FINAL REPORT

RUTHERFORD TYRE RECYCLERS – PROPOSED TYRE RECYCLING FACILITY

9 BURLINGTON PLACE, RUTHERFORD, NSW 2320

AIR QUALITY IMPACT ASSESSMENT
RWDI # 2402864
09 May 2024

SUBMITTED TO
Rutherford Tyre Recyclers

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DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Draft	March 06, 2024	Rama Robbi	Christian Reuten
B	Final	May 09, 2024	Rama Robbi	Davis Lai

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EXECUTIVE SUMMARY

This air quality impact assessment report has been prepared by RWDI Australia Pty Ltd to accompany Environment Impact Statement (EIS) and Development Application (DA) for the proposed development of a tyre recycling facility within an existing shed building located at 9 Burlington Place, Rutherford, NSW 2320 (Lot 3005 DP 1040568). The proposed facility would process up to 4,500 tonnes per annum of tyres and be characterised as a Resource Recovery Facility.

The report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) for air quality and odour with respect to the proposed development.

The report assessed the potential construction and operational dust and odour impacts associated with the proposed development in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2022).

A risk-based approach was adopted to assess dust emissions from the construction of the proposed development in accordance with the Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) "Guidance on the Assessment of Dust from Demolition and Construction" (EPUK & IAQM, 2024). The assessment concluded that there would be a low risk of dust impacts from construction, and with the implementation of recommended mitigation measures, no significant air quality impacts are expected to occur during the construction of the proposed development.

A quantitative approach was adopted to assess air quality impacts on nearby receptors during the operation of the Project. The results of the dispersion modelling indicate that dust and odour concentrations due to the worst-case operation of the proposed development would comply with the established criteria at all sensitive receptors.

Therefore, no adverse air quality impacts associated with the construction and operation of the proposed development are expected.

1 INTRODUCTION

RWDI Australia Pty Ltd (RWDI) has been commissioned by Jackson Environment and Planning Pty Ltd to provide an air quality impact assessment (AQIA) for the proposed development of a tyre recycling facility (the Proposal) within an existing shed building located at 9 Burlington Place, Rutherford, NSW 2320 (the Site). The proposed facility would process up to 4,500 tonnes of tyres per annum and be characterised as a Resource Recovery Facility. The existing industrial shed would be upgraded to meet with the requirements of operating the waste tyre recycling facility.

Under Section 4.12 of the Environmental Planning and Assessment Act 1979 the proposed development is a Designated Development, requiring an Environment Impact Statement (EIS). This report has been prepared to address the below air quality and odour requirements of the Secretary's Environmental Assessment Requirements, SEAR# 1810, with respect to the proposed development:

- A quantitative assessment of the potential air quality, dust and odour impacts of the development, during both construction and operation, in accordance with relevant Environment Protection Authority guidelines. An AQIA in accordance with relevant Environment Protection Authority guidelines.
- A description and appraisal of air quality and odour impact mitigation and monitoring measures, in line with international best practice.

1.1 Objectives

The purpose of this assessment is to document the process, objectives and outcomes of the AQIA to support the Development Application (DA) for the proposed development.

This AQIA report provides the following details:

- the existing environment;
- the land zoning of the Site and neighbouring area;
- the closest existing residential and industrial receivers;
- relevant air quality criteria;
- meteorology;
- construction and operational air quality predictions for the tyre recycling facility and assumption used in the assessment; and
- recommendations to minimise the air quality impact on the affected receivers, if required.

This AQIA has been completed with reference to relevant guidelines and policies, namely:

- Environmental Protection Authority (EPA) guideline entitled "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (NSW EPA, 2022);
- Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) "Guidance on the Assessment of Dust from Demolition and Construction" (EPUK & IAQM, 2024);
- Climate Averages Australia, Bureau of Meteorology (BOM, 2023);
- Protection of the Environment Operations Act 1997 No 156 (NSW Parliament, 2023);
- Technical Notes - Assessment and management of odour from stationary sources in NSW (NSW EPA, 2006); and
- SEARs Scoping Report prepared by Jackson Environment and Planning Pty Ltd.

2 PROJECT DESCRIPTION

2.1 Site Location, Surrounding Land Use and Sensitive Receptors

The site is located at 9 Burlington Place, Rutherford, NSW 2320 (Lot 3005 DP 1040568) within an industrial area of Maitland Local Environmental Plan 2011 as shown in Figure 2-1.

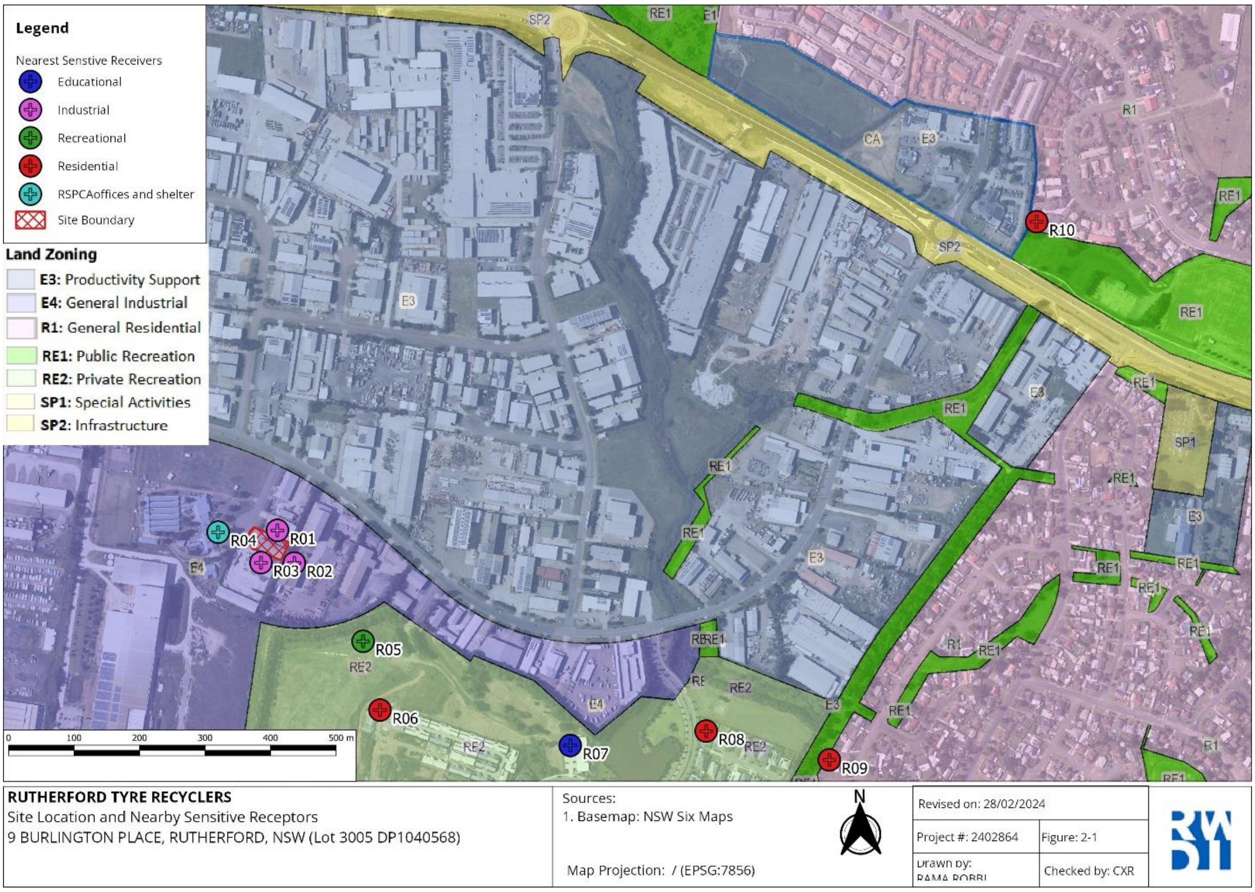

Figure 2-1: Site Location, Surrounding Land Use and Sensitive Receptors

The Site has one existing shed, an open awning, a concrete sealed hardstand and some landscaping located at the front and back of the site. The Site is surrounded by the following receivers:

- Industry developments to the northeast, east and south;
- RSPCA offices and shelter to the west;
- Gulf Recreational area approximately 180 m to the southeast;
- Oak Tree Retirement Village (Residential) approximately 250 m to the southeast;
- Day care centre approximately 500 m to the southeast; and
- R1 Residential Zone approximately 875 m to the southeast and 1200 m to the northeast.

The locations of all nearby sensitive receptors are listed in Table 2-1 and shown in Figure 2-1.

Table 2-1: Representative Sensitive Receptors

Receptor	Address	Receiver Type	Distance to Site (m)	UTM Coordinates (Zone 56 H)	
				X (m E)	Y (m S)
R01	7 Burlington Place, Rutherford, NSW	Industrial	50 m	359,983	6,379,377
R02	149 Racecourse Road, Rutherford, NSW	Industrial	50 m	360,013	6,379,267
R03	11 Burlington Place, Rutherford, NSW	Industrial	50 m	359,927	6,379,260
R04	6 Burlington Place, Rutherford, NSW	RSPCA offices and shelter	50 m	359,871	6,379,334
R05	91 Grand Parade, Rutherford, NSW	Recreational	180 m	360,092	6,379,167
R06	3 Discovery Way, Rutherford, NSW	Residential	270 m	360,118	6,379,062
R07	125 Grand parade, Rutherford, NSW	Educational	500 m	360,408	6,379,008
R08	30 Midfield Close, Rutherford, NSW	Residential	700 m	360,616	6,379,030
R09	3 Kenvil Close, Rutherford, NSW	Residential	875 m	360,804	6,378,986
R10	8 Justine Parade, Rutherford, NSW	Residential	1,240 m	361,120	6,379,808

2.2 Proposed Development

The proposed development includes the following elements:

- Fit-out of the existing shed with plant and equipment for tyre recycling.
- The tyre recycling process consists of shredding and granulation of waste tyres.
- Thermomoulding process will be used to produce rubber matting and rubber pavers on the premises from the crumb rubber.
- The recovered products from waste tyre are crumb rubber, steel and cotton.
- Alterations to existing building: enclosing of existing awning, removal of dividing wall and installation of two roller doors.

The proposed operational hours of the Site are 5am to 6pm Monday to Friday and 8am to 1pm on Saturdays. There are no proposed operations on Sundays or public holidays.

The proposed site layout and the elevation view of the building are presented in Figure 2-2 and Figure 2-3.

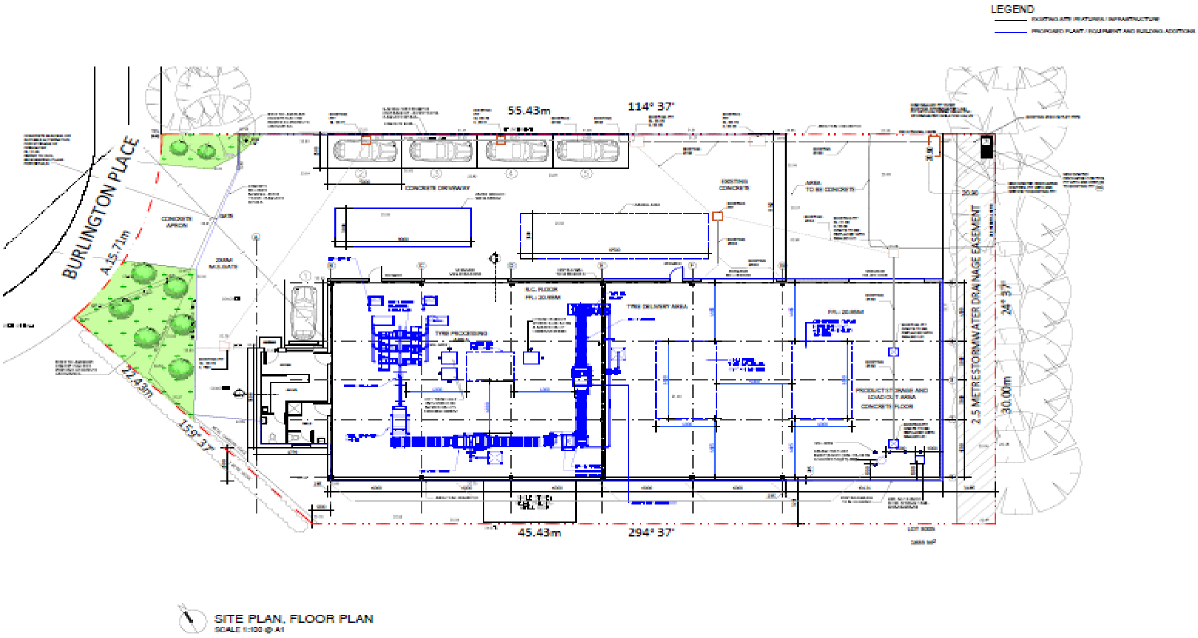

Figure 2-2: Proposed Site Concept Layout Plan

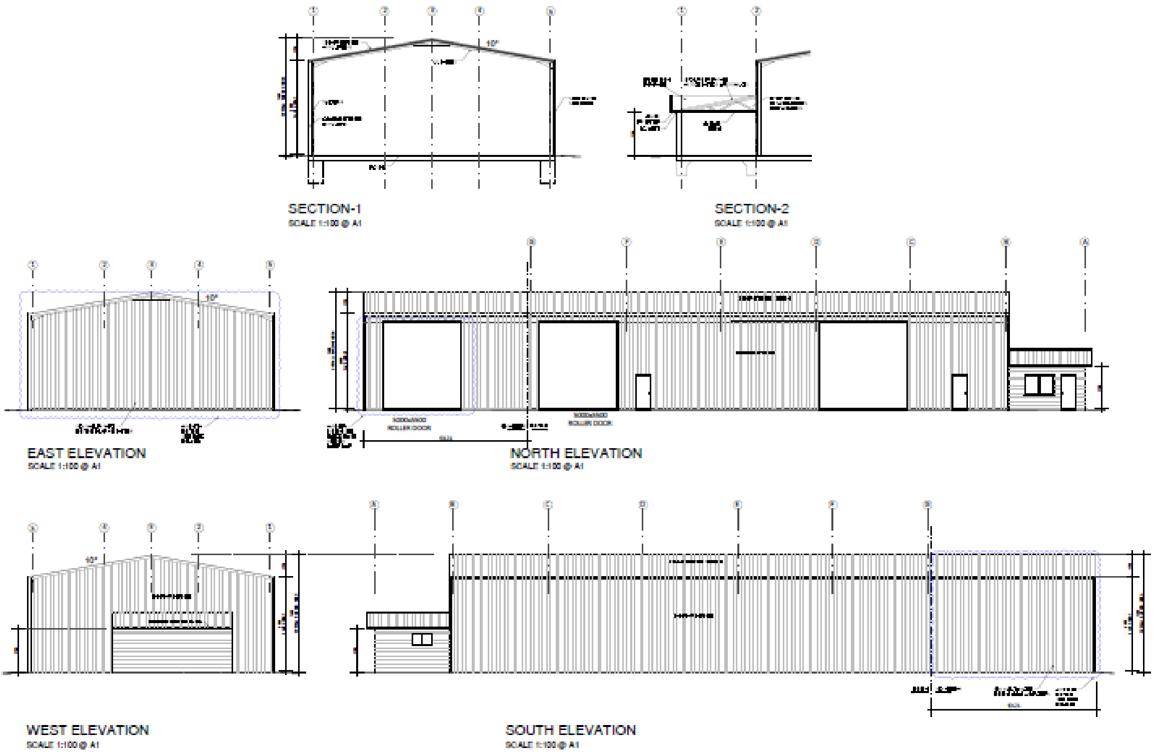

Figure 2-3: Elevation View of the Building

2.2.1 Waste Inputs and Processing

The Site would receive and process up to 4,500 tonnes of tyres per annum. The tyre recycling process consists of shredding and granulation of waste tyres. A thermal moulding process would be used to produce rubber matting and rubber pavers on the premises from the crumb rubber.

Waste tyres would primarily be brought to site from Tyres & More, a tyre retailing and fitting business located at 14 Racecourse Road, Rutherford, NSW (operated by Rutherford Tyre Recyclers). No other forms of waste would be brought to the Site. The tyres would be stored in the tyre storage space located at the eastern side of the shed, with a maximum capacity of 30 m^2. The expected output from the tyre recycling process would be 92% crumb rubber, 6% steel and 2% cotton. The following output materials from tyre processing would be stored on Site:

- crumb rubber;
- recovered steel;
- cotton;
- rubber pavers; and
- rubber matting material.

2.2.2 Proposed Operational Activities

The following operational activities are proposed:

- Medium rigid vehicles (MRV) would enter the Site from Burlington Place via the access drive. The waste tyres would be offloaded outside the building and brought into the shed to be placed in the tyre storage area towards the eastern side of the shed.
- The waste tyre recycling production line would encompass the following process steps to produce tyre crumb:
    - Tyre De-Beader –removes bead wires from inside the tyre's sidewalls.
    - Tyre Strip Cutter –cuts the tyre into long rubber stip.
    - Whole Tyre Shredder –produces 60 x 60 mm crumb rubbers, includes input and output conveyor belts.
    - Double Roller Rubber Breaker –crushes the rubber blocks into mesh rubber powder.
    - Vibration Screen –separates different sized pieces of crumb rubber.
    - Magnetic Separator –separates small steel wires from the mixed rubber granules.
    - Fiber Separator –separates the fibre and fluff from the crumb rubber.
    - The final product from the tyre recycling production line will be a pure crumb rubbers.
- The rubber tiles production line would encompass the following process steps to convert crumb rubber into rubber matting and rubber pavers:
    - Rubber Mixer –involves mixing the crumb rubber with glue.
    - Barrel Mixer –creates top part of the rubber tile with crumb rubber, pigment, and glue.
    - Vulcanizing Machine –creates vulcanized rubber tiles by compressing the rubber into dense, ultra-durable, non-porous rubber tiles.
    - Rubber Tile Molds –creates rubber tile moulds of various size.
- The MRVs will leave the site with recycled material produced on the Site.

The waste tyre recycling production line flow diagram and equipment is shown in the Figure 2-4 below.

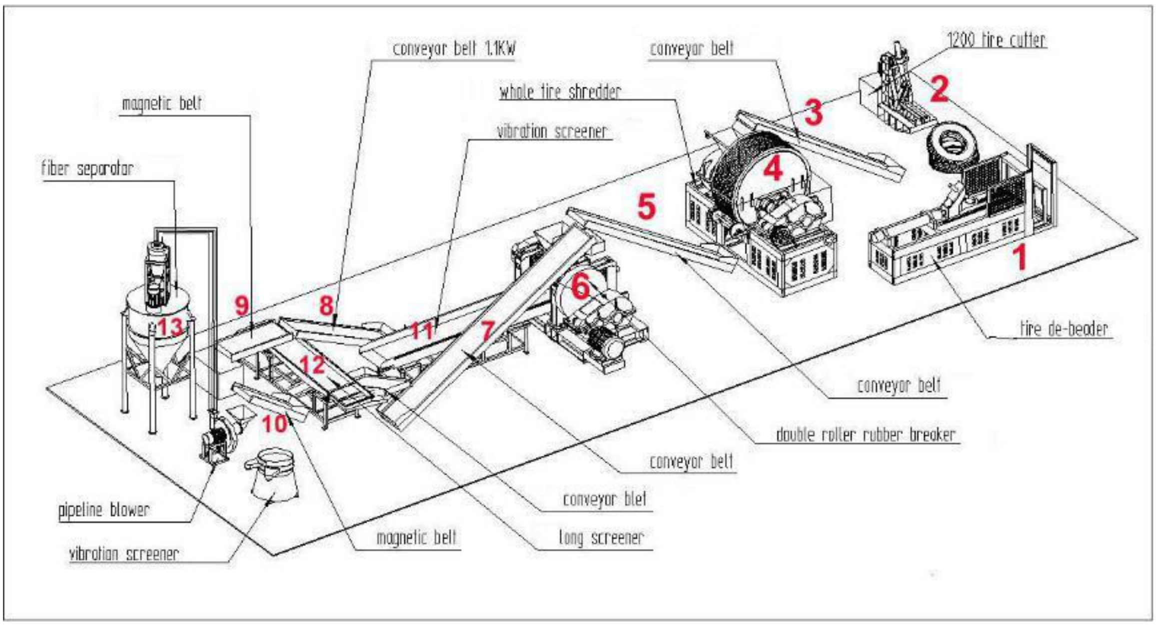

Figure 2-4: Waste Tyre Recycling Production Line Flow Diagram and Equipment

All Equipment would be located inside a building.

A 9 m portable above ground weighbridge would be located near the Site entrance. A 12.5 m loading area is proposed to be located outside between the front and middle roller door. Tyres would be offloaded outside and brought into the shed to be placed in the whole tyre storage area towards the eastern side of the shed. The MRV would arrive with whole used tyres and leave the Site with the recycled material produced on site which would include crumb rubber, cotton, steel and rubber pavers/mats. Any residual waste would be sent to an appropriate recycling or landfill facility.

The proposed development has the potential to cause dust impacts on the surrounding sensitive receptors. During the rubber tile production process, emissions of volatile organic compounds (VOCs) such as Carbon Disulfide, Cumene. Methyl Ethyl Ketone, Methyl Isobutyl Ketone, Phenol, Styrene, Toluene and Xylene that have the potential to cause odour impacts.

3 AIR QUALITY CRITERIA

3.1 Introduction

The NSW EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (the Approved Methods - 2022) provides applicable impact assessment criteria for a number of air pollutants. Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to ambient air quality. The sections below identify the pollutants of interest in this study and the applicable impact assessment criteria.

3.2 Pollutants of Interest

Dust, odour and particulate matter (PM) are the major air pollutants associated with the proposed development. Specifically, the following pollutants are identified:

- Dust, specifically:
    - Total suspended particulates (TSP)
    - Fine and coarse PM ($PM_{2.5}$ and PM_{10})
    - Deposited dust
- Odour, specifically below odorous VOCs:
    - Carbon Disulfide
    - Cumene
    - Methyl Ethyl Ketone
    - Methyl Isobutyl Ketone
    - Phenol
    - Styrene
    - Toluene
    - Xylene

3.3 Impact Assessment Criteria

The EPA's Approved Methods (NSW EPA, 2022) specify air quality assessment criteria for assessing impacts from dust and odour generating activities. These criteria are consistent with the National Environment Protection Measures for Ambient Air Quality (NEPC, 2021).

Table 3-1 summarises the air quality goals for dust and PM that are relevant to this study. The air quality goals relate to the total concentration of dust or PM in the air, caused not only from the Proposal. Therefore, some consideration of background levels needs to be made when using these goals to assess impacts.

Table 3-2 summarises the air quality goals for the VOCs relevant to this assessment, which are taken from NSW EPA (2022) and consistent with Victorian Government Gazette (VGG, 2001).

Table 3-1: Dust Impact Assessment Criteria

Pollutant	Averaging Period	Impact [1]	Criteria
Particulate Matter ≤ 2.5 µm ($PM_{2.5}$)	24-hours	Total	25 µg/m³
	Annual	Total	8 µg/m³
Particulate Matter ≤ 10 µm (PM_{10})	24-hours	Total	50 µg/m³
	Annual	Total	25 µg/m³
Total Suspended Particulates (TSP)	Annual	Total	90 µg/m³
Deposited Dust	Annual	Incremental	2 g/m²/month
	Annual	Total	4 g/m²/month

Note: (1) For air quality criteria related to the total impact, project contributions and background levels need to be considered. Incremental impacts are from project only.

Table 3-2: Impact Assessment Criteria – individual odorous pollutants

VOCs	Hourly Impact Assessment Criteria (mg/m³)	Hourly Impact Assessment Criteria (ppm)
Carbon Disulfide	0.07	0.023
Cumene	0.021	0.004
Methyl Ethyl Ketone	3.2	1.1
Methyl Isobutyl Ketone	0.23	0.05
Phenol	0.020	0.0052
Styrene	0.12	0.027
Toluene	0.36	0.09
Xylenes	0.19	0.04

4 EXISTING ENVIRONMENT

4.1 Local Meteorology

Meteorological conditions strongly influence air quality. Most significantly, wind speed, wind direction, temperature, relative humidity and rainfall affect the dispersion of air pollutants and are key inputs into dispersion models. The following subsections discuss the local meteorology near the Proposal Site and identify a representative set of meteorological data for use in the dispersion modelling to be undertaken for this assessment.

4.1.1 Long-Term Climate

Long-term meteorological data for the area surrounding the Site is available from the Bureau of Meteorology (BoM) operated Automatic Weather Station (AWS) at the Williamtown RAAF. The Williamtown RAAF is located approximately 30 km south-east of the Site and records observations of meteorological data including wind speed, wind direction, temperature, humidity and rainfall.

Long-term climate statistics are presented in Table 4-1. Temperature data recorded at the Williamtown RAAF indicates that January is the hottest month of the year, with a mean daily maximum temperature of 28.3°C. July is the coolest month with a mean daily minimum temperature of 6.5°C. March is the wettest month with an average rainfall of 128 mm falling over 8 days. There are, on an average, 86 rain days per year, delivering 1125 mm of rain.

Table 4-1: Long-term Climate Averages, Williamtown RAAF

Obs.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
9 am Mean Observations													
Temp (°C)	23.0	22.5	21.2	18.2	14.3	11.6	10.5	12.2	15.7	18.8	20.5	22.2	17.6
Hum (%)	72	76	77	76	79	80	77	71	66	64	66	68	73
3 pm Mean Observations													
Temp (°C)	26.5	26.1	24.9	22.5	19.3	16.8	16.2	17.6	20.0	21.9	23.8	25.6	21.8
Hum (%)	59	62	61	59	60	60	55	50	50	54	55	56	57
Daily Minimum and Maximum Temperature													
Min (°C)	18.2	18.2	16.5	13.2	10.1	8.0	6.5	6.9	9.2	12.0	14.5	16.6	12.5
Max (°C)	28.3	27.7	26.4	23.7	20.4	17.7	17.2	18.8	21.5	23.8	25.6	27.4	23.2
Rainfall													
Rain (mm)	98.4	118.8	128.0	109.6	108.2	121.5	75.2	71.7	60.1	75.9	82.7	76.8	1124.7
Rain (days)	7.2	7.6	8.4	7.6	7.6	8.3	6.5	6.0	5.7	7.3	7.2	7.0	86.4

4.1.2 Wind

The dispersion of dust and odour emissions is primarily influenced by the following meteorological factors:

- wind speed and direction;
- wind profile and turbulence intensity (which are affected by terrain);
- temperature gradient which affects atmospheric stability and is determined from wind speed, cloud cover and solar radiation; and
- mixing height, which is the depth of the atmospheric boundary layer, where most of the dispersion occurs.

Wind speed and atmospheric stability are examined with respect to flow direction to investigate typical flow regimes and directions of poor dispersion.

The closest meteorological station to the proposed site is the Beresfield meteorological station, which is part of NSW Department of Planning, Industry and Environment (DPIE) Air Quality Monitoring Station (AQMS). The Beresfield AQMS is located at Francis Greenway High School, on Lawson Avenue, Beresfield in a residential area north-west of Newcastle. The Beresfield AQMS is approximately 17 km south-east of the proposed Site. Observations of wind speed and direction recorded at the Beresfield AQMS have been used to describe typical wind patterns in the area surrounding the Proposal Site and has been incorporated into the dispersion modelling for this assessment.

Figure 4-1 to Figure 4-6 show the annual and seasonal "wind rose" plots from Beresfield AQMS for the period from 2019 to 2023. As can be seen, winds from the west to north-west octants are most common in the annual wind roses. The 2023 wind roses are in good agreement with the multi-year average wind roses and have therefore been adopted for modelling purposes.

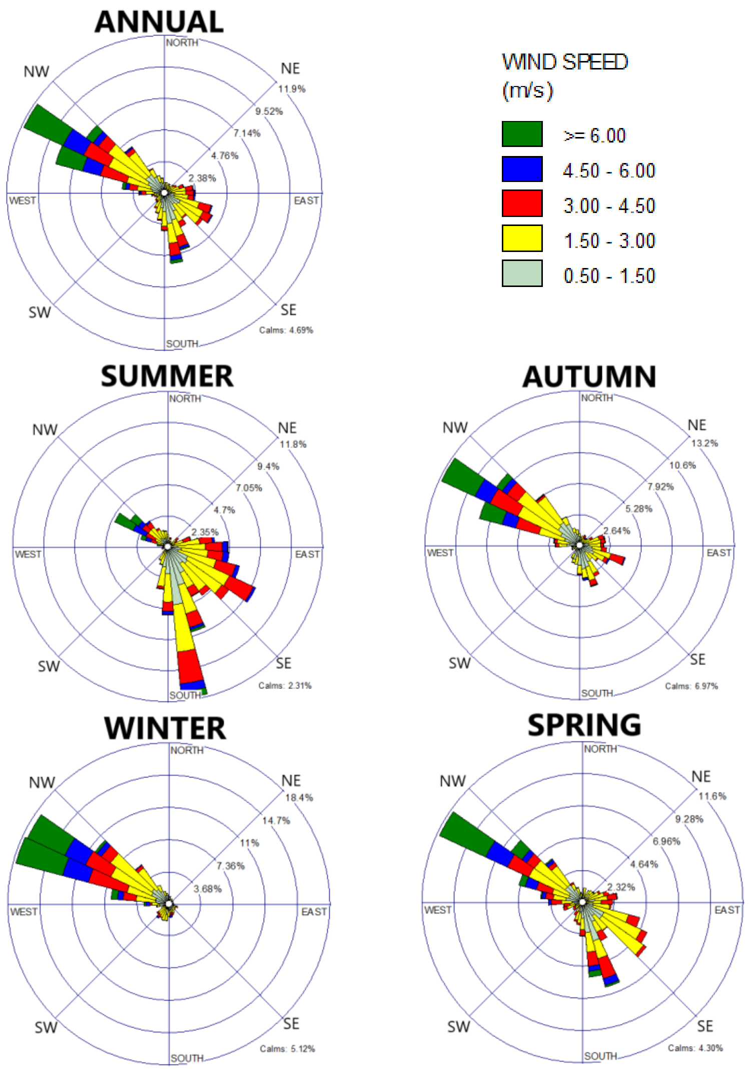

Figure 4-1: Beresfield AQMS Wind Roses, 2019

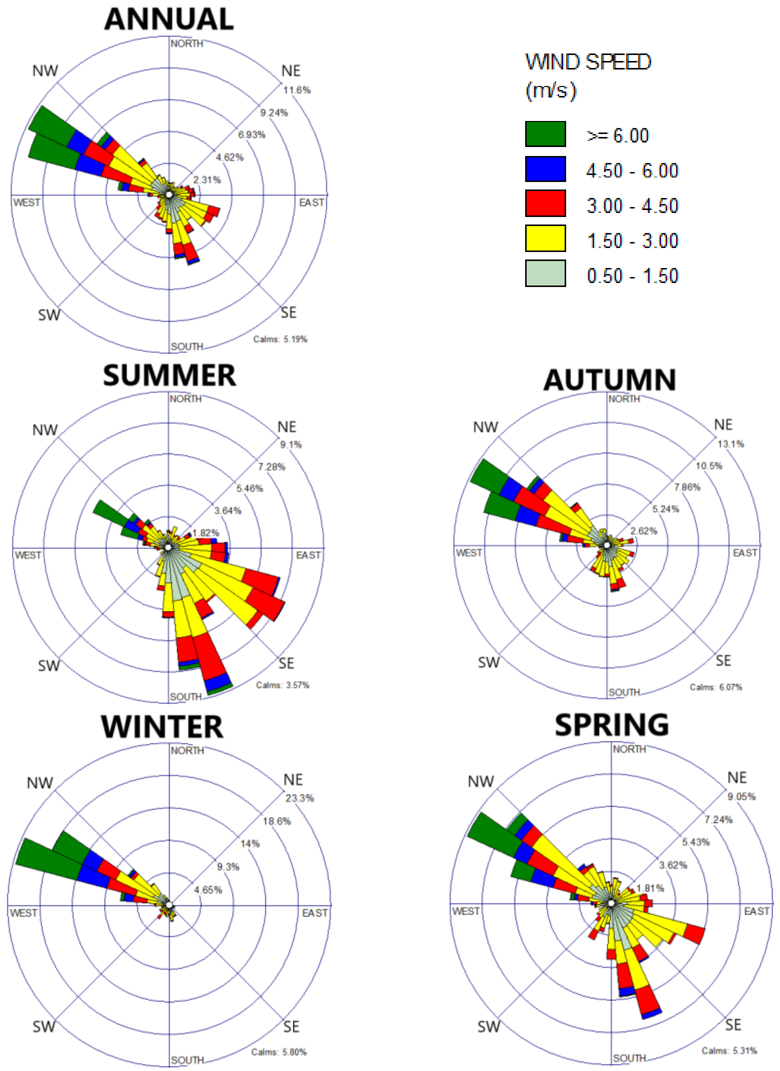

Figure 4-2: Beresfield AQMS Wind Roses, 2020

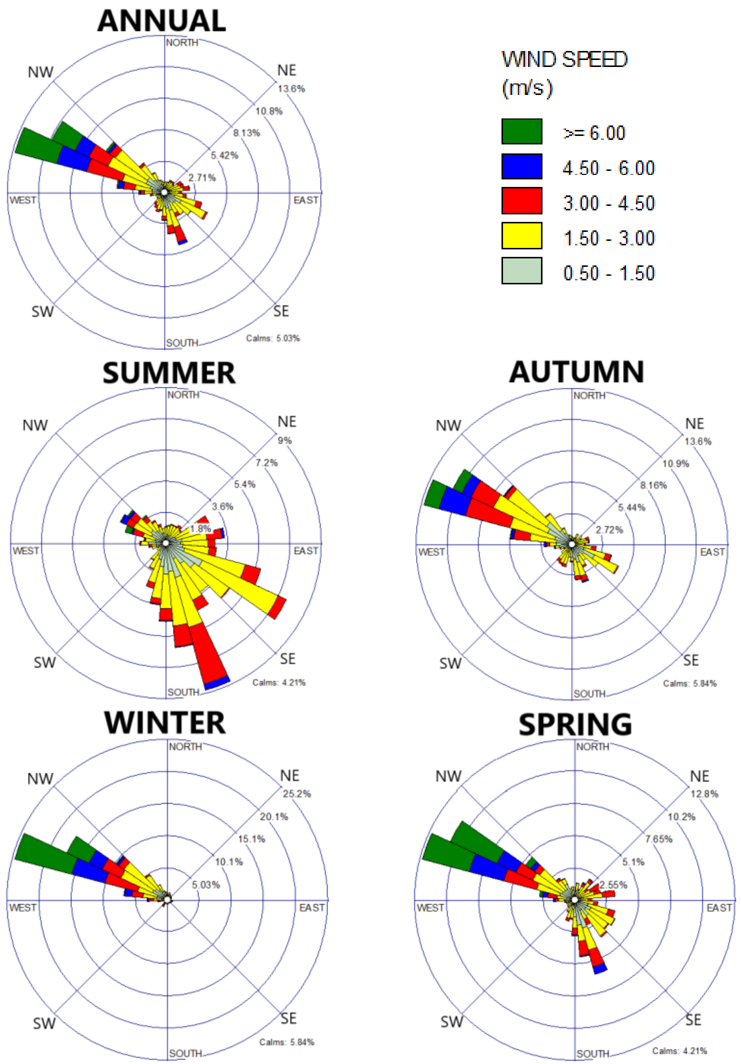

Figure 4-3: Beresfield AQMS Wind Roses, 2021

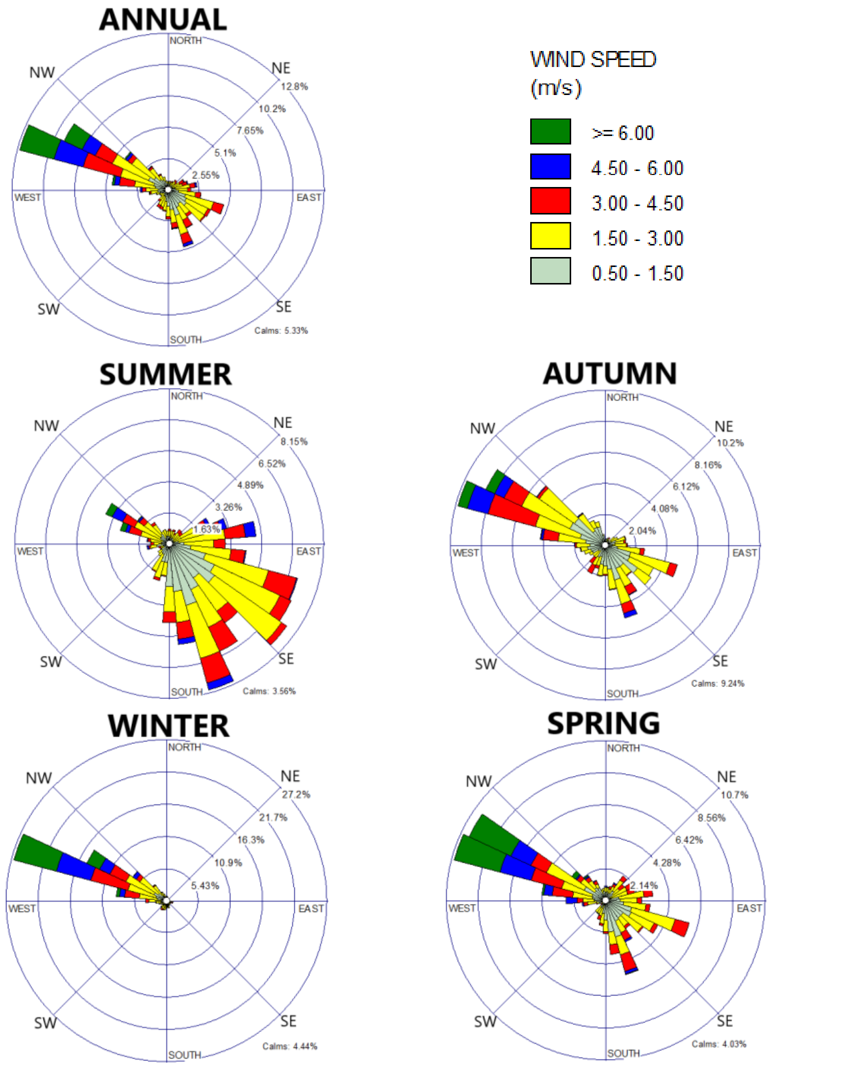

Figure 4-4: Beresfield AQMS Wind Roses, 2022

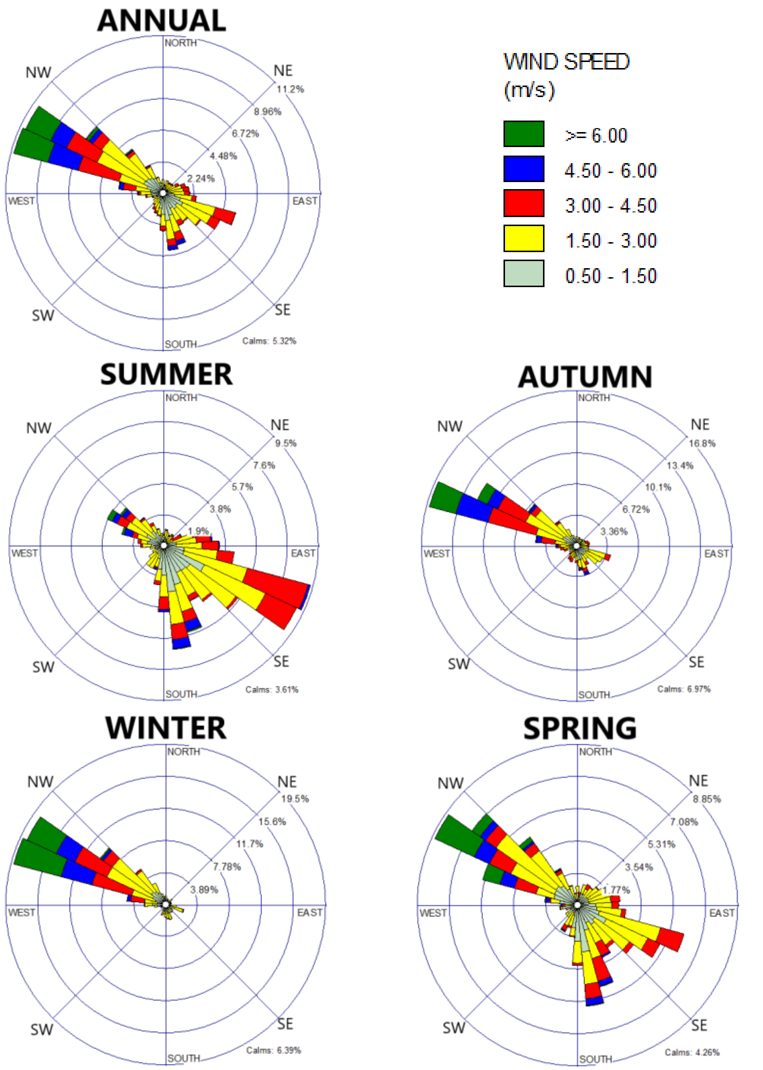

Figure 4-5: Beresfield AQMS Wind Roses, 2023

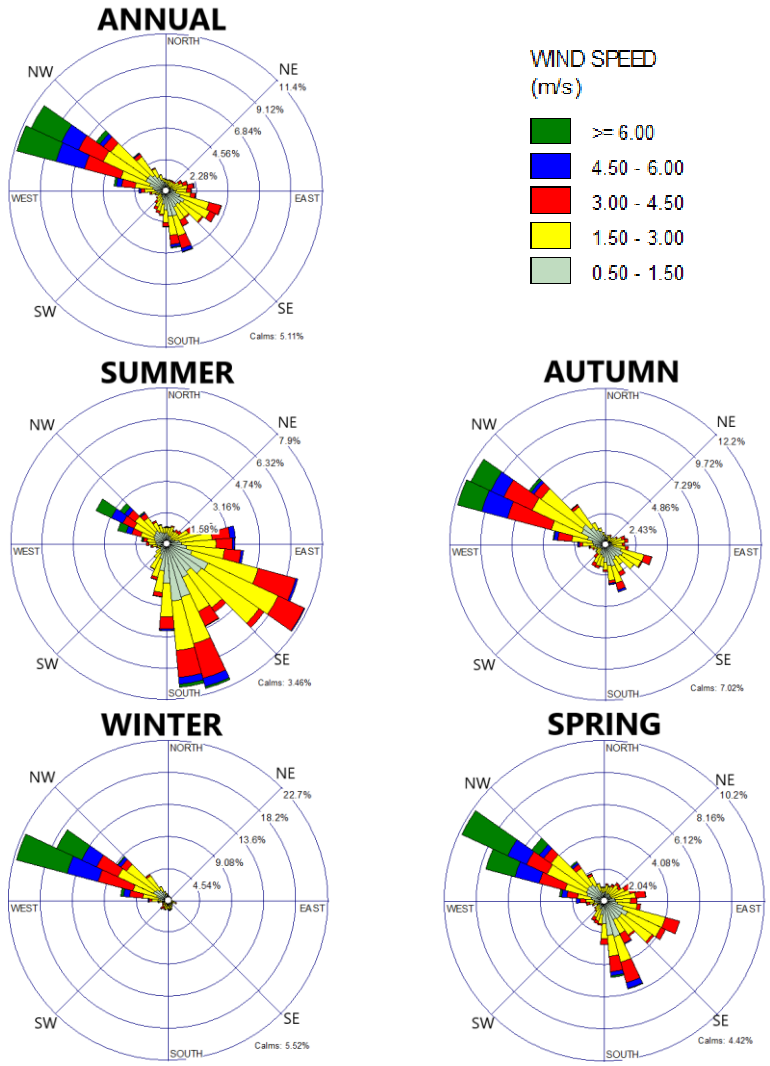

Figure 4-6: Beresfield AQMS Wind Roses, 2019 - 2023

4.1.3 Local Ambient Air Quality

No site-specific data are available to determine the existing concentrations of air pollutants at sensitive receptors near the proposed development. Data on existing background pollution concentrations were obtained from the NSW Department of Planning and Environment (DPE) air quality monitoring network. The DPE operates a network of AQMS across NSW. The nearest AQMS measuring the selected pollutants is located at Beresfield approximately 17 km south-east of the proposed development.

A summary of the ambient air quality monitoring data collected for year 2023 at Beresfield AQMS is presented in Table 4-2. Note that Total Suspended Particulates (TSP) and deposited dust are not monitored at the station. Instead, annual average background TSP concentrations were estimated from a relationship with measured PM_{10} concentrations. This relationship assumes that 40% of the TSP is PM_{10} and was established as part of a review of ambient monitoring data collected by co-located TSP and PM_{10} monitors operated for reasonably long periods of time in the Hunter Valley (NSW Minerals Council, 2000).

To estimate annual average dust deposition levels, a similar process to the method used to estimate TSP concentrations is applied. This approach assumes that a TSP concentration of 90 µg/m^3 will have an equivalent dust deposition value of 4 g/m^2/month; and indicates a background annual average dust deposition of 1.98 g/m^2/month for the area surrounding the proposed development.

Table 4-2: Ambient air quality monitoring concentrations used in the AQ Assessment

Pollutant	Averaging Period	Concentration	Impact Criteria	Ambient Air Quality Concentration as % of Criteria
Particulate matter ≤2.5 µm ($PM_{2.5}$)	24-hours[1]	16.7 µg/m^3	25 µg/m^3	67%
	Annual[2]	6.9 µg/m^3	8 µg/m^3	86%
Particulate matter ≤10 µm (PM_{10})	24-hours[1]	41.0 µg/m^3	50 µg/m^3	82%
	Annual[2]	17.8 µg/m^3	25 µg/m^3	71%
Total suspended particulates (TSP)	Annual[3]	44.6 µg/m^3	90 µg/m^3	50%
Deposited Dust	Annual[4]	1.98 g/m^2/month	4 g/m^2/month	50%

Note
1. Maximum of 24-hour data over the year
2. Average of 1-hour data over the year
3. Calculated assuming 40% of the TSP is PM10
4. Calculated assuming 90 µg/m3 will have an equivalent dust deposition value of 4 g/m2/month

As seen in Table 4-2, the ambient concentrations of all the pollutants are well below the criteria.

5 POTENTIAL SOURCES OF AIR EMISSIONS

Air emissions are likely during construction and operation of the proposed development. The most likely air quality sources for construction and operation are summarised in the following sections.

5.1 Construction Phase

The proposed Site contains an existing shed that will be used to house the tyre recycling production line. This existing shed contains an industrial area, office area and staff amenities area. Currently, this shed is being used for storage with a proposed change of use to become a tyre recycling facility. The existing shed will require minimal alterations as part of the proposed development. The industrial shed has an open awning towards the back. This will be enclosed, the dividing wall removed and two roller doors installed to create a larger fully enclosed industrial shed on site.

Since minimal construction works are proposed, minor dust emissions (non-significant quantities) are expected from all construction stages.

5.2 Operational Phase

The following sources of dust/particulate emissions associated with the operation of the proposed development were identified:

- Loading/unloading of material;
- Tyre recycling process emissions;
- Truck movements on paved roads;
- Rubber tyre production emissions; and
- Diesel exhaust from mobile plant.

No material handling, processing or stockpiling would occur outside the building. Therefore, windblown dust emissions would be negligible. A control factor of 70% has been applied to all sources located inside the building.

Odour sources associated with the operation of the proposed development are individual odorous VOC emissions during the rubber tile production process.

The estimated dust and odorous VOCs emissions associated with the operation of the Proposal are presented in Table 5-1 and Table 5-2, respectively. A detailed emissions inventory is provided in Appendix A.

Table 5-1: Estimated Operational Dust Emissions

Source ID	Activity	Total Emissions (kg/year)			Base Emission Rate (g/s)		
		TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
TDA1 - Volume Source	Raw Material Dumped to Stockpile	0.6	0.3	0.0	4.78E-05	2.26E-05	3.43E-06
	Load Material into Tyre de-beader	0.6	0.3	0.0	4.78E-05	2.26E-05	3.43E-06
	MRV Truck Idling - Loading Area	1.4	1.4	1.3	1.11E-04	1.11E-04	1.02E-04
TRP1 - Volume Source	Single hook de-beader	1.3	0.6	0.3	1.05E-04	4.61E-05	2.26E-05
	Tyre Strip Cutter	1.3	0.6	0.3	1.05E-04	4.61E-05	2.26E-05
UNLD1 - Volume Source	Whole Tire Shredder	1.3	0.6	0.3	1.05E-04	4.61E-05	2.26E-05
	Double Roller Rubber Breaker (Crusher)	1.3	0.6	0.3	1.05E-04	4.61E-05	2.26E-05
	Vibration Screen	1.3	0.6	0.3	1.05E-04	4.61E-05	2.26E-05
SLINE1 - Line Volume Source	Magnetic Separator	1.3	0.6	0.3	1.05E-04	4.61E-05	2.26E-05
	Fiber Separator	1.3	0.6	0.3	1.05E-04	4.61E-05	2.26E-05
RTP1 - Volume Source	Rubber Mixer	433.4	190.7	93.4	3.37E-02	1.48E-02	7.27E-03
	Barrel Mixer	433.4	190.7	93.4	3.37E-02	1.48E-02	7.27E-03

Table 5-2: Estimated Operational Odorous VOC Emissions

Source ID / Activity	Individual Odorous VOC Emissions	Total Emissions (kg/year)	Base Emission Rate (g/s)
RTP1 – Volume Source Vulcanizing machine and Rubber Tile Molds	Carbon Disulfide	6.2	4.83E-04
	Cumene	0.3	2.14E-05
	Methyl Ethyl Ketone	0.7	5.64E-05
	Methyl Isobutyl Ketone	17.0	1.32E-03
	Phenol	0.5	4.07E-05
	Styrene	0.6	4.95E-05
	Toluene	9.3	7.25E-04
	Xylene	21.1	1.64E-03

6 CONSTRUCTION DUST ASSESSMENT

6.1 Methodology

A qualitative assessment method of dust impacts associated with the construction of the proposed development is considered appropriate for this project. The assessment follows the "Guidance on the Assessment of Dust from Demolition and Construction" published by the Institute of Air Quality Management in the United Kingdom (IAQM 2014).

This approach has been widely used for performing qualitative assessments of dust emissions from construction sites and has been used in NSW by RWDI and other consultants. Furthermore, it has been accepted as a suitable approach in the absence of any guidance by Australian regulatory authorities.

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

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

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

6.2 Assessment of Construction Dust Impacts

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

6.2.1 Step 1 – Screen the Need for a Detailed Assessment

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

- 250 m of the boundary of the site; or,
- 50 m of the route(s) used by construction vehicles on public roads up to 250 m from the site entrance(s).

As some of the nearby sensitive receptors identified in Table 2-1 and shown in Figure 2-1, are located within 250 m of the proposed site and therefore, an assessment of dust impacts is considered necessary under the guideline.

6.2.2 Step 2A – Potential Dust Emission Magnitude

In accordance with the IAQM guidance (Section 7, Step 2: Assess the Risk of Dust Impacts), the dust emission magnitude for the construction activities at the Site are rated as:

- Small for demolition works;
- Small for earthworks;
- Small for construction; and
- Small for trackout.

6.2.3 Step 2B – Sensitivity of Surrounding Area

The sensitivity of the surrounding area to dust impacts considers the following factors:

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

In accordance with the IAQM guideline, the following receptor sensitivities have been determined:

- **Low** sensitivity to dust soiling; and
- **Low** sensitivity to human health.

6.2.4 Step 2C – Define the Risk of Impacts

To define the risk of impacts, the dust emission magnitude ("small" for this site) is combined with the sensitivity of the area for demolition, earthworks, construction and trackout, respectively. In accordance with the IAQM guideline, the following risks have been determined:

- Demolition works - **Negligible** risk for both dust soiling and human health;
- Earthwork Activities - **Negligible** risk for both dust soiling and human health;
- Construction Activities - **Negligible** risk for both dust soiling and human health; and
- Haulage/Trackout activities - **Negligible** risk for both dust soiling and human health.

The above risks assume that dust mitigation measures are not implemented.

6.2.5 Step 3 – Site-Specific Mitigation

The IAQM guidance document identifies a range of appropriate dust mitigation measures that should be implemented as a function of the risk of impacts. These measures are presented in Section 8.1.

6.2.6 Step 4 – Significance of Residual Impacts

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

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

Based on the proposed works and the advice in the IAQM guidance document, it is considered unlikely that these works would result in unacceptable air quality impacts, subject to the implementation of the mitigation measures outlined in Section 8.1 below.

7 OPERATIONAL DUST AND ODOUR ASSESSMENT

The approach taken for the operational dust and odour assessment is as follows:

1. Determine meteorological information (section 7.1).
2. Estimate annual dust and odorous VOC emissions of each activity associated with worst-case operations of proposed development (section 5.2 above).
3. Provide emissions and meteorological information to a computer-based dispersion model to predict dust and VOC concentrations in the region and at nearby sensitive receptors for the above scenarios (section 7.2).
4. Compare predicted concentrations to relevant air quality criteria (sections 7.3 and 7.4).

7.1 Meteorological Modelling

7.1.1 TAPM

No meteorological observation data is available for the Proposal Site. Therefore, site-specific meteorological data was generated using a prognostic model, The Air Pollution Model (TAPM), developed and distributed by the Commonwealth Scientific and industrial Research Organisation (CSIRO).

TAPM is an incompressible, non-hydrostatic, primitive equations prognostic model with a terrain-following vertical coordinate for three-dimensional simulations. It predicts the flows important to local scale air pollution, such as sea breezes and terrain induced flows, against a background of large-scale meteorology provided by synoptic analyses. TAPM benefits from having access to databases of terrain, vegetation and soil type, leaf area index, sea-surface temperature, and synoptic scale meteorological analyses for various regions around the world.

The prognostic modelling domain was centred at 32.72° S, 151.51° E and involved four nesting grids of 30 km, 10 km, 3 km, and 1 km with 41 grids in the lateral dimensions and 25 vertical levels.

The TAPM model included assimilation of wind data collected at the Beresfield AQMS during 2023.

7.1.2 AERMET

The TAPM results, including predictions of wind speed, wind direction, temperature, humidity, cloud cover, solar radiation and rainfall, were used as inputs to AERMET – AERMOD's meteorological pre-processor. AERMET uses the TAPM data, along with land-use data, to calculate mixing heights and velocity scaling parameters.

Figure 7-1 shows the annual and seasonal "wind rose" plots of the AERMET data. The AERMET wind rose plots reproduce the distribution of wind directions observed at the Beresfield AQMS (Figure 4-5 above) very well. Predicted wind speeds tend to be somewhat lower than observed. Overall, the meteorology data used in the model can be considered sufficiently representative of the Proposal Site.

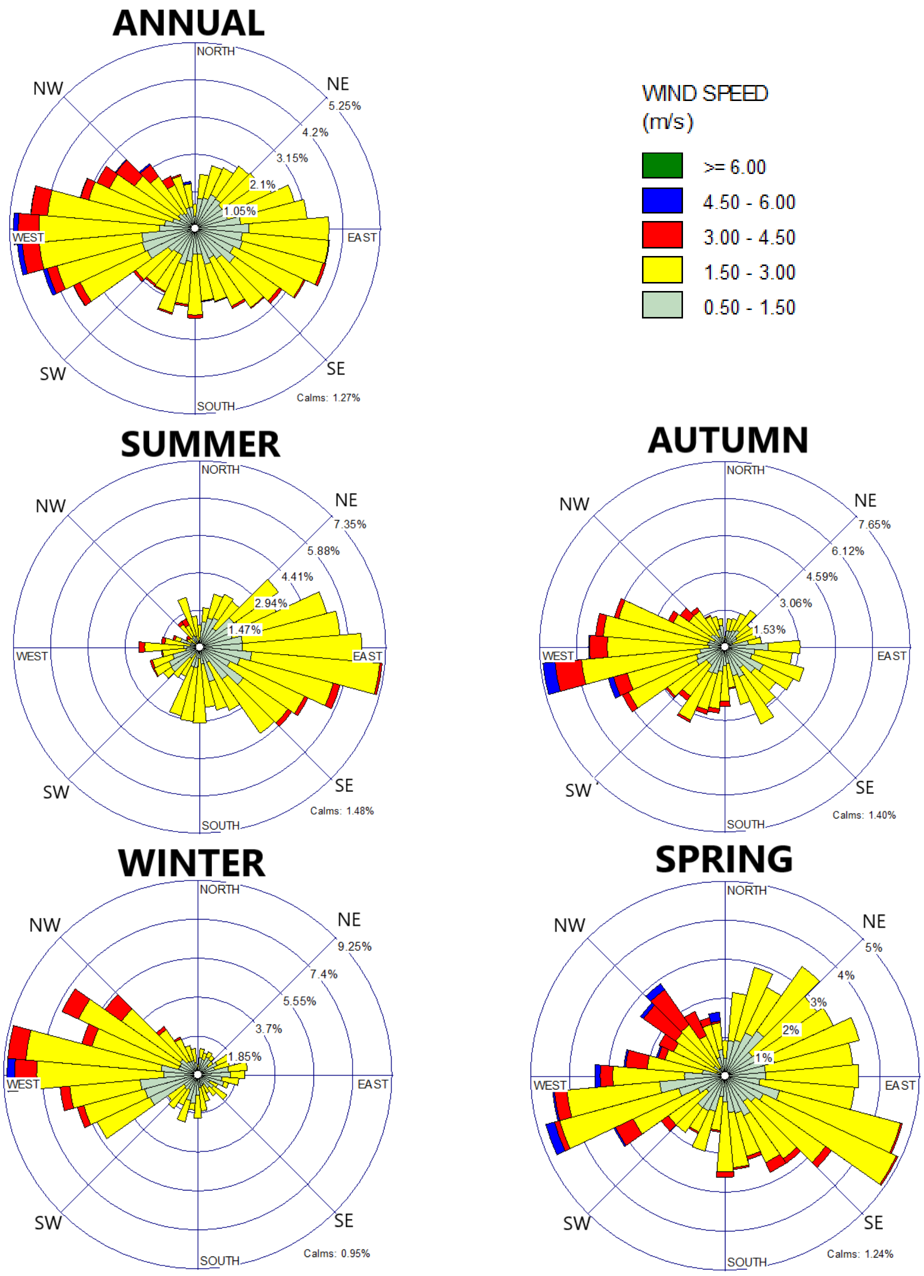

Figure 7-1: AERMET Wind Roses Based on TAPM Output, 2023

7.2 Dispersion Modelling

The dispersion model chosen for this assessment was AERMOD – the US EPA regulatory Gaussian plume air dispersion model. AERMOD is a steady state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts. It includes treatment of both surface and elevated sources and both simple and complex terrain. AERMOD is accepted by NSW EPA for use in air quality impact assessments.

7.3 Assessment of Operational Dust Impacts

This section presents the dispersion modelling results and discusses the likely off-site air quality impacts associated with the operation of the Proposal.

7.3.1 Fine Particulate Matter ($PM_{2.5}$)

Table 7-1 presents the summary of the incremental and cumulative 24-hour average and annual average $PM_{2.5}$ concentrations predicted at each surrounding sensitive receptor.

Table 7-1: Predicted Maximum 24-Hour and Annual Average $PM_{2.5}$ Concentrations at Sensitive Receptors

Receptor	24-hour Averaging Time (µg/m³)		Annual Averaging Time (µg/m³)	
	Incremental Impact	Cumulative Impact (Criterion: 25)	Incremental Impact	Cumulative Impact (Criterion: 8)
R01	3.51	21.42	0.72	7.57
R02	2.84	21.42	0.55	7.40
R03	4.63	21.42	1.12	7.97
R04	3.23	21.42	0.84	7.69
R05	0.65	21.42	0.10	6.95
R06	0.46	21.42	0.05	6.90
R07	0.17	21.42	0.02	6.87
R08	0.08	21.42	0.01	6.86
R09	0.06	21.42	0.01	6.86
R10	0.07	21.42	0.01	6.86

The results in Table 7-1 show that the Incremental and cumulative 24-hour average and annual average $PM_{2.5}$ concentrations predicted at each surrounding sensitive receptor caused by operational emissions are below the applicable criteria. The predicted air quality impacts near the surrounding locations are presented as contour plots of incremental 24-hour average $PM_{2.5}$ in Appendix B. The contour plots for annual average $PM_{2.5}$ concentrations are not shown as the incremental annual average concentrations are well below the criteria.

7.3.2 Coarse Particulate matter (PM_{10})

Table 7-2 presents the summary of the incremental and cumulative 24-hour average and annual average PM_{10} concentrations predicted at each surrounding sensitive receptor.

Table 7-2: Predicted Maximum 24-hour and Annual Average PM_{10} Concentrations at Sensitive Receptors

Receptor	24-hour Averaging Time (Criterion: 50 µg/m³)		Annual Averaging Time (Criterion: 25 µg/m³)	
	Incremental Impact (µg/m³)	Cumulative Impact (µg/m³)	Incremental Impact (µg/m³)	Cumulative Impact (µg/m³)
R01	7.15	42.63	1.47	19.24
R02	5.75	42.46	1.11	18.88
R03	9.43	43.48	2.27	20.04
R04	6.57	42.10	1.71	19.48
R05	1.33	41.55	0.21	17.98
R06	0.94	41.40	0.10	17.87
R07	0.35	41.03	0.04	17.81
R08	0.17	41.01	0.03	17.80
R09	0.12	41.01	0.02	17.79
R10	0.13	41.00	0.01	17.78

The results in Table 7-2 show that the Incremental and cumulative 24-hour average and annual average PM_{10} concentrations predicted at each surrounding sensitive receptor caused by operational emissions are below the applicable criteria. The predicted air quality impacts near the surrounding locations are presented as contour plots of incremental 24-hour average PM_{10} in Appendix B. The contour plots for annual average PM_{10} concentrations are not shown as the incremental annual average concentrations are well below the criteria.

7.3.3 TSP and Deposited Dust

Table 7-3 presents the summary of the incremental and cumulative annual average of TSP and Deposited Dust concentrations predicted at each surrounding sensitive receptor.

Table 7-3: Predicted Annual Average TSP Concentrations and Annual Averages of Total Monthly Dust Depositions at Sensitive Receptors

Receptor	TSP (µg/m³)		Deposited Dust (g/m²/month)	
	Incremental Impact	Cumulative Impact (Criterion: 90 µg/m³)	Incremental Impact (Criterion: 2 g/m²/month)	Cumulative Impact (Criterion: 4 g/m²/month)
R01	2.51	42.90	0.21	2.12
R02	1.87	42.26	0.16	2.09
R03	3.96	44.35	0.33	2.22
R04	2.94	43.33	0.25	2.15
R05	0.34	40.72	0.03	2.00
R06	0.16	40.54	0.01	1.99
R07	0.06	40.44	0.00	1.98
R08	0.04	40.42	0.00	1.98
R09	0.03	40.41	0.00	1.98
R10	0.02	40.40	0.00	1.98

The results in Table 7-3 show that the incremental and cumulative annual average TSP concentrations and dust depositions predicted at all surrounding sensitive receptors as a result of operational emissions are below the applicable criteria. The contour plots for annual average TSP concentrations are not shown as the incremental annual average concentrations are well below the criteria.

7.4 Assessment of Operational Odorous VOC Impacts

The maximum VOC impacts of Carbon Disulfide, Cumene. Methyl Ethyl Ketone, Methyl Isobutyl Ketone, Phenol, Styrene, Toluene and Xylene at the nearest sensitive receptors are shown in Table 7-4.

The 1-hour maximum concentrations are found to be two or more orders of magnitude below the most stringent NSW EPA individual odorous impact assessment guideline criteria. The result indicates that the VOC impacts from the proposed operation would unlikely be noticeable to most nearby recreational and residential receptors. The worst-case 1-hour odour (VOC) contour plots are shown in Appendix C.

Table 7-4: Predicted 1-hour Average Concentrations at Sensitive Receptors

Receptor	1-Hour Maximum Concentration (µg/m³)							
	Carbon Disulfide (Criteria: 70 µg/m³)	Cumene (Criteria: 21 µg/m³)	Methyl Ethyl Ketone (Criteria: 3200 µg/m³)	Methyl Isobutyl Ketone (Criteria: 230 µg/m³)	Phenol (Criteria: 20 µg/m³)	Styrene (Criteria: 120 µg/m³)	Toluene (Criteria: 360 µg/m³)	Xylene (Criteria: 190 µg/m³)
R01	0.65	0.03	0.08	1.76	0.05	0.07	0.97	2.19
R02	0.50	0.02	0.06	1.36	0.04	0.05	0.75	1.69
R03	1.00	0.04	0.12	2.73	0.08	0.10	1.50	3.39
R04	0.76	0.03	0.09	2.07	0.06	0.08	1.14	2.58
R05	0.14	0.01	0.02	0.38	0.01	0.01	0.21	0.47
R06	0.08	0.00	0.01	0.23	0.01	0.01	0.13	0.28
R07	0.04	0.00	0.00	0.10	0.00	0.00	0.05	0.12
R08	0.02	0.00	0.00	0.07	0.00	0.00	0.04	0.08
R09	0.02	0.00	0.00	0.05	0.00	0.00	0.03	0.06
R10	0.01	0.00	0.00	0.03	0.00	0.00	0.02	0.04

8 RECOMMENDED MITIGATION AND MANAGEMENT

8.1 Construction Dust Mitigation Measures

The assessment of potential dust impacts from the proposed construction works indicate that the proposed project would have a negligible risk of dust soiling and human health impacts from all activities (demolition, earthworks, construction and track-out) if dust mitigation measures were not implemented.

To ensure best practice management, the following mitigation measures are recommended to minimize construction dust impacts.

- **Site Management:**
  - Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner and record the measures taken.
  - Make the complaints log available to relevant authorities (Council, EPA, etc).
- **Measures for General Construction Activities:**
  - Ensure an adequate water supply on the Site for effective dust/PM suppression/mitigation, using non-potable water where possible and appropriate.
  - Ensure equipment is readily available on Site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

8.2 Operational Mitigation Measures

Although predicted air quality impacts from operational activities do not indicate that mitigation measures are required, it would be sensible to follow the below best management practices:

- Proper management, supervision and training for process operations;
- Proper use of equipment;
- Effective preventative maintenance on all plant and equipment concerned with the control of emissions to air;
- Ensuring that spares and consumables are held on site so that plant breakdowns can be rectified rapidly;
- Avoiding unnecessary idling of truck engines on-site;
- Ensuring truck maintenance is up to date;
- Paving of all operating, storage, unloading and loading areas; and
- Sealing roads if dust is considered likely to be an issue.

Although impacts on receptors would be unlikely, it is recommended to keep records of any dust and odour complaints from neighbouring receptors and the responses to these complaints. Responses should be prompt and responsive to the complaints.

9 CONCLUSION AND RECOMMENDATIONS

RWDI was engaged by Jackson Environment and Planning Pty Ltd to conduct an AQIA to accompany EIS and DA for the proposed development of a tyre recycling facility within an existing shed building located at 9 Burlington Place, Rutherford, NSW 2320 (Lot 3005 DP 1040568). The proposed facility would process up to 4,500 tonnes per annum of tyres and be characterised as a resource recovery facility.

The assessment concludes:

- The construction phases would be adequately managed so that the short-term and temporary dust related impacts would be negligible risk.
- The results of the dispersion modelling indicate that most pollutants concentrations (dust and odour from VOCs) due to the operation of the proposed development would comply with the established criteria at nearby sensitive receptors.

As such, it is expected that the air quality impacts from the proposed development would be negligible and likely insignificant.

10 REFERENCES

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VGG, 2001, Victorian Government Gazette, 'State Environment Protection Policy (Air Quality Management)', No. S 240, Government of Victoria, Melbourne. Accessible at: https://www.gazette.vic.gov.au/gazette/Gazettes2001/GG2001S240.pdf

11 STATEMENT OF LIMITATIONS

This report entitled *Rutherford Tyre Recyclers – Proposed Tyre Recycling Facility,* dated 09 May 2024, was prepared by RWDI Australia Pty Ltd ("RWDI") for Rutherford Tyre Recyclers Pty Ltd c/- Jackson Environment ("Client"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein ("Project"). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared. Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client during the final stages of the project to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

APPENDIX A

EMISSION INVENTORY OF DUST AND ODOUROUS POLLUTANTS – VOLATILE ORGANIC COMPOUNDS (VOCs)

Appendix B1: Hauling Roads Emissions

9 Burlington Pl, Rutherford, NSW

Project #2402864

UNPAVED ROAD SECTIONS - AP-42 Section 13.2.2
PAVED ROAD SECTIONS - AP-42 Section 13.2.1

Paved Roads: $E = k\,(sL)^{0.91}\,(W)^{1.02}$
Unpaved Roads - Industrial: $E = 281.9\,k\,(s / 12)^{a}\,(W / 3)^{b}$
Unpaved Roads - Public: $E = 281.9\,k\,(s / 12)^{a}\,(S / 30)^{d} / (M / 0.5)^{c} - C$

E particulate emission factor (g/VKT)
k particle size multiplier (see below)
sL road surface silt loading (g/m²)
W average weight of the vehicles traveling the road (US short tons)
s surface material silt content (%)
C emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear
M surface material moisture content (%)
S mean vehicle speed (mph)
a,b,c,d constants (see below)

Activity	Vehicle Type	Traffic Passes [1] Daily	Weekly	Monthly	Segment Length [2]	Road Surface [3]	Roadway Type [4]	Mean Vehicle Speed		Average Vehicle Weight [5]	Surface Material Moisture Content [6]	Surface Silt Content [7]	Road Surface Silt Loading [8]	Water Control	Base AP-42 Emission Factor TSP	PM$_{10}$	PM$_{2.5}$	Base Emission Rate TSP	PM$_{10}$	PM$_{2.5}$
		(#/d)	(#/w)	(#/m)	(m)			(km/h)	(mph)	(tons)	(%)	(%)	(g/m²)	(%)	(g/VKT)	(g/VKT)	(g/VKT)	(g/s)	(g/s)	(g/s)
Loaded Trucks Entering Site	MRV (Medium Rigid Vehicle) Trucks	2	12	48	42	Paved	Industrial	25	16	22.5			0.6		7.21E+01	9.3E+00	2.3E+00	1.31E-04	1.69E-05	4.09E-06
Hook Lift Bin Trucks Leaving Site	Hook Bin Trucks	0.2	1	4	50	Paved	Industrial	25	16	31			0.6		9.99E+01	1.3E+01	3.1E+00	1.81E-05	2.34E-06	5.66E-07
Loaded Trucks Leaving Site	MRV (Medium Rigid Vehicle) Trucks	2	12	48	50	Paved	Industrial	25	16	22.5			0.6		7.2E+01	9.3E+00	2.3E+00	1.99E-04	2.58E-05	6.24E-06
Employee Private Vehicles Entering the Site	Light Vehicles	4	24	96	51	Paved	Industrial	26	16	4.5			0.6		1.4E+01	1.8E+00	4.4E-01	7.88E-05	1.02E-05	2.47E-06
Employee Private Vehicles Leaving the Site	Light Vehicles	4	24	96	50	Paved	Industrial	25	16	4.5			0.6		1.4E+01	1.8E+00	4.4E-01	7.72E-05	9.99E-06	2.42E-06

Constants for Mobile Emission Equations

Roadway Type	Contaminant	k	a	b	c	d	Quality
Paved Roads:	**PM$_{2.5}$**	0.15	-	-	-	-	-
	PM$_{10}$	0.62	-	-	-	-	-
	PM$_{30}$	3.23	-	-	-	-	-
	TSP	4.79	-	-	-	-	-
Unpaved Roads - Industrial:	**PM$_{2.5}$**	0.15	0.9	0.45	-	-	C
	PM$_{10}$	1.5	0.9	0.45	-	-	B
	PM$_{30}$	4.9	0.7	0.45	-	-	B
	TSP	7.32	0.6	0.45	-	-	C
Unpaved Roads - Public:	**PM$_{2.5}$**	0.18	1	-	0.2	0.5	C
	PM$_{10}$	1.8	1	-	0.2	0.5	B
	PM$_{30}$	6	1	-	0.3	0.3	B
	TSP	8.96	1	-	0.49	0.2	C

Comments

Constants for TSP (PM44) extrapolated from published factors for PM30, PM10 and PM2.5. Data quality downgraded by one step.

Hours per day 13 5AM to 6PM M-F, 8AM-1PM Saturday and 51 weeks per year = 299 days per year

[1] As per scoping report provided, 2 truck deliveries per day and four staff vehicle movements (in) per day;
[2] Length of a specific road segment. A separate segment should be used whenever one or more parameters change
[3] Paved surfaces include asphalt, concrete, and recycled asphalt (if it forms a relatively consistent surface).
[4] Publicly accessible and dominated by light vehicles, or industrial, and dominated by heavy vehicles.
[5] The average vehicle weight reflects the average of the empty (15 tons)and loaded vehicle weight (7.5 or 16 tons), for travel in both directions.
[6] Required only for publicly accessible unpaved roads.
[7] Required only for unpaved roads (public and industrial)
[8] Required only for industrial paved roads. AP42 13.2.1 Table 13.2.1-2, Access road – ubiquitous baseline for ADT volume <500, Inside the building – for municipal solid waste landfill

Sample calculation for uncontrolled TSP emission factor for Activity Loaded Trucks Entering Site: MRV (Medium Rigid Vehicle) Trucks

EF = 281.9 x 7.32 x (6.9 /12)^(0.6) x (30/3)^(0.45) = 72 g TSP / vehicle kilometer travelled (vkt) 217.01

Sample calculation for TSP emission rate for Activity Loaded Trucks Entering Site: MRV (Medium Rigid Vehicle) Trucks

2 vehicles	42 m	1 km	72 g_{TSP}	1.00 day	1 hr	1.00 Water Control		
1 day		1000 m	1 vehicle km	13 hr	3600 s	100	=	1.31E-04 g_{TSP} / s

Appendix B2: Loading / Unloading / Transferring Material Emissions

Project #2402864

9 Burlington Pl, Rutherford, NSW

US EPA emission factor (US EPA, 1985 and updates)

$$E[kg/t] = k \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2.0}\right)^{1.4}} \right)$$

k = 0.74 for TSP, 0.35 for PM10 and 0.053 for PM2.5
U = wind speed [ms-1]
M = moisture content [%]

Activity	Average Wind Speed (m/s)	Moisture Content [1] (%)	Control Factor [2] (%)	Base AP-42 Emission Factor TSP (kg/t)	Base AP-42 Emission Factor PM_{10} (kg/t)	Base AP-42 Emission Factor $PM_{2.5}$ (kg/t)	Base Emission Rate TSP (g/s)	Base Emission Rate PM_{10} (g/s)	Base Emission Rate $PM_{2.5}$ (g/s)
Raw Material Dumped to Stockpile	0.5	1.0	70.0%	4.55E-04	2.15E-04	3.26E-05	4.78E-05	2.26E-05	3.43E-06
Load Material into Tyre de-beader	0.5	1.0	70.0%	4.55E-04	2.15E-04	3.26E-05	4.78E-05	2.26E-05	3.43E-06
Unload Processed Material to bulk bags and Load to Trucks	0.5	1.0	70.0%	4.55E-04	2.15E-04	3.26E-05	4.78E-05	2.26E-05	3.43E-06

Constants Emission Equations

Contaminant	k
$PM_{2.5}$	0.053
PM_{10}	0.35
PM_{30}	0.74
TSP	0.74

Annual throughput [t] 4,500 tons/year

Hours per week 70 5AM to 6PM M-F, 8AM-1PM Saturday and 51 weeks per year = 299 days per year

[1] As per NSW EPA (https://www.dcceew.gov.au/sites/default/files/documents/domestic-international-standards-waste-tyres.pdf) - moisture content is 1% (table 12)

[2] No material handling, processing, or stockpiling would occur outside the building. Therefore, windblown dust emissions would be negligible. A control factor of 70% has been applied to all sources located inside the building.

Sample calculation for uncontrolled TSP emission factor for Activity Raw Material Dumped to Stockpile

EF = 0.74 x 0.0016 x ((1.0/12)^(1.3))/(2.5/2.0)^(1.4)) = 4.55E-04 kg TSP / ton (material)

Sample calculation for TSP emission rate for Activity Raw Material Dumped to Stockpile

4.55E-04 kg_{TSP}	1000 g	4500 ton	1 year	1.00 week	1 hr	70.00 Control Factor		
1 ton	kg	1 year	51 weeks	70 hours	3600 s	100	=	4.78E-05 g_{TSP} / s

Appendix B3: Tyre Recycling Process Emissions

9 Burlington Pl, Rutherford, NSW

US EPA emission factor (US EPA, 2008, Draft 4.12)

Activity [1]	Annual Throughput (t/year)	Control Factor [2]	Base AP-42 Emission Factor [3]			Base Emission Rate		
			TSP (kg/t)	PM_{10} [4] (kg/t)	$PM_{2.5}$ [4] (kg/t)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Single hook debeader	4,500	70%	9.97E-04	4.39E-04	2.15E-04	1.05E-04	4.61E-05	2.26E-05
Tyre Strip Cutter			9.97E-04	4.39E-04	2.15E-04	1.05E-04	4.61E-05	2.26E-05
Whole Tire Shredder			9.97E-04	4.39E-04	2.15E-04	1.05E-04	4.61E-05	2.26E-05
Double Roller Rubber Breaker (Crusher)			9.97E-04	4.39E-04	2.15E-04	1.05E-04	4.61E-05	2.26E-05
Vibration Screen			9.97E-04	4.39E-04	2.15E-04	1.05E-04	4.61E-05	2.26E-05
Magnetic Separator			9.97E-04	4.39E-04	2.15E-04	1.05E-04	4.61E-05	2.26E-05
Fiber Separator			9.97E-04	4.39E-04	2.15E-04	1.05E-04	4.61E-05	2.26E-05

[1] Assumed, all the activties associated with tyre recycling process will have same emissions as tyre shredding.
[2] No material handling, processing, or stockpiling would occur outside the building. Therefore, windblown dust emissions would be negligible. A control
[3] For the purposes of this assessment, the emission factor for tyre retread buffing has been adopted to represent the tyre shredding process.
Emission Estimate Technique Manual for Rubber Product Version 1.1, Table 13 - https://www.dcceew.gov.au/sites/default/files/documents/rubber.pdf
The emission factor published is for Total Particulate Matter (TSP)
[4] Assumed PM 2.5 is 49% of the PM 10 , and PM 10 is 44% of the TSP - https://hero.epa.gov/hero/index.cfm/reference/details/reference_id/82846

Annual throughput [t] 4,500 tons/year
Hours per week 70 5AM to 6PM M-F, 8AM-1PM Saturday and 51 weeks per year = 299 days per year

Sample calculation for TSP emission rate for Activity Single hook debeader

$$\frac{9.97\text{E-04 } kg_{TSP}}{1 \text{ ton}} \times \frac{1000 \text{ g}}{\text{kg}} \times \frac{4500 \text{ ton}}{1 \text{ year}} \times \frac{1 \text{ year}}{51 \text{ weeks}} \times \frac{1.00 \text{ week}}{70 \text{ hours}} \times \frac{1 \text{ hr}}{3600 \text{ s}} \times \frac{70.00 \text{ Control Factor}}{100} = 1.05\text{E-04 } g_{TSP} / s$$

Appendix B4: Rubber Tyre Production Emissions

Project #2402864

9 Burlington Pl, Rutherford, NSW

US EPA emission factor (US EPA, 2008, Draft 4.12)

Activity [1]	Annual Throughput (t/year)	Control Factor [3]	Base AP-42 Emission Factor [4]			Base Emission Rate		
			TSP (kg/t)	PM_{10} [5] (kg/t)	$PM_{2.5}$ [5] (kg/t)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Rubber Mixer [1]	4,500	70%	3.21E-01	1.41E-01	6.92E-02	3.37E-02	1.48E-02	7.27E-03
Barrel Mixer [1]			3.21E-01	1.41E-01	6.92E-02	3.37E-02	1.48E-02	7.27E-03
Vulcanizing machine [2]			-	-	-	-	-	-
Rubber Tile Molds [2]			-	-	-	-	-	-

[1] Assumed, all the activties associated with Rubber and Barrel Mixer process will have same emissions as Mixing Operation in Rubber Manufacturing Plant.

[2] Vulcanizing machine and Rubber tile mold process activities will have same emissions as Platen Press Curing process (pressure curing) and therefore will not have any dust emissions.

[3] No material handling, processing, or stockpiling would occur outside the building. Therefore, windblown dust emissions would be negligible. A control factor of 70% has been applied to all sources located inside the building.

[4] For the purposes of this assessment, the emission factor for Mixing operation have been odopted.
Emission Estimate Technique Manual for Rubber Product Version 1.1, Table 5 - https://www.dcceew.gov.au/sites/default/files/documents/rubber.pdf
The emission factor published is for Total Particulate Matter (TSP)

[5] Assumed PM 2.5 is 49% of the PM 10 , and PM 10 is 44% of the TSP - https://hero.epa.gov/hero/index.cfm/reference/details/reference_id/82846

Annual throughput [t] 4,500 tons/year

Hours per week 70 — 5AM to 6PM M-F, 8AM-1PM Saturday and 51 weeks per year = 299 days per year

Sample calculation for TSP emission rate for Activity Rubber Mixer [1]

$$\frac{3.21\text{E-}01\ kg_{TSP}}{1\ ton} \times \frac{1000\ g}{kg} \times \frac{4500\ ton}{1\ year} \times \frac{1\ year}{51\ weeks} \times \frac{1.00\ week}{70\ hours} \times \frac{1\ hr}{3600\ s} \times \frac{70.00\ \text{Control Factor}}{100} = 3.37\text{E-}02\ g_{TSP}/s$$

Appendix B5: Rubber Tyre Production Individual Odorous Emissions

9 Burlington Pl, Rutherford, NSW

US EPA emission factor (US EPA, 2008, Draft 4.12)

Activity [1]	Annual Throughput (t/year)	Control Factor [3]	Base AP-42 Emission Factor [4]								Base Emission Rate							
			Carbon Disulfide (kg/t)	Cumene (kg/t)	Methyl ethyl ketone (kg/t)	Methyl isobutyl ketone (kg/t)	Phenol (kg/t)	Styrene (kg/t)	Toluene (kg/t)	Xylene (kg/t)	Carbon Disulfide (g/s)	Cumene (g/s)	Methyl ethyl ketone (g/s)	Methyl isobutyl ketone (g/s)	Phenol (g/s)	Styrene (g/s)	Toluene (g/s)	Xylene (g/s)
Vulcanizing machine and Rubber Tile Molds [2]	4,500	70%	4.60E-03	2.04E-04	5.37E-04	1.26E-02	3.87E-04	4.71E-04	6.90E-03	1.56E-02	4.83E-04	2.14E-05	5.64E-05	1.32E-03	4.07E-05	4.95E-05	7.25E-04	1.64E-03

[1] Assumed, all the activties associated with Rubber and Barrel Mixer process will have same emissions as Mixing Operation in Rubber Manufacturing Plant.

[2] Vulcanizing machine and Rubber tile mold process activities will have same emissions as Platen Press Curing process (pressure curing) and therefore will have individual odorous emissions.

[3] No material handling, processing, or stockpiling would occur outside the building. Therefore, windblown dust emissions would be negligible. A control factor of 70% has been applied to all sources located inside the building.

[4] For the purposes of this assessment, the emission factor for Tyre Curing have been adopted.
Emission Estimate Technique Manual for Rubber Product Version 1.1, Table 12 - https://www.dcceew.gov.au/sites/default/files/documents/rubber.pdf

Annual throughput [t] 4,500 tons/year

Hours per week 70 5AM to 6PM M-F, 8AM-1PM Saturday and 51 weeks per year = 299 days per year

Sample calculation for CarbonDisulfide emission rate for Activity Vulcanizing machine and Rubber Tile Molds [2]

$$\frac{4.60\text{E-03 } kg_{TSP}}{1 \text{ ton}} \times \frac{1000 \text{ g}}{\text{kg}} \times \frac{4500 \text{ ton}}{1 \text{ year}} \times \frac{1 \text{ year}}{51 \text{ weeks}} \times \frac{1.00 \text{ week}}{70 \text{ hours}} \times \frac{1 \text{ hr}}{3600 \text{ s}} \times \frac{70.00 \text{ Control Factor}}{100} = 4.83\text{E-04 } g_{TSP} / s$$

Appendix B6: Summary of Combustion Exhaust Emissions

Project #2402864

9 Burlington Pl, Rutherford, NSW

Activity	Number Of Units	Max. Hourly Traffic (#/h)	Tailpipe Emission Factor [1], [2]				Tailpipe Emission Rate			
			TSP (g/h)	PM10 (g/h)	PM2.5 (g/h)	NOx (g/h)	TSP (g/s)	PM10 (g/s)	PM2.5 (g/s)	NOx (g/s)
MRV Truck Idling - Loading Area	2.0	1		1.196	1.10	3.38E+01	1.11E-04	1.11E-04	1.02E-04	3.13E-03
MRV Truck Idling - Unloading Area	2.0	1		1.196	1.10	3.38E+01	1.11E-04	1.11E-04	1.02E-04	3.13E-03

[1] Conservative assumption of each vehicle Idling 10 minutes per hour

Sample Calculations

Heavy Truck Exhaust NOx Emissions:

$$\frac{33.763\ \text{g}}{\text{h}} \times \frac{1\ \text{h}}{3600\ \text{s}} \times \frac{10\ \text{min}}{60\ \text{min}} = 1.6\text{E-03}\ \text{g}_{NOx}/\text{s} \times 2.5\ \text{units}$$

$$= 3.13\text{E-03}\ \text{g}_{NOx}/\text{s}$$

Appendix B7: Summary of Emission Inventory - Dust

Project #2402864

9 Burlington Pl, Rutherford, NSW

Source ID's	Activity	Total Emissions (kg/year)			Base Emission Rate (g/s)		
		TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
TDA1 - Volume Source	Raw Material Dumped to Stockpile	0.6	0.3	0.0	4.78E-05	2.26E-05	3.43E-06
	Load Material into Tyre de-beader	0.6	0.3	0.0	4.78E-05	2.26E-05	3.43E-06
	MRV Truck Idling - Loading Area	1.4	1.4	1.3	1.11E-04	1.11E-04	1.02E-04
TRP1 - Volume Source	Single hook debeader	1.3	0.6	0.3	1.05E-04	4.61E-05	2.26E-05
	Tyre Strip Cutter	1.3	0.6	0.3	1.05E-04	4.61E-05	2.26E-05
	Whole Tire Shredder	1.3	0.6	0.3	1.05E-04	4.61E-05	2.26E-05
	Double Roller Rubber Breaker (Crusher)	1.3	0.6	0.3	1.05E-04	4.61E-05	2.26E-05
	Vibration Screen	1.3	0.6	0.3	1.05E-04	4.61E-05	2.26E-05
	Magnetic Separator	1.3	0.6	0.3	1.05E-04	4.61E-05	2.26E-05
	Fiber Separator	1.3	0.6	0.3	1.05E-04	4.61E-05	2.26E-05
RTP1 - Volume Source	Rubber Mixer	433.4	190.7	93.4	3.37E-02	1.48E-02	7.27E-03
	Barrel Mixer	433.4	190.7	93.4	3.37E-02	1.48E-02	7.27E-03
UNLD1 - Volume Source	Unload Processed Material to bulk bags and Load to Trucks	0.6	0.3	0.0	4.78E-05	2.26E-05	3.43E-06
	MRV Truck Idiling - Unloading Area	1.4	1.4	1.3	1.11E-04	1.11E-04	1.02E-04
SLINE1 - Line Volume Source	Loaded Trucks Entering Site	1.7	0.2	0.1	1.31E-04	1.69E-05	4.09E-06
	Employee Private Vehicles Entering the Site	1.0	0.1	0.0	7.88E-05	1.02E-05	2.47E-06
SLINE2 - Line Volume Source	Hook Lift Bin Trucks Leaving Site	0.2	0.0	0.0	1.81E-05	2.34E-06	5.66E-07
	Employee Private Vehicles Leaving the Site	1.0	0.1	0.0	7.72E-05	9.99E-06	2.42E-06

Appendix B8: Summary of Emission Inventory - Odour

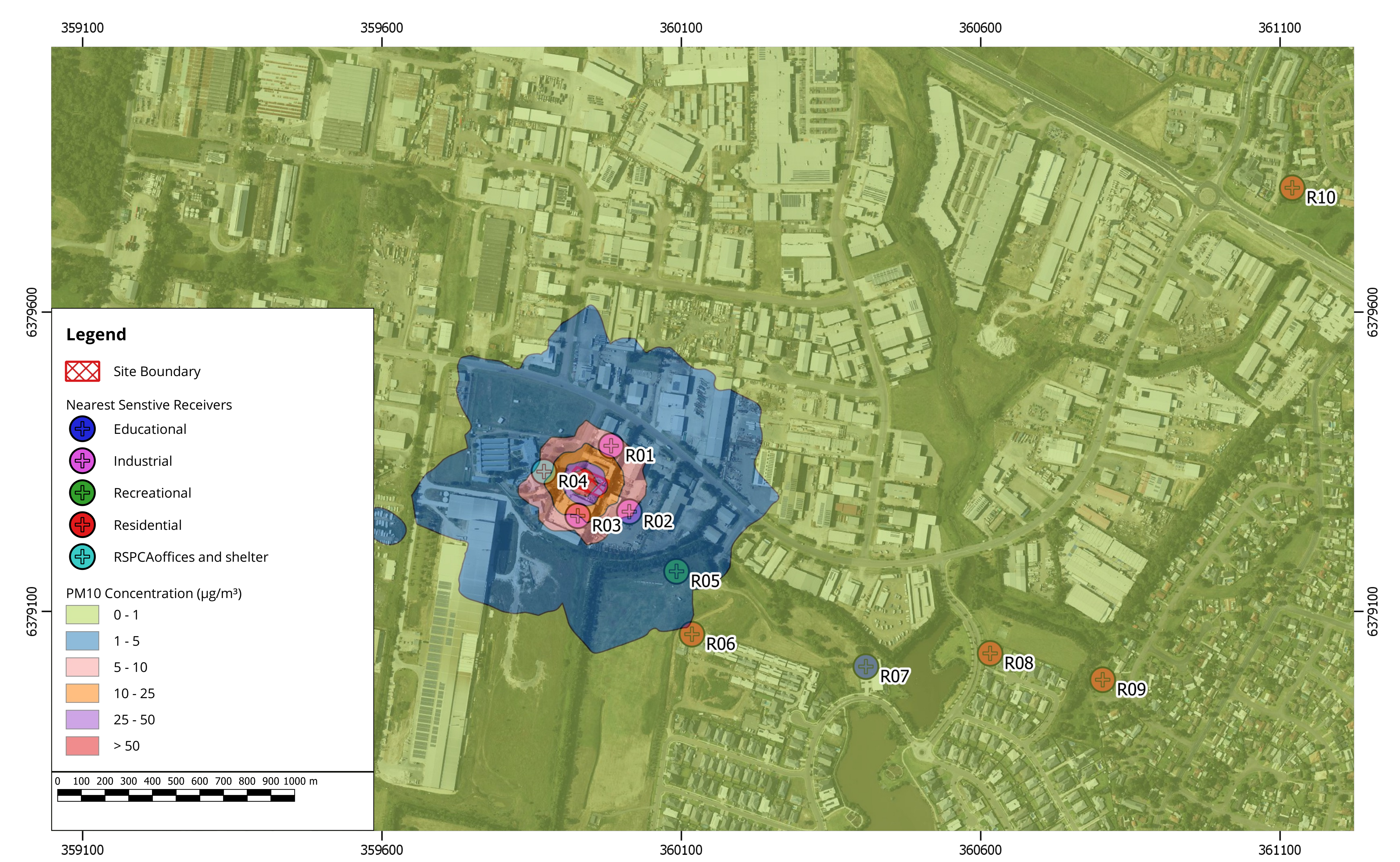
9 Burlington Pl, Rutherford, NSW

Project #2402864

Source ID's	Activity	Total Emissions (kg/year)								Base Emission Rate (g/s)							
		Carbon Disulfide	Cumene	Methyl ethyl ketone	Methyl isobutyl ketone	Phenol	Styrene	Toluene	Xylene	Carbon Disulfide	Cumene	Methyl ethyl ketone	Methyl isobutyl ketone	Phenol	Styrene	Toluene	Xylene
RTP1 - Volume Source	Vulcanizing machine and Rubber Tile Molds	6.2	0.3	0.7	17.0	0.5	0.6	9.3	21.1	4.83E-04	2.14E-05	5.64E-05	1.32E-03	4.07E-05	4.95E-05	7.25E-04	1.64E-03

APPENDIX B

CONTOUR PLOTS OF 24-HOUR AVERAGE INCREMENTAL PM_{10} AND $PM_{2.5}$ CONCENTRATIONS



RUTHERFORD TYRE RECYCLERS

Contour Plots 24-Hour Average Incremental PM10 Concentration

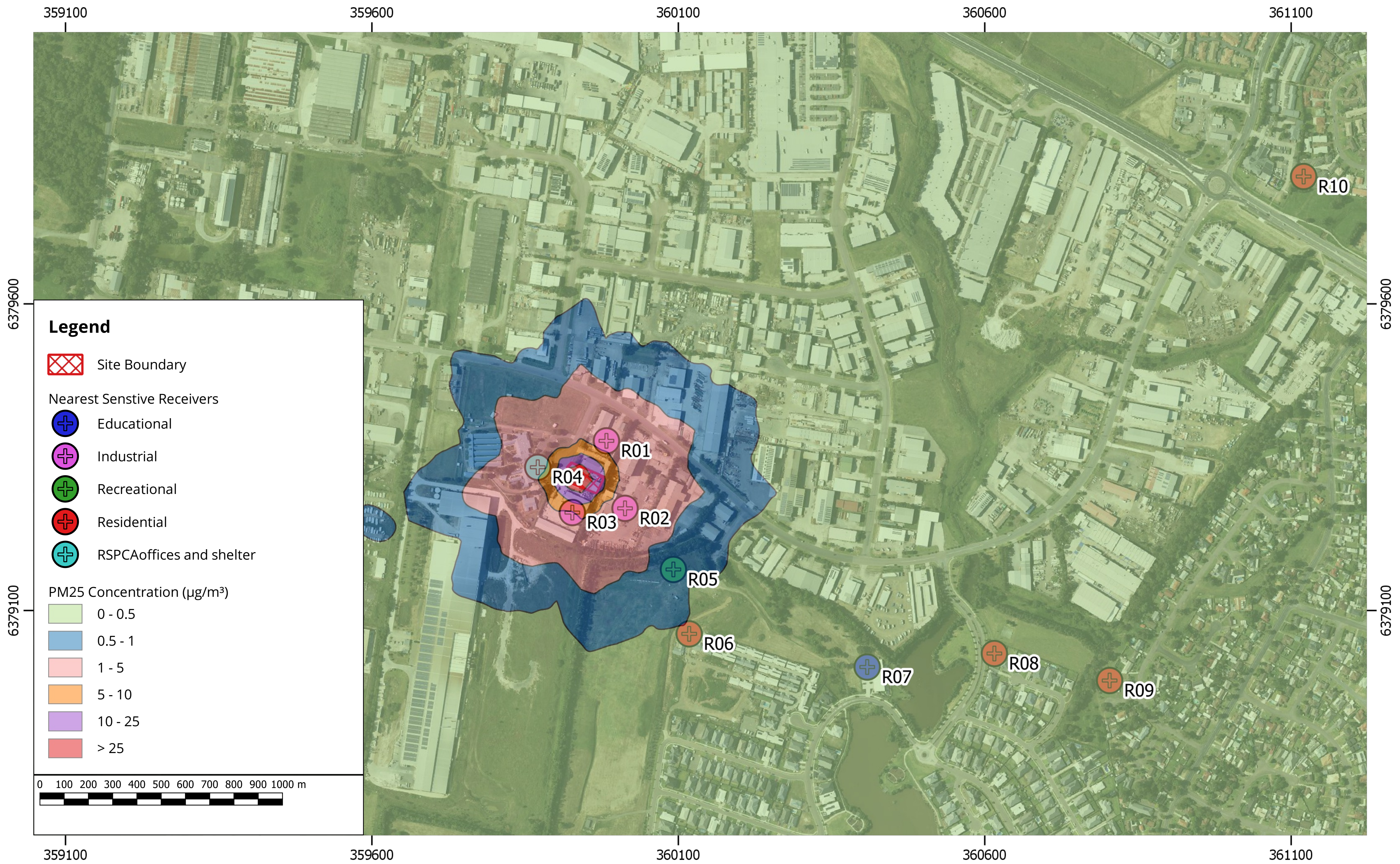
9 Burlington Place, Rutherford, NSW (Lot 3005 DP 1040568)

Sources:

1. Basemap: NSW Six maps

Map Projection: / (EPSG:7856)

Revised on: 04/03/2024	
Project #: 2402864	Figure: Appendix B-1
Drawn by: RAMA.ROBBI	Checked by: CXR



RUTHERFORD TYRE RECYCLERS

Contour Plots 24-Hour Average Incremental PM2.5 Concentration

9 Burlington Place, Rutherford, NSW (Lot 3005 DP 1040568)

Sources:

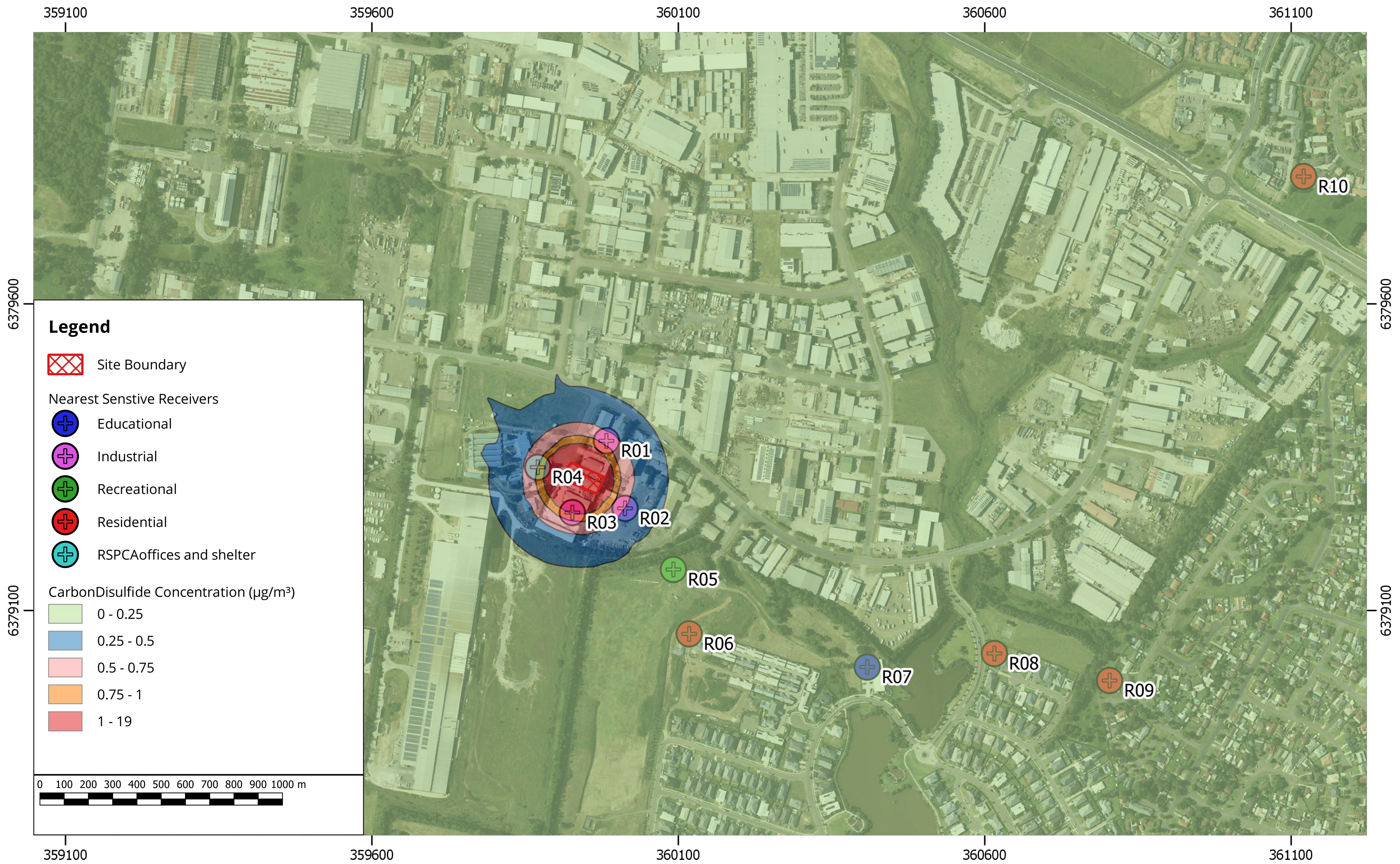
1. Basemap: NSW Six maps

Map Projection: / (EPSG:7856)

Revised on: 04/03/2024	
Project #: 2402864	Figure: Appendix B-2
Drawn by: RAMA.ROBBI	Checked by: CXR

APPENDIX C

CONTOUR PLOTS OF 1-HOUR AVERAGE ODOUROUS VOCs CONCENTRATIONS



RUTHERFORD TYRE RECYCLERS

Contour Plots 1-Hour Average Carbon Disulfide Concentration

9 Burlington Place, Rutherford, NSW (Lot 3005 DP 1040568)

Sources:

1. Basemap: NSW Six maps

Map Projection: / (EPSG:7856)

Revised on: 04/03/2024	
Project #: 2402864	Figure: Appendix C-1
Drawn by: RAMA.ROBBI	Checked by: CXR

RUTHERFORD TYRE RECYCLERS

Contour Plots 1-Hour Average Cumene Concentration

9 Burlington Place, Rutherford, NSW (Lot 3005 DP 1040568)

Sources:
1. Basemap: NSW Six maps

Map Projection: / (EPSG:7856)

Revised on: 04/03/2024	
Project #: 2402864	Figure: Appendix C-2
Drawn by: RAMA.ROBBI	Checked by: CXR

RUTHERFORD TYRE RECYCLERS

Contour Plots 1-Hour Average Methyl Ethyl Ketone Concentration

9 Burlington Place, Rutherford, NSW (Lot 3005 DP 1040568)

Sources:

1. Basemap: NSW Six maps

Map Projection: / (EPSG:7856)

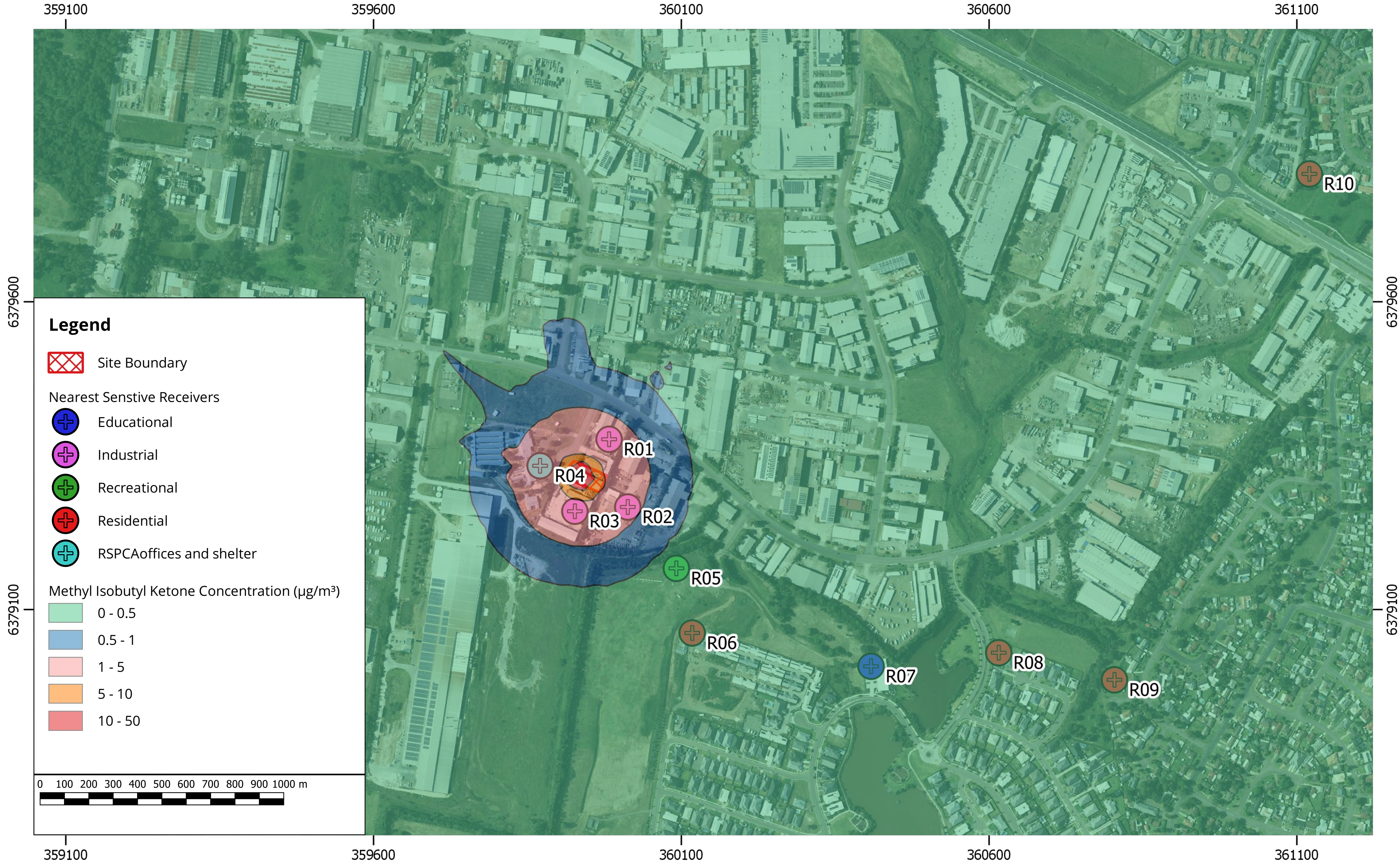
Revised on: 04/03/2024

Project #: 2402864

Figure: Appendix C-3

Drawn by: RAMA.ROBBI

Checked by: CXR



RUTHERFORD TYRE RECYCLERS

Contour Plots 1-Hour Average Methyl Isobutyl Ketone Concentration

9 Burlington Place, Rutherford, NSW (Lot 3005 DP 1040568)

Sources:

1. Basemap: NSW Six maps

Map Projection: / (EPSG:7856)

Revised on: 04/03/2024	
Project #: 2402864	Figure: Appendix C-4
Drawn by: RAMA.ROBBI	Checked by: CXR

RUTHERFORD TYRE RECYCLERS

Contour Plots 1-Hour Average Phenol Concentration

9 Burlington Place, Rutherford, NSW (Lot 3005 DP 1040568)

Sources:

1. Basemap: NSW Six maps

Map Projection: / (EPSG:7856)

Revised on: 04/03/2024	
Project #: 2402864	Figure: Appendix C-5
Drawn by: RAMA.ROBBI	Checked by: CXR

RUTHERFORD TYRE RECYCLERS

Contour Plots 1-Hour Average Styrene Concentration

9 Burlington Place, Rutherford, NSW (Lot 3005 DP 1040568)

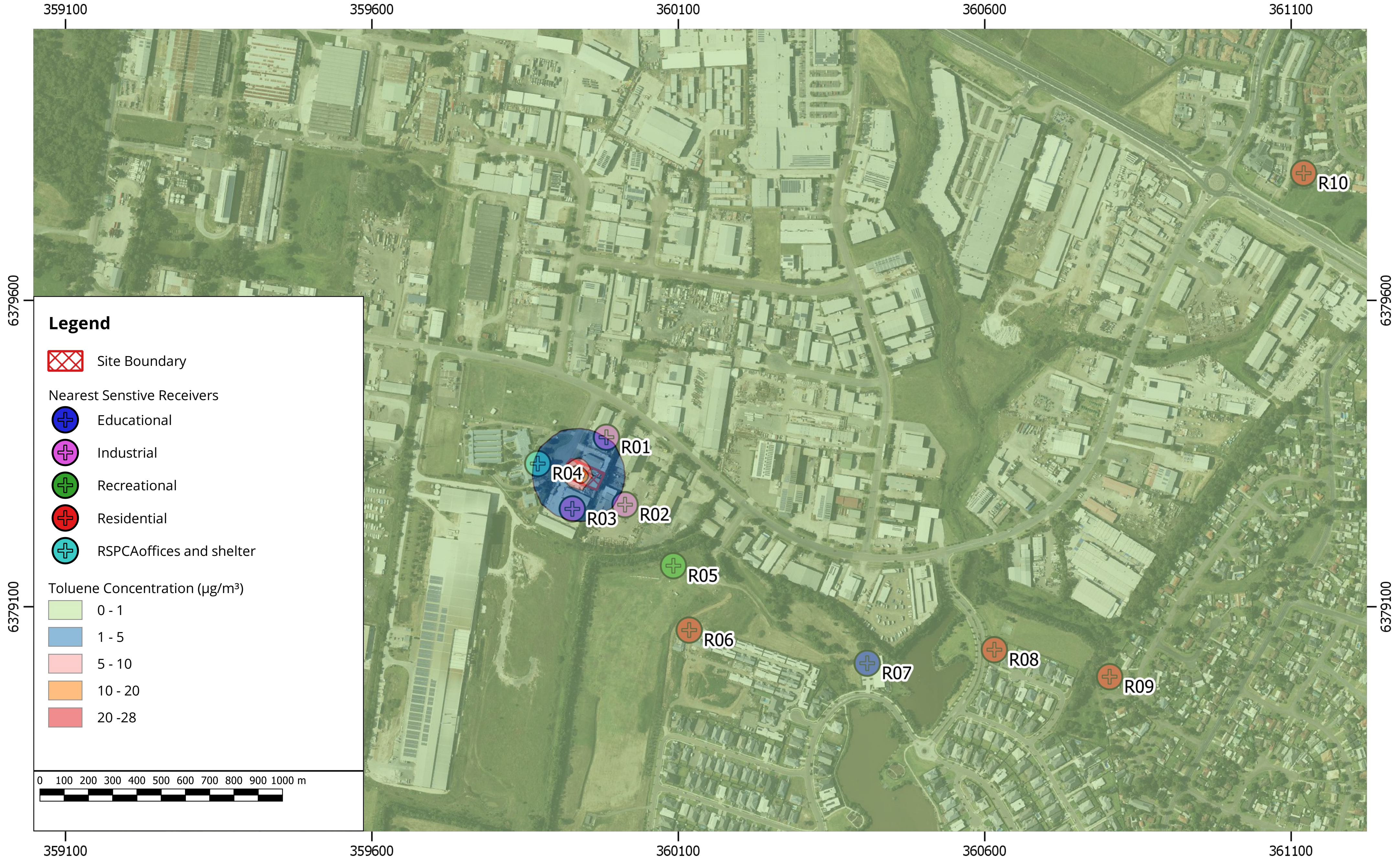
Sources:

1. Basemap: NSW Six maps

Map Projection: / (EPSG:7856)

N

Revised on: 04/03/2024	
Project #: 2402864	Figure: Appendix C-6
Drawn by: RAMA.ROBBI	Checked by: CXR



RUTHERFORD TYRE RECYCLERS

Contour Plots 1-Hour Average Toluene Concentration

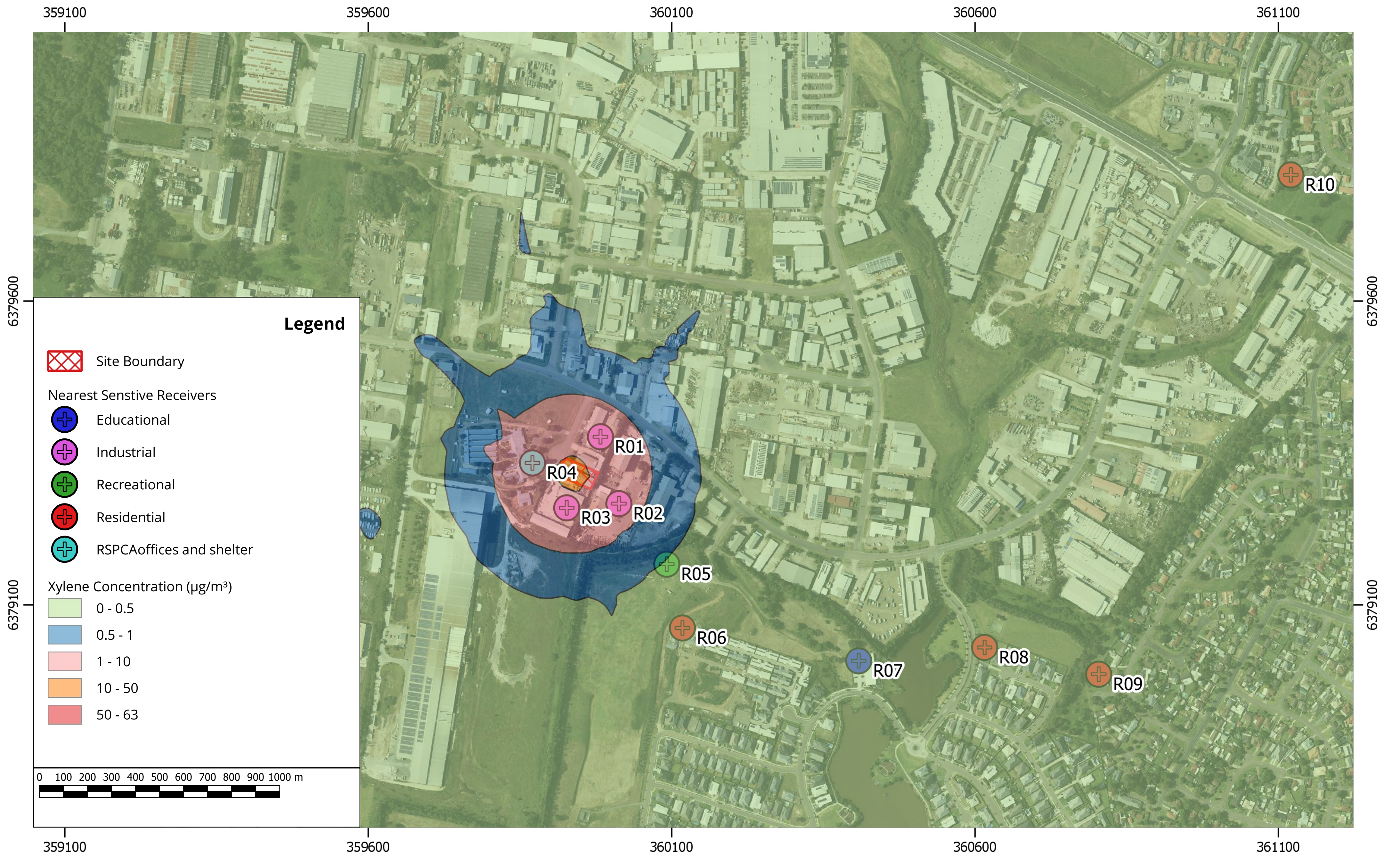
9 Burlington Place, Rutherford, NSW (Lot 3005 DP 1040568)

Sources:

1. Basemap: NSW Six maps

Map Projection: / (EPSG:7856)

Revised on: 04/03/2024	
Project #: 2402864	Figure: Appendix C-7
Drawn by: RAMA.ROBBI	Checked by: CXR



RUTHERFORD TYRE RECYCLERS

Contour Plots 1-Hour Average XYlene Concentration

9 Burlington Place, Rutherford, NSW (Lot 3005 DP 1040568)

Sources:

1. Basemap: NSW Six maps

Map Projection: / (EPSG:7856)

N

Revised on: 04/03/2024	
Project #: 2402864	Figure: Appendix C-8
Drawn by: RAMA.ROBBI	Checked by: CXR