This document has been prepared on behalf of **Sell & Parker Pty Ltd** by:

Northstar Air Quality Pty Ltd,

Suite 1504, 275 Alfred Street, North Sydney, NSW 2060

www.northstarairquality.com | Tel: +61 (02) 9071 8600

Kings Park Metal Resource Facility

Revised Air Quality Impact Assessment

Addressee(s):	Sell & Parker Pty Ltd
Report Reference:	20.1074.FR4V1
Date:	17 December 2021
Status:	Final

Quality Control

Study	Status	Prepared	Checked	Authorised
INTRODUCTION	Final	Northstar	MD, PR, AG, HR	GCG
THE PROPOSAL	Final	Northstar	MD, PR, AG, HR	GCG
LEGISLATION, REGULATION AND GUIDANCE	Final	Northstar	MD, PR, AG, HR	GCG
EXISTING CONDITIONS	Final	Northstar	MD, PR, AG, HR	GCG
METHODOLOGY	Final	Northstar	MD, PR, AG, HR	GCG
RESULTS	Final	Northstar	MD, PR, AG, HR	GCG
DISCUSSION AND CONCLUSION	Final	Northstar	MD, PR, AG, HR	GCG

Report Status

Northstar References		Report Status	Report Reference	Version
Year	Job Number	(Draft: Final)	(R*x*)	(V*x*)
20	1074	Final	R4	V1
Based upon the above, the specific reference for this version of the report is:				**20.1074.FR4V1**

Final Authority

This report must by regarded as draft until the above study components have been each marked as final, and the document has been signed and dated below.

G. Graham **17th December 2021**

Non-Technical Summary

This report (ref: 20.1074.DR4V2, dated 17/12/2021) includes components of:

- The original Air Quality Impact Assessment report (ref: 20.1074.FR1V3, dated 6 August 2020) (Northstar Air Quality, 2020) which was submitted in support of the Environmental Impact Statement; and
- The Supplementary Air Quality Impact Assessment report (ref: 20.1074.FR3V1, dated 31 March 2021) (Northstar Air Quality, 2021), which was a supplementary report prepared in response to the subsequent Request For Information request issued by the NSW Environmental Protection Authority upon review of the Environmental Impact Statement.

This report has been prepared at the request of NSW Environmental Protection Authority to submit the previously submitted report as a single document. It has been called a "Revised Air Quality Impact Assessment" report solely to differentiate it from the previous reports and is intended as a single-bound stand-alone document. It additionally includes some new content to provide further clarity on a number of issues also at the request of NSW EPA.

Sell & Parker purchase, sell and recycle all types of ferrous and non-ferrous metals. Their facilities are located strategically throughout NSW and Australia. Sell & Parker currently own and operate a resource recovery facility at 23-43 and 45 Tattersall Road, Kings Park. This resource recovery facility currently operates under State Significant Development approval 5041 and three associated modifications.

Sell & Parker is seeking approval to increase the throughput limit of the resource recovery facility from 350 000 to 600 000 tonnes per annum. Approval for the Proposal is sought as State Significant Development under Part 4, Division 4.7 of the *Environmental Planning and Assessment 1979* (EP&A Act).

Northstar Air Quality has been engaged to perform an air quality impact assessment to support the Environmental Impact Statement for the proposed throughput increase.

This revised air quality impact assessment has been performed in accordance with the State Environmental Assessment Requirements and the NSW Environment Protection Authority guidance "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*".

Using a range of site-specific data regarding the type and nature of activities to be performed on site, peak day emissions to air have been estimated in accordance with the relevant guidance, and the dispersion of emissions has been modelled using approved atmospheric dispersion modelling techniques. The corresponding impacts have been predicted at a number of receptor locations representing community exposure and at industrial locations, as discrete impacts and as cumulative impacts which account for general prevailing air quality conditions considered to be representative of the site.

The impact assessment does not predict any additional exceedances of the relevant air quality and odour assessment criteria, as published in NSW Environment Protection Authority guidance "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*", except for a predicted exceedance of the standard applicable to deposited dust at a single location beyond the site boundary, but not at a location sensitive to this potential impact.

It is noted that over some periods of the year used for the modelling exercise, the general prevailing background air quality conditions adopted from the monitoring network operated by NSW Department of Planning, Industry and Environment were already in exceedance of the impact assessment criterion. In such circumstances, the guidance provided in "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*" requires the demonstration of no additional exceedances of the health-based criteria, and this assessment demonstrates compliance with that requirement.

The air quality impact assessment also considers the potential impacts of the operation of the neighbouring Autorecyclers Pty Ltd operations at a proposed increased throughput of 130 000 tonnes per year. The report assesses the potential aggregated impacts with those emissions, and the assessment does not predict any exceedance of the relevant air quality and odour assessment criteria, as published in NSW Environment Protection Authority guidance "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*".

Further to the air quality impact assessment, a Best Management Practice Dust Control benchmarking study has been performed to identify controls that may be reasonably applied to manage particulate emissions from the activities performed. That assessment has identified a number of additional controls that have been evaluated to be applied to further control emissions, and also identifies that a number of Best Management Practice measures are already performed as part of site operations.

The report presents a number of recommendations including:

- the next scheduled emission testing event on the Hammermill, as required under the Environmental Protection Licence, is extended in scope by Sell & Parker to include a wider range of pollutants;
- a number of additional dust control measures identified through a Best Management Practice Dust Control assessment;
- a review of the configuration, location, metrics and trigger points of the on-site air quality monitoring stations.

Contents

Tables

Figures

Units Used in the Report

All units presented in the report follow International System of Units (SI) conventions, unless derived from references using non-SI units. In this report, units formed by the division of SI and non-SI units are expressed as a negative exponent, and do not use the solidus (/) symbol. *For example*, 50 micrograms per cubic metre would be expressed as 50 $\mu g \cdot m^{-3}$ and not 50 $\mu g/m^3$.

Common Abbreviations

Abbreviation	Term
ABS	Australian Bureau of Statistics
AHD	Australian height datum
AQIA	air quality impact assessment
AQMP	air quality management plan
AQMS	air quality monitoring station
AWS	Automatic Weather Station
BoM	Bureau of Meteorology
BMP	Best Management Practice
Cl_2	chlorine
CO	carbon monoxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEC	Department of Environment and Conservation
DPIE	Department of Planning, Industry and Environment
EETM	emission estimation technique manual
EIS	Environmental Impact Statement
EMS	environmental management system
EPA	Environmental Protection Authority
EPL	Environment Protection Licence
H_2S	hydrogen sulphide
HCl	hydrogen chloride
m^2	square metre
m^3	cubic metre
$m \cdot s^{-1}$	metres per second
$mg \cdot m^{-3}$	milligram per cubic metre of air
$mg \cdot Nm^{-3}$	milligram per normalised cubic metre of air
$\mu g \cdot m^{-3}$	microgram per cubic metre of air

Abbreviation	Term
mE	metres East
mS	metres South
NCAA	National Clean Air Agreement
NEPM	National Environment Protection Measure
NO	nitric oxide
NO_X	oxides of nitrogen
NO_2	nitrogen dioxide
O_3	ozone
OU	odour unit
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of 10 µm or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 µm or less
RRF	resource recovery facility
S&P	Sell and Parker
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
t	tonne
TAPM	The Air Pollution Model
tpa	tonnes per annum
TSP	total suspended particulates
US EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
VKT	vehicle kilometres travelled

1. INTRODUCTION

This report (ref: 20.1074.DR4V2, dated 17/12/2021) includes components of:

- The original Air Quality Impact Assessment report (ref: 20.1074.FR1V3, dated 6 August 2020) (Northstar Air Quality, 2020) which was submitted in support of the Environmental Impact Statement; and
- The Supplementary Air Quality Impact Assessment report (ref: 20.1074.FR3V1, dated 31 March 2021) (Northstar Air Quality, 2021), which was a supplementary report prepared in response to the subsequent Request For Information request issued by the NSW Environmental Protection Authority upon review of the Environmental Impact Statement.

This report has been prepared at the request from NSW Environmental Protection Authority to submit the previously submitted report as a single document. It has been called a "Revised Air Quality Impact Assessment" report solely to differentiate it from the previous reports and is intended as a single-bound stand-alone document. It additionally includes some new content to provide further clarity on a number of issues at the request of NSW EPA.

Highlighted text boxes have been added where necessary in this report to provide clarification where this report differs from the original AQIA report.

On behalf of Sell & Parker Pty Ltd (S&P, the applicant), Arcadis Australia Pty Ltd (Arcadis) has engaged Northstar Air Quality Pty Ltd (Northstar) to perform an Air Quality Assessment (AQIA) for the proposed expansion of the existing resource recovery facility (RRF).

1.1. Project Background

S&P purchase, sell and recycle all types of ferrous and non-ferrous metals. Their facilities are located strategically throughout NSW and Australia. S&P currently own and operate an RRF at 23-43 and 45 Tattersall Road, Kings Park (the Proposal site). This RRF currently operates under State Significant Development (SSD) approval 5041 and three associated modifications (the Original Approval)[1].

- Original Approval: https://www.planningportal.nsw.gov.au/major-projects/project/5191

S&P is seeking approval to increase the throughput limit of the RRF from 350 000 to 600 000 tonnes per annum (tpa) (the Proposal). Approval for the Proposal is sought as SSD under Part 4, Division 4.7 of the *Environmental Planning and Assessment 1979* (EP&A Act).

[1] Original Approval: https://www.planningportal.nsw.gov.au/major-projects/project/5191

The existing infrastructure at the Proposal site has the capacity to accommodate an increased throughput without altering the approved operational hours or requiring any construction works on the Proposal site.

1.2. Key Terms

The key terms are outlined in **Table 1**.

Table 1 Terminology

Term	Description
The Original Approval	The approved Environmental Impact Assessment for SSD 5041 (and subsequent modifications)
The Proposal	The proposal for which approval is being sought, namely the expansion of Kings Park metal recycling and processing facility
The Proposal site	The Sell and Parker Premises at 23-43 and 45 Tattersall Road, Kings Park NSW. The area at which the Proposal would be located incorporates the following lots: • Lot 2, DP 550522 • Lot 5, DP 7086.

1.3. Referenced Guidance

To allow assessment of the level of risk associated with the Proposal in relation to air quality, the AQIA has been performed with due reference to:

- Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA, 2017);
- Technical Framework - Assessment and Management of Odour from Stationary Sources in NSW (NSW DEC, 2006);
- Technical Notes - Assessment and Management of Odour from Stationary Sources in NSW (NSW DEC, 2006);
- *Protection of the Environment Operations Act* 1997; and
- Protection of the Environment Operations (Clean Air) Regulation 2021.

1.4. Secretary's Environmental Assessment Requirements

NSW Department of Planning, Industry and Environment (DPIE), issued the Planning Secretary's Environmental Assessment Requirements (SEARs) for the Proposal in December 2019. **Table 2** below identifies the SEARs relevant to this AQIA report and the relevant sections of the report in which they have been addressed.

Table 2 Secretary's Environmental Assessment Requirements (SSD 10396)

Agency / Issue	Requirement	Addressed
Blacktown City Council / Environmental Health	a) An air quality assessment must be conducted by a suitably qualified expert in line with the Approved methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW (EPA 2011) which includes:	This report
Air Quality Impact Assessment	• All processes and scenarios that could result in air pollution and/or generation of odour, this must also include worst case scenarios	Section 2.2 and 5.2
	• An assessment of the air quality impacts arising from the project on surrounding sensitive receptors (particularly dust and odour)	Sections 4.1.1 and 6
	• Provide an air quality management plan that includes details of the various methods that will be employed to control pollutants during the operational phase of the development	Section 7.3
	• The accumulative impact of this proposal along with adjacent development, particularly to the west of the site.	Section 7.2
NSW EPA / Air Pollution	Impact on the amenity of surrounding community from smoke, odour, particulates and dust and measures to be implemented to minimise or prevent these emissions including:	This report
	• The feasibility of semi-encapsulation of oxy-cutting activities to manage particulate emissions;	Section 7.1
	• A cumulative assessment of environmental impacts; and	Sections 6 and 7.2
	• Evidence that existing approved infrastructure can accommodate increased throughput – in particular the Emissions Collection System	Section 7.2
NSW EPA / Description of the Proposal	• Identify all sources or potential sources of air emissions from the development *Note: emissions can be classified as either: point (e.g. emissions from stack or vent) or fugitive (from wind erosion, leakages or spillages, associated with loading or unloading, conveyors, storage facilities, plant and yard operation, vehicle movements (dust from road, exhausts, loss from load), land clearing and construction works)*	Section 2.2 and 5.2 and Appendix C

Agency / Issue	Requirement	Addressed
	• Provide details of the project that are essential for predicting and assessing air impacts including:	
	A) the quantities and physio-chemical parameters (e.g. concentration, moisture content, bulk density, particle sizes etc) of materials to be used, transported, produced or stored	Section 5.2 and Appendix C
	B) an outline of procedures for handling, transport, production and storage	Section 7
	C) The management of solid, liquid and gaseous waste streams with potential to generate emissions to air.	Section 7
NSW EPA / The location	• Describe the topography and surrounding land uses. Provide details of the exact locations of dwellings, schools and hospitals.	Section 4.1.1
	Where appropriate provide a perspective view of the study area such as the terrain file used in dispersion models.	Figure 4, Figure 5
	• Describe surrounding buildings that may affect plume dispersion.	Section 2.2 and 5.1
	• Provide and analyse site representative data on following meteorological parameters: a) temperature and humidity b) rainfall, evaporation and cloud cover c) wind speed and direction d) atmospheric stability class e) mixing height (the height that emissions will be ultimately mixed in the atmosphere) f) katabatic air drainage g) air re-circulation.	Section4.3 and Appendix B
NSW EPA / The environmental issues	*Describe baseline conditions*	Section 4
	• Provide a description of existing air quality and meteorology, using existing information and site representative ambient monitoring data.	Sections 4.4 and 4.3 Appendices A and B
	Assess impacts	
	• Identify all pollutants of concern and estimate emissions by quantity (and size for particles), source and discharge point.	Sections 2.2 and 5.2
	• Estimate the resulting ground level concentrations of all pollutants. Where necessary (e.g. potentially significant impacts and complex terrain effects), use an appropriate dispersion model to estimate ambient pollutant concentrations. Discuss choice of model and parameters with the EPA. Describe the effects and significance of pollutant concentration on the environment, human health, amenity and regional ambient air quality standards or goals.	Section 6
	• Describe the contribution that the development will make to regional and global pollution, particularly in sensitive locations.	Section 6

Agency / Issue	Requirement	Addressed
	• For potentially odorous emissions provide the emission rates in terms of odour units (determined by techniques compatible with EPA procedures). Use sampling and analysis techniques for individual or complex odours and for point or diffuse sources, as appropriate. Note: With dust and odour, it may be possible to use data from existing similar activities to generate emission rates.	Section 5.2 and Appendix C
	• Reference should be made to relevant guidelines e.g. Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC, 2016); Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DEC, 2007); Assessment and Management of Odour from Stationary Sources in NSW (DEC, 2006); Technical Notes: Assessment and Management of Odour from Stationary Sources in NSW (DEC, 2006); Load Calculation Protocol for use by holders of NSW Environment Protection Licences when calculating Assessable Pollutant Loads (DECC, 2009).	Section 1.3
	Describe management and mitigation measures	
	• Outline specifications of pollution control equipment (including manufacturer's performance guarantees where available) and management protocols for both point and fugitive emissions. Where possible, this should include cleaner production processes.	Section 7

1.5. Issues Raised in Submissions

The Supplementary AQIA report (Northstar Air Quality, 2021) provided responses to the submissions outlined in **Table 3**.

Table 3 Summary of Submissions

Comment	Addressed
Blacktown City Council	
The additional Air Quality Impact Assessment notes the following: "…the annual average concentration of PM2.5 in 2018 was 8.5 µg·m-3 exceeding the criteria at all receivers without the Proposal. The additional contribution from the Proposal at all receivers is less than 0.1 µg·m-3 and is considered negligible." We remain concerned that the proposed expansion will exacerbate the air quality and requires confirmation from NSW Health that the proposed 0.1 µg·m-3 further exceedance will be negligible. Until a confirmation from NSW Health is received, we cannot support the proposal in this instance.	The values of "<0.1 µg·m^{-3}" presented in the AQIA represents the limit of reporting (LOR), and as such represents the upper bound of that value (that is, the value predicted is less than this "less than" concentration). The underlying premise of that limit is that an increment of <0.1 µg·m^{-3} is essentially a predicted unmeasurable concentration change. A concentration of 0.1 µg·m^{-3} is essentially the resolution limit of $PM_{2.5}$ analysis in the field. Any study that assesses $PM_{2.5}$ would present such predicted minimal impact results as an upper limit of limit of reporting rather than "0 µg·m^{-3}" which cannot be scientifically justified. The position adopted by Council that an increase of <0.1 µg·m^{-3} is unacceptable essentially implies that any study that assesses $PM_{2.5}$, and demonstrates a predicted minimal increment, would be unsupportable. It is therefore the position of the applicant that this position imposes a barrier to any development that has assessed $PM_{2.5}$ and is therefore unreasonable. Furthermore, as outlined by NSW EPA in the Approved Methods document (NSW EPA, 2016, section 5.1.3, page 17): 5.1.3 Dealing with elevated background concentrations *In some locations, existing ambient air pollutant concentrations may exceed the impact assessment criteria from time to time. In such circumstances, a licensee must demonstrate that no additional exceedances of the impact assessment criteria will occur as a result of the proposed activity and that best management practices will be implemented to minimise emissions of air pollutants as far as is practical* Requesting NSW Health to confirm a negligible increase is not regarded as necessary, given the assessment methodology identified by NSW EPA in the Approved Methods document. The Revised Air Quality Impact Assessment provides a detailed assessment of best management practice measures to be implemented at the site, and the report therefore meets the requirements of the NSW EPA guidance.
NSW EPA	
It is not clear whether the assumed operations and emissions in the AQIA are representative of normal operations or a worst-case scenario	The assessment has been based upon a peak "worst case" daily activity rate of 2 634 t·day^{-1}, commensurate with an extrapolated annual tonnage throughput of 795 468 t·year^{-1}. The data used to quantify the worst-case scenario is presented in **Section 2.2** and specifically in **Table 6.**

Comment	Addressed
and how the increased throughput will be handled at the facility.	The worst-case assumptions may be compared to the Proposal activity rate of 600 000 $t{\cdot}year^{-1}$ which corresponds to a daily average activity rate of 1 987 $t{\cdot}day^{-1}$ over 302 operating days. It can be seen that the assumed worst-case activity rate is approximately 33 % higher than typical activity rates. The increase in throughput is facilitated by operational efficiency, not a change in plant capacity.
The proponent must present and adequately justify that a worst-case scenario has been assessed and if it has not, undertake such an assessment.	See above. This assumption has been used in the AQIA.
The proponent must detail how the facility is capable of handling the increased throughput, particularly in light of no additional works being conducted to facilitate the increase.	The increased throughput is within the design capacity of the plant. As illustrated in in **Section 2.2** and **Table 6**, the maximum daily throughput is based upon the maximum design specification for the non-ferrous baler, the shredder, the shears and oxycutter, and the corresponding material handling and transfer rates. In regard to the capability of the plant to manage this throughput, EPL 11555 requires emissions testing on the shredder (Hammermill and emission collection system "ECS"). The NATA Accredited emission testing demonstrates that the measured TSP and Type 1&2 emissions are comfortably and consistently lower than the emission limits specified under EPL 1555. This is discussed in **Section 2.2** and **Section 5.2**. The respective complete emission test reports are presented in **Appendix F** for cross reference.
The proponent must provide a clear linkage between emission sources (Table 14), process (Figure 3), movement of materials onsite, throughput and activity rates.	The linkages between the emission sources, process flow diagram, throughput and activity rates are discussed in **Section 2.2**, which provides clarification of the material flows and assumed activity rates. **Figure 3** has been updated to provide additional clarification to the activity rates and provide a clear linkage between emission sources and the associated activity rates.
The proponent must include total emissions per year for each activity and as an entire site in the emission inventory	**Appendix C** presents an emission inventory for each activity (**Table 44** to **Table 50**) for use in the emission modelling assessment using peak-hour assumptions. Annualised emission estimates are provided in **Table 51** to **Table 53**, as requested.
There is uncertainty as to whether the hammermill is meeting current Licence limits.	EPL 11555 requires emissions testing on the shredder (Hammermill and emission collection system "ECS"). The NATA Accredited emission testing demonstrates that the measured TSP and Type 1&2 emissions are comfortably and consistently lower than the emission limits specified under EPL 1555. This is discussed in **Section 2.2** and **Section 5.2**.

Comment	Addressed
The AQIA has modelled the hammermill at the emission concentration limits from the Licence, Type 1 and 2 substances (in aggregate) of 1 mg/m3 and TSP of 20 mg/m3. The parameters of the hammermill modelled include a discharge velocity of 25 m/s.	The AQIA has modelled the emissions from the Hammermill at the maximum measured concentrations reported in the NATA endorsed emission test reports performed on the Hammermill are presented in **Appendix F** (Ektimo, May 2017), (Ektimo, Sep 2018), (Ektimo, Sep 2019), (Ektimo, Oct 2019), (Ektimo, Sep 2020) and (Ektimo, May 2021). **Table 21** presents a summary of those emission reports which shows the 2021 emission test data remains compliant with the emission limits specified in EPL 11555.
Emission concentrations from the hammermill for PM10 and PM2.5 have been given as 47 % and 15%, respectively, of the TSP concentration (Appendix C). No testing data has been provided to support these emission concentrations and parameters despite the requirement for annual testing of TSP on the licence since 2016.	Emissions of PM_{10} and $PM_{2.5}$ are derived from measurements presented in R003396 (Ektimo, May 2017). The measured emission concentrations of TSP, PM_{10} and $PM_{2.5}$ are 9.3 mg·Nm^{-3}, 6.6 mg·Nm^{-3} and <4 mg·Nm^{-3} respectively. The emission concentration of PM_{10} is therefore (approx.) 71 % of TSP and $PM_{2.5}$ is (approx.) 43 % of TSP. **Appendix F** provides the NATA accredited emissions testing performed on the Hammermill under EPL 11555 over the period from 2014 to 2021 (inclusive). The scope of testing required under EPL 11555 is TSP and Type 1 & 2 substances (metals). The various test reports demonstrate continuous compliance with the emission limits for TSP and Type 1 & 2 substances, and additional analyses performed at the request of S&P.
Further, the SEARs specifically required evidence that the existing emissions collection system can accommodate the increased throughput. No such evidence is provided in the AQIA.	EPL 11555 requires emissions testing on the shredder (Hammermill and emission collection system "ECS"). The NATA Accredited emission testing demonstrates that the measured TSP and Type 1&2 emissions are comfortably and consistently lower than the emission limits specified under EPL 1555. This is discussed in **Section 2.2** and **Section 5.2**. The NATA endorsed emission test reports performed on the Hammermill are presented in **Appendix F** (Ektimo, May 2017), (Ektimo, Sep 2018), (Ektimo, Sep 2019), (Ektimo, Oct 2019), (Ektimo, Sep 2020) and (Ektimo, May 2021). The increase in throughput is facilitated by operational efficiency, not a change in plant capacity.
The proponent must provide the emissions testing reports for the hammermill to demonstrate it is achieving compliance and to validate the use of the emission concentrations and parameters in the AQIA.	The NATA endorsed emission test reports performed on the Hammermill are presented in **Appendix F** (Ektimo, May 2017), (Ektimo, Sep 2018), (Ektimo, Sep 2019), (Ektimo, Oct 2019), (Ektimo, Sep 2020) and (Ektimo, May 2021).
The proponent must provide evidence that the existing infrastructure, including the emissions collection system, can accommodate the proposed increased throughput.	The increased throughput is within the design capacity of the plant. As illustrated in in **Section 2.2** and **Table 6**, the maximum daily throughput is based upon the maximum design specification for the non-ferrous baler, the shredder, the shears and Oxycutter, and the corresponding material handling and transfer rates.

Comment	Addressed
	In regard to the capability of the plant to manage this throughput, EPL 11555 requires emissions testing on the shredder (Hammermill and emission collection system "ECS"). The NATA Accredited emission testing demonstrates that the measured TSP and Type 1&2 emissions are comfortably and consistently lower than the emission limits specified under EPL 1555. This is discussed in **Section 2.2** and **Section 5.2**. The respective complete emission test reports are presented in **Appendix F** for cross reference.
The AQIA has not considered or included in the assessment particle or metal emissions from the oxy-cutting activities (Appendix C) as the emissions from the process are considered to be low. The EPA advises that the proponent has been required previously to verify the air emissions from oxy-cutting and the EPA can advise that oxy-cutting is not an insignificant source of particulates from the premises. The proponent must include particulate and metal emissions from oxy-cutting activities in the AQIA.	**Appendix F** presents the relevant emission test report R007718 (Ektimo, Sept 2019) which presents the NATA endorsed emissions testing report performed on the Oxycutter. The emission assumptions for the Oxycutter are presented in **Section 5.2.3** and **Appendix C** which are derived from direct measurements. Emissions of odour, particulates, NO_X and metals (incl. Ag, Al, As, Ba, Be, Ca, Cd, Co, Co[II], Cr, Cu, Fe, Fe[I,II], Hg, K, Li, Mg, Mg[IV], Mn, Mo, Na, Ni, P, Pb, Sb, Se, Sn, Th, Zn) have been assessed as documented in **Appendix F**.
There is uncertainty as to the emission factors and variables. The AQIA states that emission factors were sourced from the USEPA's AP42 Chapters 11 and 13. The emission factors for each activity is listed in Appendix C however specific details regarding the emission factors and variables used to calculate the emissions inventory have not been provided. Therefore, the EPA is unable to confirm the emissions from the proposal. The proponent must provide and justify all emission factor equations and variables used to determine the emissions inventory.	**Appendix C** presents a detailed emission inventory for each activity and specifies the emission variables and assumptions applied.

Comment	Addressed
There is uncertainty as to the source of odour emission concentration data. Estimated odour concentration and odour emission rates are given in Appendix C for the oxy-cutting and the hammermill. No information as to the source of odour data is provided in the AQIA. The proponent must provide supporting information to evaluate the odour emission rates used in the assessment (oxy-cutting and hammermill).	The odour emission rates are derived directly from the NATA endorsed emission testing reports presented in **Appendix F**. For clarity, these are measured, not estimated. The odour emissions for the Hammermill and Oxycutter is presented in report N92746 (EML Air, June 2014) which is attached in **Appendix F**. The NATA endorsed emission testing report for the odour emissions for the Oxycutter is presented in report R007718 (Ektimo, Sept 2019) which is attached in **Appendix F**. The emission estimation for the Hammermill, Oxycutter are presented in **Section 5.2.2** and **Section 5.2.3** respectively. Odour emissions are further discussed in **Section 5.2.5**
There is uncertainty regarding current air related pollution controls and proposed air related pollution controls. The AQIA lists site-specific mitigation measures "to be implemented" to achieve best available techniques. The AQIA also states that the 2015 AQIA (ERM, 2015) presented a list of best practise measures to be implemented.	**Section 7.3.1** presents the mitigation measures presented in (ERM, 2015) and **Table 34** provides a tabulated summary of how these measures have been implemented. **Appendix E** presents a detailed Best Management Practice Dust Control for the activities, based upon NSW EPA requirements (NSW OEH, 2011), and concludes with recommendations for the adoption of additional control measures. **Section 7.3** provides a summary of the daily air quality management performed by S&P and provides details of reviews of the specification of the current air quality monitoring station and pro-active and reactive use of those measurement data through the Air Quality Management Plan.
Control factors applied in the modelling appear limited to water sprays on material handling and truck dumping (70 %) and fully enclosed conveyors (100 %). The cyclone and wet scrubber controls on the hammermill are assumed in the emission concentrations for that source.	Control factors applied include waster sprays on material handling and dumping (70 %), side walls and covers on conveyors (70 %), conveyor water sprays (50 %) and road watering (30 %). The Hammermill emissions are based on measured emissions data post air pollution control, and those controls are intrinsic to the measurements.
The EPA advise that it is unclear which control and mitigation measures from the 2015 assessment have been put in place, which are still to be implemented and which are additional measures for the current proposal. It is also unclear the potential impact on the	**Section 7.3.1** presents the mitigation measures presented in (ERM, 2015) and **Table 34** provides a tabulated summary of how these measures have been implemented. **Table 34** shows that all of the control and mitigation measures identified in the 2015 assessment have been implemented and provides further commentary of the implementation of those measures. **Appendix E** presents a detailed Best Management Practice Dust Control for the activities, based upon NSW EPA requirements (NSW OEH, 2011), and concludes with recommendations for the adoption of additional control

Comment	Addressed
emissions as the AQIA has not discussed the additional controls in reducing offsite impacts.	measures. **Section 7.3** provides a summary of the daily air quality management performed by S&P and provides recommendations for a review of the specification of the current air quality monitoring station and pro-active and reactive use of those measurement data through the Air Quality Management Plan.
However, it is clear from the results of onsite monitoring presented in the AQIA (Table 11 and 12) that the current operations and controls are not adequately able to reduce particulate concentrations to below relevant criteria.	**Appendix E** presents a detailed Best Management Practice Dust Control for the activities, based upon NSW EPA requirements (NSW OEH, 2011), and concludes with recommendations for the adoption of additional control measures. **Section 7.3** provides a summary of the daily air quality management performed by S&P and provides recommendations for a review of the specification of the current air quality monitoring station and pro-active and reactive use of those measurement data through the Air Quality Management Plan. The recommendations of this AQIA are presented in **Section 7.4.2** and **Table 37**.
The proponent must clarify existing controls and proposed controls for the site, including time frames for implementation of additional controls.	As above.
Further, the predicted impacts for the proposed increase in throughput are likely to exceed the EPA's criteria at multiple receptors which indicate that even with the proposed controls there remains a high risk that impact above the EPA's criteria will occur.	<u>The AQIA does not predict any additional exceedances of the impact assessment criteria at any sensitive receptor location.</u> Impacts greater than the impact assessment criteria at locations not representative of sensitive land uses are presented in **Appendix D** for annual average PM_{10} and deposited dust, and elevated incremental 24-hour average PM_{10} concentrations are predicted. For clarity, **Section 6** of the AQIA presents a summary of the predicted impacts at the relevant receptor locations and **Appendix D** provides a full schedule of results. **Appendix E** presents a Best Management Practice Dust Control assessment, performed in accordance with NSW EPA guidance (NSW OEH, 2011), which identifies a range of additional controls which are recommended for implementation, which would help mitigate those impacts **Section 7.3** presents a series of recommendations for additional mitigation, including a thorough review of the application of the on-site air quality monitoring stations for reactive and proactive dust control, to be implemented through the Air Quality Management Plan.
The SEARs required the AQIA to consider the feasibility of semi-encapsulation of oxy-cutting activities. The AQIA concludes that the semi-encapsulation of the oxy-cutting is not considered to be	A Best Management Practice Dust Control assessment was performed in accordance with NSW EPA guidance (NSW OEH, 2011). This procedure requires an emissions inventory (without controls) to be estimated, the sources ranked to identify the most significant source contributions to that total, and the top 95 % of emissions evaluated in terms of potential controls. The Oxycutter is ranked 6 of 6 in that procedure and is estimated

Comment	Addressed
practical nor warranted as the emissions from the oxy-cutting are low and impacts are lower than the criteria. As outlined above, this is not the case and consideration to additional enclosures or encapsulation should be considered.	to contribute 0.5 $kg \cdot day^{-1}$ of a total estimate of 111.1 $kg \cdot day^{-1}$, ie. 0.45 % of the total. Based upon the methodology stipulated in (NSW OEH, 2011) the Oxycutter is screened from further evaluation in terms of additional controls. This is presented fully in **Appendix E**. Irrespective of the minor contribution of the Oxycutter to the total emission budget, **Section 7.3.5** provides a discussion of the potential for semi-encapsulation of the Oxycutter.
The proponent must consider additional control and mitigation measures aimed at ensuring particulate impacts do not exceed the EPA's air quality criteria at receptors.	A discussion of the potential for semi-encapsulation of the Oxycutter and which discusses recommendations for additional controls on that source is presented in **Section 7.3.5**.
The proponent must assess the impacts from each activity to determine where additional controls may be most effective and considers those controls which may be implemented.	A comprehensive Best Management Practice Dust Control benchmarking study has been performed in accordance with the requirements of (NSW OEH, 2011). That study identifies the activities that contribute up to 95 % of emissions from the site (uncontrolled) and provides a risk assessment against potential constraints to identify where additional controls may be effectively and reasonably implemented. The assessment identifies a number of controls, which have been recommended for implementation, as set out in **Appendix E** and summarised in **Section 7.4**.
Pick and Payless	
The AQIA appears to omit emissions from hauling activities at the site, stating that as the surface would be paved and swept regularly, emissions from vehicle and plant movements on-site are considered negligible. Based on the scale and type of the Project, hauling activities are expected to be a significant source of dust emissions from the operations, and thus its omission would lead to substantial underpredictions of impacts. The air emission inventory should include all significant dust generating activity.	The roads are paved and are swept regularly. Road haulage emissions have been included in the assessment, and this is presented in **Section 5.2.4**. **Appendix C** presents the emission estimation for road haulage.
Diesel exhaust emissions from vehicles and plant have not been considered. Diesel exhaust emissions comprise PM2.5 and	Diesel exhaust emissions from on-site vehicles were considered for inclusion within the AQIA. However, upon review of the Traffic Assessment, it was determined that the maximum hourly heavy vehicle movement would be 33

Comment	Addressed
NOX emissions which would contribute to the incremental and cumulative impact from the operations.	vehicles, with a further maximum of 10 light vehicles per hour, representing approximately just 1 vehicle every 01:25 minutes. For context, the provided traffic survey data measured on Tattersall Road during February to March 2020 reports a weekday average 2-way traffic flow of 5 531 vehicles. In context of the traffic movements on Tattersall Road, the contribution of site traffic is low, and the contribution of exhaust emissions is correspondingly low. In context of the net emissions from the site, the contribution of the low volumes of traffic exhaust is considered minor (i.e. <10 % of local traffic flows) and has not been considered further.
Only emissions of odour and NOx have been assumed for oxy cutting. The AQIA does not adequately assess the potential for fume/particle emissions from this source as required by the SEARs.	Emissions of odour, particulates, NO_X and metals (incl. Ag, Al, As, Ba, Be, Ca, Cd, Co, Co[II], Cr, Cu, Fe, Fe[I,II], Hg, K, Li, Mg, Mg[IV], Mn, Mo, Na, Ni, P, Pb, Sb, Se, Sn, Th, Zn) have been assessed from the Oxycutter. The emission assumptions for the Oxycutter are presented in **Section 5.2.3** and **Appendix C**.
It is unclear if a maximum 24-hour average rate has been adequately assessed for 24-hour average impacts. The largest daily tonnage proposed to be handled for any source is 1,800 tonnes per day, for operations six days a week (Monday to Saturday). If a single source was to handle all material in the proposed 600,000tpa, the maximum daily rate would be approximately 1,918 tonnes per day (i.e. 600,000 / 365 x 7/ 6 = 1,918). This would result in a potential underestimation of the 24-hour average impacts.	The assessment has been based upon a peak "worst case" daily activity rate of 2 634 $t{\cdot}day^{-1}$, commensurate with an extrapolated annual tonnage throughput of 795 468 $t{\cdot}year^{-1}$. The data used to quantify the worst-case scenario is presented in **Section 2.2** and specifically in **Table 6.** The worst-case assumptions may be compared to the Proposal activity rate of 600 000 $t{\cdot}year^{-1}$ which corresponds to a daily average activity rate of 1 987 $t{\cdot}day^{-1}$ over 302 operating days. It can be seen that the assumed worst-case activity rate is approximately 33 % higher than typical activity rates.
The data presented in Table 17 show levels approaching the criterion of 50µg/m³ which do not include the existing or proposed neighbouring operation. The contemporaneous assessment should be revised to include the neighbouring operation for the selected meteorological year to demonstrate the Project operating in conjunction with the neighbouring operation would not	The assessment of aggregated impacts with Autorecyclers Pty Ltd is presented in **Section 7.2** and includes justification of the conservative approach adopted. The aggregated assessment assumes the worst-case emission predictions from the operations at Sell & Parker with the worst-case impact predictions from Autorecyclers Pty Ltd, irrespective of when those impacts occur. This is more conservative than a contemporaneous assessment. Note: Autorecyclers Pty Ltd has ceased operations and the land sold. The aggregated impact assessment presented in this Revised AQIA is no longer considered to represent an actual operating scenario, although it has been retained for completeness.

Comment	Addressed
result in any additional exceedances of the relevant 24-hour particulate criteria. An attempt at a cumulative assessment of 24-hour average impacts has been made in Table 24 which considers the maximum incremental impacts from the Project and the neighbouring operation. However, as the modelling uses different meteorological years/datasets, the predicted maximum impacts and contemporaneous background levels would not occur over the same periods. The assessment does not adequately demonstrate that this would not result in any additional exceedances of the relevant 24-hour average particulate criteria.	

1.6. Consultation with EPA

Following the above response to submissions, a round of consultation with NSW EPA was performed, and an on-line meeting was held on 13th September 2021. In response to that meeting the information summarised in **Table 3** was discussed. **Table 4** provides a summary of that requested information and the associated response(s).

Table 4 Comments from consultation with EPA

Comment	Response
Air Quality Assessment Information	
The Supplementary Air Quality Assessment (Northstar) provided as Appendix D of the Response to Submissions (Arcadis, August 2021) has re-estimated emissions and remodelled impacts, however, this revised information has only been provided as data tables which have not been clearly explained or cross-referenced. As such, the EPA cannot provide detailed comments on 1. the adequacy of the response or determine if conditions of approval can be provided. 2. Further, the Response to submission includes two pieces of information from separate air quality consultants. The two pieces of correspondence provide some conflicting information (i.e. modelled emission rates). The EPA recommends the proponent presents a revised AQIA in its entirety that includes all the requested additional information and provides the appropriate context to interpret the new and/or changed information.	As requested, this AQIA report presents a revised assessment report, presented as a stand-alone document in its entity.
The emissions inventory includes 1. additional emissions sources and 2. changes in control factors and 3. assumptions that have not been explained or justified. An additional source that was stated to have negligible emissions in the original AQIA is estimated to be a significant source in the Supplementary Air Quality Assessment.	The sources assessed, the emission factors used and the associated assumptions are fully documented in this Revised AQIA. As requested, this AQIA report presents a revised assessment report, presented as a stand-alone document in its entity.

Comment	Response
An adequate assessment of cumulative impacts at industrial and commercial receptors. The Response to Submissions has labelled the receptors R10-R19 as fence-line despite the original AQIA identifying them as industrial.	In regard to health impacts associated with air pollutants, the justification of receptor locations commensurate with the associated averaging time is presented in **Section 4.1.2**. Similarly, the justification of receptor locations relative to odour amenity is presented in **Section 4.1.2** of the Revised AQIA. For clarification, **Appendix D** provides a summary of all predicted impacts at all receptor locations.
Although the adequate assessment of industrial and commercial receptors has not been provided, the incremental impacts in the original AQIA are significant at nearby industrial and commercial receptors. The original AQIA and Supplementary Air Quality Assessment has not undertaken a detailed and robust benchmarking of all mitigation and management measures against best practice to demonstrate that all reasonable and feasible measures for management of emissions is proposed and that offsite impacts can be managed.	As stated above, the justification of receptor locations commensurate with the associated averaging time is presented in **Section 4.1.2** of the revised AQIA and **Appendix D** provides a summary of all predicted impacts at all receptor locations including those at nearby industrial and commercial receptors. That Best Management Practice assessment is discussed in **Section 7.3** of this AQIA report, which presents a comprehensive summary of air quality management measures, and which are tabulated in **Table 37**. **Appendix E** of this AQIA report presents a Best Management Practice assessment, performed in accordance with the relevant guidance (NSW OEH, 2011).
The original AQIA and Supplementary Air Quality Assessment indicates that onsite meteorological and ambient air monitoring is undertaken onsite for day-to-day management of dust control. Yet there is no information about the management control measures including reactive measures and the specific triggers and actions to demonstrate that any reactive management measures proposed can manage offsite impacts	The available on-site meteorological and ambient air quality monitoring currently performed on site is discussed in **Section 4.4.3** and **Section 7.3.6** provides recommendations for the review and revision of that monitoring capability to provide proactive and reactive air quality management responses to be implemented approved through the Air Quality Management Plan. The Air Quality Management Plan includes a 4-hour average trigger concentration to manage offsite impacts.

2. THE PROPOSAL

The following provides a description of the context, location, and scale of the Proposal, and a description of the processes and development activities on site. It also identifies the potential for emissions to air associated with the Proposal.

2.1. Proposal Site

The Proposal site is situated within the Blacktown Local Government Area (LGA) approximately 40 kilometres (km) north-west of the Sydney Central Business District (CBD) and around 3 km from Blacktown CBD. The local area is characterised by general industrial development.

Access is from Tattersall Road, to which the Proposal site has approximately 240 metres (m) of frontage. Tattersall Road is a two-lane road which connects to Sunnyholt Road to the east, and Vardys Road to the north-west, both of which are four lanes. Sunnyholt Road connects in turn to the M7, 1.2 km to the north of the Tattersall Road intersection. The area of the Proposal site is approximately 6.4 hectares (ha).

The location of the Proposal site is shown in **Figure 1**. An aerial view of the Proposal site is shown in **Figure 2**.

Figure 1 Location of the Proposal site

Figure 1 – Location of the Proposal site

Source: Arcadis

Figure 2 The Proposal site

Source: Arcadis

2.2. Proposal Description

The Proposal would be considered SSD under Clause 23 (waste and resource management facilities) of Schedule 1 of the State Environmental Planning Policy (State and Regional Development) 2011, and therefore requires the preparation of an EIS prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) No. 10396 (see **Section 1.4**).

The Proposal is to increase the maximum scrap metal processing throughput at the Proposal site from 350 000 to 600 000 tpa.

The existing infrastructure at the Proposal site has the capacity to accommodate the increased throughput. The Proposal would not require any construction works and would not change the mix of materials currently received at the RRF (i.e. it is an operational approval only). However, adjustments to site management practices would be required in terms of internal vehicle movements and stacking locations to allow the increased throughput.

The Proposal would utilise existing road infrastructure, other utility installations and stormwater discharge points.

The operation of the Proposal site would result in the employment of approximately 80 full time employees at the RRF.

2.2.1. Approved Operating Hours

The approved operational hours for the existing RRF are outlined in **Table 5**.

Table 5 Approved operational hours

Activity	Day	Hours
Oxy-acetylene torch cutting	Monday to Saturday	9 am to 3 pm
	Sunday and public holidays	Nil
Maintenance and cleaning	Monday to Saturday	9 pm to 6 am
	Sunday	24 hours
All other activities	Monday to Saturday	6 am to 9 pm
	Sunday and Public Holidays	Nil

The hours of operations at the RRF would not change as a result of the Proposal.

2.2.2. Capacity and Throughput

The Proposal would facilitate an increased throughput limit from 350 000 to 600 000 tpa of scrap metal.

The AQIA has been based upon the maximum operating capacity and operating hours of process component and this data is taken from the information presented in Table 2-3 of the EIS which is reproduced as **Table 6**.

Table 6 Summary of processing capacity for plant equipment

Table 2-3 – Summary of processing capacity for plant equipment

Processing equipment	Operational capacity (tonnes per hour)[2]	Permissible Operational hours[3]	Daily Capacity (tonnes)	Weekly (tonnes)	Yearly (tonnes)[4]
Non-ferrous baler	10	15	150	900	45,300
Shredder	140	15	2,100	12,600	634,200
Lindemann Shear	7.5	15	112.5	675	33,975
Danieli Shear	17.5	15	262.5	1,575	79,275
Oxycutting	1.5	6	9	54	2,718
Total	**-**	**-**	**2,634**	**15,804**	**795,468**

Source: Arcadis

In terms of addressing the issue of peak daily verses annual average activity rates, adopting the maximum daily throughput capacities as outlined in Table 2-3 of the EIS (see **Table 6**) results in an extrapolated annual throughput of 795 468 $t{\cdot}year^{-1}$ (as presented in that table) which, when compared to the proposed annual throughput threshold of 600 000 $t{\cdot}year^{-1}$, can be seen to represent the worst-case scenario by a factor of approximately ($^{795\,468}/_{600\,000} \times 100$) 133 %.

As illustrated in **Table 6**, the shredder (Hammermill) has a maximum hourly operating capacity of 140 $t{\cdot}hr^{-1}$ and a permissible daily operating period of 15 hours, generating a throughput capacity of 2 100 $t{\cdot}day^{-1}$. The shredder and its associated Emission Collection System (ECS) has been designed to an operating capacity of 140 $t{\cdot}hr^{-1}$. For clarity, the current maximum operating capacity of the shredder is 140 $t{\cdot}hr^{-1}$ and the proposed maximum operating capacity remains unchanged at 140 $t{\cdot}hr^{-1}$.

Emissions testing reports on the shredder and ECS are presented in **Appendix F** and it can be seen that the most recently measured emission concentrations are significantly lower the emission concentration limit values stipulated through Environmental Protection Licence (EPL) 11555 (see **Section 3.1** and **Appendix F**). Based upon this direly measured data, and the fact that the operating capacity remains unchanged at 140 $t{\cdot}hr^{-1}$, it is considered that there is no reasonable evidence to imply that the shredder and ECS cannot continue to comply with the emission limits under EPL 11555.

2.2.3. Material Flow through the Processes

It is understood that the scrap metal processing is generally in accordance with Figure 2-5 of the EIA, which is reproduced below in **Figure 3**.

Additional text boxes have been added to indicate the material flow (t·day^{-1}) through the processes which are derived from the data discussed in **Section 2.2.2**.

Figure 3 Process flow diagram

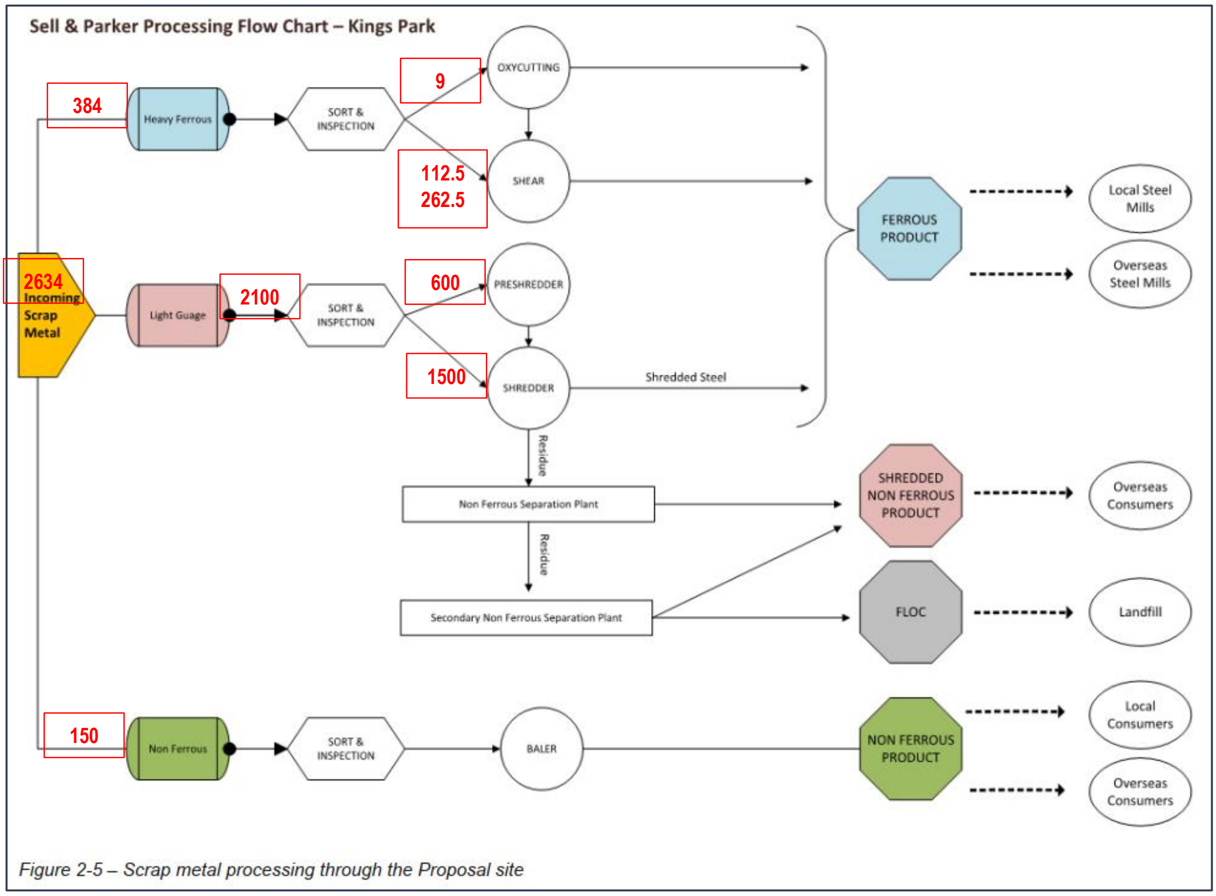


Figure 2-5 – Scrap metal processing through the Proposal site

The incoming waste (2 634 t·day^{-1}) (refer **Table 6**) becomes split into the following process 'streams'

- heavy ferrous fraction, bound for the shears and Oxycutter (at an aggregated maximum daily operating capacity of 384 t·day^{-1});
- light gauge ferrous fraction which is handled by the pre-shredder and shredder or bypasses the pre-shredder and goes directly to the shredder (at a maximum daily operating capacity of 2 100 t·day^{-1});
- non-ferrous fraction which goes straight to the fully enclosed baler (at a maximum daily operating capacity of 150 t·day^{-1}).

The heavy ferrous material (384 t·day^{-1}) is transferring the material to the oxy-cutter (9 t·day^{-1}) and Lindemann and Danieli shears (112.5 t·day^{-1} and 262.5 t·day^{-1}).

The light gauge material is transferred directly to the shredder (1 500 t·day^{-1}) or via the pre-shredder (600 t·day^{-1}), and subsequently transferred from the pre-shedder to the shredder (600 t·day^{-1}).

The increase in plant annual throughput will be achieved through increasing the processing throughput (activity rate) and not by increasing plant capacity.

2.2.4. Plant and Equipment

The existing plant and equipment would be utilised as part of the Proposal. Therefore, there would be no changes to the inventory of plant and equipment.

2.2.5. Identified Potential Emissions to Air

The existing processes operated at the Proposal site have the potential for emissions of particulates, which may be emitted at various particle size ranges. In terms of air quality studies, these may be categorised as total suspended particulates (TSP), particles with a mean aerodynamic diameter of 10 micrometres (μm) and 2.5 μm or less, (PM_{10} and $PM_{2.5}$ respectively).

The operations performed at the Proposal site are regulated by NSW EPA under the Protection of the Environment Operations (POEO) Act (1997) through an Environment Protection Licence (EPL 11555). This is discussed further in **Section 3**. EPL 11555 includes requirements for monitoring of various metals and TSP.

The AQIA has been performed for all metals tested in an emissions testing report, including: Ag, Al, As, Ba, Be, Ca, Cd, Co, Co[II], Cr, Cu, Fe, Fe[I,II], Hg, K, Li, Mg, Mg[IV], Mn, Mo, Na, Ni, P, Pb, Sb, Se, Sn, Th, Zn (refer **Appendix F**).

Reference is also made to the previous assessment reports for the Original Approval. This presents data relating to emissions from various sources including oxides of nitrogen (NO_X as NO_2) and odour.

The source of these assumptions is included in **Appendix F**.

2.3. Proximate Sources

As required under the SEARs for the Proposal (see **Section 1.4**) the AQIA is required to assess ***"…the accumulative impact of this proposal along with adjacent development, particularly to the west of the site."***

The land to the west and immediately adjacent to the Proposal site is currently occupied by Autorecyclers Pty Ltd, although it is noted that Autorecyclers Pty Ltd has currently ceased operations. Currently, that activity has an approved throughput limit of 30 000 tpa and is currently shredding around 9 000 t of cars per year. In 2019, Autorecyclers Pty Ltd made an application for an increase to 130 000 tpa which is understood to be currently under consideration for planning approval. As part of the application, an EIS was submitted, supported by an AQIA (TAS, 2019). Reference has been made to the location of the air quality receptors adopted in that AQIA and the results of the assessment of impacts commensurate with an increased annual throughput of 130 000 tpa. Consideration of receptor locations is presented in **Section 4.1.1** and the potential for cumulative impacts of the Proposal with that were assessed as part of the Autorecyclers Pty Ltd application and is presented in **Section 7.2**.

A search of the NSW EPA EPL database[2] does not show any EPL issued for any activity at that location or held by Autorecyclers Pty Ltd.

2 https://apps.epa.nsw.gov.au/prpoeoapp/default.aspx

3. LEGISLATION, REGULATION AND GUIDANCE

3.1. Protection of the Environment Operations Act

The activities performed at the Proposal site are regulated by NSW EPA under the *Protection of the Environment Operations Act 1997* and the Protection of the Environment Operations (Clean Air) Regulation 2021 through Environmental Protection Licence (EPL) 11555[3]. EPL 11555 contains various conditions of operations to manage environmental impacts, including hours of operation, throughput rates and emission concentration limits. Of relevance to this AQIA, EPL 11555 includes emission limits for metals (type 1 and type 2) and solid particles from the Hammermill Wet Scrubber Stack (licenced emission point 'EPA-3').

Table 7 EPL 11555 air concentration limits (EPA-3 Hammermill Stack)

Pollutant	Units of measure	100 percentile concentration limit	Reference conditions
Type 1 and Type 2 substances in aggregate	milligrams per cubic metre	1	Dry, 273 K, 101.3 kPa
Solid particles	milligrams per cubic metre	20	Dry, 273 K, 101.3 kPa

Appendix F presents NATA Accredited emission test reports performed on the Hammermill (shredder) as required under EPL 11555. A summary of selected emission test data from those reports is presented in **Table 8**.

Table 8 Summary of emission test results (EPA-3 Hammermill Stack)

Pollutant	Units	EPL 11555 Limit Value	Emission Test Report (Issue Date and Ref)				
			26-May-17	27-Sep-18	11-Oct-19	4-Sep-20	26-May-21
			R003396	R006468-1	R008184	R009653	R010794
TSP	$mg \cdot Nm^{-3}$	20	9.3	6.8	3.7	<3	7.3
Type 1 & 2	$mg \cdot Nm^{-3}$	1	<0.017	<0.0076	<0.042	<0.035	<0.051
PM_{10}	$mg \cdot Nm^{-3}$	n/a	6.6	nd	nd	nd	nd
$PM_{2.5}$	$mg \cdot Nm^{-3}$	n/a	<4	nd	nd	nd	nd

The data demonstrates compliance with the air concentration limits presented in **Table 7** for each and every emission test performed over the period 2017 to 2021.

EPL 11555 Condition L5 limits the hours of operation of the Oxycutter to 09:00-15:00 and between 06:00-21:00 for all other activities, consistent with the hours of operation presented in **Table 5**.

EPL 11555 Condition O3 relates to the management of dust:

[3] https://apps.epa.nsw.gov.au/prpoeoapp/ViewPOEOLicence.aspx?DOCID=186196&SYSUID=1&LICID=11555

O3 Dust

O3.1 All operations and activities occurring at the premises must be carried out in a manner that will minimise emission of dust from the premises.

O3.2 The licensee must manage stockpiles of scrap metal and processed material to ensure air emissions are minimised.

O3.3 All areas on the premises must be maintained, at all times, in a condition which effectively minimises the emission of wind-blown or traffic-generated dust.

O3.4 The licensee must ensure that no material, including sediment or oil, is tracked onto public roads from the premises.

O3.5 Ambient real time PM10 Dust Monitors must be installed and operated in accordance with the information supplied to the EPA in the report by ERM, Waste Metal Recovery, Processing and Recycling Facility 45 and 23-43 Tattersall Road, Kings Park, Blacktown, Air Quality Assessment, Sell & Parker Pty Ltd, September 2015.

O3.6 The licensee must keep a legible record of when dust generating activities are reduced or ceased as a result of the dust monitoring required by Condition O3.4 including:

a) the date and time that dust generating activities were reduced or ceased; and

b) what activities were reduced or ceased. These records must be made available to the EPA on request.

3.2. Ambient Air Quality Standards

State air quality guidelines adopted by the NSW EPA are published in the *'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW'* (the Approved Methods) (NSW EPA, 2017), which has been consulted during the preparation of this AQIA.

The Approved Methods lists the statutory methods that are to be used to model and assess emissions of criteria air pollutants from stationary sources in NSW. Section 7.1 of the Approved Methods clearly outlines the impact assessment criteria for the Proposal. The criteria listed in the Approved Methods are derived from a range of sources (including National Health and Medical Research Council (NHMRC), National Environment Protection Council (NEPC), Department of Environment (DoE), World Health Organisation (WHO), and Australian and New Zealand Environment and Conservation Council (ANZECC)). Where relevant to this AQIA (coincident with the potential emissions), the criteria have been adopted as set out in Section 7.1 of the Approved Methods (NSW EPA, 2017) which are presented in **Table 9** below.

Table 9 NSW EPA air quality standards and goals

Pollutant	Averaging period	Units	Criterion	Notes
Nitrogen dioxide (NO_2)	1 hour	$\mu g \cdot m^{-3}$ (a)	246	Numerically equivalent to the AAQ NEPM(b) standards and goals.
	1 year	$\mu g \cdot m^{-3}$	62	
Particulates (as PM_{10})	24 hours	$\mu g \cdot m^{-3}$	50	
	1 year	$\mu g \cdot m^{-3}$	25	
Particulates (as $PM_{2.5}$)	24 hours	$\mu g \cdot m^{-3}$	25	
	1 year	$\mu g \cdot m^{-3}$	8	
Particulates (as TSP)	1 year	$\mu g \cdot m^{-3}$	90	

Pollutant	Averaging period	Units	Criterion	Notes
Particulates (as dust deposition)	1-year [c]	$g \cdot m^{-2} \cdot month^{-1}$	2	Assessed as insoluble solids as defined by AS 3580.10.1
	1-year [d]	$g \cdot m^{-2} \cdot month^{-1}$	4	
Lead	1 year	$\mu g \cdot m^{-3}$	0.5	
Copper dusts and mists	1 hour	$mg \cdot m^{-3}$	0.018	
Iron oxide fumes	1 hour	$mg \cdot m^{-3}$	0.09	
Manganese and compounds	1 hour	$mg \cdot m^{-3}$	0.018	
Chromium (VI)	1 hour	$mg \cdot m^{-3}$	0.00009	

Notes: **(a):** micrograms per cubic metre of air
(b): National Environment Protection (Ambient Air Quality) Measure
(c): Maximum increase in deposited dust level
(d): Maximum total deposited dust level

3.3. Odour

It is noted that odorous materials are not accepted at the Proposal site, but a number of activities performed have the potential to give rise to odour emissions (ERM, 2015).

Impacts from odorous air contaminants are often nuisance-related rather than health-related. Odour performance goals guide decisions on odour management but are generally not intended to achieve "no odour", but manage odour impacts to an acceptable level.

The detectability of an odour is a sensory property that refers to the theoretical minimum concentration that produces an olfactory response or sensation. This point is called the odour detection threshold (ODT) and defines one odour unit (OU). An odour goal of less than 1 OU would (by definition) result in no odour impact being detectable in laboratory conditions. In practice, the character of an odour can only be judged by the receiver's reaction to it, and preferably only compared to another odour under similar social and regional conditions.

Based on the literature available, the level at which an odour is perceived to be a nuisance can range from 2 OU to 10 OU (or greater) depending on a combination of the following factors:

- **Odour quality:** whether an odour results from a pure compound or from a mixture of compounds. Pure compounds tend to have a higher threshold (lower offensiveness) than a mixture of compounds.
- **Population sensitivity:** any given population contains individuals with a range of sensitivities to odour. The larger a population, the greater the number of sensitive individuals it contains.
- **Background level:** whether a given odour source, because of its location, is likely to contribute to a cumulative odour impact. In areas with more closely-located sources it may be necessary to apply a lower threshold to prevent offensive odour.

- **Public expectation:** whether a given community is tolerant of a particular type of odour and does not find it offensive, even at relatively high concentrations. For example, background agricultural odours may not be considered offensive until a higher threshold is reached than for odours from a landfill facility.
- **Source characteristics:** whether the odour is emitted from a stack (point source) or from an area (diffuse source). Generally, the components of point source emissions can be identified and treated more easily using control equipment than diffuse sources. Point sources tend to be located in urban areas, while diffuse sources are more prevalent in rural locations.
- **Health effects:** whether a particular odour is likely to be associated with adverse health effects. In general, odours from agricultural activities are less likely to present a health risk than emissions from industrial facilities.

Experience gained through odour assessments from proposed and existing facilities in NSW indicates that an odour performance goal of 7 OU is likely to represent the level below which "offensive" odours should not occur (for an individual with a 'standard sensitivity' to odours). Therefore, the Odour Technical Framework (DECC, 2006) recommends that, as a design goal, no individual be exposed to ambient odour levels of greater than 7 OU. In modelling and assessment terms, this is expressed as the 99th percentile value, as a nose response time average (approximately one second).

Odour assessment criteria need to consider the range in sensitivities to odours within the community to provide additional protection for individuals with a heightened response to odours. This is addressed in the Technical Framework (DECC, 2006) by setting a population dependant odour assessment criterion, and in this way, the odour assessment criterion allows for population size, cumulative impacts, anticipated odour levels during adverse meteorological conditions and community expectations of amenity. A summary of odour performance goals for various population densities, as referenced in the Odour Technical Notes (DECC, 2006) is shown in **Table 10** This table shows that in situations where the population of the affected community lies between 125 and 500 people, an odour assessment criterion of 4 OU at the nearest residence (existing or any likely future residences) is to be used. For isolated residences, an odour assessment criterion of 7 OU is appropriate.

Table 10 NSW EPA Technical Framework odour criteria

Population of Affected Community	Impact Assessment Criteria for Complex Mixture of Odours (99th percentile 1-second OU)
Urban area (≥2000)	2.0
500 – 2000	3.0
125 – 500	4.0
30 – 125	5.0
10 – 30	6.0
Single residence (≤2)	7.0

Source: The Odour Technical Notes, DECC 2006

It is the view of the NSW EPA that the odour criterion which is applicable in Metropolitan Sydney is 2 OU. Given that this is the most stringent criterion, any intensification in residential development in an area would not result in a change to that criterion.

It is noted that the odour assessment criteria outlined in **Table 10** are a **design** tool rather than a **regulatory** tool. The benchmark for operational facilities is not the odour assessment criteria outlined above but whether the emission of odour is *'offensive'* or being prevented or minimised using best management practices.

The *Protection of the Environment (Operations) Act* 1997 (POEO) is applicable to scheduled activities in NSW and emphasises the importance of preventing 'offensive odour'.

For reference, "offensive odour" is defined within the POEO Act as:

> *an odour:*
>
> *(a) that, by reason of its strength, nature, duration, character or quality, or the time at which it is emitted, or any other circumstances:*
>
> > *(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
> >
> > *(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*
>
> *(b) that is of a strength, nature, duration, character or quality prescribed by the regulations or that is emitted at a time, or in other circumstances, prescribed by the regulations.*

Further to the discussion of factors that determine whether an odorous mixture may be determined to lead to a nuisance, and the impact assessment criterion determined above, numerous papers and articles identify the disconnect between those two drivers that help regulate odour (as referenced in (Graham, Lawrence, & Doyle, 2013)). The description provided in the POEO Act may be summarised as a function of five broad factors, called the FIDOL factors, namely:

- **Frequency:** indicates how often an odour is experienced. Exposure to relatively pleasant odours (such as a bakery, for example) may be perceived to be a nuisance (or 'offensive odour') if it is experienced too frequently., and conversely, a more unpleasant odour may be tolerated if it is experienced hardly ever.
- **Intensity:** indicates the relative strength of the odour;
- **Duration:** in parallel to frequency, duration is an important factor representing the length of time of which an odour exposure is observed;
- **Offensiveness:** indicates how pleasant / unpleasant an odour is to the population. Whilst individuals may express a personal opinion of acceptance to specific odours, it is generally accepted that some odours are more unpleasant than others due to their chemical composition and also a hazard identification function. The relative scale of typical pleasantness / unpleasantness is described as the odour's hedonic tone.

- **Location:** indicates the relationship between the odour experienced and the general perception of amenity that would be expected at that location. An odour that may be tolerated at an industrial site may be less tolerated at a healthcare centre, for example.

4. EXISTING CONDITIONS

4.1. Surrounding Land Sensitivity

4.1.1. Discrete Receptor Locations

Air quality assessments typically use a desk-top mapping study to identify 'discrete receptor locations', which are intended to represent a selection of locations that may be susceptible to changes in air quality. In broad terms, the identification of sensitive receptors, refers to places at which humans may be present for a period representative of the averaging period for the pollutant being assessed. Typically, these locations are identified as residential properties, although other sensitive land uses may include schools, medical centres, places of employment, recreational areas or ecologically sensitive locations.

It is important to note that the selection of discrete receptor locations, is not intended to represent a fully inclusive selection of all sensitive receptors across the study area. The location selected should be considered to be representative of its broader location and may be reasonably assumed to be representative of the immediate environs. In some instances, several viable receptor locations may be identified in a small area, for example a school neighbouring a medical centre. In this instance the receptor closest to the potential sources to be modelled would generally be selected and would be used to assess the risk to other sensitive land uses in the area.

It is further noted that in addition to the identified 'discrete' receptor locations, the entire modelling area is gridded with 'uniform' receptor locations (see **Section 4.1.3**) that are used to plot out the predicted impacts, and as such the accidental non-inclusion of a location that is sensitive to changes in air quality does not render the AQIA invalid, or otherwise incapable of assessing those potential risks.

To ensure that the selection of discrete receptors for the AQIA are reflective of the locations in which the population of the area surrounding the Proposal site reside, population-density data has been examined. Population-density data based on the 2016 census, have been obtained from the Australian Bureau of Statistics (ABS) for a 1 square kilometre (km^2) grid, covering mainland Australia (ABS, 2017). Using a Geographical Information System (GIS), the locations of sensitive receptor locations, have been confirmed with reference to their population densities.

For clarity, the ABS use the following categories to analyse population density (persons·km^{-2}):

- Very high >8,000
- High >5,000
- Medium >2,000
- Low >500
- Very low <500
- No population 0

Using ABS data in a GIS, the population density of the area surrounding the Proposal site are presented in **Figure 4**.

Figure 4 Population density and sensitive receptors surrounding the Proposal site

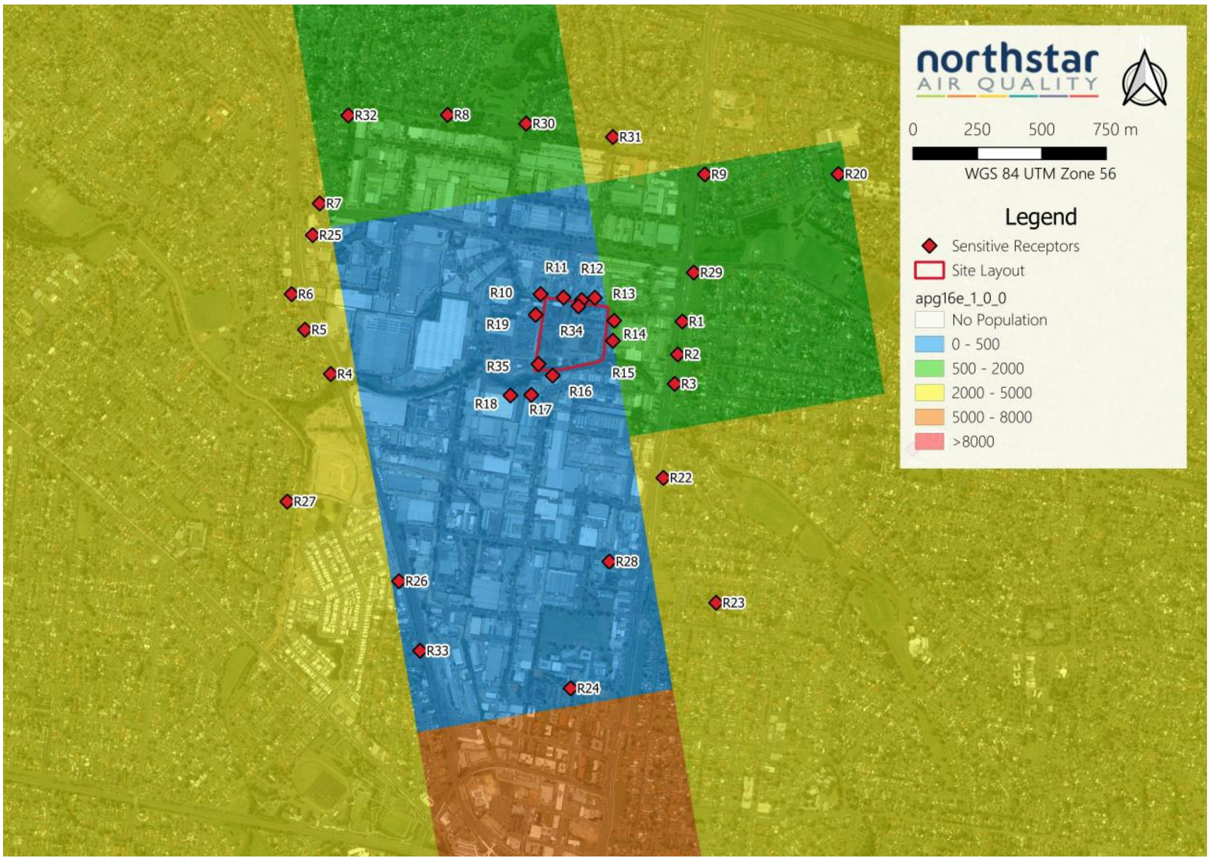


Image courtesy of Google Maps and data sourced from the ABS

The Proposal site and receptors are located in areas of 'very low', 'low' and 'medium' population densities, which would be expected given the largely industrial activities of the immediate area.

In accordance with the requirements of the NSW EPA, several receptor have been identified and the receptors adopted for use within this AQIA are presented in **Table 11** and illustrated in **Figure 4**.

Table 11 includes 35 receptor locations that have been used in this study. To facilitate intra-study assessment and comparison, receptors used in (ERM, 2015) and (TAS, 2019) have been incorporated. It is noted that receptors R10-R19 are industrial land-use receptor locations at, or near to the boundary of the Site, and designed to represent the maximum off-site pollutant concentrations and are not representative of typical community exposure locations.

Receptors R1-4, R6-8, R22 and R28-R33 are used to evaluate the potential cumulative impact with the proposed expansion of the neighbouring Autorecyclers Pty Ltd, as introduced in **Section 2.3** and discussed in **Section 7.2**. R34 and R35 are the locations of the two on-site air quality monitoring stations (named "out station" and "in station" respectively). These receptor locations are not representative of exposure locations but are used as part of the discussion in **Section 7**.

Table 11 Receptor locations used in the study

Rec	Address	Land use	Location (UTM)		Northstar 2020	ERM 2015	TAS 2019
			mE	mS			
R1	1 Anthony Street, Blacktown	Residential	306 993	6 263 656	✓	✓	✓
R2	2 Redwood Street, Blacktown	Residential	306 975	6 263 528	✓	✓	✓
R3	191-209 Sunnyholt, Road Blacktown	Nature Reserve	306 963	6 263 414	✓	✓	✓
R4	5 Chedley Place, Marayong	Residential	305 627	6 263 452	✓	✓	✓
R5	12 Railway Road, Marayong	Residential	305 527	6 263 624	✓	✓	
R6	28 Railway Road, Marayong	Residential	305 475	6 263 762	✓	✓	✓
R7	12 Cobham Street, Kings Park	Residential	305 584	6 264 114	✓	✓	✓
R8	65 Faulkland Crescent, Kings Park	Residential	306 081	6 264 458	✓	✓	✓
R9	32 Elsom Street, Kings Langley	Residential	307 080	6 264 227	✓	✓	
R10	62 Tattersall Road Kings Park	Industrial	306 442	6 263 762	✓	✓	
R11	50 Tattersall Road Kings Park	Industrial	306 531	6 263 749	✓	✓	
R12	38 Tattersall Road Kings Park	Industrial	306 602	6 263 739	✓	✓	
R13	32 Tattersall Road Kings Park	Industrial	306 653	6 263 748	✓	✓	
R14	21 Tattersall Road Kings Park	Industrial	306 728	6 263 659	✓	✓	
R15	21 Tattersall Road Kings Park	Industrial	306 723	6 263 581	✓	✓	
R16	34 Forge Street Blacktown	Industrial	306 489	6 263 446	✓	✓	
R17	24 Forge Street Blacktown	Industrial	306 406	6 263 371	✓	✓	
R18	48 Bessemer Street Blacktown	Industrial	306 325	6 263 369	✓	✓	
R19	57 Tattersall Road Kings Park	Industrial	306 423	6 263 682	✓	✓	
R20	56 Isaac Smith Parade, Kings Langley	Nature Reserve	307 599	6 264 228	✓		
R21	87 Turner Street, Blacktown	School	307 887	6 263 160	✓		
R22	2 Stephen Street, Blacktown	Residential	306 919	6 263 049	✓		✓
R23	24 Bedford Road, Blacktown	Nature Reserve	307 124	6 262 564	✓		
R24	19 Fifth Avenue ,Blacktown	School	306 559	6 262 232	✓		
R25	1 Bowmans Road, Kings Park	Commercial	305 557	6 263 991	✓		
R26	30 Ironwood Crescent, Blacktown	Residential	305 892	6 262 648	✓		
R27	Noel Street, Marayong	Nature Reserve	305 458	6 262 957	✓		
R28	90 Sunnyholt Road Blacktown	School	306 709	6 262 724	✓		✓
R29	305 Vardys Road Blacktown	Residential	307 037	6 263 846	✓		✓
R30	29 Camorta Close Kings Park	Residential	306 386	6 264 424	✓		✓
R31	7 Camorta Close Kings Park	Residential	306 723	6 264 372	✓		✓
R32	49 Cobham Street Kings Park	Residential	305 695	6 264 456	✓		✓

Rec	Address	Land use	Location (UTM)		Northstar 2020	ERM 2015	TAS 2019
			mE	mS			
R33	5 Springfield Avenue Blacktown	Residential	305 974	6 262 378	✓		✓
R34	S&P AQMS "Out station"	On-site	306 589	6 263 715	✓		
R35	S&P AQMS "In station"	On-site	306 434	6 263 491	✓		

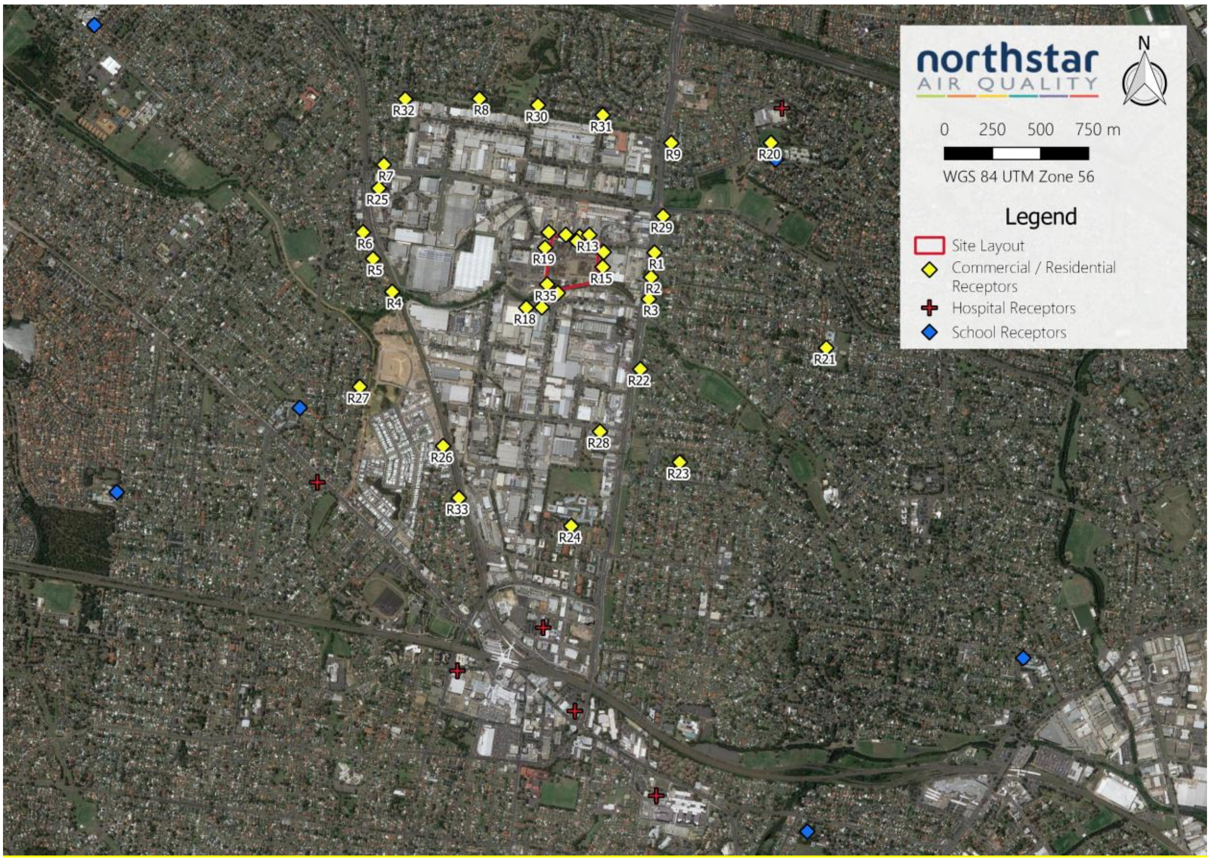
Note: The requirements of this AQIA may vary from the specific requirements of other studies, and as such the selection and naming of receptor locations, may vary between technical reports. This does not affect or reduce the validity of those assumptions.

To specifically address the requirement to identify the locations of schools and hospitals, the following locations presented in **Table 12** have been identified and these locations are presented on **Figure 5**.

Table 12 Identified proximate schools and hospitals

Location	Land use	Coordinates (UTM)		Distance to site (km)
		mE	mS	
Blacktown Hospital	Health Care	307 002	6 260 827	2.7
Kildare Road Medical Centre	Health Care	305 967	6 261 478	2.0
Pacific Medical & Dental Centre	Health Care	306 413	6 261 702	1.8
Blacktown Family Medical Centre	Health Care	306 578	6 261 268	2.2
Richmond Road Medical Centre	Health Care	305 237	6 262 460	1.6
Centre Medical Practice	Health Care	307 657	6 264 408	1.2
Kings Langley Public School	Education	307 624	6 264 141	1.0
Quakers Hill Public School	Education	304 076	6 264 841	2.6
Marrayong Public School	Education	305 146	6 262 847	1.4
Marrayong South Primary School	Education	304 193	6 262 408	2.5
William Rose School	Education	308 912	6 261 544	3.0
Bert Oldfield Public School	Education	307 788	6 260 641	3.1

Figure 5 Identified proximate schools and hospitals



As illustrated in **Figure 5**, the location of the most proximate schools and hospitals are further from the Proposal site than the receptors summarised in **Table 11**, and as such have not been used as discrete receptor locations in the assessment.

4.1.2. Land Use Sensitivity

The following provides additional clarification of how the results of the assessment have been interpreted with regard to the land use and the averaging period of the relevant pollutants.

The results of the modelling assessment used to assess the potential impact of operational phase emissions are assessed sequentially in this AQIA. The impact assessment is principally driven by the requirement to manage potential exposure at locations representative of community exposure locations commensurate with the averaging period(s) for the respective pollutants, as summarised in **Table 13**.

Table 13 Receptor selection and sensitivity

Receptors	Land uses	Context	Exposure
R1-R9	Residential	• Receptor locations used in previous studies (ERM, 2015), (TAS, 2019)[A].	All exposure periods

Receptors	Land uses	Context	Exposure
R10-R19	Industrial	• Representative of surrounding industrial land uses at, or just beyond, the boundary of the site. • Receptor locations used in previous studies (ERM, 2015).	≤ 8 hrs
R20-R33	Residential / community	• Additional receptors selected to represent additional residential / community exposure locations • Receptor locations used in previous studies (TAS, 2019)[B].	All exposure periods
R34-R35	On-site	• On-site air quality monitoring stations	None

Notes: (A) excluding R5 and R9 used in (TAS, 2019) which were not selected for use in this study

(B) relating to R22 and R28-R33.

Receptors R1-R9 are selected as they have been used historically as receptor locations in previous studies (ERM, 2015), (TAS, 2019) and adopting these receptors provides transparency with previous studies.

Receptors R10-R19 are locations have been adopted to help characterise dust control but are not representative of locations where there is potential for longer-term exposure. It is reasonable to expect an individual to be at these locations for around 8-hours per day (typical of a working shift) and are entirely appropriate for the assessment for air quality criteria with an averaging period of 8-hour or less. In this assessment, R10-R19 have been used in the assessment of 1-hour NO_2 and 1-hour (as 1-sec) odour concentrations, for example.

The principal of varying environmental risk by exposure time is intrinsic to all air quality impact criteria / standards and workplace exposure standards, implemented by every jurisdiction, including in NSW. An example of the implementation of this concept into regulation is provided in the Western Australia *Environmental Protection (Kwinana) (Atmospheric Wastes) Regulations* (1992)[4] that sets particulate (as TSP) standards with averaging periods of less than 24-hours at a significantly higher concentration threshold than for the 24-hour period. This should not be interpreted as justification for not employing best practice to reduce air emissions at source but provides a case that is it is unreasonable to impose air pollutant standards at locations where such exposure periods are unrealistic or are not likely to occur.

In regard to odour, it is considered that the sensitivity of the industrial locations at R10-R19 is lower than may be reasonably expected at residential locations, and correspondingly the application of the 2 OU criterion at the industrial locations is considered to be inappropriate. This is discussed in **Section 3.3**, and specifically addresses the "location [L]" component of the FIDOL factors.

Note: Incremental impacts from all pollutants have been assessed and are presented in this report (**Appendix D**), as this is useful to benchmark effective air emission control.

[4] https://www.legislation.wa.gov.au/legislation/statutes.nsf/law_s4417.html

Receptors R20-R33 are representative of additional potential residential / community exposure locations as these represent locations where a reasonable level of amenity is to be anticipated and protected.

Note: It is noted that the above approach is consistent with the selection of sensitive receptor locations and the assessment of of-site air quality impacts adopted in (TAS, 2019).

It is noted that comments (responses) were received in response to the EIS for the proposed expansion of the Autorecyclers Pty Ltd operations from a number of local industrial operators, including:

- Hardware & General Supplies Limited Blacktown - 24/32 Forge St, Blacktown NSW 2148;
- B&E Foods - 25 Bessemer St, Blacktown NSW 2148; and
- Wesfresh Chicken Outlet - 25 Bessemer St, Blacktown NSW 2148.

It is noted that industrial receptors R16, R17 and R18 are adopted in this assessment, and may be considered to be representative of likely exposure predictions at Forge Street. There is no specific receptor located on 25 Bessemer Street, although it is noted that R18 lies between the Proposal site and that address, and R18 may be used as a conservative assessment location for 25 Bessemer Street.

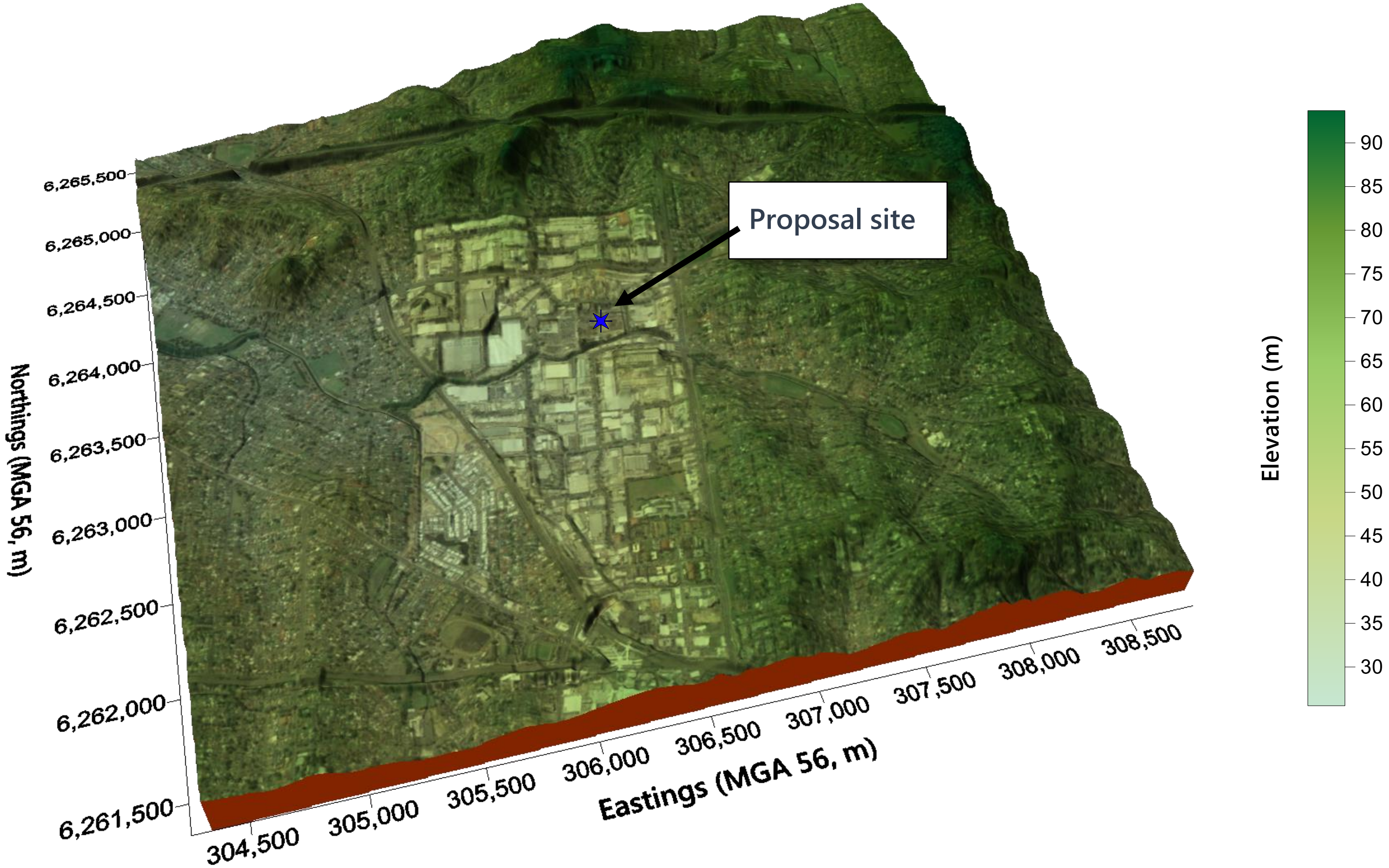
4.1.3. Uniform Receptor Locations

Additional to the sensitive receptors identified in **Section 4.1.1**, a grid of uniform receptor locations has been used in the AQIA to allow presentation of contour plots of predicted impacts.

4.2. Topography

The elevation of the Proposal site is approximately 44 m Australian Height Datum (AHD). The topography between the Proposal site and nearest sensitive receptor locations is uncomplicated. A 3-dimensional representation of the topography surrounding the Proposal site is presented in **Figure 6** overleaf.

Figure 6 Three-dimensional representation of topography surrounding the Proposal site



Source: Northstar Air Quality

Note: MGA – Map Grid of Australia

4.3. Meteorology

The meteorology experienced within an area can govern the generation (in the case of wind-dependent emission sources), dispersion, transport and eventual fate of pollutants in the atmosphere. The meteorological conditions surrounding the Proposal site have been characterised using data collected by the Australian Government Bureau of Meteorology (BoM) at a number of surrounding Automatic Weather Stations (AWS). Meteorology is also measured by DPIE at a number of Air Quality Monitoring Station (AQMS) surrounding the Proposal site (refer **Section 4.4**).

To provide a characterisation of the meteorology which would be expected at the Proposal site, a meteorological modelling exercise has also been performed.

A summary of the inputs and outputs of the meteorological modelling assessment, including validation of those outputs is presented in **Appendix A**.

A summary of the relevant AWS operated by BoM and the DPIE is provided in **Table 14** below (listed by proximity) and also displayed in **Figure 7** overleaf.

Table 14 Details of meteorological monitoring surrounding the Proposal site

Site Name	Source	Approximate Location (UTM)		Approximate Distance
		mE	mS	km
Prospect AQMS	DPIE	306 744	6 258 645	4.9
Rouse Hill AQMS	DPIE	305 670	6 271 042	7.4
Horsley Park Equestrian Centre AWS – Station # 67119	BoM	301 710	6 252 290	12.2
Sydney Olympic Park AWS – Station # 66212	BoM	321 583	6 245 405	17.4

Figure 7 Meteorological monitoring stations surrounding the Proposal site

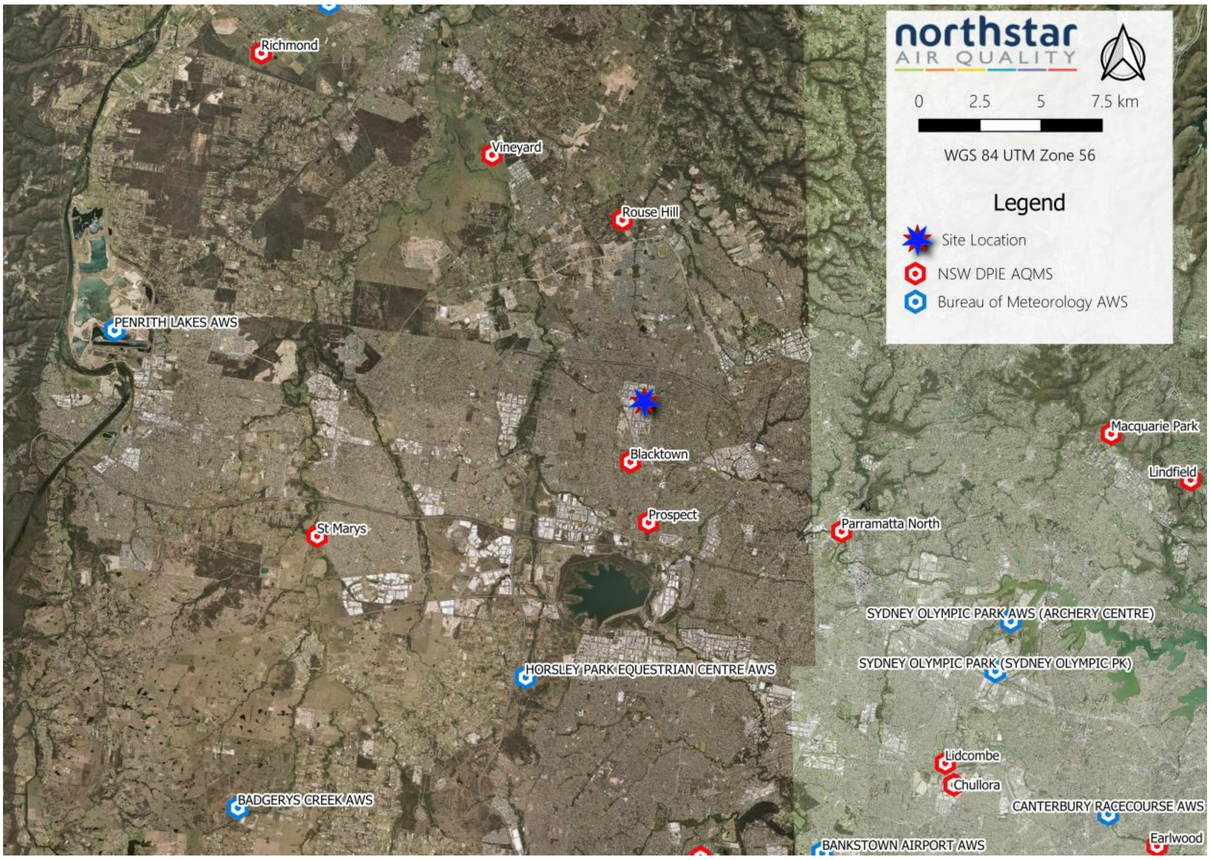


Image courtesy of Google Earth

Note: Blacktown AQMS decommissioned in 2004

The meteorological conditions measured at the identified meteorological stations, are presented in **Appendix A**.

It is considered that Prospect AQMS is most likely to represent the conditions at the Proposal site, based upon its proximity and lack of significant topographical features between the two locations. The wind roses presented in **Appendix A** indicate that from 2015 to 2019, winds at Prospect AQMS show similar wind distribution patterns across the years assessed, with a predominant south-westerly wind direction.

The majority of wind speeds experienced at Prospect AQMS over the 5-year period 2015 to 2019 are generally in the range <0.5 metres per second ($m \cdot s^{-1}$) to 5.5 $m \cdot s^{-1}$ with the highest wind speeds (greater than 8 $m \cdot s^{-1}$) occurring from an easterly direction. Winds of this speed are not frequent, occurring <0.1 % of the observed hours over the 5-year period.

Given the wind distributions across the years examined, data for the year 2018 has been selected as being appropriate for further assessment, as it best represents the general trend across the 5-year period studied. Reference should be made to **Appendix A** for further details.

4.4. Air Quality

4.4.1. DPIE Air Quality Monitoring Stations

The air quality experienced at any location will be a result of emissions generated by natural and anthropogenic sources on a variety of scales (local, regional and global). The relative contributions of sources at each of these scales to the air quality at a location, will vary based on a wide number of factors including the type, location, proximity and strength of the emission source(s), prevailing meteorology, land uses and other factors affecting the emission, dispersion and fate of those pollutants.

When assessing the impact of any particular source of emissions on the potential air quality at a location, the impact of all other sources of an individual pollutant, should also be assessed. This 'background' (sometimes called 'baseline') air quality conditions will vary depending on the pollutants to be assessed and can often be characterised by using representative air quality monitoring data.

The Proposal site is located proximate to a number of AQMS operated by NSW DPIE (**Figure 7** and **Figure 8**).

Figure 8 Air Quality Monitoring Stations surrounding the Proposal site

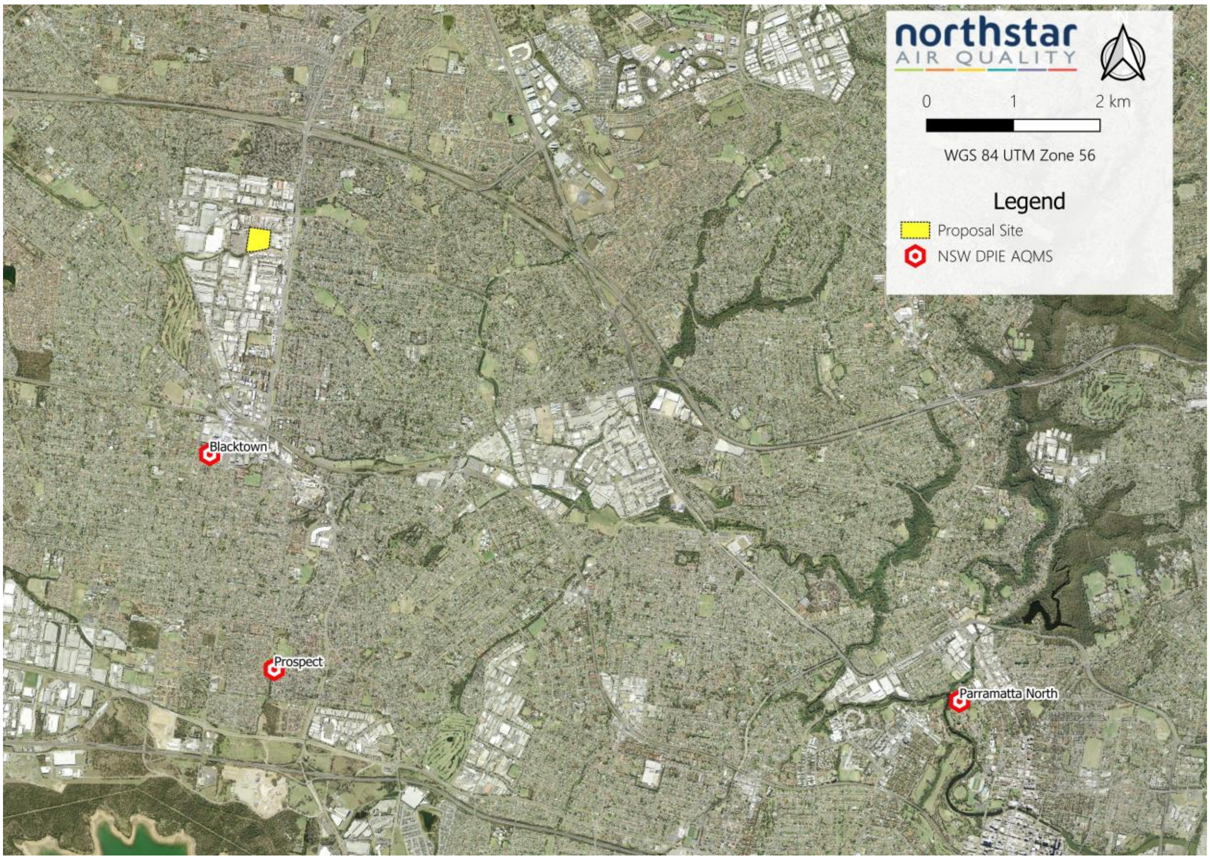


Image courtesy of Google Earth

Note: Blacktown AQMS decommissioned in 2004

It is noted that Blacktown AQMS has been decommissioned, and the closest active AQMS is noted to be located at Prospect and is generally considered to be the monitoring location most reflective of the conditions at the Proposal site.

Appendix B provides a detailed assessment of the background air quality monitoring data collected at the Prospect AQMS.

It is noted that none of the AQMS in proximity to the Proposal site measure Total Suspended Particulate (TSP) which is of relevance to the expected emissions from the Proposal. Based upon long-term historic monitoring data, a numerical relationship between TSP and PM_{10} has been established for the Sydney Metropolitan region. Based upon these data, a relationship between ambient concentrations of TSP : PM_{10} of 2.0551 : 1 is used to approximate background annual average TSP concentrations. This relationship is established and is used frequently to approximate background annual average TSP concentrations in similar locations (see **Appendix B**).

The impact assessment criteria used for deposited dust (see **Table 9**) are presented as (i) a cumulative deposition rate of 4 $g \cdot m^{-2} \cdot month^{-1}$ and (ii) an incremental deposition rate of 2 $g \cdot m^{-2} \cdot month^{-1}$. In lieu of a background deposition rate to derive a cumulative rate, the incremental impact assessment criterion (2 $g \cdot m^{-2} \cdot month^{-1}$) will be used. This is a commonly adopted approach when background deposition rates are not available, and is consistent with (ERM, 2015).

Table 15 presents a summary of the annual average per year (2014-2018) as measured at Prospect AQMS.

Table 15 Air quality background concentrations

Pollutant	Annual average concentration ($\mu g \cdot m^{-3}$)				
	2014	2015	2016	2017	2018
PM_{10}	17.6	17.6	18.9	18.9	21.9
$PM_{2.5}$	7.5	8.2	8.7	7.7	8.5
NO_2	21.1	22.5	20.9	20.1	18.7
O_3	38.5	34.2	36.3	36.3	40.6

Source: NSW DPIE[5]

A detailed summary of the background air quality is presented in **Appendix B**, and a summary of the air quality monitoring data and assumptions used in this assessment are presented in **Table 16**, noting data over the calendar year 2018 has been used to be consistent with the meteorological data used in the assessment (see **Section 4.3**).

5 https://www.dpie.nsw.gov.au/air-quality/air-quality-data-services/data-download-facility

Table 16 Summary of background air quality used in the AQIA

Pollutant	Ave Period	Measured Value	Notes
Particles (as TSP) (derived from PM_{10})	Annual µg·m^{-3}	45.0	Estimated on a TSP:PM_{10} ratio of 2.0551 : 1
Particles (as PM_{10}) (Prospect)	24-hour µg·m^{-3}	Daily Varying	The 24-hour maximum for PM_{10} in 2018 was 113.3 µg·m^{-3} (exceeding the criterion)
	Annual µg·m^{-3}	21.9	
Particles (as $PM_{2.5}$) (Prospect)	24-hour µg·m^{-3}	Daily Varying	The 24-hour maximum for $PM_{2.5}$ in 2015 was 47.5 µg·m^{-3} (exceeding the criterion)
	Annual µg·m^{-3}	8.5	
Dust deposition	Annual g·m^{-2}·month^{-1}	2.0	Difference in NSW DPIE maximum allowable and incremental impact criterion
Nitrogen dioxide (NO_2) (Prospect)	1-hour µg·m^{-3}	104.6	Hourly max 1-hr average in 2018
	Annual µg·m^{-3}	18.7	Annual average in 2018
Ozone (O_3) (Prospect)	1-hour µg·m^{-3}	224.7	Hourly max 1-hr average in 2018
	Annual µg·m^{-3}	39.8	Annual average in 2018

Note: Reference should be made to **Appendix B**

For context, in 2018 NSW experienced record temperatures and persistent dry conditions, with the entire State drought-declared in August 2018. The most extensive dust storm event occurred from 21 to 23 November 2018, when particle levels at many of the sites in the NSW air quality monitoring network exceeded the PM_{10} national standard. Ozone levels peaked in the warmer months from October to March (NSW Annual Air Quality Statement 2018).

On 28 December 2018, ozone levels above the national standards were recorded at Prospect.

In the instance of elevated background air quality conditions, the Approved Methods (NSW EPA, 2017) requires an AQIA to demonstrate that no additional exceedance of the air quality criteria are predicted as a consequence of the operation of the Proposal.

Background air quality monitoring of other pollutants assessed in this AQIA, including metals, are not routinely performed in NSW, or Australia, although specific pollutant monitoring campaigns may be performed to identify and quantify risks surrounding specific emission sources. As such data is not available for the study area, background concentrations of other pollutants, including metals is assumed to be negligible. This is a commonly adopted assumption, and consistent with (ERM, 2015). Ozone data is used to convert emissions of NO_X to NO_2 (see **Section 5.3**)

4.4.2. Exceptional Events

During 2018, local sources of air pollution, including hazard reduction burning, mining and industrial activity, and domestic wood heaters, affected air quality in some locations. As introduced above, particle pollution (PM_{10} and $PM_{2.5}$), also increased due to more frequent 'exceptional' events, such as dust storms, bushfires and hazard reduction burning.

In 2018, there were 51 days where exceptional events led to poor air quality, of which 25 days were affected by dust storms and 26 days were affected by bushfires or hazard reduction burning, and across NSW, most regions experienced some days of poor air quality due to dust storms. Increased hazard reduction burning, to manage bushfire risk, resulted in poor air quality in the Sydney region on some days during autumn and winter.

Annual $PM_{2.5}$ levels above the national standard were recorded at about half of the NSW air quality monitoring stations. This increase was mainly due to smoke from hazard reduction burning and from increased dust due to the drought (NSW OEH, 2018).

In 2018, air quality index (AQI) levels reached the 'hazardous' category (with an AQI greater than 200) on a total of 36 days. In Sydney, the majority of hazardous particle days (92 %) were due to smoke from large hazard reduction burns from April to August (NSW RFS, 2019), and a number of uncontrolled forest fires. Six of the hazardous days were due to dust storms, and these occurred in March, August and November (NSW Govt, 2018a), (NSW Govt, 2018b) The most extensive dust storm event occurred from 21 to 23 November 2018, when particle levels at many of the sites in the NSW air quality monitoring network exceeded the PM_{10} national standard. Sydney had 25 hazardous days in total as follow:

- 21 days in April (seven), May (seven), July (one), August (six) due to hazard reduction burns;
- one day each in April and July due to forest fires;
- one day in June due to a localised unidentified source; and
- one day in November due to an extensive dust storm.

4.4.3. On-Site Monitoring

An ambient air quality monitoring program has historically been performed on site. The on-site monitoring includes measurement of PM_{10} using beta attenuation monitors (BAM) at two locations, named as "In Station" (currently located to the south-west of the Proposal site) and "Out Station" (currently located to the north of the Proposal site), and meteorological monitoring at one location. For the purposes of this AQIA, data monitoring summary reports have been provided by S&P for the period Jan-Dec 2017, Jan-Dec 2018 and Feb 2020.

The locations of the monitoring locations are illustrated in **Figure 9**.

Figure 9 Sell and Parker Blacktown monitoring station locations

Source: Northstar Air Quality

The purpose of having the two monitoring locations is that during specific wind directions, the difference between the two measurements may be generally attributed to an on-site particulate contribution. When the wind is from the north north-east or south south-east directions, the influence of external contributions of particulate is likely to be less significant and the resultant change in measured concentration may be reasonably interpreted as an on-site contribution disregarding background. This metric is used by S&P to quantify on-site particulate emissions, and the 4-hour average PM_{10} concentration is used as an indicator to review the current particulate controls being deployed on site (see **Section 7.3** also).

However, when wind directions are from the east or west quadrants, the difference between the two measurements is less clearly identified and may be more attributed to off-site near-field sources of emissions. This may be more noticeable when the wind is from the western quadrant, and particulate emissions from the neighbouring Autorecyclers Pty Ltd may be a significant contributor under certain conditions. A paired-data correlation between the In-station and Out-station measurements is +0.638 and +0.630 for 2017 and 2018 respectively. The calculated coefficient indicates a reasonable correlation, but as it is not filtered by wind direction, it is influenced by cross-wind flows that do not reflect Proposal site activities.

The monitoring data has been collated from the monthly reports (as 24-hour PM_{10} measurements) and is summarised in **Table 17**. For each 24-hour average PM_{10} concentration, the difference between in In Station and Out Station concentration value has been calculated, irrespective of which station reported the higher value.

Table 17 S&P monitoring data summary (2017-2018)

Year	2017 (24-hr PM_{10} $\mu g \cdot m^{-3}$)			2018 (24-hr PM_{10} $\mu g \cdot m^{-3}$)		
Location	In Station	Out Station	Difference	In Station	Out Station	Difference
Mean	29.5	31.2	13.3	32.5	31.1	11.9
Standard deviation	24.7	28.6	18.0	27.3	22.7	17.5
Skew	*+2.1*	*+3.0*	*+2.8*	*+2.7*	*+1.8*	*+4.6*
Kurtosis	*+5.8*	*+11.4*	*+11.9*	*+11.9*	*+4.2*	*+35.8*
Minimum	2.4	2.4	0.0	3.2	3.3	0.0
Percentile 25	13.2	15.2	1.5	13.7	15.7	1.8
Percentile 50	21.9	22.4	5.7	24.9	25.0	5.5
Percentile 75	39.1	36.7	20.2	41.0	39.3	17.2
Percentile 90	62.0	56.9	34.0	65.3	58.1	32.2
Percentile 95	75.3	89.8	45.1	78.2	80.6	40.4
Percentile 99	131.3	140.8	89.6	135.9	103.3	64.4
Maximum	155.8	213.2	135.6	218.4	154.0	177.4

Deriving data useful for the AQIA is problematic due to the highly variable contributions of:

- background contributions to the measured concentration values, although these should generally contribute a similar concentration at each monitoring location (baring analyser response and the influence of micro-scale wind flows around each monitoring site);
- the variability of short-term (i.e. minutes) on-site dust-generating events to potentially affect longer-term (24-hour) concentration measurements; and
- the influence emissions from the Autorecyclers Pty Ltd, and other proximate sources to the measured concentrations.

The maximum measured 24-hour PM_{10} differential over the period 2017 – 2018 is measured on 3rd August 2018 as 177 $\mu g \cdot m^{-3}$. An excerpt from the raw 1-hour PM_{10} data report over 3rd August 2018 is reproduced in **Table 18**.

Table 18 S&P monitoring data excerpt (3 Aug 2018)

Date/Time	PM_{10} In station ($\mu g \cdot m^{-3}$)	PM_{10} Out station ($\mu g \cdot m^{-3}$)	WS ($m \cdot s^{-1}$)	WD (°)	Sigma (°)	AT 2m (°C)	AT 10m (°C)	SR ($W \cdot m^{-2}$)	Rain (mm)
3/08/2018 14:00	280	85	2.5	335	33	22.4	22.2	506	0.0
3/08/2018 15:00	107	33	1.7	349	40	23.1	22.9	392	0.0
3/08/2018 16:00	-	21	1.7	5	50	23.3	23.2	243	0.0

Date/Time	PM_{10} In station (µg·m^{-3})	PM_{10} Out station (µg·m^{-3})	WS (m·s^{-1})	WD (°)	Sigma (°)	AT 2m (°C)	AT 10m (°C)	SR (W·m^{-2})	Rain (mm)
3/08/2018 17:00	855	67	1.7	356	51	22.2	22.2	84	0.0
3/08/2018 18:00	269	34	0.9	7	51	20.5	20.6	6	0.0
3/08/2018 19:00	71	15	0.9	5	52	19.8	19.9	5	0.0
3/08/2018 20:00	-	29	0.8	4	41	19.6	19.6	6	0.0
3/08/2018 21:00	1244	15	0.9	15	36	18.6	18.7	6	0.0
3/08/2018 22:00	359	10	1.8	332	27	18.9	18.9	6	0.0
3/08/2018 23:00	26	62	3.6	299	29	18.3	18.3	3	0.0
4/08/2018 00:00	465	92	2.7	308	25	15.8	15.9	4	0.0

The selected data above shows high measured 1-hour PM_{10} differentials at the "In station" which is located to the south of the Proposal site, with a peak of >1 mg·m^{-3} at 21:00. The wind speeds are generally typical of a light breeze blowing from the northern quadrant (315° to 45°) which would represent conditions likely to transport on-site emissions to the In station monitoring station.

It is noted that the 1-hour PM_{10} measurements are not a compliance metric, but it does show that under certain conditions it is a useful tool for identifying potential off-site impacts and providing a trigger for appropriate management response.

In light of the above limitations, the most useful metric for the AQIA is the average differential 24-hour PM_{10} concentration of 13.3 µg·m^{-3} and 11.2 µg·m^{-3} for 2017 and 2018 respectively, which represents the average 24-hour on-site increment, albeit acknowledged to be an over-estimation based upon the above factors.

The time series plots of the measured 24-hour PM_{10} concentrations are presented below in **Figure 10** for 2017 (left) and 2018 (right). The corresponding calculated difference is illustrated in **Figure 11**.

Figure 10 S&P 24-hr PM_{10} monitoring data summary (2017 left) (2018 right)

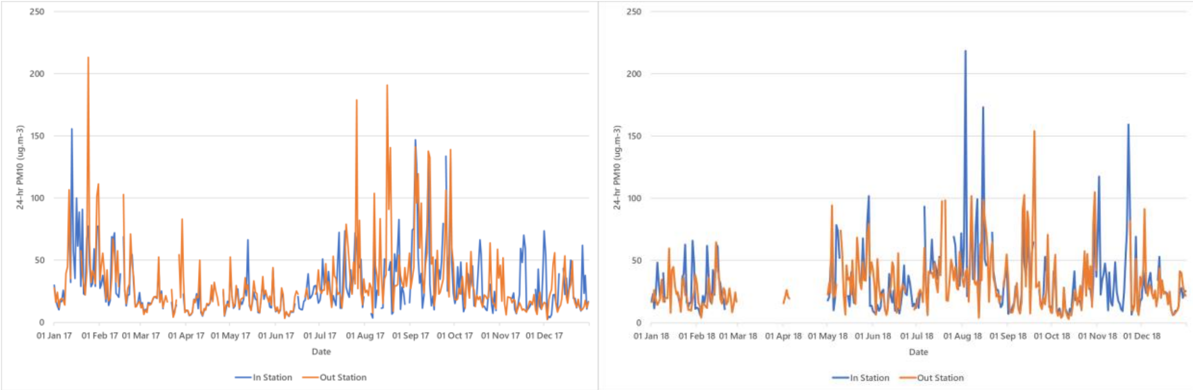
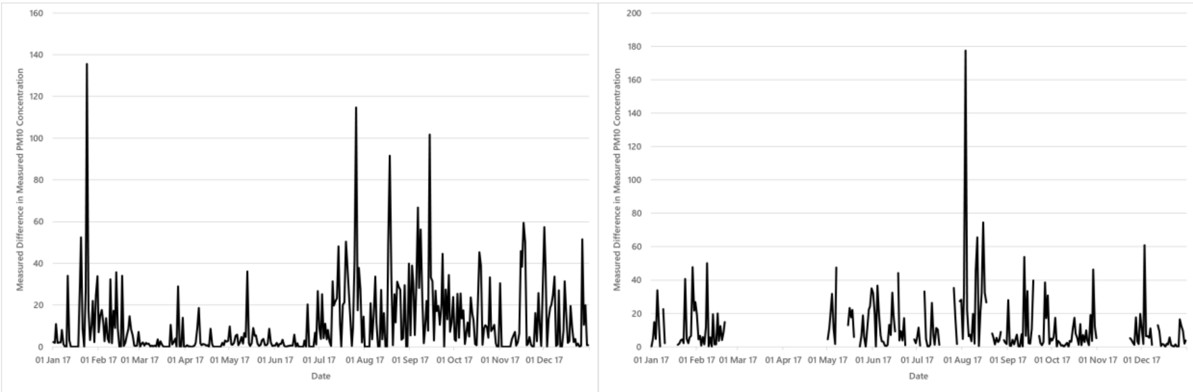


Figure 11 Difference in 24-hr PM_{10} monitoring data (2017 left) (2018 right)



This information is provided for context and descriptive purposes and is not used as part of this AQIA.

Section 7.3.6 provides further discussion, specification and application of the data collected from the two air quality monitoring stations.

5. METHODOLOGY

5.1. Dispersion Modelling

A dispersion modelling assessment has been performed using the NSW EPA approved CALPUFF Atmospheric Dispersion Model. The modelling has been performed using TAPM and processing with CALTAPM, CALMET and CALPUFF, in accordance with the general requirements of the Approved Methods (NSW EPA, 2017). This approach is consistent with that adopted in ERM (2015) which supported the Original Approval.

Table 19 TAPM and CALMET configuration

Model	Parameter	Value
TAPM (4.0.5)	Grid points	35 × 35 × 25
	Grid resolution (km)	30, 10, 3, 1
	Centre point (UTM)	306 258, 6 263 597
	Period	1 January to 31 December 2018
CALMET (6.5.0)	Observation mode	No obs
	Grids	120 × 120
	Vertical levels	12
	Land use	European Space Agency GlobCover Portal
	Elevation	90 m SRTM

An assessment of the impacts of the operation of activities at the Proposal site has been performed, which characterises the likely day-to-day (and hour-to-hour) operation, approximating average operational characteristics which are appropriate to assess against longer term (annual average) and shorter term (24-hr and 1-hr) criteria for emissions to air.

The modelling scenario provides an indication of the air quality impacts of the operation of activities at the Proposal site. The predictions are termed 'incremental impacts'. Added to the incremental impacts are background air quality concentrations (where available and discussed in **Section 4.4** and **Appendix B**), which represent the air quality which may be expected within the area surrounding the Proposal site, without the impacts of the Proposal itself. The addition of background assumptions to the incremental impacts derived the predicted 'cumulative impacts'.

The following provides a description of the determination of appropriate emissions of air pollutants resulting from the operation of the Proposal.

5.2. Emissions Estimation

5.2.1. Scope and Sources

The estimation of emissions from a process is typically performed using direct measurement or through the application of factors, which appropriately represent the processes under assessment. This assessment has used directly measured data for the point sources (i.e. the Hammermill and oxy-cutter) and adopted emission factors from the US EPA AP42 emission factor compendium (US EPA, various) specifically Chapter 13 (Miscellaneous Sources) (USEPA, 2011) for the assessment of particulate matter emissions resulting from batch drop processes which represent material transfer points, Chapter 11 (Mineral Products Industry) which were used to assess the emissions from wind erosion and Chapter 13.2.1 (Paved Roads) (USEPA, 2011) for the assessment of wheel generated particulate from on-site vehicle movements.

Data has been provided by the Applicant to approximate the activities being performed at the Proposal site on a peak basis. These data have been split into disaggregated material flows through the process (e.g. ferrous and non-ferrous materials) (see **Section 2.2**). The emissions inventory is presented in **Appendix C**.

Table 20 presents a summary of the emission sources modelled in the AQIA. The naming convention has been retained from (ERM, 2015) to provide consistency and assist review. Reference should be made to **Section 2.2.3** and **Figure 3**.

Table 20 Assumed peak material activity rates

Source ID	Location		Description	Peak Activity Rate	Units	BPM Group(D)	Notes
	mE	mS					
MH01	306607	6263635	Non-ferrous metal transferred to the non-ferrous processing building	150	$t{\cdot}day^{-1}$	TRANS	(A)
MH02	306519	6263572	Transfer of raw material directly to the inspected stockpile of scrap metal (bypass pre-shredder)	1500	$t{\cdot}day^{-1}$	TRANS	(A)
MH03	306503	6263664	Transfer of raw material directly to the inspected stockpile of scrap metal (bypass pre-shredder)	1500	$t{\cdot}day^{-1}$	TRANS	(A)
MH04	306509	6263576	Transfer of raw material from stockpile to pre-shredder	600	$t{\cdot}day^{-1}$	TRANS	(A)
MH05	306522	6263569	Transfer of raw material from stockpile to pre-shredder	600	$t{\cdot}day^{-1}$	TRANS	(A)
MH06	306523	6263581	Transfer of pre-shredder output to a truck to inspected stockpile of scrap metal close to the conveyor into the hammer mill	600	$t{\cdot}day^{-1}$	TRANS	(A)
MH07	306503	6263664	Transfer of pre-shredder output to a truck to inspected stockpile of ap metal close to the conveyor into the hammer mill	600	$t{\cdot}day^{-1}$	TRANS	(A)
MH08	306503	6263664	Transfer of the inspected stockpile of scrap metal close to the conveyor onto the hammer mill conveyor	2100	$t{\cdot}day^{-1}$	TRANS	(A)
MH09	306483	6263652	Transfer of the inspected stockpile of scrap metal close to the conveyor onto the hammer mill conveyor	2100	$t{\cdot}day^{-1}$	TRANS	(A)
MH10	306503	6263664	Ferrous metals are collected from the stockpile by FEL and loaded into trucks	1050	$t{\cdot}day^{-1}$	TRANS	(A) (2100/2)
MH11	306533	6263680	Ferrous metals are collected from the stockpile by FEL and loaded into trucks	1500	$t{\cdot}day^{-1}$	TRANS	(A) (2100/2)
MH12	306633	6263573	Heavy ferrous pick up	384	$t{\cdot}day^{-1}$	TRANS	(A), (B)
MH13	306561	6263643	Non-ferrous material collected and loaded into trucks	600	$t{\cdot}day^{-1}$	TRANS	(A), (B)
MH14	306603	6263616	Heavy ferrous drop point	384	$t{\cdot}day^{-1}$	TRANS	(A), (B)
TP01	306525	6263577	Pre-shredder drop point	600	$t{\cdot}day^{-1}$	TRANS	(A)

Source ID	Location		Description	Peak Activity Rate	Units	BPM Group(D)	Notes
	mE	mS					
TP02	306517	6263691	The cleaned fragmented material (on a conveyor C1) passes under a drum magnet, where ferrous metals are dropped onto the picking conveyor (C2)	1610	$t \cdot day^{-1}$	CONV	(A)
TP03	306529	6263701	Ferrous metals transferred from C2, where operators remove remaining non-ferrous materials to C3	1610	$t \cdot day^{-1}$	CONV	(A)
TP04	306541	6263711	Ferrous metals are conveyed to the product stockpile	1550	$t \cdot day^{-1}$	CONV	(A)
TP05	306512	6263687	Non-ferrous materials drop beneath the drum magnet to a conveyor (C4) that runs perpendicular to the ferrous product	79	$t \cdot day^{-1}$	CONV	(A)
TP06	306494	6263732	Transfer point at conveyor bend 1	471	$t \cdot day^{-1}$	CONV	(A)
TP07	306563	6263721	Transfer point at conveyor bend 2	471	$t \cdot day^{-1}$	CONV	(A)
TP08	306551	6263643	Transfer point at conveyor bend 3	471	$t \cdot day^{-1}$	CONV	(A)
CV01	306484	6263660	Material from the stockpiles is conveyed into the hammer mill	1800	$t \cdot day^{-1}$	CONV	(A), (C)
CV02	306486	6263672	Material from the stockpiles is conveyed into the hammer mill	1800	$t \cdot day^{-1}$	CONV	(A), (C)
CV03	306489	6263687	Material from the stockpiles is conveyed into the hammer mil	1800	$t \cdot day^{-1}$	CONV	(A), (C)
CV04	306489	6263694	Material from the hammer mill is carried upward by an incline conveyor and dropped into a chute	1800	$t \cdot day^{-1}$	CONV	(A), (C)
CV05	306513	6263691	The cleaned fragmented material from the cascade chute passes under the drum magnet and ferrous metals are removed	1354	$t \cdot day^{-1}$	CONV	(A), (C)
CV06	306520	6263693	Operators remove remaining non-ferrous materials	1354	$t \cdot day^{-1}$	TRANS	(A), (C)
CV07	306527	6263699	Operators remove remaining non-ferrous materials	1354	$t \cdot day^{-1}$	TRANS	(A), (C)
CV08	306534	6263704	Ferrous materials are taken and dropped onto a conveyor, which are conveyed to the product stockpile	1354	$t \cdot day^{-1}$	CONV	(A), (C)
CV09	306538	6263708	Ferrous materials are taken and dropped onto a conveyor, which are conveyed to the product stockpile	1354	$t \cdot day^{-1}$	CONV	(A), (C)
CV10	306514	6263695	Non-ferrous materials are dropped onto a conveyor, which transports material to the conveyor before the non-ferrous processing building	69	$t \cdot day^{-1}$	CONV	(A), (C)

Source ID	Location		Description	Peak Activity Rate	Units	BPM Group(D)	Notes
	mE	mS					
CV11	306515	6263702	Non-ferrous materials are dropped onto a conveyor, which transports material to the conveyor before the non-ferrous processing building	69	$t \cdot day^{-1}$	CONV	(A), (C)
CV12	306516	6263711	Conveys non-ferrous material into the non-ferrous recovery plant	69	$t \cdot day^{-1}$	CONV	(A), (C)
CV13	306491	6263710	Floc product is transferred onto conveyor	377	$t \cdot day^{-1}$	CONV	(A), (C)
CV14	306492	6263718	Floc product is transferred onto conveyor	377	$t \cdot day^{-1}$	CONV	(A), (C)
CV15	306493	6263727	Floc product is transferred onto conveyor	377	$t \cdot day^{-1}$	CONV	(A), (C)
CV16	306503	6263732	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV17	306512	6263731	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV18	306522	6263729	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV19	306533	6263727	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV20	306542	6263726	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV21	306551	6263725	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV22	306558	6263724	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV23	306558	6263713	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV24	306556	6263703	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV25	306555	6263693	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV26	306553	6263683	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV27	306552	6263674	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV28	306551	6263663	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV29	306550	6263653	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV30	306551	6263643	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV31	306557	6263635	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV32	306562	6263625	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
CV33	306567	6263617	Conveyor transports floc product to the post shredder processing building	411	$t \cdot day^{-1}$	CONV	(A), (C)
TRK01	306502	6263580	Truck dumping at raw material delivery	2634	$t \cdot day^{-1}$	TRANS	(A)

Source ID	Location		Description	Peak Activity Rate	Units	BPM Group(D)	Notes
	mE	mS					
TRK02	306503	6263664	Truck carries pre-shredder output to the inspected stockpile of scrap metal close to the conveyor into the hammer mill	600	$t \cdot day^{-1}$	TRANS	(A)
C1	306613	6263608	Oxy-acetylene cutting	9	$t \cdot day^{-1}$	OXY	(A)
WSS01	306567	6263613	Hammermill wet scrubber stack (EPL Point 3)	2100	$t \cdot day^{-1}$	HAMMER	(A)
ROAD1	various	various	Internal road from western gate to eastern gate via shred/floc	42.044	$VKT \cdot day^{-1}$	HAUL	(B)
ROAD2	various	various	Internal road from central gate to eastern gate via non-ferrous	34.608	$VKT \cdot day^{-1}$	HAUL	(B)
ROAD3	various	various	Internal road from western gate to eastern gate via pre-shredder	14.496	$VKT \cdot day^{-1}$	HAUL	(B)
ROAD4	various	various	Internal road from western gate to eastern gate via shears and oxy-cutter	12.972	$VKT \cdot day^{-1}$	HAUL	(B)
WE01	306494	6263578	Scrap stockpile	653	m^2	WE	
WE02	306507	6263543	Scrap stockpile	428	m^2	WE	
WE03	306631	6263571	Post pre-shredder stockpile 1 - at pre-shredder	2100	m^2	WE	
WE04	306503	6263664	Post pre-shredder stockpile 2 - at hammer mill	2562	m^2	WE	
WE05	306542	6263709	Ferrous product stockpile	303	m^2	WE	
WE06	306544	6263695	Ferrous product stockpile	303	m^2	WE	

Notes (A) Activity rates derived from the material flow diagram presented as Figure 2-5 in the EIA (replicated in **Table 6**).

(B) Not considered in the ERM 2015 assessment report, but upon review, these additional transfer points were added.

(C) Assumed to be 100 % controlled in the ERM 2015 assessment report but upon review and inspection on-site, the sources are no longer omitted.

(D) Best Management Practice Dust Control assessment (see **Appendix E**). Activities are assigned to the following groups:

TRANS – material handling and transfer points, incl MH01-MH14, TP01, CV06, CV07, TRK01, TRK02

CONV – conveyors, incl TP02-TP08, CV-01-CV-05, CV08-CV33

OXY – oxy-cutter, C1

HAMMER – hammermill ECS, WSS01

HAUL – internal haul road, incl ROAD1-ROAD4

WE – wind erosion sources incl WE01-WE06

The location of the sources listed in **Table 20** is illustrated in **Figure 12**.

Figure 12 Modelled emission source locations

The following is noted:

- On-site vehicle movements: The surface of the site is entirely paved and watered regularly to manage dust generation. Emissions from on-site vehicle movements have been included within this assessment. A control factor of 30 % has been used for on-site road watering and has been conservatively applied;
- All conveyor points (CV1-CV33) are enclosed with side walls and covers, and are controlled at transfer points with water sprays, and control factors of 70 % and 50 % have been applied respectively (70 % & 50 % = 85 %);
- All material handling processes (MH1-MH14) have actively operating water misting systems, and a control factor of 70 % has been applied;
- Truck dumping will only be operated with dust suppression through water sprays, and a control factor of 70 % has been adopted;
- Emissions of PM_{10} from the Hammermill has been measured at 71 %(w/w) of the TSP emission rate and similarly emissions of $PM_{2.5}$ are measured to represent 44 %(w/w) of TSP.

- Metals from the Hammermill are assumed to be speciated by mass fraction of $PM_{2.5}$ consistently with that assessed by the USEPA[6] as Cr (as Cr_{VI}) 0.04 %(w/w), Cu 0.1 %(w/w); Fe 5.76 %(w/w); Pb 0.49 %(w/w); Mn 0.088 %(w/w); Ni 0.031 %(w/w); Ti 0.025 %(w/w); V 0.001 %(w/w); and Zn 2.1 %(w/w).

Reference should be made to **Appendix C** for the details of the emission estimation.

All material handling, transfer points, conveyors and truck dumping emissions are derived from the AP-42 batch drop estimation. Truck dumping emissions are assumed to be hourly varying with wind speed. Wind erosion sources (material stockpiles) are assumed to be hourly varying.

Dispersion modelling has been performed for the Proposal only. Emissions estimations are provided in **Appendix C**.

5.2.2. Hammermill Emissions

The emissions from the Hammermill Wet Scrubber Stack are regulated under EPL 11555. The emission concentration limit values applicable to this source are presented in **Table 7** (see **Section 3.1**).

S&P has provided a number of emission test reports to inform the assumed emissions from the Hammermill as controlled through the ECS. These test reports are included as **Appendix F** of this report. A summary of the emission test results for Type 1 and Type 2 substances (in aggregate) and particulates is reproduced in **Table 21**.

Table 21 Summary of particulate emission test results from the Hammermill

Pollutant	Units	EPL 11555 Limit Value	Emission Test Report (Issue Date and Ref)				
			26-May-17 R003396	27-Sep-18 R006468-1	11-Oct-19 R008184	4-Sep-20 R009653	26-May-21 R010794
TSP	$mg{\cdot}Nm^{-3}$	20	9.3	6.8	3.7	<3	7.3
Type 1 & 2	$mg{\cdot}Nm^{-3}$	1	<0.017	<0.0076	<0.042	<0.035	<0.051
PM_{10}	$mg{\cdot}Nm^{-3}$	n/a	6.6	nd	nd	nd	nd
$PM_{2.5}$	$mg{\cdot}Nm^{-3}$	n/a	<4	nd	nd	nd	nd

The maximum emission rate ($g{\cdot}s^{-1}$) for each pollutant derived from the emission test reports listed above has been used as the emission rate in this supplementary report (highlighted in **Table 21**). The maximum measured concentration of each metal species (R003396 to R009653 inclusive) has been adopted in this assessment. Emission conditions (discharge velocity, temperature, etc) are reasonably constant, and the values measured in the most recent test report have been adopted. These data are presented in **Appendix F**.

6 https://www.epa.gov/air-emissions-modeling/speciate

Note: It is noted that the emission test reports include evidence of a 'reducing cone' attached to the discharge point of the Hammermill. The reduction in the discharge diameter increases the discharge velocity of the gas emitted from the Hammermill and also a marginal (1.2 m) increase in the discharge height (both of which improve the potential for dispersion) have been incorporated in this assessment.

The Hammermill (and associated ECS) has been designed to manage emissions at a capacity processing rate of 140 $t{\cdot}hr^{-1}$, which is incorporated into the assessment (see **Table 6**). The emission test reports demonstrate compliance with EPL 11555 emission concentration limits. Under the new proposal the hourly processing rate (140 $t{\cdot}hr^{-1}$) does not change therefore the emission rate is not anticipated to change. The most recent measured TSP concentration (i.e. most reflective of current operations), is less than 15 % of the emission limit, and the Type 1 and 2 emissions are less than 1 % of the limit value (see **Table 21**). It is considered that the emission test reports provide directly measured evidence to demonstrate that the emission collection system can accommodate the proposed increased throughput.

It is noted that the Proposal is for increased throughput based on efficiency of use of current plant. It is noted that the ECS will remain subject to strict emissions testing imposed through conditions in EPL 11555 and subject to review by NSW EPA.

The adopted odour emission rate from the Hammermill is derived from measurements reported in Emissions Testing Report N92746 (EML Air, June 2014) which is presented in its entirety in **Appendix F**. Odour was measured as two repeat tests, each comprising two replicate samples with four determinations in total, as reproduced in **Table 22**.

Table 22 Measured odour emissions from the Hammermill (EML Air, June 2014)

Replicate	Test	Concentration (OU)	Description
1	Test 1	1 000	Mildly Unpleasant/Distinct Acidic
	Test 2	1 600	Mildly Unpleasant/Distinct Acid
	Average	1 300	-
2	Test 1	940	Mildly Unpleasant/Distinct Metal
	Test 2	650	Mildly Unpleasant Metal
	Average	790	-

For the purposes of this assessment, the maximum measured odour emission (1 600 OU) has been used to represent odour emissions from the Hammermill, which is noted to be a conservative assumption.

It is recommended that the next scheduled NATA accredited emission testing event on the Hammermill ECS under EPL 11555 is supplemented to include measurement of NO_X, H_2S, HF and HCl, Cl_2 and odour, in addition to the requirement for the measurement of particulates, particulate and vapour phase metals.

5.2.3. Oxycutter Emissions

The emissions estimation for the Oxycutter is presented in **Appendix C** and the test reports are presented in **Appendix F** (EML Air, June 2014) (Ektimo, Sep 2019).

It is noted that the emissions test report and the derived emission inventory includes particulates and all measured metal species (Ag, Al, As, Ba, Be, Ca, Cd, Co, Co[II], Cr, Cu, Fe, Fe[I,II], Hg, K, Li, Mg, Mg[IV], Mn, Mo, Na, Ni, P, Pb, Sb, Se, Sn, Th, Zn), NO_X and odour as measured during an emission test during September 2019 (Ref: R007718) which is presented in **Appendix F**.

In regard to the contribution to site-wide emissions, emission estimates are provided in **Appendix E** as part of the Best Management Practice assessment.

It is recommended that the operation of the Oxycutter is kept under review.

5.2.4. Vehicle Emissions

The movement of vehicles on the paved road surfaces are included as sources in the assessment, and are described in **Appendix C**.

As reported in the Traffic Assessment (TTPP, November 2021), the number of heavy vehicles entering the site on the busiest hour is anticipated to be 33 vehicles per hour (10:00 and 14:00), with a further maximum of 10 light vehicles per hour (10:00), representing approximately 1 vehicle every 01:25 minutes and a total vehicle movement of 423 heavy vehicles and 89 light vehicles per day.

For context, the provided traffic survey data measured on Tattersall Road during February to March 2020 reports a weekday average 2-way traffic flow of 5 531 vehicles. In context of the traffic movements on Tattersall Road, the contribution of site traffic is low, and the contribution of exhaust emissions is correspondingly low. Based upon the above, the significance of site-traffic exhaust is considered minor (i.e. <10 %) and is not considered to warrant a detailed assessment.

For clarity, the contribution of wheel generated particulate emissions has been included.

5.2.5. Odour

In this AQIA it is assumed that the sources generating odour emissions are the odour emission sources are limited to the Oxycutter and the Hammermill Wet Scrubber Stack, which is consistent with (ERM, 2015).

The odour emission rate for the Oxycutter used in the assessment is derived from test report R00718 (September 2019) which was appended to letter report from ERM (ref: 0462777_L04, dated 19 September 2019). EPA responded to that letter report in January 2020 (ref: DOC20/42792, dated 30 January 2020).

The source of the odour emission rate for the Hammermill is Emissions Testing Report N92746 (EML Air, June

2014) which is presented in its entirety in **Appendix F** and which was provided as part of the EIS for SSD 5041.

The NATA accredited emission test reports from which the odour emission rates have been derived are presented in **Appendix F**.

A peak to mean ratio of 2.3 has been applied to the predicted 1-hour odour impacts, as required under (NSW EPA, 2017)

5.2.6. Summary

Emission estimates for each activity are presented in **Appendix C**, which also presents the assumed variables for each emission factor adopted. The following tables sequentially present the activity rates and subsequently the emission estimation for each activity.

- **Table 44** **Emission estimates- point source emissions**
- **Table 45** **Emission estimate – volume source emissions – peak activity rates**
- **Table 46** **Emission estimate – volume source emissions – peak emission rates**
- **Table 47** **Emission estimate – open area wind erosion sources – peak activity rates**
- **Table 48** **Emission estimate – open area wind erosion sources – peak emission rates**
- **Table 49** **Emission estimate – wheel generated dust – peak activity rates**
- **Table 50** **Emission estimate – wheel generated dust – peak emission rates**

It is important to note that the above tables in **Appendix C** are based upon the peak daily emission estimates discussed in **Section 2.2** and presented in **Table 20** and the purpose of which is to perform the dispersion modelling assessment based on peak activity rates. Those emission estimates have been used to assess the short-term and long-term impact predictions, acknowledging that they will be a highly conservative means of predicting long-term (i.e. annual average) impacts.

Appendices C and **E** of this assessment includes a requirement by NSW EPA for the following:

> *The proponent must include total emissions per year for each activity and as an entire site in the emission inventory*

To specifically address that requirement, Appendix C additionally presents annual emission estimates in the following tables:

5.3. NO_X to NO_2 Conversion

The emission rates of oxides of nitrogen (NO_X) have been modelled as nitrogen dioxide (NO_2). Approximately 90% - 95% of NO_X from a combustion process will be emitted as NO, with the remaining 5% - 10% emitted directly as NO_2. Over time and after the point of discharge, NO in ambient air will be transformed by secondary atmospheric reactions to form NO_2, and this reaction often occurs at a considerable distance downwind from the point of emission, and by which time the plume will have dispersed and diluted significantly from the concentration at point of discharge.

Air quality impact assessments need to account for the conversion of NO to NO_2 to enable a comparison against the air quality criterion for NO_2. To perform this, various techniques are common, which are briefly outlined below:

- **100% conversion**: the most conservative assumption is to assume that 100% of the total NO_X emitted is discharged as NO_2, and that further reactions do not occur.
- **Jansen method**: where the location is represented by good monitoring data for NO and NO_X, the empirical relationship between NO and NO_2 may be used to derive 'steady state' relationships.
- **Ozone limiting method**: this method uses contemporaneous ozone data to estimate that rate at which NO is oxidised to NO_2 hour-on-hour using an established relationship.

This AQIA has used an assumption of 100 % conversion of NO_X to NO_2, in accordance with the methodology described in (NSW EPA, 2017).

6. RESULTS

This section presents the results of the dispersion modelling assessment and uses the following terminology:

- Incremental impact – relates to the concentrations predicted as a result of the construction and operation of the Proposal in isolation.
- Cumulative impact – relates to the incremental concentrations predicted as a result of the construction and operation of the Proposal PLUS the background air quality concentrations discussed in **Section 4.4**.

The results are presented in this manner to allow examination of the likely impact of the Proposal in isolation and the contribution to air quality impacts in a broader sense.

In the presentation of results, the tables included shaded cells which represent the following:

Model prediction	Pollutant concentration / deposition rate less than the relevant criterion	**Pollutant concentration / deposition rate equal to, or greater than the relevant criterion**

Reference should be made to **Appendix D** which tabulates the results of the modelling at all receptor locations, irrespective of whether they represent community locations, industry receptors or on-site receptors.

The isopleth plots of predicted (i) annual average incremental TSP concentrations, (ii) incremental 24-hour PM_{10} concentrations (iii) incremental 24-hour $PM_{2.5}$ concentrations and (iv) incremental 1-hour NO_2 concentrations are presented in **Appendix E**.

Where incremental impacts are predicts as less than (<) the relevant reporting range, the cumulative impact has been calculated at 100 % of the reporting threshold.

Reference should be made to **Section 4.1.1** and **Table 13** for discussion on the interpretation of predicted results with regard to the respective pollutant averaging time.

For the purposes of ongoing air quality management, **Appendix D** presents a full summary predicted impacts at all receptor locations.

6.1. Annual Average TSP, PM_{10} and $PM_{2.5}$

Incremental and cumulative annual average TSP, PM_{10} and $PM_{2.5}$ impacts are presented in **Table 23** for R1-R9 and R20-R33. Reference should be made to **Appendix D** for a full summary of predicted impacts at all receptor locations.

Table 23 Predicted incremental annual average TSP, PM_{10} and $PM_{2.5}$ concentrations

Receptor	Annual Average Concentration ($\mu g{\cdot}m^{-3}$)								
	TSP			PM_{10}			$PM_{2.5}$		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R1	1.2	44.8	46.0	0.4	21.8	22.2	0.1	8.5	8.6
R2	1.1	44.8	45.9	0.4	21.8	22.2	<0.1	8.5	8.6
R3	0.9	44.8	45.7	0.3	21.8	22.1	<0.1	8.5	8.6
R4	0.6	44.8	45.4	0.2	21.8	22.0	<0.1	8.5	8.6
R5	0.5	44.8	45.3	0.2	21.8	22.0	<0.1	8.5	8.6
R6	0.4	44.8	45.2	0.2	21.8	22.0	<0.1	8.5	8.6
R7	0.3	44.8	45.1	0.1	21.8	21.9	<0.1	8.5	8.6
R8	0.4	44.8	45.2	0.2	21.8	22.0	<0.1	8.5	8.6
R9	0.4	44.8	45.2	0.2	21.8	22.0	<0.1	8.5	8.6
R20	0.2	44.8	45.0	<0.1	21.8	21.9	<0.1	8.5	8.6
R21	0.1	44.8	44.9	<0.1	21.8	21.9	<0.1	8.5	8.6
R22	0.4	44.8	45.2	0.2	21.8	22.0	<0.1	8.5	8.6
R23	0.2	44.8	45.0	<0.1	21.8	21.9	<0.1	8.5	8.6
R24	0.2	44.8	45.0	<0.1	21.8	21.9	<0.1	8.5	8.6
R25	0.4	44.8	45.2	0.1	21.8	21.9	<0.1	8.5	8.6
R26	0.3	44.8	45.1	0.1	21.8	21.9	<0.1	8.5	8.6
R27	0.4	44.8	45.2	0.1	21.8	21.9	<0.1	8.5	8.6
R28	0.4	44.8	45.2	0.1	21.8	21.9	<0.1	8.5	8.6
R29	0.9	44.8	45.7	0.3	21.8	22.1	<0.1	8.5	8.6
R30	0.4	44.8	45.2	0.2	21.8	22.0	<0.1	8.5	8.6
R31	0.4	44.8	45.2	0.2	21.8	22.0	<0.1	8.5	8.6
R32	0.3	44.8	45.1	0.1	21.8	21.9	<0.1	8.5	8.6
R33	0.3	44.8	45.1	0.1	21.8	21.9	<0.1	8.5	8.6
Criterion	-	90		-	25			8	

The results do not predict an exceedance of the annual average TSP or PM_{10} criteria. The annual average $PM_{2.5}$ criterion is predicted to be exceeded, but these impacts are associated with a background contribution already exceeding the criterion (see also **Section 4.4** and **Table 16**). The assessment does not predict the operation of the Proposal would lead to any additional exceedances of the relevant criteria.

6.2. 24-hour Average PM_{10} and $PM_{2.5}$

6.2.1. Incremental Impacts

Maximum incremental 24-hour PM_{10} and $PM_{2.5}$ impacts are presented in **Table 24** for R1-R9 and R20-R33. Reference should be made to **Appendix D** for a full summary of predicted impacts at all receptor locations.

Table 24 Predicted incremental 24-hour average PM_{10} and $PM_{2.5}$ concentrations

Receptor	Maximum 24-hour average concentration ($\mu g \cdot m^{-3}$)	
	PM_{10}	$PM_{2.5}$
R1	4.7	1.2
R2	**6.2**	**1.6**
R3	4.5	1.2
R4	2.1	0.6
R5	1.8	0.5
R6	1.9	0.5
R7	1.9	0.5
R8	1.9	0.5
R9	1.9	0.5
R20	1.4	0.4
R21	1.2	0.3
R22	3.6	1.0
R23	2.0	0.5
R24	1.9	0.5
R25	1.8	0.5
R26	1.6	0.5
R27	2.1	0.6
R28	2.1	0.6
R29	4.3	1.2
R30	2.7	0.7
R31	2.4	0.6
R32	1.4	0.4
R33	1.1	0.3

6.2.2. Cumulative Impacts

Cumulative impacts are assessed as incremental impact aggregated with the background concentration assumptions discussed in **Section 4.4** and **Appendix B**, and are presented in **Table 25** and **Table 26**.

Results are presented for the receptor at which the highest incremental PM_{10} and $PM_{2.5}$ impacts have been predicted (see **Table 24**), and also for the receptors at which the highest cumulative impacts (increment plus background) have been predicted. These may often be different receptors than those at which the highest incremental impacts are predicted.

The left side of the tables show the predicted concentration on days with the highest cumulative predictions (generally driven by the highest background concentration days), and the right side shows the total predicted concentration on days with the highest predicted incremental concentrations. Correspondingly, **Table 25** presents impacts at R2 for PM_{10} and **Table 26** for $PM_{2.5}$.

Table 25 Predicted cumulative 24-hour average PM_{10} concentrations

Date	24-hour average PM_{10} concentration R2 ($\mu g \cdot m^{-3}$)			Date	24-hour average PM_{10} concentration R2 ($\mu g \cdot m^{-3}$)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
22/11/2018	1.4	113.3	114.7	12/07/2018	6.2	20.0	26.2
19/03/2018	<0.1	70.2	70.3	13/06/2018	4.2	14.1	18.3
28/05/2018	<0.1	65.8	65.9	21/05/2018	3.4	17.5	20.9
18/07/2018	3.3	61.9	65.2	18/07/2018	3.3	61.9	65.2
15/02/2018	<0.1	61.6	61.7	23/05/2018	2.9	29.3	32.2
29/05/2018	<0.1	58.7	58.8	17/08/2018	2.9	20.0	22.9
21/11/2018	0.7	55.7	56.4	14/06/2018	2.8	12.6	15.4
19/07/2018	<0.1	54.4	54.5	4/08/2018	2.8	22.3	25.1
18/03/2018	1.3	47.9	49.2	27/07/2018	2.8	31.2	34.0
14/04/2018	<0.1	47.8	<47.9	14/08/2018	2.5	18.6	21.1
These data represent the highest Cumulative Impact 24-hour PM_{10} predictions outlined in red as a result of the operation of the project.				These data represent the highest Incremental Impact 24-hour PM_{10} predictions outlined in blue as a result of the operation of the project.			

The results predict exceedances of the 24-hour PM_{10} criterion, although these are shown to be driven by elevated background concentrations already exceeding the criterion (see also **Section 4.4** and **Table 16**).

Critically, the assessment does not predict the operation of the Proposal would lead to any additional exceedances of the relevant 24-hour PM_{10} criterion.

Table 26 Predicted cumulative 24-hour average $PM_{2.5}$ concentrations

Date	24-hour average $PM_{2.5}$ concentration R2 ($\mu g \cdot m^{-3}$)			Date	24-hour average $PM_{2.5}$ concentration R2 ($\mu g \cdot m^{-3}$)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
29/05/2018	<0.1	47.5	47.6	12/07/2018	1.6	13.8	15.4
28/05/2018	<0.1	42.5	42.6	13/06/2018	1.1	6.9	8.0
6/05/2018	0.3	27.1	27.4	27/07/2018	0.8	19.5	20.3
27/05/2018	<0.1	27.0	27.1	21/05/2018	0.8	7.4	8.2
15/07/2018	0.5	23.1	23.6	23/05/2018	0.8	11.3	12.1
9/05/2018	<0.1	21.7	21.8	18/07/2018	0.8	8.9	9.7
25/04/2018	<0.1	20.6	20.7	14/06/2018	0.8	5.2	6.0
27/07/2018	0.8	19.5	20.3	17/08/2018	0.8	9.4	10.2
8/05/2018	0.2	19.9	20.1	4/08/2018	0.7	9.2	9.9
26/08/2018	0.6	18.4	19.0	22/06/2018	0.7	17.0	17.7
These data represent the highest Cumulative Impact 24-hour PM_{10} predictions outlined in red as a result of the operation of the project.				These data represent the highest Incremental Impact 24-hour PM_{10} predictions outlined in blue as a result of the operation of the project.			

The results predict exceedances of the 24-hour $PM_{2.5}$ criterion, although these are shown to be driven by elevated background concentrations already exceeding the criterion (see also **Section 4.4** and **Table 16**).

Critically, the assessment does not predict the operation of the Proposal would lead to any additional exceedances of the relevant 24-hour $PM_{2.5}$ criterion.

6.3. Nitrogen Dioxide

Incremental and cumulative 1-hour and annual average NO_2 impacts are presented in **Table 27**. The results schedules report concentrations at R1-R33, as those receptor locations are relevant to a 1-hour averaging period. The results at R34 and R35 are not shown as they are on-site monitoring locations and are not representative of potential off-site exposure locations.

Reference should be made to **Appendix D** for a full summary of predicted impacts at all receptor locations

It is noted that the assessment assumes a 100 % conversion of NO_X to NO_2 (see **Section 5.3**) and adopts the highest 1-hour measured NO_2 concentration and the annual average NO_2 concentration as background values.

Table 27 Predicted incremental 1-hour and annual average NO_2 concentrations

Rec.	Nitrogen dioxide (NO_2) concentration ($\mu g{\cdot}m^{-3}$)					
	1 hour			Annual Average		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R1	1.0	104.6	105.6	0.01	18.7	18.7
R2	0.9	104.6	105.5	0.01	18.7	18.7
R3	0.8	104.6	105.4	0.01	18.7	18.7
R4	0.5	104.6	105.1	0.01	18.7	18.7
R5	0.4	104.6	105.0	0.00	18.7	18.7
R6	0.4	104.6	105.0	0.00	18.7	18.7
R7	0.4	104.6	105.0	0.00	18.7	18.7
R8	0.7	104.6	105.3	0.01	18.7	18.7
R9	0.8	104.6	105.4	0.01	18.7	18.7
R10	1.1	104.6	105.7	0.06	18.7	18.8
R11	1.8	104.6	106.4	0.07	18.7	18.8
R12	2.3	104.6	106.9	0.05	18.7	18.8
R13	2.6	104.6	107.2	0.05	18.7	18.7
R14	2.1	104.6	106.7	0.04	18.7	18.7
R15	1.3	104.6	105.9	0.04	18.7	18.7
R16	3.5	104.6	108.1	0.09	18.7	18.8
R17	1.8	104.6	106.4	0.05	18.7	18.8
R18	1.2	104.6	105.8	0.04	18.7	18.7
R19	1.4	104.6	106.0	0.05	18.7	18.8
R20	0.5	104.6	105.1	0.00	18.7	18.7
R21	0.6	104.6	105.2	0.00	18.7	18.7
R22	0.7	104.6	105.3	0.00	18.7	18.7
R23	0.6	104.6	105.2	0.00	18.7	18.7
R24	0.5	104.6	105.1	0.01	18.7	18.7
R25	0.5	104.6	105.1	0.00	18.7	18.7
R26	0.4	104.6	105.0	0.01	18.7	18.7
R27	0.4	104.6	105.0	0.01	18.7	18.7
R28	0.6	104.6	105.2	0.01	18.7	18.7
R29	0.9	104.6	105.5	0.01	18.7	18.7
R30	0.6	104.6	105.2	0.01	18.7	18.7
R31	0.8	104.6	105.4	0.01	18.7	18.7
R32	0.5	104.6	105.1	0.00	18.7	18.7
R33	0.4	104.6	105.0	0.00	18.7	18.7
Criterion		246			62	

The results do not predict any exceedances of the 1-hour or annual average NO_2 criteria.

6.4. Metals

Metals are assessed as the respective fraction of $PM_{2.5}$, as indicated in **Section 5.2** as Cr (as Cr_{VI}) 0.04 %(w/w), Cu 0.1 %(w/w); Fe 5.76 %(w/w); Pb 0.49 %(w/w); Mn 0.088 %(w/w); Ni 0.031 %(w/w); Ti 0.025 %(w/w); V 0.001 %(w/w); and Zn 2.1 %(w/w).

The maximum incremental 1-hour $PM_{2.5}$ prediction is 25.4 $\mu g \cdot m^{-3}$ at R11 (an industrial receptor). Accounting for the contribution of site-wide emissions (as a worst case assumption) rather than just the Hammermill in isolation and the above mass fractions derives maximum 1-hour concentrations of the following:

- Cr (assessed as Cr_{VI}) 0.01 $\mu g \cdot m^{-3}$ (11.3 % of the criterion)
- Cu 0.03 $\mu g \cdot m^{-3}$ (0.1 % of the criterion)
- Fe 1.46 $\mu g \cdot m^{-3}$ (1.6 % of the criterion)
- Mn 0.02 $\mu g \cdot m^{-3}$ (0.1 % of the criterion)

Lead (Pb) has an annual average criterion. The maximum (non-industrial) concentration has been used for the assessment. The maximum annual average $PM_{2.5}$ prediction of <0.1 $\mu g \cdot m^{-3}$ and a Pb fraction of 0.49 % derives an annual average lead concentration of 0.0005 $\mu g \cdot m^{-3}$ (0.1 % of the criterion).

Background concentrations of metals are assumed to be negligible (see **Section 4.4.1**), and therefore the assessment considers incremental impacts only, or alternatively, the incremental impact is equal to the cumulative impact.

The results do not predict any exceedances of the respective 1-hour metals criteria nor the annual average Pb criterion.

6.5. Annual Average Dust Deposition

Incremental and cumulative deposited dust impacts are presented in **Table 28**. Reference should be made to **Appendix D** for a full summary of predicted impacts at all receptor locations

Table 28 Predicted incremental & cumulative dust deposition rates

Receptor	Annual Average Dust Deposition ($g \cdot m^{-2} \cdot month^{-1}$)		
	Incremental Impact	Background	Cumulative Impact
R1	0.1	2.0	2.1
R2	<0.1	2.0	<2.1
R3	<0.1	2.0	<2.1
R4	<0.1	2.0	<2.1
R5	<0.1	2.0	<2.1
R6	<0.1	2.0	<2.1
R7	<0.1	2.0	<2.1
R8	<0.1	2.0	<2.1

Receptor	Annual Average Dust Deposition ($g \cdot m^{-2} \cdot month^{-1}$)		
	Incremental Impact	Background	Cumulative Impact
R9	<0.1	2.0	<2.1
R10	1.3	2.0	3.3
R11	3.2	2.0	5.2
R12	1.95	2.0	3.9
R13	1.0	2.0	3.0
R14	0.7	2.0	2.7
R15	0.7	2.0	2.7
R16	0.9	2.0	2.9
R17	0.4	2.0	2.4
R18	0.3	2.0	2.3
R19	1.8	2.0	3.8
R20	<0.1	2.0	<2.1
R21	<0.1	2.0	<2.1
R22	<0.1	2.0	<2.1
R23	<0.1	2.0	<2.1
R24	<0.1	2.0	<2.1
R25	<0.1	2.0	<2.1
R26	<0.1	2.0	<2.1
R27	<0.1	2.0	<2.1
R28	<0.1	2.0	<2.1
R29	<0.1	2.0	<2.1
R30	<0.1	2.0	<2.1
R31	<0.1	2.0	<2.1
R32	<0.1	2.0	<2.1
R33	<0.1	2.0	<2.1
Criterion	2	-	2

The results predict a minor exceedance of the annual average dust deposition rate at R11, which is an industrial location at close proximity to the Proposal site. This assessment presents a Best Management Practice Dust Control assessment in **Appendix E**, which identifies opportunities for proactive dust control.

6.6. Odour

Incremental 99th percentile odour impacts are presented in **Table 29** at receptors R1-R9 and R20-R33 representing locations where amenity impacts are to be managed. Reference should be made to **Appendix D** for a full summary of predicted impacts at all receptor locations

Table 29 Predicted incremental 99th percentile odour impacts

Receptor	99th percentile nose response time odour concentration (OU)
R1	0.2
R2	0.2
R3	0.2
R4	0.1
R5	0.1
R6	0.1
R7	0.1
R8	0.1
R9	0.1
R20	0.1
R21	0.0
R22	0.1
R23	0.0
R24	0.1
R25	0.1
R26	0.1
R27	0.1
R28	0.1
R29	0.2
R30	0.1
R31	0.1
R32	0.1
R33	0.1
Criterion	2.0

The assessment does not predict any exceedance of the 2 OU odour impact criterion at any receptors.

In accordance with the requirements of the POEO (see **Section 3.3**) odour is to be assessed and controlled from each premises to not give rise to offensive odour.

Correspondingly, odour is assessed as discrete emissions only although the potential cumulative impacts are discussed considering the AQIA supporting the neighbouring operations of Autorecyclers Pty Ltd (see **Section 2.3** and **Section 7.2**).

7. DISCUSSION AND CONCLUSION

7.1. Compliance with Air Quality Criteria

The prediction of potential impacts associated with operational activities has been performed in general accordance with the requirements of the NSW Approved Methods (NSW EPA, 2017), using an approved and appropriate dispersion modelling technique. The estimation of emissions has been performed using referenced emission factors, and this is documented in **Section 5.2** and **Appendix C**.

The predicted incremental and cumulative impacts from the operation of the Proposal are presented in **Section 6**, which may be compared to the relevant air quality criteria outlined in **Section 3**. Based upon the assumptions presented in this report, the AQIA does not predict there to be any exceedances of the air quality criteria with the exception of the following

- In regard to annual average $PM_{2.5}$ the Proposal is not predicted to result in any additional exceedances. The background annual average $PM_{2.5}$ of 8.5 $\mu g \cdot m^{-3}$ already exceeds the impact assessment criterion of 8.0 $\mu g \cdot m^{-3}$. See **Section 6.1**;
- In regard to 24-hour PM_{10}, the Proposal is not predicted to result in any additional exceedance. Exceedances at R2 are presented in **Table 25**, which is caused by background 24-hour PM_{10} concentrations already exceeding the impact assessment criterion. See **Section 6.2**;
- In regard to 24-hour $PM_{2.5}$, the Proposal is not predicted to result in any additional exceedances. Exceedances at R2 are presented in **Table 26**, which is caused by daily-varying background 24-hour $PM_{2.5}$ concentrations already exceeding the impact assessment criterion. See **Section 6.2**;
- In regard to annual average dust deposition, an exceedance is predicted at R11, which is at an industrial location and not a residential receptor location. See **Section 6.5**.

On all occasions of predicted exceedances of the 24-hour PM_{10} and $PM_{2.5}$ criteria, the assessment is driven by elevated background conditions, that would give rise to exceedances, irrespective of any contribution of the Proposal site.

7.2. Aggregated Impacts with Autorecyclers Pty ltd

Reference has been made to the AQIA (TAS, 2019) submitted as part of the EIS for the extension of throughput to 130 000 tpa at the neighbouring site (see **Section 2.3**).

To facilitate the assessment of aggregated potential impacts, the discrete impact assessment results have been extracted from that AQIA and are summarised in the section below. Reference is made to **Section 2.3** and **Section 4.1.1** for the discussion of how the discrete receptor locations were selected for this purpose, and the co-incidence of receptors in the studies is tabulated below. It is noted that the co-ordinates of the receptor locations in (TAS, 2019) are not presented in that report and have been approximated from a desktop mapping exercise.

The predicted results associated with the list of common receptors presented in **Table 30** have been used for this aggregated impact exercise.

Table 30 Aggregated impact receptors

Northstar Receptor	TAS Receptor	mE	mS	Northstar Receptor	TAS Receptor	mE	mS
R1	R3	306 993	6 263 656	R22	R2	306 919	6 263 049
R2	R4	306 975	6 263 528	R28	R1	306 709	6 262 724
R3	R5	306 963	6 263 414	R29	R6	307 037	6 263 846
R4	R13	305 627	6 263 452	R30	R8	306 386	6 264 424
R6	R12	305 475	6 263 762	R31	R7	306 723	6 264 372
R7	R11	305 584	6 264 114	R32	R10	305 695	6 264 456
R8	R9	306 081	6 264 458	R33	R15	305 974	6 262 378

The calculated aggregated annual average TSP, PM_{10} and $PM_{2.5}$ concentrations are presented in **Table 31** overleaf, and the corresponding 24-hour average PM_{10} and $PM_{2.5}$ concentrations are presented in **Table 32**.

The aggregated assessment has used the maximum incremental impact predicted in this study with the respective contemporaneous 24-hour background and aggregated this with the maximum 24-hour increment predicted from emissions associated with the proposed Autorecyclers Pty Ltd throughput expansion to 130 000 tpa. It is noted that this is a highly conservative assumption, as the incremental impacts are not necessarily contemporaneous.

Table 31 Predicted aggregated annual average TSP, PM_{10} and $PM_{2.5}$ concentrations

Rec	TAS Rec	Northstar (2020)						TAS (2019)			Estimated Aggregate		
		TSP		PM_{10}		$PM_{2.5}$		TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
		Incr	BG	Inc	BG	Inc	BG	Inc	Inc	Inc	Aggr	Aggr	Aggr
		A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*A+B+G*	*C+D+H*	*E+F+I*
R1	R3	1.2	44.8	0.4	21.8	0.1	8.5	0.3	0.2	0.1	46.3	22.4	8.7
R2	R4	1.1	44.8	0.4	21.8	0.1	8.5	0.4	0.2	0.1	46.3	22.4	8.7
R3	R5	0.9	44.8	0.3	21.8	0.1	8.5	0.5	0.2	0.1	46.2	22.3	8.7
R4	R13	0.6	44.8	0.2	21.8	0.1	8.5	0.4	0.2	0.1	45.8	22.2	8.7
R6	R12	0.4	44.8	0.2	21.8	0.1	8.5	0.3	0.1	0.1	45.5	22.1	8.7
R7	R11	0.3	44.8	0.1	21.8	0.1	8.5	0.2	0.1	0.1	45.3	22.0	8.7
R8	R9	0.4	44.8	0.2	21.8	0.1	8.5	0.3	0.1	0.1	45.5	22.1	8.7
R22	R2	0.4	44.8	0.2	21.8	0.1	8.5	0.2	0.1	0.1	45.4	22.1	8.7
R28	R1	0.4	44.8	0.1	21.8	0.1	8.5	0.2	0.1	0.1	45.4	22.0	8.7
R29	R6	0.9	44.8	0.3	21.8	0.1	8.5	0.6	0.3	0.1	46.3	22.4	8.7
R30	R8	0.4	44.8	0.2	21.8	0.1	8.5	0.3	0.1	0.1	45.5	22.1	8.7
R31	R7	0.4	44.8	0.2	21.8	0.1	8.5	0.3	0.2	0.1	45.5	22.2	8.7
R32	R10	0.3	44.8	0.1	21.8	0.1	8.5	0.2	0.1	0.1	45.3	22.0	8.7
R33	R15	0.3	44.8	0.1	21.8	0.1	8.5	0.3	0.1	0.1	45.4	22.0	8.7
Criterion	-	-	-	-	-	-	-	-	-	-	90	25	8

Note Incr = incremental impact ($\mu g{\cdot}m^{-3}$), BG = background ($\mu g{\cdot}m^{-3}$), aggr = aggregate ($\mu g{\cdot}m^{-3}$) (comprised of Northstar increment + background + TAS increment

Table 32 Predicted aggregated 24-hour PM_{10} and $PM_{2.5}$ concentrations

Rec	TAS Rec	Northstar (2020)				TAS (2019)		Estimated Aggregate	
		PM_{10}		$PM_{2.5}$		PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
		Inc	BG	Inc	BG	Inc	Inc	Aggr	Aggr
		A	*B*	*C*	*D*	*E*	*F*	*A+B+E*	*C+D+F*
R1	R3	4.7	20.0	1.2	13.8	3.0	1.0	27.7	16.0
R2	R4	6.2	20.0	1.6	13.8	3.4	1.2	29.6	16.6
R3	R5	4.5	20.0	1.2	13.8	3.0	1.1	27.5	16.1
R4	R13	2.1	22.9	0.6	10.7	2.3	0.8	27.3	12.1
R6	R12	1.9	18.4	0.5	13	2.4	0.9	22.7	14.4
R7	R11	1.9	22.1	0.5	13.3	2.1	0.8	26.1	14.6
R8	R9	1.9	13.9	0.5	6.6	1.9	0.7	17.7	7.8
R22	R2	3.6	8.9	1.0	6.8	1.5	0.5	14.0	8.3
R28	R1	2.1	58.7	0.6	47.5	1.8	0.5	62.6	48.6
R29	R6	4.3	18.9	1.2	16.1	2.9	0.9	26.1	18.2
R30	R8	2.7	11.3	0.7	7.7	2.1	0.8	16.1	9.2
R31	R7	2.4	20.0	0.6	6.9	2.4	0.8	24.8	8.3
R32	R10	1.4	22.1	0.4	13.3	1.4	0.6	24.9	14.3
R33	R15	1.1	17.9	0.3	11	1.7	0.6	20.7	11.9
Criterion	-	-	-	-	-	-	-	50	25

Note Incr = incremental impact ($\mu g \cdot m^{-3}$), BG = background ($\mu g \cdot m^{-3}$), aggr = aggregate ($\mu g \cdot m^{-3}$) (comprised of Northstar increment + background + TAS increment

Table 31 indicates that the annual average $PM_{2.5}$ concentrations are predicted to exceed the relevant air quality criteria at all receptors. However, as highlighted in **Section 4.4**, the background is (in itself) exceeding the air quality criterion. The incremental annual average $PM_{2.5}$ predictions from both sites are predicted to be 0.1 $\mu g \cdot m^{-3}$ or less at all receptors.

The assessment predicts an exceedance of the 24-hour PM_{10} and $PM_{2.5}$ criteria at R28, however this is noted to be driven by already exceeding background PM_{10} and $PM_{2.5}$ concentrations, and the assessment does not predict any additional exceedances of the relevant criterion.

With regard to odour, the aggregated impact is estimated as shown in **Table 33**.

Table 33 Predicted aggregated 99th percentile 3-second odour concentrations

REC	TAS Rec	Northstar (2021)	TAS (2019)	Estimated Aggregate
		OU (3-sec OU)		
R1	R3	0.2	0.2	0.4
R2	R4	0.2	0.2	0.4
R3	R5	0.2	0.2	0.4
R4	R13	0.1	0.3	0.4
R6	R12	0.1	0.2	0.3
R7	R11	0.1	0.2	0.3
R8	R9	0.1	0.2	0.3
R22	R2	0.1	0.1	0.2
R28	R1	0.1	0.1	0.2
R29	R6	0.2	0.3	0.5
R30	R8	0.1	0.2	0.3
R31	R7	0.1	0.2	0.3
R32	R10	0.1	0.2	0.3
R33	R15	0.1	0.1	0.2
Criterion	-	-	-	2

It is appreciated that the above approach is limited in that it aggregates two discrete sets of 99th percentile values, but it is limited as to the data available. It is noted that the meteorological period adopted in each assessment differs, however the above aggregates the corresponding maximum (as 99th percentile) predictions at each receptor, independently of wind conditions, and will therefore be conservative.

Based upon the above, it is considered that the aggregated impact of the Proposal with the proposed expansion of Autorecyclers Pty Ltd should not cause any exceedance of the relevant odour criterion.

The aggregated assessment presented above does not predict any additional exceedances of any criteria.

7.3. Air Quality Management

7.3.1. Committed Air Quality Management Measures

It is noted that (ERM, 2015) presented a series of best practice measures to be implemented by reference to the relevant EU Integrated Pollution Prevent & Control (IPPC) Bureau reference documents, including waste treatment which includes: "***common waste treatments such as the temporary storage of waste, blending and mixing, repackaging, waste reception, sampling, checking and analysis, waste transfer and handling installations, and waste transfer stations***"[7]. The site-specific mitigation measures identified in (ERM, 2015) and to be implemented to achieve best available techniques included measures for:

- Managing, receiving and recording incoming raw material streams, and identification of unacceptable materials, including spot checks;
- Procedural visual material checks at the point of raw material reception, raw material handling at the cutter, subsequent transfer, control cabin;
- Non-acceptance of cars with LPG cylinders;
- Draining of petrol and oil from scrap cars and storage in above-ground storage tanks for removal off-site;
- Waste and product storage to control emissions to atmosphere;
- Full and complete enclosure of all conveyors and conveyor transfer points;
- Operation of an "Emission Collection System" is regulated through EPL 11555 to manage and control emissions from the Hammermill;
- Operation of all oxy-cutting processes under wet conditions to manage the emissions of NO_X and metal fumes;
- Operation of water sprays / mists on all material handling activities, and the collection of subsequent run-off within an on-site retention basin;
- Regular sweeping of on-site surfaces to minimise wheel-generated emissions from plant and vehicles;
- Management of dust emissions through the Environmental Management Plan (EMP).

Table 34 below provides a summary of the committed mitigation measures and an update from S&P regarding implementation.

Table 34 Committed air quality control measures

Committed Mitigation Measure (ERM, 2015)	Implementation Status	Comments
Managing, receiving and recording incoming raw material streams, and identification of unacceptable materials, including spot checks	Implemented	All loads are inspected to comply with the conditions imposed to EPL 11555

7 https://eippcb.jrc.ec.europa.eu/reference/waste-treatment-0

Committed Mitigation Measure (ERM, 2015)	Implementation Status	Comments
Procedural visual material checks at the point of raw material reception, raw material handling at the cutter, subsequent transfer, control cabin	Implemented	All loads are inspected to comply with the conditions imposed to EPL 11555
Non-acceptance of cars with LPG cylinders	Implemented	Any LPG End of Life Vehicles (ELV) are returned to the supplier or sent for third-party treatment.
Draining of petrol and oil from scrap cars and storage in above-ground storage tanks for removal off-site	Implemented	It is noted that the vast majority of ELV received are already drained prior to receival on site.
Waste and product storage to control emissions to atmosphere	Implemented	Floc and non-ferrous are stored in enclosed buildings.
Full and complete enclosure of all conveyors and conveyor transfer points;	Implemented	Conveyors are enclosed with water sprays at transfer points
Operation of an "Emission Collection System" is regulated through EPL 11555 to manage and control emissions from the Hammermill	Implemented	The "Emission Collection System" is operational and regulated as EPA ID 3 "Hammermill Stack through EPL 11555. (See also **Section 5.2.2**).
Operation of all oxy-cutting processes under wet conditions to manage the emissions of NO_X and metal fumes	Implemented	Water suppression provided by Spraystream 25i (or equivalent)
Operation of water sprays / mists on all material handling activities, and the collection of subsequent run-off within an on-site dam	Implemented	All surface run off is directed by gravity flow to the retention basin.
Regular sweeping of on-site surfaces to minimise wheel-generated emissions from plant and vehicles	Implemented	Currently performed with two permanent sweepers and a hired third-party sweeper (a required).
Management of dust emissions through the Environmental Management Plan (EMP)	Implemented	Air quality is managed through the AQMP, implemented through the EMS.

As may be determined from **Table 34**, S&P have implemented all identified control measures in (ERM, 2015), with the exception that material stored in enclosures are not subject to water sprays, as it is not required due to the controls offered by enclosure.

7.3.2. Proposed Air Quality Management Measures

The AQIA is underpinned by an emissions estimation that is described in **Section 5.2** and **Appendix C** which accounts for various "control factors" on various sources, as derived from published sources. The control factors applied are commensurate with operational controls described by S&P and implemented though the EPL and also operational procedures.

As requested by NSW EPA, this AQIA includes a benchmarked evaluation of potential control measures that may be reasonably implemented at the Proposal site. **Appendix E** of this AQIA includes a Best Management Practice Dust Control assessment, performed in accordance with the NSW EPA requirements and standard procedure (NSW OEH, 2011) which provides a comprehensive Best Management Practice assessment to transparently and systematically benchmark and evaluate control measures that may be considered for the operations at the Proposal site.

The benchmarking of those emissions, the evaluation of potential control options and the recommendations for further control measures are presented in **Appendix E**. Based upon the assumptions presented, the implementation of those best practice measures is estimated to offer the following emission reductions, when compared to uncontrolled emissions:

- Reduce emissions of particulate from haulage by 65 % of uncontrolled estimates;
- Reduce emissions of particulate from conveying materials by 85 % of uncontrolled estimates; and
- Reduce emissions of particulate from material handling and transfer by 51 % of uncontrolled estimates.

A summary of the recommended controls is presented below in **Table 35**. It is noted that a number of these controls have been implemented by S&P and this has been noted in the table.

Table 35 Summary of adopted control measures

Control Measure	Regulatory Requirements RISK	Environmental Impacts RISK	Safety Implications RISK	Compatibility with Current Processes and Future Developments RISK	Conclusion of Evaluation
Haulage					
Sweeping	RISK = LOW	RISK = LOW	RISK = LOW	RISK = LOW	☑ Adopted potential measure **RH1**
Watering	RISK = LOW	RISK = LOW	RISK = MEDIUM	RISK = LOW	☑ Already implemented control
Conveying					
Enclosure of transfers	RISK = LOW	RISK = LOW	RISK = LOW	RISK = LOW	☑ Adopted potential measure **C1**
Water sprays	RISK = LOW	RISK = LOW	RISK = LOW	RISK = LOW	☑

Control Measure	Regulatory Requirements RISK	Environmental Impacts RISK	Safety Implications RISK	Compatibility with Current Processes and Future Developments RISK	Conclusion of Evaluation
					Already implemented control
Handling and transfer					
Water sprays during truck unloading	RISK = LOW	RISK = LOW	RISK = LOW	RISK = LOW	☑ Already implemented control
Water sprays	RISK = LOW	RISK = LOW	RISK = LOW	RISK = LOW	☑ Adopted potential measure **HT1**
Minimisation of drop height	RISK = LOW	RISK = LOW	RISK = LOW	RISK = LOW	☑ Adopted potential measure **HT2**

7.3.3. Implementation through the EMS

This AQIA does not seek to replace the S&P Environmental Management System (EMS) as the published / approved EMS includes various commitments implemented to comply with the conditions associated with the Original Approval, including the Air Quality Management Plan (AQMP) (Arcadis, 2019) However, to comply with the requirement of the SEARs (see **Section 1.4**) this AQIA proposes additions in accordance with the assumptions and commitments determined through the BMP assessment (as outlined in **Table 35** and **Appendix E**).

The EMS will be updated by S&P as per the Conditions of the new consent.

7.3.4. Hammermill

The NATA endorsed emission testing reports performed on the Hammermill and the associated ECS are presented (in full) in **Appendix F**. Selected data are also summarised in **Table 8** and **Table 21**.

The maximum measured TSP emission concentration of 9.3 mg·Nm^{-3} (Ektimo, May 2017) is 47 % of the EPL 11555 emission concentration limit.

The maximum measured Type 1 and 2 emission concentration of <0.051 mg·Nm^{-3} (upper bound concentration) is less than 5.1 % of the EPL 11555 emission concentration limit.

The data presented in the NATA endorsed emission testing reports do not show any exceedance of any emission concentration limits imposed through EPL 11555.

It is noted that the assessment utilises the maximum measured TSP emission concentration value, and also the maximum speciated Type 1 and Type 2 metal concentration value, irrespective of the report.

With reference to **Appendix E**, the Best Management Practice assessment estimates the emission from the Hammermill of 4.1 kg·day^{-1} is approximately 3.7 % of the uncontrolled peak daily site emission estimate of 111 kg·day^{-1}.

Corresponding, irrespective of the fact that the hammermill is screened from consideration in the Best Management Practice assessment, in accordance with the procedure outlined in (NSW OEH, 2011), additional controls on the hammermill are not considered to be warranted.

7.3.5. Oxycutter

Emissions from oxycutting are not subject to emission concentration limits in EPL 11555. However, NATA accredited emission testing report performed on the Oxycutter are presented in **Appendix F** (EML Air, June 2014), (Ektimo, Sept 2019).

With reference to data presented in the NATA accredited test reports presented in **Appendix F**, the Best Management Practice assessment (presented in **Appendix E**) estimates the particulate emission from the Oxycutter of 0.3 kg·day^{-1}, which is approximately 0.27 % of the uncontrolled peak daily site emission estimate of 111 kg·day^{-1} (see **Table 63**). Consequently, the Oxycutter is screened from consideration in the Best Management Practice assessment, in accordance with the procedure outlined in (NSW OEH, 2011).

The issue of semi-encapsulation of the Oxycutter has been specifically raised by NSW EPA (see **Table 3**). Despite the emissions from the Oxycutter being screened from the Best Practice Assessment, an evaluation of the potential of that control is provided below in **Table 36**.

Table 36 Practicability of implementing the (specific) control measure of semi-encapsulation on the Oxycutter

Control Measure	Regulatory Requirements RISK	Environmental Impacts RISK	Safety Implications RISK	Compatibility with Current Processes and Future Developments RISK	Conclusion of Evaluation
Semi-encapsulation	RISK = LOW	RISK = LOW	RISK = HIGH The structure would need to be constructed with an above ground clearance of approximately 15 m to avoid safety issues with the crane / hoist striking the roof of an enclosure.	RISK = HIGH The site has limited capacity to locate a suitably sized structure for semi-encapsulation.	☒ Not considered further in this assessment given that the current risk assessed and BMP indicates that the Oxycutter adds a negligible contribution to air quality emissions

In regard to the limited ability of the site to accommodate this control, reference is made to previous correspondence between NSW EPA and S&P on this issue. A summary of that previous discussion are chronologically presented below.

In September 2019, a letter addressing the commissioning of the oxy-cutter was provided to NSW EPA (ref: 0462777_L04, dated 19 September 2019) (ERM, Sep 2019). That letter report was appended with a monitoring report performed on the oxycutter (Ektimo, Sept 2019), which is also provided in **Appendix F** of this revised AQIA report.

In January 2020, the EPA provided a response to S&P on the above commissioning report (ref: DOC20/42792, dated 30 January 2020) requesting further clarification on compliance with Conditions 1.5(d) (relating to modelled compliance with the relevant impact assessment criteria) and Condition 1.5 (e) (relating to changes to the oxy-cutter to achieve compliance with 1.5(d).

In April 2020, S&P responded to the EPA letter (dated: 1 April 2020) which provided further clarification on the modelling performed as part of the commissioning of the oxy-cutter, and the subsequent opinion that no further changes to the operation of the oxy-cutter were required to achieve compliance with the relevant impact assessment criteria.

That opinion expressed on the April 2020 letter is supported by the findings of this report. The BMP assessment has identified emissions from the Oxycutter, as derived from NATA accredited emission testing (Ektimo, Sept 2019) to be 0.27 % of site emissions. It is further advised by S&P through the BMP assessment that there are significant safety and compatibility constraints for the semi-encapsulation of the Oxycutter (see **Table 36**). Based upon the foregoing, it is not considered that further changes to the operation of the Oxycutter are required nor warranted.

7.3.6. Air Quality Monitoring

The AQMP includes a commitment for the monitoring of PM_{10} concentrations at two AQMS, the 'In-station' and the 'Out-station'. Reference should be made to **Section 4.4.3** of this report that provides a summary of the locations of the AQMS and the measured concentration values.

The limitations of the measured data and its applicability to this AQIA are discussed in **Section 4.4.3**. It is proposed that the air quality monitoring program is continued to achieve the following objectives:

- Provide quantification of impacts using methods referenced in (NSW DEC, 2007);
- Provide S&P relevant metrics (i.e. rolling 4-hour PM_{10} concentration value) to implement reactive air quality management responses; and
- Provide a means to verify operational air quality control.

However, as noted in **Section 4.4.3**, the analysis and use of the data collected by the AQMS is not straight forward, and requires an element of judgement of source contribution to interpret the data, particularly with regard to the disaggregation of the measured concentrations to background sources, neighbouring contributions and on-site contributions.

As part of an ongoing commitment through the EMS, a review is periodically undertaken regarding the appropriateness of the current location of the two AQMS at the Premises with regard to:

- Proximity of the monitoring locations to potential sources;
- Validity of those locations to represent particulate emissions from the site;
- Compliance with Australian Standard 3580.1.1:2016 *Methods for sampling and analysis of ambient air - Guide to siting air monitoring equipment*, and
- The potential effect of building and structure wake on the measurements.

In summary, the reviews performed by S&P have reconfirmed that:

- The site layout has not significantly changed since 2015;
- There are limited locations that an AQMS can be located on site that meet the requirements of AS 3580.1.1
- Potential locations next to identified sources are unable to be pursued due to safety concerns to equipment and personnel

- Internal site locations were subject to wake effects from buildings. and limitations imposed through AS 3850.1.1;
- Two previous locations that had been trialled were further away from identified sources than the current locations;

Subsequent to these reviews, it has been determined that the two AQMS will remain in their current positions and S&P will undertake a review periodically as required under the EMS, or when the site undergoes significant changes in configuration. The AQMS will continue to be operated in accordance with the specifications provided in the AQMP (Arcadis, 2019).

7.4. Conclusion

7.4.1. Summary

S&P is seeking approval to increase the throughput limit of the RRF from 350 000 to 600 000 tonnes per annum (tpa). Approval for the Proposal is sought as State Significant Development (SSD) under Part 4, Division 4.7 of the *Environmental Planning and Assessment 1979* (EP&A Act).

The existing infrastructure at the Proposal site has the capacity to accommodate an increased throughput without altering the approved operational hours or requiring any construction works on the Proposal site by making more efficient use of the existing processes.

The AQIA has been performed in accordance with the relevant guidance and is cognisant of the SEARs (see **Section 1.4**).

Using a range of site-specific data regarding the type and nature of activities to be performed on site, emissions to air have been estimated in accordance with the relevant guidance, and the dispersion of emissions associated with peak operations has been modelled using approved atmospheric dispersion modelling techniques. The corresponding impacts have been predicted at a number of receptor locations representing community exposure and at industrial locations, as discrete impacts and as cumulative impacts which account for general prevailing air quality conditions considered to be representative of the site.

The impact assessment does not predict any exceedances of the relevant air quality and odour assessment criteria, as published in NSW Environment Protection Authority guidance "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*" at any surrounding residential receptor locations. There is noted to be a potential for off-site exceedance of the deposited dust criterion at a non-residential location beyond the site boundary. It is recommended that the additional measures identified through the Best Management Practice Dust Control assessment are implemented to manage this risk.

The air quality impact assessment also considers the potential impacts of the operation of the neighbouring Autorecyclers Pty Ltd operations at a proposed increased throughput of 130 000 tonnes per year. The report assesses the potential aggregated impacts with those emissions, and the assessment does not predict any exceedance of the relevant air quality and odour assessment criteria, as published in NSW Environment Protection Authority guidance "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*".

Impacts at surrounding industrial receptors have been presented within the main body of the report where exposure times are commensurate with those land uses. **Appendix D** presents a full schedule of results at all receptor locations, irrespective of averaging time, and this indicates that additional controls should be implemented to reduce off-site migration of site-generated emissions. To identify the additional controls which may be reasonably implemented, a Best Management Practice Dust Control assessment has been performed, which is presented in **Appendix E**.

That assessment has been performed in accordance with NSW EPA methodology and identifies a range of recommendations for additional controls.

7.4.2. Recommendations

The recommendations presented in the report, including those identified through the best management practice dust control assessment have been summarised.

This report provides the following recommendations, as summarised in **Table 37**:

Table 37 Summary of recommendations

Reference	Recommendation	Report Reference
1	The next scheduled NATA accredited emission testing event on the Hammermill ECS be extended in scope to include measurement of NO_X, H_2S, HF and HCl, Cl_2 and odour, in addition to the requirement for the measurement of particulates, particulate and vapour phase metals.	**Section 5.2.2**
2	It is recommended that the operation, and emissions from the Oxycutter are kept under review	**Section 5.2.3**
3	The recommendations of the Best Management Practice Dust Control assessment are implemented at the earliest opportunity, as detailed in **Appendix E**, and including: • Continued use of road sweepers to manage road silt content, and particularly to remove silt from road verges after large rain events (adopted potential measure HR1)	**Appendix E, Table 69**
4	• Enclosure of the conveyor transfer points (adopted potential measure C1);	**Appendix E, Table 70**

Reference	Recommendation	Report Reference
5	• Use of targeted water sprays on all appropriate handling and transfer points, ensuring that run off is appropriately captured, filtered and discharged or recycled (adopted potential measure HT1 (on appropriate sources);	Appendix E, Table 71
6	• Minimisation of drop heights on all handling and transfer points (adopted potential measure HT2).	**Appendix E, Table 71**
7	It is recommended that the current AQMS configuration, location, metrics and trigger points continue to be periodically reviewed, as required through the EMS, to achieve the objectives outlined in **Section 7.3.6**.	**Section 7.3.6**

8. REFERENCES

ABS. (2017). *Australian Bureau of Statistics*. Retrieved from 3101.0 - Australian Demographic Statistics: http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Jun%202015?OpenDocument

AIRUSE Life 11. (2017). *Guidebook, Measures to Improve Urban Air Quality .*

Arcadis. (2019). *Sell and Parker Kings Park Metal Recovery, Processing and Recycling Facility - Air Quality Management Plan (Rev E).*

Australian Govt. (2012). *National Pollutant Invenory - Emission Estimation Technique Manual for Moning (Version 3.1).*

Countess Environmental. (2006). *WRAP Fugitive Dust Handbook.*

DECC. (2006). *Technical Framework: Assessment and Management of Odour from Stationary Sources in NSW.*

DECC. (2006). *Technical Notes: Assessment and Management of Odour from Stationary Sources in NSW.*

Ektimo. (May 2017). *R003396 Emission Testing Report - Sell and Parker, Kings Park.*

Ektimo. (May 2021). *R010794 Annual Emission Testing, Sell and Parker, Kings Park.*

Ektimo. (Oct 2019). *R008184 Annual Emission Testing - Sell and Parker, Kings Park.*

Ektimo. (Sep 2018). *R006468-1 Emission Testing - ERM Australia Pty Ltd, Docklands.*

Ektimo. (Sep 2019). *R007718 Emission Testing - ERM Australia Pty Ltd.*

Ektimo. (Sep 2020). *R009653 Annual Emission Testing - Sell and Parker, Kings Park.*

Ektimo. (Sept 2019). *R007718 Emission Testing.*

EML Air. (June 2014). *N92746 Emission Testing Report.*

ERM. (2015). *Waste Metal Recovery, Processing and Recycling Facility, 45 and 23-43 Tatterhall Road, Kings Park, Blacktown - Air Quality Assessment.*

ERM. (Sep 2019). *Oxy-Cutting Commissioing Report for Sell and Parker Pty Ltd, Kings Park Metal Recycling Facility.*

Graham, G., Lawrence, K., & Doyle, M. (2013). Development of Odour Impact Assessment Methodologies Accounting for Odour 'Offensiveness' or Hedonic Tone. *Proceedings of the 21st Clean Air Society of Australia and New Zealand Conference.* Sydney.

Katestone. (2011). *NSW Coal Mining Benchmarking Study: International Best Practice for the Prevention and/or Minimisation of Emissions of Particulate Matter from Coal Mining.*

Northstar Air Quality. (2020). *Kings Park Metal Resource Facility - Air Quality Impact Assessment (20.1074.FR1V3).*

Northstar Air Quality. (2021). *Kings Park Metal Resource Facility - Supplementary Air Quality Impact Assessment (20.1074.FR3V1).*

NSW DEC. (2006). Technical Framework: Assessment and Management of Odour from Stationary Sources in NSW.

NSW DEC. (2006). Technical Notes: Assessment and Management of Odour from Stationary Sources in NSW.

NSW DEC. (2007). *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales.*

NSW EPA. (2017). *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.* NSW Environment Protection Authority.

NSW Govt. (2018a). *DustWatch Report (March).*

NSW Govt. (2018b). *DustWatch Report (November).*

NSW OEH. (2011). *Coal Mine Particulate matter Cintrol Best Practice - Site-specific determination guideline.*

NSW OEH. (2011). *Coal Mine Particulate Matter Control Best Practice - Site-specific determination guideline.*

NSW OEH. (2018). *NSW Annual Average Air Quality Statement.*

NSW RFS. (2019). *Annual Report (2018/19).*

SKM. (2005). *Improvement of NPI Fugitive Particulate Matter Emission Estimation Techniques.*

TAS. (2019). *Air quality impact assessment - 57 Tattershall Road, Kings Park.*

TTPP. (November 2021). *23-43 & 45 Tattersall Road, Kings Park - Response to Submissions (ref: 19237).*

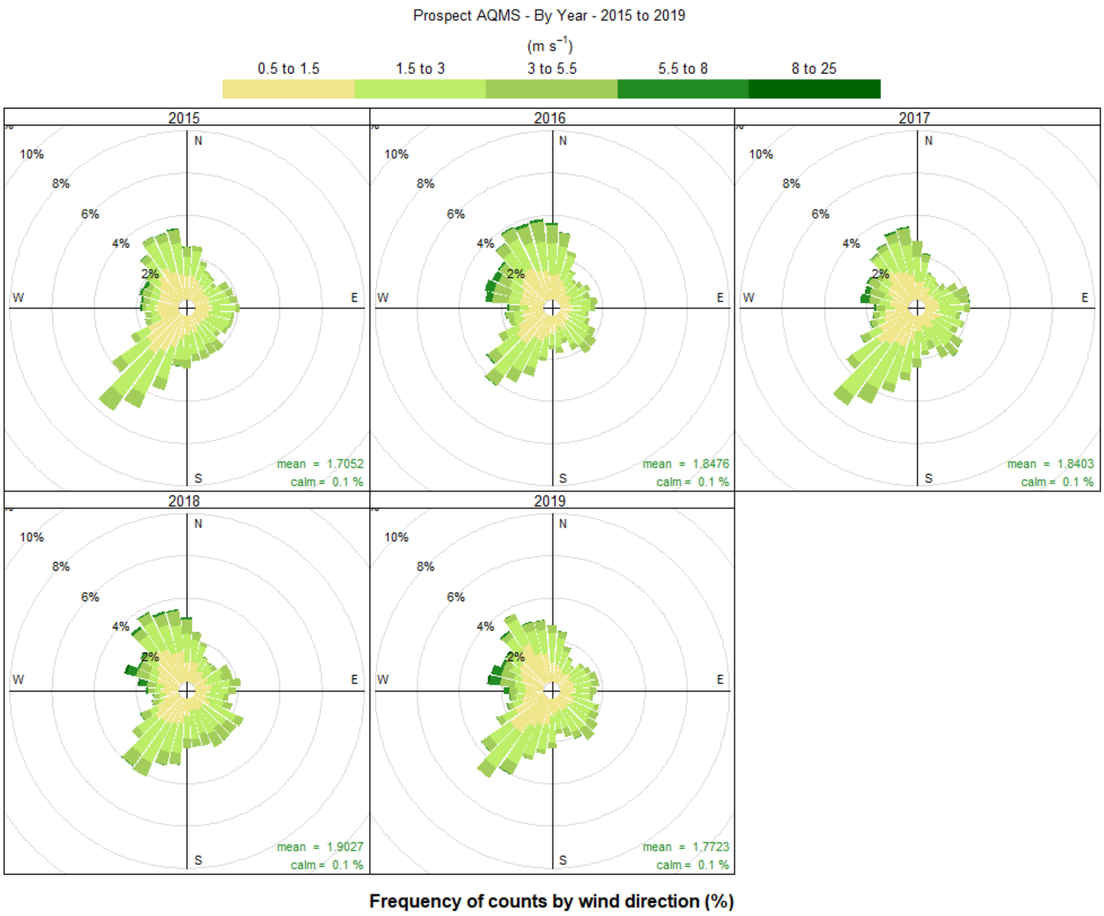
USEPA. (2011). *AP-42 Compilation of Air Pollutant Emission Factors, Chapter 13.2.1 Paved Roads.*

Appendix A - Meteorology

As discussed in **Section 4.3** a meteorological modelling exercise has been performed to characterise the meteorology of the Proposal site in the absence of site-specific measurements. The meteorological monitoring has been based on measurements taken at a number of surrounding automatic weather stations (AWS) operated by the Bureau of Meteorology (BoM). Meteorology is also measured by the NSW Department of Planning, Industry and Environment (DPIE) at a number of Air Quality Monitoring Station (AQMS) surrounding the Proposal site (refer **Section 4.4**).

Meteorological conditions at Prospect AQMS was chosen for further investigation due to its location relative to the Proposal site. This site has been examined to determine a 'typical' or representative dataset for use in dispersion modelling. Annual wind roses for the most recent 5 years of data (2015 to 2019) are presented in **Figure 13**.

Figure 13 Annual wind roses 2015 to 2019, Prospect AQMS



The wind roses indicate that from 2015 to 2019, winds at Prospect AQMS show similar patterns across the years, with a predominant south-easterly wind direction.

The majority of wind speeds experienced at Prospect AQMS over the 5-year period, 2015 to 2019 are generally in the range <0.5 metres per second ($m{\cdot}s^{-1}$) to 5.5 $m{\cdot}s^{-1}$ with the highest wind speeds (greater than 8 $m{\cdot}s^{-1}$) occurring from a north westerly direction. Winds of this speed are not frequent, occurring <0.1% of the observed hours over the 5-year period, at Prospect. Calm winds (<0.5 $m{\cdot}s^{-1}$) occur during 0.1 % of hours on average across the 5-year period.

Given the wind distributions across the years examined, data for the year 2015 has been selected as being appropriate for further assessment, as it best represents the general trend across the 5-year period studied.

Presented in **Figure 14** is the annual wind rose for the 2015 to 2019 period and **Figure 15** illustrates the corresponding wind speed distribution over the same period.

Figure 14 Annual wind roses 2015 to 2019 – Prospect AQMS

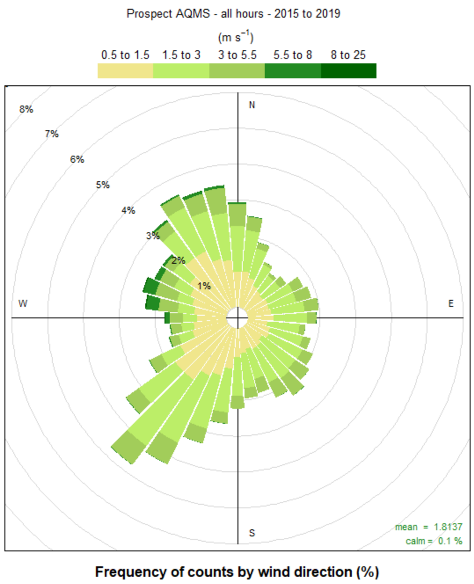
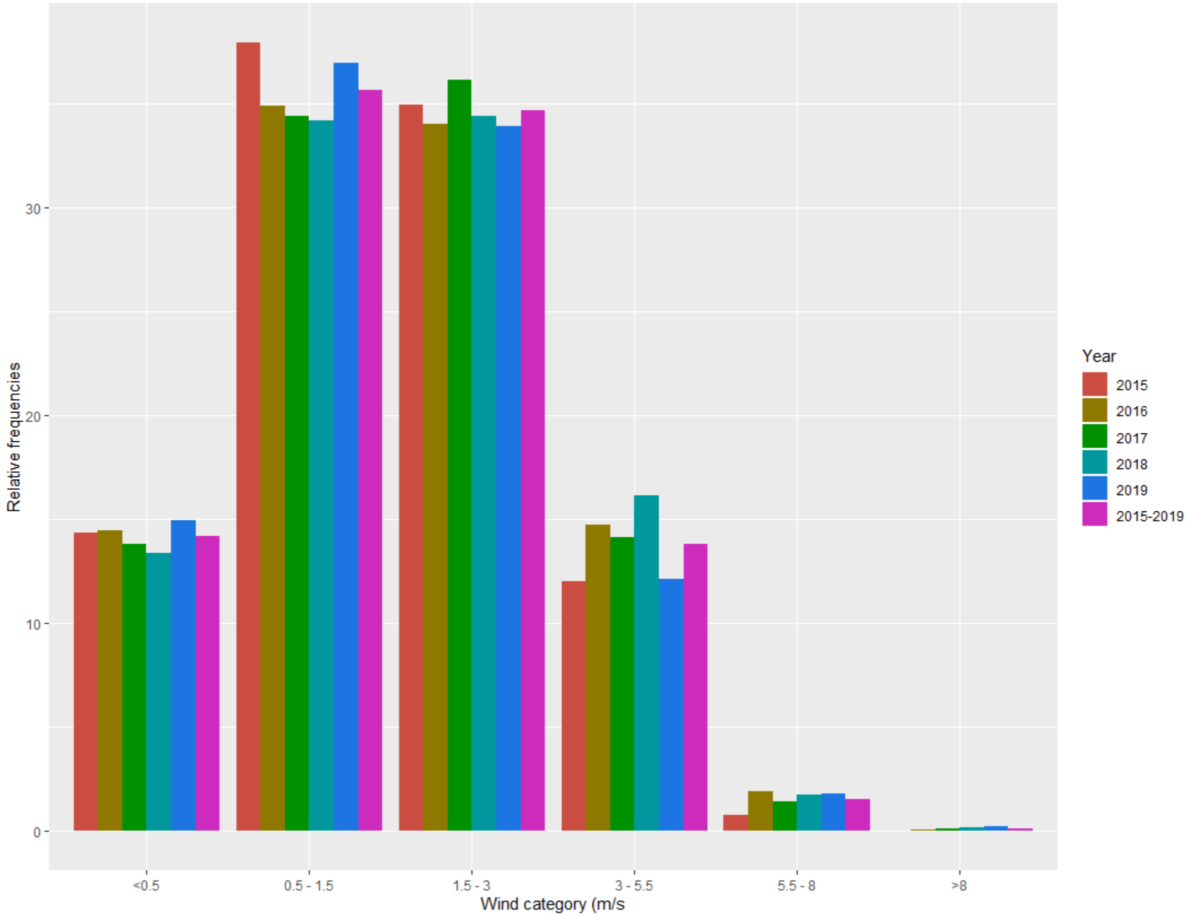


Figure 15 Annual wind speed distribution – Prospect AQMS



Meteorological Processing

The BoM and DPIE data adequately cover the issues of data quality assurance, however it is limited by its location compared to the Proposal site. To address these uncertainties, a multi-phased assessment of the meteorology data has been performed.

In absence of any measured onsite meteorological data, site representative meteorological data for this proposal was generated using the TAPM meteorological model in a format suitable for using in the CALPUFF dispersion model (refer **Section 5.1**).

Meteorological modelling using The Air Pollution Model (TAPM, v 4.0.5) has been performed to predict the meteorological parameters required for CALPUFF. TAPM, developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) is a prognostic model which may be used to predict three-dimensional meteorological data and air pollution concentrations.

TAPM predicts wind speed and direction, temperature, pressure, water vapour, cloud, rain water and turbulence. The program allows the user to generate synthetic observations by referencing databases (covering terrain, vegetation and soil type, sea surface temperature and synoptic scale meteorological analyses) which are subsequently used in the model input to generate site-specific hourly meteorological observations at user-defined levels within the atmosphere.

CALMET is a meteorological model that develops wind and temperature fields on a three-dimensional gridded modelling domain. Associated two-dimensional fields such as mixing height, surface characteristics, and dispersion properties are also included in the file produced by CALMET. The interpolated wind field is then modified within the model to account for the influences of topography, as well as differential heating and surface roughness associated with different land uses across the modelling domain. These modifications are applied to the winds at each grid point to develop a final wind field and thus the final wind field reflects the influences of local topography and current land uses.

The parameters used in TAPM and CALMET modelling are presented in **Table 38**.

Table 38 Meteorological parameters used for this study

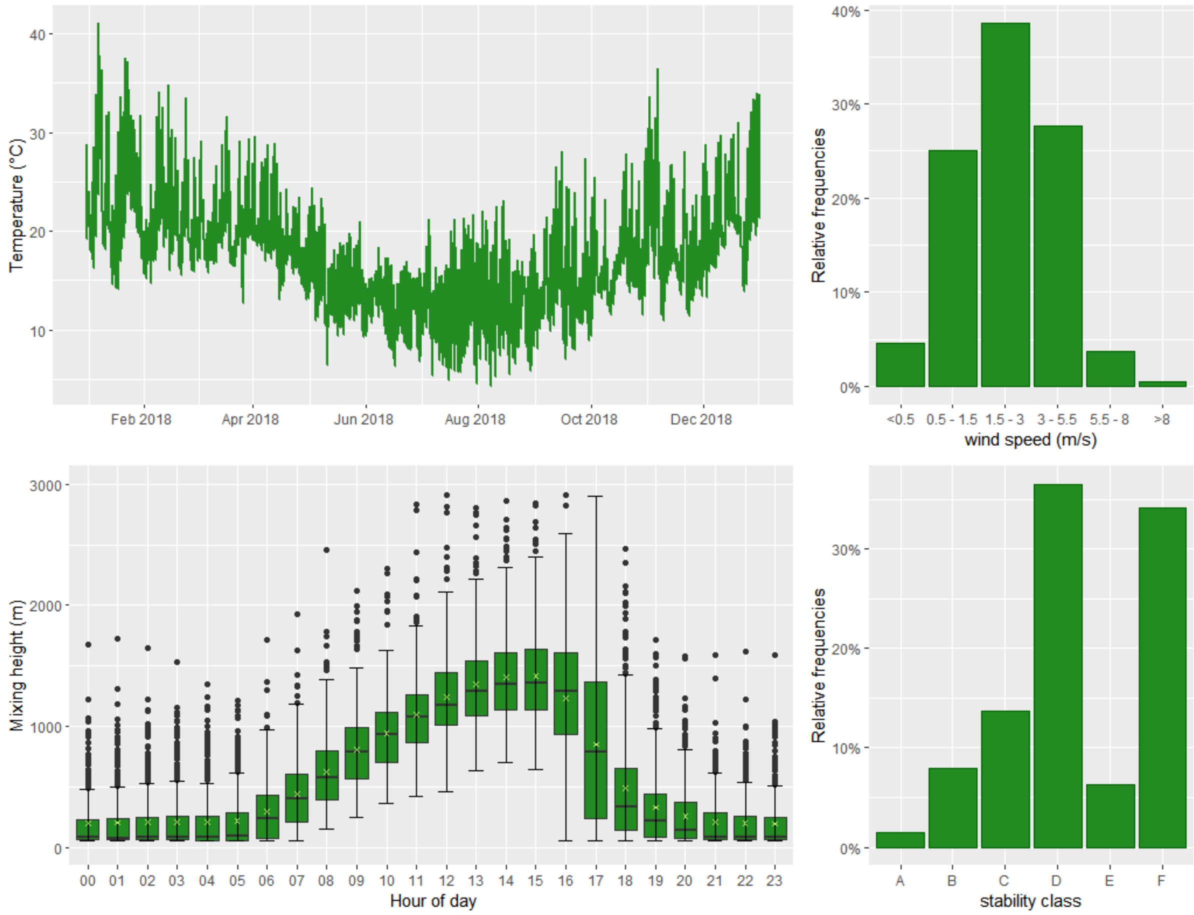
TAPM v 4.0.5	
Modelling period	1 January 2019 to 31 December 2019
Centre of analysis	306 258 mE, 6 263 597 mS (UTM Coordinates)
Number of grid points	35 × 35 × 25
Number of grids (spacing)	4 (30 km, 10 km, 3 km, 1 km)
Terrain	AUSLIG 9 second DEM
Data assimilation	None
CALMET	
Modelling period	1 January 2019 to 31 December 2018
South-West corner of analysis	294,580 mE, 6,251,617 mS (UTM Coordinates)
Meteorological grid domain (resolution)	0.2 km x 120 x 120
Vertical resolution (cell heights)	10 (0 m, 20 m, 40 m, 80 m, 12 0m, 180 m, 300 m, 600 m, 1000 m, 1200 m, 1800 m, 2200 m, 3000 m)
Data assimilation	No-obs approach using TAPM – 3D.DAT file

As generally required by the NSW EPA the following provides a summary of the modelled meteorological dataset. Given the nature of the pollutant emission sources at the Proposal site, detailed discussion of the humidity, evaporation, cloud cover, katabatic air drainage and air recirulation potential of the Proposal site has not been provided. Details of the predictions of wind speed and direction, mixing height and temperature at the Proposal site are provided below.

Diurnal variations in maximum and average mixing heights predicted by CALMET at the Proposal site during 2019 period are illustrated in **Figure 16**. Also presented are predicted temperature, stability class and wind speed frequency.

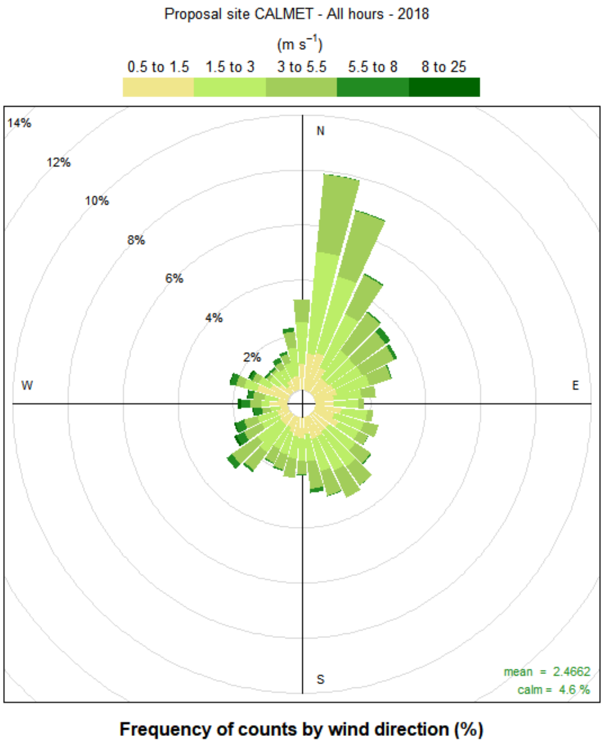
As expected, an increase in mixing height during the morning is apparent, arising due to the onset of vertical mixing following sunrise. Maximum mixing heights occur in the mid to late afternoon, due to the dissipation of ground based temperature inversions and growth of the convective mixing layer.

Figure 16 Predicted meteorological parameters – Proposal site 2018



The modelled wind speed and direction at the Proposal site during 2019 are presented in **Figure 17**.

Figure 17 Predicted wind speed and direction – Proposal site 2018



TAPM Validation

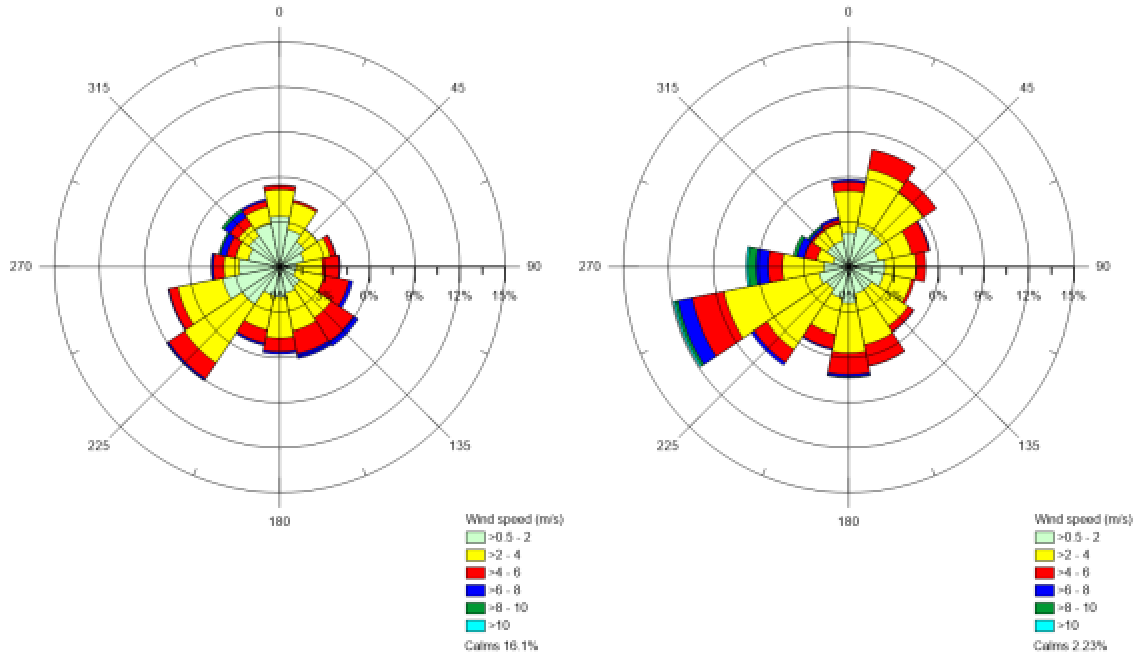
Table 39 Statistics for meteorological observations and TAPM model predictions at Horsley Park Equestrian Centre AWS

Parameter	Units	Source	Average	STD	Minimum	Maximum
Wind speed	m·s-1	Observations	2.2	1.7	0.0	9.7
		TAPM	2.9	1.6	0.5	12.3
U component	m·s-1	Observations	0.0	2.1	-7.0	9.0
		TAPM	0.3	2.4	-5.8	12.3
V component	m·s-1	Observations	0.4	1.9	-6.9	7.6
		TAPM	0.3	2.2	-6.3	9.0
Temperature	°C	Observations	17.6	6.4	-1.3	44.1
		TAPM	17.1	5.6	4.4	40.4

Table 40 Correlation statistics for TAPM meteorological performance

Statistic	Ideal score	Wind speed	U component	V component	Temperature
Root mean square error	0	1.6	1.6	1.6	2.4
Systemic root mean square error	0	1.8	2.1	1.9	6.4
Unsystemic root mean square error	0	1.6	2.4	2.2	5.6
Mean error	0	0.6	0.3	-0.1	-0.5
Absolute mean error	0	1.2	1.2	1.2	1.9
Index of agreement	1	0.8	0.9	0.8	1.0
Skill e	<1	1.0	1.2	1.2	0.9
Skill v	1	1.0	1.2	1.2	0.9
Skill r	<1	0.9	0.8	0.9	0.4

Figure 18 Wind roses, observed (left) and TAPM (right)



Appendix B – Background Air Quality

Continuous air quality monitoring data measured at a representative location has been adopted for the purposes of this assessment. Determination of data to be used as a location representative of the Proposal site and during a representative year can be complicated by factors which include:

- the sources of air pollutant emissions around the Proposal site and representative AQMS; and
- the variability of particulate matter concentrations (often impacted by natural climate variability).

Air quality monitoring is performed by the NSW Department of Planning, Industry and Environment (DPIE) at four air quality monitoring station (AQMS) within a 17 km radius of the Proposal site. Details of the monitoring performed at these AQMS is presented in **Table 41** (below) and **Figure 7** (in **Section 4.3**).

Table 41 Details of closest AQMS surrounding the site

AQMS Location	Data Availability	Distance to Site (km)	Screening Parameters					
			2018 Data	Measurements				
				PM_{10}	$PM_{2.5}$	TSP	NO_2	O_3
Prospect	2007 - 2019	4.9	✓	✓	✓	×	✓	✓
Rouse Hill	Since May 2019	7.3	✓	✓	✓	×	✓	✓
Parramatta North	2017- 2019	9.5	✓	✓	✓	×	✓	✓
St Marys	2002-2019	14.5	✓	✓	✓	×	✓	✓

Based on the sources of AQMS data available and their proximity to the Proposal site, Prospect was selected as the candidate source of AQMS data for use in this assessment.

Summary statistics are for PM_{10} and $PM_{2.5}$ data are presented in **Table 42**.

Table 42 PM_{10} and $PM_{2.5}$ statistics (Prospect 2018)

AQMS	Prospect	
Year	2018	
Pollutant	PM_{10}	$PM_{2.5}$
Averaging Period	24-hour	24-hour
Data Points (number)	363	352
Mean (µg·m^{-3})	21.9	8.5
Standard Deviation (µg·m^{-3})	10.9	4.9
Skew[1]	2.7	3.0
Kurtosis[2]	15.6	17.7
Minimum (µg·m^{-3})	5.4	1.1
Percentiles (µg·m^{-3})		
1	7.1	2.0
5	9.9	3.2
10	11.2	4.1
25	14.8	5.3
50	20.2	7.4
75	25.8	10.4
90	33.3	13.8
95	37.4	16.1
97	42.9	17.8
98	52.8	19.9
99	61.7	25.0
Maximum	113.3	47.5
Data Capture (%)	99.5	96.4

Notes: **1:** Skew represents an expression of the distribution of measured values around the derived mean. Positive skew represents a distribution tending towards values higher than the mean, and negative skew represents a distribution tending towards values lower than the mean. Skew is dimensionless.

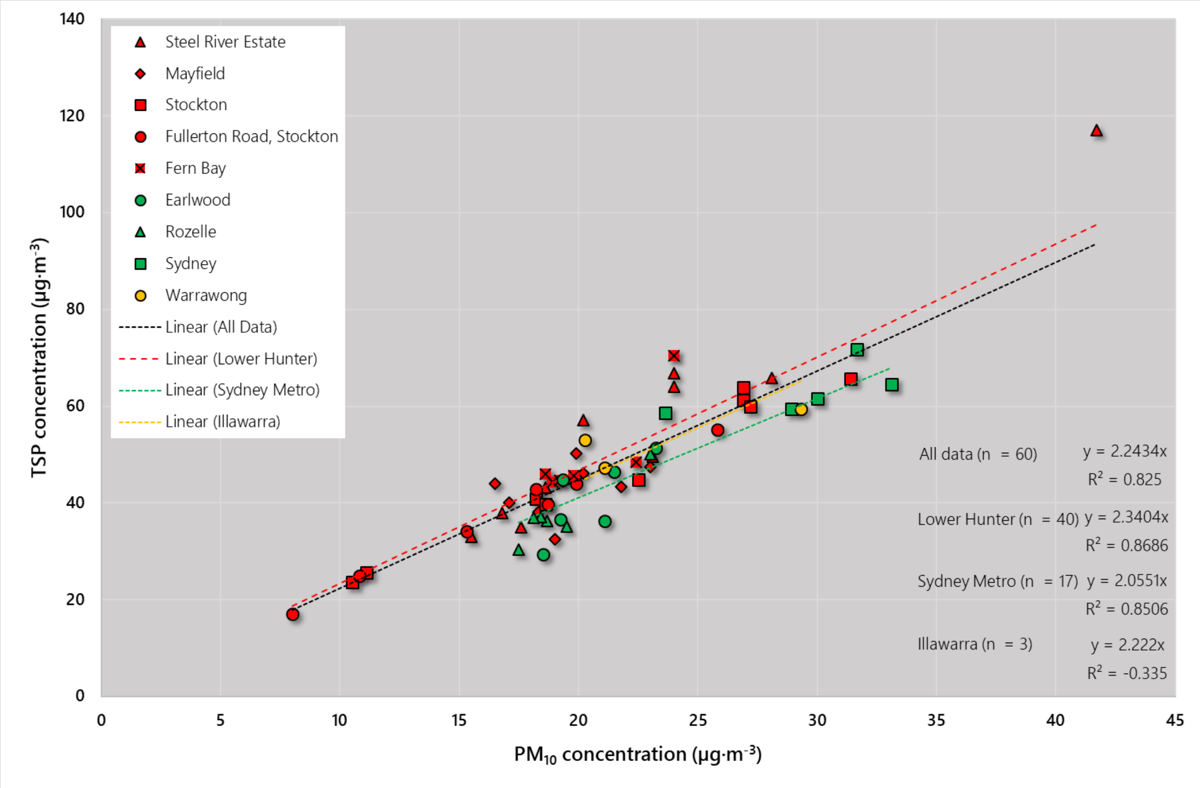
2: Kurtosis represents an expression of the value of measured values in relation to a normal distribution. Positive skew represents a more peaked distribution, and negative skew represents a distribution more flattened than a normal distribution. Kurtosis is dimensionless.

Concentrations of TSP are not measured by the NSW DPIE at any AQMS surrounding the Proposal site. An analysis of co-located measurements of TSP and PM_{10} in the Lower Hunter (1999 to 2011), Illawarra (2002 to 2004), and Sydney Metropolitan (1999 to 2004) regions is presented in **Figure 19**.

The analysis concludes that, on the basis of the measurements collected across NSW between 1999 to 2011, the derivation of a broad TSP:PM_{10} ratio of 2.0551 : 1 (i.e. PM_{10} represents ~48 % of TSP) is appropriate to be applied to measurements in the Sydney Metro.

In the absence of any more specific information, this ratio has been adopted within this AQIA. These estimates have not been adjusted for background exceedances.

Figure 19 Co-located TSP and PM_{10} measurements, Lower Hunter, Sydney Metro and Illawarra



Similarly, no dust deposition data is available for the area surrounding the Proposal site. The incremental impact criterion of 2 g·m^{-2}·month^{-1} as outlined within the Approved Methods has been adopted which effectively provides a background deposition level of 2 g·m^{-2}·month^{-1} (the total allowable deposition being 4 g·m^{-2}·month^{-1}).

A summary of background air quality data for the site for the year 2018 is presented in **Table 43**.

Graphs presenting the daily varying PM_{10} and $PM_{2.5}$ data recorded at Prospect in 2018 are presented in **Figure 20** and **Figure 21**, respectively.

Table 43 Summary of measured background air quality data (Prospect 2018)

Pollutant	TSP ($\mu g{\cdot}m^{-3}$)	PM_{10} ($\mu g{\cdot}m^{-3}$)	$PM_{2.5}$ ($\mu g{\cdot}m^{-3}$)	NO_2 ($\mu g{\cdot}m^{-3}$)	O_3 ($\mu g{\cdot}m^{-3}$)
Averaging Period	Annual	24-Hour	24-Hour	1-Hour	1-Hour
Data Points (number)	363	363	352	7583.0	7529.0
Mean	45.01	21.9	8.5	18.7	39.8
Standard Deviation	-	10.9	4.9	17.0	28.8
Skew[1]	-	2.7	3.0	1.2	1.0
Kurtosis[2]	-	15.6	17.7	1.0	1.9
Minimum	45.01	5.4	1.1	-4.1	-2.1
Percentiles ($\mu g{\cdot}m^{-3}$)					
1	-	7.1	2.0	0.0	0.0
5	-	9.9	3.2	0.0	2.1
10	-	11.2	4.1	2.1	4.3
25	-	14.8	5.3	6.2	17.1
50	-	20.2	7.4	12.3	38.5
75	-	25.8	10.4	28.7	55.6
90	-	33.3	13.8	43.1	72.8
95	-	37.4	16.1	53.3	89.9
97	-	42.9	17.8	59.5	102.7
98	-	52.8	19.9	64.5	112.6
99	-	61.7	25.0	69.7	130.1
Maximum	45.01	113.3	47.5	104.6	224.7
Data Capture (%)	99.5	99.5	96.4	86.6	85.9

Figure 20 PM$_{10}$ measurements, Prospect 2018

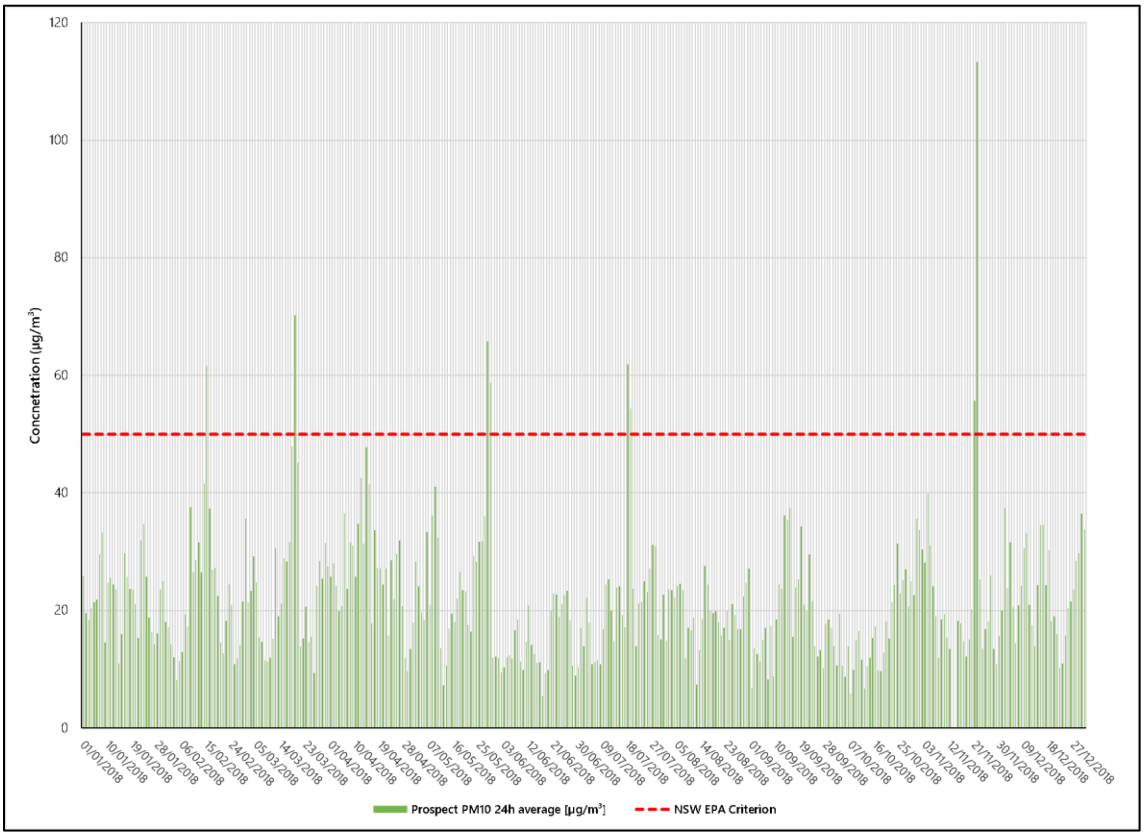
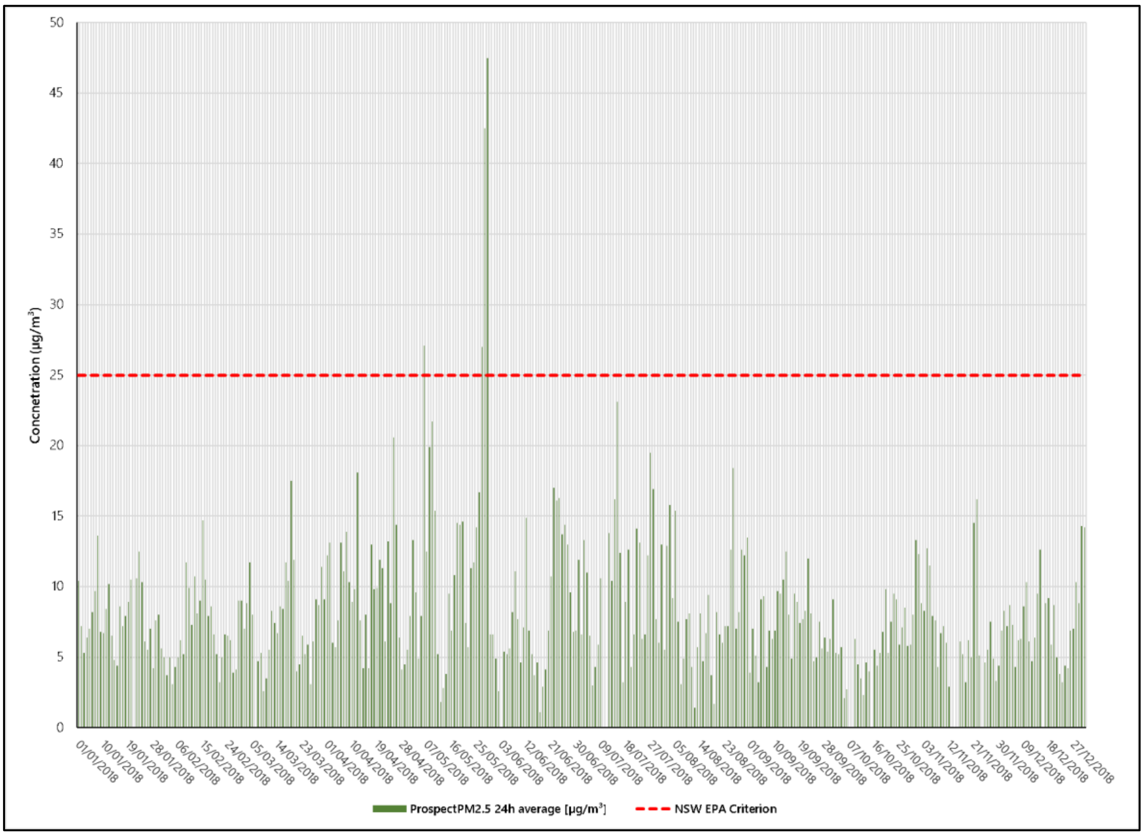


Figure 21 PM$_{2.5}$ measurements, Prospect 2018



Appendix C – Emission Estimation

Point Source Emission Estimates

Table 44 presents a summary of the emission estimation for the Oxycutter and Hammermill (post ECS). Reference should also be made to the emission test reports presented in **Appendix F**.

Table 44 Emission estimates- point source emissions

Source	Units	Oxycutter(1)	Hammermill(2)
Emission source	value	C1	WSS01
Easting	m	306 613	306 567
Northing	m	6 263 608	6 263 613
Elevation	m	44.73	44.21
Start time (Table 5)	hh:mm	09:00	06:00
End time (Table 5)	hh:mm	15:00	21:00
Stack height	m AGL	1	16.7
Diameter at point of discharge	m ID	0.05	0.440
Emission temperature	°C	31	39
Emission velocity (discharge)	$m \cdot s^{-1}$	14.0	50.0
Gas flow	$Nm^3 \cdot s^{-1}$	0.1	6.6
ER (odour)	$OU \cdot m^3 \cdot s^{-1}$	2.50E+02	1.216E+04
ER (TSP)	$g \cdot s^{-1}$	2.17E-02	7.50E-02
ER (PM_{10})	$g \cdot s^{-1}$	-	5.33E-02
ER ($PM_{2.5}$)	$g \cdot s^{-1}$	-	3.33E-02
ER (NO_X)	$g \cdot s^{-1}$	5.50E-02	3.33E-02
ER (Ag)	$g \cdot s^{-1}$	1.500E-07	-
ER (Al)	$g \cdot s^{-1}$	2.833E-05	-
ER (As)	$g \cdot s^{-1}$	3.333E-06	1.667E-05
ER (Ba)	$g \cdot s^{-1}$	5.000E-05	-
ER (Be)	$g \cdot s^{-1}$	1.333E-07	6.667E-06
ER (Ca)	$g \cdot s^{-1}$	5.000E-05	-
ER (Cd)	$g \cdot s^{-1}$	1.167E-07	5.000E-06
ER (Co)	$g \cdot s^{-1}$	3.333E-07	6.667E-06
ER (CO II)	$g \cdot s^{-1}$	6.333E-06	-
ER (Cr)	$g \cdot s^{-1}$	1.267E-06	1.833E-05
ER (CrVI)	$g \cdot s^{-1}$	-	3.333E-05
ER (Cu)	$g \cdot s^{-1}$	5.167E-06	2.000E-05
ER (Fe)	$g \cdot s^{-1}$	5.500E-03	2.333E-04
ER (FE II,III)	$g \cdot s^{-1}$	2.333E-02	-
ER (Hg)	$g \cdot s^{-1}$	8.333E-08	2.167E-05
ER (K)	$g \cdot s^{-1}$	3.333E-05	-
ER (Li)	$g \cdot s^{-1}$	1.500E-07	-

Source	Units	Oxycutter(1)	Hammermill(2)
ER (Mg)	$g{\cdot}s^{-1}$	3.333E-05	-
ER (Mg IV)	$g{\cdot}s^{-1}$	1.467E-04	-
ER (Mn)	$g{\cdot}s^{-1}$	9.167E-05	2.000E-05
ER (Mo)	$g{\cdot}s^{-1}$	8.333E-07	-
ER (Na)	$g{\cdot}s^{-1}$	3.333E-05	-
ER (Ni)	$g{\cdot}s^{-1}$	1.567E-06	1.667E-05
ER (P)	$g{\cdot}s^{-1}$	1.517E-05	-
ER (Pb)	$g{\cdot}s^{-1}$	3.333E-06	2.000E-05
ER (Sb)	$g{\cdot}s^{-1}$	1.167E-06	5.000E-05
ER (Se)	$g{\cdot}s^{-1}$	1.167E-06	5.000E-05
ER (Sn)	$g{\cdot}s^{-1}$	5.333E-07	1.667E-05
ER (Ti)	$g{\cdot}s^{-1}$	-	1.267E-05
ER (Th)	$g{\cdot}s^{-1}$	5.000E-07	-
ER (V)	$g{\cdot}s^{-1}$	-	3.333E-05
ER (W)	$g{\cdot}s^{-1}$	-	1.167E-05
ER (Zn)	$g{\cdot}s^{-1}$	1.833E-04	1.500E-03

Note: (1) Source data derived from Ektimo Emission Test Report (Ektimo, Sep 2019) as appended to (ERM, Sep 2019). The tests were performed in duplicate, and the maximum value has been used to quantify the emission rates. See **Appendix F**.

(2) Source data derived from Ektimo Emission Test Reports (Ektimo, May 2017), (Ektimo, Sep 2018), (Ektimo, Oct 2019), (Ektimo, Sep 2020). The maximum measured emission rate from all test reports has been adopted in this supplementary AQIA. Emission conditions, including flow rates, temperatures etc., were derived from (Ektimo, Sep 2020). See **Appendix F** for the complete monitoring reports.

To provide additional clarification on the adoption of the maximum measured emission rates for the Hammermill, a summary of those emission rates derived from the NATA accredited emissions monitoring reports is presented below.

TT

Parameter	Units	18-Jun-14	26-May-17	27-Sep-18	11-Oct-19	4-Sep-20	26-May-21	Adopted	% PM2.5
		N92746	R003396	R006468-1	R008184	R009653	R010794		
Flow	$Nm^3.s^{-1}$, STP		8.0	6.1	6.2	6.7	6.6		
Flow	$m^3.s^{-1}$ actual		9.2	7	7.1	7.6	7.6		
Temperature	°C		28	31	36	27	39	39	
Measured velocity	$m.s^{-1}$		25	25	26	27	27		
Diameter at sampling plane	m ID		0.680	0.595	0.595	0.595	0.595		
Diameter at discharge	m ID			0.440	0.440	0.440	0.440		
Velocity at sampling plane	$m.s^{-1}$ (A)		25	25	26	27	27		
Velocity at discharge	$m.s^{-1}$ (A)			46	47	50	50	50	
ER (TSP)	$g.s^{-1}$		7.500E-02	4.167E-02	2.333E-02	1.667E-02	4.833E-02	7.500E-02	
ER (PM_{10})	$g.s^{-1}$		5.333E-02					5.333E-02	
ER ($PM_{2.5}$)	$g.s^{-1}$		3.333E-02					3.333E-02	
ER (NO_X)	$g.s^{-1}$		3.333E-02	1.667E-02				3.333E-02	
ER (H_2S)	$g.s^{-1}$		5.000E-05	5.000E-05				5.000E-05	
ER (HF)	$g.s^{-1}$			8.333E-05				8.333E-05	
ER (HCl)	$g.s^{-1}$			8.333E-05				8.333E-05	
ER (Cl_2)	$g.s^{-1}$			8.333E-05				8.333E-05	
ER (odour)	$OU.m^3.s^{-1}$	1.216E+04						1.216E+04	
ER (As)	$g.s^{-1}$		1.167E-05	8.333E-06	1.667E-05	1.667E-05	1.667E-05	1.667E-05	0.050%
ER (Be)	$g.s^{-1}$		6.667E-06			5.000E-06	6.667E-06	6.667E-06	0.020%
ER (Cd)	$g.s^{-1}$		3.333E-06	2.833E-06	5.000E-06	5.000E-06	5.000E-06	5.000E-06	0.015%
ER (Co)	$g.s^{-1}$		3.333E-06	3.333E-06	6.667E-06	6.667E-06	6.667E-06	6.667E-06	0.020%
ER (Cr)	$g.s^{-1}$		4.833E-06	4.167E-06	8.333E-06	1.833E-05	1.300E-05	1.833E-05	0.055%
ER (Cr_{VI})	$g.s^{-1}$		3.333E-05					3.333E-05	0.100%
ER (Cu)	$g.s^{-1}$		2.000E-05					2.000E-05	0.060%

Parameter	Units	18-Jun-14	26-May-17	27-Sep-18	11-Oct-19	4-Sep-20	26-May-21	Adopted	% PM2.5
		N92746	R003396	R006468-1	R008184	R009653	R010794		
ER (Fe)	$g.s^{-1}$		2.333E-04					2.333E-04	0.700%
ER (Hg)	$g.s^{-1}$		5.500E-06	2.167E-05		6.667E-06	1.667E-05	2.167E-05	0.065%
ER (Mn)	$g.s^{-1}$		8.333E-06	1.000E-05	1.667E-05	2.000E-05	4.167E-05	4.167E-05	0.125%
ER (Ni)	$g.s^{-1}$		6.667E-06	5.000E-06	1.667E-05	1.167E-05	3.333E-05	3.333E-05	0.100%
ER (Pb)	$g.s^{-1}$		8.667E-06	1.083E-05	2.000E-05	2.000E-05	4.667E-05	4.667E-05	0.140%
ER (Sb)	$g.s^{-1}$		3.333E-05	1.667E-05	5.000E-05	5.000E-05	1.333E-04	1.333E-04	0.400%
ER (Se)	$g.s^{-1}$		3.333E-05	1.667E-05	5.000E-05	5.000E-05		5.000E-05	0.150%
ER (Sn)	$g.s^{-1}$		1.167E-05	8.333E-06	1.667E-05	1.667E-05	1.667E-05	1.667E-05	0.050%
ER (Ti)	$g.s^{-1}$		1.267E-05					1.267E-05	0.038%
ER (V)	$g.s^{-1}$		6.667E-06	5.000E-06	1.333E-05	3.333E-05	1.333E-05	3.333E-05	0.100%
ER (W)	$g.s^{-1}$		1.167E-05					1.167E-05	0.035%

Volume Source Emissions

Material Handling

Emissions for material handling (MH*n*), transfer points (TP*n*) and conveyors (CV*n*) have been estimated using the US EPA batch drop equations. The assumed variables used have been highlighted for clarity.

Sources modelled as wind speed dependent volume sources during hours of operation.

The activity rates relevant to each material handling are presented in **Table 45** and the corresponding emission estimates are presented in **Table 46**.

$$ER = EF \times A \times (1 - CF) \times \frac{1000}{3600}$$

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

where:

ER = emission rate ($g \cdot s^{-1}$)

EF = emission factor ($kg \cdot t^{-1}$)

A = throughput ($t \cdot hr^{-1}$)

CF = control factor

k = particle size multiplier

(TSP: 0.74; PM_{10}: 0.35; $PM_{2.5}$: 0.053)

U = hourly wind speed ($m \cdot s^{-1}$) (ave 2.48 $m \cdot s^{-1}$)

M = moisture content (assumed 2 %)

Wind Erosion Sources

Emissions for wind erosion sources (i.e. material stockpiles) (WE*n*) have been modelled as wind speed varying volume sources using the NPI Wind Erosion equation.

The activity rates relevant to each wind erosion source are presented in **Table 47** and the corresponding emission estimates are presented in. **Table 48**.

$$ER_{TSP,hr} = WF_{hr} \times ER_{TSP}$$

$$ER_{PM10,hr} = WF_{hr} \times ER_{PM10}$$

$$ER_{PM2.5,hr} = WF_{hr} \times ER_{PM2.5}$$

$$WF_{hr} = \begin{cases} 0 & U \leq 3.1 \\ \dfrac{(U^* - U_t^*)^3}{\sum_{hr=1}^{8760} (U^*{}_{hr} - U_t^*)^3} & U > 3.1 \end{cases}$$

where:

ER = emission rate ($g \cdot s^{-1}$)

WF = hourly weighting factor

U = hourly wind speed ($m \cdot s^{-1}$) (ave 2.48 $m \cdot s^{-1}$)

U^* = threshold friction velocity (assumed 0.11U)

U^*_t = threshold friction vel. ($m \cdot s^{-1}$) for 3.1 $m \cdot s^{-1}$

Paved Roads at Industrial Sites

Wheel generated dust emissions have been modelled for all site vehicles using the US EPA equation.

The activity rates relevant to each road source are presented in **Table 49** and the corresponding emission estimates are presented in **Table 50**.

$$E = k(sL)^{0.91} \times (W)^{1.02}$$

where:

E = particulate emission factor

k = particle size multiplier

sL = road silt loading ($9.7\ g \cdot m^{-2}$)

W = average weight (15 t) of the vehicles

Controls

The control factor (CF) assumed for material handling points MH1-MH14, truck dumping points TRKD01 and TRK02 and transfer points TP 01-08 have been assumed to be controlled by 70 % through water sprays.

Conveyor points CV1-CV33 are considered to be controlled by water sprays (50 %) and by enclosure (70 %) (50 % & 70% = 85 %)

An emission reduction of 30 % has been applied for the watering of paved roads as per (USEPA, 2011) which indicates that an hourly water flushing at a rate of 0.48 $gal \cdot yd^{-2}$ (equivalent to 2.2 $L \cdot m^{-2} \cdot hr^{-1}$) could result in emissions reductions of between 30 % and 70 %. For the purposes of this assessment, the lower (conservative) reduction factor of 30 % has been adopted.

Table 45 Emission estimate – volume source emissions – peak activity rates

Source ID	Co-ordinates mE	Co-ordinates mS	Description	Source Type	Emissions	Time Start	Time Stop	Source Group	Peak Activity Rates t.day^{-1}	hr.day^{-1}	t.hr^{-1}
MH01	306607	6263635	Non-ferrous metal transferred to the non-ferrous processing building	volume	Constant	6am	9pm	TRANS	150	15	10.0
MH02	306519	6263572	Transfer of raw material directly to the inspected stockpile of scrap metal (bypass pre-shredder)	volume	Constant	6am	9pm	TRANS	1500	15	100.0
MH03	306503	6263664	Transfer of raw material directly to the inspected stockpile of scrap metal (bypass pre-shredder)	volume	Constant	6am	9pm	TRANS	1500	15	100.0
MH04	306509	6263576	Transfer of raw material from stockpile to pre-shredder	volume	Constant	6am	9pm	TRANS	600	15	40.0
MH05	306522	6263569	Transfer of raw material from stockpile to pre-shredder	volume	Constant	6am	9pm	TRANS	600	15	40.0
MH06	306523	6263581	Transfer of pre-shredder output to a truck to inspected stockpile of scrap metal close to the conveyor into the hammer mill	volume	Constant	6am	9pm	TRANS	600	15	40.0
MH07	306503	6263664	Transfer of pre-shredder output to a truck to inspected stockpile of ap metal close to the conveyor into the hammer mill	volume	Constant	6am	9pm	TRANS	600	15	40.0
MH08	306503	6263664	Transfer of the inspected stockpile of scrap metal close to the conveyor onto the hammer mill conveyor	volume	Constant	6am	9pm	TRANS	2100	15	140.0
MH09	306483	6263652	Transfer of the inspected stockpile of scrap metal close to the conveyor onto the hammer mill conveyor	volume	Constant	6am	9pm	TRANS	2100	15	140.0
MH10	306503	6263664	Ferrous metals are collected from the stockpile by FEL and loaded into trucks	volume	Constant	6am	9pm	TRANS	1050	15	70.0
MH11	306533	6263680	Ferrous metals are collected from the stockpile by FEL and loaded into trucks	volume	Constant	6am	9pm	TRANS	1050	15	70.0
MH12	306633	6263573	Heavy ferrous pick up	volume	Constant	6am	9pm	TRANS	384	15	25.6
MH13	306561	6263643	Non ferrous material collected and loaded into trucks	volume	Constant	6am	9pm	TRANS	150	15	10.0

Source ID	Co-ordinates		Description	Source Type	Emissions	Time		Source Group	Peak Activity Rates		
	mE	mS				Start	Stop		t.day^{-1}	hr.day^{-1}	t.hr^{-1}
MH14	306603	6263616	Heavy ferrous drop point	volume	Constant	6am	9pm	TRANS	384	15	25.6
TP01	306525	6263577	Pre-shredder drop point	volume	Constant	6am	9pm	TRANS	600	15	40.0
TP02	306517	6263691	The cleaned fragmented material (on a conveyor C1) passes under a drum magnet, where ferrous metals are dropped onto the picking conveyor (C2)	volume	Constant	6am	9pm	CONV	1610	15	107.3
TP03	306529	6263701	Ferrous metals transferred from C2, where operators remove remaining non-ferrous materials to C3	volume	Constant	6am	9pm	CONV	1610	15	107.3
TP04	306541	6263711	Ferrous metals are conveyed to the product stockpile	volume	Constant	6am	9pm	CONV	1550	15	103.4
TP05	306512	6263687	Non-ferrous materials drop beneath the drum magnet to a conveyor (C4) that runs perpendicular to the ferrous product	volume	Constant	6am	9pm	CONV	79	15	5.2
TP06	306494	6263732	Transfer point at conveyor bend 1	volume	Constant	6am	9pm	CONV	471	15	31.4
TP07	306563	6263721	Transfer point at conveyor bend 2	volume	Constant	6am	9pm	CONV	471	15	31.4
TP08	306551	6263643	Transfer point at conveyor bend 3	volume	Constant	6am	9pm	CONV	471	15	31.4
CV01	306484	6263660	Material from the stockpiles is conveyed into the hammer mill	volume	Constant	6am	9pm	CONV	1800	15	120.0
CV02	306486	6263672	Material from the stockpiles is conveyed into the hammer mill	volume	Constant	6am	9pm	CONV	1800	15	120.0
CV03	306489	6263687	Material from the stockpiles is conveyed into the hammer mill	volume	Constant	6am	9pm	CONV	1800	15	120.0
CV04	306489	6263694	Material from the hammer mill is carried upward by an incline conveyor and dropped into a chute	volume	Constant	6am	9pm	CONV	1800	15	120.0
CV05	306513	6263691	The cleaned fragmented material from the cascade chute passes under the drum magnet and ferrous metals are removed	volume	Constant	6am	9pm	CONV	1354	15	90.3
CV06	306520	6263693	Operators remove remaining non ferrous materials	volume	Constant	6am	9pm	TRANS	1354	15	90.3
CV07	306527	6263699	Operators remove remaining non ferrous materials	volume	Constant	6am	9pm	TRANS	1354	15	90.3

Source ID	Co-ordinates		Description	Source Type	Emissions	Time		Source Group	Peak Activity Rates		
	mE	mS				Start	Stop		$t.day^{-1}$	$hr.day^{-1}$	$t.hr^{-1}$
CV08	306534	6263704	Ferrous materials are taken and dropped onto a conveyor, which are conveyed to the product stockpile	volume	Constant	6am	9pm	CONV	1354	15	90.3
CV09	306538	6263708	Ferrous materials are taken and dropped onto a conveyor, which are conveyed to the product stockpile	volume	Constant	6am	9pm	CONV	1354	15	90.3
CV10	306514	6263695	Non-ferrous materials are dropped onto a conveyor, which transports material to the conveyor before the non-ferrous processing building	volume	Constant	6am	9pm	CONV	69	15	4.6
CV11	306515	6263702	Non-ferrous materials are dropped onto a conveyor, which transports material to the conveyor before the non-ferrous processing building	volume	Constant	6am	9pm	CONV	69	15	4.6
CV12	306516	6263711	Conveys non-ferrous material into the non-ferrous recovery plant (3/3)	volume	Constant	6am	9pm	CONV	69	15	4.6
CV13	306491	6263710	Floc product is transferred onto conveyor	volume	Constant	6am	9pm	CONV	377	15	25.1
CV14	306492	6263718	Floc product is transferred onto conveyor	volume	Constant	6am	9pm	CONV	377	15	25.1
CV15	306493	6263727	Floc product is transferred onto conveyor	volume	Constant	6am	9pm	CONV	377	15	25.1
CV16	306503	6263732	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4
CV17	306512	6263731	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4
CV18	306522	6263729	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4
CV19	306533	6263727	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4
CV20	306542	6263726	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4

Source ID	Co-ordinates		Description	Source Type	Emissions	Time		Source Group	Peak Activity Rates		
	mE	mS				Start	Stop		$t.day^{-1}$	$hr.day^{-1}$	$t.hr^{-1}$
CV21	306551	6263725	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4
CV22	306558	6263724	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4
CV23	306558	6263713	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4
CV24	306556	6263703	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4
CV25	306555	6263693	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4
CV26	306553	6263683	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4
CV27	306552	6263674	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4
CV28	306551	6263663	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4
CV29	306550	6263653	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4
CV30	306551	6263643	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4
CV31	306557	6263635	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4
CV32	306562	6263625	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4
CV33	306567	6263617	Conveyor transports floc product to the post shredder processing building	volume	Constant	6am	9pm	CONV	411	15	27.4

Source ID	Co-ordinates		Description	Source Type	Emissions	Time		Source Group	Peak Activity Rates		
	mE	mS				Start	Stop		$t.day^{-1}$	$hr.day^{-1}$	$t.hr^{-1}$
TRKD01	306502	6263580	Truck dumping at raw material delivery	volume	Constant	6am	9pm	TRANS	2634	15	175.6
TRKD02	306503	6263664	Truck carries pre-shredder output to the inspected stockpile of scrap metal close to the conveyor into the hammer mill	volume	Constant	6am	9pm	TRANS	600	15	40

Note: source group please refer to **Appendix E**

Table 46 Emission estimate – volume source emissions – peak emission rates

The variables used in these estimations are presented earlier in **Appendix C**.

Source ID	Emission Factor (AP42 batch drop)			Emission Rate (Uncontrolled) (ERu)			Emission Rate (Controlled) (ERc)			
	EF TSP	EF PM_{10}	EF $PM_{2.5}$	ERu TSP	ERu PM_{10}	ERu $PM_{2.5}$	CF	ERc TSP	ERc PM_{10}	ERc $PM_{2.5}$
	$kg.t^{-1}$	$kg.t^{-1}$	$kg.t^{-1}$	$g.s^{-1}$	$g.s^{-1}$	$g.s^{-1}$	%	$g.s^{-1}$	$g.s^{-1}$	$g.s^{-1}$
MH01	0.0014	0.0007	0.0001	3.843E-03	1.818E-03	2.753E-04	70	1.153E-03	5.453E-04	8.258E-05
MH02	0.0014	0.0007	0.0001	3.843E-02	1.818E-02	2.753E-03	70	1.153E-02	5.453E-03	8.258E-04
MH03	0.0014	0.0007	0.0001	3.843E-02	1.818E-02	2.753E-03	70	1.153E-02	5.453E-03	8.258E-04
MH04	0.0014	0.0007	0.0001	1.537E-02	7.271E-03	1.101E-03	70	4.612E-03	2.181E-03	3.303E-04
MH05	0.0014	0.0007	0.0001	1.537E-02	7.271E-03	1.101E-03	70	4.612E-03	2.181E-03	3.303E-04
MH06	0.0014	0.0007	0.0001	1.537E-02	7.271E-03	1.101E-03	70	4.612E-03	2.181E-03	3.303E-04
MH07	0.0014	0.0007	0.0001	1.537E-02	7.271E-03	1.101E-03	70	4.612E-03	2.181E-03	3.303E-04
MH08	0.0014	0.0007	0.0001	5.380E-02	2.545E-02	3.854E-03	70	1.614E-02	7.634E-03	1.156E-03
MH09	0.0014	0.0007	0.0001	5.380E-02	2.545E-02	3.854E-03	70	1.614E-02	7.634E-03	1.156E-03
MH10	0.0014	0.0007	0.0001	2.690E-02	1.272E-02	1.927E-03	70	8.071E-03	3.817E-03	5.780E-04
MH11	0.0014	0.0007	0.0001	2.690E-02	1.272E-02	1.927E-03	70	8.071E-03	3.817E-03	5.780E-04
MH12	0.0014	0.0007	0.0001	9.838E-03	4.653E-03	7.046E-04	70	2.952E-03	1.396E-03	2.114E-04
MH13	0.0014	0.0007	0.0001	3.843E-03	1.818E-03	2.753E-04	70	1.153E-03	5.453E-04	8.258E-05
MH14	0.0014	0.0007	0.0001	9.838E-03	4.653E-03	7.046E-04	70	2.952E-03	1.396E-03	2.114E-04
TP01	0.0014	0.0007	0.0001	1.537E-02	7.271E-03	1.101E-03	0	1.537E-02	7.271E-03	1.101E-03
TP02	0.0014	0.0007	0.0001	4.125E-02	1.951E-02	2.954E-03	0	4.125E-02	1.951E-02	2.954E-03
TP03	0.0014	0.0007	0.0001	4.125E-02	1.951E-02	2.954E-03	0	4.125E-02	1.951E-02	2.954E-03
TP04	0.0014	0.0007	0.0001	3.972E-02	1.879E-02	2.845E-03	0	3.972E-02	1.879E-02	2.845E-03
TP05	0.0014	0.0007	0.0001	2.011E-03	9.513E-04	1.441E-04	0	2.011E-03	9.513E-04	1.441E-04
TP06	0.0014	0.0007	0.0001	1.207E-02	5.708E-03	8.643E-04	0	1.207E-02	5.708E-03	8.643E-04
TP07	0.0014	0.0007	0.0001	1.207E-02	5.708E-03	8.643E-04	0	1.207E-02	5.708E-03	8.643E-04
TP08	0.0014	0.0007	0.0001	1.207E-02	5.708E-03	8.643E-04	0	1.207E-02	5.708E-03	8.643E-04
CV01	0.0014	0.0007	0.0001	1.153E-02	5.453E-03	8.258E-04	85	1.729E-03	8.180E-04	1.239E-04
CV02	0.0014	0.0007	0.0001	1.153E-02	5.453E-03	8.258E-04	85	1.729E-03	8.180E-04	1.239E-04

Source ID	Emission Factor (AP42 batch drop)			Emission Rate (Uncontrolled) (ERu)			Emission Rate (Controlled) (ERc)			
	EF TSP	EF PM_{10}	EF $PM_{2.5}$	ERu TSP	ERu PM_{10}	ERu $PM_{2.5}$	CF	ERc TSP	ERc PM_{10}	ERc $PM_{2.5}$
	$kg.t^{-1}$	$kg.t^{-1}$	$kg.t^{-1}$	$g.s^{-1}$	$g.s^{-1}$	$g.s^{-1}$	%	$g.s^{-1}$	$g.s^{-1}$	$g.s^{-1}$
CV03	0.0014	0.0007	0.0001	1.153E-02	5.453E-03	8.258E-04	85	1.729E-03	8.180E-04	1.239E-04
CV04	0.0014	0.0007	0.0001	1.153E-02	5.453E-03	8.258E-04	85	1.729E-03	8.180E-04	1.239E-04
CV05	0.0014	0.0007	0.0001	6.940E-03	3.282E-03	4.970E-04	85	1.041E-03	4.923E-04	7.455E-05
CV06	0.0014	0.0007	0.0001	6.940E-03	3.282E-03	4.970E-04	85	1.041E-03	4.923E-04	7.455E-05
CV07	0.0014	0.0007	0.0001	6.940E-03	3.282E-03	4.970E-04	85	1.041E-03	4.923E-04	7.455E-05
CV08	0.0014	0.0007	0.0001	6.940E-03	3.282E-03	4.970E-04	85	1.041E-03	4.923E-04	7.455E-05
CV09	0.0014	0.0007	0.0001	6.940E-03	3.282E-03	4.970E-04	85	1.041E-03	4.923E-04	7.455E-05
CV10	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV11	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV12	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV13	0.0014	0.0007	0.0001	3.221E-03	1.523E-03	2.307E-04	85	4.831E-04	2.285E-04	3.460E-05
CV14	0.0014	0.0007	0.0001	3.221E-03	1.523E-03	2.307E-04	85	4.831E-04	2.285E-04	3.460E-05
CV15	0.0014	0.0007	0.0001	3.221E-03	1.523E-03	2.307E-04	85	4.831E-04	2.285E-04	3.460E-05
CV16	0.0014	0.0007	0.0001	1.054E-02	4.986E-03	7.550E-04	85	1.581E-03	7.479E-04	1.132E-04
CV17	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV18	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV19	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV20	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV21	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV22	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV23	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV24	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV25	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV26	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV27	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV28	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV29	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06

Source ID	Emission Factor (AP42 batch drop)			Emission Rate (Uncontrolled) (ERu)			Emission Rate (Controlled) (ERc)			
	EF TSP	EF PM_{10}	EF $PM_{2.5}$	ERu TSP	ERu PM_{10}	ERu $PM_{2.5}$	CF	ERc TSP	ERc PM_{10}	ERc $PM_{2.5}$
	$kg.t^{-1}$	$kg.t^{-1}$	$kg.t^{-1}$	$g.s^{-1}$	$g.s^{-1}$	$g.s^{-1}$	%	$g.s^{-1}$	$g.s^{-1}$	$g.s^{-1}$
CV30	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV31	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV32	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
CV33	0.0014	0.0007	0.0001	5.856E-04	2.770E-04	4.194E-05	85	8.784E-05	4.155E-05	6.291E-06
TRKD01	0.0014	0.0007	0.0001	6.749E-02	3.192E-02	4.833E-03	70	2.025E-02	9.576E-03	1.450E-03
TRKD02	0.0014	0.0007	0.0001	1.537E-02	7.271E-03	1.101E-03	70	4.612E-03	2.181E-03	3.303E-04

Table 47 Emission estimate – open area wind erosion sources – peak activity rates

Source ID	Co-ordinates		Description	Emissions	Time		Source Group	Peak Activity Rates	
	mE	mS			Start	Stop		Area	hr.day^{-1}
WE01	306,494	6,263,578	Scrap stockpile	Hourly varying	12am	12am	WE	653 sqm	24
WE02	306,507	6,263,543	Scrap stockpile	Hourly varying	12am	12am	WE	428 sqm	24
WE03	306,631	6,263,571	Post pre-shredder stockpile 1- at pre-shredder	Hourly varying	12am	12am	WE	2100 sqm	24
WE04	306,503	6,263,664	Post pre-shredder stockpile 2- at hammer mill	Hourly varying	12am	12am	WE	2562 sqm	24
WE05	306,542	6,263,709	Ferrous product stockpile.	Hourly varying	12am	12am	WE	303 sqm	24
WE06	306,544	6,263,695	Ferrous product stockpile.	Hourly varying	12am	12am	WE	303 sqm	24

Table 48 Emission estimate – open area wind erosion sources – peak emission rates

The variables used in these estimations are presented earlier in **Appendix C**.

Source ID		Emission Factor kg·ha^{-1}·yr^{-1}			Emission Rate kg·yr^{-1}		
		TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
WE01	NPI Mining	925.8	462.9	370.3	60.5	30.2	24.2
WE02	NPI Mining	925.8	462.9	370.3	39.6	19.8	15.8
WE03	NPI Mining	925.8	462.9	370.3	194.4	97.2	77.8
WE04	NPI Mining	925.8	462.9	370.3	237.2	118.6	94.9
WE05	NPI Mining	925.8	462.9	370.3	28.1	14.0	11.2
WE06	NPI Mining	925.8	462.9	370.3	28.1	14.0	11.2
				Total	588	294	235

Table 49 Emission estimate – wheel generated dust – peak activity rates

Source	Gate in	Destination	Gate out	Dist. (m)	$Veh \cdot day^{-1}$	$VKT \cdot day^{-1}$	W (ave t)	sL	Sources
ROAD 1	Western	Shred/Floc	Eastern	457	92	42.044	15	9.7	16
ROAD 2	Central	Non Ferrous	Eastern	336	103	34.608	15	9.7	16
ROAD 3	Western	Pre Shred	Eastern	604	24	14.496	15	9.7	16
ROAD 4	Western	Shear & Oxy	Eastern	564	23	12.972	15	9.7	16

Table 50 Emission estimate – wheel generated dust – peak emission rates

The variables used in these estimations are presented earlier in **Appendix C**.

Source	EF $kg \cdot VKT^{-1}$			ERu ($kg \cdot day^{-1}$)			CF	ERc ($kg \cdot day^{-1}$)			ERc ($g \cdot s^{-1}$)		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	%	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
ROAD 1	0.4044	0.0776	0.0188	17.001	3.263	0.790	30	11.901	2.875	0.767	0.2204	0.0532	0.0142
ROAD 2	0.4044	0.0776	0.0188	13.994	2.686	0.650	30	9.796	2.423	0.634	0.1814	0.0449	0.0117
ROAD 3	0.4044	0.0776	0.0188	5.862	1.125	0.272	30	4.103	1.079	0.269	0.0760	0.0200	0.0050
ROAD 4	0.4044	0.0776	0.0188	5.245	1.007	0.244	30	3.672	0.970	0.241	0.0680	0.0180	0.0045

The following tables present annual emission estimates, as discussed in **Section 5.2.6**.

Table 51 Annual emission estimate by activity and site total - TSP

Estimation	Peak(B)		Typical(C)			
Conditions	Uncon	Con(A)	Uncon	Con	Uncon	Con
BPM Source Group(D)	kg·day^{-1}	kg·day^{-1}	kg·day^{-1}	kg·day^{-1}	kg·yr^{-1}	kg·yr^{-1}
Haulage (HAUL)	42.1	29.5	31.8	22.2	9 527.1	6 669.0
Conveying (CONV)	36.3	5.5	27.4	4.1	8 223.6	1 233.5
Handling/transfer (TRANS)	26.7	8.0	20.2	6.0	6 045.5	1 813.7
Hammermill (E) (HAMMER)	4.1	4.1	4.1	4.1	1215.0	1 215.0
Wind erosion (E)(F) (WE)	1.6	1.6	1.6	1.6	587.8	587.8
Oxycutting (E)(F) (OXY)	0.3	0.3	0.3	0.3	88.6	88.6
Total	111	49	85	38	25 688	11 608

Notes: (A) Controlled as per the control factors (CF) presented in **Appendix C**, ie. 30 % for road haulage, 85 % for conveyors and 70 % for handling / transfers

(B) Based on peak daily activity rates (see **Section 2.2.2** and **Section 5.2**)

(C) Based on typical emission daily activity rates (see **Section 2.2.2**) (daily peak × 0.753), extrapolated to annual estimates through multiplication by 300 operational days per year, except wind erosion which is 365 days per year.

(D) See **Appendix E**

(E) Assumed to be constant with the peak activity rates

(F) Emission rates determined from monitoring data, and therefore represents actual conditions

Table 52 Annual emission estimate by activity and site total – PM_{10}

Estimation	Peak(B)		Typical(C)			
Conditions	Uncon	Con(A)	Uncon	Con	Uncon	Con
BPM Source Group(D)	kg·day^{-1}	kg·day^{-1}	kg·day^{-1}	kg·day^{-1}	kg·yr^{-1}	kg·yr^{-1}
Haulage (HAUL)	8.1	5.7	6.1	4.3	1828.7	1280.1
Conveying (CONV)	17.2	2.6	13.0	1.9	3889.5	583.4
Handling/transfer (TRANS)	12.6	3.8	9.5	2.9	2859.4	857.8
Hammermill (E) (HAMMER)	2.9	2.9	2.9	2.9	864.0	864.0
Wind erosion (E)(F) (WE)	0.8	0.8	0.8	0.8	293.9	293.9
Oxycutting (E)(F) (OXY)	0.0	0.0	0.0	0.0	0.0	0.0
Total	42	16	32	13	9 736	3 879

Notes: (A) Controlled as per the control factors (CF) presented in **Appendix C**, ie. 30 % for road haulage, 85 % for conveyors and 70 % for handling / transfers

(B) Based on peak daily activity rates (see **Section 2.2.2** and **Section 5.2**)

(C) Based on typical emission daily activity rates (see **Section 2.2.2**) (daily peak × 0.753), extrapolated to annual estimates through multiplication by 300 operational days per year, except wind erosion which is 365 days per year.

(D) See **Appendix E**

(E) Assumed to be constant with the peak activity rates

(F) Emission rates determined from monitoring data, and therefore represents actual conditions

Table 53 Annual emission estimate by activity and site total – $PM_{2.5}$

Estimation	Peak(B)		Typical(C)			
Conditions	Uncon	Con(A)	Uncon	Con	Uncon	Con
BPM Source Group(D)	kg·day^{-1}	kg·day^{-1}	kg·day^{-1}	kg·day^{-1}	kg·yr^{-1}	kg·yr^{-1}
Haulage (HAUL)	2.0	1.4	1.5	1.0	442.4	309.7
Conveying (CONV)	2.6	0.4	2.0	0.3	589.0	88.3
Handling/transfer (TRANS)	1.9	0.6	1.4	0.4	433.0	129.9
Hammermill (E) (HAMMER)	1.8	1.8	1.8	1.8	540.0	540.0
Wind erosion (E)(F) (WE)	0.6	0.6	0.6	0.6	235.1	235.1
Oxycutting (E)(F) (OXY)	0.0	0.0	0.0	0.0	0.0	0.0
Total	9	5	7	4	2 240	1 303

Notes: (A) Controlled as per the control factors (CF) presented in **Appendix C**, ie. 30 % for road haulage, 85 % for conveyors and 70 % for handling / transfers

(B) Based on peak daily activity rates (see **Section 2.2.2** and **Section 5.2**)

(C) Based on typical emission daily activity rates (see **Section 2.2.2**) (daily peak × 0.753), extrapolated to annual estimates through multiplication by 300 operational days per year, except wind erosion which is 365 days per year.

(D) See **Appendix E**

(E) Assumed to be constant with the peak activity rates

(F) Emission rates determined from monitoring data, and therefore represents actual conditions

Appendix D – Schedule of Results

The following section presents the results of the dispersion modelling exercise performed with the emission inventory presented in **Appendix C**.

This section presents the results of the dispersion modelling assessment and uses the following terminology:

- Incremental impact – relates to the concentrations predicted as a result of the construction and operation of the Proposal in isolation.
- Cumulative impact – relates to the incremental concentrations predicted as a result of the construction and operation of the Proposal PLUS the background air quality concentrations.

The results are presented in this manner to allow examination of the likely impact of the Proposal in isolation and the contribution to air quality impacts in a broader sense.

In the presentation of results, the tables included shaded cells which represent the following:

Model prediction	Pollutant concentration / deposition rate less than the relevant criterion	**Pollutant concentration / deposition rate equal to, or greater than the relevant criterion**

Where incremental impacts are predicts as less than (<) the relevant reporting range, the cumulative impact has been calculated at 100 % of the reporting threshold.

Reference should be made to **Section 4.1.1** and **Table 13** for discussion on the interpretation of predicted results with regard to the respective pollutant averaging time. For the purposes of ongoing air quality management this appendix presents a full summary predicted impacts at all receptor locations.

Results at industrial receptors R10 to R19 and on-site monitoring stations R34 to R35 are shown as *italicised* text to assist with interpretation and context.

Annual Average TSP, PM_{10} and $PM_{2.5}$

Table 54 Predicted incremental and cumulative annual average TSP, PM_{10} and $PM_{2.5}$ concentrations (all receptors)

Receptor	Annual Average Concentration ($\mu g \cdot m^{-3}$)								
	TSP			PM_{10}			$PM_{2.5}$		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R1	1.2	44.8	46.0	0.4	21.8	22.2	0.1	8.5	8.6
R2	1.1	44.8	45.9	0.4	21.8	22.2	<0.1	8.5	8.6
R3	0.9	44.8	45.7	0.3	21.8	22.1	<0.1	8.5	8.6
R4	0.6	44.8	45.4	0.2	21.8	22.0	<0.1	8.5	8.6
R5	0.5	44.8	45.3	0.2	21.8	22.0	<0.1	8.5	8.6
R6	0.4	44.8	45.2	0.2	21.8	22.0	<0.1	8.5	8.6
R7	0.3	44.8	45.1	0.1	21.8	21.9	<0.1	8.5	8.6
R8	0.4	44.8	45.2	0.2	21.8	22.0	<0.1	8.5	8.6
R9	0.4	44.8	45.2	0.2	21.8	22.0	<0.1	8.5	8.6
R10	*10.6*	*44.8*	*55.4*	*3.9*	*21.8*	*25.7*	*0.8*	*8.5*	*9.3*
R11	*21.1*	*44.8*	*65.9*	*8.7*	*21.8*	*30.5*	*1.6*	*8.5*	*10.1*
R12	*11.9*	*44.8*	*56.7*	*4.3*	*21.8*	*26.1*	*0.9*	*8.5*	*9.4*
R13	*7.3*	*44.8*	*52.1*	*2.4*	*21.8*	*24.2*	*0.6*	*8.5*	*9.1*
R14	*5.5*	*44.8*	*50.3*	*1.6*	*21.8*	*23.4*	*0.4*	*8.5*	*8.9*
R15	*5.3*	*44.8*	*50.1*	*1.4*	*21.8*	*23.2*	*0.4*	*8.5*	*8.9*
R16	*7.1*	*44.8*	*51.9*	*2.3*	*21.8*	*24.1*	*0.6*	*8.5*	*9.1*
R17	*3.5*	*44.8*	*48.3*	*1.2*	*21.8*	*23.0*	*0.3*	*8.5*	*8.8*
R18	*2.7*	*44.8*	*47.5*	*0.9*	*21.8*	*22.7*	*0.2*	*8.5*	*8.7*
R19	*14.6*	*44.8*	*59.4*	*5.3*	*21.8*	*27.1*	*1.1*	*8.5*	*9.6*
R20	0.2	44.8	45.0	<0.1	21.8	21.9	<0.1	8.5	8.6
R21	0.1	44.8	44.9	<0.1	21.8	21.9	<0.1	8.5	8.6
R22	0.4	44.8	45.2	0.2	21.8	22.0	<0.1	8.5	8.6
R23	0.2	44.8	45.0	<0.1	21.8	21.9	<0.1	8.5	8.6
R24	0.2	44.8	45.0	<0.1	21.8	21.9	<0.1	8.5	8.6
R25	0.4	44.8	45.2	0.1	21.8	21.9	<0.1	8.5	8.6
R26	0.3	44.8	45.1	0.1	21.8	21.9	<0.1	8.5	8.6
R27	0.4	44.8	45.2	0.1	21.8	21.9	<0.1	8.5	8.6
R28	0.4	44.8	45.2	0.1	21.8	21.9	<0.1	8.5	8.6
R29	0.9	44.8	45.7	0.3	21.8	22.1	<0.1	8.5	8.6
R30	0.4	44.8	45.2	0.2	21.8	22.0	<0.1	8.5	8.6
R31	0.4	44.8	45.2	0.2	21.8	22.0	<0.1	8.5	8.6
R32	0.3	44.8	45.1	0.1	21.8	21.9	<0.1	8.5	8.6

Receptor	Annual Average Concentration ($\mu g \cdot m^{-3}$)								
	TSP			PM_{10}			$PM_{2.5}$		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R33	0.3	44.8	45.1	0.1	21.8	21.9	<0.1	8.5	8.6
R34	*16.4*	*44.8*	*61.2*	*6.1*	*21.8*	*27.9*	*1.2*	*8.5*	*9.7*
R35	*9.5*	*44.8*	*54.3*	*3.0*	*21.8*	*24.8*	*0.8*	*8.5*	*9.3*
Criterion	-	90		-	25			8	

24-hour Average Incremental PM_{10} and $PM_{2.5}$

Table 55 Predicted incremental 24-hour average PM_{10} and $PM_{2.5}$ concentrations

Receptor	Maximum 24-hour average concentration ($\mu g \cdot m^{-3}$)	
	PM_{10}	$PM_{2.5}$
R1	4.7	1.2
R2	6.2	1.6
R3	4.5	1.2
R4	2.1	0.6
R5	1.8	0.5
R6	1.9	0.5
R7	1.9	0.5
R8	1.9	0.5
R9	1.9	0.5
R10	*20.9*	*4.4*
R11	*42.1*	*7.2*
R12	*29.3*	*5.2*
R13	*14.9*	*3.3*
R14	*11.4*	*3.0*
R15	*15.2*	*3.9*
R16	*16.1*	*3.6*
R17	*7.0*	*1.9*
R18	*7.1*	*2.0*
R19	*21.8*	*4.3*
R20	1.4	0.4
R21	1.2	0.3
R22	3.6	1.0
R23	2.0	0.5
R24	1.9	0.5
R25	1.8	0.5
R26	1.6	0.5
R27	2.1	0.6
R28	2.1	0.6
R29	4.3	1.2
R30	2.7	0.7
R31	2.4	0.6
R32	1.4	0.4
R33	1.1	0.3
R34	*38.9*	*6.2*
R35	*14.0*	*3.7*

24-hour Average Cumulative PM_{10} and $PM_{2.5}$

Table 56 Predicted cumulative 24-hour average PM_{10} concentrations

Date	24-hour average PM_{10} concentration R2 ($\mu g \cdot m^{-3}$)			Date	24-hour average PM_{10} concentration R2 ($\mu g \cdot m^{-3}$)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
22/11/2018	1.4	113.3	114.7	12/07/2018	6.2	20.0	26.2
19/03/2018	<0.1	70.2	70.3	13/06/2018	4.2	14.1	18.3
28/05/2018	<0.1	65.8	65.9	21/05/2018	3.4	17.5	20.9
18/07/2018	3.3	61.9	65.2	18/07/2018	3.3	61.9	65.2
15/02/2018	<0.1	61.6	61.7	23/05/2018	2.9	29.3	32.2
29/05/2018	<0.1	58.7	58.8	17/08/2018	2.9	20.0	22.9
21/11/2018	0.7	55.7	56.4	14/06/2018	2.8	12.6	15.4
19/07/2018	<0.1	54.4	54.5	4/08/2018	2.8	22.3	25.1
18/03/2018	1.3	47.9	49.2	27/07/2018	2.8	31.2	34.0
14/04/2018	<0.1	47.8	47.9	14/08/2018	2.5	18.6	21.1
These data represent the highest Cumulative Impact 24-hour PM_{10} predictions outlined in red as a result of the operation of the project.				These data represent the highest Incremental Impact 24-hour PM_{10} predictions outlined in blue as a result of the operation of the project.			

Table 57 Predicted cumulative 24-hour average $PM_{2.5}$ concentrations

Date	24-hour average $PM_{2.5}$ concentration R2 ($\mu g \cdot m^{-3}$)			Date	24-hour average $PM_{2.5}$ concentration R2 ($\mu g \cdot m^{-3}$)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
29/05/2018	<0.1	47.5	47.6	12/07/2018	1.6	13.8	15.4
28/05/2018	<0.1	42.5	42.6	13/06/2018	1.1	6.9	8.0
6/05/2018	0.3	27.1	27.4	27/07/2018	0.8	19.5	20.3
27/05/2018	<0.1	27.0	27.1	21/05/2018	0.8	7.4	8.2
15/07/2018	0.5	23.1	23.6	23/05/2018	0.8	11.3	12.1
9/05/2018	<0.1	21.7	21.8	18/07/2018	0.8	8.9	9.7
25/04/2018	<0.1	20.6	20.7	14/06/2018	0.8	5.2	6.0
27/07/2018	0.8	19.5	20.3	17/08/2018	0.8	9.4	10.2
8/05/2018	0.2	19.9	20.1	4/08/2018	0.7	9.2	9.9
26/08/2018	0.6	18.4	19.0	22/06/2018	0.7	17.0	17.7
These data represent the highest Cumulative Impact 24-hour PM_{10} predictions outlined in red as a result of the operation of the project.				These data represent the highest Incremental Impact 24-hour PM_{10} predictions outlined in blue as a result of the operation of the project.			

Nitrogen Dioxide

Incremental and cumulative 1-hour and annual average NO_2 impacts are presented in **Table 27**. The results schedules report concentrations at R1-R33, as those receptor locations are relevant to a 1-hour averaging period. The industrial receptor locations are shown with shading to assist with interpretation.

It is noted that the assessment assumes a 100 % conversion of NO_X to NO_2.

Table 58 Predicted incremental 1-hour and annual average NO_2 concentrations

Rec.	Nitrogen dioxide (NO_2) concentration ($\mu g \cdot m^{-3}$)					
	1 hour			Annual Average		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R1	1.0	104.6	105.6	0.01	18.7	18.7
R2	0.9	104.6	105.5	0.01	18.7	18.7
R3	0.8	104.6	105.4	0.01	18.7	18.7
R4	0.5	104.6	105.1	0.01	18.7	18.7
R5	0.4	104.6	105.0	0.00	18.7	18.7
R6	0.4	104.6	105.0	0.00	18.7	18.7
R7	0.4	104.6	105.0	0.00	18.7	18.7
R8	0.7	104.6	105.3	0.01	18.7	18.7
R9	0.8	104.6	105.4	0.01	18.7	18.7
R10	*1.1*	*104.6*	*105.7*	*0.06*	*18.7*	*18.8*
R11	*1.8*	*104.6*	*106.4*	*0.07*	*18.7*	*18.8*
R12	*2.3*	*104.6*	*106.9*	*0.05*	*18.7*	*18.8*
R13	*2.6*	*104.6*	*107.2*	*0.05*	*18.7*	*18.7*
R14	*2.1*	*104.6*	*106.7*	*0.04*	*18.7*	*18.7*
R15	*1.3*	*104.6*	*105.9*	*0.04*	*18.7*	*18.7*
R16	*3.5*	*104.6*	*108.1*	*0.09*	*18.7*	*18.8*
R17	*1.8*	*104.6*	*106.4*	*0.05*	*18.7*	*18.8*
R18	*1.2*	*104.6*	*105.8*	*0.04*	*18.7*	*18.7*
R19	*1.4*	*104.6*	*106.0*	*0.05*	*18.7*	*18.8*
R20	0.5	104.6	105.1	0.00	18.7	18.7
R21	0.6	104.6	105.2	0.00	18.7	18.7
R22	0.7	104.6	105.3	0.00	18.7	18.7
R23	0.6	104.6	105.2	0.00	18.7	18.7
R24	0.5	104.6	105.1	0.01	18.7	18.7
R25	0.5	104.6	105.1	0.00	18.7	18.7
R26	0.4	104.6	105.0	0.01	18.7	18.7
R27	0.4	104.6	105.0	0.01	18.7	18.7
R28	0.6	104.6	105.2	0.01	18.7	18.7
R29	0.9	104.6	105.5	0.01	18.7	18.7

Rec.	Nitrogen dioxide (NO_2) concentration ($\mu g \cdot m^{-3}$)					
	1 hour			Annual Average		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R30	0.6	104.6	105.2	0.01	18.7	18.7
R31	0.8	104.6	105.4	0.01	18.7	18.7
R32	0.5	104.6	105.1	0.00	18.7	18.7
R33	0.4	104.6	105.0	0.00	18.7	18.7
R34	*2.0*	*104.6*	*106.6*	*0.05*	*18.7*	*18.8*
R35	*3.1*	*104.6*	*107.7*	*0.08*	*18.7*	*18.8*
Criterion		246			62	

The results do not predict any exceedances of the 1-hour or annual average NO_2 criteria.

Annual Average Dust Deposition

Table 59 Predicted incremental & cumulative dust deposition rates

Receptor	Annual Average Dust Deposition ($g \cdot m^{-2} \cdot month^{-1}$)		
	Incremental Impact	Background	Cumulative Impact
R1	0.1	2.0	2.1
R2	<0.1	2.0	2.1
R3	<0.1	2.0	2.1
R4	<0.1	2.0	2.1
R5	<0.1	2.0	2.1
R6	<0.1	2.0	2.1
R7	<0.1	2.0	2.1
R8	<0.1	2.0	2.1
R9	<0.1	2.0	2.1
R10	*1.3*	*2.0*	*3.3*
R11	*3.2*	*2.0*	*5.2*
R12	*1.9*	*2.0*	*3.9*
R13	*1.0*	*2.0*	*3.0*
R14	*0.7*	*2.0*	*2.7*
R15	*0.7*	*2.0*	*2.7*
R16	*0.9*	*2.0*	*2.9*
R17	*0.4*	*2.0*	*2.4*
R18	*0.3*	*2.0*	*2.3*
R19	*1.8*	*2.0*	*3.8*
R20	<0.1	2.0	2.1
R21	<0.1	2.0	2.1
R22	<0.1	2.0	2.1
R23	<0.1	2.0	2.1
R24	<0.1	2.0	2.1
R25	<0.1	2.0	2.1
R26	<0.1	2.0	2.1
R27	<0.1	2.0	2.1
R28	<0.1	2.0	2.1
R29	<0.1	2.0	2.1
R30	<0.1	2.0	2.1
R31	<0.1	2.0	2.1
R32	<0.1	2.0	2.1
R33	<0.1	2.0	2.1
R34	*3.0*	*2.0*	*5.0*
R35	*1.3*	*2.0*	*3.3*
Criterion	2	-	2

Other Pollutants

Model predictions for metals and other pollutants (including Cl_2 and HF) for which there are a published criterion in the Approved Methods (NSW EPA, 2017) are summarised in **Table 60** and **Table 61**.

The predicted impacts are not predicted to exceed the relevant impact assessment criteria for any pollutants.

Table 60 Predicted incremental impacts (1 of 2)

Rec.	Predicted Impact ($\mu g{\cdot}m^{-3}$)								
	Ag	As	Ba	Cd	Cl_2	Cr(VI)	Cr	Cu	Fe
	1-hour	1-hour	1-hour	1-hour	1-hour	1-hour	1-hour	1-hour	1-hour
1	2.57E-06	4.92E-04	8.56E-04	1.47E-04	2.45E-03	9.80E-04	5.39E-04	5.89E-04	9.63E-02
2	2.49E-06	4.43E-04	8.29E-04	1.33E-04	2.21E-03	8.83E-04	4.85E-04	5.30E-04	9.32E-02
3	2.23E-06	4.18E-04	7.43E-04	1.25E-04	2.08E-03	8.33E-04	4.58E-04	5.01E-04	8.45E-02
4	7.11E-07	2.34E-04	2.37E-04	7.01E-05	1.17E-03	4.67E-04	2.57E-04	2.81E-04	2.73E-02
5	5.84E-07	1.98E-04	1.95E-04	5.94E-05	9.90E-04	3.96E-04	2.17E-04	2.38E-04	2.29E-02
6	5.72E-07	2.15E-04	1.91E-04	6.44E-05	1.07E-03	4.29E-04	2.36E-04	2.58E-04	2.24E-02
7	3.93E-07	2.09E-04	1.31E-04	6.26E-05	1.04E-03	4.17E-04	2.29E-04	2.51E-04	1.49E-02
8	5.21E-07	3.57E-04	1.74E-04	1.07E-04	1.78E-03	7.11E-04	3.91E-04	4.27E-04	1.98E-02
9	9.92E-07	4.14E-04	3.31E-04	1.24E-04	2.06E-03	8.25E-04	4.53E-04	4.95E-04	3.89E-02
10	*8.26E-06*	*6.95E-04*	*2.75E-03*	*1.61E-04*	*2.62E-03*	*1.05E-03*	*6.33E-04*	*8.97E-04*	*3.09E-01*
11	*1.41E-05*	*9.05E-04*	*4.69E-03*	*2.71E-04*	*4.52E-03*	*1.81E-03*	*9.92E-04*	*1.08E-03*	*5.22E-01*
12	*1.91E-05*	*1.16E-03*	*6.38E-03*	*3.49E-04*	*5.81E-03*	*2.32E-03*	*1.28E-03*	*1.39E-03*	*7.04E-01*
13	*1.98E-05*	*1.31E-03*	*6.60E-03*	*3.94E-04*	*6.56E-03*	*2.62E-03*	*1.44E-03*	*1.57E-03*	*7.28E-01*
14	*2.17E-05*	*1.05E-03*	*7.22E-03*	*3.15E-04*	*5.24E-03*	*2.10E-03*	*1.15E-03*	*1.26E-03*	*7.95E-01*
15	*2.18E-05*	*9.65E-04*	*7.27E-03*	*2.01E-04*	*3.35E-03*	*1.34E-03*	*7.36E-04*	*1.32E-03*	*8.05E-01*
16	*1.23E-05*	*1.75E-03*	*4.10E-03*	*5.23E-04*	*8.71E-03*	*3.48E-03*	*1.91E-03*	*2.09E-03*	*4.51E-01*
17	*5.50E-06*	*8.81E-04*	*1.83E-03*	*2.64E-04*	*4.39E-03*	*1.76E-03*	*9.65E-04*	*1.06E-03*	*2.04E-01*
18	*3.19E-06*	*5.96E-04*	*1.06E-03*	*1.78E-04*	*2.97E-03*	*1.19E-03*	*6.53E-04*	*7.14E-04*	*1.19E-01*
19	*1.18E-05*	*7.55E-04*	*3.93E-03*	*2.13E-04*	*3.51E-03*	*1.40E-03*	*7.91E-04*	*9.42E-04*	*4.32E-01*
20	3.45E-07	2.52E-04	1.15E-04	7.55E-05	1.26E-03	5.03E-04	2.76E-04	3.02E-04	1.29E-02
21	2.49E-07	2.79E-04	8.32E-05	8.36E-05	1.39E-03	5.57E-04	3.06E-04	3.34E-04	9.40E-03
22	8.77E-07	3.64E-04	2.92E-04	1.09E-04	1.82E-03	7.27E-04	3.99E-04	4.36E-04	3.28E-02

Rec.	Predicted Impact (µg·m⁻³)								
	Ag	As	Ba	Cd	Cl_2	Cr(VI)	Cr	Cu	Fe
	1-hour	1-hour	1-hour	1-hour	1-hour	1-hour	1-hour	1-hour	1-hour
23	3.03E-07	3.22E-04	1.01E-04	9.65E-05	1.61E-03	6.43E-04	3.53E-04	3.86E-04	1.15E-02
24	2.40E-07	2.70E-04	8.01E-05	8.08E-05	1.35E-03	5.38E-04	2.96E-04	3.23E-04	9.24E-03
25	4.83E-07	2.29E-04	1.61E-04	6.86E-05	1.14E-03	4.57E-04	2.51E-04	2.74E-04	1.83E-02
26	5.28E-07	2.26E-04	1.76E-04	6.75E-05	1.13E-03	4.50E-04	2.47E-04	2.70E-04	2.10E-02
27	3.60E-07	1.97E-04	1.20E-04	5.91E-05	9.84E-04	3.94E-04	2.16E-04	2.36E-04	1.37E-02
28	5.14E-07	3.00E-04	1.71E-04	8.97E-05	1.50E-03	5.98E-04	3.28E-04	3.59E-04	1.94E-02
29	1.89E-06	4.54E-04	6.29E-04	1.36E-04	2.26E-03	9.05E-04	4.97E-04	5.44E-04	7.02E-02
30	6.70E-07	2.91E-04	2.23E-04	8.73E-05	1.45E-03	5.81E-04	3.19E-04	3.49E-04	2.55E-02
31	9.07E-07	4.07E-04	3.02E-04	1.22E-04	2.03E-03	8.11E-04	4.46E-04	4.87E-04	3.54E-02
32	3.80E-07	2.41E-04	1.27E-04	7.22E-05	1.20E-03	4.81E-04	2.64E-04	2.89E-04	1.45E-02
33	3.82E-07	2.20E-04	1.27E-04	6.59E-05	1.10E-03	4.39E-04	2.41E-04	2.64E-04	1.45E-02
34	*2.96E-05*	*1.02E-03*	*9.86E-03*	*3.04E-04*	*5.07E-03*	*2.03E-03*	*1.11E-03*	*1.31E-03*	*1.09E+00*
35	*9.24E-06*	*1.57E-03*	*3.08E-03*	*4.69E-04*	*7.82E-03*	*3.13E-03*	*1.72E-03*	*1.88E-03*	*3.43E-01*
Max	2.96E-05	1.75E-03	9.86E-03	5.23E-04	8.71E-03	3.48E-03	1.91E-03	2.09E-03	1.09E+00
Criterion	1.8	0.09	9	0.018	50	0.09	9	3.7	90
Max/Crit.	0.00%	1.94%	0.11%	2.90%	0.02%	3.87%	0.02%	0.06%	1.21%

Table 61 Predicted incremental impacts (2 of 2)

Receptor	Predicted Impact (µg·m⁻³)					
	Fe (II,III)	Hg	Mg	Mn	Pb	HF
	1-hour	1-hour	1-hour	1-hour	Annual	24-hour
1	3.99E-01	6.39E-04	5.70E-04	1.76E-03	8.07E-06	3.04E-05
2	3.86E-01	5.75E-04	5.52E-04	1.70E-03	6.96E-06	2.59E-05
3	3.46E-01	5.43E-04	4.95E-04	1.60E-03	5.42E-06	2.01E-05
4	1.10E-01	3.04E-04	1.58E-04	5.41E-04	3.60E-06	1.43E-05
5	9.07E-02	2.58E-04	1.30E-04	4.88E-04	2.60E-06	1.02E-05
6	8.89E-02	2.80E-04	1.27E-04	4.72E-04	2.43E-06	9.58E-06
7	6.10E-02	2.72E-04	8.71E-05	2.83E-04	2.71E-06	1.07E-05
8	8.09E-02	4.64E-04	1.16E-04	4.27E-04	4.54E-06	1.78E-05
9	1.54E-01	5.37E-04	2.20E-04	8.23E-04	4.58E-06	1.81E-05
10	*1.28E+00*	*6.82E-04*	*1.83E-03*	*5.62E-03*	3.93E-05	*1.45E-04*
11	*2.18E+00*	*1.18E-03*	*3.12E-03*	*9.12E-03*	4.79E-05	*1.63E-04*
12	*2.97E+00*	*1.51E-03*	*4.25E-03*	*1.19E-02*	4.32E-05	*1.30E-04*
13	*3.08E+00*	*1.71E-03*	*4.40E-03*	*1.22E-02*	3.69E-05	*1.22E-04*
14	*3.37E+00*	*1.37E-03*	*4.81E-03*	*1.33E-02*	3.32E-05	*1.07E-04*
15	*3.39E+00*	*8.72E-04*	*4.84E-03*	*1.38E-02*	2.83E-05	*8.77E-05*
16	*1.91E+00*	*2.27E-03*	*2.73E-03*	*7.55E-03*	5.85E-05	*2.17E-04*
17	*8.54E-01*	*1.14E-03*	*1.22E-03*	*3.57E-03*	3.33E-05	*1.28E-04*
18	*4.96E-01*	*7.75E-04*	*7.08E-04*	*2.14E-03*	2.49E-05	*9.69E-05*
19	*1.83E+00*	*9.16E-04*	*2.61E-03*	*7.23E-03*	3.66E-05	*1.34E-04*
20	5.35E-02	3.28E-04	7.65E-05	3.02E-04	2.62E-06	1.05E-05
21	3.88E-02	3.63E-04	5.54E-05	3.34E-04	1.68E-06	6.75E-06
22	1.36E-01	4.74E-04	1.95E-04	5.96E-04	3.25E-06	1.21E-05
23	4.70E-02	4.19E-04	6.72E-05	3.86E-04	1.84E-06	7.19E-06

Receptor	Predicted Impact (µg·m^{-3})					
	Fe (II,III)	Hg	Mg	Mn	Pb	HF
	1-hour	1-hour	1-hour	1-hour	Annual	24-hour
24	3.73E-02	3.51E-04	5.33E-05	3.23E-04	3.23E-06	1.28E-05
25	7.50E-02	2.98E-04	1.07E-04	3.46E-04	2.85E-06	1.12E-05
26	8.19E-02	2.93E-04	1.17E-04	4.63E-04	3.99E-06	1.57E-05
27	5.60E-02	2.56E-04	8.00E-05	2.64E-04	3.29E-06	1.32E-05
28	7.98E-02	3.89E-04	1.14E-04	3.65E-04	3.83E-06	1.47E-05
29	2.93E-01	5.90E-04	4.19E-04	1.24E-03	7.79E-06	3.01E-05
30	1.04E-01	3.79E-04	1.49E-04	4.95E-04	4.71E-06	1.82E-05
31	1.41E-01	5.29E-04	2.01E-04	7.39E-04	4.26E-06	1.64E-05
32	5.90E-02	3.13E-04	8.43E-05	2.89E-04	3.01E-06	1.19E-05
33	5.93E-02	2.86E-04	8.47E-05	2.79E-04	3.13E-06	1.23E-05
34	*4.60E+00*	*1.32E-03*	*6.57E-03*	*1.82E-02*	4.77E-05	*1.22E-04*
35	*1.44E+00*	*2.04E-03*	*2.05E-03*	*6.03E-03*	5.50E-05	*2.08E-04*
Max	4.60E+00	2.27E-03	6.57E-03	1.82E-02	5.85E-05	2.17E-04
Criterion	90	0.18	180	18	0.5	1.5
Max/Crit.	5.11%	1.26%	<0.01%	0.10%	0.01%	0.01%

Note: 7-day, 30-day and 90-day HF results have not been estimated due to the very low incremental impacts predicted.

Odour

Incremental 99th percentile odour impacts are presented in **Table 29** at receptors R1-R9 and R20-R33 representing locations where amenity impacts are to be managed. Results for R10-R19 (fenceline locations) are presented, although these should not be compared to the odour impact criterion of 2 OU with caution as they are not representative of typical sensitive exposure locations, although it is noted that the predictions are all lower than the odour criterion in any case.

Table 62 Predicted incremental 99th percentile odour impacts

Receptor	99th percentile nose response time odour concentration (OU)
R1	0.2
R2	0.2
R3	0.2
R4	0.1
R5	0.1
R6	0.1
R7	0.1
R8	0.1
R9	0.1
R10	*0.7*
R11	*0.8*
R12	*0.9*
R13	*0.8*
R14	*0.7*
R15	*0.7*
R16	*0.7*
R17	*0.5*
R18	*0.4*
R19	*0.8*
R20	0.1
R21	0.0
R22	0.1
R23	0.0
R24	0.1
R25	0.1
R26	0.1
R27	0.1
R28	0.1
R29	0.2
R30	0.1
R31	0.1
R32	0.1

Receptor	99th percentile nose response time odour concentration (OU)
R33	0.1
R34	*0.9*
R35	*0.7*
Criterion	2.0

Appendix E – Best Management Practice Dust Control

A site-specific Best Management Practice (BMP) assessment has been performed for the operations at the Project site in accordance with the methodology outlined in (NSW OEH, 2011)

The BPM assessment has been performed to allow the identification of control measures which might be implemented as part of the Project operation whilst taking into consideration:

- regulatory requirements;
- environmental impacts;
- safety implications; and
- compatibility with proposed future development.

NSW EPA guidance relates to best practice dust assessments for the coal mining industry (there are no guidelines specific to the waste management industry) and indicates that either the top four sources, or sources representing 95 % of total annual site emissions should be examined for application of further controls.

Broadly, the following outlines the procedure adopted:

- **Step 1:** assessment of major sources to identify emissions that contribute to the top 95 % of emissions;
- **Step 2:** assessment of control measures to address the top 95 % of emissions;
- **Step 3:** evaluation of potential additional control measures

Step 1: Assessment of Major Sources

Sources of particulate matter emissions associated with the project operating at a throughput of 600 000 tpa have been categorised as follows:

- haulage;
- handling and transfer;
- conveying;
- Oxycutting;
- Hammermill; and
- wind erosion.

Uncontrolled emissions of particulate matter for the Project have been calculated adopting the emission factors outlined in **Appendix C**. The results indicate that the top emission sources, covering 95% of total site emissions (of TSP) comprise of (and rank), as presented in **Table 9**, and graphically in **Figure 22**.

The three emissions source categories contributing to 95 % of total site emissions of TSP included haulage, conveying, and handling and transfer activities.

Note that the rank order of emissions sources does change depending on the particulate fraction being examined, and the sources contributing to the top 95 % of sources also changes. Emission of PM_{10} associated with haulage, conveying, and handling and transfer activities account for 91 % of total site emissions. Inclusion of PM_{10} emissions from the hammermill increases that to 100 %. For the purposes of this BMP assessment, the emissions sources of haulage, conveying, handling and transfer, and hammermill activities have been considered.

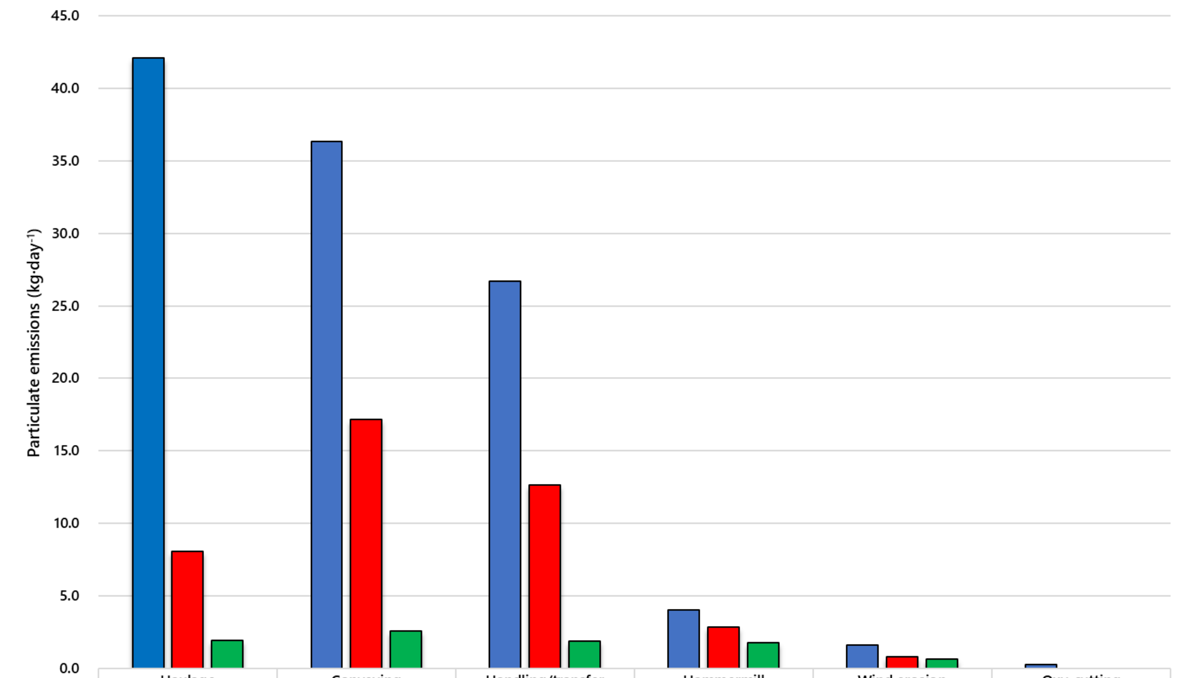
For clarity, and as discussed elsewhere in this report, the emissions associated with the hammermill are controlled through the use of a cyclone and wet scrubber. The emission test reports demonstrate compliance with EPL 11555 emission concentration limits. The most recent measured TSP concentration (i.e. most reflective of current operations), is less than 15 % of the emission limit. It is considered that the emission test reports provide directly measured evidence to demonstrate that the emission collection system can appropriately control particulate emissions, and no further discussion of additional controls associated with the hammermill is provided.

Table 63 Uncontrolled particulate emissions

Emission source	Emissions ($kg{\cdot}day^{-1}$)			Rank (TSP)	Cumulative TSP %
	TSP	PM_{10}	$PM_{2.5}$		
Haulage	42.1	8.1	2.0	1	38
Conveying	36.3	17.2	2.6	2	71
Handling and transfer	26.7	12.6	1.9	3	95
Hammermill(a)	4.1	2.9	1.8	4	98
Wind erosion	1.6	0.8	0.6	5	100
Oxycutting(b)	0.3	-	-	6	100
Total	111.1	41.6	8.9	-	-

Notes: (a): Controlled emission, no data on uncontrolled emissions available
(b):No PM_{10} or $PM_{2.5}$ emission data available for the Oxycutter

Figure 22 Potential uncontrolled emission estimate



	Haulage	Conveying	Handling/transfer	Hammermill	Wind erosion	Oxy-cutting
TSP	42.1	36.3	26.7	4.1	1.6	0.3
PM10	8.1	17.2	12.6	2.9	0.8	0.0
PM2.5	2.0	2.6	1.9	1.8	0.6	0.0

Notes: (a): Controlled emission for hammermill, no data on uncontrolled emissions available

Step 2: Assessment of Control Measures

In accordance with the method outlined in NSW EPA (2011), a range of particulate control measures associated with each emission source identified above have been reviewed. Emission control measures have been determined through review of the following documents:

- National Pollutant Inventory Emission Estimation Technique for Mining, Version 3.1 (Australian Govt, 2012)
- NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining. June 2011 (NSW OEH, 2011)
- Western Regional Air Partnership, Fugitive Dust Handbook (Countess Environmental, 2006)
- Guidebook, Measures to Improve Urban Air Quality (AIRUSE Life 11, 2017)

Options for the control of particulate matter from each identified source are presented in the following sections.

Haulage routes

Published control factors associated with paved roads (as are present at the Project site) are limited, but would be associated with:

- Vehicle restrictions that limit the speed, weight or number of vehicles on the road.
- Surface improvement through minimisation of silt loading (through for example, sweeping).
- Surface treatment through water flushing or addition of chemical suppressants.

Emissions reductions due to reduction in vehicle speeds on paved roads at the Project site have not been assessed, as there are no defensible emissions reductions available in the literature. Speed limits of 5 $km \cdot hr^{-1}$ are imposed at the Project site and would result in the minimisation of particulate entrainment, however.

The application of water to paved haulage routes could occur, and an emission reduction of 30 % could been applied to the watering of paved roads as per (USEPA, 2011) which indicates that an hourly water flushing at a rate of 0.48 $gal \cdot yd^{-2}$ (equivalent to 2.2 $L \cdot m^{-2} \cdot hr^{-1}$) could result in emissions reductions of between 30 % and 70 %. For the purposes of this assessment, the lower (conservative) reduction factor of 30 % has been adopted.

Paved road surfaces could also be routinely swept to keep surfaces clean and to avoid dust generation through resuspension, and emission reductions for a range of street sweeper units as published in (AIRUSE Life 11, 2017) indicate PM_{10} reduction factors (particulate loading) of between 88 % and 99 % when compared to a reference (dry) street. (AIRUSE Life 11, 2017) does also indicate that detection of a reduction in ambient PM_{10} due to street sweeping is difficult, and is affected by factors including:

- The road dust (silt) loading.
- Sweeper efficiency.
- Retention of particles within the sweeper.
- Road surface type and integrity.
- Frequency of sweeping.

For the purposes of this assessment, and considering the factors above, a nominal control factor associated with sweeping has been taken to be 50 % as this is appropriately conservative.

A summary of the potential control measures for minimising particulate emissions from paved haulage routes, and their effectiveness, is provided in **Table 64**.

Table 64 Best practice control measures – paved haulage routes

Emission control measure	Adopted control efficiency (%)	Comments
Limitation of vehicle speed	Not quantified	No justifiable control factor available in literature
Sweeping	50	Conservative, and dependent on the type of street sweeper
Watering	30	At a rate of 2.2 $L \cdot m^2 \cdot hr^{-1}$

Conveying

Published control factors associated with the movement of material on conveyors are presented in (NSW OEH, 2011), (Australian Govt, 2012) and (USEPA, 2011) and are generally associated with:

- Wind shielding, including enclosure.
- Belt cleaning.
- Water sprays (with chemicals).

A summary of the potential control measures for minimising particulate emissions from conveyors, and their effectiveness, is provided in **Table 65**.

Table 65 Best practice control measures – conveyors

Emission control measure	Adopted control efficiency (%)	Comments
Wind shielding (roof or side wall)	40	-
Wind shielding (roof and side wall)	70	-
Enclosure of transfers	70	-
Water sprays with chemicals	90	-
Water sprays	50	-
Belt cleaning and spillage minimisation	Not quantified	No justifiable control factor available in literature

Handling and Transfer

Published control factors associated with the handling and transfer of material are similar to those for conveying and are also presented in (NSW OEH, 2011), (Australian Govt, 2012) and (USEPA, 2011) and are generally associated with:

- Wind shielding, including enclosure.
- Water sprays (with chemicals).

A summary of the potential control measures for minimising particulate emissions from materials handling and transfer, and their effectiveness, is provided in **Table 66**.

Table 66 Best practice control measures – handling and transfer

Emission control measure	Adopted control efficiency (%)	Comments
Water sprays during truck unloading	70	-
Enclosure	70	-
Water sprays with chemicals	90	-

Emission control measure	Adopted control efficiency (%)	Comments
Water sprays	50	-
Minimisation of drop height	30	-
Three sided and roofed enclosure	70	-
Three sided and roofed enclosure with water sprays	85	-

Quantification of Potential Particulate Management Measures

Table 67 presents the emission control factors assumed in this assessment for the potential particulate management measures identified. Note that emissions reductions associated with the hammermill have not been included in **Table 67** as emissions are already considered to be appropriately controlled in accordance with best practice.

Table 67 Control factors assumed for potential control measures

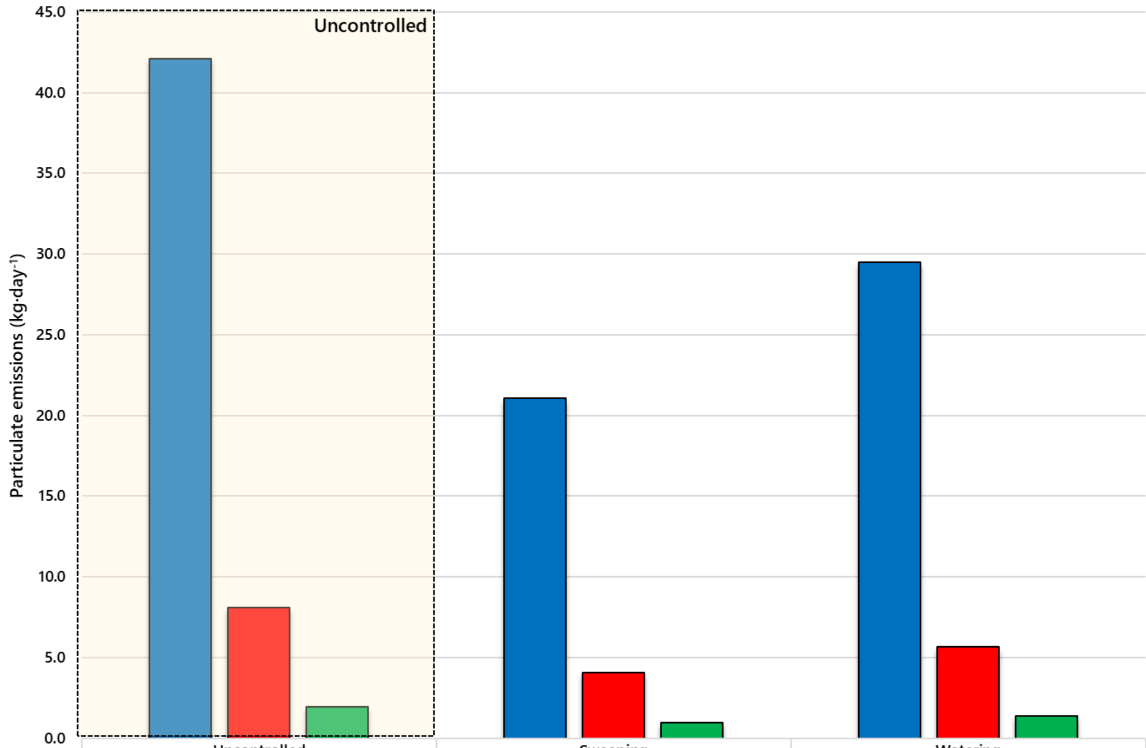
Emission Source	Emission control measure	Control factor assumed (%)
Paved Roads	Sweeping	50
	Watering	30
Conveying	Wind shielding (roof or side wall)	40
	Wind shielding (roof and side wall)	70
	Enclosure of transfers	70
	Water sprays with chemicals	90
	Water sprays	50
Handling and transfer	Water sprays during truck unloading	70
	Enclosure	70
	Water sprays with chemicals	90
	Water sprays	50
	Minimisation of drop height	30
	Three sided and roofed enclosure	70
	Three sided and roofed enclosure with water sprays	85

outlines the anticipated emissions reductions should the reduction measures in **Table 67** be applied. These are also presented graphically in **Figure 23**, **Figure 24** and **Figure 25**.

Table 68 Potential emissions reductions from further control measures

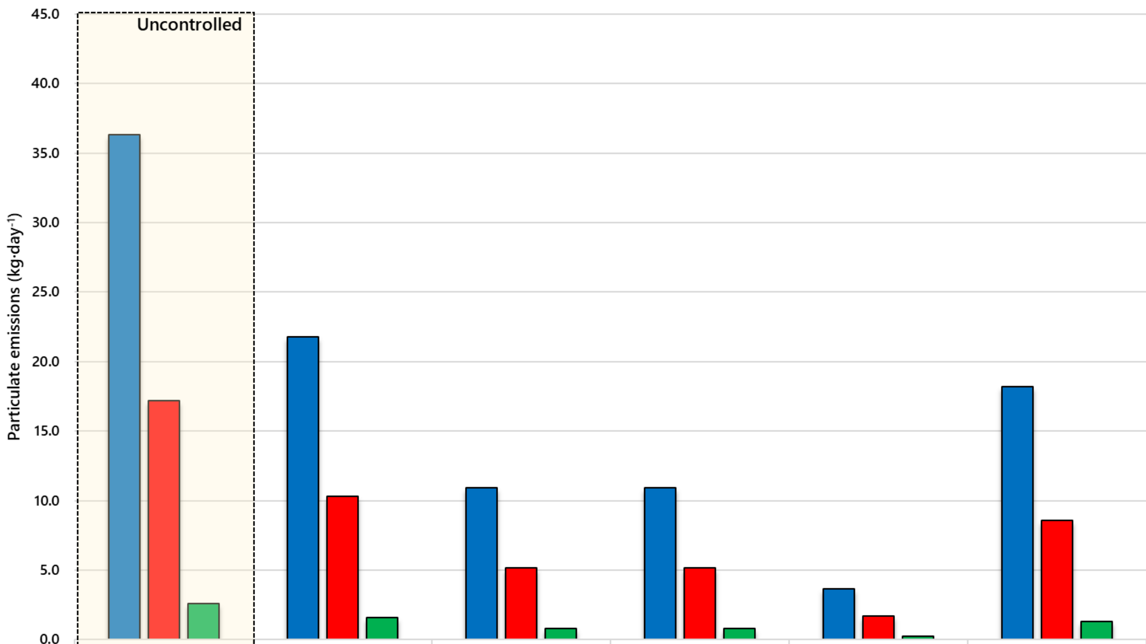
Emission Source	Emission control measure	Control factor assumed (%)	Emissions (uncontrolled) (kg·day^{-1})			Emissions (controlled) (kg·day^{-1})		
			TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Paved Roads	Sweeping	50	42.1	8.1	2.0	21.1	4.1	1.0
	Watering	30				29.5	5.7	1.4
Conveying	Wind shielding (roof or side wall)	40	36.3	17.2	2.6	21.8	10.3	1.6
	Wind shielding (roof and side wall)	70				10.9	5.2	0.8
	Enclosure of transfers	70				10.9	5.2	0.8
	Water sprays with chemicals	90				3.6	1.7	0.3
	Water sprays	50				18.2	8.6	1.3
Handling and transfer	Water sprays during truck unloading	70	26.7	12.6	1.9	8.0	3.8	0.6
	Enclosure	70				8.0	3.8	0.6
	Water sprays with chemicals	90				2.7	1.3	0.2
	Water sprays	50				13.4	6.3	1.0
	Minimisation of drop height	30				18.7	8.8	1.3
	Three sided and roofed enclosure	70				8.0	3.8	0.6
	Three sided and roofed enclosure with water sprays	85				4.0	1.9	0.3

Figure 23 Potential emissions reductions associated with haulage



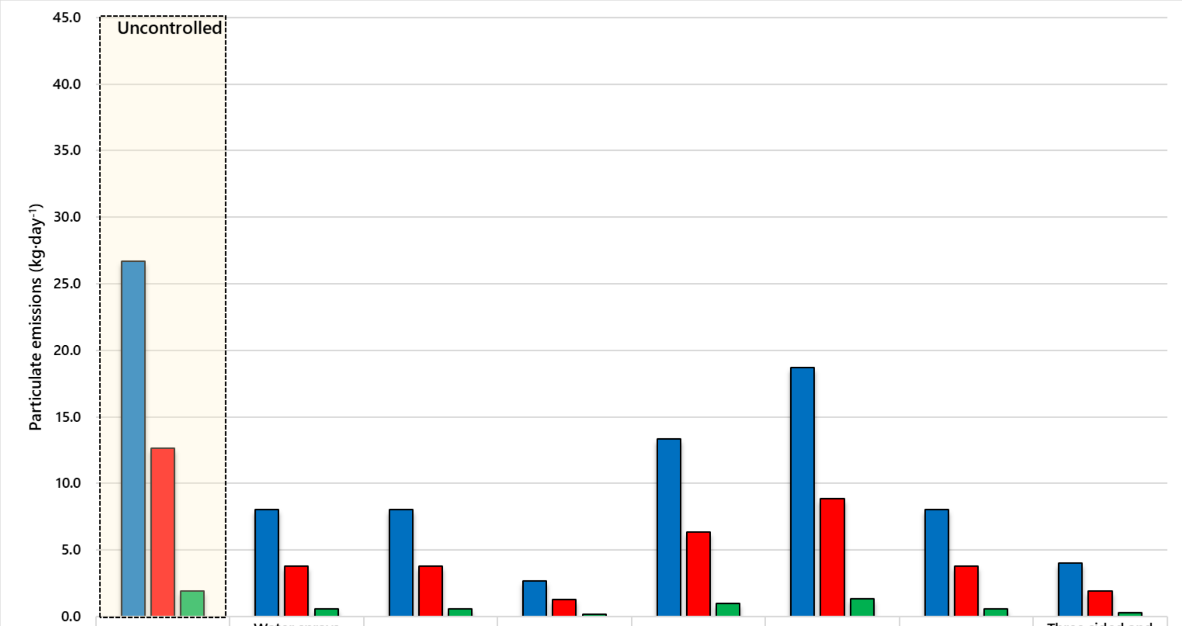
	Uncontrolled	Sweeping	Watering
TSP	42.1	21.1	29.5
PM10	8.1	4.0	5.7
PM2.5	2.0	1.0	1.4

Figure 24 Potential emissions reductions associated with conveying



	Uncontrolled	Wind shielding (roof or side wall)	Wind shielding (roof and side wall)	Enclosure of transfers	Water sprays with chemicals	Water sprays
TSP	36.3	21.8	10.9	10.9	3.6	18.2
PM10	17.2	10.3	5.2	5.2	1.7	8.6
PM2.5	2.6	1.6	0.8	0.8	0.3	1.3

Figure 25 Potential emissions reductions associated with handling and transfer



	Uncontrolled	Water sprays during truck unloading	Enclosure	Water sprays with chemicals	Water sprays	Minimisation of drop height	Three sided and roofed enclosure	Three sided and roofed enclosure with water sprays
TSP	26.7	8.0	8.0	2.7	13.4	18.7	8.0	4.0
PM10	12.6	3.8	3.8	1.3	6.3	8.8	3.8	1.9
PM2.5	1.9	0.6	0.6	0.2	1.0	1.3	0.6	0.3

Step 3: Evaluation of additional control measures

As required by EPA, the practicability of implementing each of the particulate control options identified above is to be assessed with due consideration given to:

- regulatory requirements;
- environmental impacts;
- safety implications; and
- compatibility with current processes and proposed future developments.

The following sections examine the measures that may constrain the implementation of the particulate control measures outlined above, namely the regulatory requirements, environmental impacts, safety implications and compatibility with current processes and future development.

Each measure is provided a risk rating (**low**, **medium** or **high**) which identifies the constraints which may result in the implementation of the measure not being practical at the Project site. Where any of the four measures of practicability are rated as high, these measures are not taken forward for an assessment of cost implication and feasibility.

Evaluation findings – haulage routes

Table 69 provides a discussion of the feasibility of control measures for haulage routes.

Table 69 Practicability of implementing control measures for haulage routes

Control Measure	Regulatory Requirements RISK	Environmental Impacts RISK	Safety Implications RISK	Compatibility with Current Processes and Future Developments RISK	Conclusion of Evaluation
Sweeping	RISK = LOW	RISK = LOW Need to ensure that any sweeper removes material, rather than redistributing silt. Sweeping / removal of silt from road verges after large rain events	RISK = LOW	RISK = LOW	☑ Adopted potential measure **HR1**
Watering	RISK = LOW Ensure that run off is appropriately captured, filtered and discharged or recycled	RISK = LOW Ensure that run off is appropriately captured, filtered and discharged or recycled	RISK = MEDIUM Applying further water to routes with high silt content may generate a safety risk and potentially result in avoidable accidents (see sweeping)	RISK = LOW	☑ Already implemented control

Evaluation findings – conveying

Table 70 provides a discussion of the feasibility of control measures for conveying.

Table 70 Practicability of implementing control measures for conveying

Control Measure	Regulatory Requirements RISK	Environmental Impacts RISK	Safety Implications RISK	Compatibility with Current Processes and Future Developments RISK	Conclusion of Evaluation
Wind shielding (roof or side wall)	RISK = LOW	RISK = LOW	RISK = LOW	RISK = HIGH Conveyors already enclosed	☒ Not considered further in this assessment
Wind shielding (roof and side wall)	RISK = LOW	RISK = LOW	RISK = LOW	RISK = HIGH Conveyors already enclosed	☒ Not considered further in this assessment
Enclosure of conveyor transfers	RISK = LOW	RISK = LOW	RISK = LOW	RISK = LOW	☑ Adopted potential measure **C1**
Water sprays with chemicals	RISK = LOW	RISK = HIGH Use of chemicals in areas where they are not required to ensure that environmental objectives are met is not considered to be best practice	RISK = LOW	RISK = LOW	☒ Not considered further in this assessment
Water sprays	RISK = LOW Ensure that run off is appropriately captured, filtered and discharged or recycled	RISK = LOW Ensure that run off is appropriately captured, filtered and discharged or recycled	RISK = LOW	RISK = LOW Already applied	☑ Already implemented control

Evaluation findings – handling and transfer

Table 71 provides a discussion of the feasibility of control measures for handling and transfer activities.

Table 71 Practicability of implementing control measures for handling and transfer

Control Measure	Regulatory Requirements RISK	Environmental Impacts RISK	Safety Implications RISK	Compatibility with Current Processes and Future Developments RISK	Conclusion of Evaluation
Water sprays during truck unloading	RISK = LOW Ensure that run off is appropriately captured, filtered and discharged or recycled	RISK = LOW Ensure that run off is appropriately captured, filtered and discharged or recycled	RISK = LOW	RISK = LOW Already applied	☑ Already implemented control
Enclosure	RISK = LOW	RISK = LOW	RISK = LOW	RISK = HIGH Several handling and transfer points are small and cannot be enclosed without affecting flow of material around the site.	☒ Not considered further in this assessment
Water sprays with chemicals	RISK = LOW	RISK = HIGH Use of chemicals in areas where they are not required to ensure that environmental objectives are met is not considered to be best practice	RISK = LOW	RISK = LOW	☒ Not considered further in this assessment

Control Measure	Regulatory Requirements RISK	Environmental Impacts RISK	Safety Implications RISK	Compatibility with Current Processes and Future Developments RISK	Conclusion of Evaluation
Water sprays	RISK = LOW Ensure that run off is appropriately captured, filtered and discharged or recycled	RISK = LOW Ensure that run off is appropriately captured, filtered and discharged or recycled	RISK = LOW	RISK = MEDIUM There is limited potential for the use of water sprays on floc material as it creates material handling issues. Floc is already transferred in enclosures and water sprays would have minimal effect on dust control. The potential for water sprays on finished product is also constrained by commercial limitations.	☑ Adopted potential measure **HT1** (where appropriate)
Minimisation of drop height	RISK = LOW	RISK = LOW	RISK = LOW	RISK = LOW	☑ Adopted potential measure **HT2**
Three sided and roofed enclosure	RISK = LOW	RISK = LOW	RISK = LOW	RISK = HIGH Several handling and transfer points are small and cannot be enclosed without affecting flow of material around the site.	☒ Not considered further in this assessment

Control Measure	Regulatory Requirements RISK	Environmental Impacts RISK	Safety Implications RISK	Compatibility with Current Processes and Future Developments RISK	Conclusion of Evaluation
Three sided and roofed enclosure with water sprays	RISK = LOW	RISK = LOW	RISK = LOW	RISK = HIGH Several handling and transfer points are small and cannot be enclosed without affecting flow of material around the site.	☒ Not considered further in this assessment

It is understood that NSW EPA generally consider that Best Management Practice for activities performed at the Project site would be represented by full enclosure. This mitigation measure has not been considered in this BMP assessment, as it was regarded as economically unviable at an early stage.

Evaluation findings – summary

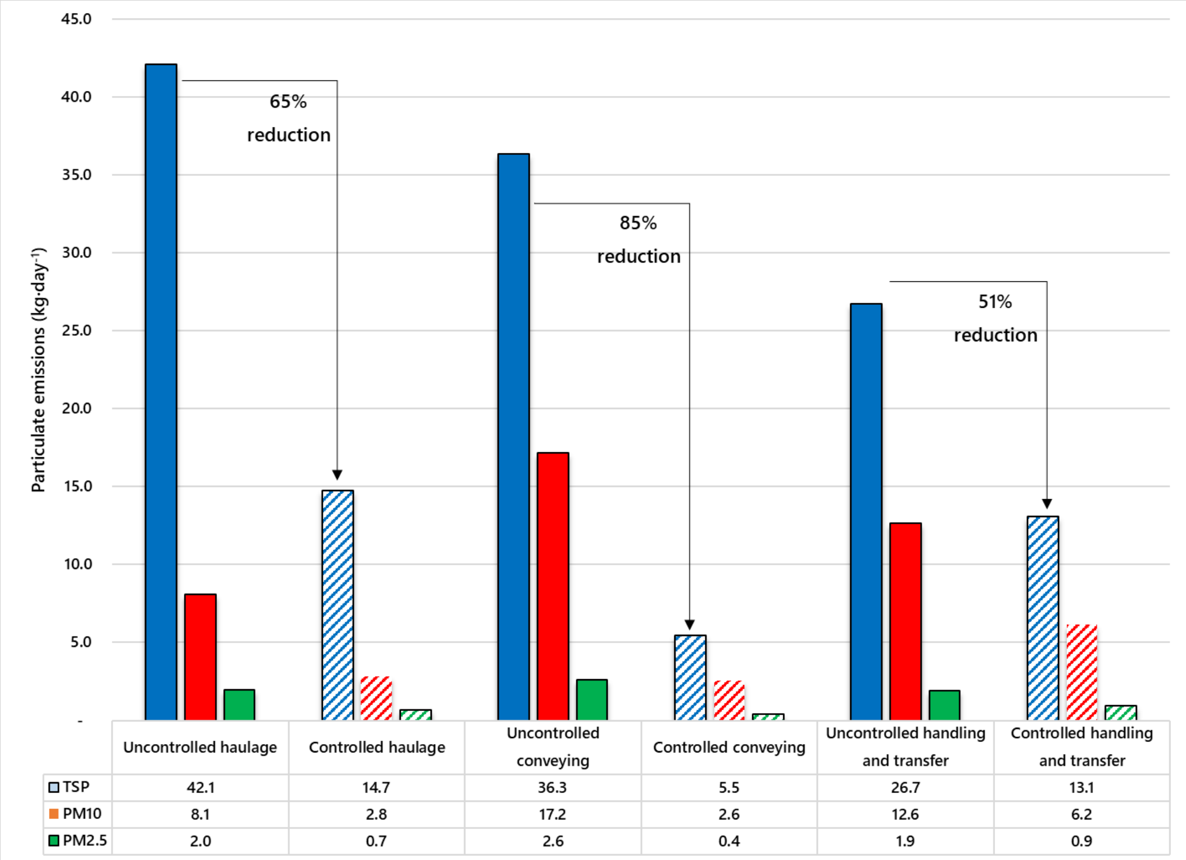
A summary of the emission control measures selected for implementation at the Project site are presented in **Table 72**, and presented graphically in **Figure 26**.

Table 72 Summary of adopted control measures

Control Measure	Regulatory Requirements RISK	Environmental Impacts RISK	Safety Implications RISK	Compatibility with Current Processes and Future Developments RISK	Conclusion of Evaluation
Haulage					
Sweeping	RISK = LOW	RISK = LOW	RISK = LOW	RISK = LOW	☑ Adopted potential control **HR1**
Watering	RISK = LOW	RISK = LOW	RISK = MEDIUM	RISK = LOW	☑ Already implemented control
Conveying					
Enclosure of transfers	RISK = LOW	RISK = LOW	RISK = LOW	RISK = LOW	☑ Adopted potential measure **C1**
Water sprays	RISK = LOW	RISK = LOW	RISK = LOW	RISK = LOW	☑ Already implemented control
Handling and transfer					
Water sprays during truck unloading	RISK = LOW	RISK = LOW	RISK = LOW	RISK = LOW	☑ Already implemented control
Water sprays	RISK = LOW	RISK = LOW	RISK = LOW	RISK = MEDIUM Limited application, as per **Table 71**	☑ Adopted potential measure **HT1** (where appropriate)

Control Measure	Regulatory Requirements RISK	Environmental Impacts RISK	Safety Implications RISK	Compatibility with Current Processes and Future Developments RISK	Conclusion of Evaluation
Minimisation of drop height	RISK = LOW	RISK = LOW	RISK = LOW	RISK = LOW	☑ Adopted potential measure **HT2**

Figure 26 Summary of potential site wide emissions reductions



Although not included within this BMP assessment, S&P has installed a series of shipping containers on the side of the Project site, primarily to manage offsite noise impacts.

It would be anticipated that this would also result in reductions in the transport of particulate matter from the site, although this has not been quantified.

Appendix F – Emission Test Reports

EML Air Pty Ltd
Report Number N92746

Emission Testing Report
ERM Australia Pty Ltd, Blacktown Plant

This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced except in full

This document is confidential and is prepared for the exclusive use of ERM Australia Pty Ltd and those granted permission by ERM Australia Pty Ltd.

Melissa Reddan BAppSc
Compliance Manager

Matthew Cook
Laboratory Manager

Document Information

Client Name:	ERM Australia Pty Ltd
Report Number:	N92746
Report Title:	Emission Testing Report
Date of Issue:	18 June 2014
Attention:	Dr Iain Cowan
Address:	ERM Australia Pty Ltd Level 3, Tower 3, World Trade Centre, 18-38 Siddeley Street DOCKLANDS VIC 3005

Sampling Information

Sampling Date:	June 2014
Sampling Team:	DH

Report Status

Format	Document Number	Report Date	Prepared By	Reviewed By (1)	Reviewed By (2)
Preliminary Report	-	-	-	-	-
Draft Report	-	-	-	-	-
Final Report	N92746	18 June 2014	JW/AD	MR	MC
Amend Report	-	-	-	-	-

Internal Reference: ad doc:n92746.doc

Amendment Record

Document Number	Initiator	Report Date	Section	Reason
Nil	-	-	-	-

Table of Contents

List of Tables

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	**State**	NSW
EML Staff	DH/ZP				
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 Windl - Test Results

Date	12/06/2014	**Client**	Sell & Parker - (ERM Australia)		
Report	N92746	**Stack ID**	Oxy Cutting Area (Upwind)		
Licence No.	-	**Location**	Blacktown	**State**	NSW
EML Staff	DH/ZP				
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		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 Windl - Test Results

Date	12/06/2014	**Client**	Sell & Parker - (ERM Australia)		
Report	N92746	**Stack ID**	Oxy Cutting Area (Downwind)		
Licence No.	-	**Location**	Blacktown	**State**	NSW
EML Staff	DH/ZP				
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

Address (Head Office)
7 Redland Drive
MITCHAM VIC 3132

Office Locations
VIC NSW WA QLD

Postal Address
52 Cooper Road
COCKBURN CENTRAL WA 6164

Freecall: 1300 364 005
www.ektimo.com.au
ABN: 86 600 381 413

Report Number R003396

Emission Testing Report
Sell and Parker, Kings Park

Document Information

Client Name:	Sell and Parker
Report Number:	R003396
Date of Issue:	26 May 2017
Attention:	Howard Richards
Address:	46 Tattersall Road Kings Park NSW 2148
Testing Laboratory:	Ektimo (EML) ABN 98 006 878 342

Report Status

Format	Document Number	Report Date	Prepared By	Reviewed By (1)	Reviewed By (2)
Preliminary Report	-	-	-	-	-
Draft Report	R003396[DRAFT]	17/05/2017	JWe	ADa	ZXa
Final Report	R003396	26/05/2017	JWe	ADa	ZXa
Amend Report	-	-	-	-	-

Template Version: 170407

Amendment Record

Document Number	Initiator	Report Date	Section	Reason
Nil	-	-	-	-

Report Authorisation

Aaron Davis
Client Manager

NATA Accredited Laboratory
No. 2732

Zac Xavier
Ektimo Signatory

Accredited for compliance with ISO/IEC 17025. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

Table of Contents

1 EXECUTIVE SUMMARY

Ektimo was engaged by Sell and Parker to perform air emission testing for various analytes from the Hammer Mill exhaust duct.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA 3 Hammer Mill	27 April 2017	Solid particles (TPM), fine particulates (PM_{10} and $PM_{2.5}$), type 1 and type 2 substances in aggregate, hexavalent chromium (Cr6+), silver, tungsten, iron, titanium, copper, zinc, hydrogen sulfide (H_2S), nitrogen oxides (NOx), sulfur dioxide, sulfuric acid mist and sulfur trioxide (as SO_3), carbon dioxide, oxygen

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

The sampling methodologies chosen by Ektimo are those recommended by 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 results are reported on a dry basis at STP. Unless otherwise indicated, the methods cited in this report have been performed without deviation.

Plant operating conditions have been noted in the report.

2 RESULTS SUMMARY

The following comparison table shows that all analytes highlighted in green are below the limits prescribed by the *Protection of Environment Operations (Clean Air) Regulation 2010; Schedule 4 Standards of Concentration for Scheduled Premises: General Activities and Plant (Group 6).*

Location	Pollutant	Units	POEO Reg Limit (Gp 6)	Detected values
EPA 3 Hammer Mill	Solid particles	mg/m^3	20	9.3
	Nitrogen oxides (NO_x)	mg/m^3	350	<3
	Sulfur dioxide (SO_2)	mg/m^3	1000	<0.01
	Sulfuric acid mist and sulfur trioxide (SO_3)	mg/m^3	100	<0.01
	Hydrogen sulfide (H_2S)	mg/m^3	5	<0.006
	Type 1 substances in aggregate (Sb, As, Cd, Pb, Hg)	mg/m^3	-	≤0.0072
	Type 1 and 2 substances in aggregate (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, N, Se, Sn, V)	mg/m^3	1	≤0.017
	Cadimum (Cd)	mg/m^3	0.2	<0.0004
	Mercury (Hg)	mg/m^3	0.2	0.00069
	Silver (Ag), tungsten (W), iron (Fe), titanium (Ti), Copper (Cu), Zinc (Zn)	mg/m^3	-	see report

3 RESULTS

3.1 EPA 3 Hammer Mill

Date	27-04-2017	**Client**	Sell & Parker
Report	R003396	**Stack ID**	EPA 3 Hammer Mill Stack
Licence No.	11555	**Location**	Kings Park
Ektimo Staff	Aaron Davis / Steven Weekes	**State**	NSW
Process Conditions	Please refer to client records.		

Sampling Plane Details	
Sampling plane dimensions	680 mm
Sampling plane area	0.363 m²
Sampling port size, number	4" BSP (x2)
Access & height of ports	Stairs 15 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 4 D
Upstream disturbance	Bend 6 D
No. traverses & points sampled	2 8
Sample plane compliance to AS4323.1	Satisfactory

Stack Parameters		
Moisture content, %v/v	3.7 (saturated)	
Gas molecular weight, g/g mole	28.6 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1000	
Temperature, °C	28	
Temperature, K	301	
Velocity at sampling plane, m/s	25	
Volumetric flow rate, discharge, m³/s	9.2	
Volumetric flow rate (wet STP), m³/s	8.3	
Volumetric flow rate (dry STP), m³/s	8	
Mass flow rate (wet basis), kg/hour	38000	
Velocity difference, %	<1	

Gas Analyser Results	Average	
Sampling time	1030-1129	
	Concentration mg/m³	Mass Rate g/min
Combustion Gases		
Nitrogen oxides (as NO_2)	<3	<2
	Concentration %	
Carbon dioxide	<0.3	
Oxygen	20.9	

Isokinetic Results	Results	
Sampling time	1010 - 1115	
	Concentration mg/m³	Mass Rate g/min
Solid Particles	9.3	4.5
Fine particulates (PM10)	6.6	3.2
Fine particulates (PM2.5)	<4	<2
D50 cut size, 10µm	10.5	
D50 cut size, 2.5µm	2.20	
Sulfur dioxide	<0.01	<0.006
Sulfuric acid mist and sulfur trioxide (as SO_3)	<0.01	<0.005
Isokinetic Sampling Parameters	Isokinetic	PM 10&2.5
Sampling time, min	64	64
Isokinetic rate, %	93	88

Date	27-04-2017	**Client**	Sell & Parker
Report	R003396	**Stack ID**	EPA 3 Hammer Mill Stack
Licence No.	11555	**Location**	Kings Park
Ektimo Staff	Aaron Davis / Steven Weekes	**State**	NSW
Process Conditions	Please refer to client records.		

Sampling Plane Details	
Sampling plane dimensions	680 mm
Sampling plane area	0.363 m²
Sampling port size, number	4" BSP (x2)
Access & height of ports	Stairs 15 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 4 D
Upstream disturbance	Bend 6 D
No. traverses & points sampled	2 8
Sample plane compliance to AS4323.1	Satisfactory

Stack Parameters		
Moisture content, %v/v	3.7 (saturated)	
Gas molecular weight, g/g mole	28.6 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1000	
Temperature, °C	28	
Temperature, K	301	
Velocity at sampling plane, m/s	25	
Volumetric flow rate, discharge, m³/s	9.2	
Volumetric flow rate (wet STP), m³/s	8.3	
Volumetric flow rate (dry STP), m³/s	8	
Mass flow rate (wet basis), kg/hour	38000	
Velocity difference, %	<1	

Isokinetic Results	Results	
Sampling time	1230-1335	
	Concentration mg/m³	Mass Rate g/min
Antimony	<0.004	<0.002
Arsenic	<0.001	<0.0007
Beryllium	<0.0007	<0.0004
Cadmium	<0.0004	<0.0002
Chromium	0.00061	0.00029
Cobalt	<0.0005	<0.0002
Copper	0.0026	0.0012
Iron	0.028	0.014
Lead	0.0011	0.00052
Manganese	<0.001	<0.0005
Mercury	0.00069	0.00033
Nickel	<0.0009	<0.0004
Selenium	<0.004	<0.002
Silver	<0.0005	<0.0002
Tin	<0.001	<0.0007
Titanium	0.0016	0.00076
Tungsten	<0.001	<0.0007
Vanadium	<0.0008	<0.0004
Zinc	0.19	0.09
Type 1 & 2 Substances		
Upper Bound		
Total Type 1 Substances	≤0.0072	≤0.0034
Total Type 2 Substances	≤0.0096	≤0.0046
Total Type 1 & 2 Substances	≤0.017	≤0.0081
Isokinetic Sampling Parameters		
Sampling time, min	64	
Isokinetic rate, %	100	

Date	27-04-2017	**Client**	Sell & Parker
Report	R003396	**Stack ID**	EPA 3 Hammer Mill Stack
Licence No.	11555	**Location**	Kings Park
Ektimo Staff	Aaron Davis / Steven Weekes	**State**	NSW
Process Conditions	Please refer to client records.		

Sampling Plane Details	
Sampling plane dimensions	680 mm
Sampling plane area	0.363 m²
Sampling port size, number	4" BSP (x2)
Access & height of ports	Stairs 15 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 4 D
Upstream disturbance	Bend 6 D
No. traverses & points sampled	2 8
Sample plane compliance to AS4323.1	Satisfactory

Stack Parameters		
Moisture content, %v/v	3.7 (saturated)	
Gas molecular weight, g/g mole	28.6 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1000	
Temperature, °C	28	
Temperature, K	301	
Velocity at sampling plane, m/s	25	
Volumetric flow rate, discharge, m³/s	9.2	
Volumetric flow rate (wet STP), m³/s	8.3	
Volumetric flow rate (dry STP), m³/s	8	
Mass flow rate (wet basis), kg/hour	38000	
Velocity difference, %	<1	

Hydrogen Sulfide	Results	
Sampling time	1130-1230	
	Concentration mg/m³	Mass Rate g/min
Hydrogen sulfide	<0.006	<0.003

Isokinetic Results	Results	
Sampling time	1120-1225	
	Concentration mg/m³	Mass Rate g/min
Hexavalent chromium	<0.004	<0.002
Isokinetic Sampling Parameters		
Sampling time, min	64	
Isokinetic rate, %	98	

4 PLANT OPERATING CONDITIONS

Unless otherwise stated, the plant operating conditions were normal at the time of testing. See Sell and Parker's records for complete process conditions.

5 TEST METHODS

All sampling and analysis was performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling Method	Analysis Method	Uncertainty*	NATA Accredited Sampling	NATA Accredited Analysis
Sample plane criteria	NSW TM-1	NA	-	✓	NA
Moisture content	NSW TM-22	NSW TM-22	19%	✓	✓
Temperature	NSW TM-2	NA	2%	✓	NA
Flow rate	NSW TM-2	NA	8%	✓	NA
Velocity	NSW TM-2	NA	7%	✓	NA
Solid particles (TPM)	NSW TM-15	NSW TM-15	5%	✓	✓
Particulate matter < 2.5µm ($PM_{2.5}$)	USEPA 201A	USEPA 201A	9%	✓	✓
Particulate matter < 10µm (PM_{10})	NSW OM-5	NSW OM-5	6%	✓	✓
Type 1 substances (Sb, As, Cd, Pb, Hg)	NSW TM-12	Envirolab inhouse	15%	✓	✓[1]
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW TM-13	Envirolab inhouse	15%	✓	✓[1]
Total (gaseous and particulate) metals & compounds incl Ag, Fe, W, Ti, Cu, Zn	NSW TM-12, NSW TM-13, NSW TM-14	Envirolab inhouse	15%	✓	✓[1]
Hexavalent chromium	NSW OM-4	Envirolab inhouse	16%	×	✓[1]
Sulfur dioxide and sulfur trioxide	NSW TM-3	Ektimo (EML Air) 235	16%	✓	✓
Hydrogen sulfide	NSW TM-5	NSW TM-5	19%	✓	✓
Nitrogen oxides (NOx)	NSW TM-11	NSW TM-11	12%	✓	✓
Carbon dioxide	NSW TM-24	NSW TM-24	13%	✓	✓
Oxygen	NSW TM-25	NSW TM-25	13%	✓	✓

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

1. Analysis performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 10 May 2017 in report number 166156.

6 QUALITY ASSURANCE/ QUALITY CONTROL INFORMATION

Ektimo (EML) and Ektimo (ETC) are accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo (EML) and Ektimo (ETC) are accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025. – General Requirements for the Competence of Testing and Calibration Laboratories. ISO/IEC 17025 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 Compliance 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 Ektimo 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.

7 DEFINITIONS

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

STP	Standard 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
DER	WA Department of Environment & Regulation
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

Ektimo

Address (Head Office)
7 Redland Drive
MITCHAM VIC 3132

Postal Address
52 Cooper Road
COCKBURN CENTRAL WA 6164

Office Locations
VIC NSW WA QLD

Freecall: 1300 364 005
www.ektimo.com.au
ABN: 86 600 381 413

Report Number R006468-1

Emission Testing
ERM Australia Pty Ltd, Docklands

Document Information

Client Name:	ERM Australia Pty Ltd
Report Number:	R006468-1
Date of Issue:	27 September 2018
Attention:	Iain Cowan
Address:	Level 3, Tower 3, World Trade Centre, 18-38 Siddeley Street DOCKLANDS VIC 3005
Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

Report Status

Format	Document Number	Report Date	Prepared By	Reviewed By (1)	Reviewed By (2)
Preliminary Report	-	-	-	-	-
Draft Report	R006468-1[DRAFT]	21/09/2018	ADo	ADa	SCo
Final Report	R006468-1	27/09/2018	ADo	ADa	SCo
Amend Report	-	-	-	-	-

Template Version: 080818

Amendment Record

Document Number	Initiator	Report Date	Section	Reason
Nil	-	-	-	-

Report Authorisation

Aaron Davis
Client Manager

NATA Accredited Laboratory
No. 14601

Accredited for compliance with ISO/IEC 17025 - Testing. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

Table of Contents

1 EXECUTIVE SUMMARY

Ektimo was engaged by ERM Australia Pty Ltd to perform emission testing at Sell and Parker, Kings Park NSW.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA 3 - Hammer Mill	11 September 2018	Total solid particles, type 1 and 2 substances, total fluoride, hydrogen chloride, chlorine, sulfur trioxide and sulfuric acid mist, hydrogen sulfide, nitrogen oxides, carbon dioxide, oxygen

* Flow rate, velocity, temperature and moisture were also determined.

All results are reported on a dry basis at STP

Plant operating conditions have been noted in the report.

2 POEO RESULTS COMPARISON

PROTECTION OF THE ENVIRONMENT OPERATIONS (CLEAN AIR) REGULATION 2010 - SCHEDULE 4 **GROUP 6**			
Air Impurity	**POEO Limit**	**Units**	**Detected Values 11/09/2018**
Total Solid Particles	50	mg/m^3	6.8
Nitrogen dioxide (NO_2) or Nitric oxide (NO) or both, as NO_2 equivalent	350	mg/m^3	<3
Sulfuric acid mist (H_2SO_4) or sulfur trioxide (SO_3) or both, as SO_3 equivalent	100	mg/m^3	<0.008
Hydrogen sulfide	5	mg/m^3	<0.009
Fluorine (F_2) and any compound containing fluorine, as total fluoride (HF equivalent)	50	mg/m^3	<0.01
Chlorine (Cl_2)	200	mg/m^3	<0.01
Hydrogen chloride (HCl)	100	mg/m^3	<0.01
Type 1 substances (in aggregate)	NA	NA	≤0.011
Type 1 substances and Type 2 substances (in aggregate)	1	mg/m^3	≤0.0076
Cadmium (Cd)	0.2	mg/m^3	0.00047
Mercury (Hg)	0.2	mg/m^3	0.0034

Note: All analytes highlighted in green are below the Group 6 - Protection of the Environment Operations (Clean Air) Regulation 2010 limits.

3 RESULTS

3.1 EPA 3 – Hammer Mill

Date	11/09/2018	**Client**	ERM
Report	R006468-1	**Stack ID**	EPA 3 - Hammer Mill
Licence No.	11555	**Location**	Kings Park
Ektimo Staff	Aaron Davis / Steven Weekes	**State**	NSW
Process Conditions	Please refer to client records.		180831

Sampling Plane Details		
Sampling plane dimensions	595 mm	
Sampling plane area	0.278 m²	
Sampling port size, number	4" BSP (x2)	
Access & height of ports	Elevated work platform	20 m
Duct orientation & shape	Vertical	Circular
Downstream disturbance	Exit cone	3 D
Upstream disturbance	Bend	8 D
No. traverses & points sampled	2	8
Sample plane compliance to AS4323.1	Ideal	

Comments
An exit cone has been installed on the stack exit which measures 440mm in diameter

Stack Parameters		
Moisture content, %v/v	3.1	
Gas molecular weight, g/g mole	28.6 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	0945 & 1115	
Temperature, °C	31	
Temperature, K	304	
Velocity at sampling plane, m/s	25	
Velocity at exit plane, m/s	46	
Volumetric flow rate, actual, m³/s	7	
Volumetric flow rate (wet STP), m³/s	6.3	
Volumetric flow rate (dry STP), m³/s	6.1	
Mass flow rate (wet basis), kg/hour	29000	

Gas Analyser Results	Average		Minimum		Maximum	
Sampling time	1007 - 1110		1007 - 1110		1007 - 1110	
Combustion Gases	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Nitrogen oxides (as NO_2)	<3	<1	<3	<1	<3	<1
	Concentration %		Concentration %		Concentration %	
Carbon dioxide	<0.1		<0.1		<0.1	
Oxygen	20.9		20.9		20.9	

Non-isokinetics	Results	
Sampling time	1009-1109	
	Concentration mg/m³	Mass Rate g/min
Hydrogen sulfide	<0.009	<0.003

Isokinetic Results	Results	
Sampling time	1003-1110	
	Concentration mg/m³	Mass Rate g/min
Sulfur trioxide and/or Sulfuric acid (as SO3)	<0.008	<0.003
Isokinetic Sampling Parameters		
Sampling time, min	64	
Isokinetic rate, %	100	
Velocity difference, %	<1	

Date	11/09/2018	**Client**	ERM
Report	R006468-1	**Stack ID**	EPA 3 - Hammer Mill
Licence No.	11555	**Location**	Kings Park
Ektimo Staff	Aaron Davis / Steven Weekes	**State**	NSW
Process Conditions	Please refer to client records.		180831

Sampling Plane Details	
Sampling plane dimensions	595 mm
Sampling plane area	0.278 m²
Sampling port size, number	4" BSP (x2)
Access & height of ports	Elevated work platform 20 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit cone 3 D
Upstream disturbance	Bend 8 D
No. traverses & points sampled	2 8
Sample plane compliance to AS4323.1	Ideal

Comments

An exit cone has been installed on the stack exit which measures 440mm in diameter

Stack Parameters		
Moisture content, %v/v	3.1	
Gas molecular weight, g/g mole	28.6 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1550 & 1705	
Temperature, °C	33	
Temperature, K	306	
Velocity at sampling plane, m/s	25	
Velocity at exit plane, m/s	46	
Volumetric flow rate, actual, m³/s	7	
Volumetric flow rate (wet STP), m³/s	6.3	
Volumetric flow rate (dry STP), m³/s	6.1	
Mass flow rate (wet basis), kg/hour	29000	

Isokinetic Results	Results	
Sampling time	1557-1702	
	Concentration mg/m³	Mass Rate g/min
Solid Particles	6.8	2.5
Antimony	<0.003	<0.001
Arsenic	<0.001	<0.0005
Beryllium	<0.0007	<0.0003
Cadmium	0.00047	0.00017
Chromium	0.00068	0.00025
Cobalt	<0.0005	<0.0002
Lead	0.0018	0.00065
Manganese	<0.002	<0.0006
Mercury	0.0034	0.0013
Nickel	<0.0008	<0.0003
Selenium	<0.004	<0.001
Tin	<0.001	<0.0005
Vanadium	<0.0008	<0.0003
Type 1 & 2 Substances		
Upper Bound		
Total Type 1 Substances	≤0.011	≤0.0039
Total Type 2 Substances	≤0.01	≤0.0037
Total Type 1 & 2 Substances	≤0.021	≤0.0076
Isokinetic Sampling Parameters		
Sampling time, min	64	
Isokinetic rate, %	99	
Velocity difference, %	-1	

Date	11/09/2018	**Client**	ERM
Report	R006468-1	**Stack ID**	EPA 3 - Hammer Mill
Licence No.	11555	**Location**	Kings Park
Ektimo Staff	Aaron Davis / Steven Weekes	**State**	NSW
Process Conditions	Please refer to client records.		180831

Sampling Plane Details		
Sampling plane dimensions	595 mm	
Sampling plane area	0.278 m²	
Sampling port size, number	4" BSP (x2)	
Access & height of ports	Elevated work platform	20 m
Duct orientation & shape	Vertical	Circular
Downstream disturbance	Exit cone	3 D
Upstream disturbance	Bend	8 D
No. traverses & points sampled	2	8
Sample plane compliance to AS4323.1	Ideal	

Comments

An exit cone has been installed on the stack exit which measures 440mm in diameter

Stack Parameters		
Moisture content, %v/v	3	
Gas molecular weight, g/g mole	28.6 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	0945 & 1115	
Temperature, °C	31	
Temperature, K	304	
Velocity at sampling plane, m/s	25	
Velocity at exit plane, m/s	46	
Volumetric flow rate, actual, m³/s	7	
Volumetric flow rate (wet STP), m³/s	6.3	
Volumetric flow rate (dry STP), m³/s	6.2	
Mass flow rate (wet basis), kg/hour	29000	

Isokinetic Results	Results	
Sampling time	1003-1110	
	Concentration mg/m³	Mass Rate g/min
Total fluoride (as HF)	<0.01	<0.005
Chloride (as HCl)	<0.01	<0.005
Chlorine	<0.01	<0.005
Isokinetic Sampling Parameters		
Sampling time, min	64	
Isokinetic rate, %	102	
Velocity difference, %	<1	

4 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.

5 TEST METHODS

All sampling and analysis was performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling Method	Analysis Method	Uncertainty*	NATA Accredited	
				Sampling	Analysis
Sample plane criteria	NSW TM-1	NA	-	✓	NA
Flow rate, temperature and velocity	NSW TM-2	NA	8%, 2%, 7%	✓	NA
Moisture content	NSW TM-22	NSW TM-22	8%	✓	✓
Carbon dioxide	NSW TM-24	NSW TM-24	13%	✓	✓
Nitrogen oxides (NO_X)	NSW TM-11	NSW TM-11	12%	✓	✓
Oxygen	NSW TM-25	NSW TM-25	13%	✓	✓
Hydrogen sulfide	NSW TM-5	NSW TM-5	not specified	✓	✓[†]
Chlorine	NSW TM-7	Ektimo 235	14%	✓	✓[†]
Total fluoride	NSW TM-9	ALS Method QWI-EN/EA144C & Ektimo 235	17%	✓	✓[#,†]
Hydrogen chloride	NSW TM-8	Ektimo 235	14%	✓	✓[†]
Particulate matter	NSW TM-15	NSW TM-15	5%	✓	✓
Sulfuric acid mist (including sulfur trioxide)	NSW TM-3	Ektimo 235	16%	✓	✓[†]
Type 1 substances (Sb, As, Cd, Pb, Hg)	NSW TM-12	Envirolab inhouse	15%	✓	✓[‡]
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW TM-13	Envirolab inhouse	15%	✓	✓[‡]

180613

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

† Analysis performed by Ektimo, NATA accreditation number 14601.
Laboratory analytical results were reported on 17 September 2018 in report number R006468-H2S
Laboratory analytical results were reported on 20 September 2018 in report number R006468-SOx_Halides_Halogens

‡ Analysis performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 20 September 2018 in report number 200664

\# Analysis (solid fluoride only) performed by Australian Laboratory Services Pty Ltd, NATA accreditation number 825. Results were reported to Ektimo on 21 September 2018 in report number EN1805880

6 QUALITY ASSURANCE/QUALITY CONTROL INFORMATION

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

Ektimo is accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing 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 Director.

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 worldwide.

7 DEFINITIONS

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

~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
APHA	American public health association, Standard Methods for the Examination of Water and Waste Water
AS	Australian Standard
BSP	British standard pipe
CARB	Californian Air Resources Board
CEM	Continuous Emission Monitoring
CEMS	Continuous Emission Monitoring System
CTM	Conditional test method
D	Duct diameter or equivalent duct diameter for rectangular ducts
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.
DECC	Department of Environment & Climate Change (NSW)
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.
DWER	Department of Water and Environmental Regulation
EPA	Environment Protection Authority
FTIR	Fourier Transform Infra Red
ISC	Intersociety committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
NA	Not applicable
NATA	National Association of Testing Authorities
NIOSH	National Institute of Occupational Safety and Health
NT	Not tested or results not required
OM	Other approved method
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_{10}	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm).
$PM_{2.5}$	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 2.5 microns (µm).
PSA	Particle size analysis
RATA	Relative Accuracy Test Audit
STP	Standard 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.
TM	Test Method
TOC	The sum of all compounds of carbon which contain at least one carbon to carbon bond, plus methane and its derivatives.
USEPA	United States Environmental Protection Agency
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
Vic EPA	Victorian Environment Protection Authority
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.

Ektimo

Address (Head Office)
7 Redland Drive
MITCHAM VIC 3132

Office Locations
VIC NSW WA QLD

Postal Address
52 Cooper Road
COCKBURN CENTRAL WA 6164

Freecall: 1300 364 005
www.ektimo.com.au
ABN: 86 600 381 413

Report Number R007718

Emission Testing
ERM Australia Pty Ltd

Document Information

Client Name:	ERM Australia Pty Ltd
Report Number:	R007718
Date of Issue:	5 September 2019
Attention:	Iain Cowan
Address:	Level 3, Tower 3, World Trade Centre, 18-38 Siddeley Street Docklands VIC 3005
Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

Report Status

Format	Document Number	Report Date	Prepared By	Reviewed By (1)	Reviewed By (2)
Preliminary Report	-	-	-	-	-
Draft Report	R007718[DRAFT]	19/07/2019	DBu	RCo	ADa
Final Report	R007718	05/09/2019	DBu	RCo	ADa
Amend Report	-	-	-	-	-

Template Version: 180619

Amendment Record

Document Number	Initiator	Report Date	Section	Reason
Nil	-	-	-	-

Report Authorisation

Ryan Collins
Client Manager

NATA Accredited Laboratory
No. 14601

Aaron Davis
Ektimo Signatory

Accredited for compliance with ISO/IEC 17025 - Testing. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

Table of Contents

1 EXECUTIVE SUMMARY

Monitoring was performed at the Sell & Parker facility, 45 Tattersall Rd, Blacktown NSW as follows:

Location	Test Date	Test Parameters*
Scrap metal cutting area	12 June 2019	Metals (total) plus copper oxide, iron oxide and manganese oxide Solid particles Nitrogen dioxide and nitric oxide (as nitrogen dioxide) Odour Crystalline phases in solids

* Flow rate, velocity, temperature and moisture were also determined.

All results are reported on a dry basis at STP (except odour wet – STP).

Plant operating conditions have been noted in the report.

Sell & Parker process scrap metal at their Blacktown Plant. Part of the process involves cutting large pieces of scrap metal (eg beams, pipes, rail undercarriage parts) into manageable sizes; approximately 800mm.

The cutting operation is conducted in an outdoors open area, by hand, using an oxy-cutter.

A fume extraction system was fabricated and used manually to capture fumes generated by the oxy-cutting. The captured fumes were exhausted through a rigid PVC duct allowing for sampling according to NATA and NSW EPA approved methods.

Observation of the operation of the fume extraction system indicated that the majority of generated fume was captured.

2 APPROACH TO SAMPLING AND ANALYSIS

Sampling was conducted from the exhaust duct of the sampling system during two separate and consecutive testing periods. Each testing period consisted of oxy-cutting operations on the same large mild steel beam and included occasional short periods of non-cutting time as the operator shifted to different sections of the same beam.

The sampling system was operated according to the following plan:

- Combustion gases were measured continuously throughout each of the two testing periods, both during and in between cutting activities;
- Metals were sampled during each of the two test periods only when oxy-cutting was actually taking place. That is, the sampling system was paused whenever cutting was not taking place.
- Odour sampling was conducted only when oxy-cutting was actually taking place (during Test 2).

Particulate metals samples were divided into two equal portions with half submitted for analysis according to NSW TM 12, 13 and 14 and the other half submitted for X-Ray Diffractometry (XRD) to determine crystalline phases of solid emissions.

Concentrations and mass emission rates of metal oxides have been determined by expressing elemental concentrations of copper, manganese and iron as their equivalent typical oxide.

3 RESULTS

3.1 *Scrap Metal Cutting Area, Test 1*

Date	12/06/2019	**Client**	ERM Australia Pty Ltd
Report	R007718	**Stack ID**	Sell and Parker, Oxy cutting process
Licence No.	11555	**Location**	Kings Park
Ektimo Staff	Ryan Collins, Daniel De Sensi	**State**	NSW
Process Conditions	Please refer to client records.		190528

Sampling Plane Details	
Sampling plane dimensions	100 mm
Sampling plane area	0.00785 m²
Sampling port size, number	1" hole (x1)
Access & height of ports	Ground level 1 m
Duct orientation & shape	Horizontal Circular
Downstream disturbance	Exit 22 D
Upstream disturbance	Junction 8 D
No. traverses & points sampled	1 1
Sample plane compliance to AS4323.1	Ideal

Stack Parameters		
Moisture content, %v/v	0.83	
Gas molecular weight, g/g mole	28.9 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.29 (wet)	1.29 (dry)
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1038 & 1238	
Temperature, °C	31	
Temperature, K	304	
Velocity at sampling plane, m/s	14	
Volumetric flow rate, actual, m³/s	0.11	
Volumetric flow rate (wet STP), m³/s	0.1	
Volumetric flow rate (dry STP), m³/s	0.1	
Mass flow rate (wet basis), kg/hour	470	
Velocity difference, %	2	

Gas Analyser Results	Average		Minimum		Maximum	
Sampling time	1101 - 1221		1101 - 1221		1101 - 1221	
Combustion Gases	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Nitrogen oxides (as NO_2)	5.4	0.033	<4	<0.02	88	0.53

Date	12/06/2019	**Client**	ERM Australia Pty Ltd
Report	R007718	**Stack ID**	Sell and Parker, Oxy cutting process
Licence No.	11555	**Location**	Kings Park
Ektimo Staff	Ryan Collins, Daniel De Sensi	**State**	NSW
Process Conditions	Please refer to client records.		190528

Isokinetic Results	Test 1	
Sampling time	1101-1218	
	Concentration mg/m³	Mass Rate g/min
Solid Particles	140	0.82
Aluminium	**0.27**	**0.0016**
Antimony	**0.011**	**0.000064**
Arsenic	**0.018**	**0.00011**
Barium	**0.39**	**0.0024**
Beryllium	<0.0005	<0.000003
Cadmium	**0.0011**	**0.0000066**
Calcium	**0.17**	**0.001**
Chromium	**0.0092**	**0.000056**
Cobalt	**0.0018**	**0.000011**
Copper	**0.049**	**0.00029**
Iron	**36**	**0.21**
Lead	**0.029**	**0.00017**
Lithium	<0.0006	<0.000004
Magnesium	<0.2	<0.001
Manganese	**0.62**	**0.0037**
Mercury	<0.0004	<0.000002
Molybdenum	**0.0053**	**0.000032**
Nickel	**0.011**	**0.000064**
Phosphorus	**0.12**	**0.0007**
Potassium	<0.1	<0.0009
Selenium	<0.005	<0.00003
Silver	<0.0006	<0.000004
Sodium	**0.15**	**0.00088**
Thallium	<0.002	<0.00001
Tin	**0.0053**	**0.000032**
Zinc	**1.8**	**0.011**
Copper (II) oxide	**0.061**	**0.00037**
Manganese (IV) oxide	**0.99**	**0.0059**
Iron (II,III) oxide	**150**	**0.89**
Isokinetic Sampling Parameters		
Sampling time, min	59	
Isokinetic rate, %	92	
Velocity difference, %	2	

3.2 *Scrap Metal Cutting Area, Test 2*

Date	12/06/2019	**Client**	ERM Australia Pty Ltd
Report	R007718	**Stack ID**	Sell and Parker, Oxy cutting process
Licence No.	11555	**Location**	Kings Park
Ektimo Staff	Ryan Collins, Daniel De Sensi	**State**	NSW
Process Conditions	Please refer to client records.		190528

Sampling Plane Details	
Sampling plane dimensions	100 mm
Sampling plane area	0.00785 m²
Sampling port size, number	1" hole (x1)
Access & height of ports	Ground level 1 m
Duct orientation & shape	Horizontal Circular
Downstream disturbance	Exit 22 D
Upstream disturbance	Junction 8 D
No. traverses & points sampled	1 1
Sample plane compliance to AS4323.1	Ideal

Stack Parameters		
Moisture content, %v/v	1.5	
Gas molecular weight, g/g mole	28.8 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1334 & 1413	
Temperature, °C	30	
Temperature, K	303	
Velocity at sampling plane, m/s	14	
Volumetric flow rate, actual, m³/s	0.11	
Volumetric flow rate (wet STP), m³/s	0.1	
Volumetric flow rate (dry STP), m³/s	0.1	
Mass flow rate (wet basis), kg/hour	470	
Velocity difference, %	<1	

Gas Analyser Results	Average		Minimum		Maximum	
Sampling time	1328 - 1436		1328 - 1436		1328 - 1436	
Combustion Gases	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Nitrogen oxides (as NO_2)	<4	<0.02	<4	<0.02	8.2	0.049

Odour	Average		Test 1		Test 2	
Sampling time			1317 - 1325		1419 - 1427	
	Concentration ou	Mass Rate oum³/min	Concentration ou	Mass Rate oum³/min	Concentration ou	Mass Rate oum³/min
Results	2300	14000	2400	15000	2100	13000
Lower uncertainty limit	1500		1100		950	
Upper uncertainty limit	3300		5300		4500	
Hedonic tone			mildly unpleasant		mildly unpleasant	
Odour character			Burnt, combustion		Burnt, combustion	
Analysis date & time			13/06/19, 1100-1230		13/06/19, 1100-1230	
Holding time			22 hours		21 hours	
Dilution factor			1		1	
Bag material			Nalophan		Nalophan	
Hedonic tone			0		0	
Odour character			0		0	
Butanol threshold (ppb)	37.7					
Laboratory temp (°C)	21.85					
Last calibration date	October 2018					

Date	12/06/2019	**Client**	ERM Australia Pty Ltd
Report	R007718	**Stack ID**	Sell and Parker, Oxy cutting process
Licence No.	11555	**Location**	Kings Park
Ektimo Staff	Ryan Collins, Daniel De Sensi	**State**	NSW
Process Conditions	Please refer to client records.		190528

Isokinetic Results	Results	
Sampling time	1337-1410	
	Concentration mg/m³	Mass Rate g/min
Solid Particles	220	1.3
Aluminium	**0.28**	**0.0017**
Antimony	<0.01	<0.00007
Arsenic	**0.033**	**0.0002**
Barium	**0.5**	**0.003**
Beryllium	<0.001	<0.000008
Cadmium	<0.001	<0.000007
Calcium	<0.4	<0.003
Chromium	**0.013**	**0.000076**
Cobalt	**0.0033**	**0.00002**
Copper	**0.051**	**0.00031**
Iron	**54**	**0.33**
Lead	**0.034**	**0.0002**
Lithium	<0.001	<0.000009
Magnesium	<0.3	<0.002
Manganese	**0.92**	**0.0055**
Mercury	<0.0009	<0.000005
Molybdenum	**0.0084**	**0.00005**
Nickel	**0.016**	**0.000094**
Phosphorus	**0.15**	**0.00091**
Potassium	<0.3	<0.002
Selenium	<0.01	<0.00007
Silver	<0.001	<0.000009
Sodium	<0.3	<0.002
Thallium	<0.005	<0.00003
Tin	<0.005	<0.00003
Zinc	**1.6**	**0.0096**
Copper (II) oxide	**0.063**	**0.00038**
Manganese (IV) oxide	**1.5**	**0.0088**
Iron (II,III) oxide	**230**	**1.4**
Isokinetic Sampling Parameters		
Sampling time, min	30	
Isokinetic rate, %	104	
Velocity difference, %	<1	

4 PLANT OPERATING CONDITIONS

Unless otherwise stated, the plant operating conditions were normal at the time of testing. The manual oxy-cutting operator performed cutting activities on one large mild steel beam throughout the testing programme.

See ERM Australia Pty Ltd's records for complete process conditions.

5 TEST METHODS

All sampling and analysis was performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling Method	Analysis Method	Uncertainty*	NATA Accredited	
				Sampling	Analysis
Sample plane criteria	NSW TM-1	NA	NA	✓	NA
Flow rate, temperature and velocity	NA	NSW TM-2	8%, 2%, 7%	NA	✓
Moisture content	NSW TM-22	NSW TM-22	19%	✓	✓
Carbon dioxide	NSW TM-24	NSW TM-24	13%	✓	✓
Nitrogen oxides	NSW TM-11	NSW TM-11	12%	✓	✓
Oxygen	NSW TM-25	NSW TM-25	13%	✓	✓
Solid particles (total)	NSW TM-15	NSW TM-15	5%	✓	✓
Total (gaseous and particulate) metals and metallic compounds	NSW TM-12, NSW TM-13, NSW TM-14	Envirolab inhouse Metals-006, Metals-022, Metals-021	15%	✓	✓‡
Type 1 substances (Sb, As, Cd, Pb, Hg)	NSW TM-12	Envirolab inhouse Metals-006, Metals-022, Metals-021	15%	✓	✓‡
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW TM-13	Envirolab inhouse Metals-006, Metals-022	15%	✓	✓‡
Odour	NSW OM-7	NSW OM-7¥	Refer to results	✓	✓
Odour Characterisation	NA	direct observation	NA	NA	×
Crystalline phases in solids	USEPA 29	Safe Work NSW Inhouse (WCA.112 modified)	NA	×	× b

190624

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

‡ Analysis performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 28 June 2019 in report number 220106

¥ Odour analysis conducted at the Ektimo NSW laboratory by forced choice olfactometry. Results were reported to Ektimo on 13 June 2019 in report number OV-00108

b Analysis performed by WorkCover New South Wales. NATA Accreditation does not cover the performance of this service. Results were reported to Ektimo on 9 July 2019 in Laboratory Reference 2019-2896

6 QUALITY ASSURANCE/QUALITY CONTROL INFORMATION

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

Ektimo is accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing 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 Director.

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 worldwide.

7 DEFINITIONS

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

% v/v	Volume to volume ratio, dry or wet basis
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
APHA	American public health association, Standard Methods for the Examination of Water and Waste Water
AS	Australian Standard
BSP	British standard pipe
CARB	Californian Air Resources Board
CEM	Continuous Emission Monitoring
CEMS	Continuous Emission Monitoring System
CTM	Conditional test method
D	Duct diameter or equivalent duct diameter for rectangular ducts
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.
DECC	Department of Environment & Climate Change (NSW)
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.
DWER	Department of Water and Environmental Regulation (WA)
DEHP	Department of Environment and Heritage Protection (QLD)
EPA	Environment Protection Authority
FTIR	Fourier Transform Infra-red
ISC	Intersociety committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
Lower Bound	Defines values reported below detection as equal to zero.
Medium Bound	Defines values reported below detection are equal to half the detection limit.
NA	Not applicable
NATA	National Association of Testing Authorities
NIOSH	National Institute of Occupational Safety and Health
NT	Not tested or results not required
OM	Other approved method
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_{10}	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm).
$PM_{2.5}$	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 2.5 microns (µm).
PSA	Particle size analysis
RATA	Relative Accuracy Test Audit
Semi-quantified VOCs	Unknown VOCs (those not matching a standard compound), are identified by matching the mass spectrum of the chromatographic peak to the NIST Standard Reference Database (version 14.0), with a match quality exceeding 70%. An estimated concentration will be determined by matching the integrated area of the peak with the nearest suitable compound in the analytical calibration standard mixture.
STP	Standard 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.
TM	Test Method
TOC	The sum of all compounds of carbon which contain at least one carbon to carbon bond, plus methane and its derivatives.
USEPA	United States Environmental Protection Agency
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
Vic EPA	Victorian Environment Protection Authority
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.
XRD	X-ray Diffractometry
Upper Bound	Defines values reported below detection are equal to the detection limit.

8 APPENDIX 1: SAFE WORK AUSTRALIA REPORT

Analysis of Crystalline Phases in Solids

Reference Number	Ektimo Sample ID	Sample Location	Crystalline Phases Detected
2019-2896-1	N8715	Scrap metal cutting area Test 1.	Magnetite: Fe_3O_4
2019-2896-2	N9370	Scrap metal cutting area Test 2.	Magnetite: Fe_3O_4
2019-2896-3	N9371	Field Blank	No crystalline phase detected

NSW GOVERNMENT | SafeWork NSW

Test Safe AUSTRALIA

Ryan Collins
Ektimo
7 Redland Drive
MITCHAM VIC 3132

Lab. Reference: 2019-2896

SAMPLE ORIGIN: Job R007718

DATE OF INVESTIGATION: Not Stated

DATE RECEIVED: 24/06/19

ANALYSIS REQUIRED: Crystalline Phases

RESULTS OF ANALYSIS

See attached sheet(s) for sample description and test results.

For all administrative or account details please contact Jeanine Wells.

Increment and total pagination can be seen on the following pages.

Martin Mazereeuw
Manager

Date: 9/07/19

TestSafe Australia – Chemical Analysis Branch
Level 2, Building 1, 9-15 Chilvers Road, Thornleigh, NSW 2120, Australia
T: +61 2 9473 4000 E: lab@safework.nsw.gov.au W: testsafe.com.au
ABN 81 913 830 179

Report of Analysis for Crystalline Phases in Solids

Requested by: Ryan Collins **Sample received: 24-Jun-2019**

Organisation: Ektimo

Reference number	Sample ID (Type)	Crystalline Phases Detected (qualitative)
2019-2896-1	N8715 (filter)	Magnetite: Fe_3O_4
2019-2896-2	N9370 (filter)	Magnetite: Fe_3O_4
2019-2896-3	N9371 (filter)	No crystalline phase detected.

Comments: The filter samples were analysed as received.

Method Description : Qualitative Identification of Minerals and Other Inorganic Crystalline Substances in Bulk Solids by X-Ray Diffractometry.
Method No. : WCA.112 modified
Detection Limit : 1% - 10% depending on matrix and phase constituents.

TestSafe Australia – Chemical Analysis Branch ABN 81 913 830 179 Level 2, Building 1, 9–15 Chilvers Road, Thornleigh, NSW 2120, Australia
Telephone +61 2 9473 4000 Email lab@safework.nsw.gov.au Website testsafe.com.au

SW08052 1215

REPORT NUMBER R008184

Annual Emission Testing
Sell and Parker, Kings Park

www.ektimo.com.au

Document Information

Client Name:	Sell and Parker
Report Number:	R008184
Date of Issue:	11 October 2019
Attention:	Howard Richards
Address:	46 Tattersall Road Kings Park NSW 2148
Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

Report Authorisation

NATA Accredited Laboratory
No. 14601

Aaron Davis
Client Manager

Accredited for compliance with ISO/IEC 17025 - Testing. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

Table of Contents

1 EXECUTIVE SUMMARY

1.1 Background

Ektimo was engaged by Sell and Parker to perform emission testing at their Kings Park plant. Testing was carried out in accordance with Environmental Licence 11555.

1.2 Project objectives

The objectives of the project were to conduct a monitoring programme to quantify emissions from one discharge point to determine whether it was in compliance with Sell and Parker's Environmental licence and the *Protection of Environment Operations (Clean Air) Regulation* 2010; Schedule 4 Standards of Concentration for Scheduled Premises: General Activities and Plant (Group 6)

Location	Test Date	Test Parameters*
EPA 3 – Hammer Mill Stack	26 September 2019	Solid particles, type 1 and 2 substances

* Flow rate, velocity, temperature and moisture were also determined.

All results are reported on a dry basis at STP.

Plant operating conditions have been noted in the report.

1.3 Licence Comparison

The following licence comparison table shows that all analytes highlighted in green are within the licence limit set by:

- The *Protection of Environment Operations (Clean Air) Regulation* 2010; Schedule 4 Standards of Concentration for Scheduled Premises: General Activities and Plant (Group 6).
- the NSW EPA as per licence 11555 (last amended on 10 December 2018).

Monitoring results are summarized in the following table:

Location	Pollutant	Units	POEO Reg Limit (Gp 6)	Environment Protection Licence Limit	Detected values
EPA 3 Hammer Mill	Solid particles	mg/m^3	20	20	**3.7**
	Type 1 substances in aggregate (Sb, As, Cd, Pb, Hg)	mg/m^3	-	-	**≤0.017**
	Type 1 and 2 substances in aggregate (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, N, Se, Sn, V)	mg/m^3	1	1	**≤0.042**
	Cadimum (Cd)	mg/m^3	0.2	-	**<0.0009**
	Mercury (Hg)	mg/m^3	0.2	-	**0.0011**

Please note that the measurement uncertainty associated with the test results was not considered when determining whether the results were compliant or non-compliant.

Refer to the Test Methods table for the measurement uncertainties.

2 RESULTS

2.1 EPA 3 – Hammer Mill Stack

Date	26/09/2019	**Client**	Sell and Parker
Report	R008184	**Stack ID**	EPA 3 - Hammer Mill
Licence No.	11555	**Location**	Kings Park
Ektimo Staff	Aaron Davis / Hamish Proust	**State**	NSW
Process Conditions	Normal operating conditions for Hammer Mill		*190909*

Sampling Plane Details	
Sampling plane dimensions	595 mm
Sampling plane area	0.278 m²
Sampling port size, number	4" BSP (x2)
Access & height of ports	Elevated work platform 20 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit cone 3 D
Upstream disturbance	Bend 8 D
No. traverses & points sampled	2 8
Sample plane compliance to AS4323.1	Ideal

Comments

An exit cone has been installed on the stack which measures 440mm in diameter
The discharge is assumed to be composed of dry air and moisture

Stack Parameters		
Moisture content, %v/v	2	
Gas molecular weight, g/g mole	28.7 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)

Gas Flow Parameters	
Flow measurement time(s) (hhmm)	1140 & 1255
Temperature, °C	36
Temperature, K	309
Velocity at sampling plane, m/s	26
Volumetric flow rate, actual, m³/s	7.1
Volumetric flow rate (wet STP), m³/s	6.4
Volumetric flow rate (dry STP), m³/s	6.2
Mass flow rate (wet basis), kg/hour	29000

Date	26/09/2019	**Client**	Sell and Parker
Report	R008184	**Stack ID**	EPA 3 - Hammer Mill
Licence No.	11555	**Location**	Kings Park
Ektimo Staff	Aaron Davis / Hamish Proust	**State**	NSW
Process Conditions	Normal operating conditions for Hammer Mill		190909

Isokinetic Results	Results	
Sampling time	1145-1250	
	Concentration mg/m³	Mass Rate g/min
Solid Particles	3.7	1.4
Antimony	<0.009	<0.003
Arsenic	<0.004	<0.001
Beryllium	<0.001	<0.0004
Cadmium	**<0.0009**	**<0.0003**
Chromium	<0.001	<0.0005
Cobalt	<0.001	<0.0004
Lead	0.0033	0.0012
Manganese	<0.004	<0.001
Mercury	**0.0011**	**0.0004**
Nickel	<0.003	<0.001
Selenium	<0.009	<0.003
Tin	<0.004	<0.001
Vanadium	<0.002	<0.0008
Type 1 & 2 Substances		
Upper Bound		
Total Type 1 Substances	≤0.017	≤0.0065
Total Type 2 Substances	<0.02	<0.009
Total Type 1 & 2 Substances	**≤0.042**	**≤0.016**
Isokinetic Sampling Parameters		
Sampling time, min	64	
Isokinetic rate, %	93	
Velocity difference, %	<1	

3 PLANT OPERATING CONDITIONS

Normal operating conditions for Hammer Mill

4 TEST METHODS

All sampling and analysis will be performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling Method	Analysis Method	Uncertainty*	NATA Accredited	
				Sampling	Analysis
Sample plane criteria	NSW TM-1	NA	NA	✓	NA
Flow rate, temperature and velocity	NA	NSW TM-2	8%, 2%, 7%	NA	✓
Moisture content	NSW TM-22	NSW TM-22	8%	✓	✓
Molecular weight	NA	NSW TM-23	not specified	NA	✓
Solid particles (total)	NSW TM-15	NSW TM-15††	5%	✓	✓
Total (gaseous and particulate) metals and metallic compounds	NSW TM-12, NSW TM-13, NSW TM-14	Envirolab inhouse Metals-006, Metals-022, Metals-021	15%	✓	✓‡
Type 1 substances (Sb, As, Cd, Pb, Hg)	NSW TM-12	Envirolab inhouse Metals-006, Metals-022, Metals-021	15%	✓	✓‡
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW TM-13	Envirolab inhouse Metals-006, Metals-022	15%	✓	✓‡

190808

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

†† Gravimetric analysis conducted at the Ektimo Unanderra, NSW laboratory, NATA accreditation number 14601.

‡ Analysis performed by Envirolab, NATA accreditation number 2901.
Results were reported to Ektimo on 8 October 2019 in report number 227343.

5 QUALITY ASSURANCE/QUALITY CONTROL INFORMATION

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

Ektimo is accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing 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 Director.

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 worldwide.

6 DEFINITIONS

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

% v/v	Volume to volume ratio, dry or wet basis
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
APHA	American public health association, Standard Methods for the Examination of Water and Waste Water
AS	Australian Standard
BSP	British standard pipe
CARB	Californian Air Resources Board
CEM	Continuous Emission Monitoring
CEMS	Continuous Emission Monitoring System
CTM	Conditional test method
D	Duct diameter or equivalent duct diameter for rectangular ducts
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.
DECC	Department of Environment & Climate Change (NSW)
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.
DWER	Department of Water and Environmental Regulation (WA)
DEHP	Department of Environment and Heritage Protection (QLD)
EPA	Environment Protection Authority
FTIR	Fourier Transform Infra-red
ISC	Intersociety committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
Lower Bound	Defines values reported below detection as equal to zero.
Medium Bound	Defines values reported below detection are equal to half the detection limit.
NA	Not applicable
NATA	National Association of Testing Authorities
NIOSH	National Institute of Occupational Safety and Health
NT	Not tested or results not required
OM	Other approved method
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_{10}	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm).
$PM_{2.5}$	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 2.5 microns (µm).
PSA	Particle size analysis
RATA	Relative Accuracy Test Audit
Semi-quantified VOCs	Unknown VOCs (those not matching a standard compound), are identified by matching the mass spectrum of the chromatographic peak to the NIST Standard Reference Database (version 14.0), with a match quality exceeding 70%. An estimated concentration will be determined by matching the integrated area of the peak with the nearest suitable compound in the analytical calibration standard mixture.
STP	Standard 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.
TM	Test Method
TOC	The sum of all compounds of carbon which contain at least one carbon to carbon bond, plus methane and its derivatives.
USEPA	United States Environmental Protection Agency
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
Velocity Difference	The percentage difference between the average of initial flows and afterflows.
Vic EPA	Victorian Environment Protection Authority
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.
XRD	X-ray Diffractometry
Upper Bound	Defines values reported below detection are equal to the detection limit.
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range.

Address (Head Office)
7 Redland Drive
Mitcham VIC 3132

Postal Address
52 Cooper Road
Cockburn Central WA 6164

Office Locations
VIC NSW WA QLD

Freecall: 1300 364 005
www.ektimo.com.au
ABN 86 600 381 413

REPORT NUMBER R009653

Annual Emission Testing

Sell and Parker, Kings Park

Document Information

Template Version; 030620

Client Name:	Sell and Parker
Report Number:	R009653
Date of Issue:	4 September 2020
Attention:	Howard Richards
Address:	46 Tattersall Road Kings Park NSW 2148
Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

Report Authorisation

Aaron Davis
Client Manager

NATA Accredited Laboratory
No. 14601

Accredited for compliance with ISO/IEC 17025 - Testing. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

This document is confidential and is prepared for the exclusive use of Sell and Parker and those granted permission by Sell and Parker. The report shall not be reproduced except in full.

Please note that only numerical results pertaining to measurements conducted directly by Ektimo are covered by Ektimo's terms of NATA accreditation. This does not include comments, conclusions or recommendations based upon the results. Refer to 'Test Methods' for full details of testing covered by NATA accreditation.

Table of Contents

1 EXECUTIVE SUMMARY

1.1 *Background*

Ektimo was engaged by Sell and Parker to perform emission testing at their Kings Park facility. Testing was carried out in accordance with the requirements of their Environmental Protection Licence 11555.

1.2 *Project Objectives*

The objectives of the project were to conduct monitoring to quantify emissions from one discharge point to determine whether it was in compliance with Sell and Parker's Environmental Protection licence and the *Protection of Environment Operations (Clean Air) Regulation* 2010; Schedule 4 Standards of Concentration for Scheduled Premises: General Activities and Plant (Group 6).

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA 3 – Hammer Mill Stack	21 August 2020	Solid particles Metals type 1 and 2 substances

* Flow rate, velocity, temperature and moisture were also determined as per EPL 11555 requirements

All results are reported on a dry basis at STP.

Plant operating conditions have been noted in the report.

1.3 *Licence Comparison*

The following licence comparison table shows that all analytes highlighted in green are within the licence limit set by:

- The *Protection of Environment Operations (Clean Air) Regulation* 2010; Schedule 4 Standards of Concentration for Scheduled Premises: General Activities and Plant (Group 6).
- the NSW EPA as per licence 11555 (last amended on 24 April 2020).

Monitoring results are summarised in the following table:

Location	Pollutant	Units	POEO Reg Limit (Gp 6)	Environment Protection Licence Limit	Detected values
EPA 3 Hammer Mill	Solid particles	mg/m^3	20	20	<3
	Type 1 substances in aggregate (Sb, As, Cd, Pb, Hg)	mg/m^3	-	-	≤0.015
	Type 1 and 2 substances in aggregate (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, N, Se, Sn, V)	mg/m^3	1	1	≤0.035
	Cadimum (Cd)	mg/m^3	0.2	-	<0.0007
	Mercury (Hg)	mg/m^3	0.2	-	<0.0009

Please note that the measurement uncertainty associated with the test results was not considered when determining whether the results were compliant or non-compliant.

Refer to the Test Methods table for the measurement uncertainties.

2 RESULTS

2.1 *EPA 3 – Hammer Mill Stack*

Date	21/08/2020	**Client**	Sell and Parker
Report	R009653	**Stack ID**	EPA 3 - Hammer Mill
Licence No.	11555	**Location**	Kings Park
Ektimo Staff	Aaron Davis / Joel Micale-David	**State**	NSW
Process Conditions	Normal operating conditions for Hammer Mill with expansion spray chamber system operational during commissioning.		200805

Sampling Plane Details	
Sampling plane dimensions	595 mm
Sampling plane area	0.278 m²
Sampling port size, number	4" BSP (x2)
Access & height of ports	Elevated work platform 20 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit cone 3 D
Upstream disturbance	Bend 8 D
No. traverses & points sampled	2 8
Sample plane compliance to AS4323.1	Ideal
Comments	
An exit cone has been installed on the stack which measures 440mm in diameter	
The discharge is assumed to be composed of dry air and moisture	

Stack Parameters		
Moisture content, %v/v	2.4	
Gas molecular weight, g/g mole	28.7 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	0945 & 1055	
Temperature, °C	27	
Temperature, K	300	
Velocity at sampling plane, m/s	27	
Volumetric flow rate, actual, m³/s	7.6	
Volumetric flow rate (wet STP), m³/s	6.9	
Volumetric flow rate (dry STP), m³/s	6.7	
Mass flow rate (wet basis), kg/hour	32000	

Ektimo

Date	21/08/2020	**Client**	Sell and Parker
Report	R009653	**Stack ID**	EPA 3 - Hammer Mill
Licence No.	11555	**Location**	Kings Park
Ektimo Staff	Aaron Davis / Joel Micale-David	**State**	NSW
Process Conditions	Normal operating conditions for Hammer Mill with expansion spray chamber system operational during commissioning.		200805

Isokinetic Results	Results	
Sampling time	0946-1051	
	Concentration mg/m³	Mass Rate g/min
Solid Particles	<3	<1
Antimony	<0.007	<0.003
Arsenic	<0.003	<0.001
Beryllium	<0.0008	<0.0003
Cadmium	<0.0007	<0.0003
Chromium	0.0027	0.0011
Cobalt	<0.001	<0.0004
Lead	0.003	0.0012
Manganese	0.003	0.0012
Mercury	<0.0009	<0.0004
Nickel	<0.002	<0.0007
Selenium	<0.007	<0.003
Tin	<0.003	<0.001
Vanadium	<0.002	<0.0007
Type 1 & 2 Substances		
Upper Bound		
Total Type 1 Substances	≤0.015	≤0.0059
Total Type 2 Substances	≤0.021	≤0.0084
Total Type 1 & 2 Substances	≤0.035	≤0.014
Isokinetic Sampling Parameters		
Sampling time, min	64	
Isokinetic rate, %	107	
Velocity difference, %	<1	

NATA

3 PLANT OPERATING CONDITIONS

See Sell and Parker records for complete process conditions.

Low magnesium steels and general black iron were being processed at the time of testing.

4 TEST METHODS

All sampling and analysis performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling Method	Analysis Method	Method Detection Limit	Uncertainty*	NATA Accredited	
					Sampling	Analysis
Sample plane criteria	NSW TM-1	NA	NA	NA	✓	NA
Flow rate, temperature and velocity	NA	NSW TM-2	Location specific	8%, 2%, 7%	NA	✓
Moisture content	NSW TM-22	NSW TM-22	0.1%	8%	✓	✓
Molecular weight	NA	NSW TM-23	not specified	not specified	NA	✓
Solid particles (total)	NSW TM-15	NSW TM-15††	0.001 g/m³	5%	✓	✓
Total (gaseous and particulate) metals and metallic compounds	NSW TM-12, NSW TM-13, NSW TM-14	Envirolab inhouse Metals-006, Metals-022, Metals-021	Analyte specific	15%	✓	✓‡
Type 1 substances (Sb, As, Cd, Pb, Hg)	NSW TM-12	Envirolab inhouse Metals-006, Metals-022, Metals-021	not specified	15%	✓	✓‡
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW TM-13	Envirolab inhouse Metals-006, Metals-022	not specified	15%	✓	✓‡

190808

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

†† Gravimetric analysis conducted at the Ektimo Unanderra, NSW laboratory, NATA accreditation number 14601.

‡ Analysis performed by Envirolab, NATA accreditation number 2901.
Results were reported to Ektimo on 1 September 2020 in report number 249772.

5 QUALITY ASSURANCE/QUALITY CONTROL INFORMATION

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

Ektimo is accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing 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 Director.

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 worldwide.

6 DEFINITIONS

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

% v/v	Volume to volume ratio, dry or wet basis
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
APHA	American public health association, Standard Methods for the Examination of Water and Waste Water
AS	Australian Standard
BSP	British standard pipe
CARB	Californian Air Resources Board
CEM	Continuous Emission Monitoring
CEMS	Continuous Emission Monitoring System
CTM	Conditional test method
D	Duct diameter or equivalent duct diameter for rectangular ducts
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.
DECC	Department of Environment & Climate Change (NSW)
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.
DWER	Department of Water and Environmental Regulation (WA)
DEHP	Department of Environment and Heritage Protection (QLD)
EPA	Environment Protection Authority
FTIR	Fourier Transform Infra-red
ISC	Intersociety committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
Lower Bound	Defines values reported below detection as equal to zero.
Medium Bound	Defines values reported below detection are equal to half the detection limit.
NA	Not applicable
NATA	National Association of Testing Authorities
NIOSH	National Institute of Occupational Safety and Health
NT	Not tested or results not required
OM	Other approved method
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_{10}	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm).
$PM_{2.5}$	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 2.5 microns (µm).
PSA	Particle size analysis
RATA	Relative Accuracy Test Audit
Semi-quantified VOCs	Unknown VOCs (those not matching a standard compound), are identified by matching the mass spectrum of the chromatographic peak to the NIST Standard Reference Database (version 14.0), with a match quality exceeding 70%. An estimated concentration will be determined by matching the integrated area of the peak with the nearest suitable compound in the analytical calibration standard mixture.
STP	Standard 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.
TM	Test Method
TOC	The sum of all compounds of carbon which contain at least one carbon to carbon bond, plus methane and its derivatives.
USEPA	United States Environmental Protection Agency
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
Velocity Difference	The percentage difference between the average of initial flows and afterflows.
Vic EPA	Victorian Environment Protection Authority
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.
XRD	X-ray Diffractometry
Upper Bound	Defines values reported below detection are equal to the detection limit.
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range.

Address (Head Office)
7 Redland Drive
Mitcham VIC 3132

Postal Address
52 Cooper Road
Cockburn Central WA 6164

Office Locations
VIC NSW WA QLD

Freecall: 1300 364 005
www.ektimo.com.au
ABN 86 600 381 413

Ektimo

REPORT NUMBER R010794

Annual Emission Testing

Sell and Parker, Kings Park

Document Information

Template Version; 240920

Client Name:	Sell and Parker
Report Number:	R010794
Date of Issue:	26 May 2021
Attention:	Howard Richards
Address:	46 Tattersall Road Kings Park NSW 2148
Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

Report Authorisation

Steven Cooper
Ektimo Signatory

NATA Accredited Laboratory
No. 14601

Accredited for compliance with ISO/IEC 17025 - Testing. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

Please note that only numerical results pertaining to measurements conducted directly by Ektimo are covered by Ektimo's terms of NATA accreditation. This does not include comments, conclusions or recommendations based upon the results. Refer to 'Test Methods' for full details of testing covered by NATA accreditation.

Table of Contents

1 EXECUTIVE SUMMARY

1.1 *Background*

Ektimo was engaged by Sell and Parker to perform emission testing at their Kings Park facility. Testing was carried out in accordance with the requirements of their Environment Protection Licence (EPL) 11555.

1.2 *Project Objectives*

The objectives of the project were to conduct monitoring to quantify emissions from one discharge point to determine compliance with Sell and Parker's EPL as well as the *Protection of Environment Operations (Clean Air) Regulation* 2010; Schedule 4 Standards of Concentration for Scheduled Premises: General Activities and Plant (Group 6).

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA 3 – Hammer Mill Stack	26 April 2021	Solid particles Metals (type 1 and 2 substances)

* Flow rate, velocity, temperature and moisture were also determined, as per EPL 11555 requirements.

All results are reported on a dry basis at STP.

Plant operating conditions have been noted in the report.

1.3 *Licence Comparison*

The following licence comparison table shows that all analytes highlighted in green are within the licence limit set by:

- The *Protection of Environment Operations (Clean Air) Regulation* 2010; Schedule 4 Standards of Concentration for Scheduled Premises: General Activities and Plant (Group 6).
- the NSW EPA as per licence 11555 (last amended on 15 April 2021).

Monitoring results are summarised in the following table:

Location	Pollutant	Units	POEO Reg Limit (Gp 6)	Environment Protection Licence Limit	Detected values
EPA 3 Hammer Mill	Solid particles	mg/m^3	20	20	7.3
	Type 1 substances in aggregate (Sb, As, Cd, Pb, Hg)	mg/m^3	-	-	≤0.022
	Type 1 and 2 substances in aggregate (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, N, Se, Sn, V)	mg/m^3	1	1	≤0.051
	Cadimum (Cd)	mg/m^3	0.2	-	<0.0008
	Mercury (Hg)	mg/m^3	0.2	-	0.0025

Please note that the measurement uncertainty associated with the test results was not considered when determining whether the results were compliant or non-compliant.

Refer to the Test Methods table for the measurement uncertainties.

2 RESULTS

2.1 *EPA 3 – Hammer Mill Stack*

Date	26/04/2021	**Client**	Sell and Parker
Report	R010794	**Stack ID**	EPA 3 - Hammer Mill
Licence No.	11555	**Location**	Kings Park
Ektimo Staff	Steven Cooper & Ahmad Ramiz	**State**	NSW
Process Conditions	Normal operating conditions		210329

Sampling Plane Details	
Sampling plane dimensions	595 mm
Sampling plane area	0.278 m²
Sampling port size, number	4" BSP (x2)
Access & height of ports	Elevated work platform 20 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit cone 3 D
Upstream disturbance	Bend 8 D
No. traverses & points sampled	2 8
Sample plane compliance to AS4323.1	Ideal

Comments
Test paused between 1136-1247 due to operational issues - wire tangled on drum shaft
The discharge is assumed to be composed of dry air and moisture

Stack Parameters		
Moisture content, %v/v	1.5	
Gas molecular weight, g/g mole	28.8 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.14	
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	0940 & 1345	
Temperature, °C	39	
Temperature, K	312	
Velocity at sampling plane, m/s	27	
Volumetric flow rate, actual, m³/s	7.6	
Volumetric flow rate (wet STP), m³/s	6.8	
Volumetric flow rate (dry STP), m³/s	6.6	
Mass flow rate (wet basis), kg/hour	31000	
Velocity difference, %	-2	

Date	26/04/2021	**Client**	Sell and Parker
Report	R010794	**Stack ID**	EPA 3 - Hammer Mill
Licence No.	11555	**Location**	Kings Park
Ektimo Staff	Steven Cooper & Ahmad Ramiz	**State**	NSW
Process Conditions	Normal operating conditions		210329

Isokinetic Results	Results	
Sampling time	1115-1332	
	Concentration mg/m³	Mass Rate g/min
Solid particles	7.3	2.9
Antimony	<0.008	<0.003
Arsenic	<0.003	<0.001
Beryllium	<0.0009	<0.0004
Cadmium	<0.0008	<0.0003
Chromium	0.002	0.00078
Cobalt	<0.001	<0.0004
Lead	0.0069	0.0028
Manganese	0.0062	0.0025
Mercury	0.0025	0.001
Nickel	0.0051	0.002
Selenium	<0.008	<0.003
Tin	<0.003	<0.001
Vanadium	<0.002	<0.0008
Type 1 & 2 Substances		
Upper Bound		
Total Type 1 Substances	≤0.022	≤0.0087
Total Type 2 Substances	≤0.029	≤0.012
Total Type 1 & 2 Substances	≤0.051	≤0.02
Isokinetic Sampling Parameters		
Sampling time, min	64	
Isokinetic rate, %	99	
Velocity difference, %	-2	

3 PLANT OPERATING CONDITIONS

See Sell and Parker records for complete process conditions.

Normal condition: Hammer Mill processing typical feedstock.

4 TEST METHODS

All sampling and analysis performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling Method	Analysis Method	Uncertainty*	NATA Accredited	
				Sampling	Analysis
Sample plane criteria	NSW TM-1	NA	NA	✓	NA
Flow rate, temperature and velocity	NSW TM-2	NSW TM-2	8%, 2%, 7%	NA	✓
Moisture content	NSW TM-22	NSW TM-22	8%	✓	✓
Molecular weight	NA	NSW TM-23	not specified	NA	✓
Solid particles (total)	NSW TM-15	NSW TM-15††	3%	✓	✓
Total (gaseous and particulate) metals and metallic compounds	NSW TM-12, NSW TM-13, NSW TM-14	Envirolab inhouse Metals-006, Metals-022, Metals-021	15%	✓	✓‡
Type 1 substances (Sb, As, Cd, Pb, Hg)	NSW TM-12	Envirolab inhouse Metals-006, Metals-022, Metals-021	15%	✓	✓‡
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW TM-13	Envirolab inhouse Metals-006, Metals-022	15%	✓	✓‡

210316

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

†† Gravimetric analysis conducted at the Ektimo Unanderra, NSW laboratory, NATA accreditation number 14601.

‡ Analysis performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 7 May 2021 in report number 268004.

5 QUALITY ASSURANCE/QUALITY CONTROL INFORMATION

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

Ektimo is accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing 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 Director.

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 worldwide.

6 DEFINITIONS

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

% v/v	Volume to volume ratio, dry or wet basis
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
APHA	American public health association, Standard Methods for the Examination of Water and Waste Water
AS	Australian Standard
BSP	British standard pipe
CARB	Californian Air Resources Board
CEM	Continuous Emission Monitoring
CEMS	Continuous Emission Monitoring System
CTM	Conditional test method
D	Duct diameter or equivalent duct diameter for rectangular ducts
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.
DECC	Department of Environment & Climate Change (NSW)
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.
DWER	Department of Water and Environmental Regulation (WA)
DEHP	Department of Environment and Heritage Protection (QLD)
EPA	Environment Protection Authority
FTIR	Fourier Transform Infra-red
ISC	Intersociety committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
Lower Bound	Defines values reported below detection as equal to zero.
Medium Bound	Defines values reported below detection are equal to half the detection limit.
NA	Not applicable
NATA	National Association of Testing Authorities
NIOSH	National Institute of Occupational Safety and Health
NT	Not tested or results not required
OM	Other approved method
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_{10}	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm).
$PM_{2.5}$	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 2.5 microns (µm).
PSA	Particle size analysis
RATA	Relative Accuracy Test Audit
Semi-quantified VOCs	Unknown VOCs (those not matching a standard compound), are identified by matching the mass spectrum of the chromatographic peak to the NIST Standard Reference Database (version 14.0), with a match quality exceeding 70%. An estimated concentration will be determined by matching the integrated area of the peak with the nearest suitable compound in the analytical calibration standard mixture.
STP	Standard 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.
TM	Test Method
TOC	The sum of all compounds of carbon which contain at least one carbon to carbon bond, plus methane and its derivatives.
USEPA	United States Environmental Protection Agency
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
Velocity Difference	The percentage difference between the average of initial flows and afterflows.
Vic EPA	Victorian Environment Protection Authority
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.
XRD	X-ray Diffractometry
Upper Bound	Defines values reported below detection are equal to the detection limit.
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range.

Address (Head Office)
7 Redland Drive
Mitcham VIC 3132

Postal Address
52 Cooper Road
Cockburn Central WA 6164

Office Locations
VIC NSW WA QLD

Freecall: 1300 364 005
www.ektimo.com.au
ABN 86 600 381 413