0.70
CV29	Volume	-	-	3	0.70	0.70
CV30	Volume	-	-	3	0.70	0.70
CV31	Volume	-	-	5	0.70	1.16
CV32	Volume	-	-	5	0.70	1.16
CV33	Volume	-	-	5	0.70	1.16
C1	Point	0.05	0.01	1	-	-
C2	Point	0.05	0.01	1	-	-
WE01	Volume	-	-	3.5	2.33	3.26
WE02	Volume	-	-	3.5	2.33	3.26
WE03	Volume	-	-	3.5	1.16	3.26
WE04	Volume	-	-	3.5	2.33	3.26
WE05	Volume	-	-	3.5	2.33	3.26
WE06	Volume	-	-	3.5	2.33	3.26
- The release temperature for all sources is ambient air temperature. - WSS – wet scrubber stack; TRKD – truck dumping; MH – materials handling; TP – conveyor transfer point; CV – conveyors; WE – wind erosion from stockpiles.						

The locations of the sources, described by a source name in *Table 4.4*, are indicated in *Figure 4.4*.

Figure 4.4 Location of the point and volume sources modelled



4.4.1 *Time Varying Emission Rates*

Time varying emission rates have been used for some parameters. The point source, the wet scrubber, will operate between the hours of 6 am to 8 pm and has been modelled only for these hours. The emission rate from the wet scrubber has also been correlated to the ambient temperature (Annex A). The metal cutting operations typically take place up to 10 hours in a day (assumed from 7 am to 5 pm).

The materials handling activities on site, which have been represented as volume sources, have also been modelling between the hours of 6 am to 8 pm. Truck dumping, associated with the transportation of raw materials on the proposed site, has been modelled between the site operation hours of 6 am to 9 pm. The emission rates associated with proposed truck dumping and wind erosion from stockpiles have utilised equations relating wind speed and rainfall to the estimate the emissions of dust from these activities (Annex A).

4.4.2 *Receptor Grid*

A receptor grid of dimension 12 km by 12 km with a south west corner at 300580 mE, 6257617 mN (UTM Grid Zone 56) at a resolution of 200m was used to model predicted concentrations at ground level. The height of each receptor within the grid was extracted from the SRTM data.

4.5 *POST-PROCESSING*

Post processing has been undertaken using CALPOST for each of the five years modelled. This process reviews each of the hourly predicted concentrations across the model grid and at the sensitive receptors, averages the concentrations according to the requirements of the assessment criteria and retrieves the maximum predicted concentration at each location for the requisite averaging period specified by the Impact Assessment Criteria.

The assessment of impacts has considered the predicted concentrations of TSP, PM₁₀, PM_{2.5} and deposited dust at the sensitive receptors, with and without background air quality concentrations.

5.1 **CONTOUR PLOTS**

The concentration or deposition contours for the modelled domain are presented in Annex B. Contours plots have been presented without the background concentrations as the elevated 24-hour and annual background concentrations do not allow the scale of the predicted results to be clearly demonstrated.

5.2 **SENSITIVE RECEPTORS**

The predicted concentrations are to be assessed against the assessment criteria at the nearest existing or likely future off-site sensitive receptor. The following tables report the incremental impact from the site, the maximum background concentration (if applicable) and the total impact (incremental impact plus background) as the 100th percentile concentration (or deposition).

5.2.1 **Total Suspended Particulate Matter**

The predicted annual average TSP concentrations at the receptors were produced from the model. The highest concentration at each receptor over a 5 year period is presented in *Table 5.1*. Whilst ambient TSP is not measured at Prospect, typically PM₁₀ is considered to be half of the ambient TSP value. Taking the annual average PM₁₀ value of 18.4 µg/m³ this indicates an annual average background TSP value of 36.8 µg/m³. When this indicative background is added to the maximum modelled annual mean TSP concentration at a sensitive receptor (0.89 µg/m³) this provides a cumulative concentration of approximately 37.7 µg/m³. When compared to the assessment criteria of 90 µg/m³, the highest annual average TSP concentrations at each of the receptors is therefore below the assessment criteria.

Table 5.1 *Highest Annual Average TSP Concentrations at Receptors over 5 years*

Sensitive Receptor	X	Y	Annual Average TSP	Impact Assessment Criteria (µg/m³)
			Concentration (Increment) ¹ (µg/m³)	
1	306993	6263656	0.89	90
2	306975	6263528	0.75	
3	306963	6263414	0.53	
4	305627	6263452	0.34	
5	305527	6263624	0.26	
6	305475	6263762	0.23	
7	305584	6264114	0.20	
8	306081	6264458	0.30	
9	306603	6264395	0.28	
10	307080	6264227	0.22	
1. Maximum at each of the receptors over 5 years.				

5.2.2 *Dust Deposition*

With an unknown background, the maximum allowable increase in deposited dust is 2 g/m²/month. *Table 5.2* shows the highest annual average dust deposition at each of the receptors produced from 5 years of data. The predicted concentrations at each of the sensitive receptors are below the assessment criteria (*Table 5.2*).

Table 5.2 *Highest Annual Average Dust Deposition at Receptors over 5 years*

			Annual Average Dust Deposition (Increment) ¹ (g/m ² /month)	Impact Assessment Criteria (g/m ² /month)
Sensitive Receptor	X	Y		
1	306993	6263656	0.11	2
2	306975	6263528	0.09	
3	306963	6263414	0.06	
4	305627	6263452	0.03	
5	305527	6263624	0.03	
6	305475	6263762	0.02	
7	305584	6264114	0.02	
8	306081	6264458	0.04	
9	306603	6264395	0.04	
10	307080	6264227	0.03	
1. Maximum at each of the receptors over 5 years.				

5.2.3 *PM_{2.5}*

While there is no appropriate assessment criterion for PM_{2.5} concentrations, the highest maximum 24-hour average concentrations have been presented at each of the receptors over a 5 year time period (*Table 5.3*).

Table 5.3 *Maximum predicted contribution to 24-hour Average PM_{2.5} concentrations at Receptors over 5 years*

Sensitive Receptor	X	Y	Year	Maximum PM _{2.5} background ¹ concentration (µg/m ³)	Maximum PM _{2.5} Concentration (Increment) ² (µg/m ³)	Increment plus background (µg/m ³)
1	306993	6263656	2010	20.8	4.15	25.0
2	306975	6263528	2010	20.8	4.05	24.9
3	306963	6263414	2010	20.8	2.79	23.6
4	305627	6263452	2009	148.9	1.88	150.8
5	305527	6263624	2009	148.9	1.62	150.5
6	305475	6263762	2009	148.9	1.04	149.9
7	305584	6264114	2009	148.9	1.04	149.9
8	306081	6264458	2009	148.9	1.54	150.4
9	306603	6264395	2008	17.7	1.24	18.9
10	307080	6264227	2010	20.8	0.87	21.7

1. Data from Richmond
2. Maximum at each of the receptors over 5 years.

5.2.4 *PM₁₀ Annual Mean*

The highest annual average PM₁₀ concentrations at each receptor are presented in *Table 5.4*. The corresponding background concentration for the year in which the maximum concentration was predicted is also presented. The addition of the background concentration and the maximum increment results concentrations below the annual mean criteria for PM₁₀ (*Table 5.4*).

Table 5.4 Maximum Annual Average PM₁₀ Concentrations at Receptors over 5 years

Sensitive Receptor	X	Y	Annual Average PM ₁₀ Concentration (Increment) ¹ (µg/m ³)	Year Maximum Concentration Occurred	Background Air Quality (µg/m ³)	Increment plus Background (µg/m ³)	Impact Assessment Criteria (µg/m ³)
1	306993	6263656	0.57	2009	25.9	26.5	30
2	306975	6263528	0.49	2009	25.9	26.4	
3	306963	6263414	0.36	2009	25.9	26.3	
4	305627	6263452	0.22	2012	17.2	17.4	
5	305527	6263624	0.18	2012	17.2	17.4	
6	305475	6263762	0.15	2012	17.2	17.4	
7	305584	6264114	0.14	2012	17.2	17.3	
8	306081	6264458	0.2	2011	15.8	16.0	
9	306603	6264395	0.19	2012	17.2	17.4	
10	307080	6264227	0.15	2012	17.2	17.4	

As shown in *Table 2.2*, the maximum 24-hour average PM₁₀ concentration for 2009 exceeds the respective assessment criteria. The highest 24-hour average PM₁₀ concentrations at each receptor are presented in *Table 5.5*, together with the maximum 24-hour average background concentration for the relevant year in which the prediction occurred.

While the highest maximum 24-hour average PM₁₀ concentrations at each of the receptors (i.e. the increment) over 5 years are below the assessment criteria, the increment plus background exceeds the assessment criteria at receptors 1, 2, 4, 5, 6, 7 and 8 (*Table 5.5*). The exceedances of the background are the result of elevated backgrounds that are either close to or above the assessment criteria.

Level 2 Contemporaneous Assessment

The guidance document for the modelling and assessment of air pollutants in NSW (Department of Environment and Conservation, 2005) states that, where existing ambient air pollutant concentrations exceed the impact assessment criteria, it must be demonstrated that no additional exceedances of the impact assessment criteria will occur as a result of the proposed activity.

The guidance indicates that the maximum predicted concentrations at the receptors as a result of site activities must be matched with the corresponding 24-hour average in the background ambient air quality data. This approach also needs to be applied vice versa, in that the maximum concentrations in the ambient air quality data, with the corresponding predicted 24-hour average at the receptors.

To facilitate this analysis, the highest maximum 24-hour average PM₁₀ concentrations at each of the receptors for 5 years were extracted from the model data. These maximum concentrations at the receptors were matched with the corresponding 24-hour background concentration and added together to provide the increment plus background, when the concentrations at the receptors are at their highest over 5 years (*Table 5.6*).

The maximum Site contribution was determined to be 12.4 µg/m³ at receptor 1. To determine whether there is potential for the site to result in additional exceedances of the criteria, the maximum 24-hour background concentrations below the criteria were extracted from the EPA measurements to a level equal to or below 37.6 µg/m³. *Table 5.7* shows the maximum, non-exceedance background concentrations, together with the date on which they occurred, the predicted site contribution at the sensitive receptors and the cumulative impact of background plus site contribution.

Table 5.5 Maximum 24-hour Average PM₁₀ Concentrations at Receptors over 5 years

Sensitive Receptor	X	Y	Maximum 24-hour Average PM ₁₀ Concentration (Increment) ¹ (µg/m ³)	Year Maximum Concentration Occurred	Background Air Quality (µg/m ³)	Increment plus Background (µg/m ³)	Impact Assessment Criteria (µg/m ³)
1	306993	6263656	12.35	2010	40.1	52.5	50
2	306975	6263528	11.91	2010	40.1	52.0	
3	306963	6263414	8.05	2010	40.1	48.2	
4	305627	6263452	4.37	2009	1,680.3	1,684.4	
5	305527	6263624	3.72	2009	1,680.3	1,684.0	
6	305475	6263762	2.84	2009	1,680.3	1,683.1	
7	305584	6264114	2.84	2009	1,680.3	1,683.1	
8	306081	6264458	3.98	2009	1,680.3	1,684.3	
9	306603	6264395	3.84	2008	41.8	45.6	
10	307080	6264227	2.59	2010	41.5	44.1	

1. Maximum at each of the receptors over 5 years.

In these analyses, the results indicate that there would be no additional exceedances as a result of the site activities (*Table 5.6* and *Table 5.7*). This results from events when dust is transported from the Project Site to receptors when the background concentrations are low, and when background concentrations are elevated, but below criteria, the concentrations as a result of Site activities is correspondingly low.

Table 5.6 Maximum 24-hour average Site contribution to PM₁₀ Concentrations at the Receptors plus background

Date	Background ¹ (µg/m³)	PM ₁₀ Maximum Predicted 24-hour average Site contribution (µg/m³)										Increment plus Background (µg/m³)									
		Sensitive Receptors										Sensitive Receptors									
		1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
05/02/2008	6.3									3.8											
03/06/2009	21.3				4.3	3.7				4										10	
21/06/2009	11.6				7	2			2.8	2.8	3.9				26	25					
17/07/2010	18.1							4	4	8							14	14	16		
13/11/2010	18.4	12.3	11.9	8.0																	
		5	1	5																	

1. Sourced from the Prospect ambient monitoring station

Table 5.7 24-hour average Site contribution to PM₁₀ concentrations at the sensitive receptors at the time of the highest non-exceeding background concentrations

Date	Background ¹ PM ₁₀ 24-hour average (ug/m ³)	24 -hour average at the Sensitive Receptors (ug/m ³)										Increment plus background									
		1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
27/11/2009	48.5	0.0	0.1	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.5	48.6	49.2	48.5	48.5	48.5	48.5	48.5	48.5	48.5
20/11/2009	48.1	0.0	0.0	0.0	0.1	0.1	0.1	0.3	0.1	0.2	0.1	48.1	48.1	48.1	48.2	48.2	48.2	48.4	48.2	48.3	48.2
25/02/2009	44.7	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.0	0.0	44.7	44.7	44.7	44.7	44.7	44.7	44.9	45.2	44.7	44.7
02/10/2009	42.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	42.6	42.6	42.6	42.6	42.6	42.6	42.6	42.6	43.4	42.6
06/12/2008	41.8	0.8	0.8	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.1	42.6	42.6	42.3	41.8	41.8	41.8	41.8	41.8	42.3	41.9
16/09/2008	41.5	0.9	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.7	42.4	41.8	41.6	41.5	41.5	41.5	41.5	41.5	41.6	42.2
20/09/2011	41.5	0.4	0.3	0.2	0.0	0.0	0.0	0.3	0.0	0.0	0.0	41.9	41.8	41.7	41.5	41.5	41.5	41.8	41.5	41.5	41.5
25/08/2009	40.9	1.6	1.7	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.5	42.6	42.0	40.9	40.9	40.9	40.9	40.9	40.9	40.9
01/07/2008	40.1	1.6	2.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.7	42.1	40.4	40.1	40.1	40.1	40.1	40.1	40.1	40.1
27/03/2010	40.1	0.2	1.6	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.3	41.7	41.9	40.1	40.1	40.1	40.1	40.1	40.1	40.1
26/03/2009	39.7	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.2	0.0	39.7	39.7	39.7	39.7	39.7	39.8	40.0	39.9	39.9	39.7
15/09/2008	39.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.2	39.2	39.3	39.2	39.2	39.2	39.2	39.2	39.2	39.2
14/10/2009	38.8	2.5	0.9	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.3	39.7	39.0	38.8	38.8	38.8	38.8	38.8	38.8	38.8
23/09/2011	38.7	0.0	0.0	0.0	0.3	1.1	1.0	0.5	0.1	0.3	0.0	38.7	38.7	38.7	39.0	39.8	39.7	39.2	38.8	39.0	38.7
26/10/2012	38.7	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	38.7	38.7	38.7	38.8	38.7	38.7	38.7	38.7	38.7	38.7
12/09/2009	38.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.1	38.1	38.2	38.1	38.1	38.1	38.1	38.1	38.1	38.1
25/01/2011	37.5	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.2	0.0	37.5	37.5	37.5	37.5	37.5	37.5	37.8	37.7	37.7	37.5

1- Sourced from Prospect monitoring station

5.2.6

Odour

The evaluation of odour impacts requires the estimation of short or peak concentrations on the time scale of less than one second. The peak odour impacts are estimated from the 1-hour odour modelling results by multiplying with the appropriate factor from Table 6.1 of the Approved Methods. The selection of the appropriate factor is based on the wet scrubber vent of the hammer mill, which is the biggest source of odour (see *Sections A1.5 and A1.6 in Annex A*), i.e. the value of 2.3 for a wake-affected point (the 3 m height of the wet scrubber is within the building wake zone).

In *Table 5.8*, the incremental odour results are reported for the nearest sensitive receptors (99th percentile for mixed odorants for a Level 2 assessment), as required by the Approved Methods. In addition, the maximum incremental offsite odour impact (99th percentile) has also been reported, as requested by the EPA. No odour background concentrations are available for this assessment.

Table 5.8 *Maximum predicted peak odour concentrations at Receptors and maximum offsite odour concentrations over 5 years*

Sensitive Receptor	X	Y	Year	Maximum peak odour concentration ¹ (OU)
1	306993	6263656	2010	0.23
2	306975	6263528	2010	0.17
3	306963	6263414	2010	0.16
4	305627	6263452	2009	0.07
5	305527	6263624	2009	0.05
6	305475	6263762	2009	0.04
7	305584	6264114	2009	0.05
8	306081	6264458	2009	0.06
9	306603	6264395	2008	0.08
10	307080	6264227	2010	0.07
Maximum offsite location				1.03
1. Maximum at each of the receptors over 5 years.				

Based on an impact assessment criterion of 2 OU (for urban population of >2000 people) as presented in *Table 3.1*, it can be seen that odour impacts from the Site at the sensitive receptors are below the assessment criterion.

5.2.7

NO₂ Annual Mean

Nitrogen oxide (NO_x) is emitted by the metals cutting process (see *Section A1.6 of Annex A*); however, it is NO₂ that pertains to human health impact. NO_x consists of nitrogen oxide (NO) and NO₂, but NO will undergo oxidation in the atmosphere to become NO₂.

The Approved Methods recommend that 100% conversion of NO to NO₂, as a worst-case assessment, and this has been adopted in this impact assessment for conservative purposes. The results of mean NO₂ concentrations for an annual averaging period are reported for the nearest sensitive receptors in *Table 5.9*.

With an annual mean assessment criterion of 62 µg/m³, it can be seen from the results in *Table 5.9* that the NO₂ impacts at the sensitive receptors on an annual basis are below the assessment criterion.

5.2.8

NO₂ 1-Hour Mean

Using a 100% NO-to-NO₂ conversion, the results of 1-hour mean NO₂ concentrations for a 100th percentile is reported in *Table 5.10* for the nearest sensitive receptors.

With an assessment criterion of 246 µg/m³, it can be seen from the results in *Table 5.10* that the NO₂ impacts at the sensitive receptors on an hourly basis are below the assessment criterion.

Table 5.9 Maximum Annual Average NO₂ Concentrations at Receptors over 5 years

Sensitive Receptor	X	Y	Annual Average NO ₂ Concentration (Increment) ¹ (µg/m ³)	Year Maximum Concentration Occurred	Background Air Quality (µg/m ³)	Increment plus Background (µg/m ³)	Impact Assessment Criteria (µg/m ³)
1	306993	6263656	0.32	2009	22.7	23.0	62
2	306975	6263528	0.34	2009	22.7	23.0	
3	306963	6263414	0.27	2009	22.7	23.0	
4	305627	6263452	0.13	2012	20.7	20.8	
5	305527	6263624	0.11	2012	20.7	20.8	
6	305475	6263762	0.09	2012	20.7	20.8	
7	305584	6264114	0.08	2012	20.7	20.8	
8	306081	6264458	0.14	2011	20.7	20.8	
9	306603	6264395	0.12	2012	20.7	20.8	
10	307080	6264227	0.11	2012	20.7	20.8	
1. Maximum at each of the receptors over 5 years.							

Table 5.10 Maximum Hourly Average NO₂ Concentrations at Receptors over 5 years

Sensitive Receptor	X	Y	99.9 th Percentile Hourly Average NO ₂ Concentration (Increment) ¹ (µg/m ³)	Year Maximum Concentration Occurred	Maximum Measured Background Air Quality (µg/m ³)	Increment plus Background (µg/m ³)	Impact Assessment Criteria (µg/m ³)
1	306993	6263656	52	2010	40.4	92.0	246
2	306975	6263528	67	2010	40.4	107.4	
3	306963	6263414	79	2011	36.3	115.0	
4	305627	6263452	33	2009	39.4	72.1	
5	305527	6263624	34	2009	39.4	73.2	
6	305475	6263762	18	2012	36.1	54.5	
7	305584	6264114	14	2011	36.3	50.3	
8	306081	6264458	36	2009	39.4	75.6	
9	306603	6264395	30	2009	39.4	69.4	
10	307080	6264227	16	2011	36.3	52.5	
1. Maximum at each of the receptors over 5 years.							

5.2.9

Iron Oxide Fumes 1-Hour Mean

Table 5.11 presents the 99.9th percentile hourly iron oxide fume concentrations predicted by the modelling at the sensitive receptors and for the 10-hour adjusted maximum concentration (100th percentile) at any offsite location within the industrial estate.

Table 5.11 *99.9th percentile predicted 1-hour mean iron oxide fume concentrations at Receptors and 10-hour maximum offsite iron oxide fume concentrations over 5 years*

Sensitive Receptor	X	Y	Year	Hourly average incremental iron oxide fumes concentration ¹ (mg/m ³)
1	306993	6263656	2010	0.078
2	306975	6263528	2010	0.085
3	306963	6263414	2010	0.077
4	305627	6263452	2009	0.048
5	305527	6263624	2009	0.039
6	305475	6263762	2009	0.028
7	305584	6264114	2009	0.027
8	306081	6264458	2009	0.026
9	306603	6264395	2008	0.027
10	307080	6264227	2010	0.024
Maximum offsite location (10 hours)				2.01
1. Maximum at each of the receptors over 5 years.				

Based on the toxic air pollutants criterion of 0.09 mg/m³, it can be seen that at the sensitive receptors where this criterion applies, the predicted 1 hour concentrations at 99.9th percentile are below the assessment criterion.

At the maximum offsite location, using 10 hours of metals cutting and the adjusted TWA of 4 mg/m³, the predicted iron oxide fume concentration of 2.01 mg/m³ does not exceed the Safe Work Australia criterion.

5.2.10

Manganese and Compounds 1-Hour Mean

In keeping with the iron oxide fume impact assessment, the Approved Methods toxic air pollutant criterion does not apply at the industrial estate where the Site is located.

Consequently, the sensitive receptors have been assessed against a 1-hour criterion of 0.018 mg/m³ as per

Table 3.1, whilst the 10-hour TWA for manganese and compounds of 0.8 mg/m³ has been used within the industrial area as per Table 3.1.

Table 5.12 shows that ambient manganese concentrations are below the adopted assessment criteria in the relevant locations.

Table 5.12 *99.9th percentile predicted 1-hour mean manganese and compounds concentrations at Receptors and 10-hour maximum offsite manganese and compounds concentrations over 5 years*

Sensitive Receptor	X	Y	Year	Hourly average incremental manganese and compounds concentration ¹ (mg/m ³)
1	306993	6263656	2010	0.0082
2	306975	6263528	2010	0.0089
3	306963	6263414	2010	0.0080
4	305627	6263452	2009	0.0050
5	305527	6263624	2009	0.0041
6	305475	6263762	2009	0.0029
7	305584	6264114	2009	0.0028
8	306081	6264458	2009	0.0028
9	306603	6264395	2008	0.0028
10	307080	6264227	2010	0.0025
Maximum offsite location (10 hours)				0.21
1. Maximum at each of the receptors over 5 years.				

5.2.11 *Copper Dusts and Mists 1-Hour Mean*

In keeping with the iron oxide fume impact assessment, the Approved Methods toxic air pollutant criterion does not apply at the industrial estate where the Site is located.

Consequently, the sensitive receptors have been assigned a 1-hour assessment criterion for copper dusts and mists of 0.018 mg/m³ as per Table 3.1, whilst the 10-hour TWA for copper dusts and mists of 0.8 mg/m³ has been used within the industrial area as per Table 3.1.

Table 5.13 shows that ambient concentrations of copper dusts and mists are below the adopted assessment criteria in the relevant locations.

Table 5.13 *99.9th percentile predicted 1-hour mean copper dusts and mists concentrations at Receptors and 10-hour maximum offsite copper dusts and mist concentrations over 5 years*

Sensitive Receptor	X	Y	Year	Hourly average incremental copper dusts and mists concentration ¹ (mg/m ³)
1	306993	6263656	2010	0.0011
2	306975	6263528	2010	0.0012
3	306963	6263414	2010	0.0011
4	305627	6263452	2009	0.0007
5	305527	6263624	2009	0.0005
6	305475	6263762	2009	0.0004
7	305584	6264114	2009	0.0004
8	306081	6264458	2009	0.0004
9	306603	6264395	2008	0.0004
10	307080	6264227	2010	0.0003
Maximum offsite location (10 hours)				0.0081
1. Maximum at each of the receptors over 5 years.				

CONCLUSION

An air quality assessment has been undertaken for an expansion and increase in the handling capacity of Sell and Parker's existing waste metal recovery, processing and recycling facility at Blacktown, New South Wales.

The number and type of sources of emission from the site were thoroughly investigated and appropriately assessed for inclusion in the air dispersion modelling. The air dispersion modelling results indicated that:

- the highest predicted annual average TSP concentrations at each of the receptors is below the assessment criteria;
- the highest annual average dust deposition at each of the receptors produced from 5 years of data is below the assessment criteria;
- the highest annual average PM₁₀ concentration at the receptors at each of the receptors is below the assessment criteria;
- the maximum predicted 24-hour average PM₁₀ concentration together with the maximum background concentration results in levels that exceed the assessment criteria at the sensitive receptors due to the elevated background ambient air quality concentration in this area;
- the peak odour concentration at the receptors is below the assessment criterion;
- the highest annual average and 1 hour average NO₂ concentrations at the receptors are below the respective assessment criteria; and
- the toxic air pollutants (iron oxide fumes, manganese and compounds, copper dusts and mists) concentrations are found not to exceed the Work Safe 10-hour adjusted TWA at offsite locations within the industrial estate where the Site is located, and found not to exceed the human health assessment criteria at the nearest sensitive receptors.

Where existing ambient air pollutant concentrations exceed the impact assessment criteria, it must be demonstrated that no additional exceedances of the impact assessment criteria will occur as a result of the proposed activity:

A cumulative assessment of the maximum predicted 24-hour concentrations at the sensitive receptors together with the background concentration, that occurred on the date of the prediction, indicated that there would be no additional exceedance due to the Site activities.

A cumulative assessment of the periods of background concentration below the assessment criteria, together with the predicted concentrations as a result of site activities on those dates, indicated that there would be no additional exceedance due to the Site activities.

LIMITATIONS

This report was prepared in accordance with the scope of work outlined and/or referenced within this report and subject to the applicable cost, time and other constraints. ERM performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental profession. No warranties, expressed or implied, are made.

ERM makes no warranty concerning the suitability of the Site for any purpose or the permissibility of any use, development or re-development of the Site. Use of the Site for any purpose may require planning and other approvals and, in some cases, EPA and accredited site auditor approvals. ERM offers no opinion as to the likelihood of obtaining any such approvals, or the conditions and obligations which such approvals may impose, which may include the requirement for additional environment works.

Except as otherwise stated, ERM's assessment is limited to specified environmental conditions associated with the subject Site and does not evaluate operational or other conditions of any part of the Site (including any buildings, equipment or infrastructure).

This assessment is based on Site conditions described in the report, and information provided by Sell and Parker Pty Ltd or other people with knowledge of the Site conditions. Conclusions and recommendations made in the report are the professional opinions of the ERM personnel involved with the project and, while normal checking of the accuracy of data has been conducted, ERM assumes no responsibility or liability for errors in data obtained from such sources, regulatory agencies and/or any other external sources, nor from occurrences outside the scope of this project.

It is unlikely that the results and estimations presented in this report will represent the extremes of conditions within the Site. Conditions including impact concentrations can change in a limited period of time. ERM have used the last five years of meteorology in assessing the potential for impact to surrounding land use. No guarantee is provided that this contains the worst case meteorological conditions that could ever occur, and higher ground level concentrations than predicted in this assessment are possible. Only the chemicals specifically referred to in this report have been considered. ERM makes no statement or representation as to the existence (or otherwise) of any chemicals other than those specifically referred to herein. Except as otherwise specifically stated in this report, ERM makes no warranty or representation as to the presence or otherwise of asbestos and/or asbestos containing materials ("ACM") on the Site.

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This report does not constitute legal advice.

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Annex A

Emission Estimation

A.1 METHODOLOGY

Annex A provides a description of the methodology used to derive the emission estimates for each source type together with the input data used in the emission estimation.

The general equation for emissions estimation is:

Equation A.1 General Equation for Emission Estimation

$$E_i = A \times EF_i$$

where:

E_i = Emission of substance i (kg/day)

A = Activity rate (quantity of materials handled through the source) (t/day)

EF_i = Emission factor of substance i (kg/t)

A.1.1 Source Screening

The site activities were screened to ascertain any activities that would not produce a sufficient emission to warrant inclusion in the dispersion model. Complex air quality dispersion models, such as CALPUFF, take increasing amounts of time to run as the complexity of the site increases.

One drop point was considered adequate for the drop off of non-ferrous product by the public to the non-ferrous processing area. The building is enclosed and materials inside the shed are sorted and packed for transport off-site to end users.

Transfer of large items to the shear, the shearing process and loading of shear product onto truck for transport off-site were all deemed activities that would generate few emissions of particulate matter. The material taken to the shear was described as large (i.e. railway sleepers etc.) that were simply cut into more manageable sizes.

The post shredder processing building that processes the 'floc' is an enclosed building designed to recover additional materials from the initial recovery process. It was deemed that the building would not provide an additional source of particulate matter once the conveyor had delivered the 'floc' into the enclosed shed.

A.1.2 Materials Handling/Transfer Points/Conveying

The materials handling sources include materials handling of raw material, shredded material, product or waste material by front end loaders and/or other material handling equipment fitted with grapples.

The National Pollution Inventory (NPI) Manual for Mining (Department of Sustainability, Environment, Water, Population and Communities, 2012) was used to estimate the emissions from the materials handling processes.

The default emission factors for TSP and PM₁₀ are 0.005 kg/t and 0.002 kg/t, respectively, for materials handling of high moisture content ores from metalliferous mines. The high moisture content ore emission factors were selected on the basis that the particulate matter fractions from metals recycling will be much larger than that for metalliferous mines.

The resulting emission factor was fed into *Equation A.1* and applied to every hour the source is operational (6am-8pm for all materials handling operations).

Each of the sources involved in materials handling processes will operate without any additional controls except for the conveyor that transports the 'floc' to the post-shredder processing building. An additional 70% reduction of emissions has been applied to this conveyor, as it is enclosed.

A load in/load out particulate matter size distribution between PM_{2.5} and PM₁₀ of 32% has been used to calculate the emission rate of PM_{2.5} for all materials handling sources (SKM, 2005).

A.1.3 *Truck Dumping*

Truck dumping only occurs at two areas of the site, where the raw materials are delivered onto the scrap stockpile, and the dumping of the output from the pre-shredder onto the inspected stockpile near the shredder.

The National Pollution Inventory (NPI) Manual for Mining (Department of Sustainability, Environment, Water, Population and Communities, 2012) provides an equation for the loading and unloading of trucks (rear dumping) that takes into account mean wind speed and moisture content of the product. This equation was used to estimate the emissions from the truck dumping processes.

Equation A.2 Emission Estimation for Loading and Unloading Trucks

$$EFTSP = KTSP \times 0.0016 \times \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Where:

EFTSP = emission factor for total suspended particles (kg/t)

EFPM₁₀ = emission factor for PM₁₀ (kg/t)

KTSP = 0.74 for particles less than 30 micrometres in aerodynamic diameter

KPM₁₀ = 0.35 for particles less than 10 micrometres in aerodynamic diameter

U = mean wind speed (m/s)

M = moisture content (% by weight)

The moisture content entered into this equation for the raw material was 2%, as provided by Sell and Parker. Hourly wind speed was extracted at the site from the CALMET meteorological model. This allowed for an hourly changing wind speed to be included in the emission estimation. The wind speed (extracted at 10 m) was adjusted to the release height using *Equation A.3*.

Equation A.3 Wind Speed at Release Height

$$\frac{U}{U_r} = \left(\frac{Z}{Z_r}\right)^a$$

Where:

U = wind speed (m/s) at height Z

U_r = wind speed at reference height (10 m)

Z_r = reference height (10 m)

a = an empirically derived coefficient that varies dependent upon the stability of the atmosphere

The resulting emission factor was fed into *Equation A.1* and applied to every hour the source is operational (6am-9pm for raw material delivery and 6am-8pm for post pre-shredder dumping). The throughput rates for the source TRKD01 (at the raw material delivery) was 1500 tonnes/day and 300 tonnes/day for TRKD02 (truck dumping pre-shredder output at the inspected stockpile).

A load in/load out particulate matter size distribution between PM_{2.5} and PM₁₀ of 32% has been used to calculate the emission rate of PM_{2.5} for all materials handling sources (SKM, 2005).

A.1.4 Wind Erosion from Stockpiles

Wind erosion from stockpiles was estimated by using an equation from The National Pollution Inventory (NPI) Manual for Mining (Department of Sustainability, Environment, Water, Population and Communities, 2012).

Equation A.4 Wind erosion from stockpiles

$$EFTSP = 1.9 \times \left(\frac{S}{1.5}\right) \times 365 \times \left(\frac{365 - p}{235}\right) \times \left(\frac{f}{15}\right)$$

Where:

EFTSP = the emission factor of TSP (kg/ha/y)

S = silt content (5 by weight)

p = number of days per year when rainfall is greater than (0.25mm)

f = percentage of time that wind speed is greater than 5.4 m/s at the mean height of the stockpile

A silt content of 5.3% was used, which corresponded to the silt content of slag from iron and steel production (AP-42, 2006). For each year assessed, the total TSP content was calculated using *Equation A.4*.

This total emission per year was divided between the number of hours where both the wind speed and rainfall conditions were met. This kg/ha/yr emission rate was converted to a g/sec/m² emission rate.

A wind erosion based particulate matter size distribution between PM₁₀ and PM₃₀ factor of 0.5 was used to calculate the emission rate of PM_{2.5} for wind erosion (SKM, 2005). Similarly, a factor of 0.4 was used to calculate the particulate matter size distribution between PM_{2.5} and PM₁₀.

A.1.5 Wet Scrubber Vent

Air Species

The wet scrubber vent has been modelled with the following parameters:

- Stack height = 3 m
- Stack diameter = 0.56 m (the rectangle area of 0.25 m² has been approximated to the area of a circle and the diameter taken from this)
- Temperature = ambient temperature (taken for every hour of the year from the CALMET meteorological modelling)
- Stack velocity = 11.28 m/s. An electric fan and throttle valve are located within the stack close to the release point, which will disrupt the laminar flow of air from the stack. To account for this disturbance to the flow, the velocity of the stack flow has been reduced by 50%.
- Maximum dust concentration from the vent = 20 mg/m³.
- Volumetric flow rate = 20,000 Nm³/h.

A particulate matter size distribution between PM_{2.5} and PM₁₀ of 32% has been used to calculate the emission rate of PM_{2.5} out the vent (SKM, 2005).

The normalised volumetric flow was converted to ambient temperature (for every hour the source was operational) and multiplied by the mass flow rate of 20 mg/m³. This was subsequently converted to a g/sec emission rate and applied to every hour the source is operational (6am-8pm).

Odour

The odour source strength from the wet scrubber vent of the hammer mill has been assessed during an odour source monitoring exercise, undertaken on 12 June, 2014 by EML Air Pty Ltd (test results are presented in Annex C).

Using a conservative approach, the maximum measured odour concentration (in units of odour unit (OU)/m³) for the hammer mill of 1600 OU/m³ has been used in the odour impact assessment. With a stack velocity of 11.28 m/s, this provides an odour source strength of 4445.2 OU/s that has been used in the modelling.

A.1.6

Metals Cutting

Air Species

Metal cutting on site takes place at the scrap metal unloading area. Sell and Parker has reported that mild steel (about 20 mm thickness) is usually cut in wet and dry conditions, with typically 8 to 10 hours cutting per day.

The National Pollutant Inventory (NPI) has been used as a reference source for establishing the types of emissions from metals cutting. The NPI Emission Estimation Technique Manual for Structural & Fabricated Metal Product Manufacture³ provided metals cutting emission factors. To facilitate emissions estimation, the following assumptions were made:

- there are no control equipment for cutting emissions;
- the NPI manual is limited only to emission factors for plasma cutting (with air as the plasma gas) for mild steel of 8 mm, and therefore the set of emission factors associated with this has been used;
- as a conservative approach, conventional cutting (dry cutting) is assumed as it provides the higher emission factors when compared to wet cutting;
- as a conservative approach, cutting takes place continuously through 10 hours in a day (starting 7 am, ending 5 pm);
- metals cutting has been observed on 12 June, 2014 (during the odour monitoring) to take place at two locations within that area, therefore two point sources have been assumed;
- metals cutting was observed to be undertaken at a ground/ low level on 12 June, and therefore as a default 1 m has been assumed;

³ <http://www.npi.gov.au/resource/emission-estimation-technique-manual-structural-fabricated-metal-product-manufacture>

- temperature has been assumed at 700 C, which is the approximate ignition temperature of steel⁴;
- exit velocity from metals cutting emissions is not well defined in literature, as it depends on the operating conditions, materials and the environment of application, which may change depend on the scrap metal received. As a conservative measure, a nominally low exit velocity of 0.01 m/s for the emissions has been assumed; and
- exit diameter for metals cutting emission is also not well defined in literature. As a conservative measure, a nominally low exit diameter of 0.05 m has been assumed.

The emissions which have corresponding assessment criteria in *Table 3.1* are shown below:

- Nitrogen oxide (NO_x) = 0.33 g/s
- Metal fumes (as iron oxide fumes, since iron is the main metal of steel) = 1.15 g/s
- Manganese = 0.12 g/s
- Copper dusts and mists = 0.016 g/s

Odour

The odour source strength from metal cutting has been assessed during the odour source monitoring exercise on 12 June, 2014.

Using a conservative approach, the maximum measured odour concentration (in units of odour unit (OU)/m³) for metal cutting of 940 OU/m³ has been used in the odour impact assessment. With an exit velocity of 0.01 m/s, this provides an odour source strength of 0.018 OU/s that has been used in the modelling for each point source.

⁴ <http://www.twi-global.com/technical-knowledge/job-knowledge/oxyfuel-cutting-process-and-fuel-gases-049/>

Annex B

Figures

Figure B.1 *Maximum predicted (over 5 years) Site contribution to annual average TSP Concentrations (excluding background)*



Figure B.2 *Maximum predicted (over 5 years) Site contribution to Dust Deposition (excluding background)*



Figure B.3 *Maximum predicted (over five years) Site contribution to annual average PM₁₀ concentrations (excluding background)*



Figure B.4 Maximum predicted (over five years) Site contribution to 24-hour average PM₁₀ concentrations (excluding background)



Figure B.5 *Maximum predicted (over five years) Site contribution to Peak odour concentrations (excluding background)*

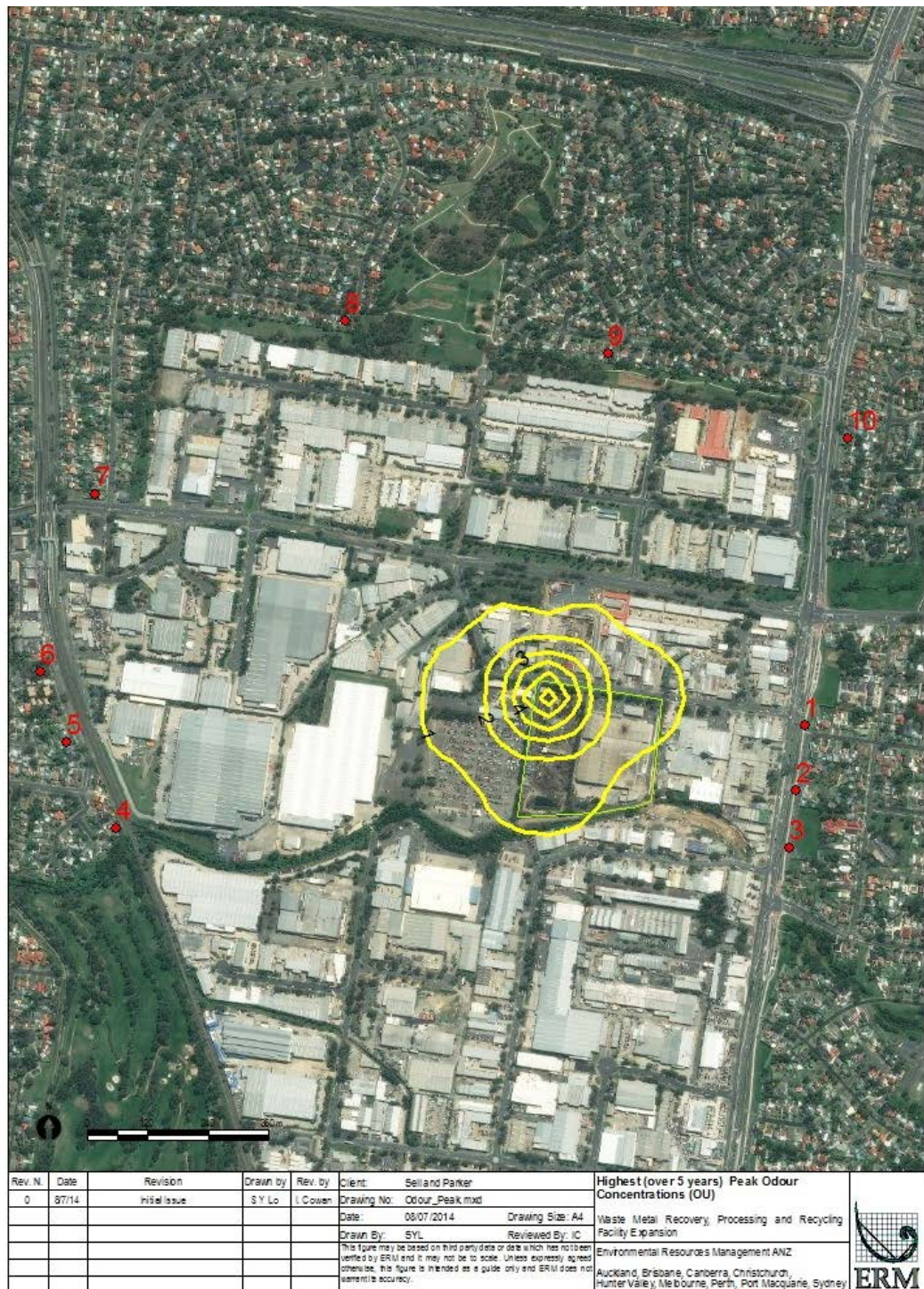


Figure B.6 Maximum predicted (over five years) Site contribution to annual average NO₂ concentrations (excluding background)

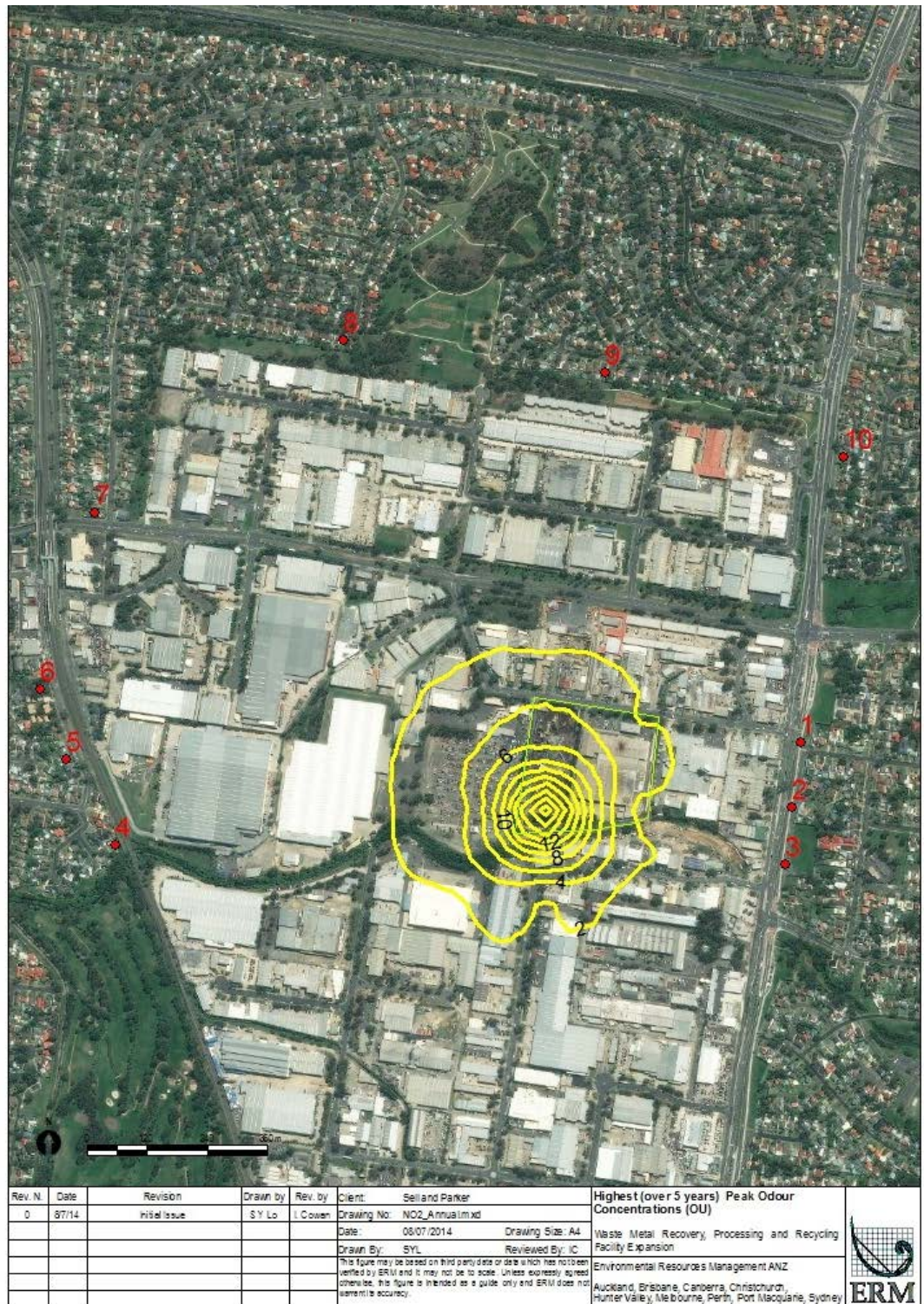


Figure B.7 Maximum predicted (over five years) Site contribution to hourly average NO₂ concentrations (excluding background)



Figure B.8 Maximum predicted (over five years) Site contribution to hourly iron oxide fumes concentrations (excluding background)

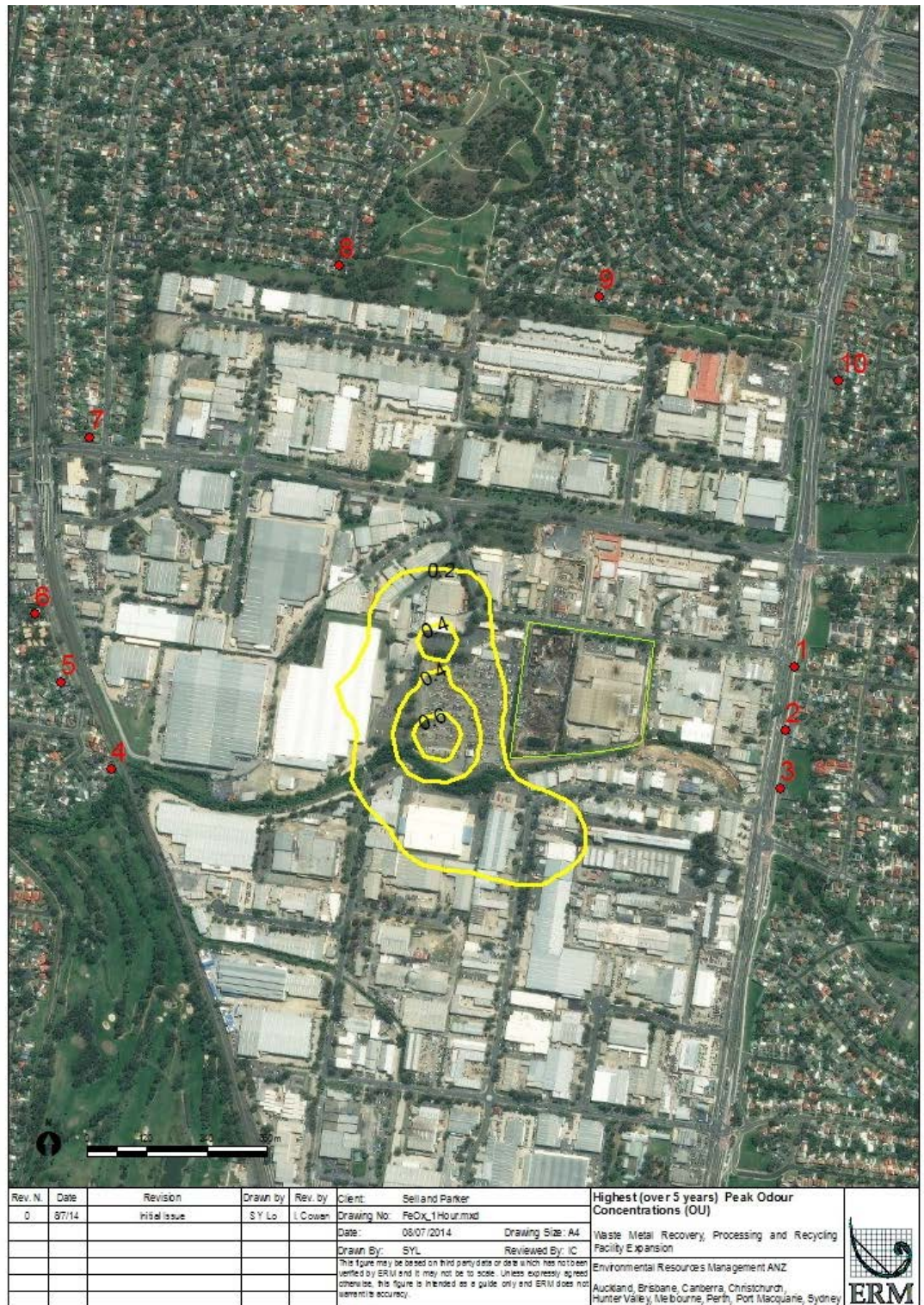
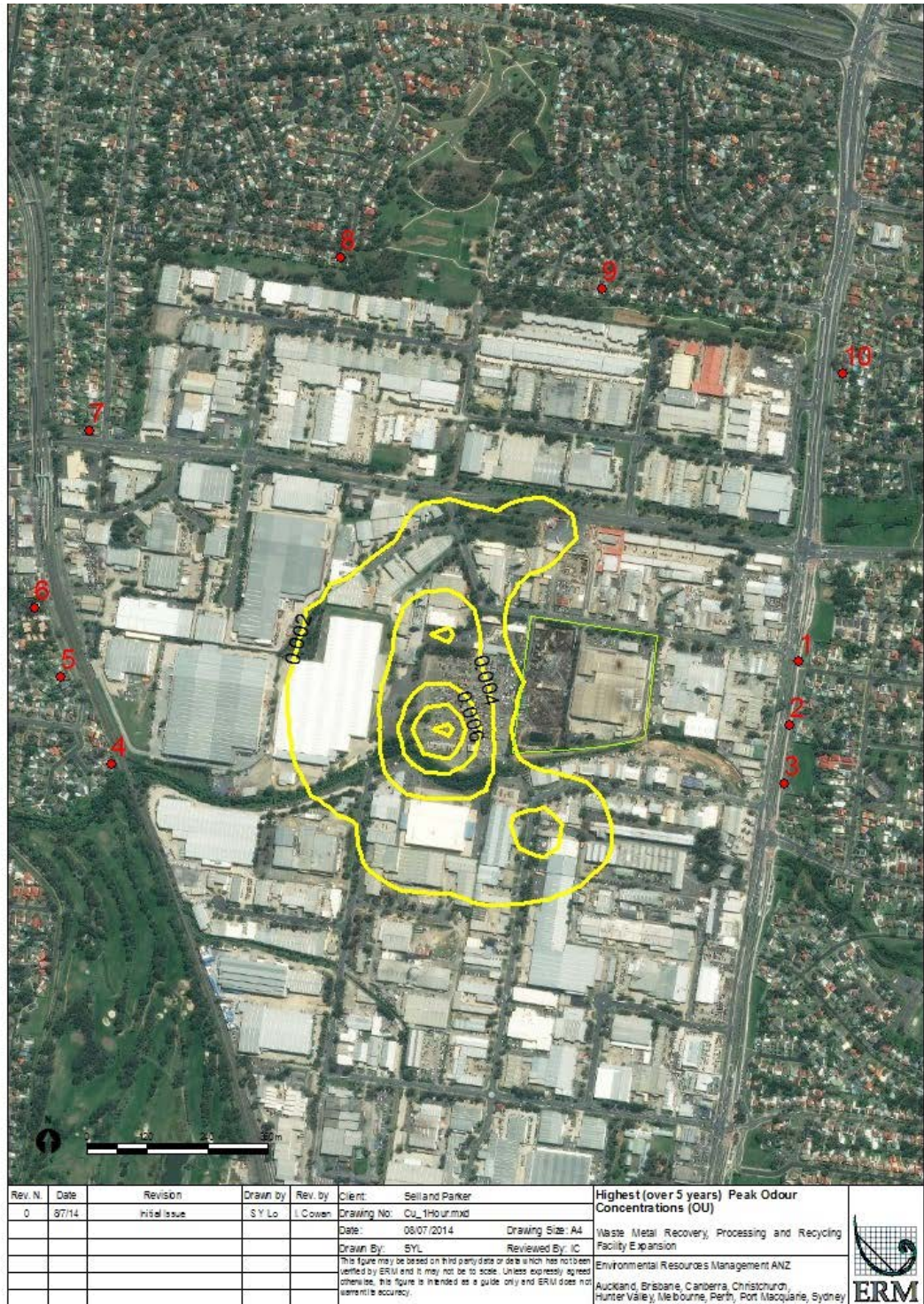


Figure B.9 *Maximum predicted (over five years) Site contribution to hourly manganese and compounds concentrations (excluding background)*



Figure B.10 Maximum predicted (over five years) Site contribution to hourly copper dusts and mists concentrations (excluding background)



Annex C

Odour Test Data



EML Air Pty Ltd
Report Number N92746

Emission Testing Report
ERM Australia Pty Ltd, Blacktown Plant



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Appendices

Nil

1 EXECUTIVE SUMMARY

Tests were performed at the request of ERM Australia Pty Ltd to determine emissions to air as detailed below;

Table 1: Testing Summary

Location	Test Date	Test Parameters*
Hammer Mill	12 June 2014	Odour and character
Oxy Cutting Area (up wind)	12 June 2014	Odour and character
Oxy Cutting Area (down wind)	12 June 2014	Odour and character

* Flow rate, velocity, temperature and moisture were determined unless otherwise stated.

2 RESULTS

Table 2: Hammer Mill - Test Results

Date	12/06/2014	Client	Sell & Parker - (ERM Australia)
Report	N92746	Stack ID	Hammer Mill
Licence No.	-	Location	Blacktown
EML Staff	DH/ZP	State	NSW
Process Conditions	Please refer to client records.		
Reason for testing:	Client requested testing to determine emissions to air		

Odour	Average	Test 1		Test 2	
Sampling date & Time		12/06/14	1102	12/06/14	1128
Analysis date & Time		13/06/14	1438	13/06/14	1444
Holding time			27 hours		27 hours
Dilution factor & Threshold		1	1000 ou	1	1600 ou
Butanol threshold	29 ppb				
Laboratory temp	20 °C		Concentration		Concentration
Last calibrated	10/01/14	ou	ou	ou	
No. ITE's used			12		12
Concentration	1300		1000		1600
Lower Uncertainty Limit	900		470		750
Upper Uncertainty Limit	2000		2200		3500
Hedonic tone			Mildly Unpleasant/Distinct		Mildly Unpleasant/Distinct
Odour character			Acidic		Acid

Table 3: Oxy Cutting Area (Up Wind) - Test Results

Date	12/06/2014	Client	Sell & Parker - (ERM Australia)
Report	N92746	Stack ID	Oxy Cutting Area (Upwind)
Licence No.	-	Location	Blacktown
EML Staff	DH/ZP	State	NSW
Process Conditions	Please refer to client records.		
Reason for testing:	Client requested testing to determine emissions to air		

Odour	Average	Test 1		Test 2	
Sampling date & Time		12/06/14	1248	12/06/14	1322
Analysis date & Time		13/06/14	1451	13/06/14	1500
Holding time			26 hours		26 hours
Dilution factor & Threshold		1	940 ou	1	650 ou
Butanol threshold	29 ppb				
Laboratory temp	20 °C		Concentration		Concentration
Last calibrated	10/01/14		ou		ou
No. ITE's used			8		12
Concentration	790		940		650
Lower Uncertainty Limit	540		430		300
Upper Uncertainty Limit	1200		2000		1400
Hedonic tone			Mildly Unpleasant/Distinct		Mildly Unpleasant
Odour character			Metal		Metal

Table 4: Oxy Cutting Area (Down Wind) - Test Results

Date	12/06/2014	Client	Sell & Parker - (ERM Australia)
Report	N92746	Stack ID	Oxy Cutting Area (Downwind)
Licence No.	-	Location	Blacktown
EML Staff	DH/ZP	State	NSW
Process Conditions	Please refer to client records.		
Reason for testing:	Client requested testing to determine emissions to air		

Odour	Average	Test 1	Test 2
Sampling date & Time		12/06/14 1248	12/06/14 1322
Analysis date & Time		13/06/14 1421	13/06/14 1431
Holding time		26 hours	25 hours
Dilution factor & Threshold		1 540 ou	1 550 ou
Butanol threshold 29 ppb			
Laboratory temp 20 °C		Concentration	Concentration
Last calibrated 10/01/14	ou	ou	ou
No. ITE's used		12	10
Concentration	550	540	550
Lower Uncertainty Limit	370	250	250
Upper Uncertainty Limit	800	1200	1200
Hedonic tone		Mildly Unpleasant/Distinct	Mildly Unpleasant/Distinct
Odour character		Smokey, Metal	Smokey,Metal

3 PLANT OPERATING CONDITIONS

Unless otherwise stated, the plant operating conditions were normal at the time of testing. See ERM Australia Pty Ltd's records for complete process conditions.

4 TEST METHODS

Unless otherwise stated, the following methods meet the requirements of the NSW Office of Environment and Heritage (as specified in the Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales, January 2007). All sampling and analysis was performed by EML Air unless otherwise specified. Specific details of the methods are available upon request.

Table 5: Test Method Table

Parameter	Test Method	Method Detection Limit	Uncertainty*	NATA Accredited	
				Sampling	Analysis
Sample Plane Criteria	NSW TM-1	NA	-	✓	NA
Velocity	NSW TM-2	2ms ⁻¹	7%	✓	NA
Temperature	NSW TM-2	0°C	2%	✓	NA
Flow rate	NSW TM-2	Location specific	8%	✓	NA
Moisture content	NSW TM-22	0.4%	8%	✓	✓
Odour	NSW OM-7	16ou	not specified	✓	✓

* Uncertainty values cited in this table are calculated at the 95% confidence level (coverage factor = 2)

5 QUALITY ASSURANCE/ QUALITY CONTROL INFORMATION

EML Air Pty Ltd is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources (Accreditation number 2732). Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for EML Air at NATA's website www.nata.asn.au.

EML Air Pty Ltd is accredited by NATA (National Association of Testing Authorities) to Australian Standard 17025 – General Requirements for the Competence of Testing and Calibration Laboratories. Australian Standard 17025 requires that a laboratory have a quality system similar to ISO 9002. More importantly it also requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Assurance Manager.

NATA is a member of APLAC (Asia Pacific Laboratory Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through the mutual recognition arrangements with both of these organisations, NATA accreditation is recognised world –wide.

A formal Quality Control program is in place at EML Air to monitor analyses performed in the laboratory and sampling conducted in the field. The program is designed to check where appropriate; the sampling reproducibility, analytical method, accuracy, precision and the performance of the analyst. The Laboratory Manager is responsible for the administration and maintenance of this program.

6 DEFINITIONS

The following symbols and abbreviations may be used in this test report:

NTP	Normal temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0°C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa, unless otherwise specified.
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
VOC	Any chemical compound based on carbon with a vapour pressure of at least 0.010 kPa at 25°C or having a corresponding volatility under the particular conditions of use. These compounds may contain oxygen, nitrogen and other elements, but specifically excluded are carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonate salts.
TOC	The sum of all compounds of carbon which contain at least one carbon to carbon bond, plus methane and its derivatives.
OU	The number of odour units per unit of volume. The numerical value of the odour concentration is equal to the number of dilutions to arrive at the odour threshold (50% panel response).
PM _{2.5}	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 2.5 microns (µm).
PM ₁₀	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm).
BSP	British standard pipe
NT	Not tested or results not required
NA	Not applicable
D ₅₀	'Cut size' of a cyclone defined as the particle diameter at which the cyclone achieves a 50% collection efficiency ie. half of the particles are retained by the cyclone and half are not and pass through it to the next stage. The D ₅₀ method simplifies the capture efficiency distribution by assuming that a given cyclone stage captures all of the particles with a diameter equal to or greater than the D ₅₀ of that cyclone and less than the D ₅₀ of the preceding cyclone.
D	Duct diameter or equivalent duct diameter for rectangular ducts
<	Less than
>	Greater than
≥	Greater than or equal to
~	Approximately
CEM	Continuous Emission Monitoring
CEMS	Continuous Emission Monitoring System
DEC	Department of Environment & Conservation (WA)
DECC	Department of Environment & Climate Change (NSW)
EPA	Environment Protection Authority
FTIR	Fourier Transform Infra Red
NATA	National Association of Testing Authorities
RATA	Relative Accuracy Test Audit
AS	Australian Standard
USEPA	United States Environmental Protection Agency
Vic EPA	Victorian Environment Protection Authority
ISC	Intersociety committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
APHA	American public health association, Standard Methods for the Examination of Water and Waste Water
CARB	Californian Air Resources Board
TM	Test Method
OM	Other approved method
CTM	Conditional test method
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
NIOSH	National Institute of Occupational Safety and Health
XRD	X-ray Diffractometry

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