Modification of Consent

Modification Report

Prepared for Reinforced Concrete Pipes Australia

May 2023

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Reinforced Concrete Pipes Australia

E230025 RP#1

May 2023

Version	Date	Prepared by	Reviewed by	Comments
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Executive Summary

Reinforced Concrete Pipes Australia (NSW) Pty Ltd (RCPA) operates a concrete pipe manufacturing facility (facility) located at 8 Kestrel Avenue, Thornton, New South Wales (NSW) within the Maitland City Council local government area (LGA).

The facility operates in accordance with an existing development consent (DA 06-1324) issued by Maitland City Council on 29 August 2006 as modified. The facility produces steel reinforced concrete pipes and other precast components for infrastructure such as drainage systems. The authorised use of the facility includes the installation and operation of a concrete batching plant required for the production of concrete pipes.

Between 9 October 2021 and 12 June 2022, the concrete batching plant was relocated to the outside south-west side of the existing building. The operation of the concrete batching plant external to the existing building resulted in neighbouring commercial and industrial facilities raising concerns regarding dust, vibration, and noise from the facilities operations. Following inspections by representatives from Maitland City Council and subsequent correspondence from Maitland City Council dated 30 November 2022, it was identified that the installation and operation of the concrete batching plant, external to the existing on-site building, is not in accordance with DA 06-1324.

To address matters raised by Maitland City Council, RCPA seek to modify DA 06-1324 pursuant to section 4.55(2) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The proposed modifications to DA 06-1324 include:

- regularising the installation of a concrete batching plant and associated infrastructure outside the RCPA building
- regularising the relocation of pipe testing racks and aggregate storage bins on site
- installation of an acoustic barrier to mitigate noise impacts on industrial and commercial neighbours
- installation of additional hardstand along trafficable areas to reduce the air quality impacts associated with raised dust from the currently unsealed areas.

This Modification Report has been prepared to support an application to modify DA 06-1324. This modification report is supported by noise and vibration assessment and air quality assessment that have been prepared to assess the potential impacts of the development on the locality.

The noise modelling results presented in the Noise and Vibration Assessment (ACA, 2023) indicate the proposed modifications may be expected to operate in compliance with the Noise Policy for Industry (NPfI) Project Noise Trigger Levels (PNTLs) and sleep disturbance screening levels at the residential areas in the vicinity of the Site and therefore residential impacts would not be anticipated.

To manage impacts of the proposed modification on the adjacent commercial receivers, RCPA proposes to install an acoustic barrier along the south-western perimeter of the Site. At the closest commercial receivers to the south-west, with the inclusion of the 50 metres (m) long 2.9 m high acoustic barrier, noise modelling predicted a residual exceedance of the adopted project amenity level by up to 4 dB may be anticipated. Whilst the adopted project amenity level is predicted to be exceeded by up to 4 dB, the recommended amenity level is expected to be met.

In accordance with the NPfI, the residual exceedance at the closest commercial receiver, is considered marginal only. Regardless, RCPA propose to extend the length of the noise barrier wall to 73 m which would provide an equal or better outcome than what has been modelled and assessed in the Noise and Vibration Assessment.

The results of the air dispersion modelling presenting in the Air quality Assessment (EMM, 2023) identified that:

- Single shift operations at the Site are not predicted to result in any additional exceedance of applicable 24-hour average criterion for PM_{10} and $PM_{2.5}$ criteria at any surrounding assessment locations under current site configuration.

- Double shift operations at the Site are not predicted to result in any additional exceedance of applicable 24-hour average criterion for PM_{10} and $PM_{2.5}$ criteria at any surrounding assessment locations with the inclusion of a paved road section between the sand and aggregate storage bays and the currently paved site entry/exit onto Kestrel Avenue.

- Cumulative annual average concentrations of TSP, PM_{10} and $PM_{2.5}$ are predicted to comply with applicable impact assessment criterion for single shift days under current procedures, and for double shift days following the inclusion of the proposed paved section.

To maintain compliance with the applicable PM_{10} and $PM_{2.5}$ criteria, RCPA will seal approximately 2,635 m^2 of current unsealed trafficable areas prior to production exceeding 30,000 tonnes per annum (tpa) or moving to a double shift 24-hour operation.

The development, as modified, would remain substantially the same as the development originally granted, which is for a concrete manufacturing plant. The facility and the activities of the Site remain as general industries and the installation of the concrete batching function outside, rather than inside the building, does not materially alter the approved development.

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1 Introduction

1.1 Background and context

Reinforced Concrete Pipes Australia (NSW) Pty Ltd (RCPA) operates a concrete pipe manufacturing facility (facility) located at 8 Kestrel Avenue, Thornton, New South Wales (NSW) (the Site). The site is located within the Maitland City Council local government area (LGA).

The facility operates in accordance with an existing development consent (DA 06-1324) issued by Maitland City Council on 29 August 2006 as modified. The facility produces steel reinforced concrete pipes and other precast components for infrastructure such as drainage systems. The authorised use of the facility includes the installation and operation of a concrete batching plant, required for the production of concrete pipes.

Between 9 October 2021 and 12 June 2022, the concrete batching plant was relocated to the outside south-west side of the existing building. The operation of the concrete batching plant external to the existing building resulted in neighbouring commercial and industrial facilities raising concerns regarding dust, vibration, and noise from the facilities operations. Following inspections by representatives from Maitland City Council and subsequent correspondence from Maitland City Council dated 30 November 2022, it was identified that the installation and operation of the concrete batching plant, external to the existing on-site building, is not in accordance with the conditions of DA 06-1324.

To address matters raised by Maitland City Council, RCPA seek to modify DA 06-1324 pursuant to section 4.55(2) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to address:

- the need to regularise the installation of the concrete batching plant in its current position outside the building
- the need to address the concerns of some industrial and commercial neighbours regarding noise, vibration and dust.

This Modification Report therefore seeks to address those matters to enable the continued authorised operation of the RCPA facility and to maintain an acceptable level of amenity for the nearby commercial and industrial businesses.

1.2 Development approval history

1.2.1 Development consents

The facility operates in accordance with the following development consents issued by Maitland City Council:

- **UD 00-767** dated 22 June 2000 providing for the erection of two (2) industrial buildings. Building 1 was approved for the purposes of steel fabrication of building frames and Building 2 was approved for the purposes of a concrete production plant manufacturing precast concrete items to produce up to 16,000 tonnes per annum.
- **DA 06-1324** dated 29 August 2006 providing for industrial development, including the construction of additions to the existing buildings approved under UD 00-767 and an expansion of production of the concrete manufacturing plant up to 28,000 tonnes per annum.
- **DA 06-2671** dated 26 October 2006 granting consent for an extension to the building to accommodate an office area.
- **DA 11-2963** dated 5 December 2011 granting consent for the addition of awnings and vehicle access doors to the existing building.

- **DA 06-1324 (Section 96 Amendment)** dated 10 June 2014 amending the hours of operation to 24 hours a day, seven days a week and increasing production to a maximum annual output of 60,000 tonnes.

The development approvals concerning the Site provide planning approval for batching of concrete as a fundamental part of the manufacturing of concrete products. In a letter from Maitland City Council to GWH Group dated 11 November 2010, Maitland City Council clarify development consent relating to the use of buildings for concrete product manufacturing. Maitland City Council state the following, relating to the original development consent:

> "The original development consent for the site, being UD 00-767 proposed the erection of two (2) industrial buildings was approved by Council on 22 June 2000….
>
> …Building 2, the larger of the two buildings… was approved specifically for the purposes of accommodating Hunter Concrete Products which manufactured precast concrete items…The shed was to accommodate the fabrication of the reinforcing for the concrete products **as well as the batching and moulding of concrete**…"

As described by the Council, the Development Consent 00-767 permitted the site to be used for the purpose of concrete batching operations.

Further, the Development modification DA 06-1324 did not alter the type of operations permitted by the original approval but merely concerned expansion of buildings not a change of operations. This is also described in the 11 November 2010 letter as follows:

> "(Council's) understanding is that the intended purchase wishes to use the building as an **extension of the concrete products manufacturing currently undertaken** in Building 2. Council would have no 'in-principle' objection to this occurring as there would technically be no change in classification of the building required under the Building Code of Australia and hence **no basis for a development application for a 'change of use'** as defined under the Environmental Planning and Assessment Act 1979."

Further the operations were considered for a modification application to DA 06-1324 to permit 24/7 operation and an increase in production.

In the *Noise Impact Assessment Extension of Operating Hours and Production - Humes Concreting Plant* (RAPL. July 2012) for the application the noise impacts of the current operations are considered. The 'batching plant' impacts are noted at Table 3 as part of the 'workshop equipment/site activities, further at *Table 6: Item/Activity - Day/Evening/Night*, 'batching plant' is described as operating continuously. Per this study the operation of concrete batching is a part of regular operations.

It can be understood that since the original development approval UD 00-767 in 2000 concrete batching has been an approved part of operations at the site. Accordingly, the current application is an application to modify the location of the pre-existing approved concrete batch plant.

1.2.2 Consent to be modified

This Application to Modify a Consent relates to **DA 06-1324**.

The Application is made pursuant to section 4.55(2) of the EP&A Act.

1.3 Modification need

The proposed modifications to DA 06-1324 include:

- regularising the installation of a concrete batching plant and associated infrastructure outside the RCPA building
- regularising the relocation of pipe testing racks and aggregate storage bins on site
- installation of an acoustic barrier to mitigate noise impacts on industrial and commercial neighbours
- installation of additional hardstand along trafficable areas to reduce the air quality impacts associated with raised dust from the currently unsealed areas.

These modifications, in combination, (the proposed modifications) aim to enable the continued operation of the facility while addressing the concerns of nearby businesses and Maitland City Council in relation to noise, vibration and dust impacts.

1.4 Applicant

The Applicant is Reinforced Concrete Pipes Australia (NSW) Pty Ltd.

1.5 Landowner consent

Landowner consent to the making of the Application to Modify a Consent has been provided by Kestrel Avenue Pty Ltd (ACN 655 339 263; ABN 11 655 339 263).

A copy of the letter from Kestrel Avenue Pty Ltd is provided at Appendix C.

2 The site

2.1 The land subject to this development application

The land the subject of this development application (the Site) is located at 8 Kestrel Avenue, Thornton. The land is legally described as Lot 1201 DP 1043669. It forms part of the Thornton Industrial Estate and is within the Maitland City Council LGA (refer Figure 2.1).

The Site is an irregular shaped lot with a frontage of approximately 57 m to Kestrel Avenue. The Site has an area of approximately 4.3 hectares(ha) (refer Figure 2.2).

The land is within the Mindaribba Local Aboriginal Land Council area.

2.2 Surrounding development

2.2.1 Industrial land

The Site is centrally located in a precinct of commercial and industrial businesses. This precinct is known as the Thornton Industrial Estate.

The uses in surrounding business facilities are mixed and include manufacturing, engineering services, distribution centres and commercial services.

2.2.2 Residential land

There are residential areas outside the precinct occupied by the Thornton Industrial Estate.

The nearest residential premises are found approximately 350 m to the south-west of the Site, on the southern side of the New England Highway.

There are other residential premises approximately 550 m to the north-west of the Site, and approximately 900 m to the north-east of the Site.

2.2.3 Open space

There is a ribbon of vegetated open space along the northern side of the New England Highway (A43). The open space corridor is approximately 180 m to the south-west of the Site.

KEY

- Project area
- Train station
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- Local government area

Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

0 1 2 km

GDA2020 MGA Zone 56

N

\\emmsvr1\EMM2\2023\E230025 - Thornton Concrete Batching Plant\GIS\02 Maps\G002 RegionalContext 20230427 01.mxd 27/04/2023

Regional context

Thornton Concrete Batching Plant
Figure 2.1

EMM
creating opportunities

KEY

- Project area
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Site location

Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

0 250 500 m

GDA2020 MGA Zone 56

N

Thornton Concrete Batching Plant
Figure 2.2

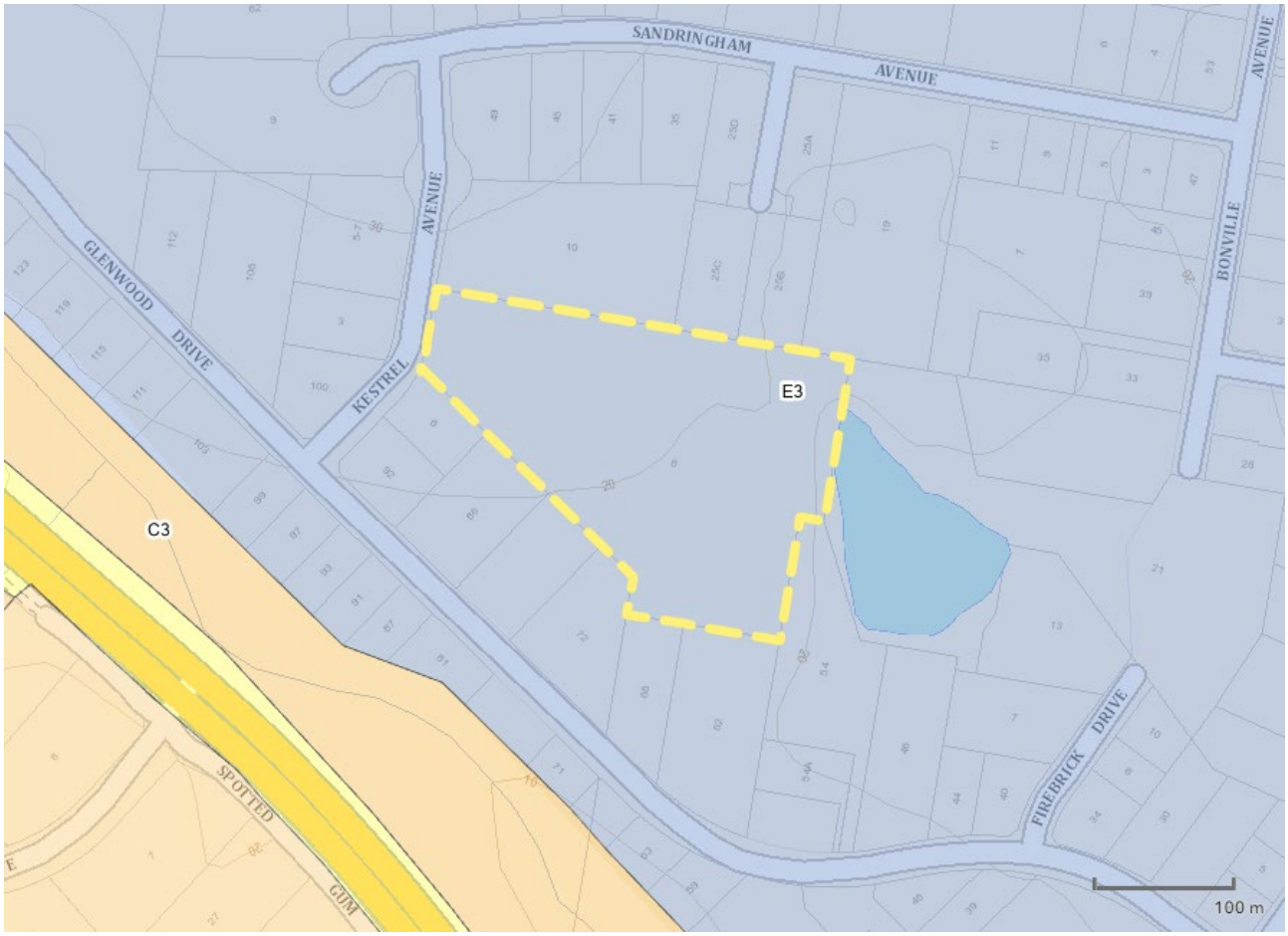
EMM creating opportunities

\\emmsvr1\EMM2\2023\E230025 - Thornton Concrete Batching Plant\GIS\02 Maps\G001 SiteLocation 20230427 01.mxd 27/04/2023

2.3 Land use zoning

The Site is zoned E3 Productivity Support (previously zoned B5 Business Development)[1] under Maitland Local Environmental Plan 2011 (Maitland LEP 2011).

The objectives of the zone and related development controls are considered at Section 4.2 of this Modification Report.



Source: NSW Planning Portal

Figure 2.3 Land use zoning (E3)

2.4 Compliance matters

In response to representations from neighbouring commercial and industrial facilities regarding dust, vibration and noise concerns, Maitland City Council Officers inspected the Site on 19 October 2022 and made a number of observations. Council subsequently contacted RCPA by email on 16 November 2022 seeking details of annual production output and requesting an acoustic report.

Council contacted RCPA again by email on 30 November 2022 to express a view that RCPA's operations were not compliant with the conditions of DA 06-1324, specifically related to the installation of mobile concrete batching machines at the premises.

[1] Zoning changes were made pursuant to Standard Instrument (Local Environmental Plans) Amendment (Land Use Zones) Order 2021.

RCPA undertook actions to investigate the matter and sought an extension of time to provide the items requested by Council. Council agreed to defer compliance action until 9 January 2023 and requested from the owners a proposed date by which the operation of the machines would cease.

On 23 December 2022, RCPA advised Council that the requested documentation would likely be provided to Council by the end of January 2023, and that in the interim RCPA would implement measures to mitigate noise and vibration.

Council responded on 23 December 2022 indicating that it had not received any agreed date by which the operation of the machines would cease and would therefore initiate orders pursuant to Division 9.3 of the EP&A Act. Council also directed that the use of the batching machinery stop as of 23 December 2022, until the land use has been regularised.

In addition, Council issued a Notice of Intention to Give a Development Control Order (ref 2022/347055) to RCPA indicating an intention to issue an Order Item 11 pursuant to section 9.34 of the EP&A Act.

On 23 December 2023, Hall & Wilcox, who act on behalf of RCPA, responded to the Council's email and advised that the Council's Direction to stop use of the batching machinery was invalid due to legal error. They also advised they would respond to the Council's proposed Order in due course.

On 20 January 2023, Hall & Wilcox sent a letter to the Council setting out submissions as to why the proposed Order should not be issued. Hall & Wilcox advised that a planning approval application to regularise the concrete batching plant was being prepared and would be submitted to the Council. Further, RCPA had implemented a number of noise mitigation measures to reduce noise impacts arising from the concrete batching plant.

On 17 March 2023, the Council sent an email to RCPA and Hall & Wilcox to confirm that they would not be proceeding with the Order associated with the Notice of Intention to Give a Development Control Order, issued on 23 December 2022.

Council subsequently issued second a Notice of Intention to Give a Development Control Order (ref 2022/347055) to RCPA on 1 May 2023.

3 Details of the proposed modification

3.1 Overview

RCPA seeks to modify DA 06-1324 to:

- regularise the installation of a concrete batching plant and associated infrastructure outside the RCPA building
- regularise the relocation of pipe testing racks and aggregate storage bins on site
- install an acoustic barrier to mitigate noise impacts on industrial and commercial neighbours
- install additional hardstand along trafficable areas to reduce the air quality impacts associated with raised dust from the currently unsealed areas.

These proposed modifications aim to enable the continued operation of the facility while addressing the concerns of nearby businesses and Maitland City Council in relation to noise, vibration and dust impacts.

3.2 Land use characterisation

Under the Maitland LEP 2011, the forms of possible industrial development include 'general industry', 'heavy industry' and 'light industry'.

The Maitland LEP 2011 defines the term 'industry' as follows:

> ***industry*** means any of the following—
>
> (a) general industry
>
> (b) heavy industry,
>
> (c) light industry,
>
> but does not include—
>
> (d) rural industry, or
>
> (e) extractive industry, or
>
> (f) mining.

3.2.1 Heavy industry

Heavy industry is a defined term, being:

> ***heavy industry*** means a building or place used to carry out an industrial activity that requires separation from other development because of the nature of the processes involved, or the materials used, stored or produced, and includes—
>
> (a) hazardous industry, or
>
> (b) offensive industry.
>
> It may also involve the use of a hazardous storage establishment or offensive storage establishment.
>
> Note— Heavy industries are a type of **industry**—see the definition of that term in this Dictionary.

The terms 'hazardous industry' and 'offensive industry' are also defined as follows:

> ***hazardous industry*** means a building or place used to carry out an industrial activity that would, when carried out and when all measures proposed to reduce or minimise its impact on the locality have been employed (including, for example, measures to isolate the activity from existing or likely future development on other land in the locality), pose a significant risk in the locality—
>
> (a) to human health, life or property, or
>
> (b) to the biophysical environment.
>
> ***offensive industry*** means a building or place used to carry out an industrial activity that would, when carried out and when all measures proposed to reduce or minimise its impact on the locality have been employed (including, for example, measures to isolate the activity from existing or likely future development on other land in the locality), emit a polluting discharge (including, for example, noise) in a manner that would have a significant adverse impact in the locality or on existing or likely future development on other land in the locality.

State Environmental Planning Policy (Resilience and Hazards) 2021 (resilience and Hazards SEPP) considers whether a development proposal is a potentially hazardous and/or offensive development, and if so, are properly assessed in relation to these matters.

The publication *Applying SEPP 33: Hazardous and offensive development application guidelines* (Department of Planning, 2011) can be used to assist in determining whether or not the concrete batching plant is a hazardous or offensive industry. Appendix 3 to the SEPP 33 Guidelines lists industries that may be potentially hazardous or offensive. Potentially offensive industries include 'cement works', which include crushing, grinding and separation works generally as an industry that may be potentially offensive but not potentially hazardous. The proposed development is defined as 'concrete works' and not 'cement works'. The processes involved with the development does not include any crushing or grinding activities. As such, the proposed development is not identified as potentially hazardous or potentially offensive and therefore not subject to the provisions of the Resilience and Hazards SEPP.

Notwithstanding this, as part of the supporting documentation for this modification report, both a noise impact assessment and air quality impact assessment have been undertaken to assess any potential impacts of the development on the locality. Both assessments found that through the implementation of specific environmental management measures, impacts arising from the concrete batching plant can be appropriately mitigated to ensure it does not have a significant adverse impact in the locality.

3.2.2 Light industry

The Maitland LEP 2011 defines 'light industry' as:

> ***light industry*** means a building or place used to carry out an industrial activity that does not interfere with the amenity of the neighbourhood by reason of noise, vibration, smell, fumes, smoke, vapour, steam, soot, ash, dust, waste water, waste products, grit or oil, or otherwise, and includes any of the following—
>
> (a) high technology industry,
>
> (b) home industry,
>
> (c) artisan food and drink industry,
>
> (d) creative industry.

The development at the Site does not meet this classification.

3.2.3 General industry

The Maitland LEP defines 'general industry' as:

> ***general industry*** means a building or place (other than a heavy industry or light industry) that is used to carry out an industrial activity. As the development is not classified as 'heavy industry' and not as 'light industry', the appropriate characterisation is 'general industry'.

3.3 Proposed modifications

3.3.1 Installation of external concrete batching plant

The installation of a concrete batching plant external to the existing building has already occurred, and this modification seeks to regularise that installation.

The location and particulars regarding the concrete batching plant and the associated plant or infrastructure are shown on drawings provided at Appendix D.

3.3.2 Relocation of ancillary infrastructure

The pipe testing racks and aggregate storage bins on site have been relocated from previously approved areas on site to the eastern end of the existing building. The relocation of this ancillary infrastructure has already occurred, and this modification seeks to regularise that relocation. The location and particulars regarding the ancillary infrastructure are shown on drawings provided at Appendix D.

3.3.3 Installation of an acoustic barrier

It is proposed to install a series of six abutting shipping containers to form an acoustic barrier along the perimeter of the Site near the concrete batching plant.

The dimensions of each shipping container are approximately 3 m high, 3 m wide and 12.2 m long.

This achieves an overall lateral length of approximately 73 m.

The containers will be filled with aggregate to improve acoustic performance and to secure the containers in place.

The specific location of the acoustic barrier is shown in the architectural drawings at Appendix D.

3.3.4 Extension of hardstand

The trafficable area on the south-western side of the building is currently unsealed. Sealing of this area to establish a suitable hardstand is proposed to reduce impacts from dust to surrounding receptors prior to the operations exceeding a production capacity of 30,000 tpa or moving to a double shift, 24 hour operation.

This area proposed to be sealed comprises approximately 2,635 m^2.

The specific location of the additional hardstand is shown in the architectural drawings at Appendix D.

3.4 Modification matters

3.4.1 Modification pathway

Section 4.55 of the EP&A act provides for three types of modification:

- 4.55(1) Modifications involving minor error, misdescription or miscalculation

- 4.55(1A) Modifications involving minimal environmental impact
- 4.55(2) Other modifications.

On the basis of the above, we would suggest that the regularisation of the concrete batching plant could be achieved via a Modification of Consent under section 4.55(2) of the EP&A Act.

3.4.2 Substantially the same development

Section 4.55(2)(a) of the EP&A act stipulates that a consent authority may modify the consent if:

> (a) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all)

The development remains substantially the same as the development originally granted in 2000, which is for a concrete manufacturing plant. The facility and the activities of the Site remain as general industries and the installation of the concrete batching function outside, rather than inside, the building does not materially alter the approved development.

The change does not represent a 'radical transformation'. Consistent with case law such as *Vacik Pty Ltd v Penrith City Council* [1992] NSWLEC 8, the development, once modified, will essentially and materially have the same essence and the modified elements do not involve an additional or distinct use.

3.5 Alternatives considered

3.5.1 Do nothing

A 'do nothing' option would render the facility unable to operate. This is because the batching plant machinery is an essential component of production at the facility and inaction regarding the regularisation of the machinery may cause Council to further pursue compliance actions, and therefore compromise the ability of the facility to operate.

Furthermore, Council has recognised the need to regularise the current operations and therefore a 'do nothing' option has not been explored further.

3.5.2 Pre mixed concrete

The use of concrete trucks to deliver pre-mixed concrete to site has been investigated. The use of pre-mixed concrete for the manufacture of concrete pipes does not produce a suitable product for use and does not enable sufficient flexibility in the different concrete mix ratios required to manufacture the range of concrete pipe products produced on site. The reliance on concrete trucks to deliver pre-mixed concrete would result in significant increases in daily truck movements and additional noise impacts that has not been considered.

3.5.3 Acoustic mitigation

In the period since Maitland City Council first contacted RCPA regarding the concerns of neighbouring premises, RCPA has initiated various mitigation measures to reduce the impacts associated with acoustics, vibration and dust arsing from the external concrete batching plant. This includes the installation of acoustic curtains on some components of the concrete batching plant and associated equipment.

These initiatives assisted in mitigating noise impacts however it was considered that further measures, notably an acoustic barrier, would be required to appropriately mitigate noise impacts to neighbours.

4 Statutory context

4.1 Environmental Planning and Assessment Act 1979

4.1.1 Development

The NSW *Environmental Planning and Assessment Act 1979* ('the EP&A Act') includes a definition of 'development' (at section 1.5) being:

> (1) For the purposes of this Act, ***development*** is any of the following—
>
> (a) the use of land,
>
> (b) the subdivision of land,
>
> (c) the erection of a building,
>
> (d) the carrying out of a work,
>
> (e) the demolition of a building or work,
>
> (f) any other act, matter or thing that may be controlled by an environmental planning instrument.
>
> (2) However, development does not include any act, matter or thing excluded by the regulations (either generally for the purposes of this Act or only for the purposes of specified provisions of this Act).

The proposed works at the Site are therefore considered to be development and the EP&A Act and its supporting instruments apply.

4.1.2 Modification provisions

Section 4.55 of the EP&A Act makes provision for the modification of consents.

Three types of modification are possible:

- Section 4.55(1) for correcting misdescriptions etc in a consent
- Section 4.55(1A) for modifications involving minimal environmental impact
- Section 4.55(2) for other modifications.

This application is made pursuant to section 4.55(2).

Section 4.55(2)(a) requires the consent authority to be satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all).

The development, as modified, would remain substantially as the development as originally approved in 2000, which is for a concrete manufacturing plant.

There is no radical transformation of the development. It essentially and materially retains the same essence and overall purpose. The installation of a concrete batching plant outside the building, plus the installation of an acoustic barrier and hardstand, do not significantly alter the scale or operational capacity of the Site. In those circumstances, the fundamental elements of the original approved development is retained.

We recommend that Council form a similar view with respect to section 4.55(2)(a).

4.1.3 Designated development

Under section 4.10 of the EP&A Act, designated development is development that is declared to be designated development by an environmental planning instrument (including the Environmental Planning and Assessment Regulation 2021 ('the EPA Regulation').

Section 17 of Part 2 of Schedule 3 of the EPA Regulation lists the following as designated development:

> **17 Concrete works**
>
> (1) Development for the purposes of concrete works is designated development if the works have an intended production capacity of more than—
>
> (a) 150 tonnes per day, or
>
> (b) 30,000 tonnes per year.
>
> (2) Development for the purposes of concrete works is designated development if the works—
>
> (a) have an intended production capacity of more than 500 tonnes per year, and
>
> (b) are located within—
>
> (i) 100 metres of a natural waterbody or wetland, or
>
> (ii) 250 metres of a residential zone, or
>
> (iii) 250 metres of a dwelling not associated with the development.
>
> (3) This section does not apply to concrete works located on or adjacent to a construction site exclusively providing material to the development carried out on the site—
>
> (a) for a period of less than 12 months, or
>
> (b) if the environmental impacts were previously assessed in an environmental impact statement prepared for the development.
>
> (4) In this section—
>
> *concrete works* means works that produce pre-mixed concrete or concrete products.

Once a development is characterised as being concrete works (or other prescribed development) there needs to be consideration of Part 3 of Schedule 3 of the EPA Regulations, which provides for exceptions to types of designated development.

Part 3 of Schedule 3 articulates (at section 48 of Schedule 3) the circumstances when alterations or additions to development are not designated development:

> (1) Development involving alterations or additions to development, whether existing or approved, is not designated development if, in the consent authority's opinion, the alterations or additions do not significantly increase the environmental impacts of the existing or approved development.
>
> (2) In forming its opinion, a consent authority must consider the following—
>
> (a) the impact of the existing development, including the following—

(i) previous environmental management performance, including compliance with the conditions of any consents, licences, leases or authorisations by a public authority and compliance with any relevant codes of practice,

(ii) rehabilitation or restoration of any disturbed land,

(iii) the number and nature of all past changes and their cumulative effects,

(b) the likely impact of the proposed alterations or additions, including the following—

(i) the scale, character or nature of the proposal in relation to the development,

(ii) the existing vegetation, air, noise and water quality, scenic character and special features of the land on which the development is, or will be, carried out and the surrounding locality,

(iii) the degree to which the potential environmental impacts can be predicted with adequate certainty,

(iv) the capacity of the receiving environment to accommodate changes in environmental impacts,

(c) proposals to mitigate the environmental impacts and manage residual risk,

(d) proposals to facilitate compliance with relevant standards, codes of practice or guidelines published by the Department or other public authorities.

There are two key elements to the above provisions:

- Does the proposed development constitute "alterations and additions to development (whether existing or approved)"?
- If so, do those alterations and additions "significantly increase the environmental impacts" of the total development (that is the existing or approved development together with the additions or alterations) compared with the existing or approved development"?

If the answer to question 1 is "yes" and question 2 is "no", the proposed development satisfies the "alterations and additions" exemption, which means that development does not constitute "designated development".

Question 1: Does the proposed development constitute "alterations and additions to development (whether existing or approved)"?

The proposed development – being changes to the location of the concrete batching plant from within the existing building to the external south-west side of the building, is considered to be an alteration to the existing approved development designed to improve the overall function and efficiency of the approved on site activity.

The answer to Question 1 is therefore "yes".

Question 2: Do those alterations and additions "significantly increase the environmental impacts of the total development (that is the development together with the additions or alterations) compared with the existing or approved development"?

As part of the supporting documentation for this modification report, both a noise impact assessment and air quality impact assessment have been undertaken to assess any potential impacts of the development on the locality. Both assessments found that through the implementation of specific environmental management measures, impacts arising from the concrete batching plant can be appropriately mitigated to ensure it does not have a significant adverse impact in the locality. The results of these assessments are summarised in Chapter 6 with the full Noise and Vibration Assessment (ACA, 2023) provided as Appendix A and Air Quality Assessment (EMM, 2023) provided as Appendix B.

The test for Question 2 is not whether impacts arise, but whether the impacts are increased significantly as a result of the alterations or additions.

Section 48(2) of Part 3 in Schedule 3 of the EP&A Regulation provides that in forming its opinion as to whether or not development is designated development, a consent authority must consider a range of factors. For convenience, these are addressed in Table 4.1.

Table 4.1 Factors to be taken into consideration under EP&A Regulation section 48(2)

Matter	Analysis
(a) the impact of the existing development having regard to factors including:	
(i) previous environmental management performance, including compliance with the conditions of any consents, licences, leases or authorisations by a public authority and compliance with any relevant codes of practice, and	RCPA has received a Notice of Intention to Give a Development Control Order (ref 2022/347055) dated 1 May 2023 regarding the operation of a concrete batching plant. RCPA has received no other regulatory actions regarding the performance of the facilities operations.
(ii) rehabilitation or restoration of any disturbed land, and	The approved development does not include any proposed rehabilitation or restoration works on the site.
(iii) the number and nature of all past changes and their cumulative effects, and	Past changes, notably the addition of awnings and vehicle access doors to the existing building, increasing the hours of operation to 24/7 and increasing production capacity from 30,ooo tpa to 60,000 tpa have not resulted in significant impacts inconsistent with the approved land use.
(b) the likely impact of the proposed alterations or additions including:	
(i) the scale, character or nature of the proposal in relation to the development, and	The proposed modifications are consistent with the host environment, and the existing structures on the Site and surrounds. The proposed modification will not change the approved hours of operation or production throughput.
(ii) the existing vegetation, air, noise and water quality, scenic character and special features of the land on which the development is or is to be carried out and the surrounding locality, and	There are acknowledged to be impacts associated with the concrete batching plant and associated infrastructure with respect to noise, vibration and air quality. As detailed in Section 3.3 and Chapter 6, the proposed development includes mitigation measures to reduce impacts to acceptable levels. There are negligible impacts on other factors such as visual amenity, water quality and scenic character in the precinct.
(iii) the degree to which the potential environmental impacts can be predicted with adequate certainty, and	Environmental impacts for noise and air quality have been prepared by technical experts and the associated modelling and assessment methods can be relied upon.
(iv) the capacity of the receiving environment to accommodate changes in environmental impacts, and	The impacts on the receiving environment, specifically the nearby industrial and commercial premises, are broadly within the guidelines and standards as set by regulators such as the NSW EPA, or represent only marginal exceedances to those guidelines and standards. These exceedances are considered acceptable following the implementation of all feasible and reasonable mitigation measures proposed being implemented.
(c) proposals to mitigate the environmental impacts and manage any residual risk	The proposed modifications include the installation of an acoustic wall and the surface treatment for operational areas where dust may arise through the operation of mobile plant.
(d) proposals to facilitate compliance with relevant standards, codes of practice or guidelines published by the Department or other public authorities.	There are mitigation measures recommended in technical reports for noise, vibration and air quality which facilitate compliance with relevant standards, codes of practice or guidelines published by the Department or other State regulators. The recommendations to be adopted by RCPA have been summarised in Chapter 7.

Consideration of the above matters indicates that the proposed modifications will not significantly increase the environmental impacts of the total development (that is the development together with the additions or alterations) compared with the existing or approved development.

On this basis, the proposed development cannot reasonably be characterised as designated development for the purposes of the EP&A Regulation.

We recommend that Council form a similar view.

4.2 Maitland Local Environmental Plan 2011

4.2.1 Zone objectives

The Site is zoned E3 Productivity Support (previously zoned B5 Business Development)[2] under the Maitland Local Environmental Plan 2011 ('the Maitland LEP 2011').

The zone objectives are:

- To provide a range of facilities and services, light industries, warehouses and offices.
- To provide for land uses that are compatible with, but do not compete with, land uses in surrounding local and commercial centres.
- To maintain the economic viability of local and commercial centres by limiting certain retail and commercial activity.
- To provide for land uses that meet the needs of the community, businesses and industries but that are not suited to locations in other employment zones.
- To provide opportunities for new and emerging light industries.
- To enable other land uses that provide facilities and services to meet the day to day needs of workers, to sell goods of a large size, weight or quantity or to sell goods manufactured on-site.
- To minimise conflict between land uses within the zone and with adjoining zones.

The proposed modifications are consistent with the objectives of the E3 zone.

The consent authority must have regard to the objectives for development in a zone when determining a development application.

4.2.2 Permissibility

The proposed development is characterised as a 'general industry' (refer to Section 3.1 of this Report).

The land zoning table for E3 Productivity Support identifies that 'general industries' are permitted with consent.

4.2.3 Development standards

Part 4 of the Maitland LEP 2011 provides principal development standards. Relevant standards are addressed below.

[2] Zoning changes were made pursuant to Standard Instrument (Local Environmental Plans) Amendment (Land Use Zones) Order 2021

i Height of buildings

Clause 4.3 of the Maitland LEP 2011 provides:

> (1) The objectives of this clause are as follows—
>
> (a) to ensure that the height of buildings complements the streetscape or the rural character of the area in which the buildings are located,
>
> (b) to protect the heritage character and significance of buildings and avoid an adverse effect on the integrity of heritage items,
>
> (c) to ensure that the height of buildings protects the amenity of neighbouring properties in terms of visual bulk, access to sunlight, privacy and views.
>
> (2) The height of a building on any land is not to exceed the maximum height shown for the land on the Height of Buildings Map.

Reference to the Height of Buildings Map indicates that the Site does not have a maximum building height specified.

ii Floor space ratio

Clause 4.4 of the Maitland LEP 2011 provides:

> (1) The objectives of this clause are as follows—
>
> (a) to ensure development is compatible with the streetscape and character of the area by providing an appropriate correlation between the size of a site and the extent of any development on that site.
>
> (2) The maximum floor space ratio for a building on any land is not to exceed the floor space ratio shown for the land on the Floor Space Ratio Map.

Reference to the Height of Buildings Map indicates that the Site does not have a maximum floor space ratio specified.

iii Exceptions to development standards

Clause 4.6 of the Maitland LEP 2011 provides for flexibility in the application of development standards.

This clause is not enlivened as the development complies with the objectives of the relevant development standards and the concurrence of the consent authority to a variation is therefore not required.

4.2.4 Miscellaneous provisions

i Architectural roof features

Clause 5.6 of Maitland LEP 2011 addresses architectural roof features which result in minor encroachments.

This provision is not triggered as the roof features of the facility do not exceed the height limits set under clause 4.3 of the Maitland LEP 2011.

ii Heritage conservation

Clause 5.10 of the Maitland LEP 2011 deals with the conservation of environmental heritage.

The proposed works are not part of a heritage item, an Aboriginal object or within a heritage conservation area. This clause is therefore not triggered by the proposed development.

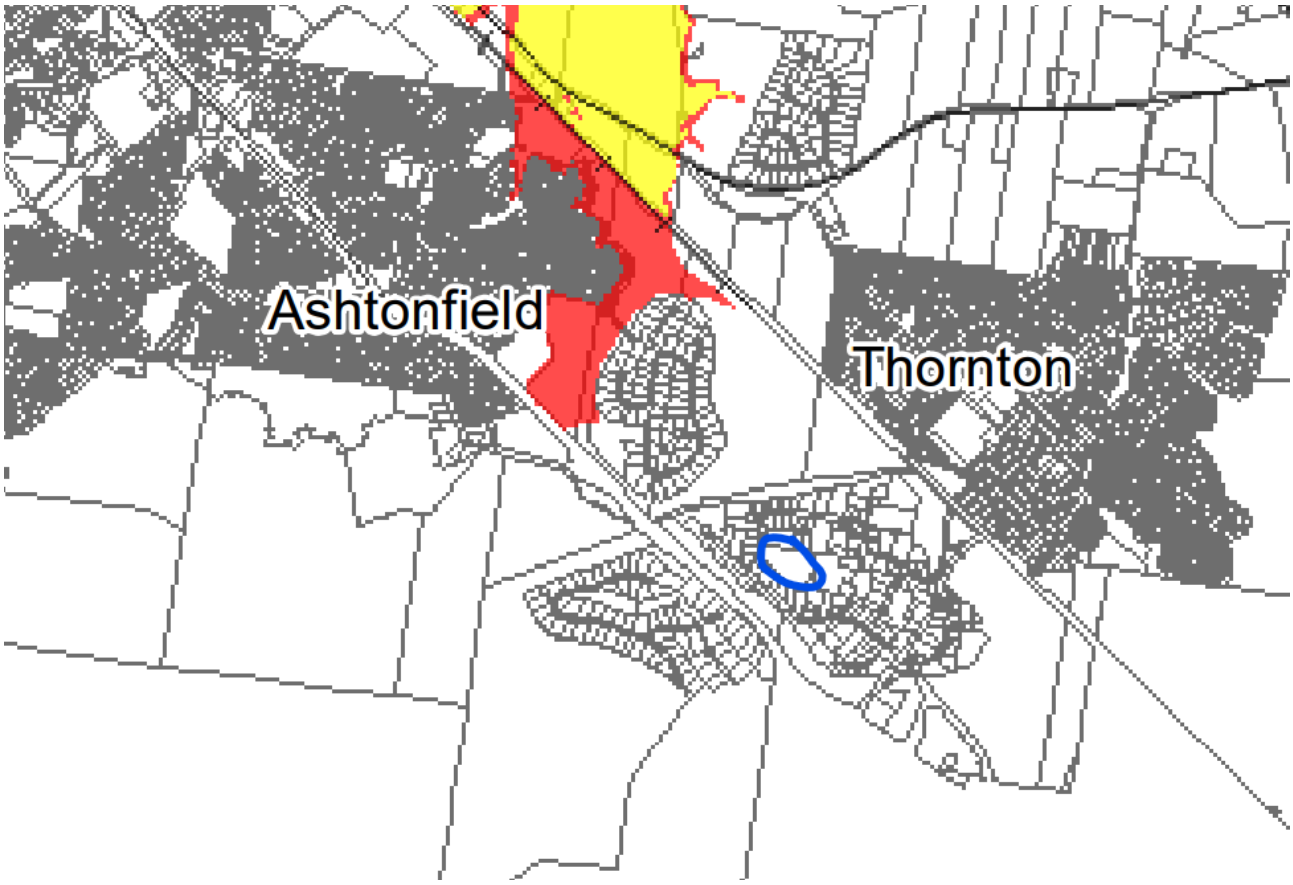
iii Flood planning

Clause 5.21 of the Maitland LEP 2011 deals with flood planning in the local government area (LGA).

The flood planning level for the purposes of development controls under the Maitland LEP 2011 is the 1% Annual Exceedance Probability (AEP) plus 0.5 m freeboard.

Council has adopted the *Hunter River Floodplain Risk Management Study and Plan* (WMA, 2015)

The Site is not identified as being within the flood planning level or within the probable maximum flood area (refer Figure 4.1).



Source: *Hunter River Floodplain Risk Management Study and Plan* (Figure 5); Adapted by EMM

Note: Red indicates PMF; Yellow indicates flood planning area; Site circled in blue

Figure 4.1 Flood mapping

4.2.5 Additional local provisions

i Acid sulfate soils

Clause 7.1 of the Maitland LEP 2011 seeks to ensure minimal disturbance of acid sulfate soils.

The Site is mapped as Class 5 Acid Sulfate Soils under the Maitland LEP 2011.

Specified development on land mapped as Class 5 Acid Sulfate Soils is:

> Works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum and by which the watertable is likely to be lowered below 1 metre Australian Height Datum on adjacent Class 1, 2, 3 or 4 land.

The proposed works are more than 500 m from the nearest land (to the east) mapped as Class 2 Acid Sulfate Soils, and are also unlikely to lower the watertable on those Class 2 lands.

ii Earthworks

Clause 7.2 of the Maitland LEP 2011 applies to earthworks.

No earthworks are required with respect to the proposed modifications.

iii Riparian land and watercourses

Clause 7.4 of the Maitland LEP 2011 applies to land identified as 'watercourse land' on the relevant Watercourse map under the LEP.

The Site is not within 40 m of an identified watercourse, and is therefore not watercourse land, and clause 7.4 does not apply.

The nearest (un-named) watercourse is approximately 170 m to the south-west of the site, near the New England Highway.

iv Significant extractive resources

Clause 7.5 of the Maitland LEP 2011 identifies land that contains significant resources of minerals, petroleum or extractive materials.

The Site is not within land mapped as a Mineral Resource Area under the LEP.

4.3 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* ('the **BC Act**') provides a range of measures and controls to maintain a healthy, productive and resilient environment, based on the principles of ecologically sustainable development (ESD).

Criteria for determining whether a development or activity is likely to significantly affect threatened species or communities is set out in section 7.2 of the BC Act. Under section 7.7 of the BC Act if a proposed development is likely to significantly affect threatened species or communities, the development application must be accompanied by a Biodiversity Development Assessment Report (**BDAR**).

A preliminary assessment of whether the proposed development would significantly affect threatened species or communities and thus require preparation of a BDAR has been undertaken. Refer to Section 6.5 of this Report and in particular Table 6.1.

Note that with respect to the installation of the concrete batching plant outside the building, the requirement is to consider the effect of the installation at the time that the installation occurred. That is, a retrospective assessment is required.

To this end, we rely on advice from Maitland City Council, provided in the Notice of Intention to Give a Development Control Order (dated 23 December 2022) in which Council records are relied upon to show that the installation was made between 9 October 2021 and 12 June 2022. Annexure A to the Council Notice also provides satellite imagery which shows that, at the time of installation, the land which now supports the concrete batching plant and related infrastructure was devoid of vegetation. Refer to Plate 4.1.

Source: Maitland City Council (2022) Notice of Intention to Give a Development Control Order, Annexure A

Plate 4.1 Historical imagery, pre and post installation

The BC Act also gives the Minister for the Environment the power to declare Areas of Outstanding Biodiversity Value. The purpose of declaring Areas of Outstanding Biodiversity Value is to identify, highlight and effectively manage sites that make significant contributions to the persistence of biodiversity in New South Wales, Australia and globally.

Areas of declared critical habitat under the *Threatened Species Conservation Act 1995* (now repealed) have become the first Areas of Outstanding Biodiversity Value in New South Wales.

The Register of Areas of Outstanding Biodiversity Value indicates that the Site is not listed as critical habitat and therefore not within an Area of Outstanding Biodiversity Value.

The proposed modifications do not require the clearing of vegetation.

4.4 Biosecurity Act 2015

The *Biosecurity Act 2015* has superseded the *Noxious Weeds Act 1993*, which has now been repealed. The primary objective of the *Biosecurity Act* is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

The *Biosecurity Act* stipulates management arrangements for weed biosecurity risks in NSW, with the aim to prevent, eliminate and minimise risks. Management arrangements include:

- any land managers and users of land have a responsibility for managing weed biosecurity risks that they know about or could reasonably be expected to know about
- applies to all land within NSW and all waters within the limits of the State
- local strategic weed management plans will provide guidance on the outcomes expected to discharge duty for the weeds in that plan.

The study area is located within the Hunter Local Land Services (LLS) region and is subject to the *Hunter Regional Strategic Weed Management Plan 2017-2022*.

Matters related to weeds are discussed further in Section 6.5.5 of this Report.

4.5 Rural Fires Act 1997

The NSW *Rural Fires Act 1997* (RF Act) aims to prevent, mitigate, and suppress bush and other fires in local government areas of the State. There is a general duty, pursuant to Part 4 of the RF Act, for owners and occupiers of land to prevent bush fires.

The Site is not mapped as Bush Fire Prone Land on the draft *Maitland City Council Bush Fire Prone Land Map* (refer to Figure 6.3) (BFPLM). The draft BFPLM was prepared as required under the EP&A Act section 10.3.

4.6 Water Management Act 2000

The *Water Management Act 2000* (WM Act) regulates the use and interference with surface and groundwater in NSW where a water sharing plan has been implemented. Section 91(2) of the WM Act requires an activity approval for the carrying out of a controlled activity in, on or under waterfront land.

The proposed modifications do not include works within 40 m of a watercourse.

A controlled activity approval is therefore not required pursuant to section 91 of the WM Act.

4.7 Contaminated Land Management Act 1997

The Site is not identified as 'contaminated' under the *Contaminated Land Management Act 1997*.

4.8 Commonwealth legislation

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), actions that may have a significant impact on a matter of national environmental significance (MNES) are 'controlled actions' and require approval from the Commonwealth. MNES include world heritage properties, wetlands of international importance, and listed threatened species and ecological communities.

A search of the EPBC Act Protected Matters mapping facility (13 April 2023) with a specified search area of a radius of 2 km from the Site. The results are presented in Table 4.2.

Table 4.2 Protected matters search results

Protected matter	Result
World heritage properties	0
National heritage places	0
Wetlands of international importance	1
Great Barrier Reef Marine Park	0
Commonwealth marine area	0
Listed threatened ecological communities	4
Listed threatened species	48
Listed migratory species	18
Commonwealth lands	2
Commonwealth heritage places	0
Listed marine species	23
Whales and other cetaceans	0
Critical habitats	0
Commonwealth terrestrial reserves	0
Australian marine parks	0
Habitat critical to the survival of marine turtles	0
Nuclear actions	0
A water resource, in relation to coal seam gas development and large coal mining development	N/A

The wetlands of international importance identified by the search are the Hunter Estuary Wetlands, being within 10 km of the Site.

The Commonwealth lands identified in the search are defence housing facilities within the buffer area (items 11621 and 11628).

Section 6.5 of this Modification Report considers the potential impacts to biodiversity as a result of the proposed modifications and concludes that biodiversity impacts are considered unlikely as the modifications do not require the clearing of any native vegetation and the activities are unlikely to impact threatened species or communities.

As such, the proposed modifications are not considered to have an impact on any of the MNES and, accordingly, a referral to the Commonwealth Minister for the Environment has not been made.

4.9 Local Strategic Planning Statement

Maitland City Council has prepared a *Local Strategic Planning Statement 2040+* (June 2020) for the local government area (LGA).

The Local Strategic Planning Statement (LSPS) gives local effect to the NSW Government's Greater Newcastle Metropolitan Plan 2036 and the Hunter Regional Plan 2036. It defines the Council's long-term vision for land use and infrastructure within the LGA. The LSPS will be the foundation of strategic land use decisions by Council.

The LSPS includes a structure plan (p 31) which confirms the role of the Thornton Industrial Estate as an area for 'employment land'. This land is described as "regionally significant industrial and business cluster that will continue to provide jobs in metro region".

The proposed modifications, being a component of locally significant manufacturing facility, is consistent with the strategic outcomes sought for the precinct.

4.10 Hunter Regional Plan 2041

The Hunter Regional Plan (DPE 2022) provides strategic direction for a number of council areas, including Maitland.

The Plan identifies a regionally significant growth area comprising several precincts with the National Pinch Point. Place strategies include Thornton which has an expressed outcome of "reinforce business and light industrial uses to service the surrounding residential community and to complement services offered at Thornton local centre" (p117).

The proposed modifications are therefore consistent with the strategic intent of the Hunter Regional Plan.

4.11 Greater Newcastle Metropolitan Plan 2036

Greater Newcastle Metropolitan Plan 2036 acknowledges that "Greater Newcastle is the only place in regional NSW where the national road and rail trade routes intersect with an international trade port" (p 13) and that this manifests as a series of trading hubs which support manufacturing and freight.

Thornton Industrial Estate is also positioned next to the key connectivity route (A43 New England Highway) between Maitland and Newcastle.

The proposed modifications are therefore consistent with the strategic intent of the Greater Newcastle Metropolitan Plan 2036.

5 Development control plan

The Maitland Development Control Plan 2011 (Maitland DCP) is the applicable DCP for the proposed modifications.

Relevant provisions are address in Table 5.1.

Table 5.1 Assessment against relevant development controls under Part 6.3 of the Maitland DCP

Relevant development control	Assessment
DCP Part C – Design guidelines	
C5 – Industrial land; Section 2.1 Design and appearance of buildings	
The external walls of industrial buildings shall be of profiled colour-treated cladding or masonry materials, or a combination of both.	No change to authorised development.
Particular consideration shall be given to the design and use of the above materials in the street elevation of industrial buildings, particularly where such buildings are in close proximity to residential or commercial neighbourhoods or front main roads.	No change to authorised development.
Where the side or rear elevation of an industrial building is visible from residential areas, colours and wall profiles should be selected to minimise their visual impact.	Nil visibility from residential areas.
Buildings should be designed to be energy efficient through the use of insulation, correct orientation on the site, passive solar design and other energy saving technologies.	No change to authorised development.
Where the site is liable to flooding, accurate information on ground and building levels should be provided. This should be related to proposed measures for evacuation, safe storage and hazard reduction in the event of a flood.	Site is not flood liable
C5 – Industrial land; Section 2.2 Landscaping	
The following areas of the site shall be landscaped: i. the front setback area to a minimum depth of 5 m ii. the side and rear setbacks if visible from residential areas or a public place iii. the perimeters of open storage areas are to be landscaped as necessary to provide screening from public view iv. car parking areas are to be landscaped to provide shade and to soften the visual impact of parking facilities.	No change to authorised development.
A physical barrier of kerb is to be constructed between all landscaped and grassed areas, and areas for the standing or manoeuvring of vehicles on the site.	No change to authorised development.
Where practicable, parking areas in the front of building could be constructed at a lower level, to increase the effect of frontage mounding and landscaping in screening parking areas.	No change to authorised development.
A detailed plan is to be submitted with the development application and is to show the location and species of all planting and all other landscaping works to be carried out. In this regard Australian native plants will grow faster and require less attention than introduced species. A brochure of suitable species for the Maitland area is available from Council.	No change to authorised development.

Table 5.1 Assessment against relevant development controls under Part 6.3 of the Maitland DCP

Relevant development control	Assessment
Landscaping treatment should be designed to complement any existing vegetation and any landscaping of roads and other public spaces.	No change to authorised development.
C5 – Industrial land; Section 2.3 Vehicular access	
Access drives shall have a minimum width of 6 m (Note: Major traffic generating developments may require a greater access width, divided at the property line).	Compliant. No change to street ingress/egress. Internal circulation road has a minimum width of 10.3 m.
Access drives shall not be located in close proximity to an intersection.	No change to authorised development.
Loading and unloading facilities appropriate to the particular development are to be provided on site such that service vehicles are located wholly within the site, and do not create conflicts with parking areas.	Compliant. The loading facilities associated with the concrete batching plant accommodate service vehicles within the site and do not conflict with parking areas.
C5 – Industrial land; Section 2.4 Parking	
Vehicular Access and Car Parking for number of parking spaces required.	No change to authorised development.
All car parking facilities shall be located behind the front 5 metre landscaped area.	No change to authorised development.
Where it is proposed to locate parking facilities behind an industrial building or to the rear of an industrial site, separate provision for visitor parking shall be made in front of the building and behind the front 5 metre landscaped area.	No change to authorised development.
Car parking bays are to have a minimum construction standard of a two coat bitumen seal, be clearly delineated, and have dimensions of 2.6 m width x 5.5 m length.	No change to authorised development.
C5 – Industrial land; Section 2.5 Setbacks	
Front building setback shall be determined on the following criteria: i. Provision of landscaped area to a minimum depth of 5 m ii. Provision of car parking facilities iii. Building height, bulk and layout; iv. The nature and needs of the industrial activity; v. The general streetscape.	No change to authorised development.
Side and rear setbacks shall be as specified by the Building Code of Australia.	No change to authorised development.
C5 – Industrial land; Section 2.6 Storage areas	
External storage areas are to be located to the rear or the site and be screened from public view by means of fencing and/or landscaping.	No change to authorised development.
C5 – Industrial land; Section 2.7 Advertising signs	
Advertising signs and structures shall be of a size, colour and design which is compatible with the building to which they relate and is streetscape.	No change to authorised development.
Advertising signs and structures may be located as prescribed.	No change to authorised development.

Table 5.1 Assessment against relevant development controls under Part 6.3 of the Maitland DCP

Relevant development control	Assessment
C5 – Industrial land; Section 2.8 Drainage	
On-site detention of stormwater is required in accordance with Council's Manual of Engineering Standards, to restrict the discharge rate of stormwater runoff. The methods may include tanks (either underground or aboveground) or surface storage areas such as driveways	No change to authorised development.
Ultimate discharge for collected stormwater runoff should be to a street drainage system, to an inter allotment drainage line, or by approval to a public area. The system should be gravity-drained. Pumping of stormwater is not permitted.	No change to authorised development.
Pollutants carried in stormwater runoff, generated from building activity, vehicle parking, manoeuvring, and hardstand areas should be assessed for the potential adverse effects of sediment movement (by wind, water and wheel tracking), and vehicle-sources hydrocarbon pollution. Appropriate measures must be taken to contain pollutants, both during construction and long term permanent treatments. Reference should be made to Landcom/Department of Housing guidelines "Managing Urban Stormwater". An Erosion and Sediment Control Plan should be prepared as part of the drainage design for the site.	No change to authorised development.
C5 – Industrial land; Section 2.9 Security fencing	
Security fencing, wherever possible, is to be located within or behind the front 5 metre landscaped area.	No change to authorised development.
C5 – Industrial land; Section 2.10 Compatibility	
Windows, doors and other wall openings should be arranged to minimise noise impacts on residences, where an industry is located within 400 metres of a residential zone	No change to authorised development.
External plant such as generators, air conditioning plant and the like should be enclosed to minimise noise nuisance.	Non-compliant. Specific aspects of the concrete batching plant (such as the aggregate weighting system) have been enclosed with noise curtains and conveyors are covered, however it is not feasible to enclose the concrete batching plant in its entirety. Refer to Section 5.1.2 of this Modification Report.
External and security lighting should be directed and shielded to avoid light spillage to adjoining residential areas.	No change to authorised development.
Driveways should be arranged or screened to avoid leadlight glare on residential windows.	No change to authorised development.
Hours of operation may be limited if extended operation is likely to cause a nuisance to adjoining residential areas (including nuisance from traffic).	No change to authorised development.

5.1.2 Non-compliant aspects

The proposed modifications do not comply with the provision at DCP Part C5 Industrial land; Section 2.10 Compatibility.

That provision stipulates:

> External plant such as generators, air conditioning plant and the like should be enclosed to minimise noise nuisance.

Although aspects of the concrete batching plant (such as the aggregate weighting system) have been enclosed with noise curtains, and conveyors are covered, it is not feasible to enclose the concrete batching plant in its entirety.

DCP Part A1; Section 1.7 nevertheless provides:

> Council may consent to an application that departs from the provisions of this DCP. In this case, the request for a departure shall be in writing (either as part of the Statement of Environmental Effects or a separate submission) justifying the need for the departure. Such justification may necessitate the need for additional plans, photomontages and the like, or additional studies and reports such as traffic or car parking studies.
>
> Any departure from this DCP will only be considered where it can be demonstrated to the satisfaction of the consent authority that the departure has merit.

This section of the Modification Report therefore formally requests a departure from the provision (at DCP Part C5 Industrial land; Section 2.10 Compatibility) in relation to the proposed modifications. The merit considerations are examined below.

The justification does not, in our view, require additional plans, montages etc. Rather, the justification is based on a closer examination of the intent of the DCP provision.

i Merit considerations

The DCP objectives for land zoned industrial or B5 Business development are:

> a. To encourage growth in the industrial sector, provided that new industrial development does not present unacceptable risks to residential areas or other land by way of pollution, hazards or otherwise.
>
> b. To encourage applicants to act in their own interests by submitting fully substantiated and documented proposals, including hazards analysis where appropriate.
>
> c. To encourage a process which minimises problems with development proposals, through appropriate consultation prior to applications being submitted.
>
> d. To provide general guidelines for applications for designated development, as to matters to be addressed in Environment Impact Statements.
>
> e. To assist applicants by minimising duplication of documentation required under other laws (pollution control, occupational health and safety etc.).
>
> f. To encourage visual and operational compatibility between industrial development and residential areas.
>
> g. To encourage improvements to the character and appearance of industrial estates, including the inclusion of development appropriate landscaping elements.

These objectives primarily focus on risks and hazards which may impact residential zones.

A range of measures have been identified that will be implemented by RCPA to mitigate the impacts of the development on surrounding receptors. These mitigation measures are summarised in Chapter 7 and include construction of an acoustic barrier along the perimeter of the Site near the concrete batching plant and sealing an existing unsealed area to establish a suitable hardstand prior to the operations exceeding a production capacity of 30,000 tpa or moving to a double shift, 24 hour operation.

With the implementation of the proposed mitigation measures, there is negligible impact from the proposed development, and the development does not present unacceptable risks to residential areas or other land by way of pollution, hazards or otherwise.

Furthermore, while a concrete batching plant is, by definition, an item of 'plant', the intention of DCP Part C5 Industrial land; Section 2.10 Compatibility is unlikely to have sought to require all external plant to be enclosed. This is evidenced by the examples noted such as air conditioning units and generators. These are small items of external plant, and easily enclosed in most cases. Concrete batching plants are rarely enclosed due to their size and operational needs. There are numerous examples of unenclosed concrete batching plants in the Maitland LGA, including within the Thornton Industrial Estate.

We therefore suggest that this non-compliance merely arises due to the wording, rather than the policy intent, of the DCP provision. We recommend that Council form a similar view.

6 Impact assessment

6.1 Noise

6.1.1 Background

Acoustics Consultants Australia (ACA) was initially engaged by RCPA in November 2022 to evaluate noise and vibration emissions from the site in response to complaints received by Maitland City Council from the operators of the adjoining commercial premises located at 82 Glenwood Drive.

Site visits and noise and vibration measurements were undertaken on Thursday 10 November 2022 between approximately 7.00 am and 3.00 pm and again on Wednesday 16 November 2022 between approximately 10.00 am and 2.00 pm to evaluate noise and vibration emissions from the site.

The initial measurements indicated an exceedance of the EPA's Noise Policy for Industry (NPfI) recommended noise levels at the site's south-west boundary, but no exceedance of the vibration criteria recognised by the EPA's vibration guidelines.

In response to the identified noise exceedance, RCPA has undertaken significant modifications to its manufacturing process and has implemented a number of noise mitigation measures on site to reduce noise emissions from the operation of its fixed plant.

A subsequent site visit was undertaken by ACA on 17 January 2023 to re-evaluate the RCPA noise emissions following the installation of the noise mitigation treatments. This determined that the implemented noise mitigation measures are effective in significantly reducing noise levels from the fixed plant, but further treatment was necessary to reduce noise levels from mobile plant items.

6.1.2 Methodology

Potential noise and vibration impacts associated with the site's proposed operational activities have been assessed in accordance with the following NSW Government guidelines:

- NSW Noise Policy for Industry (NPfI, EPA 2017) for the assessment of the operational noise
- NSW Road Noise Policy (RNP, DECCW 2011) for the assessment of the off-site traffic noise on public roads
- Assessing Vibration: A Technical Guideline (AVTG, DEC 2006) for the assessment of human response to vibration.

The following international standards have additionally been considered:

- British Standard BS7385-2:1993 Evaluation and Measurement for Vibration in Buildings, Part 2 -Guide to Damage Levels from Ground Borne Vibration (1993)
- German Standard DIN4150:1999 Structural Vibration - Effects of Vibration on Structures (1999).

Noise sources are identified as the concrete batching plant (including the sand and aggregate hopper, overhead aggregate bins and conveyors) as well as mobile plant and equipment such as forklifts and trucks.

Assessments for residential receptors considered three periods being:

- Daytime: 7.00 am–6.00 pm
- Evening: 6.00 pm–10.00 pm
- Night-time: 10.00 pm-7.00 am.

The assessment for schools and commercial or industrial receptors was based on periods when those premises are in use.

A Noise and Vibration Assessment has been prepared by Acoustic Consultants Australia (ACA) and is provided at Appendix A.

6.1.3 Sensitive receptors

The closest residential area is to the south-west of the site beyond the intervening New England Highway. Dwellings in this area are setback from the RCPA site boundary by distances of >350 m and are exposed to appreciable levels of road traffic noise from the highway. Other residences to the south-west are slightly further away (450 m or more) and to the north-west (550 m or more from the boundary of the RCPA site.

Thornton Public School, is located approximately 1 km to the north-east of the RCPA site.

Aspect Hunter School, is located approximately 560 m to the north-east of the RCPA site.

The site is adjoined to the north and east by other industrial uses, with a mix of industrial and commercial uses to the south and south-west.

The closest commercial/industrial receivers:

- 82 Glenwood Drive – Commercial/Industrial Business Units
- 86 Glenwood Drive – Valley Kitchens & Joinery
- Kestrel Avenue – Valley Air Conditioning
- 3 Kestrel Avenue – National Mining Services Offices
- 8 Kestrel Avenue – ArmorGalv (Industrial Workshop)
- 25 Sandringham Avenue – Aggreko (Industrial Workshop)
- 29 Firebrick Drive – Steelline Hunter (Industrial Workshop)
- 46 Glenwood Drive – Becker Mining (Industrial Workshop)/Hunter Concrete Batch Plant
- 62 Glenwood Drive – Neumann Steel (Industrial Workshop)
- 72 Glenwood Drive – Hyva Hydraulics (Industrial Workshop).

It is noted that the closest commercial receiver at 82 Glenwood Drive is situated at a lower elevation with respect to the RCPA site, with a 4-5 m high retaining wall separating the two sites.

6.1.4 Assessment

Initial inspections of the RCPA Thornton site were undertaken on Thursday 10 November 2022 between 7.00 am and 2.00 pm and on Wednesday 16 November 2022 between 10.00 am and 2.00 pm to evaluate noise and vibration levels against the noise and vibration criteria.

During these site visits ACA undertook a series of observations and noise and vibration measurements during the operation of the concrete pipe production machinery. Observations and noise measurements were made on the RCPA site at the south-western site boundary adjacent to the neighbouring commercial warehouse at Unit 3, 82 Glenwood Drive. Additionally, on Wednesday 16 November 2022 observations and noise and vibration measurements were made within the commercial warehouse at Unit 3, 82 Glenwood Drive.

Measurements were conducted generally over 15-minute intervals at the monitoring locations. During the measurements, meteorological conditions were generally suitable for noise monitoring, with no rain or winds exceeding 5 metres per second.

Further assessment by ACA was undertaken after RCPA sought to address noise and vibration concerns by introducing a number of operational improvements, such as:

- walls of the annex building housing the pipe machine substantially internally lined with acoustic absorption to minimum thickness of 150 mm
- aggregate bin vibrator disabled and its use discontinued
- vibrator on conveyor to overhead aggregate bin disabled and use discontinued
- vibrator on conveyor to overhead mixer disabled and use discontinued
- overhead aggregate bin vibrator disabled and replaced with pneumatic vibrator
- Flexshield curtains installed beneath overhead aggregate bin (installed to all sides including rear of the hopper in order to substantially enclose the operational pneumatic vibrator)
- Flexshield curtains installed over hydraulic pump room perforated roller shutter door (closely fitted to reduce noise breakout)
- roller shutters and external doors to main factory kept normally closed.

A detailed Noise and Vibration Assessment (ACA, 2023) was prepared to support the modification and is provided as Appendix A. The Noise and Vibration Assessment was prepared with consideration to the following operational noise and vibration policy/guidelines and international standards:

- NSW Environment Protection Authority (EPA) Noise Policy for Industry (NPfI)
- NSW Road Noise Policy (RNP)
- NSW EPA Assessing Vibration a Technical Guideline (AVTG)
- British Standard BS7385-2:1993 Evaluation and Measurement for Vibration in Buildings, Part 2 -Guide to Damage Levels from Ground Borne Vibration (1993)
- German Standard DIN4150:1999 Structural Vibration - Effects of Vibration on Structures (1999).

The noise modelling results presented in the Noise and Vibration Assessment indicate the proposed modifications may be expected to operate in compliance with the Noise Policy for Industry (NPfI) Project Noise Trigger Levels (PNTLs) and sleep disturbance screening levels at the residential areas in the vicinity of the Site and therefore residential impacts would not be anticipated.

At the closest commercial receivers to the south-west, with the inclusion of the 50 m long 2.9 m high acoustic barrier, a residual exceedance of the adopted project amenity level by up to 4 dB may be anticipated. it should be noted that whilst the adopted project amenity level of LAeq,15min 63 dBA is predicted to be exceeded by up to 4 dB, the recommended amenity level of LAeq,15min 68 dBA (i.e. LAeq,Period 65 dBA + 3 dB) is expected to be met. Regarding the significance of the residual exceedance at the closest commercial receiver, the NPfI identifies that the residual exceedance is considered marginal only.

6.1.5 Mitigation measures

To further reduce noise levels at 82 Glenwood Drive and adjacent commercial and industrial premises, RCPA proposes to install an acoustic barrier along the south-western perimeter of the Site.

The installation of the acoustic barrier forms part of the modification application and is discussed in further detail in Section 3.3.3.

If a further reduction in off-site noise emissions is sought it is recommended RCPA:

- undertake review of externally operated mobile plant noise emissions and where feasible implement engineering controls, such as engine exhaust mufflers to reduce noise emissions from these items
- ensure staff and contractors are briefed on the importance of minimisation of noise from the site, adhering to good driving practices on-site and limiting the use of horns etc
- ensure vehicles accessing the site are generally well maintained and serviced to minimise their noise emissions
- switch off truck engines when not in use
- maximise the offset distance between noisy plant items at the south-west site boundary where practicable
- minimise noise breakout by continuing to keep factory doors normally closed (within the south-western façade of the RCPA building)
- consider the further use of local barriers and/or mass loaded vinyl curtains (e.g. Flexshield PVC Curtains or Flexshield Sonic Clear Ribbed Curtains), around the batch plant conveyors with a view to further reduce batch plant noise emissions
- consider the further use of absorptive internal linings within the hydraulic room to reduce noise breakout (or alternately consider replacing the existing louvre with an acoustically rated type).

6.2 Air quality

An air quality impact assessment (AQIA) has been prepared which documents the existing air quality and meteorological environment, applicable impact assessment criteria, air pollutant emissions calculations, dispersion modelling of calculated emissions and provides an assessment of predicted impacts relative to criteria.

The applicable assessment guidelines are provided by the NSW EPA in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA 2022).

A copy of the AQIA, prepared by EMM Consulting Pty Ltd (EMM), is provided at Appendix B.

6.2.1 Methodology

Local meteorological conditions and background air quality were quantified primarily using data from the Department of Planning and Environment (DPE) automatic weather station (AWS) and air quality monitoring station (AQMS) at Beresfield, with additional inputs from the Bureau of Meteorology (BoM) AWS at Williamstown RAAF base.

Emissions estimation and dispersion modelling was completed for existing and proposed future scenarios. Emissions of total suspended particulates (TSP), particulate matter less than 10 micrometres (µm) in aerodynamic diameter (PM_{10}), and particulate matter less than 2.5 µm in aerodynamic diameter ($PM_{2.5}$) were estimated and modelled. The atmospheric dispersion of air pollutant emissions was simulated using the AERMOD model.

Proposed mitigation measures (principally water carts, water sprays and additional road paving) were incorporated into the emissions calculations and dispersion modelling conducted.

To assess the potential impacts associated with the modification, two emissions scenarios were configured, accounting for the following:

- Scenario 1 – single shift (12-hour day) operations at the site, with a proposed annual concrete production rate of 12,500 m^3 per year (30,000 tonnes per annum (tpa)) – without the inclusion of additional proposed paved section.
- Scenario 2 – double shift (24-hour day) operations at the site, with a proposed annual concrete production rate of 25,000 m^3 per year (60,000 tpa) – with additional proposed paved section of currently unpaved access roads between sand and aggregate storage bays and connecting with the current paved site entry/exit onto Kestrel Avenue.

The sources of atmospheric emissions associated with the site, and incorporated for assessment purposes, include:

- the movement of vehicles across paved and unpaved surfaces around the site (e.g. raw material delivery, forklift and FEL movements, pipe product transport truck movements)
- unloading of sand and aggregate material to the raw material stockpiles
- transfer of cement to silos under vacuum
- concrete batching processes (weigh hopper, conveying and central mixing)
- wind erosion from stockpiles and exposed surfaces
- diesel fuel combustion by on-site equipment and trucks.

6.2.2 Assessment

The results of the modelling show that the predicted concentrations and deposition rates for incremental particulate matter (TSP, PM_{10}, $PM_{2.5}$ and dust deposition) were below the applicable impact assessment criteria at all assessment locations for both single shift operations without further proposed mitigation and double shift operations with proposed mitigations implemented.

The results of the AERMOD dispersion modelling highlighted the following:

- Single shift operations at the site are not predicted to result in any additional exceedance of applicable 24-hour average criterion for PM_{10} and $PM_{2.5}$ criteria at any surrounding assessment locations under current site configuration.

- Double shift operations at the site are not predicted to result in any additional exceedance of applicable 24-hour average criterion for PM_{10} and $PM_{2.5}$ criteria at any surrounding assessment locations with the inclusion of a paved road section between the sand and aggregate storage bays and the currently paved site entry/exit onto Kestrel Avenue.

- Cumulative annual average concentrations of TSP, PM_{10} and $PM_{2.5}$ are predicted to comply with applicable impact assessment criterion for single shift days under current procedures, and for double shift days following the inclusion of the proposed paved section.

On the basis of the predicted compliance with applicable NSW EPA impact assessment criteria, it is considered that the mitigation measures are appropriate for the management of particulate matter emissions and impacts during operation of the site.

6.2.3 Mitigation measures

A number of emission reduction initiatives are proposed to continue for the site during operations. The operational measures (and the emission reduction factor applied to assess impacts) are:

- use of sweepers on paved roads and surfaces (Scenario 2 only) – 70% reduction for sweeping (US-EPA 2006)

- use of water carts on unpaved roads and yard area – 75% reduction for water application (NPI 1999)

- cement silo loading under vacuum – controlled emission factors applied for pneumatic loading of silos

- water sprays at storage bunkers – 50% reduction for water applications and 70% for three-sided walls (NPI 1999) – combined reduction factor of 85% applied

- acoustic cladding at sand/aggregate transfer hopper – 70% reduction applied (NPI 1999)

- enclosure at weigh hopper and central mix loader – 90% reduction applied (NPI 1999).

In addition to the mitigation measures above, sealing of approximately 2,635 m^2 of current unsealed trafficable areas, prior to production exceeding 30,000 tpa or moving to a double shift 24-hour operation will be implemented as discussed in further detail in Section 3.3.4.

6.3 Greenhouse gases

6.3.1 Assessment

The relevant workbook for estimating greenhouse gas emissions is the *Australian National Greenhouse Accounts Factors* (Commonwealth of Australia 2022).

Factors such as transport fuel combustion, stationary energy sources and fugitive emissions are not varied due to the proposed modifications as the modifications are to approved design and drawings, and do not require demolition or duplication of energy or materials consumption.

The proposed modifications do not materially alter the operations of the approved facility and therefore generate negligible direct or indirect greenhouse gas emissions.

6.3.2 Mitigation measures

Management measures available to further minimise greenhouse gas emissions include:

- on-site equipment will be regularly maintained and serviced to maximise fuel efficiency
- vehicle kilometres travelled on site will be minimised
- energy efficiency will be progressively reviewed and implemented throughout the life of the facility.

6.4 Visual

6.4.1 Existing environment

The local industrial and business precinct is broadly defined as being within a triangle of land, roughly 1 km^2, between New England Highway, Thornton Road and the Hunter Rail Line.

The entire area is characterised by industrial buildings which support engineering, manufacturing, vehicle repair services, hardware, warehousing and related business services. The bulk, scale and materiality of the RCPA facility is consistent with the scale and design of other buildings within the estate. Refer to Photograph 6.1.

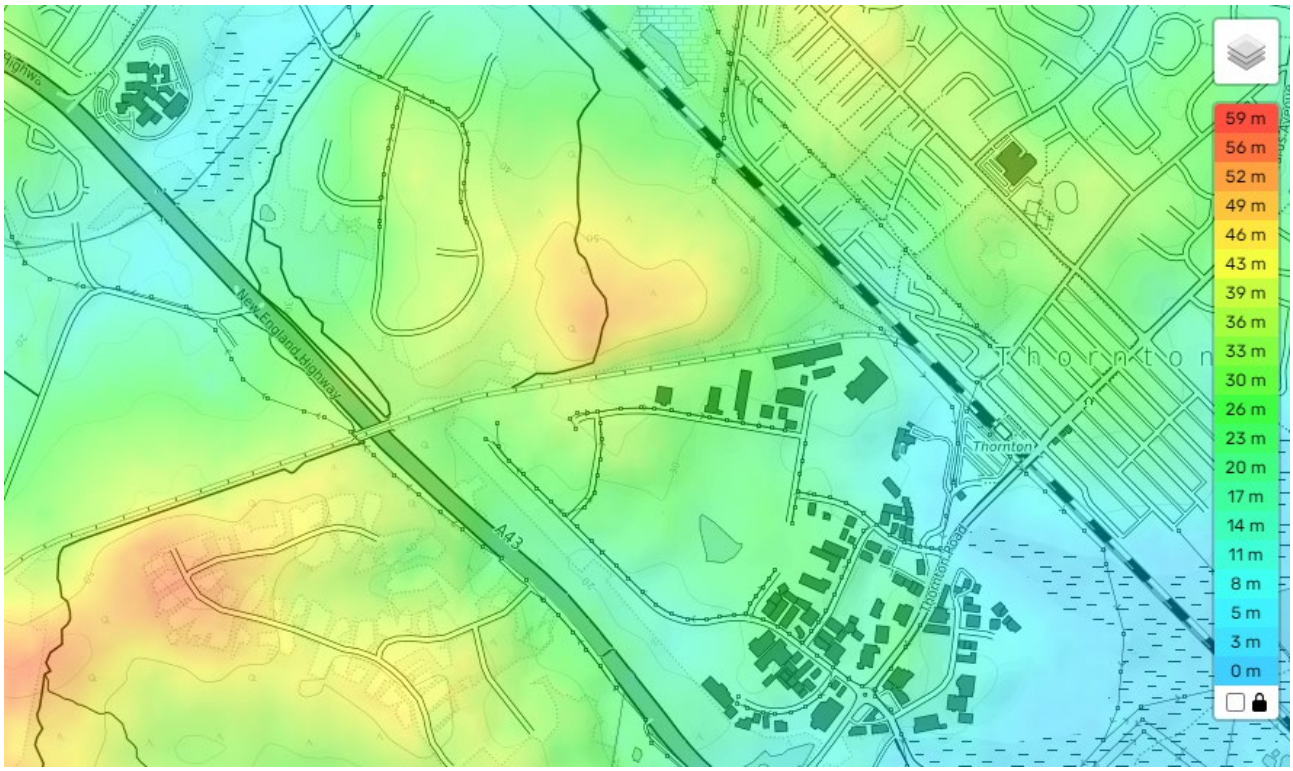
Source: EMM (J Wearne)

Photograph 6.1 The existing RCPA facility

The topography is generally flat to undulating. The local elevated areas are illustrated in Figure 6.1.

The elevated point to the north of the Site comprises vacant land and is heavily vegetated. There is no feasible view line to the Site from this elevated area.

The elevated area to the west of the Site is the large lot residential area at the intersection of Barrington Grove and Parish Drive, Thornton. This area is approximately 1.2 km to the west of the Site and remains landscaped with mature vegetated, and hence there is no feasible view line to the Site from this elevated area.



Source: topographic-map.com

Figure 6.1 Local topography

There are no publicly promoted lookouts in the vicinity. The Bolwarra Heights Lookout is 10 km to the north-west and the Mt Sugarloaf Lookout is approximately 15 km to the south-west. Neither lookout will have views impacted by the proposed modifications.

6.4.2 Sensitive receptors

The only receptors with a viewshed that includes some of the proposed modifications are the commercial and industrial receptors along Glenwood Drive. These receptors have a potential view line to proposed acoustic barrier comprising shipping containers.

The two closest receptors – 82 Glenwood Drive and 86 Glenwood Drive – are situated approximately 4 m below the RCPA land due to former subdivision earthworks and the installation of a retaining wall separating the lots. The dominant element in their viewshed is, and will continue to be, the retaining wall.

Furthermore, those closest receptors are noted to have no fenestration facing the retaining wall and the acoustic barrier; and there are stands of mature trees along the boundary which will filter any line of sight (from the carpark areas) towards the acoustic barrier. Refer to Photograph 6.2 and Photograph 6.3.

Source: EMM (J Wearne)

Photograph 6.2 View to 82 Glenwood Drive

Source: EMM (J Wearne)

Photograph 6.3 View to 86 Glenwood Drive

6.4.3 Assessment

Considering the generally industrial character of the host environment, the structural elements of the proposed modifications are considered to be generally of low contrast and sufficiently integrated to the existing visual landscape.

The limited number of sensitive visual receptors, and the non-dominant nature of the proposed new elements, which are further mitigated by vegetation filtering any line of sight towards the new structures, suggest that the visual effect of the modifications will be low.

The overall visual impact is therefore rated as low.

6.4.4 Mitigation measures

As the potential overall visual impact of the proposed modification on visual amenity is considered low, no additional management measures to mitigate the risk of visual amenity impacts are considered necessary.

6.5 Biodiversity

A desktop assessment was undertaken noting that satellite imagery (refer to Plate 4.1) has identified an absence of vegetation in the locations where works are proposed.

The desktop assessment comprised database searches and review of relevant information, including:

- a search of the Protected Matters Search Tool, managed by DAWE, for matters protected by the EPBC Act
- a search of the BioNet Atlas of NSW Wildlife, managed by the Biodiversity Conservation Division (BCD) of the Department of Planning and Environment (DPE), for threatened species and communities listed under the BC Act and EPBC Act.

The land is not biodiversity certified under Part 8 of the Biodiversity Conservation Act 2016 ('the BC Act').

The land is not subject to a biodiversity stewardship agreement under Part 5 of the BC Act.

6.5.1 Habitat and vegetation

There is no loss of habitat due to the proposed modifications.

The site is already highly modified and the area the subject of the modifications does not require the removal of native vegetation.

No local environmental plan or draft local environmental plan identifies the land as including or comprising critical habitat.

As noted in Section 4.3, the assessment needs to consider, from a retrospective view, whether at the time of the installation of the concrete batching plant and associated infrastructure, habitat or vegetation was lost.

Aerial photography (refer to Plate 4.1) confirms that the location of the current concrete batching plant and associated infrastructure did not support any vegetation at the time the works were undertaken.

6.5.2 Threatened species and communities

A search of the Bionet database (17 April 2023) for an area of 10 km around the Site. Key results are noted below.

i Threatened species

Key threatened or vulnerable fauna species are recorded as follows:

- Green and golden bell frog (*Litoria aurea*) is listed as endangered (NSW) and vulnerable (Commonwealth). The nearest record of presence is in Metford, approximately 2.5 km to the north-west of the Site.
- Magpie goose (*Anseranas semipalmata*) is listed as vulnerable (NSW). The nearest record of presence is in Beresfield, approximately 3 km to the south-east of the Site.
- Blue-billed duck (*Oxyura australis*) is listed as vulnerable (NSW). The nearest record of presence is in Four Mile Creek, approximately 4.5 km to the south-west of the Site.
- Freckled duck (*Stictonetta naevosa*) is listed as vulnerable (NSW). The nearest record of presence is in Beresfield, approximately 4 km to the south-east of the Site.
- Wompoo fruit dove (*Ptilinopus magnificus*) is listed as vulnerable (NSW). The nearest record of presence is in Chisholm, approximately 3 km to the north of the Site.
- White-throated needletail (Hirundapus caudacutus) is listed as vulnerable (Commonwealth). The nearest record of presence is in Thornton, approximately 1.5 km to the south-west of the Site.

ii Communities

None of the listed communities are within the Site or within 1 km of the Site.

iii Endangered populations

The Bionet search identified that the *Eucalyptus camaldulensis* population in the Hunter catchment is a local endangered population. One mapped occurrence is located approximately 900 m north-east of the Site, near Beyer Road, Thornton.

The listed threats to this population include loss of soil moisture, hydrological changes and modification of the flooding regime. The threats do not include impacts associated with the proposed modifications.

6.5.3 Assessment of significance

The BC Act requires consideration of a range of matters. These are itemised in Table 6.1.

Table 6.1 Assessment of significance

Criterion	Assessment
The proposed development is likely to significantly affect threatened species or ecological communities, or their habitats, according to the test in Section 7.3 of the BC Act.	Assessments of significance have been prepared in accordance with *Threatened Species Test of Significance Guidelines* (OEH 2018) and are provided in Table 6.2. These assessments have determined that the modification will not result in a significant effect on threatened species or communities.
The development exceeds the biodiversity offsets scheme thresholds outlined in Section 7.1 of the BC Regulation: • it involves clearing of native vegetation that exceeds the threshold for clearing	The proposed development does not require the clearing of native vegetation. The historical installation of the concrete batching plant also did not, at the time, require the clearing of native vegetation (refer to Plate 4.1).
• clearing of native vegetation on land included in the Biodiversity Values Map.	The Site is not located on land mapped on the Biodiversity Values Map.
The site is a declared area of outstanding biodiversity value.	The Site is not located in an area of outstanding biodiversity value.

Section 7.2 of the BC Act sets of the test for determining whether proposed development is likely to significantly affect threatened species or ecological communities, or their habitats. This is often referred to as 'the five part test'. Each matter pursuant to section 7.2 of the BC Act is addressed in Table 6.2.

Table 6.2 Five part test

Criterion	Assessment
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	Threatened species are not mapped as being present on the Site and the land does not support habitat for threatened species. The development is not likely to have an adverse effect on the life cycle of the species.
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity— (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	Endangered ecological communities are not mapped as being present on the Site. The development is not likely to have an adverse effect on the extent of an endangered ecological community, nor to substantially and adversely modify the composition of an ecological community.
(c) in relation to the habitat of a threatened species or ecological community— (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	No habitat of a threatened species or ecological community is to be removed or modified, fragmented or isolated as a result of the proposed development.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	There is no area of outstanding biodiversity value withing or near the Site. The proposed development is not likely to have an adverse effect on any area of outstanding biodiversity value.
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The proposed development will not increase any key threatening processes listed in Schedule 4 to the BC Act – with the exception of anthropogenic climate change. Any development which requires the use of machinery that produces greenhouse gas emissions contributes is some small way to climate change. For this project however, that contribution is negligible.

Taking into account the matters addressed in Table 6.2, it is concluded that the proposed modification is not likely to significantly affect threatened species or ecological communities, or their habitats.

6.5.4 Areas of outstanding biodiversity value

The *Biodiversity Conservation Act 2016* ('the BC Act') gives the Minister for the Environment the power to declare Areas of Outstanding Biodiversity Value.

The Register of Declared Areas of Outstanding Biodiversity has information about declared Areas of Outstanding Biodiversity Value in New South Wales, including declarations and maps.

Areas of declared critical habitat under the (now repealed) *Threatened Species Conservation Act 1995*, including Little Penguin and Wollemi Pine declared areas, are now considered Areas of Outstanding Biodiversity Value under the BC Act.

The proposed modifications are not within, and will not impact, any declared Areas of Outstanding Biodiversity Value.

6.5.5 Weeds

The proposed modification has been determined unlikely to impact any priority weeds listed under the *Biosecurity Act 2015* for the Greater Sydney Region such that they would pose a risk to any areas of native vegetation. None of the drivers, threats and risks for weed transport (section 3.1.3 of the *Hunter Regional Strategic Weed Management Plan 2017-2022*) are generated by the proposed modifications.

6.5.6 Mitigation measures

As the proposed modification will not result in any loss of biodiversity values or result in impacts to any threatened species, ecological communities or their habitats, no additional management measures to mitigate the risk of impacts to biodiversity values are considered necessary.

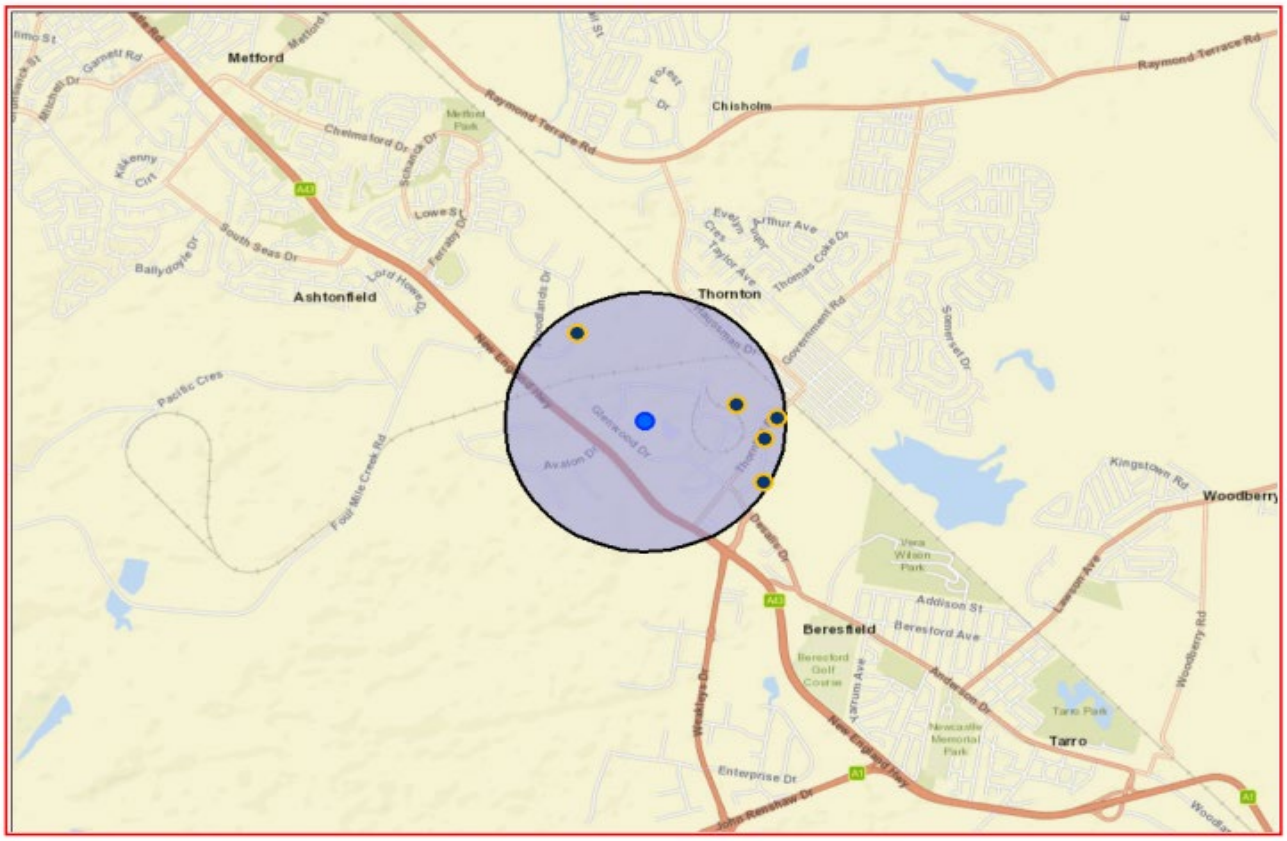
6.6 Aboriginal heritage

EMM conducted a search of the Aboriginal Heritage Information Management System (AHIMS) on 14 April 2023 to identify any items of Aboriginal heritage at the Site or in the vicinity.

A search with a 1 km radius found:

- five Aboriginal sites
- nil Aboriginal places.

The locations of the recorded Aboriginal sites are shown in Figure 6.2. The nearest Aboriginal site is approximately 700 m to the north-east of the Site. The proposed modifications are unlikely to have any impact on identified Aboriginal sites. No additional management measures to mitigate the risk of impacts to Aboriginal cultural heritage sites are considered necessary.



Source: AHIMS; Accessed 14 April 2023

Figure 6.2 Aboriginal sites

6.7 Historical heritage

The Site is not located within a Heritage Conservation Area.

There are no heritage items which are listed on local or State heritage registers within or adjacent to the Site.

The nearest State heritage items are in East Maitland, being a series of terrace buildings at King Street, East Maitland (Items 00297, 00298 and 00299) and the Victoria Street Railway Station (Item 01277). At a distance of approximately 5.6 km, the proposed modifications will not impact these items.

The nearest items listed on local environmental planning instruments are in Beresfield. Two heritage items are included on the Newcastle LEP 2012 being Newcastle Crematorium (Item I34) and Beresfield Public School (Item I35). These are both approximately 3.5 km to the south-east of the Site and will not be impacted by the proposed modifications. No additional management measures to mitigate the risk of impacts to areas of historical heritage are considered necessary.

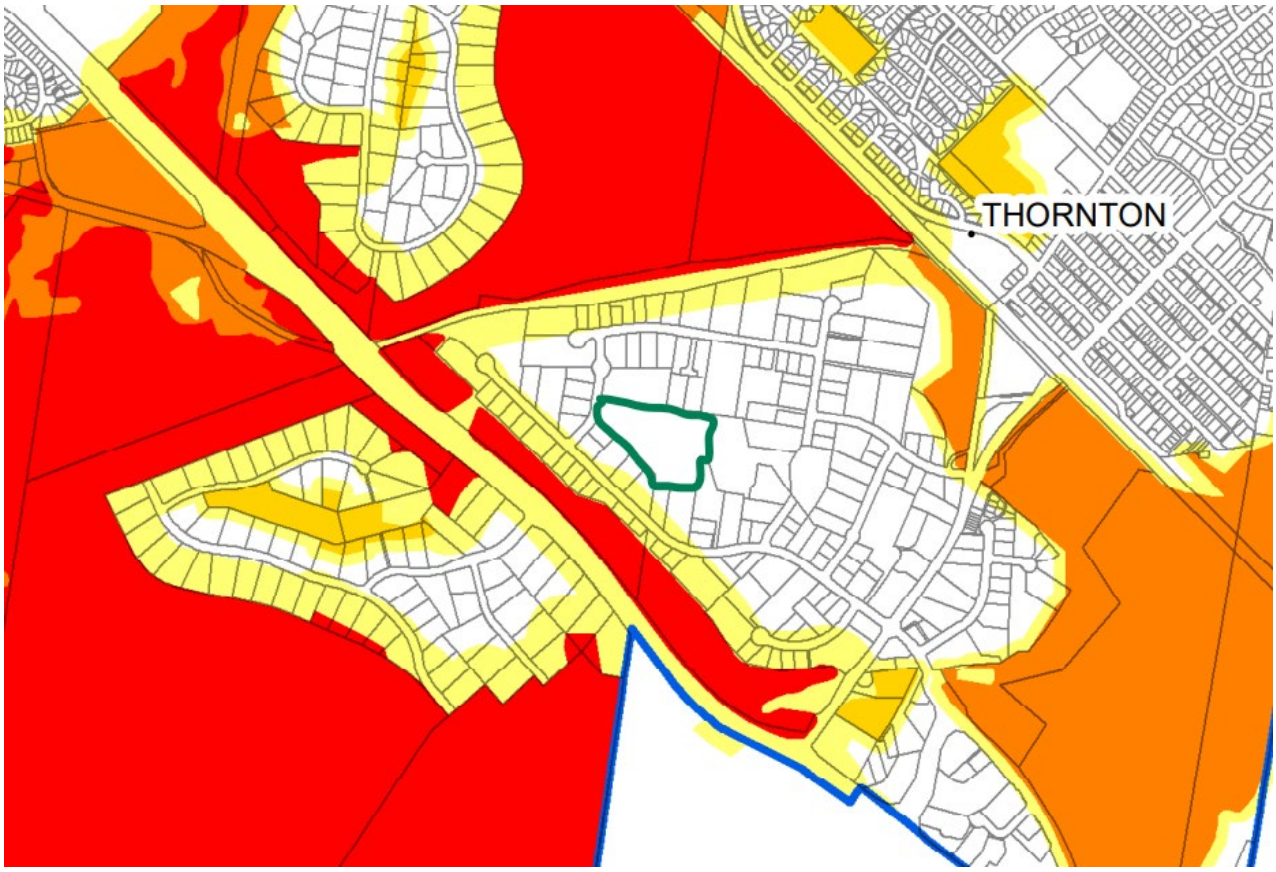
6.8 Traffic and transport

The proposed modifications do not change waste volumes to be received at the facility and creates no additional operational traffic. It does not modify traffic movements, on-site manoeuvrability or parking.

Pending installation of the acoustic barrier, there will remain a clearance of approximately 10.3 m between the acoustic barrier and the main building at the closest point. Hence the modifications retain capacity for safe vehicle movement within the site. No additional management measures to mitigate the risk of impacts from traffic on the local road network are considered necessary.

6.9 Bush fire

The Site is not mapped as bushfire prone land in the draft Maitland City Council Bush Fire Prone Land Map (2021). Refer to Figure 6.3. No additional management measures to mitigate the risk of bushfire are considered necessary.



Source: Maitland City Council Bushfire Prone Land Map; Adapted by EMM

Note: Red indicates Vegetation Category 1; Orange indicates Vegetation Category 3; Yellow indicates Vegetation Buffer

Figure 6.3 Bushfire prone land

6.10 Mine subsidence risk

The Site is not within lands proclaimed to be within a Mine Subsidence District. No additional management measures to mitigate the risk of subsidence impacts are considered necessary.

6.11 Contamination

The Site is not significantly contaminated land within the meaning of the *Contaminated Land Management Act 1997* (CLM Act) and is not subject to a management order or maintenance order under the CLM Act. No additional management measures to mitigate the risk of contamination impacts are considered necessary.

6.12 Coastal processes and hazards

Chapter 2 of the State Environmental Planning Policy (Resilience and Hazards) 2021 applies in areas mapped as the Coastal Zone, and this mapping extends generally as far as any tidal limit.

Therefore, this Chapter of the Resilience and Hazards SEPP does not apply to the Site. No additional management measures to mitigate the risk of impacts to coastal zones are considered necessary.

6.13 Cumulative impacts

A search of the NSW Planning Portal State Significant Projects records (17 April 2023) identified four major projects in the Thornton precinct, all related to the development of a new industrial business park at Beresfield.

Freeway North Business Park (MP 06_0199) was approved on 29 September 2008 and comprises an industrial business park with a90 lot subdivision plus associated utilities and infrastructure. The site is approximately 85 ha and is bounded by New England Highway to the north, Yangan Drive to the south, Weakleys Drive to the east and the Donaldson mine site to the west. The project approval was subsequently modified to provide for the Aldi Distribution Centre (MP 06_0199 – Mod 1) and to provide for an additional 30 lots (MP 06_0199 – Mod 2). This major development is approximately 800 m to the south of the ACPA Site.

This industrial park is also the location of the subsequent application for the construction of the Aldi Distribution Centre (MP 10_0042).

There is sufficient distance between these major projects and the Site to avoid any cumulative impacts in the areas of concern, being noise, vibration and air quality. The cumulative impacts of the proposed modifications are therefore considered to be negligible.

7 Summary of mitigation measures

A summary of the mitigation measures to be adopted as a result of the modification are summarised in Table 7.1.

Table 7.1 Summary of mitigation measures

Aspect	Mitigation measure
Noise	Maintain acoustic cladding at sand/aggregate transfer hopper
	Maintain enclosure at weigh hopper and central mix loader
	Install a series of abutting shipping containers to form an acoustic barrier along the perimeter of the Site near the concrete batching plant to achieve an overall lateral length of approximately 73 m
	Undertake review of externally operated mobile plant noise emissions and where feasible implement engineering controls, such as engine exhaust mufflers to reduce noise emissions from these items
	Ensure staff and contractors are briefed on the importance of minimisation of noise from the site, adhering to good driving practices on-site and limiting the use of horns etc.
	Ensure vehicles accessing the site are generally well maintained and serviced to minimise their noise emissions
	Switch off truck engines when not in use
	Maximise the offset distance between noisy plant items at the south-west site boundary where practicable
	Minimise noise breakout by continuing to keep factory doors normally closed (within the southwestern façade of the RCPA building)
	Consider the further use of local barriers and/or mass loaded vinyl curtains (e.g. Flexshield PVC Curtains or Flexshield Sonic Clear Ribbed Curtains), around the batch plant conveyors with a view to further reduce batch plant noise emissions
	Consider the further use of absorptive internal linings within the hydraulic room to reduce noise breakout (or alternately consider replacing the existing louvre with an acoustically rated type)
Air quality	Use of sweepers on paved roads and surfaces
	Use of water carts on unpaved roads and yard area
	Cement silo loading undertaken under vacuum
	Use of water sprays at storage bunkers
	Seal approximately 2,635 m^2 of current unsealed trafficable areas prior to production exceeding 30,000 tpa or moving to a double shift 24-hour operation
Greenhouse gas	On-site equipment will be regularly maintained and serviced to maximise fuel efficiency
	Vehicle kilometres travelled on site will be minimised
	Energy efficiency will be progressively reviewed and implemented throughout the life of the facility

8 Modification justification

The authorised use of the facility includes the installation and operation of a concrete batching plant required for the production of concrete pipes. The installation of the concrete batching plant however was not previously identified as being outside the main building.

The proposed modifications are proposed to regularise the installation of the concrete batching plant in its current position outside the building pursuant to the requirements of the EP&A Act, the EP&A Regulation and related environmental planning instruments. Additional measures have been prosed as part of the modification to address the concerns of some industrial and commercial neighbours regarding noise, vibration and dust.

If approved, the modification will enable the continued authorised operation of the facility and will maintain an acceptable level of amenity for the nearby commercial and industrial businesses. The continued use of the facility will support the ongoing direct full-time employment of 22 persons. Other socio-economic benefits associated with the modifications are the improved operational efficiency of the facility and the improvement in amenity for other commercial and industrial premises in the precinct.

The overall suitability of the Site as a location for an industrial manufacturing facility was determined through UD 00-767 and DA 06-1324. The land remains suitably zoned as E3 Productivity Support (previously B5 Business Development) and exists within the large and long-established industrial precinct of Thornton.

The Site is therefore considered suitable and able to accommodate the proposed modifications.

The proposed modifications form part of the Site's strategy to prevent or minimise noise, lighting, dust and visual impacts on nearby residents, businesses, and open spaces by providing a physical barrier to noise, light and air emissions.

Furthermore, the provision of industrial manufacturing services is broadly recognised in high level strategic planning instruments as an essential and appropriate industry given the particular characteristics of the Thornton precinct as a trading hub.

The proposed modifications are therefore viewed as an initiative to enable a better public outcome for an essential urban service.

9 Conclusion

The proposed modification seeks to regularise the concrete batching plant and associated infrastructure in their current location. Additional measures have been proposed, which form part of this modification application, to mitigate impacts of noise, vibration and dust from the operations associated with the relocated concrete batching plant. These mitigation measures include the installation of a 73 m long acoustic barrier and sealing of approximately 2,635 m^2 of currently unsealed trafficable areas.

All other environmental impacts arising from the proposed modifications are considered to be appropriately managed.

The development, as modified, would remain substantially the same as the development originally granted in 2000, which is for a concrete manufacturing plant, and can be assessed and approved under section 4.55(2) of the EP&A Act.

If approved, the modification will enable the continued authorised operation of the facility and will maintain an acceptable level of amenity for the nearby commercial and industrial businesses.

References

ACA, 2023. RCPA Thornton Operational Noise & Vibration Assessment: Report 11.00398R-03, Acoustics Consultants Australia

EMM, 2023. Air Quality Impact Assessment: Thornton Pipe Factory, EMM Consulting Pty Ltd

RAPL, 2012. Noise Impact Assessment: Extension of Operating Hours And Production, Reverb Acoustics Pty Ltd

Appendix A
Noise and vibration assessment

EMM
creating opportunities

acoustics consultants AUSTRALIA

RCPA THORNTON OPERTIONAL NOISE & VIBRATION ASSESSMENT

Report 11.00398R-03

prepared for Reinforced Concrete Pipes Australia (RCPA)
on 17/05/2023

REPORT PREPARED BY

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BASIS OF REPORT

This report has been prepared by **Acoustics Consultants Australia (ACA)** with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with the Client. Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from ACA. ACA disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

REFERENCE	DATE	PREPARED	REVIEWED	AUTHORISED
11.00398R-03 - DRAFT	27/04/2023	SF	MdIM	SF
11.00398R-03 - DRAFT	14/05/2023	SF	MdIM	SF
11.00398R-03 - DRAFT	15/05/2023	SF	MdIM	SF
11.00398R-03 - DRAFT	15/05/2023	SF	MdIM	SF
11.00398R-03 - FINAL	17/05/2023	SF	MdIM	SF

CONTENTS

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Report 11.00398R-03

1. INTRODUCTION

Reinforced Concrete Pipes Australia (RCPA) operates the site located at 8 Kestrel Avenue, Thornton for the purposes of manufacturing concrete pipe products.

The site currently operates between the hours 6.30 am to 4.00 pm, Monday to Friday, however it is permitted to operate on a 24/7 basis with a maximum permitted throughput of 60,000 tonnes per annum under an existing development consent provided by Maitland City Council.

A concrete batch plant has been installed on the site since the development consent was issued. Accordingly, RCPA proposes to modify its existing consent to regularise the external location of the concrete batch plant and associated works.

This report presents the findings of an operational noise and vibration assessment conducted by Acoustics Consultants Australia (ACA) in relation to the proposed modification.

Potential noise and vibration impacts associated with the site's proposed operational activities have been assessed in accordance with the following NSW Environment Protection Authority (EPA) guidelines:

- *NSW Noise Policy for Industry* (NPfI, EPA 2017) for the assessment of the operational noise;
- *NSW Road Noise Policy* (RNP, DECCW 2011) for the assessment of the off-site traffic noise on public roads;
- *Assessing Vibration: A Technical Guideline* (AVTG, DEC 2006) for the assessment of human response to vibration;

The following international standards have additionally been considered:

- British Standard *BS7385-2:1993 Evaluation and Measurement for Vibration in Buildings, Part 2 -Guide to Damage Levels from Ground Borne Vibration (1993)*; and
- German Standard *DIN4150:1999 Structural Vibration - Effects of Vibration on Structures (1999)*.

Acoustic terms used in this report are defined in the Glossary in **Appendix A**.

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2. PROJECT DESCRIPTION

Historically, the operation of the concrete batching plant had been authorised and has been undertaken on the northern side of the existing industrial shed.

The site was operated until around 2018, at which time the operator vacated the premise and it remained vacant until 2022 when RCPA took up a new tenancy to continue production of concrete products at the approved site.

The location of the concrete batch plant was not explicitly clear on the original approved plans and RCPA installed this on the southern side of the factory.

RCPA now seek to regularise the approval with the batch plant location shown on the plans in the preferred location, on the southern side of the factory.

Accordingly, a modification to the existing development consent (DA 06-1234) is proposed.

Infrastructure comprising the concrete batching plant includes the following:

- sand and aggregate hopper
- aggregate conveyor
- overhead aggregate bins
- feed conveyor
- batch plant
- two cement silos

Sand and aggregate are loaded into the sand and aggregate hopper from the aggregate and sand storage bays via front end loader. Aggregate and sand are transferred via conveyor to the batching plant where cement and water is added. The batched concrete is transferred by conveyor from the batch plant to the pipe machine radial press located inside the existing industrial shed.

As a result of assessment outcomes, undertaken to support the modification, RCPA also seeks to authorise the installation of additional paving on operational areas which are currently unpaved in order to reduce air quality impacts (principally raised dust) associated with movements of vehicles and outdoor operations. Additionally it is proposed to construct a noise barrier on the southern boundary of the site formed from shipping containers, that would be effective in further reducing noise from the concrete batch plant and the batch plant clean down process, in addition to the mobile plant (cement trucks and FEL) that are required for the operation of the batch plant.

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3. BACKGROUND INFORMATION

ACA was initially engaged by RCPA in November 2022 to evaluate noise and vibration emissions from the site in response to complaints received by Maitland City Council from the operators of the adjoining commercial premises located at 82 Glenwood Drive.

Site visits and noise and vibration measurements were undertaken on Thursday 10 November 2022 between approximately 7.00am and 3.00pm and again on Wednesday 16 November 2022 between approximately 10.00am and 2.00pm to evaluate noise and vibration emissions from the site.

The initial measurements indicated an exceedance of the EPA's *Noise Policy for Industry* (NPfI) recommended noise levels at the site's south-west boundary, but no exceedance of the vibration criteria recognised by the EPA's vibration guidelines.

In response to the identified noise exceedance RCPA has undertaken significant modifications to its manufacturing process and has implemented a number of noise mitigation measures on site to reduce noise emissions from the operation of its fixed plant.

A subsequent site visit was undertaken by ACA on 17 January 2023 to re-evaluate the RCPA noise emissions following the installation of the noise mitigation treatments. This determined that the implemented noise mitigation measures are effective in significantly reducing noise levels from the fixed plant, but further treatment was necessary to reduce noise levels from mobile plant items.

The findings of the initial site visits and the implemented noise mitigation measures are set out in **Sections 7 and 8** of this report.

Previous Noise Assessments Undertaken for the Site

The site at 8 Kestrel Avenue was previously operated by Humes Pty Ltd also for the manufacturing of concrete products. Operational noise from the Humes operated site was previously assessed by Reverb Acoustics Pty Ltd. This assessment additionally considers the findings of the Reverb Acoustics assessment (Report No 11-1619-R1).

Structure of this Report

The reminder of this report is structured as follows.

- **Section 4** provides a description of the RCPA site location and surrounding area, including a summary of the noise receivers considered by this assessment.
- **Section 5** discusses the existing acoustic environments of the closest residential receivers.
- **Section 6** sets out the NSW EPA operational noise and vibration policy / guidelines and international standards considered by this assessment.
- **Section 7** discusses the findings of ACA's initial site visits and includes the results of noise and vibration monitoring undertaken at the site.

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- **Section 8** provides a summary of the noise mitigation measures recently implemented by RCPA on the site and further measures proposed to be installed as part of the modification to reduce the site's environmental noise emissions.

- **Section 9** sets out an operational noise modelling assessment and evaluation against the NPfI requirements.

- **Section 10** summarises compliances with the identified policy and guidelines.

- **Section 11** outlines further recommendations with respect to the management of noise from the site.

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4. RCPA THORNTON & SURROUNDS

The RCPA site location and surrounding area is shown in **Figure 4.1**.

Figure 4.1 RCPA Site Location and Surrounding Areas

The site and neighbouring sites are located within the E3 - Productivity Support zone (previously - B5 Business Development zone) under the Maitland Local Environmental Plan 2011.

The E3 zone objectives are:

- *To provide a range of facilities and services, light industries, warehouses and offices.*
- *To provide for land uses that are compatible with, but do not compete with, land uses in surrounding local and commercial centres.*
- *To maintain the economic viability of local and commercial centres by limiting certain retail and commercial activity.*
- *To provide for land uses that meet the needs of the community, businesses and industries but that are not suited to locations in other employment zones.*

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- *To provide opportunities for new and emerging light industries.*
- *To enable other land uses that provide facilities and services to meet the day to day needs of workers, to sell goods of a large size, weight or quantity or to sell goods manufactured on-site.*
- *To minimise conflict between land uses within the zone and with adjoining zones.*

Sensitive Receivers

Three general groups of residential receivers (R1a/b, R2 and R3) and two schools (S1 and S2) are located within 1km of the site, as indicated in **Figure 4.1**.

R1a The closest residential area is to the south-west of the site beyond the intervening New England Highway. Dwellings in this area are setback from the RCPA site boundary by distances of >350 m and are exposed to appreciable levels of road traffic noise from the highway.

R1b Further south-west from R1a, the R1b dwellings in this area are setback from the RCPA site boundary by distances of >450 m. These dwellings are still exposed to road traffic noise, but at a reduced level compared to the R1a receivers.

R2 To the north-west of the site residential receivers are located beyond other intervening commercial/industrial sites at setbacks of >550 m from the RCPA site boundary (and >670 m from the recently installed batch plant).

R3 To the north-east of the site residential receivers are located at setbacks of >900 m from the RCPA site boundary (and >1 km from the recently installed batch plant).

S1 Thornton Public School, is located approximately 1 km to the north-east of the RCPA site.

S2 Aspect Hunter School, is located approximately 560 m to the north-east of the RCPA site.

The R1, R2 and R3 general residential receiver groups were also identified in the previous assessment undertaken by Reverb Acoustics. However, the Reverb Acoustics assessment appears to consider the R1b location and not the closer R1a location, which is noted to be more exposed to road traffic noise from the New England Highway.

For the purposes of this assessment ACA has considered the potential for noise impacts at the both the R1a and R1b residences in addition to the R2 and R3 residential receiver groups.

The site is adjoined to the north and east by other industrial uses, with a mix of industrial and commercial uses to the south and south-west. **Figure 4.2** identifies the closest commercial and industrial receivers considered by this assessment.

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Figure 4.2 Commercial and Industrial Receivers Surrounding RCPA Site

Note: Commercial use receivers are identified as C1, C2, C3, C4, Industrial use receivers identified as I1, I2, I3, I4, I5, I6. It is noted that the businesses surrounding the site compromise a mix of commercial/industrial uses and several of the sites may be considered to include both commercial and industrial components. The commercial/industrial classifications considered by this assessment are based on site observations and review of on-line aerial and streetview imagery of the adjoining sites.

The closest commercial / industrial receivers considered, as indicated in **Figure 4.2**, are as follows:

C1 82 Glenwood Drive – Commercial/Industrial Business Units.

C2 86 Glenwood Drive – Valley Kitchens & Joinery.

C3 6 Kestrel Avenue – Valley Air Conditioning.

C4 3 Kestrel Avenue – National Mining Services Offices.

I1 8 Kestrel Avenue – ArmorGalv (Industrial Workshop).

I2 25 Sandrinham Avenue – Aggreko (Industrial Workshop).

I3 29 Firebrick Drive – Steelline Hunter (Industrial Workshop).

I4 46 Glenwood Drive – Becker Mining (Industrial Workshop) / Hunter Concrete Batch Plant.

I5 62 Glenwood Drive – Neumann Steel (Industrial Workshop).

I6 72 Glenwood Drive – Hyva Hydraulics (Industrial Workshop).

The closest commercial receiver, C1 located at 82 Glenwood Drive is situated at a lower elevation with respect to the RCPA site, with a 4-5 m high retaining wall separating the two sites.

Unit 3 of 82 Glenwood Drive is located at the northern end of the commercial receiver building and is occupied by a business that manufacturers perfumes for the retail market. The premises includes a

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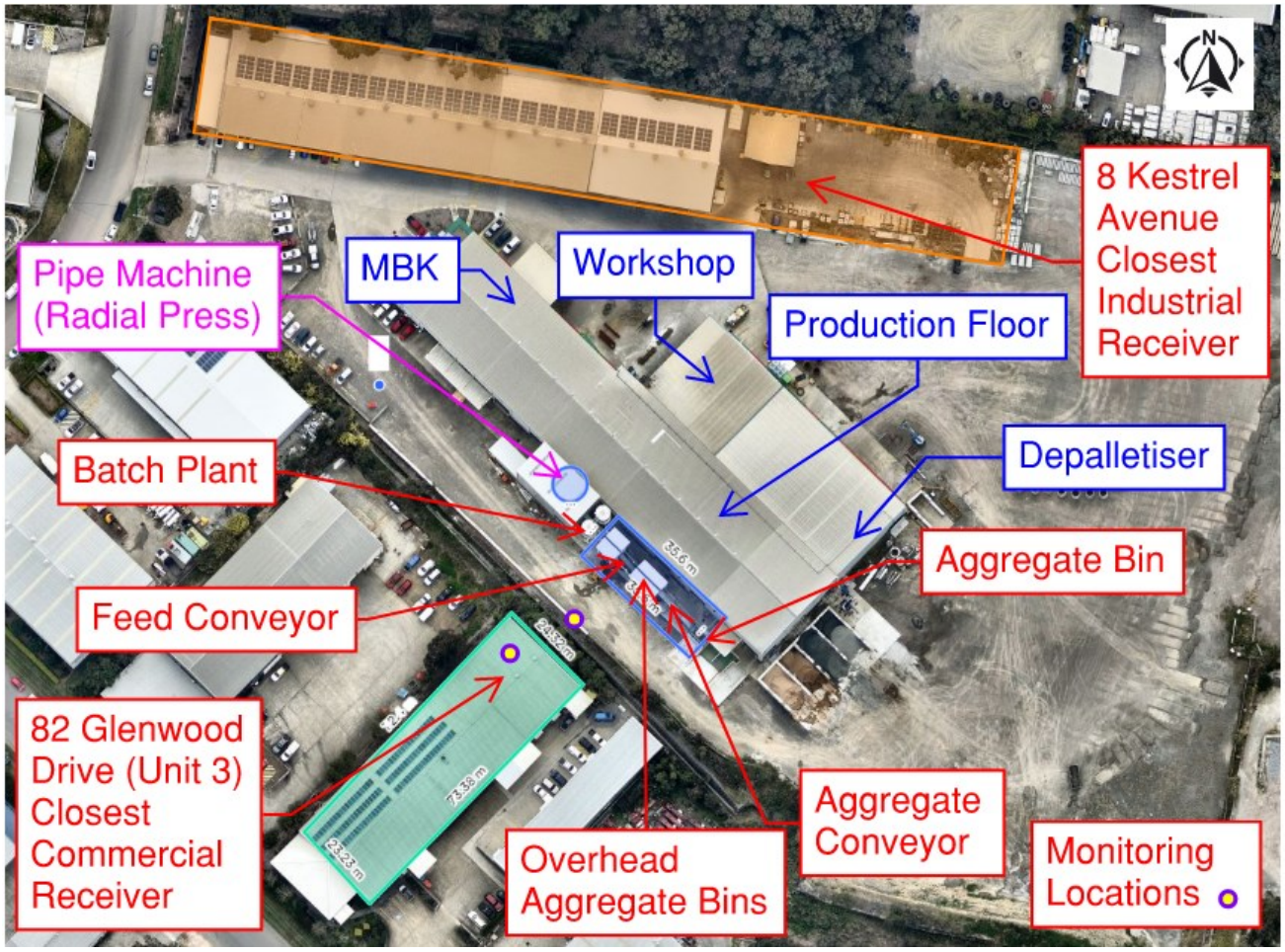
laboratory area for the perfume manufacturing process, general warehouse space and separate office/reception area.

RCPA Site Configuration and Noise Sources

A closer aerial view of the site shown in **Figure 4.3** identifies RCPA's principal operational areas and noise generating plant items.

Figure 4.3 RCPA Thornton Site Layout



Notes: The items/areas identified in blue font are located internally, inside the main factory building. The items identified by red font are the recently installed batch plant components externally located to the south-west of the main factory building. These externally located items operate together during the pipe making process and are referred to collectively as the 'batch plant'. The pipe machine (radial press), also recently installed, is housed within an annex to the main factory building.

In addition to the items shown in the figure, noise is also generated on site by mobile plant items including forklifts, a front-end loader and delivery and dispatch truck movements.

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General Observations

During ACA's site visits it has been observed that at the south-west site boundary, noise generated from the internal factory noise sources are generally indiscernible over the noise generated by the externally located batch plant when the factory doors are closed.

The RCPA site boundaries to the north and east are adjoined by other industrial uses. According to ACA's observations on site, noise from the RCPA batch plant is relatively indiscernible at these sites due to the acoustic screening provided by the RCPA factory building and due to the masking effect of noise generated on the neighbouring industrial sites.

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5. EXISTING ACOUSTIC ENVIRONMENT AT RESIDENCES

ACA undertook inspection of the identified residential areas on 2 February 2023.

Observations were made at R1a (7 Avalon Drive and surrounding area), R1b (Further south along Avalon Drive and along Killarney Street and surrounding area), R2 (37 Woodlands Drive and surrounding area) and R3 (7 Karuah Street and surrounding area). The following observations were noted:

R1a At R1a during the daytime site visit noise from the Thornton industrial area was not audible. Traffic noise from the New England Highway was identified as the dominant noise source at the dwellings closest to the road. Traffic noise was noted to control the L_{Aeq} ambient and L_{A90} background noise levels at these locations.

R1b At increasing distance from the highway, road noise levels reduce according to distance from the road and the effects of local screening and ground effects. However, the New England Highway road noise was noted to remain the principal influence on background noise level within distances of up to approximately 300-400 m from the highway. At R1b noise from the Thornton industrial area was not audible.

R2 At R2, during the site visit noise from the Thornton industrial area was not audible. Traffic noise from the New England Highway was identified as the primary noise source at the dwellings located closest to the road. Traffic noise was noted to be the primary influence on the L_{Aeq} ambient and L_{A90} background noise levels at these dwellings.

R3 At R3, during the site visit noise from the Thornton industrial area was not audible. Traffic noise from Thornton Road was identified as the dominant noise source influencing the L_{Aeq} ambient and L_{A90} background noise levels. Additionally, train movements on the Main Northern line rail line were noted to generate the appreciable noise levels in the area.

Noise Monitoring

For assessment purposes, an environmental noise logger was installed at 7 Avalon Drive, the closest residence to the RCPA site at the R1a location shown in **Figure 4.1**. The logger was set to continuously process and store background and ambient noise levels between 2 - 13 February 2023. A photograph of the installed logger is shown in **Figure 5.1**.

The monitoring location was selected with consideration to its proximity to the RCPA site and its noise exposure to the New England Highway. Background noise levels measured at this location may be considered to be broadly representative of the background levels expected at the closest residential receivers facing the New England Highway.

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Figure 5.1 Noise Logger Location at 7 Avalon Drive

Noise Monitoring Equipment

A Rion NL-32 Type 1 noise logger (serial number 00982868) was deployed at the identified monitoring location for a period of 12 days to assess the long-term background and ambient noise levels. All measurements were undertaken in general accordance with *AS1055:1997: Acoustics – Description and Measurement of Environmental Noise* and the *NSW Noise Policy for Industry* (NPfI).

The noise logger was calibrated before and after the measurements with a using a SVAN Type SV33B calibrator and no significant drift in the pre and post calibration measurements occurred.

The instruments used in the survey comply with *AS IEC 61672.1:2004: Electroacoustics – Sound Level Meters – Specifications* and *AS IEC 60942:2004: Electroacoustics – Sound Calibrators* as appropriate, and have recent calibration certificates traceable to a NATA certified laboratory.

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Noise Monitoring Methodology

The logger was set to A-Weighting and fast response and positioned with its microphone at approximately 1.5 m above ground, external to the dwelling in the direction of the RCPA site and batching plant at a setback distance of approximately 75 m from the New England Highway.

The logger was located at 1.5 m from the façade of the dwelling and as such in establishing criteria the levels have been conservatively adjusted by -2.5 dB to account for any reflection effects from the building.

Statistical noise levels were processed and stored by the instrument every 15 minutes for the whole monitoring period.

The noise logger determines a variety of descriptors such as L_{A1}, L_{A10}, L_{A90} and L_{Aeq} used to describe the existing noise environment. The L_{A90} level is taken as the background noise level and is used to derive the Rating Background Levels (RBLs) as per the requirements of the NPfI. The L_{Aeq} level is taken as the ambient noise level and is used to derive the traffic noise contributions at the site. Full definitions of these and other measured parameters are set out in the Glossary of Acoustic Terms in **Appendix A**.

Measured Noise Levels at R1a

Table 5.1 provides a summary of the adjusted daytime, evening and night-time RBLs derived directly from the unattended logging. The ambient L_{Aeq} levels are also shown. As required by the NPfI, in deriving the RBLs, any effects due to extraneous noise sources or adverse weather (rain and wind greater than 5m/s at a height of 1.5m) have been excluded from the analysis. Meteorological data collected during the noise monitoring period at the Maitland Airport meteorological station was reviewed for this purpose and some weather affected periods were excluded.

Table 5.1 Rating Background Levels and Ambient Noise Levels from Unattended Logging at R1a

Location	Logging Period	Day (7am – 6pm)		Evening (6pm – 10pm)		Night (10pm – 7am)	
		RBL	L_{Aeq}	RBL	L_{Aeq}	RBL	L_{Aeq}
R1a 7 Avalon Drive	2-13 February 2023	59	64	53	62	47	60

Note: The identified levels include a conservative -2.5 dB adjustment to account for any reflection effects from the building.

Daily noise monitoring plots are provided in **Appendix B** of this report

The noted background and ambient noise levels were observed to be controlled by road traffic on the New England Highway. The plots in **Appendix B** show typical diurnal pattern characteristic of road traffic noise. The measured noise levels are considered broadly representative of the external noise exposure of the residences facing New England Highway. At increasing distance from the highway, road noise levels reduce according to distance from the road and the local screening and ground effects.

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Measured Noise Levels at R1b

Supplementary attended noise measurements were undertaken at the R1b location on 2 February 2023 at approximately 150 m from the New England Highway to determine the difference in background and ambient noise levels at increased distance from the road. This identified that the L_{Aeq} traffic noise level reduced by approximately 5 dB and the L_{A90} noise level reduced by approximately 6 dB for an approximate doubling of distance from the road. Accordingly, these adjustments have been applied to determine the R1b existing noise levels for the purposes of assessment.

Measured Noise Levels at R2 and R3

With respect to the further away residential receivers (R2 and R3), reference is made to the existing noise levels determined by Reverb Acoustics Pty Ltd, in the noise assessment prepared for Humes Pty Ltd, the previous operators of the site at 8 Kestrel Avenue (Report No 11-1619-R1).

Assessed Rating Background Levels and Ambient Noise Levels for All Residential Receivers

The assessed rating background levels and ambient noise levels adopted by this assessment for all residential receivers are set out in **Table 5.2**.

Table 5.2 Rating Background Levels and Ambient Noise Levels for Residential Receivers

Location	Day (7am – 6pm)		Evening (6pm – 10pm)		Night (10pm – 7am)	
	RBL	L_{Aeq}	RBL	L_{Aeq}	RBL	L_{Aeq}
R1a (7 Avalon Drive)	59	64	53	62	47	60
R1b - Kilarney Drive	53	59	47	57	41	55
R2 - Woodlands Drive	41	61	40	54	39	52
R3 – Karuah Street	45	59	44	56	42	51

Note: R1a and R1b noise levels have been determined by ACA from noise monitoring undertaken between 2-13 February 2023. Noise levels for the further R2 and R3 locations are consistent with the levels determined by Reverb Acoustics Pty Ltd, as set out in the noise assessment prepared for Humes Pty Ltd, the previous operators of the site at 8 Kestrel Avenue (Report No 11-1619-R1).

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6. NSW EPA NOISE & VIBRATION CRITERIA

The RCPA site operates under a Development Consent issued by Maitland City Council, which as ACA understands includes no conditions related to specific noise or vibration limits.

For the purposes of this assessment the following NSW EPA operational noise and vibration policy / guidelines and international standards have been considered:

- *NSW EPA Noise Policy for Industry* (NPfI);
- *NSW Road Noise Policy* (RNP);
- *NSW EPA Assessing Vibration a Technical Guideline* (AVTG);
- British Standard *BS7385-2:1993 Evaluation and Measurement for Vibration in Buildings, Part 2 -Guide to Damage Levels from Ground Borne Vibration (1993)*; and
- German Standard *DIN4150:1999 Structural Vibration - Effects of Vibration on Structures (1999)*.

NSW EPA Noise Policy for Industry (NPfI)

The NSW EPA considers the provisions of the *NSW Noise Policy for Industry* (NPfI) in regulation of noise effects from commercial / industrial sites.

The NPfI provides a framework and process for deriving noise criteria for consents and licences that enable the EPA and others to regulate premises that are scheduled under the Protection of the Environment Operations Act 1997. The approaches documented in the NPfI are specifically aimed at assessment and control of noise from industrial premises and can also be used to provide guidance for the assessment of noise from other continuous or semi-continuous operational sources.

The NPfI sets out procedures to determine 'Project Noise Trigger Levels' (PNTLs) relevant to a particular industrial development. The PNTLs apply to existing noise-sensitive receivers (and may also be used in strategic planning processes for proposed land uses).

The PNTLs are determined within the relevant daytime (7.00am to 6,00pm), evening (6.00pm to 10.00pm) and night (10.00pm to 7.00am) assessment periods based on an assessment of two components – Noise Intrusiveness and Noise Amenity. The PNTLs reflect the most stringent noise level requirement from the criteria derived from both the intrusiveness and project amenity noise levels to ensure that intrusive noise is limited, and amenity is protected.

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Intrusiveness Noise Levels

The Intrusiveness Noise Level is determined as follows:

- $L_{Aeq,15min}$ = Rating Background Noise Level (RBL) + 5 dB

where the RBL is determined by long-term monitoring, over at least seven days.

Importantly, Intrusiveness Noise Levels only apply to residential receivers (residences) and not to commercial or industrial receivers.

As discussed in **Section 5** during ACA's site visit it was observed that the background noise level experienced by receivers in the vicinity of the New England Highway is principally related to the receiver setback distance from the road.

Based on the measured background noise levels described in **Section 5**, and considering the background noise level to reduce at a rate of approximately 6 dB per doubling of distance from the road, the adopted intrusiveness noise levels considered by this assessment are set out in **Table 6.1**.

Table 6.1 *NPfI* Intrusiveness Noise Levels

Receiver	Time of Day	Rating Background Noise Level $L_{A90,Period}$ dBA	Intrusiveness Noise Level $L_{Aeq,15min}$ dBA
R1a Residences within 75m of New England Highway	Day	59	64
	Evening	53	58
	Night	47	52
R1b Residences	Day	53	58
	Evening	47	52
	Night	41	46
R2 Residences	Day	41	46
	Evening	40	45
	Night	39	44
R3 Residences	Day	45	50
	Evening	44	49
	Night	42	47

Given RCPA's potential hours of operation, the night intrusiveness noise levels may be considered the most stringent criterion for determining intrusiveness noise compliance for the identified receivers.

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Amenity Noise Levels

The Amenity Noise Levels set limits on the total noise level from all industrial noise sources affecting a receiver. Different amenity criteria apply for different types of receiver (e.g. residential, commercial, industrial) and different areas (e.g. urban, suburban, rural).

The subject site is located in the E3 - Productivity Support zone and is adjoined by other commercial/industrial uses. The NPfI identifies that the commercial receiver classification applies to receivers undertaking *'commercial activities in a planning zone that allows commercial land uses'*. As noted, the closest commercial receivers adjoin the RCPA site to the south-west at 82 Glenwood Drive.

The closest residential receivers have been conservatively regarded as 'suburban' residential receivers. It should be noted, however, that given their proximity to major roads (e.g. the New England Highway and Thornton Road), the closest residences to the site may arguably be regarded as 'urban' in terms of the receiver classifications identified by the *NPfI*.

Table 6.2 sets out the standard amenity noise levels recommended by the *NPfI*, applicable to the surrounding receivers. The recommended amenity noise levels refer only to noise from industrial sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific site under consideration. For individual sites, the NPfI nominates Project Amenity Noise Levels which are set at 5 dB below the Recommended Amenity Noise Levels.

Table 6.2 *NPfI* Standard Amenity Noise Levels

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended Amenity Noise Level $L_{Aeq,Period}$ dBA	Project Amenity Noise Level $L_{Aeq,Period}$ dBA
Residences	Suburban	Day	55	50
		Evening	45	40
		Night	40	35
Commercial	All	When in use	65	60
Industrial	All	When in use	70	65

Note 1: Daytime 7.00am–6.00pm; Evening 6.00pm–10.00pm; Night 10.00pm-7.00am.

Note 2: The Recommended Amenity Noise Levels are set with respect to 'all industrial noise'. RCPA's noise emissions should comply with the identified Project Amenity Noise Levels.

Note 3: Residential receivers have been conservatively regarded as 'suburban' residential receivers. Given their proximity to major roads (e.g. the New England Highway and Thornton Road), the closest residences to the site may arguably be regarded as 'urban' in terms of the receiver classifications identified by the NPfI.

Note 4: With respect to the proposed use of the site, the daytime, evening and night Amenity Noise Levels are considered by this assessment.

Note 5: Section 2.4.1 of the NPfI includes provision for alternative assessment criteria in areas of high traffic noise. This provision is considered by this assessment.

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As the closest residential receivers to the site are currently exposed to appreciable levels of road traffic noise, particularly from the New England Highway the provisions of Section 2.4.1 of the NPfI have been considered. Section 2.4.1 provides the following regarding the assessments in areas of high traffic noise:

> *The level of transport noise, road traffic noise in particular, may be high enough to make noise from an industrial source effectively inaudible, even though the L_{Aeq} noise level from that industrial noise source may exceed the project amenity noise level. In such cases the project amenity noise level may be derived from the $L_{Aeq, period(traffic)}$ minus 15 dB.*
>
> *This high traffic project amenity noise level may be applied only if all the following apply:*
>
> - *traffic noise is identified as the dominant noise source at the site*
> - *the existing traffic noise level is 10 dB or more above the recommended amenity noise level for the area*
> - *it is highly unlikely traffic noise levels will decrease in the future.*
>
> *The applicability of these traffic noise provisions needs to be determined for each assessment period (that is, day, evening and night).*

Applying Section 2.4.1 of the NPfI with consideration to the existing L_{Aeq} levels set out in **Table 5.2**, results in the Project Amenity Levels set out in **Table 6.3**.

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Table 6.3 *NPfI* Project Amenity Noise Levels

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Existing Traffic Noise Level $L_{Aeq,Period}$ dBA	Recommended Amenity Noise Level $L_{Aeq,Period}$ dBA	Existing Traffic Noise Level >10dB above Recommended Amenity Noise Level?	Project Amenity Noise Level $L_{Aeq,Period}$ dBA
R1a Residences within 75m of New England Highway	Suburban	Day	64	55	No	55 - 5 = 50
		Evening	62	45	Yes	62 - 15 = 47
		Night	60	40	Yes	60 - 15 = 45
R1b Residences	Suburban	Day	59	55	No	55 - 5 = 50
		Evening	57	45	Yes	57 - 15 = 42
		Night	55	40	Yes	55 - 15 = 40
R2 Residences	Suburban	Day	61	55	No	55 - 5 = 50
		Evening	54	45	No	45 - 5 = 40
		Night	52	40	Yes	52 - 15 = 37
R3 Residences	Suburban	Day	59	55	No	55 - 5 = 50
		Evening	56	45	Yes	56 - 15 = 41
		Night	51	40	Yes	51 - 15 = 36
School Classrooms	All	When in use	-	45*	-	45 - 5 = 40
Commercial	All	When in use	-	65	-	65 - 5 = 60
Industrial	All	When in use	-	70	-	70 - 5 = 65

Note 1: Daytime 7.00am–6.00pm; Evening 6.00pm–10.00pm; Night 10.00pm-7.00am.

Note 2: Existing traffic noise levels for R1a are based on the measured traffic levels at 7 Avalon Drive. With increasing distance from the road, traffic noise levels reduce. The R1b traffic noise levels are based on the measured traffic levels at 7 Avalon Drive and distance corrected based on supplementary attended noise measurements undertaken at 150 m from the New England Highway. For the further receivers (R2, R3), the traffic noise levels determined by the Reverb Acoustics assessment have been adopted. These levels accord with ACA's observations at the R2, R3 receiver locations.

Note 5: Given the proposed operating hours of the site, daytime, evening and night levels are applicable to this assessment.

Note 6: The NPfI Recommended Amenity Levels should be met in consideration of all industrial noise, i.e. not only from the project site. Where a receiver may be impacted by more than one particular industrial site it is usual practice to aim to achieve Project Amenity Noise Levels for the individual industrial sites that are 5 dB lower than the identified Recommended Amenity Levels for all industrial noise. For this assessment, the identified Project Amenity Levels have been considered.

Note 7: The closest residential receivers are exposed to appreciable levels of road traffic noise, particularly from the New England Highway. For these receivers the provisions of Section 2.4.1 of the NPfI are considered in developing the Project Amenity noise levels.

Note 8: Conservatively the residential receivers have been considered as 'Suburban' classification receivers. The receivers most exposed to high levels of exiting road traffic noise may arguably be considered as 'Urban' receivers, according to the definitions set out in the NPfI, for which the day/ evening/ night Recommended Amenity Levels are relaxed by 5 dB.

Note 9: The NPfI Recommended Amenity Levels for school classrooms is $L_{Aeq,1hour}$ 35 dB which applies internally. For assessment purposes external noise levels for school classrooms of $L_{Aeq,Period}$ 45 dBA (Recommended Amenity noise level) and $L_{Aeq,Period}$ 40 dBA (Project Amenity noise level) have been adopted with consideration to the generally accepted reduction in noise through a partially open window of 10 dB.

Note 10: The Project Amenity Levels shown are $L_{Aeq,Period}$ Levels and therefore are not directly comparable with the Intrusiveness levels which are determined on a 15 minute basis. The Project Amenity Levels are converted to equivalent $L_{Aeq,15minute}$ levels in Table 6.4.

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Project Noise Trigger Levels (PNTLs)

The *PNTLs* reflect the most stringent noise level requirement from the criteria derived from both the intrusiveness and project amenity noise levels to ensure that intrusive noise is limited, and amenity is protected.

The L_{Aeq} descriptor is used to describe both the intrusiveness noise level and the amenity noise level. This descriptor represents the level of average noise energy over the relevant period of measurement and takes account of peak noise levels as well as the degree of noise fluctuation.

The L_{Aeq} is determined over a 15-minute period for the project intrusiveness noise level and over the day/evening/night period for the project amenity noise level. This leads to the situation where, because of the different averaging periods, the same numerical value does not necessarily represent the same average noise energy. To standardise the time periods for the intrusiveness and amenity noise levels, for most situations, the *NPfI* recommends that the $L_{Aeq,15min}$ will be taken to be equal to the $L_{Aeq,Period}$ + 3 dB. This conversion factor has been adopted by this assessment.

A summary of the *PNTLs* considered applicable to the operation of the RCPA site are identified in bold font in **Table 6.4**.

In assessing noise levels at receivers, the noise level is to be assessed at the most affected point on or within the property boundary, however, the school/commercial/industrial *PNTLs* are applicable only when such sites are in use (i.e. generally during school hours or the commercial/industrial receiver's business hours).

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Table 6.4 Project Noise Trigger Levels for Operational Noise Emissions, dBA

Type of Receiver	Area Class	Period[1]	Existing Traffic Noise Level[2] ($L_{Aeq, Period}$)	RBL[3] $L_{A90(15min)}$	Intrusiveness[4] $L_{Aeq(15min)}$	Project Amenity[5] $L_{Aeq\ (15min)}$
R1a Residences within 75m of New England Highway	Suburban	Day	64	59	64	50+3 = **53**
		Evening	62	53	58	47+3 = **50**
		Night	60	47	52	45+3 = **48**
R1b Residences	Suburban	Day	59	53	58	50+3 = **53**
		Evening	57	47	52	42+3 = **45**
		Night	55	41	46	40+3 = **43**
R2 Area Residences	Suburban	Day	61	41	**46**	50+3 = 53
		Evening	54	40	45	40+3 = **43**
		Night	52	39	44	37+3 = **40**
R3 Area Residences	Suburban	Day	59	45	**50**	50+3 = 53
		Evening	56	44	49	41+3 = **44**
		Night	51	42	47	36+3 = **39**
School Classrooms	All	When in use	-	-	-	40+3 = **43**
Commercial	All	When in use	-	-	-	60+3 = **63**
Industrial	All	When in use	-	-	-	65+3 = **68**

Notes:

1.Daytime: 7.00am–6.00pm; Evening: 6.00pm–10.00pm; Night-time: 10.00pm-7.00am;

2. The closest residential receivers are exposed to appreciable levels of road traffic noise from the new England Highway. For the purposes of assessment, the provisions of Section 2.4.1 of the NPfI have been considered in developing the Project Amenity Levels.

3. RBL = Rating Background Level.

4. Intrusiveness criterion is only applicable to residential receivers.

5. The identified NPfI Project Amenity Levels should be met for all receivers.

6. Given the proposed operating hours of the site, daytime, evening and night levels are applicable to this assessment.

7: Conservatively the residential receivers have been considered as 'Suburban' classification receivers. The receivers most exposed to high levels of exiting road traffic noise may arguably be considered as 'Urban' receivers, according to the definitions set out in the NPfI, for which the day/ evening/ night Recommended Amenity Levels are relaxed by 5 dB

8. The commercial/industrial *PNTLs* are applicable only when such sites are in use (i.e. generally during the commercial/industrial receiver's business hours).

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In summary the PNTLs considered by this assessment are as follows:

R1a

Day	$L_{Aeq,15min}$ 53 dBA
Evening	$L_{Aeq,15min}$ 50 dBA
Night	$L_{Aeq,15min}$ 48 dBA

R1b

Day	$L_{Aeq,15min}$ 53 dBA
Evening	$L_{Aeq,15min}$ 45 dBA
Night	$L_{Aeq,15min}$ 43 dBA

R2

Day	$L_{Aeq,15min}$ 46 dBA
Evening	$L_{Aeq,15min}$ 43 dBA
Night	$L_{Aeq,15min}$ 40 dBA

R3

Day	$L_{Aeq,15min}$ 50 dBA
Evening	$L_{Aeq,15min}$ 44 dBA
Night	$L_{Aeq,15min}$ 39 dBA

School Classrooms

When in Use $L_{Aeq,15min}$ 43 dBA

Commercial Receivers

When in Use $L_{Aeq,15min}$ 63 dBA

Industrial Receivers

When in Use $L_{Aeq,15min}$ 68 dBA

To fully comply with the *NPfI*, cumulative operational noise levels from the subject site should not exceed these PNTLs at the closest residential, educational and neighbouring commercial/industrial sites during the relevant operating periods.

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Modifying Factor Corrections for Annoying Noise Characteristics

The NPfI (Fact Sheet C) identifies corrections for annoying noise characteristics that are to be applied in industrial noise assessments. NPfI Fact Sheet C notes:

Where a noise source contains certain characteristics, such as tonality, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. On the other hand, some sources may cause less annoyance where only a single event occurs for a limited duration.

Correction factors are to be applied to the source noise level at the receiver before comparison with the project noise trigger levels specified in Section 2, to account for the additional annoyance caused by these modifying factors.

The modifying factor corrections should be applied having regard to:

• the contribution noise level from the premises when assessed/measured at a receiver location, and

• the nature of the noise source and its characteristics.

Table C1 sets out the corrections to be applied. The corrections specified for tonal, intermittent and low-frequency noise are to be added to the measured or predicted noise levels at the receiver before comparison with the project noise trigger levels. The adjustments for duration are to be applied to the criterion.

The Modifying Factor Corrections (per NPfI Table C1) are set out in **Table 6.5**.

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Table 6.5 Modifying Factor Corrections (per NPfl Table C1 and definitions in Section C2)

Factor	Assessment / Measurement	When to Apply	Correction[1]	NPfl Comments
Tonal noise	One-third octave band analysis using the objective method for assessing the audibility of tones in noise – simplified method (ISO1996.2-2007– Annex D).	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: • 5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz • 8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz • 15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz.	5 dB[2,3]	Third octave measurements should be undertaken using unweighted or Z-weighted measurements. Note: Narrow-band analysis using the reference method in ISO1996-2:2007, Annex C may be required by the consent/regulatory authority where it appears that a tone is not being adequately identified, e.g. where it appears that the tonal energy is at or close to the third octave band limits of contiguous bands.
Low-frequency noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave Measurements in the range 10–160 Hz	Measure/assess source contribution C- and A-weighted $L_{eq,T}$ levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and: • where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2-dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period • where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5-dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period and a 2-dB(A) positive adjustment applies for the daytime period.	2 or 5 dB[2]	A difference of 15 dB or more between C and A-weighted measurements identifies the potential for an unbalance spectrum and potential increased annoyance. The values in Table C2 are derived from Moorhouse (2011) for DEFRA fluctuating low-frequency noise criteria with corrections to reflect external assessment locations.
Intermittent noise	Subjectively assessed but should be assisted with measurement to gauge the	The source noise heard at the receiver varies by more than 5 dB(A) and the intermittent nature of the noise is clearly audible.	5 dB	Adjustment to be applied for **night-time only**.

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	extent of change in noise level.			
Duration	Single-event noise duration may range from 1.5 min to 2.5 h.	One event in any assessment period.	0 to 20 dB(A)	The project noise trigger level may be increased by an adjustment depending on duration of noise (see Table C3).
Maximum adjustment	Refer to individual Modifying factors.	Where two or more modifying factors are indicated.	Maximum correction of 10 dB(A)[2] (excluding duration correction).	

Notes:

1. Corrections to be added to the measured or predicted levels, except in the case of duration where the adjustment is to be made to the criterion.
2. Where a source emits tonal and low-frequency noise, only one 5-dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.
3. Where narrow-band analysis using the reference method is required, as outlined in column 5, the correction will be determined by the ISO1996-2:2007 standard.

NPfI Maximum Noise Level Sleep Disturbance Criteria

Guidance for assessing the potential for sleep disturbance impacts on nearby residences is provided in Section 2.5 of the NPfI, which states:

Where the subject development/premises night-time noise levels at a residential location exceed:

- *$L_{Aeq,15min}$ 40 dBA or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
- *L_{AFmax} 52 dBA or the prevailing RBL plus 15 dB, whichever is the greater, a detailed maximum noise level event assessment should be undertaken.*

Based on the identified night RBLs the following night-time sleep disturbance noise levels are considered by this assessment:

- R1a L_{AFmax} 62 dBA
- R1b L_{AFmax} 56 dBA
- R2 L_{AFmax} 54 dBA
- R3 L_{AFmax} 57 dBA

ACA notes that the EPA has conducted an independent and comprehensive review of the most recent research on sleep disturbance and maximum noise levels and a synopsis of this research is included in the NSW Road Noise Policy (RNP) and previously in the ECRTN. The EPA concluded that from the research on sleep disturbance to date:

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- *Maximum internal noise levels below 50-55dBA are unlikely to awaken people from sleep;*
- *One or two noise events per night with maximum internal noise levels of 65-70dBA are not likely to affect health and wellbeing significantly.*

The 55 dBA maximum noise level may be considered to be equivalent to an external maximum noise level of 65 dBA, considering the 10 dB attenuation typically achieved through partially open windows.

Based on the above, this assessment principally considers the external screening levels of L_{AFmax} 62 dBA (R1a) / L_{AFmax} 56 dBA (R1b) / L_{AFmax} 54 dBA (R2) / L_{AFmax} 57 (R3) in accordance with the NPfI and additionally considers the external noise criterion of L_{AFmax} 65 dBA referenced by the RNP.

Road Traffic Noise Criteria

Criteria for off-site road traffic noise are specified in the NSW Road Noise Policy (RNP). The base criteria applicable to existing residences affected by additional traffic on existing roads due to land use developments are summarised in **Table 6.6**.

Table 6.6 RNP Criteria for Road Traffic Noise

Type of Development	Assessment Criteria (dBA)	
	Daytime (7.00am - 10.00pm)	Night-time (10.00pm - 7.00am)
Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,15hour}$ 60 (external)	$L_{Aeq,9hour}$ 55 (external)
Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq,1hour}$ 55 (external)	$L_{Aeq,1hour}$ 50 (external)

There are no residential local roads in the vicinity of the site that trucks accessing the site would travel on. For the purpose of assessing likely future road traffic noise arising due to the site's operation, the $L_{Aeq,15hour}$ 60dBA daytime and $L_{Aeq,15hour}$ 55dBA night-time assessment goals have been considered.

Additionally, in accordance with the provisions of the RNP, any increase in the total traffic noise level should be limited to 2 dB above the corresponding road traffic noise levels due to general traffic growth that would have occurred if the project had not proceeded. A 2 dB increase is not typically considered noticeable.

It should be noted that the identified criteria do not apply to vehicle movements within the site. Any noise generated by on-site vehicle movements is considered as industrial noise and assessed holistically with on-site fixed and mobile plant in accordance with the NPfI.

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Vibration Criteria

When assessing vibration there are two components that require consideration:

- human exposure to vibration; and
- the potential for building damage from vibration.

Humans can sense vibration at levels significantly below levels considered for cosmetic building damage. It follows that where human comfort criteria are met, the risk of building damage occurring is considered negligible.

Human Exposure to Vibration

The NSW EPA's *Assessing Vibration a Technical Guideline* (AVTG) provides guidance for assessing human exposure to vibration and presents preferred and maximum vibration values for use in assessing human responses to vibration. The AVTG does not address vibration-induced damage to buildings or structures.

The AVTG is based on British Standard BS6472:1992. Intermittent vibration may be assessed by the Vibration Dose Value (VDV) which is based on the weighted root mean quartic (rmq) acceleration. However, for simplicity of assessment and monitoring, a peak particle velocity or acceleration goal is often preferred.

With respect to the RCPA pipe making plant, according to ACA's observations assessment against the EPA's criteria for continuous vibration is considered appropriate.

Table 6.7 sets out the preferred and maximum weighted rms acceleration values for continuous vibration for different uses, as specified by AVTG.

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Table 6.7 Human Comfort Vibration Goals for Continuous Vibration – Vibration Acceleration (m/s^2)

Type of Receiver	Preferred	Maximum
	z-axis / x- and y axis / (dB re 10^{-6} m/s^2)	z-axis / x- and y axis / (dB re 10^{-6} m/s^2)
Residences (Daytime)	0.01 / 0.007 / (80 dB)	0.02 / 0.014 / (86 dB)
Residences (Night-time)	0.007 / 0.005 / (77 dB)	0.014 / 0.010 / (83 dB)
Offices (Day or Night)	0.020 / 0.014 / (86 dB)	0.040 / 0.028 / (92 dB)
Workshops (Day or Night)	0.040 / 0.029 / (92 dB)	0.080 / 0.058 / (98 dB)

Note: Human Comfort Vibration Goals for Continuous Vibration – Vibration Acceleration (m/s^2) 1-80 Hz

For the purposes of this assessment the preferred rms acceleration values for offices is conservatively considered with respect to the adjoining commercial receivers. Given the substantial distance to the closest residential areas, it is considered there would be no material risk of any vibration effects on any residential receivers.

Building Damage from Vibration

There are currently no Australian Standards or guidelines to provide guidance on assessing the potential for building damage from vibration. It is common practice to derive goal levels from international standards. British Standard *BS7385:1993* and German Standard *DIN4150:1999* both provide goal levels; below which vibration is considered insufficient to cause building damage. Of these, DIN4150 is the more stringent. **Table 6.8** summarises the goal levels specified in DIN4150.

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Table 6.8 Guideline Values for Vibration Velocity to be used when Evaluating the Effects of Short-Term Vibration on Structures (DIN4150-3:1999)

Type of Structure	Guideline Values for Velocity – PPV (mm/s)		
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz
Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20 to 40	40 to 50
Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20
Structures that, because of their particular sensitivity to vibration, cannot be classified under either of the other classifications and of great intrinsic value	3	3 to 8	8 to 10

With regard to these levels DIN4150 states, *"experience has shown that if these values are complied with, damage that reduces the serviceability of the building will not occur. If damage nevertheless occurs, it is to be assumed that other causes are responsible. Exceeding [these] values does not necessarily lead to damage; should they be significantly exceeded; however, further investigations are necessary."*

For the RCPA plant considered by this assessment, the dominant frequencies of vibration are in the range 31.5 – 125 Hz. Therefore, this assessment considers a conservative goal of 20 mm/s for the adjoining commercial / industrial buildings appropriate. Given the distance to the closest residential areas, it is considered there would be no material risk of any vibration effects on any residential buildings.

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7. INITIAL ATTENDED NOISE & VIBRATION MEASUREMENTS

Initial inspections of the RCPA Thornton site were undertaken on Thursday 10 November 2022 between 7.00am and 2.00pm and on Wednesday 16 November 2022 between 10.00am and 2.00pm to evaluate noise and vibration levels against the noise and vibration criteria identified in **Section 6**.

During these site visits ACA undertook a series of observations and noise and vibration measurements during the operation of the concrete pipe production machinery. Observations and noise measurements were made on the RCPA site at the south-western site boundary adjacent to the neighbouring commercial warehouse at Unit 3, 82 Glenwood Drive. Additionally, on Wednesday 16 November 2022 observations and noise and vibration measurements were made within the commercial warehouse at Unit 3, 82 Glenwood Drive.

The monitoring locations are identified in **Figure 4.3** and in the photographs shown in **Figure 7.1** (site boundary monitoring location) and **Figure 7.2**. (Unit 3 warehouse monitoring location).

The attended noise measurements were conducted using a NTi Type XL2 sound level meter (SLM), in general accordance with *AS1055:2018: Acoustics – Description and Measurement of Environmental Noise* and the *NSW Noise Policy for Industry*. The SLM calibration was checked using a SVAN Type SV33B calibrator and no significant drift in the pre and post calibration measurements occurred.

The instruments used for the survey comply with *AS IEC 61672.1:2013: Electroacoustics – Sound Level Meters – Specifications* and *AS IEC 60942:2017: Electroacoustics - Sound Calibrators*.

The SLM was positioned at the identified measurement locations in the free field, with its microphone set at 1.5 m above ground level and the instrument was set to A-weighted frequency response and Fast time weighting.

Measurements were conducted generally over 15-minute intervals at the established monitoring locations.

During the measurements, meteorological conditions were generally suitable for noise monitoring, with no rain or winds exceeding 5 m/s.

For vibration measurement a Svantek 958 vibration monitor was installed within the Unit 3 warehouse and set to monitor and store tri-axial vibration levels in the warehouse floor slab continuously whilst the RCPA pipe making plant operated.

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Figure 7.1 Attended Noise Measurement Location at South-Western Site Boundary

Figure 7.2 Attended Noise & Vibration Monitoring Equipment Setup within Unit 3, 82 Glenwood Drive

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With respect to RCPA's noise emissions it was noted that during the pipe production process, noise from the site fluctuated in level continuously with a quasi-periodic (cyclic) acoustic signature. This was quite apparent at the site boundary and additionally at the off-site commercial receiver location.

Additionally, low frequency tonal components emitted by the vibrators were intermittently identifiable during the concrete pipe making process, both subjectively and by narrow band frequency analysis.

Site Boundary Noise Levels

Noise measurements and observations were undertaken at the RCPA south-western site boundary on Thursday 10/11/2022 generally over the 15-minute measurement periods between approximately 08:20am to 09:20am.

Noise from RCPA pipe making process noise was dominant at the measurement location, with the principal noise sources controlling the measured noise levels noted as being:

- Vibrator on aggregate bin
- Vibrator on conveyor to overhead aggregate bin
- Vibrator on overhead aggregate bin
- Vibrator on conveyor to overhead mixer
- Aggregate feed conveyors and batch plant
- Pipe machine (radial press)
- Hydraulic pump room and internal process noise
- FEL intermittently loading the aggregate bin

With the pipe machine, batch plant, conveyors and vibrators operating, periodically fluctuating noise emissions were observed. At the site boundary, overall noise levels were measured at approximately 74-76 dBA for 3.5 seconds, followed by 8 seconds at typically 63-65 dBA in a continuous pattern.

Subjectively the noise from the plant included low-frequency components with intermittent character.

A 1/3 octave frequency analysis indicated that during the vibratory events relatively strong 40Hz and 50 Hz low-frequency noise components arose.

When evaluated against the NPfI modifying factors, as set out in **Table 6.5**, a 2 dB correction for low frequency noise was considered to apply with respect to the considered daytime period (as the one-third octave noise levels in NPfI Table C2 were exceeded by more than 5 dB).

With consideration to the RCPA noise over the 15-minute measurement period and the applied 2 dB low frequency penalty, the assessed boundary noise level was determined to be $L_{Aeq,15min}$ 74 dBA – an exceedance of the PNTL by 11 dB.

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Noise Levels within the Commercial Warehouse at Unit 3, 82 Glenwood Drive

Measurements and observations were undertaken within the commercial warehouse at Unit 3, 82 Glenwood Drive on Wednesday 16/11/2022 generally over the 15-minute measurement periods between approximately 10:45am to 12:50pm.

No activities were being undertaken within the Unit 3 warehouse during the measurements, however some intermittent noise from neighbouring commercial units at 82 Glenwood Drive was observed.

Generally, noise from RCPA pipe making process noise was clearly audible at the measurement location within the warehouse when noise from the neighbouring units was reduced. The principal RCPA noise sources generally controlling the measured noise levels were noted as being the externally located pipe making plant - primarily the vibrators and the pipe machine (radial press). Other items including the FEL were also intermittently audible.

The cyclic noise generated by the vibrators in addition to the pipe machine was clearly audible and the low frequency components perceptible within the warehouse. The characteristic cyclic noise with periodic fluctuating level was observed, with noise levels at approximately 52-54 dBA for approximately 3.5 seconds, followed by approximately 8 seconds at typically 40-42 dBA (or 44-46 dBA when radial press appeared to operate).

1/3 octave frequency analysis of the noise data revealed that during the cyclic vibratory events, relatively strong periodic low frequency dominances occurred around the 40 Hz 1/3 octave band (within the low frequency range 31Hz to 125 Hz).

1/3 octave frequency analysis indicated that a 2 dB correction for low frequency noise applied for the daytime period in accordance with the NPfI, with the other NPfI modifying factors not triggered when evaluated over the 15-minute assessment period.

With consideration to the RCPA noise over the 15-minute measurement period and the applied 2 dB low frequency penalty, the assessed noise level within the warehouse was determined to be $L_{Aeq,15min}$ 50 dBA.

The NPfI is generally geared towards assessment of external noise levels. Australian Standard *AS/NZS 2107:2016 Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors* identifies recommended internal noise levels and reverberation times for different purpose buildings.

For laboratories or test areas within industrial buildings, AS/NZS 2107 recommends noise levels from external sources do not exceed L_{Aeq} 40-50 dBA.

The evaluated noise levels within the Unit 3 warehouse were considered to be at the upper levels of acceptability for the type of building, as identified by AS/NZS 2107.

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Vibration Levels within the Commercial Warehouse at Unit 3, 82 Glenwood Drive

Review of the vibration data shows the vibration levels from the RCPA processes imparted into the floor slab of the Unit 3 warehouse were measurable and clearly identifiable. The vibration acceleration levels obtained over the measurement intervals between 10.45am and 11.30am on Wednesday 16/11/2022 are shown in in **Figure 7.3**. The RMS vibration acceleration levels (m/s^2) in three tri-axial directions (x, y and z directions) and vector sum are shown.

On close inspection of the data the characteristic cyclic pattern of the vibrators (3.5 seconds on / 8 seconds off) and the periodic pipe machine (approx. 100 second) events can be seen (refer **Figure 7.4**).

Figure 7.5 provides an assessment against the AVTG human comfort criteria.

Figure 7.5 shows that whilst clearly seen in the data, the magnitude of vibration generated by the RCPA plant did not exceed the acceptable vibration level for offices, per the AVTG. Whilst not applicable to the warehouse, for context the AVTG human comfort criteria for residences are also shown in **Figure 7.5**.

On this basis, the vibration emissions occurring at the time of ACA's site visit were considered acceptable in terms of tactile vibrations, i.e. vibration that is perceptible through the floor of the warehouse.

Figure 7.3 Unit 3 Vibration Acceleration Levels - Wednesday 16/11/2022 between 10:45am to 11:30am

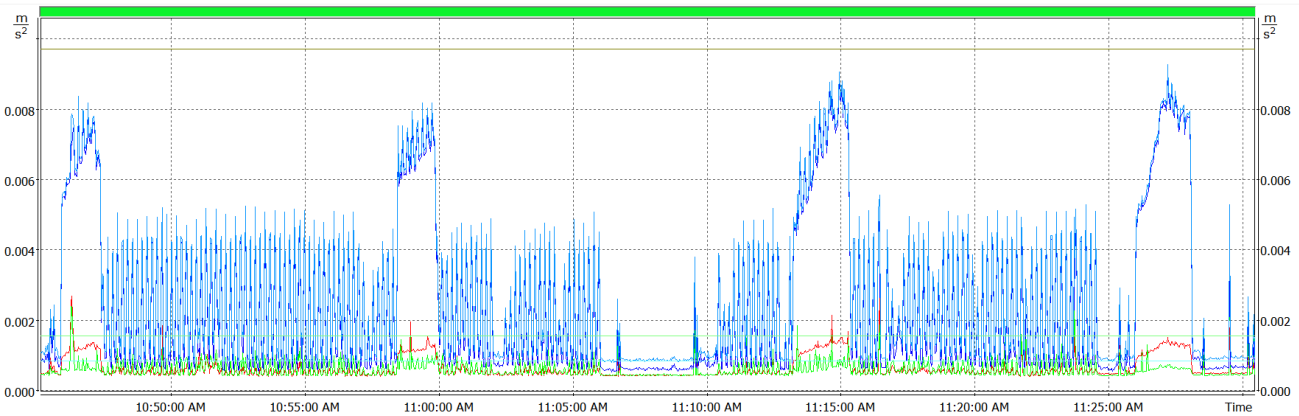

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Figure 7.4 Unit 3 Vibration Acceleration Levels - Wednesday 16/11/2022 between 11:12am to 11:16am

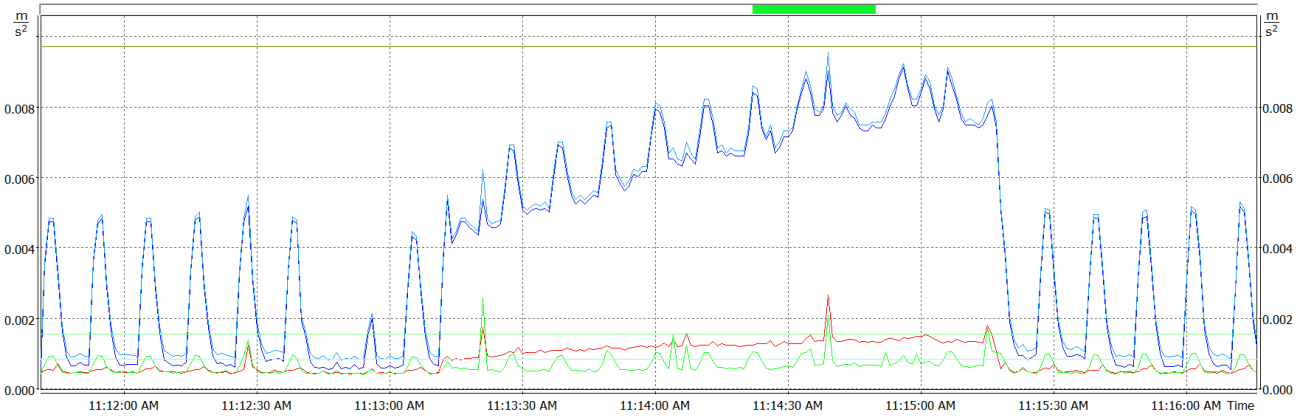
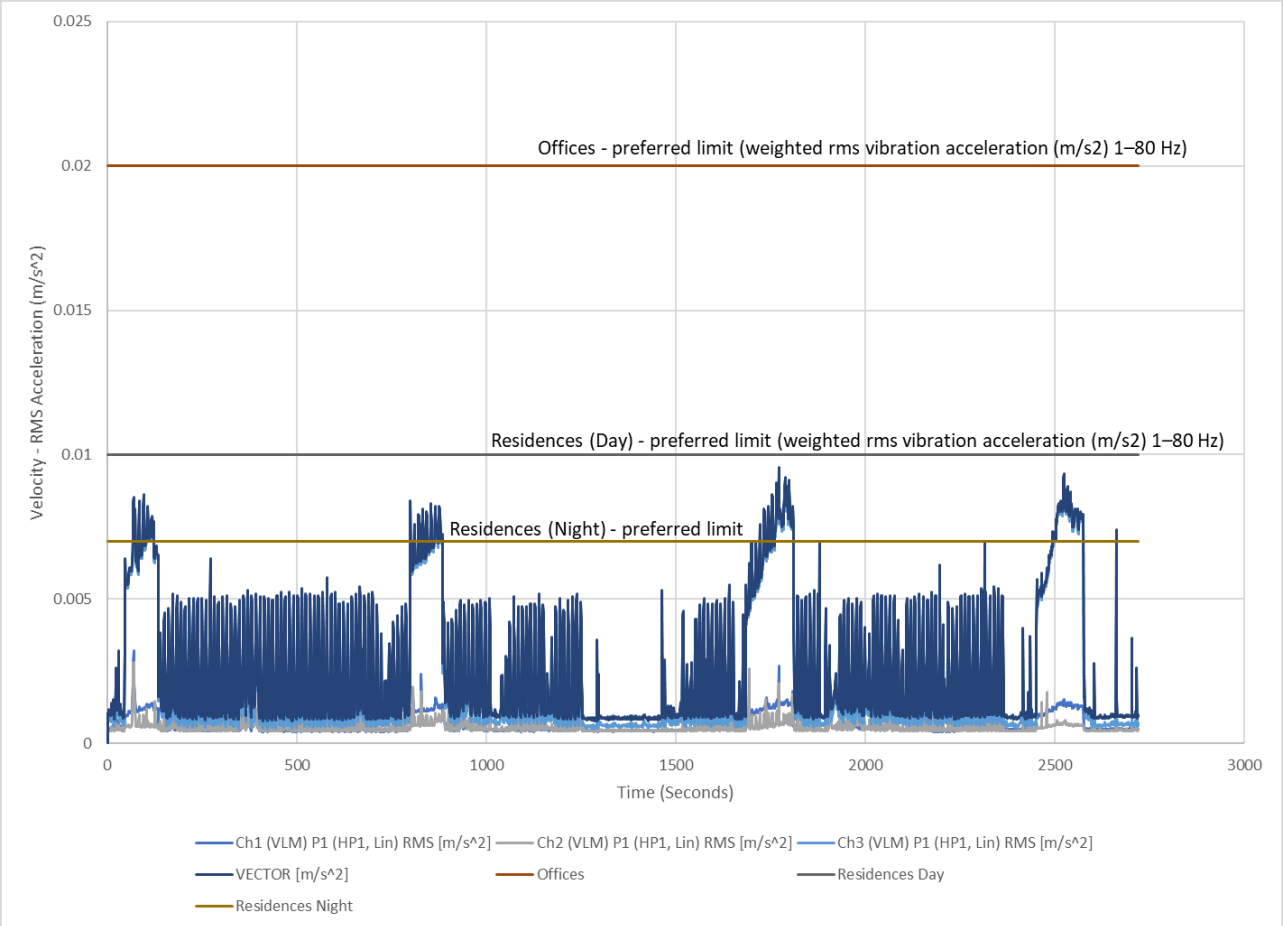


Figure 7.5 Human Comfort Assessment of Vibration Levels Measured in Unit 3 Warehouse Floor Slab



Notes: The measured RMS vibration acceleration in three tri-axial directions (x,y and z) and vector sum is shown in m/s^2.
The z-component normal to the floor shows the strongest correlation with the RCPA plant operation.
For context the preferred z-component acceleration limits for human comfort identified by the AVGT for offices and residences are shown.

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Frequency Analysis of Vibration Levels at Commercial Warehouse at Unit 3, 82 Glenwood Drive

The dominant frequencies of vibration imparted to the warehouse were evident from review of the 1/3 octave vibration velocity levels. **Figures 7.6**, **7.7** and **7.8** show respectively (in the x,y and z planes) the typical ambient levels (when RCPA plant not operating), typical maximum levels during the vibrator operation and the typical maximum levels during the pipe machine (radial press) operation.

Comparison of the graphs shows the marked increase in the 40 Hz and 50 Hz 1/3 octave bands due to the vibrators and further increase in the 40 Hz and 63 Hz 1/3 octave bands with the radial press also operating.

The following is indicated:

- **Figure 7.6** shows ambient rms velocity levels are seen to remain below 3 µm/s across all frequencies (when RCPA plant not operating).
- **Figure 7.7** shows with the vibrator operation the rms velocity increased to 16 µm/s at 40 Hz and 9 µm/s at 50 Hz in the z-direction (normal to the floor slab).
- **Figure 7.8** shows with the with the pipe machine radial press also operating the rms velocity increased to 27 µm/s at 50 Hz and 6 µm/s at 63 Hz in the z-direction (normal to the floor slab).

Whilst apparent in **Figures 7.6** to **7.8** (and **Figures 7.3** to **7.5**), the vibration levels indicated are within the acceptable range for offices with respect to human comfort and substantially lower than building damage risk levels.

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Figure 7.6 Ambient RMS Velocity Levels in Warehouse Floor Slab

Logger 1/3 Octave, 16/11/2022 11:07:40 AM

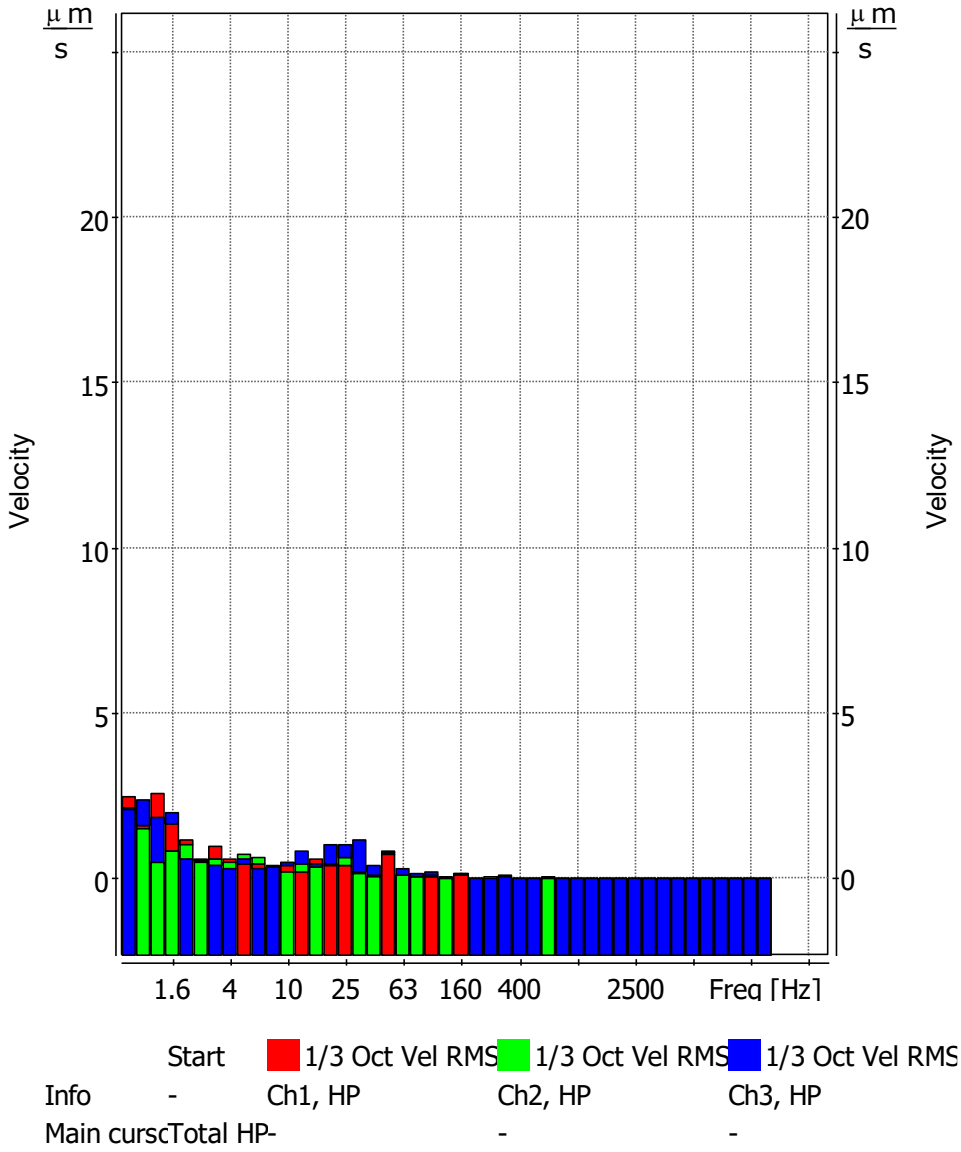

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Figure 7.7 Maximum RMS Velocity Levels in Warehouse Floor Slab - Vibrator Operation

Logger 1/3 Octave, 16/11/2022 11:11:32 AM

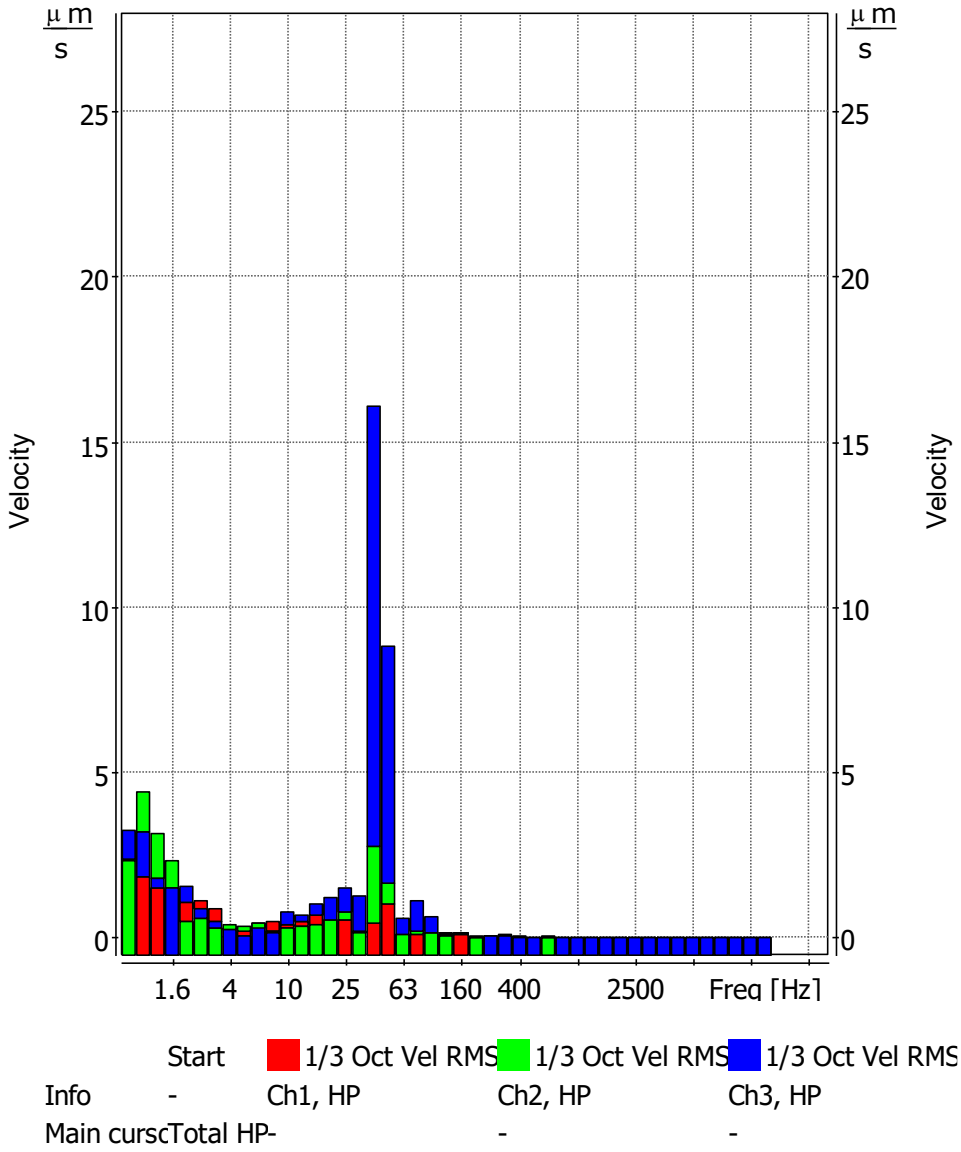

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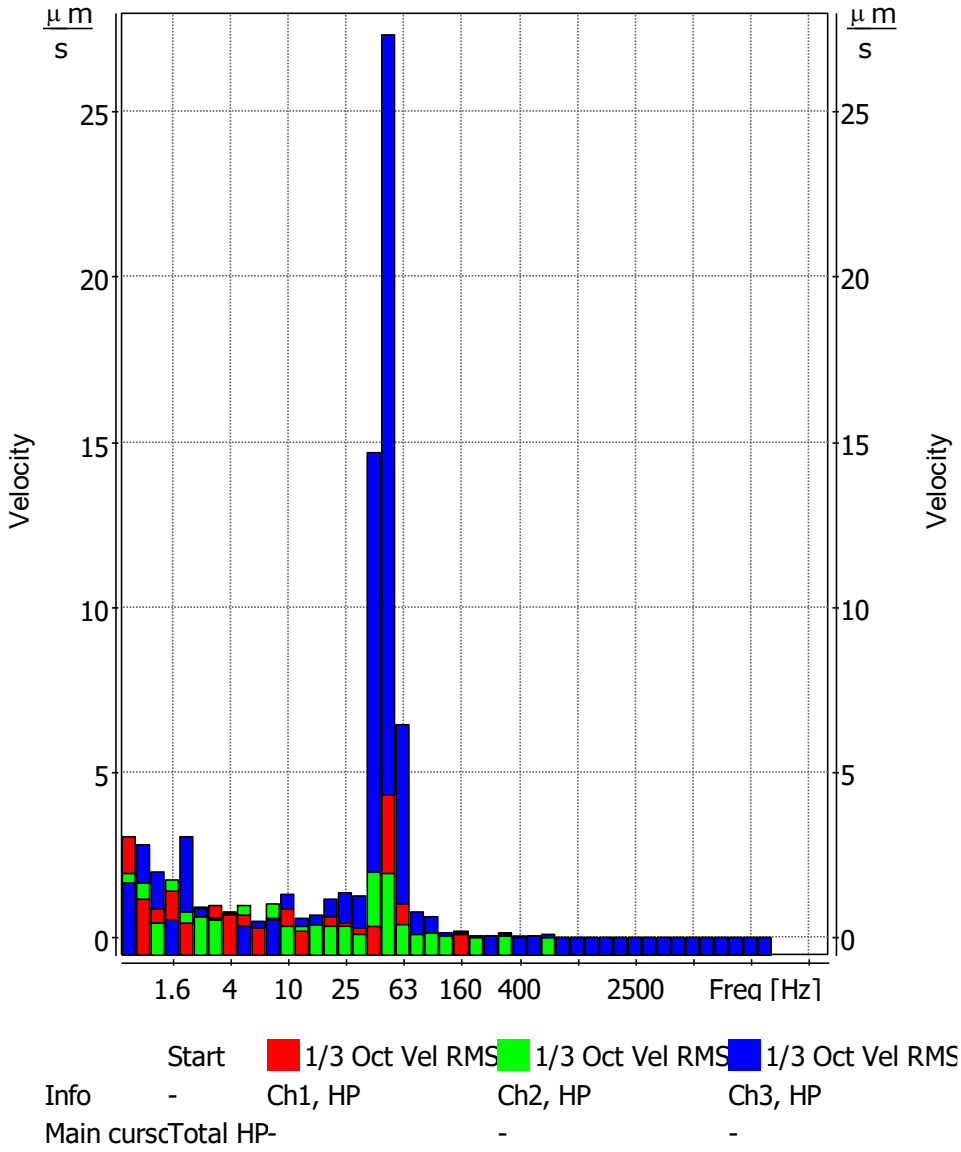
Figure 7.8 Maximum RMS Velocity Levels in Warehouse Floor Slab - Pipe Machine Radial Press

Logger 1/3 Octave, 16/11/2022 11:14:56 AM



	Start	1/3 Oct Vel RMS	1/3 Oct Vel RMS	1/3 Oct Vel RMS
Info	-	Ch1, HP	Ch2, HP	Ch3, HP
Main curs	Total HP	-	-	-

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Summary of Commercial Receiver Observations

As discussed above, whilst tactile vibration was not considered a primary issue, it is noted that the peaks in the measured vibration correlate with the peaks in the measured noise levels, indicating that the vibration being imparted to the warehouse may have resulted in a degree of regenerated (groundborne) noise.

Nevertheless, according to on-site observations, ACA considers that the airborne noise component, i.e. the airborne noise transmitted through the lightweight building elements of the warehouse is materially more significant than any groundborne noise component.

A cursory review of the Unit 3 warehouse structure identified that the building is constructed with:

- lower walls comprising concrete tilt slab;
- relatively light-weight unlined profiled steel upper walls; and
- roof formed from light-weight profiled steel, with internal anticon lining.

Additionally, it was noted during ACA's inspection that there are some visible gaps at some of the profiled steel wall junctions that would reduce the building's noise control efficacy.

It is expected that the warehouse's light-weight building elements would be relatively ineffective in the control of airborne noise with a moderate low-frequency component.

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8. MITIGATION MEASURES IMPLEMENTED BY RCPA

Given the identified exceedances of the commercial receiver PNTL at the south-west site boundary, RCPA has implemented a number of noise mitigation treatments at the site.

The following measures have been introduced on site to reduce noise emissions from the operation of the fixed plant:

- Walls of the annex building housing the pipe machine substantially internally lined with acoustic absorption to minimum thickness of 150mm.
- Aggregate bin vibrator disabled and its use discontinued.
- Vibrator on conveyor to overhead aggregate bin disabled and use discontinued.
- Vibrator on conveyor to overhead mixer disabled and use discontinued.
- Overhead aggregate bin vibrator disabled and replaced with pneumatic vibrator.
- Flexshield curtains installed beneath overhead aggregate bin (installed to all sides including rear of the hopper in order to substantially enclose the operational pneumatic vibrator).
- Flexshield curtains installed over hydraulic pump room perforated roller shutter door (closely fitted to reduce noise breakout).
- Roller shutters and external doors to main factory kept normally closed.

Following the completion of these measures, ACA was engaged to return to the site to re-evaluate the noise levels at the site boundary.

A summary of the noise levels measured on Tuesday 17 January 2023 at the RCPA Thornton south-west site boundary is set out in **Table 8.1**.

The levels measured indicate that following the incorporation of the mitigation measures, the RCPA fixed plant operates within the NPfI PNTL at the south-west site boundary.

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Table 8.1 Measured Noise Levels at the RCPA Thornton South-West Site Boundary - Tuesday 17/01/2023

# / Time	Measured Noise Level ($L_{Aeq,15min}$, dBA)	NPfl Penalty	Assessed Level ($L_{Aeq,15min}$, dBA)	NPfl PNTL Exceedance (Daytime)	Principal Noise Sources
1 10:10 – 10:25	62	-	⩽62	-	- External batch plant operating throughout measurements (vibrator noise notably reduced since recent measures introduced) - Pipe machine operating throughout measurements (pipe machine noise notably reduced since internal linings to pipe machine building introduced) - Contribution from batch plant tonal alarm (up to 83 dBA briefly) at 11:38 excluded from measurement #6 on the basis that this will be disabled/modified (as confirmed by RCPA) - Other off-site influences on the measured levels included intermittent mechanical plant noise from adjoining commercial sites (principally 86 Glenwood Drive and car detailer at 6/82 Glenwood Drive), intermittent industrial noise from Hunter Concrete at 54 Glenwood Drive, distant traffic noise, distant industrial hum, insects and birds
2 10:25 – 10:40	61	-	⩽61	-	
3 10:40 – 10:55	62	-	⩽62	-	
4 10:55 – 11:10	62	-	⩽62	-	
5 11:10 – 11:25	62	-	⩽62	-	
6 11:25 – 11:40	61	-	⩽61	-	
7 11:44 – 11:53 (9 mins)	68	-	68	5	- Pipe machine and batch plant stopped for clean down (material from batch plant conveyor and mixer cleaned off into skip bins)
8 11:55 – 12:02 (7 mins)	68	-	68	5	Pipe machine and batch plant stopped – clean down continues (including pressure hosing of batch plant conveyor)
9 12:04 – 12:19	Background Noise Level Measurement: - Pipe machine and batch plant shutdown (no notable contribution). - Background noise level at $L_{A90,15min}$ 52 dBA controlled by adjoining commercial sites and industrial site to east (Hunter Concrete), distant traffic, distant industrial activities, insects and birds. - Minimal RCPA noise contribution (only minor contribution from residual RCPA process noise)				

Further Proposed Noise Reducing Measures

To further reduce noise levels at 82 Glenwood Drive, RCPA proposes to install a 50 m long (minimum length), 2.9 m high barrier formed from shipping containers at the site boundary that would be effective in further reducing noise from the batch plant and the batch plant clean down process, in addition to the mobile plant (cement trucks and FEL) that are required for the operation of the batch plant.

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A 50 m (minimum) barrier length has been assumed by this assessment, noting that this may be achieved with approximately six shipping containers. However, additional shipping containers (up to eight) may actually be installed, which would provide an equal or better outcome than what has been modelled and assessed.

RCPA has evaluated the feasibility of stacking the shipping containers to achieve a higher barrier, but has determined that this would not be feasible due to the proximity to the retaining wall and the stability of the land.

RCPA's structural/civil engineer has estimated that approximately 30 tonnes of ballast in each of the bottom containers would be required to resist the wind load for a double stacked solution. This presents a combined dead load of 120-130 tonnes on the edge of the retaining wall, which would present a significant risk of overloading the crib wall. Significant setback from the wall would be required to allow adequate geotechnical design which is not considered to be practicable as this would impede access to the yard and factory.

On this basis it is understood that the maximum barrier height practicably achievable at the boundary is considered to be 2.9 m.

The proposed barrier location is shown in **Figure 8.1**.

Additionally, RCPA has confirmed that the batch plant tonal alarm that occasionally operates shall be disabled/replaced. To ensure noise levels do not exceed the PNTL at the boundary, the alarm should be replaced with a broadband (non-tonal) alarm and operated at a level and duration that would not materially influence the LAeq,15min noise level at the boundary. Accordingly, the replacement alarm shall be specified/located to ensure it contributes noise levels not exceeding $L_{Aeq,15min}$ 55 dBA at the south-west site boundary and shall not emit noise of a tonal character according to the definitions described by the NPfI.

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Figure 8.1 Proposed Barrier Location at South-West Site Boundary

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9. ASSESSMENT OF NOISE IMPACTS (POST MITIGATION)

RCPA's site noise emissions have been assessed with consideration to the existing noise reducing measures already implemented in addition to and the proposed 50 m x 2.9 m barrier.

Noise Modelling

Operational noise emissions have been predicted using the SoundPLAN (Ver 8.2) environmental noise prediction software, implementing the Concawe calculation algorithm.

Factors that are addressed in the noise modelling are:

- Equipment noise level emissions and locations
- Shielding/reflection effects from structures
- Receiver locations
- Ground topography (based ELVIS - Geoscience Australia - data)
- Noise attenuation due to geometric spreading
- Ground absorption
- Atmospheric absorption and
- Influence of meteorology, per Concawe methodologies.

Meteorology

Certain meteorological/weather conditions may increase noise levels by focusing soundwave propagation paths at a single point, particularly at relatively large distances from a source. Such refraction of sound waves will occur during temperature inversions (atmospheric conditions where temperatures increase with height above ground level), and where there is a wind gradient (that is, wind velocities increasing with height) with wind direction from the source to the receiver.

Resultant noise levels at receivers due to the influence of meteorological conditions can therefore vary from hour to hour and night to night.

This assessment has adopted the default standard and noise-enhancing meteorological conditions recognised by the NPfI, as set out in **Table 9.1**.

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Table 9.1 Standard and Noise-Enhancing Meteorological Conditions

Meteorological Conditions	Meteorological Parameters
Standard Meteorological Conditions	Day/evening/night: stability categories A–D with wind speed up to 0.5 m/s at 10 m AGL.
Noise-Enhancing Meteorological Conditions	Daytime/evening: stability categories A–D with light winds (up to 3 m/s at 10 m AGL). Night-time: stability category F with winds up to 2 m/s at 10 m AGL.

Notes: m/s = metres per second; m = metres; AGL = above ground level. All wind speeds are referenced to 10 m AGL. Stability categories are based on the Pasquill–Gifford stability classification scheme.

Noise Sources

The principal noise source locations considered are shown below in **Figure 9.1**.

Figure 9.1 Modelled Noise Source Locations

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Truck Movements

Table 9.2 sets out the anticipated on-site daily truck movements considered by this assessment.

Table 9.2 On-Site Truck Movements

Type	Number Incoming Loads per Average Day		
	Day (7.00am - 6.00pm)	Evening (6.00pm – 10.00pm)	Night (10.00pm - 7.00am)
Aggregate Truck	4	2	4
Sand Truck	4	2	4
Cement Truck (and fly ash)	3	0	0
Pipe Products Dispatch Truck (outgoing)	15	0	0

Note: Pipe products dispatch trucks would use the onsite truck route shown in blue in Figure 9.1. Aggregate, Sand and Cement trucks would use the onsite truck route shown in green in Figure 9.1.

For the purposes of assessment, it has been conservatively assumed that half of the day / evening / night raw material truck movements may potentially occur within one hour within the respective periods. Additionally, it has been assumed that five daytime dispatch truck movements may coincide with the identified daytime hourly raw material truck movements.

The applied truck movement scenarios are considered representative of the worst-case day / evening / night hours for the site. For most of the time it would be expected that a broader distribution of truck movements may occur, which would result in typically lower truck noise level emissions than assessed.

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Sound Power Levels

Table 9.3 sets out the applied sound power levels based on noise measurements undertaken on site and on other RCPA sites.

Table 9.3 Operational Noise Source Sound Power Levels

Noise Source	Sound Power Levels			Octave Band Centre Frequencies (Hz, dB Lin)							
	L_{Aeq} (dBA)	$L_{Aeq,15min}$ (dBA)	$L_{Amax,15min}$ (dBA)	63	125	250	500	1k	2k	4k	8k
Pipe Machine (Mitigated)	93	93	-	108	101	93	89	87	83	80	71
Batch Plant (Mitigated)	95	95	-	96	94	94	95	88	84	82	78
Cement Truck Unloading Cement	108	108	-	106	100	102	100	103	103	98	86
Front End Loader (FEL)	108	103	120	101	101	103	100	99	94	87	77
Sand/Aggregate Truck Unloading	102	102	-	100	97	94	95	95	96	97	89
Forklift (8t)	103	98	114	97	102	98	104	97	94	87	77
Forklift (8t)	103	98	114	97	102	98	104	97	94	87	77
Watercart on identified route	107	-	-	106	107	101	105	99	100	96	91
Hydraulic Room Louvre Noise	89	89		85	82	86	87	83	82	76	69
Hydraulic Room Fan Noise	93	93		80	86	89	93	86	85	79	71
Aggregate Trucks Movements (Day: 2 per hour, Eve: 1 per hour, Night: 2 per hour)	109	-	-	112	103	95	98	99	107	89	84
Sand Trucks Movements (Day: 2 per hour, Eve: 1 per hour, Night: 2 per hour)	109	-	-	112	103	95	98	99	107	89	84
Cement Trucks Movements (Day: 2 per hour, Eve: 1 per hour, Night: 0 per hour)	109	-	-	112	103	95	98	99	107	89	84
Pipe Dispatch Trucks Movements (Day: 5 per hour, Eve: 0 per hour, Night: 0 per hour)	109	-	-	112	103	95	98	99	107	89	84
Internal reverberant noise (Sound Pressure Level) from production floor - considered to estimate breakout noise from factory building	-	-	-	79	76	82	84	85	87	85	75

1. On the basis that the forklifts and FEL may typically operate for approximately 5 minutes within a 15-minute assessment period the $L_{Aeq,15min}$ sound power levels from forklift and FEL movements have been reduced by 5 dB with respect to the unadjusted L_{Aeq} sound power levels.
2. It has been assumed that delivery/dispatch trucks would traverse the identified on-site routes at slow speed (<25km/Hr). Conservatively it has been assumed that half of the total anticipated day / evening / night raw material truck movements could occur within one hour within the respective periods. Additionally, it has been assumed that five daytime dispatch truck movements coincide with the identified daytime hourly raw material truck movements. Pipe dispatch trucks would not operate during the evening or night periods. Cement trucks would not operate during the night period.
3. It has been assumed that no tonal reversing alarms would operate on site and the batch plant tonal alarm would be disabled.
4. The noise breakout from the main factory building has been estimated considering the construction of the building and noise levels measured internally.
5. Modelling conservatively assumes the coinciding operation of the all identified plant items.

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Predicted Noise Levels

Tables 9.4 to **9.6** show the predicted daytime, evening and night-time $L_{Aeq,15min}$ noise levels with and without the proposed 50 m long, 2.9m high shipping container barrier.

Table 9.4 Predicted $L_{Aeq,15min}$ Daytime Noise Levels External to Receivers

Receiver	Predicted Noise Level $L_{Aeq,15min}$ (dBA)				NPfI PNTL $L_{Aeq,15min}$ (dBA)	PNTL Exceedance			
	No Barrier		2.9m x 50m Barrier			No Barrier		2.9m x 50m Barrier	
	Neutral Met	Noise Enhancing Met	Neutral Met	Noise Enhancing Met		Neutral Met	Noise Enhancing Met	Neutral Met	Noise Enhancing Met
R1a	46	51	45	49	53	-	-	-	-
R1b	40	45	39	43	53	-	-	-	-
R2	<35	35	<35	35	46	-	-	-	-
R3	<35	35	<35	35	50	-	-	-	-
S1	<35	35	<35	35	43	-	-	-	-
S2	<35	36	<35	36	43	-	-	-	-
C1	75	76	66	67	63	12 dB	13 dB	3 dB	4 dB
C2	61	63	61	63	63	-	-	-	-
C3	61	63	61	63	63	-	-	-	-
C4	58	61	58	61	63	-	-	-	-
IN1	64	65	64	65	68	-	-	-	-
IN2	58	61	58	61	68	-	-	-	-
IN3	54	56	54	56	68	-	-	-	-
IN4	57	61	57	61	68	-	-	-	-
IN5	63	66	63	66	68	-	-	-	-
IN6	66	67	61	62	68	-	-	-	-

Note: NPfI PNTL = Noise Policy for Industry Project Noise Trigger Level.
Default standard and noise enhancing meteorological conditions per Table 9.1 have been considered.
PNTLs for School, Commercial and Industrial receivers only apply where these receiver buildings are in use and therefore potentially affected.

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Table 9.5 Predicted $L_{Aeq,15min}$ Evening Noise Levels External to Receivers

Receiver	Predicted Noise Level $L_{Aeq,15min}$ (dBA)				NPfI PNTL $L_{Aeq,15min}$ (dBA)	PNTL Exceedance			
	No Barrier		2.9m x 50m Barrier			No Barrier		2.9m x 50m Barrier	
	Neutral Met	Noise Enhancing Met	Neutral Met	Noise Enhancing Met		Neutral Met	Noise Enhancing Met	Neutral Met	Noise Enhancing Met
R1a	46	51	45	49	50	-	1	-	-
R1b	40	45	38	43	45	-	-	-	-
R2	<35	35	<35	35	43	-	-	-	-
R3	<35	<35	<35	35	44	-	-	-	-
S1	<35	<35	<35	<35	43	-	-	-	-
S2	<35	35	<35	36	43	-	-	-	-
C1	75	76	66	66	63	12 dB	13 dB	3 dB	3 dB
C2	61	63	61	62	63	-	-	-	-
C3	60	61	60	61	63	-	-	-	-
C4	56	59	56	59	63	-	-	-	-
IN1	61	63	61	63	68	-	-	-	-
IN2	57	59	57	59	68	-	-	-	-
IN3	51	54	51	55	68	-	-	-	-
IN4	57	61	57	61	68	-	-	-	-
IN5	63	65	63	65	68	-	-	-	-
IN6	66	67	61	62	68	-	-	-	-

Note: NPfI PNTL = Noise Policy for Industry Project Noise Trigger Level.
Default standard and noise enhancing meteorological conditions per Table 9.1 have been considered.
PNTLs for School, Commercial and Industrial receivers only apply where these receiver buildings are in use and therefore potentially affected.

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Table 9.6 Predicted $L_{Aeq,15min}$ Night Noise Levels External to Receivers

Receiver	Predicted Noise Level $L_{Aeq,15min}$ (dBA)				NPfI PNTL $L_{Aeq,15min}$ (dBA)	PNTL Exceedance			
	No Barrier		2.9m x 50m Barrier			No Barrier		2.9m x 50m Barrier	
	Neutral Met	Noise Enhancing Met	Neutral Met	Noise Enhancing Met		Neutral Met	Noise Enhancing Met	Neutral Met	Noise Enhancing Met
R1a	44	48	43	47	48	-	-	-	-
R1b	38	38	37	42	43	-	-	-	-
R2	<35	<35	<35	<35	40	-	-	-	-
R3	<35	<35	<35	<35	39	-	-	-	-
S1	<35	<35	<35	<35	43	-	-	-	-
S2	<35	35	<35	35	43	-	-	-	-
C1	**69**	**70**	62	63	63	6 dB	7 dB	-	-
C2	61	62	60	62	63	-	-	-	-
C3	60	61	60	61	63	-	-	-	-
C4	55	58	55	58	63	-	-	-	-
IN1	61	63	61	63	68	-	-	-	-
IN2	57	59	57	59	68	-	-	-	-
IN3	51	54	51	54	68	-	-	-	-
IN4	53	56	53	56	68	-	-	-	-
IN5	60	62	60	62	68	-	-	-	-
IN6	62	64	60	61	68	-	-	-	-

Note: NPfI PNTL = Noise Policy for Industry Project Noise Trigger Level.
Default standard and noise enhancing meteorological conditions per Table 9.1 have been considered.
PNTLs for School, Commercial and Industrial receivers only apply where these receiver buildings are in use and therefore potentially affected.

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Sleep Disturbance

The predicted $L_{Amax,15min}$ maximum noise level contributions from the RCPA site at the closest residential areas are set out in **Table 9.5**.

The predicted maximum noise levels comply with the NPfI screening criteria and the noise criterion of L_{AFmax} 65 dBA referenced by the RNP. On this basis the site would not be expected to result in sleep disturbance impacts if operated at night.

Table 9.5 Predicted $L_{Amax,15min}$ Night Noise Levels External to Residential Receivers

Receiver	Predicted Noise Level $L_{Amax,15min}$ (dBA)		Night Sleep Disturbance Screening Level $L_{Amax,15min}$ (dBA)	Exceedance	
	Neutral Met	Noise Enhancing Met		Neutral Met	Noise Enhancing Met
R1a	57	62	62 (65)	-	-
R1b	50	55	56 (65)	-	-
R2	45	52	54 (65)	-	-
R3	<40	45	57 (65)	-	-

Notes: The EPA has conducted an independent and comprehensive review of the most recent research on sleep disturbance and maximum noise levels and a synopsis of this research is included in the NSW Road Noise Policy (RNP). The NPfI Night-time Sleep Disturbance Screening Levels are shown in the table, with the levels shown in brackets being those outlined by the RNP.
Default standard and noise enhancing meteorological conditions per Table 9.1 have been considered.
The proposed 50 m x 2.9 m shipping container barrier has been included in the predictions.

Discussion of Predicted Noise Levels

The noise modelling results indicate the proposed project may be expected to operate in compliance with the NPfI PNTLs and sleep disturbance screening levels at the residential areas in the vicinity of the site and therefore residential impacts would not be anticipated.

At the closest commercial receivers to the south-west, with the inclusion of the proposed 50 m x 2.9 m barrier, a residual exceedance of the project amenity level by up to 4 dB may be anticipated.

With respect to the commercial receiver residual exceedance, it should be noted that whilst the adopted project amenity level of $L_{Aeq,15min}$ 63 dBA is predicted to be exceeded by up to 4 dB, the recommended amenity level of $L_{Aeq,15min}$ 68 dBA (i.e. $L_{Aeq,Period}$ 65 dBA + 3 dB) is expected to be met.

Regarding the significance of the residual exceedance (that is, noise levels above the PNTL) at the closest commercial receiver, the NPfI identifies that as a general guide, where all source and pathway feasible and reasonable noise mitigation measures have been applied, the significance of residual noise levels above the PNTL can be considered, as outlined in **Table 9.6**.

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Table 9.6 Significance of Residual Noise Impacts

If the predicted noise level minus the project noise trigger level is:	And the total cumulative industrial noise level is:	Then the significance of residual noise level is:
≤ 2 dB	Not applicable	Negligible
≥ 3 but ≤ 5 dB	< recommended amenity noise level or > recommended amenity noise level, but the increase in total cumulative industrial noise level resulting from the development is less than or equal to 1dB	Marginal
≥ 3 but ≤ 5 dB	> recommended amenity noise level and the increase in total cumulative industrial noise level resulting from the development is more than 1 dB	Moderate
> 5 dB	≤ recommended amenity noise level	Moderate
> 5 dB	> recommended amenity noise level	Significant

Considering the predicted noise level does not exceed the PNTL by more than 4 dB and that the recommended amenity noise level is not exceeded, in the context of Table 9.6, the residual exceedance is considered marginal only.

As discussed, RCPA has evaluated the feasibility of stacking containers to create a higher barrier, but has found this cannot be achieved at the required location due to the ground stability. With consideration to the noise mitigation measures already adopted and the further reasonable and feasible measures proposed by RCPA, the residual exceedance is considered acceptable.

RCPA has confirmed that the batch plant tonal alarm that occasionally operates shall be disabled/replaced, so its contribution has been disregarded in the predictions. Subject to meeting any safety requirements, to ensure noise levels do not exceed the PNTL, the alarm should be replaced with a broadband (non-tonal) alarm and operated at a level and duration that would not materially influence the $L_{Aeq,15min}$ noise level at the boundary. The replacement alarm shall be specified/located to ensure it contributes noise levels not exceeding $L_{Aeq,15min}$ 55 dBA at the south-west site boundary.

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Off-Site Road Traffic Noise Assessment

RCPA estimates that currently the site generates approximately 26 daily average truck movements to and from the site during operating hours. It is understood that the proposed modification would not result in any additional truck movements.

The site is accessed from Kestrel Avenue via Glenwood Drive which connects with Thornton Road (sub-arterial) and then other sub-arterial / arterial routes.

Whilst Glenwood Drive and Kestrel Avenue may be classified as local roads, no residences are located on these roads. Therefore, the $L_{Aeq,15hour}$ 60dBA daytime and $L_{Aeq,15hour}$ 55dBA night-time sub-arterial/ arterial road criteria are applicable for assessing likely future road traffic noise arising due to the site's operation.

Based on the estimated daily vehicle movements generated by the RCPA site, it is expected that RCPA traffic would generate off-site traffic noise at levels significantly lower than the base RNP daytime and night-time criteria on the sub-arterial and arterial routes used by RCPA's contractors. Given the relatively low estimated vehicle movements, the RCPA traffic would not be expected to materially contribute to overall off-site traffic noise levels.

Additionally, given the relatively low vehicle movements, RCPA generated traffic wouldn't be expected to contribute to a notable increase in off-site road traffic noise levels.

RCPA's off-site traffic noise contribution would be expected to be well within the 2 dB margin identified by the RNP. On this basis off-site traffic noise impacts are not anticipated.

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10. SUMMARY OF COMPLIANCE WITH EPA NOISE & VIBRATION CRITERIA

Considering the implemented and proposed noise reduction measures this assessment has found the following:

- Compliance with the residential receiver NPfI PNTLs is predicted.
- Compliance with the residential receiver NPfI sleep disturbance screening levels is predicted.
- Compliance with the residential receiver RNP traffic noise criteria is predicted.
- Vibration levels observed by ACA whilst on-site did not exceed the tolerable levels nominated by the NSW EPA's *Assessing Vibration a Technical Guideline* (AVTG) with respect to human comfort, nor building damage risk levels per German Standard DIN4150:1999.
- A residual exceedance of the NPfI PNTL by up to 4 dB at the closest commercial receiver is predicted, which in the context of the NPfI is considered only marginal.

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11. RECOMMENDATIONS

In addition to the proposed installation of the shipping container noise barrier and replacement of the batch plant tonal alarm, it is recommended that the following additional measures are considered by RCPA if a further reduction in off-site noise emissions is sought:

- Undertake review of externally operated mobile plant noise emissions and where feasible implement engineering controls, such as engine exhaust mufflers to reduce noise emissions from these items.
- Ensure staff and contractors are briefed on the importance of minimisation of noise from the site, adhering to good driving practices on-site and limiting the use of horns etc.
- Ensure vehicles accessing the site are generally well maintained and serviced to minimise their noise emissions.
- Switch off truck engines when not in use.
- Maximise the offset distance between noisy plant items at the south-west site boundary where practicable.
- Minimise noise breakout by continuing to keep factory doors normally closed (within the south-western façade of the RCPA building).
- Consider the further use of local barriers and/or mass loaded vinyl curtains (e.g. Flexshield PVC Curtains or Flexshield Sonic Clear Ribbed Curtains), around the batch plant conveyors with a view to further reduce batch plant noise emissions.
- Consider the further use of absorptive internal linings within the hydraulic room to reduce noise breakout (or alternately consider replacing the existing louvre with an acoustically rated type).

It is considered that a combination of the noise control measures set out above may be applied at RCPA Thornton to further reduce operational noise levels from the site.

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APPENDIX A: Glossary of Acoustic Terms

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1 Sound Level (or Noise Level)

Sound may be defined as any pressure variation that the human ear can detect. The human ear responds to a wide range of changes in sound pressure. As the greatest sound pressures to which the human ear responds are 10,000,000 times greater than the lowest, the decibel (dB) scale, by the use of logarithms is used to express sound pressure levels more conveniently.

The standard reference sound pressure used to define a Sound Pressure Level is 2 x 10^{-5} Pascals (Pa).

The decibel is defined as ten times the logarithmic ratio of two pressures. The smallest perceptible change is approximately 1 dB.

Sound Pressure Level is typically abbreviated as SPL, L_P, or L.

2 "A" Weighted Sound Pressure Level

The most common frequency rating is 'A-Weighting'. The A-weighting frequency response curve is designed to approximate the sensitivity of the human ear. The symbol L_A represents A-weighted Sound Pressure Level - The overall broadband level of a sound/noise is typically expressed as a dB(A) level.

Human hearing is most sensitive mid frequencies sounds (500 Hz to 4000 Hz), and less sensitive at higher and lower frequencies. Therefore, the level expressed in dB(A) correlates strongly with the perceived loudness of the sound/noise.

A change in sound pressure level of 1-2 dB is barely noticeable to most people, whilst a 3-5 dB change is perceived as a small but noticeable change in loudness. A 10 dB change is perceived as an approximate doubling or halving in loudness. The table below present the sound pressure levels of some common sources.

Sound Pressure Level (dB)	Sound Source	Typical Subjective Description
140	Propeller aircraft; artillery fire, gunner's position	Intolerable
120	Riveter; rock concert, close to speakers; ship's engine room	
110	Grinding; sawing	
100	Punch press and wood planers, at operator's position; pneumatic hammer or drilling (at 2 m)	Very noisy
80	Kerbside of busy highway; shouting; Loud radio or TV	Noisy
70	Kerbside of busy traffic	
60	Department store, restaurant, conversational speech	
50	General office	Moderate to quiet
40	Private office; Quiet residential area	Quiet
30	Theatre; quiet bedroom at night	
20	Unoccupied recording studio; Leaves rustling	Very quiet
10	Hearing threshold, good ears at frequency of maximum sensitivity	
0	Hearing threshold, excellent ears at frequency maximum response	

In addition to A-weighting, other less commonly applied frequency weightings include B, C and D weightings. Unweighted or Linear levels are sound levels measured without any weighting. These are expressed as simply dB, or dB(lin) or dB(Z).

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3 Sound Power Level

The rate at which a noise source emits acoustic energy is defined by its Sound Power Level. Sound Power Levels are also expressed in decibel units (dB or dB(A)). Sound Power is typically identified as SWL or LW. The standard reference sound power used to define a Sound Power Level is 1 x 10^{-12} Watts (W).

4 Statistical Noise Levels

Environmental noise levels from various sources in the environment will vary in level over time. Statistical exceedance levels are typically expressed as L_{AN} levels (i.e. the A-weighted sound pressure level exceeded for N% of a specific measurement period.

The most commonly used statistical noise levels are as follows:

L_{Amax} Maximum noise level over a sample period (typically measured on fast time-weighting response).

L_{A1} Noise level exceeded for 1% of a sample period (typically 15-minute interval).

L_{A10} Noise level exceeded for 10% of a sample period (typically 15-minute interval).

L_{A90} Noise level exceeded for 90% of a sample period. This noise level is commonly used to describe the background noise level (in the absence of the source under investigation).

L_{Aeq} A-weighted equivalent noise level. This is equivalent to the steady sound level containing the same amount of acoustical energy as the time-varying sound. Often referred to as the average noise level.

ABL Assessment Background Level. This is the single figure background level representing each assessment period (day, evening and night) for each day. It is determined by calculating the lowest 10th percentile background noise level (L_{A90}) for each period.

RBL Rating Background Level. This is the median value of the ABL values for each period (day, evening, night), determined over several days of measurements.

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APPENDIX B: Daily Noise Monitoring Plots

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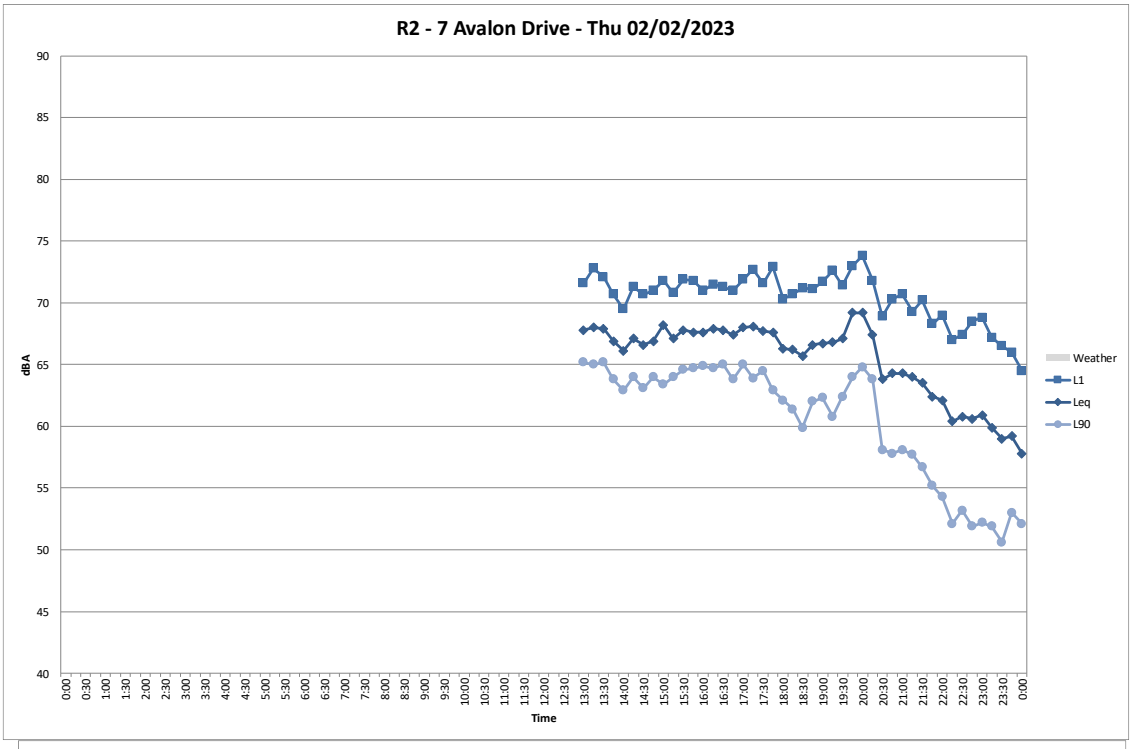

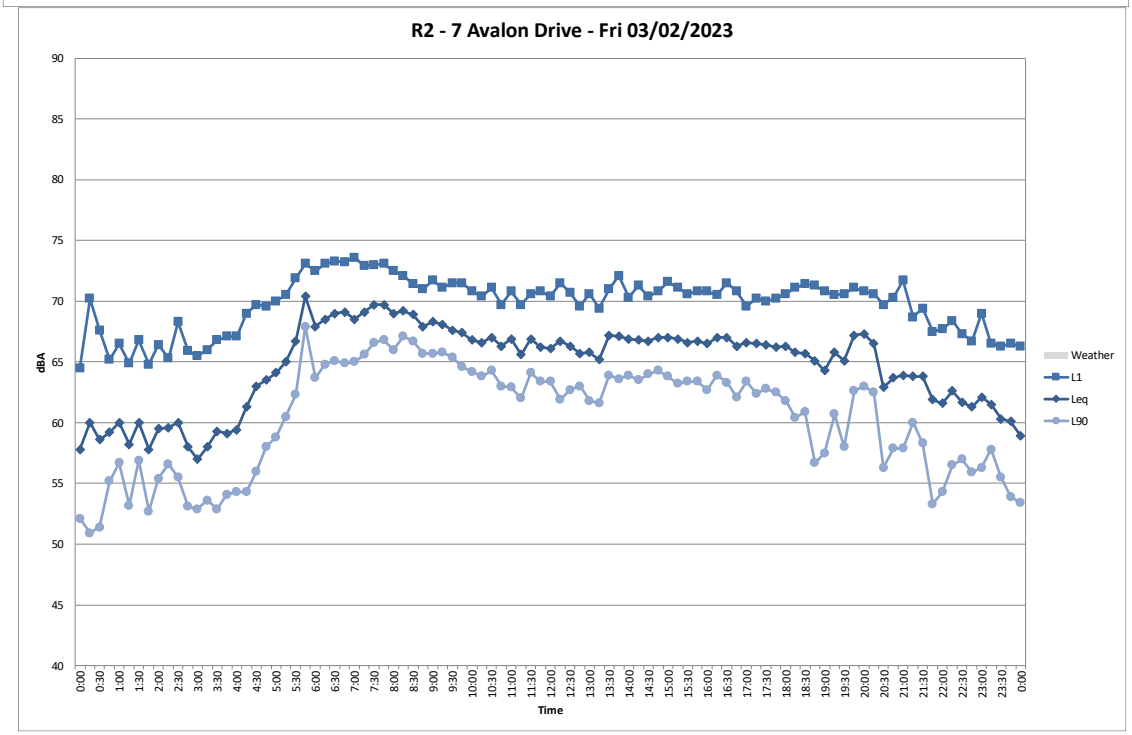

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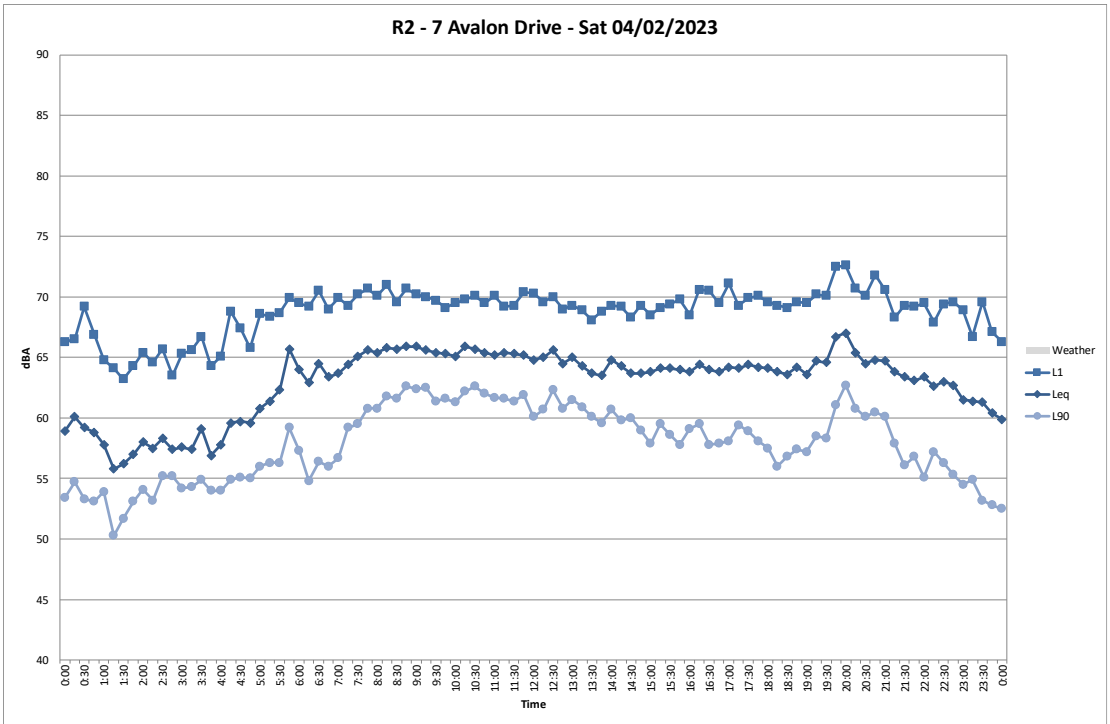

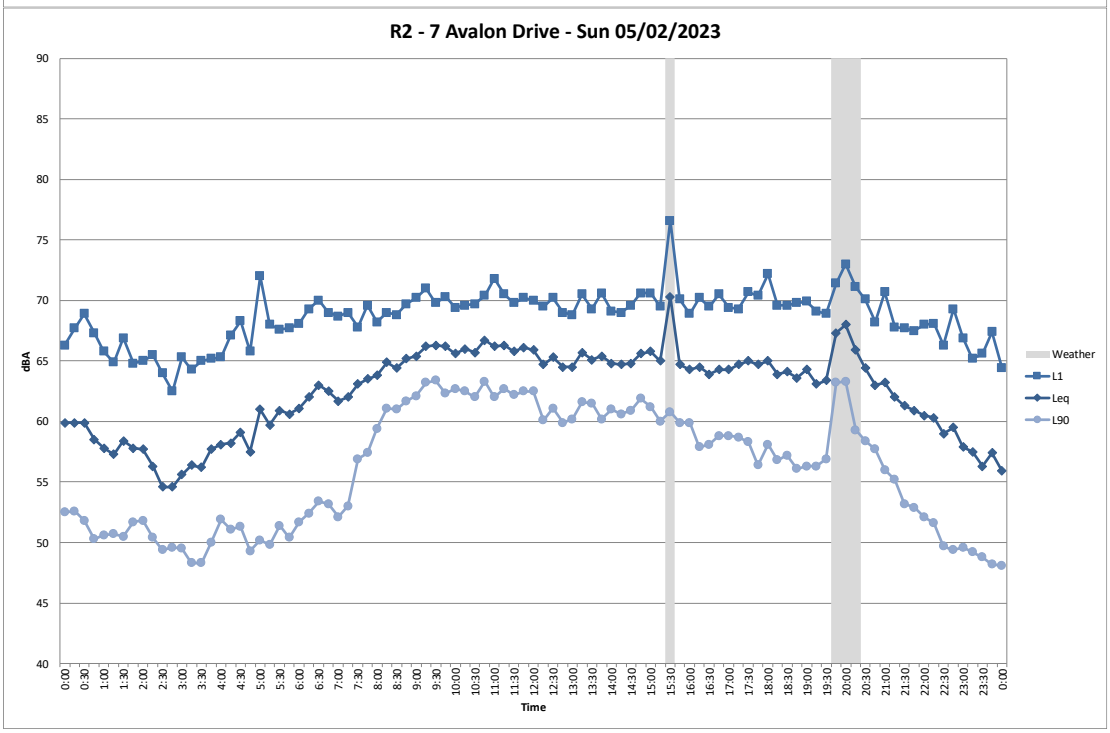

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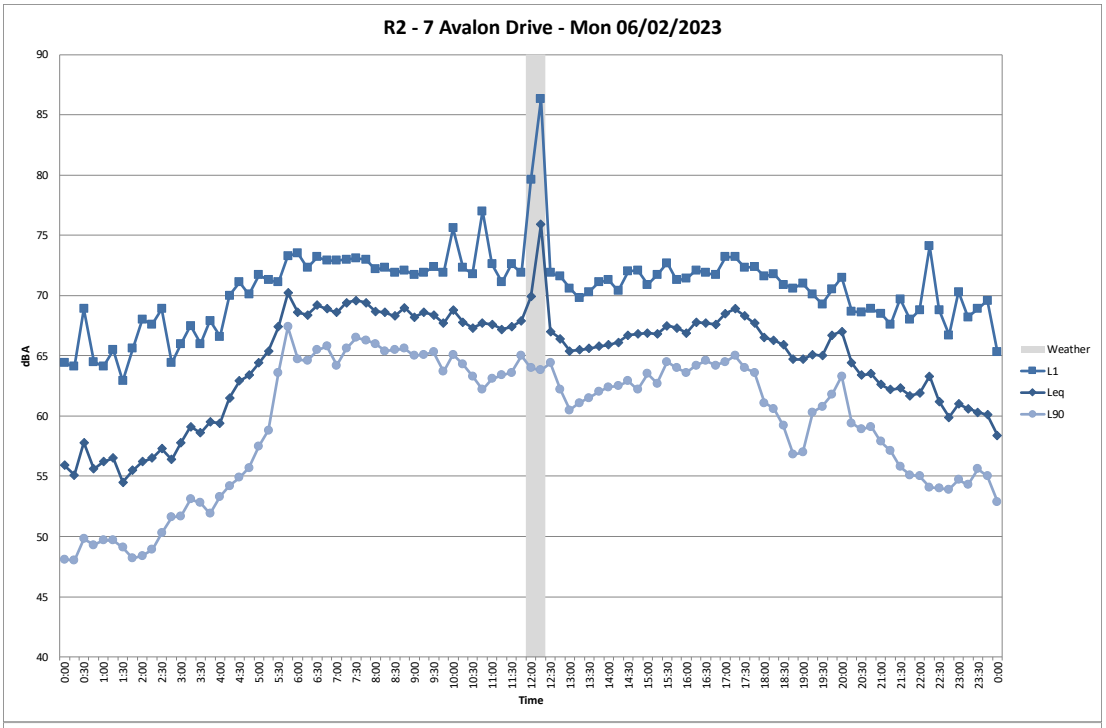

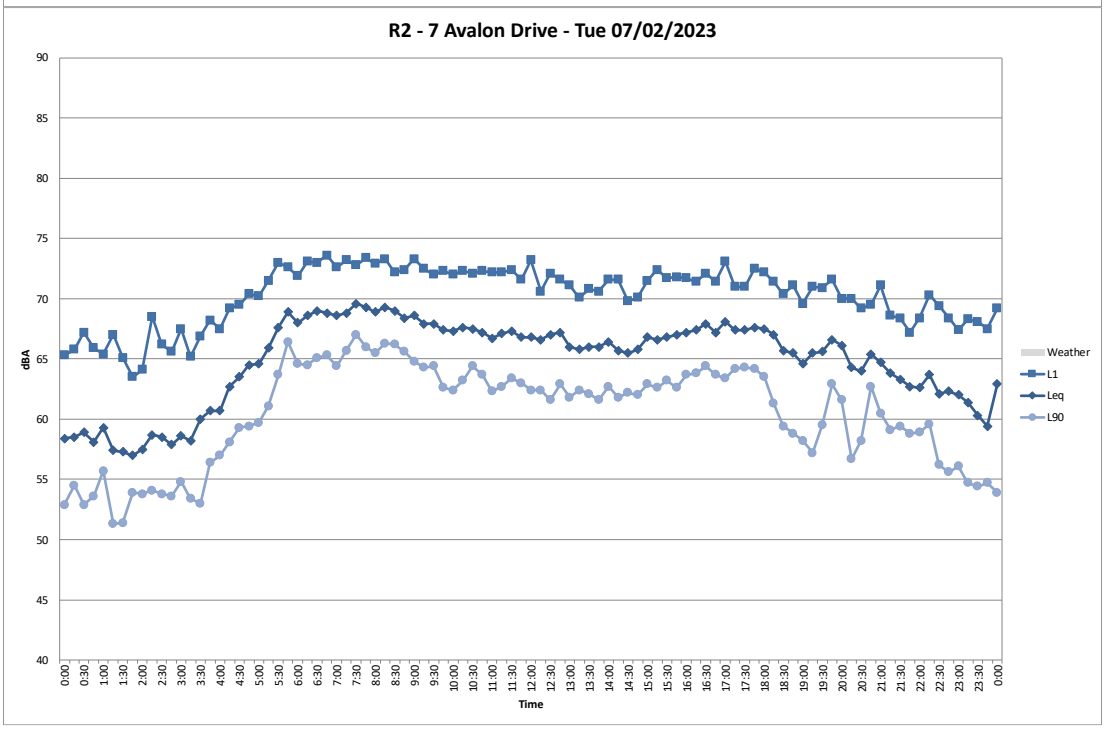

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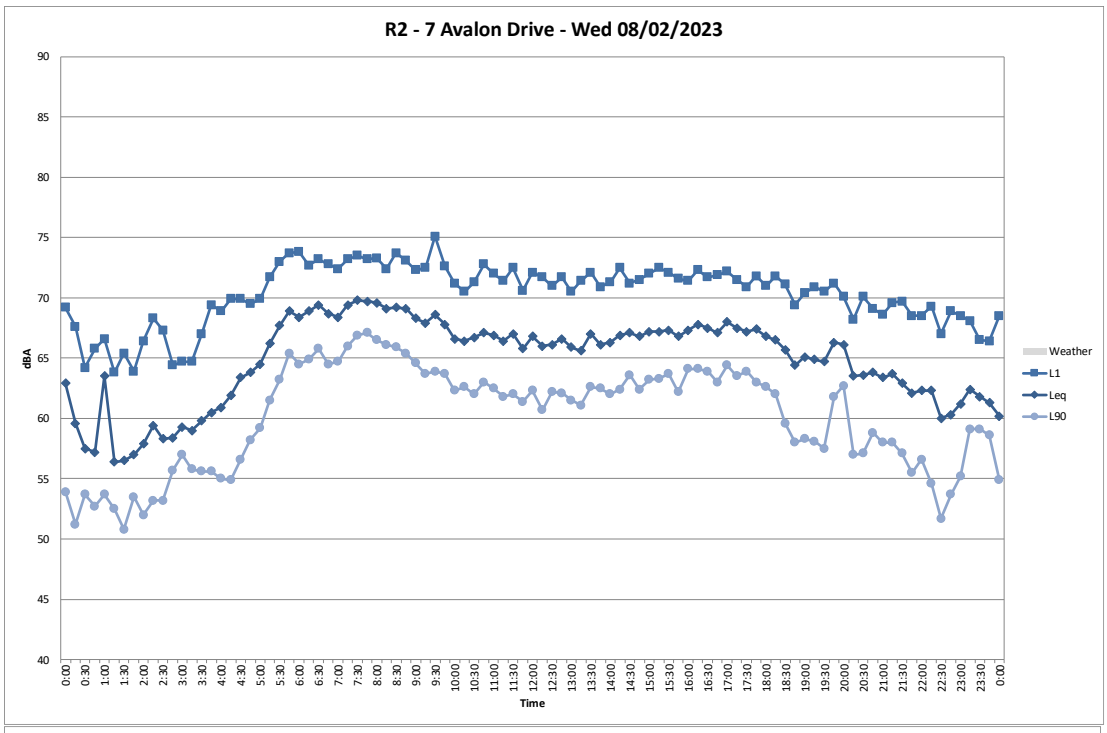

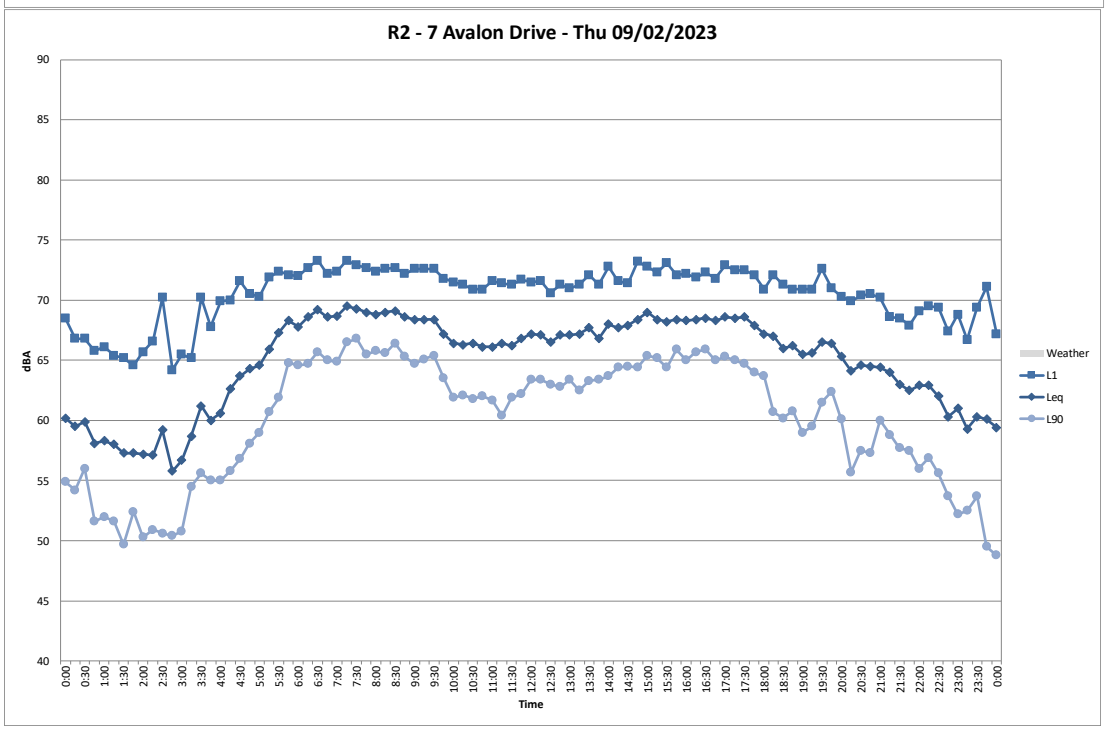

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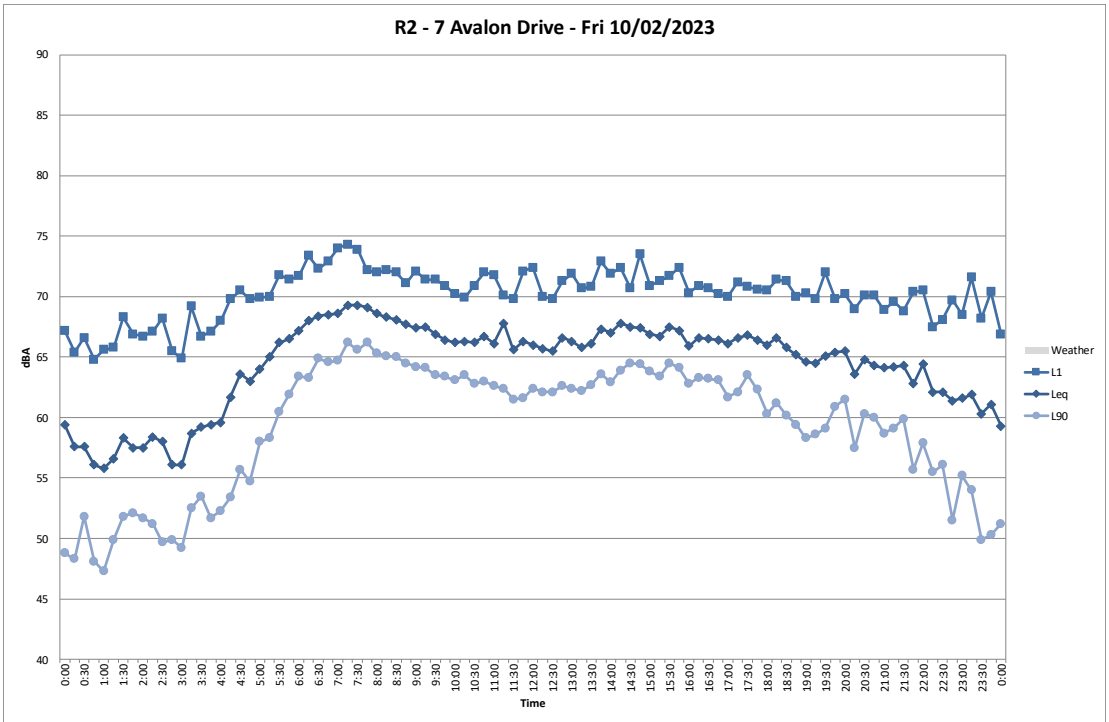

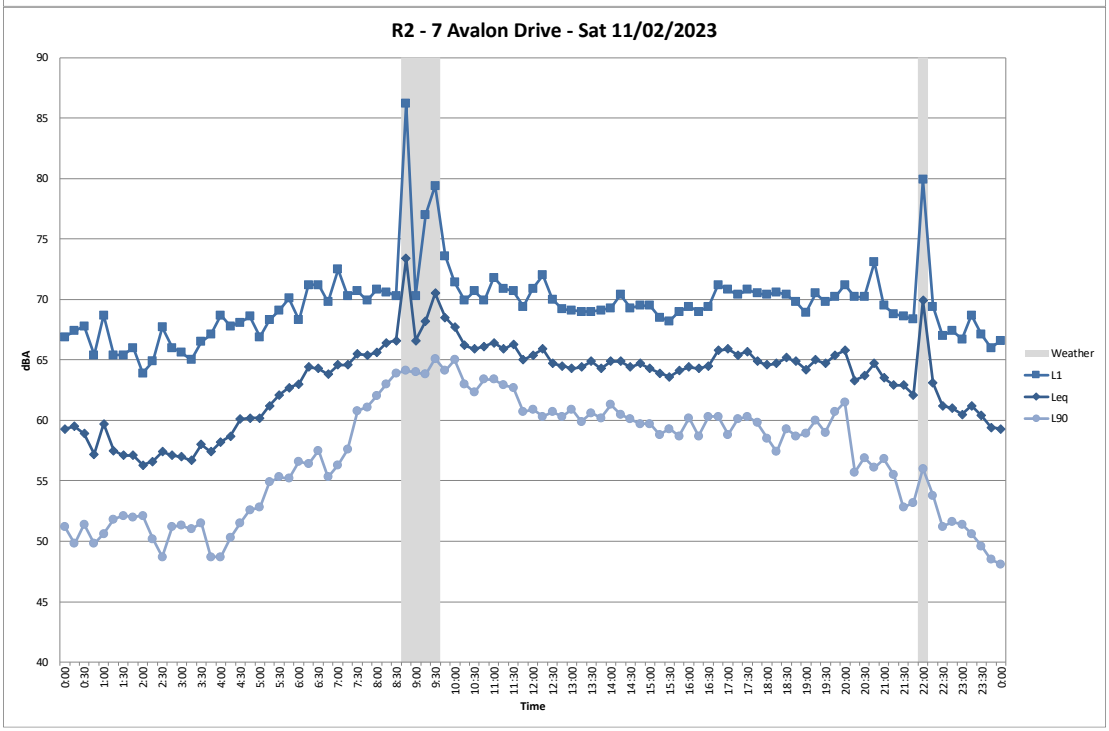

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Appendix B
Air quality assessment

EMM
creating opportunities

Air Quality Impact Assessment

Thornton Pipe Factory

Prepared for Reinforced Concrete Pipes Australia Pty Ltd

May 2023

Air Quality Impact Assessment

Thornton Pipe Factory

Reinforced Concrete Pipes Australia Pty Ltd

E230025 RP1

May 2023

Version	Date	Prepared by	Approved by	Comments
V1	16 May 2023	Amie Gilbert	Scott Fishwick	

Approved by

Scott Fishwick
National technical lead – air quality
18 May 2023

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Executive Summary

Reinforced Concrete Pipes Australia (NSW) Pty Ltd (RCPA) operates a precast concrete pipe manufacturing plant located at 8 Kestrel Avenue, Thornton NSW (the site). The site is approximately 25 kilometres (km) north-west of Newcastle within the Maitland City Council Government Area (LGA).

The site was previously operated by Humes, who received development consent (DA 06-1234) from the Maitland City Council on 10 June 2014 to authorise the use of the site as a precast concrete manufacturing plant and enable the development to operate 24 hours a day, seven days a week with a maximum annual output of 60,000 tonnes (t) of concrete pipe products. Humes later ceased operating the site in 2019 and vacated the property.

RCPA is now seeking to modify the current development consent to authorise the installation and operation of the concrete batching plant in a new location on the southern side of the building, external to the existing industrial shed, as well as the installation of air and noise mitigation methods.

This air quality impact assessment (AQIA) documents the existing air quality and meteorological environment, applicable impact assessment criteria, air pollutant emissions calculations, dispersion modelling of calculated emissions and provides an assessment of predicted impacts relative to criteria.

The AQIA has been prepared in general accordance with the guidelines specified by the NSW Environment Protection Authority (EPA) in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA 2022).

Local meteorological conditions and background air quality were quantified primarily using data from the Department of Planning and Environment (DPE) Automatic weather station (AWS) and air quality monitoring station (AQMS) at Beresfield, with additional inputs from the Bureau of meteorology (BoM) AWS at Williamstown RAAF.

Emissions estimation and dispersion modelling was completed for existing and proposed future scenarios. Emissions of total suspended particulates (TSP), particulate matter less than 10 micrometres (µm) in aerodynamic diameter (PM_{10}), and particulate matter less than 2.5 µm in aerodynamic diameter ($PM_{2.5}$) were estimated and modelled. The atmospheric dispersion of air pollutant emissions was simulated using the AERMOD model.

The results of the modelling show that the predicted concentrations and deposition rates for incremental particulate matter (TSP, PM_{10}, $PM_{2.5}$ and dust deposition) were below the applicable impact assessment criteria at all assessment locations for both single shift operations without further proposed mitigation and double shift operations with proposed mitigations implemented.

Cumulative impacts were assessed by combining modelled project impacts with recorded ambient background levels. The cumulative results showed that compliance with applicable NSW EPA impact assessment criteria is predicted at all assessment locations for all pollutants and averaging periods.

Proposed mitigation measures (principally water carts, water sprays and additional road paving for future double shift operations) were incorporated into the emissions calculations and dispersion modelling conducted. On a basis of the predicted compliance with applicable NSW EPA impact assessment criteria, it is considered that the mitigation measures are appropriate for the management of particulate matter emissions and impacts during operation of the site.

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Appendices

Tables

Figures

1 Introduction

1.1 Project context and overview

Reinforced Concrete Pipes Australia (NSW) Pty Ltd (RCPA) operates a precast concrete pipe manufacturing plant at 8 Kestrel Avenue, Thornton (the site). The site is located approximately 25 kilometres (km) north-west of Newcastle on Lot 1201 of Deposited Plan (DP) 1043699 and within the Maitland City Council Government Area (LGA). The regional and site locations are presented in Figure 1.1 and Figure 1.2.

The site had been previously occupied and operated by Humes until 2022 when RCPA took over operations at the site. Development consent DA 06-1234 was granted by Maitland City Council (the Council) on 29 August 2006 for extensions to the existing industrial shed for office areas. The development consent DA 06-1234 was subsequently modified on 10 June 2014 by Humes to authorise the use of the site as a precast concrete manufacturing plant and enable the development to operate 24 hours a day, seven days a week with a maximum annual output not exceeding 60,000 tonnes (t) of concrete pipe products.

Historically, the operation of the batching of concrete had been authorised and undertaken on the northern side of the building, with part of the process located inside the existing industrial shed. When Humes vacated the property, all fixed plant equipment was removed. In 2022 when RCPA occupied the site, a new mobile concrete batching plant was installed on the southern external side of the existing shed in the area shown on Figure 1.2. The installation and operation of the concrete batching plant in the new location is not considered to be consistent with the existing approved plans and RCPA therefore seek to regularise the approvals for this new location.

EMM Consulting Pty Limited (EMM) has been engaged by RCPA to prepare an air quality impact assessment (AQIA), which will accompany a modification application to DA 06-1234 to the Council. This AQIA accompanies the Statement of Environmental Effects (SEE) for the application.

1.2 Overview of the proposed modification

RCPA are seeking to modify DA 06-1234 to regularise the current development and authorise the relocation and operation of a concrete batching plant (the Project) in the area shown on Figure 1.2.

The proposed modification includes the instillation of additional noise and air quality mitigation measures at the site, specifically being:

- an acoustic noise barrier wall
- additional roadway pavement.

These mitigation measures are discussed further in Sections 1.2.2 and 1.2.3. With the exception of the installation and operation of the mobile batching plant and associated mitigation measures identified, all other elements of the Project will remain as currently approved.

A summary of approved and proposed activities is provided in Table 1.1.

Table 1.1 Summary of approved and proposed development and activities

Aspect	Approved activities	Proposed modifications
Site	8 Kestrel Avenue Thornton Lot 1201 DP 1043699	No change
Hours of operation	24 hours/day Seven days/week	No change
Output	Maximum 60,000 tonnes	No change
Infrastructure	• industrial shed • laydown area • sand and aggregate storage bays • Cement storage • paved and unpaved roadways	As approved with the addition of: • additional paved roadways • relocation of the concrete plant outside of shed • acoustic barrier wall
Material deliveries and dispatch	Deliveries of aggregate, sand and cement/fly ash	No change

1.2.1 Concrete batching plant infrastructure and activities

Infrastructure comprising the concrete batching plant includes the following:

- sand and aggregate hopper with vibrator
- aggregate conveyor
- overhead aggregate bins
- feed conveyor
- batch plant
- two cement silos.

Sand and aggregate are loaded into the sand and aggregate hopper from the aggregate and sand storage bays via front end loader. Aggregate and sand are transferred via conveyor to the batching plant where cement and water is added. Batched concrete is transferred by conveyor from the batch plant to the pipe machine radial press located inside the existing industrial shed.

1.2.2 Acoustic barrier wall

RCPA proposes to install an approximately 70 metre (m) long and 2.9 m high acoustic barrier wall on the south side of the site between the concrete batching plant and the adjacent industrial receivers. The acoustic barrier wall will be constructed using shipping containers and be designed to minimise the impacts of the concrete batching plant and associated mobile equipment operations to the adjacent industrial receivers.

1.2.3 Additional pavement

RCPA also proposes to install additional paving on operational areas which are currently unpaved in order to reduce air quality impacts (principally raised dust) associated with movements of outdoor vehicle operations. RCPA proposes to install pavement on the section of unpaved access road between the sand and aggregate storage bays and connecting with the currently paved site entry/exit onto Kestrel Avenue.

The type of pavement to be installed has yet to be confirmed and will be determined following a detailed review into suitable options.

1.3 Assessment approach

This AQIA report has been conducted in general accordance with the guidelines specified by the NSW Environment Protection Authority (EPA) in the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA 2022), hereafter "the Approved Methods for Modelling". Consistent with Section 2.1 of the Approved Methods for Modelling, this AQIA is classed as a Level 2 assessment and implements a refined dispersion modelling approach using site-specific/representative input.

This report comprises of the following sections:

- a description of the local setting and surrounds of the site
- relevant pollutants for assessment and applicable impact assessment criteria
- a description of baseline inputs, specifically:
    - meteorology and climate
    - existing air quality environment
- a detailed air pollution emissions inventory for the site
- results of atmospheric dispersion modelling conducted for the site, including an analysis of Project-only and cumulative impacts accounting for background air quality.

KEY

- Site boundary

Existing environment

- Train station
- Rail line
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- Local government area

Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

0 1 2 km

GDA2020 MGA Zone 56

N

\\emmsvr1\EMM2\2023\E230025 - Thornton Concrete Batching Plant\GIS\02 Maps\G002 RegionalContext 20230517 03.mxd 17/05/2023

Regional context

Thornton Pipe Factory
Air Quality Impact Assessment
Figure 1.1

EMM
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KEY

- Project area
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

\\emmsvr1\EMM2\2023\E230025 - Thornton Concrete Batching Plant\GIS\02 Maps\G001 SiteLocation 20230517 03.mxd 17/05/2023

Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

0 250 500 m

GDA2020 MGA Zone 56

N

Site location

Thornton Pipe Factory
Air Quality Impact Assessment
Figure 1.2

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2 Site setting and sensitive receptors

2.1 Site setting

The site is zoned as E3 Productivity Support, with land classifications in the nearby vicinity including C3 Environmental Management, RU2 Rural Landscape and E4 General Industry. Land usage in the surrounding area is a mixture of general residential, environmental living, environmental conservation and light industrial uses.

The closest residences are about 340 m south-west of the site boundary, on the opposite side of the New England Highway. The closest school is Aspect Hunter School, approximately 450 m north-east of the site.

2.2 Assessment locations

A selection of representative residential, industrial and commercial properties surrounding the site have been chosen as assessment locations for this modelling study. The assessment locations are presented in Table 2.1 and shown in Figure 2.1.

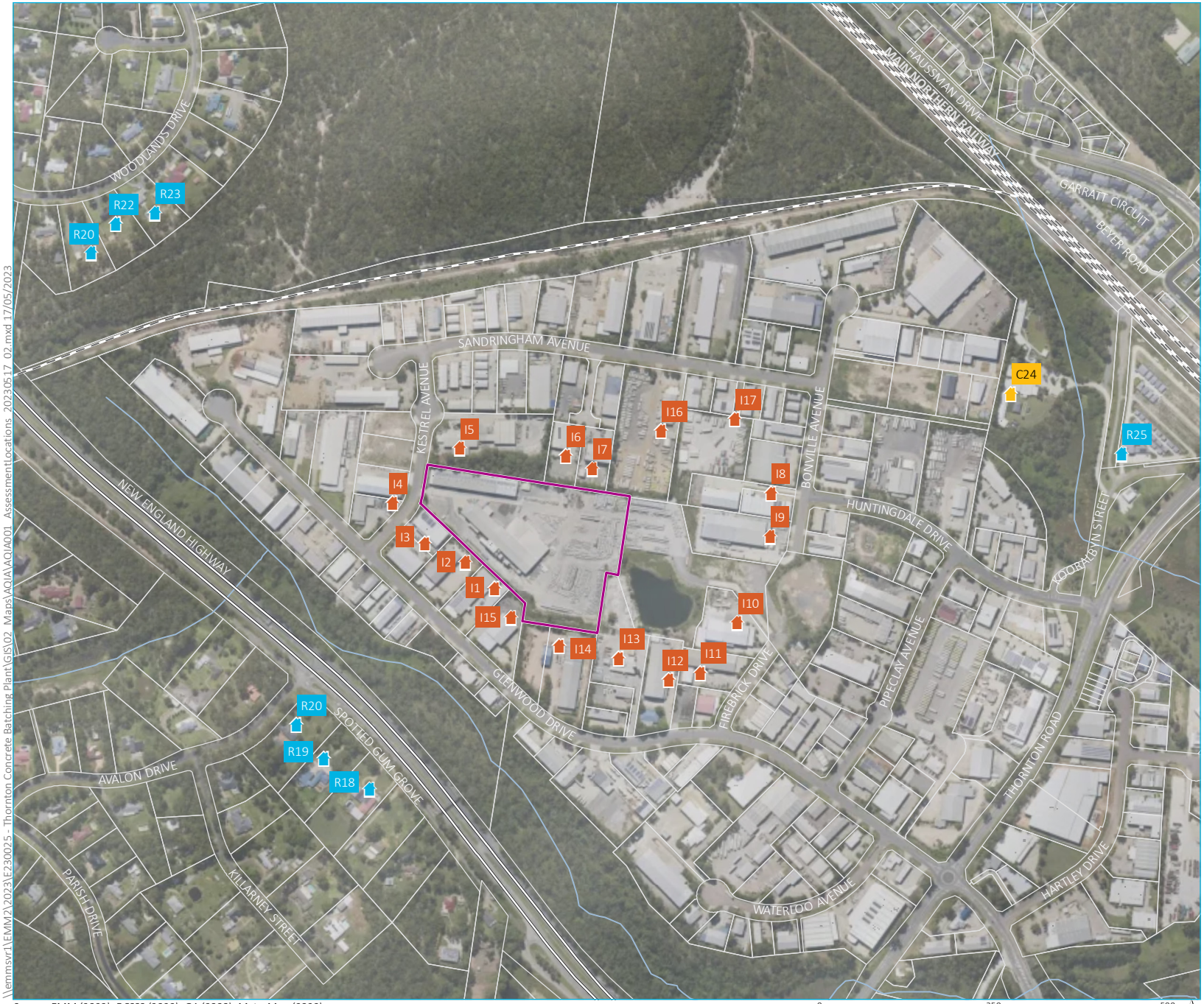
These locations are used as points for detailed model analysis of air quality impacts from the site. Compliance with applicable assessment criteria at these representative assessment locations would indicate the criteria will be met at other more distant assessment locations.

Table 2.1 Assessment locations

Assessment location ID	Type	Easting	Northing
I1	Industrial	371597	6371579
I2	Industrial	371556	6371616
I3	Industrial	371497	6371643
I4	Industrial	371451	6371701
I5	Industrial	371547	6371780
I6	Industrial	371700	6371769
I7	Industrial	371738	6371751
I8	Industrial	371994	6371715
I9	Industrial	371993	6371653
I10	Industrial	371946	6371529
I11	Industrial	371893	6371457
I12	Industrial	371847	6371447
I13	Industrial	371775	6371478
I14	Industrial	371690	6371496
I15	Industrial	371621	6371537
I16	Industrial	371837	6371805
I17	Industrial	371942	6371822
I18	Residential	371418	6371290

Table 2.1 Assessment locations

Assessment location ID	Type	Easting	Northing
R19	Residential	371352	6371334
R20	Residential	371313	6371383
R21	Residential	371018	6372060
R22	Residential	371053	6372102
R23	Residential	371110	6372118
C24	Education	372339	6371858
R25	Residential	372497	6371772



\\emmsvr1\EMM2\2023\E230025 - Thornton Concrete Batching Plant\GIS\02_Maps\AQIA\AQIA001_AssessmentLocations_20230517_02.mxd 17/05/2023

Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

Assessment locations

Thornton Pipe Factory
Air Quality Impact Assessment
Figure 2.1

EMM
creating opportunities

3 Pollutants and assessment criteria

3.1 Potential air pollutants

The operation of the site has the potential to generate emissions of various air pollutants to the ambient atmosphere. Emission sources will comprise of a mixture of fugitive particulate matter emissions from heavy mobile equipment, material handling and transfers, concrete batching plant processes and wind erosion of storage bunkers and point releases associated with mobile diesel fuel combustion sources (site equipment and trucks).

The main air pollutants include:

- Particulate matter, specifically
  - total suspended particulate matter (TSP)
  - particulate matter less than 10 micrometres in aerodynamic diameter (PM_{10})
  - particulate matter less than 2.5 micrometres in aerodynamic diameter ($PM_{2.5}$)
- oxides of nitrogen (NO_X)
- sulphur dioxide (SO_2)
- carbon monoxide (CO)
- volatile organic compounds (VOCs).

Particulate matter pollutants (TSP, PM_{10} and $PM_{2.5}$) are anticipated to be the key pollutants with regards to both magnitude of emissions generated by the site and the associated compliance with impact assessment criteria at surrounding assessment locations. This assessment will, therefore, focus on the quantification of particulate matter emissions and impacts (fugitive releases and diesel combustion related particulate matter).

Emissions and impacts from other pollutants associated with diesel combustion (NO_x, SO_2, CO and VOCs) are expected to be minor and have not been addressed further in this assessment.

3.2 Applicable air quality assessment criteria

3.2.1 Particulate matter

The NSW EPA's impact assessment criteria for particulate matter, as documented in Section 7 of the Approved Methods for Modelling, are presented in Table 3.1. The assessment criteria for PM_{10} and $PM_{2.5}$ are consistent with the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM) national reporting standards (Department of the Environment 2016).

TSP, which relates to air borne particles less than 50 micrometres (µm) in diameter, is used as a metric for assessing amenity impacts (reduction in visibility, dust deposition and soiling of buildings and surfaces) rather than health impacts (NSW EPA 2013). Particles less than 10 µm and 2.5 µm in diameter are fine enough to enter the human respiratory system and can lead to adverse human health impacts. The NSW EPA impact assessment criteria for PM_{10} and $PM_{2.5}$ are, therefore, used to assess the potential impact to human health from particulate matter concentrations.

The Approved Methods for Modelling classifies TSP, PM_{10}, $PM_{2.5}$ and dust deposition as 'criteria pollutants'. Assessment criteria for 'criteria pollutants' are applied at the nearest existing or likely future off-site sensitive receptor and compared against the 100th percentile (ie the highest) dispersion modelling prediction. Both the incremental and cumulative impacts need to be presented, requiring consideration of existing ambient background concentrations for the criteria pollutants assessed.

For dust deposition, the NSW EPA (2022) specify criteria for project-only increment and cumulative dust deposition levels. Dust deposition impacts are derived from TSP emission rates and particle deposition calculations in the dispersion modelling process.

Table 3.1 Impact assessment criteria for particulate matter

PM metric	Averaging period	Assessment criteria
TSP	Annual	90 µg/m^3
PM_{10}	24 hour	50 µg/m^3
	Annual	25 µg/m^3
$PM_{2.5}$	24 hour	25 µg/m^3
	Annual	8 µg/m^3
Dust deposition	Annual	2 g/m^2/month (project increment only)
		4 g/m^2/month (cumulative)

Notes: µg/m^3: micrograms per cubic meter; g/m^2/month: gram per square meter per month.

4 Meteorology and climate

4.1 Monitoring data resources

There are no meteorological measurements taken at the site. In reviewing the meteorological environment of the local area, the following publicly available data sources were used:

- Department of Planning and Environment (DPE) air quality monitoring station (AQMS) at Beresfield, located approximately 3.2 km south-east of the site. One-hour measurements of wind speed, wind direction, standard deviation of wind direction, temperature, relative humidity and rainfall were sourced from this station.

- Bureau of Meteorology (BoM) Automatic weather station (AWS) at Williamtown RAAF (station 061078), located approximately 19.4 km east of the site. One-hour average measurements of wind speed, wind direction, standard deviation of wind direction, temperature, relative humidity, station-level barometric pressure and cloud observations were sourced from this AWS.

The meteorological data recorded by the DPE Beresfield AQMS were analysed for the five-year period between 2018 and 2022 (Appendix A). The analysis demonstrated a similarity across years in the most important parameters for pollutant dispersion, such as wind speed and wind direction winds. The annual average recorded wind speed ranged from 2.2 m/s to 2.4 m/s, while the frequency of calm conditions (wind speeds less than 0.5 m/s) ranged from 4.9% to 5.4% of the time.

Inter-annual profiles for air temperature and relative humidity were also generally comparable between 2018 and 2022 (Appendix A). 2018 and 2019 datasets showed higher daytime temperatures and lower relative humidity, which are indicative of the strong drought conditions during these two years.

For the purpose of the AQIA, on the basis of similarities in the inter-annual trends of wind speed and direction for the years between 2018 and 2022, 2021 was considered suitable representative of the two reference monitoring stations for use in the assessment to meet the requirements of the Approved Methods for Modelling. At the time of commencing this AQIA, 2021 represented the most complete and representative recent calendar year of hourly varying measurements available.

4.2 Meteorological modelling

Atmospheric dispersion modelling for this assessment has been completed using the AMS[1]/USEPA[2] regulatory model (AERMOD) (model version v22112, further discussion presented in Section 7). The meteorological inputs for AERMOD were generated using the AERMET meteorological processor (model version v22112), using local surface observations and upper air profiles generated by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) TAPM meteorological modelling module.

Further details of the TAPM meteorological modelling and AERMET data processing completed to prepare the inputs for AERMOD are documented in Appendix A.

1 AMS - American Meteorological Society

2 USEPA - United States Environmental Protection Agency

4.3 Prevailing winds

The annual wind rose showing the wind speed and direction from DPE Beresfield AQMS recorded during 2021 is presented in Figure 4.1. The wind rose shows a prevailing wind alignment from the south-east and north-west. The annual average wind speed for the year 2021 was 2.4 m/s. The annual average frequency of calm conditions (wind speed less than 0.5 m/s) was 5%. Calm winds are typically associated with stable atmospheric conditions (see Section 4.4 for additional discussion) which have a lower potential for the dispersion of air pollutant emissions.

Seasonal wind roses from the DPE Beresfield AQMS 2021 dataset are shown in Figure 4.2. The mean wind speed ranges from 2.1 m/s in summer and autumn to 2.9 m/s in winter. The frequency of calm conditions ranges from 3.5% in summer to 6.8% in autumn. The autumn, winter and spring months show prevailing north-westerly winds, while winds from the south-easterly are more dominant in the summer months.

Diurnal wind roses from the DPE Beresfield AQMS 2021 dataset are shown in Figure 4.3. The wind direction patterns during the night hours are dominated by air flow from the north-west and south-south-easterly direction. While a notable north-westerly is experienced during the day. Wind speeds are higher during the daylight hours, with an average wind speed of 2.9 m/s compared to 1.8 m/s at night-time, while the percentage of calms is higher at night (7.5% versus 2.7% during the day).

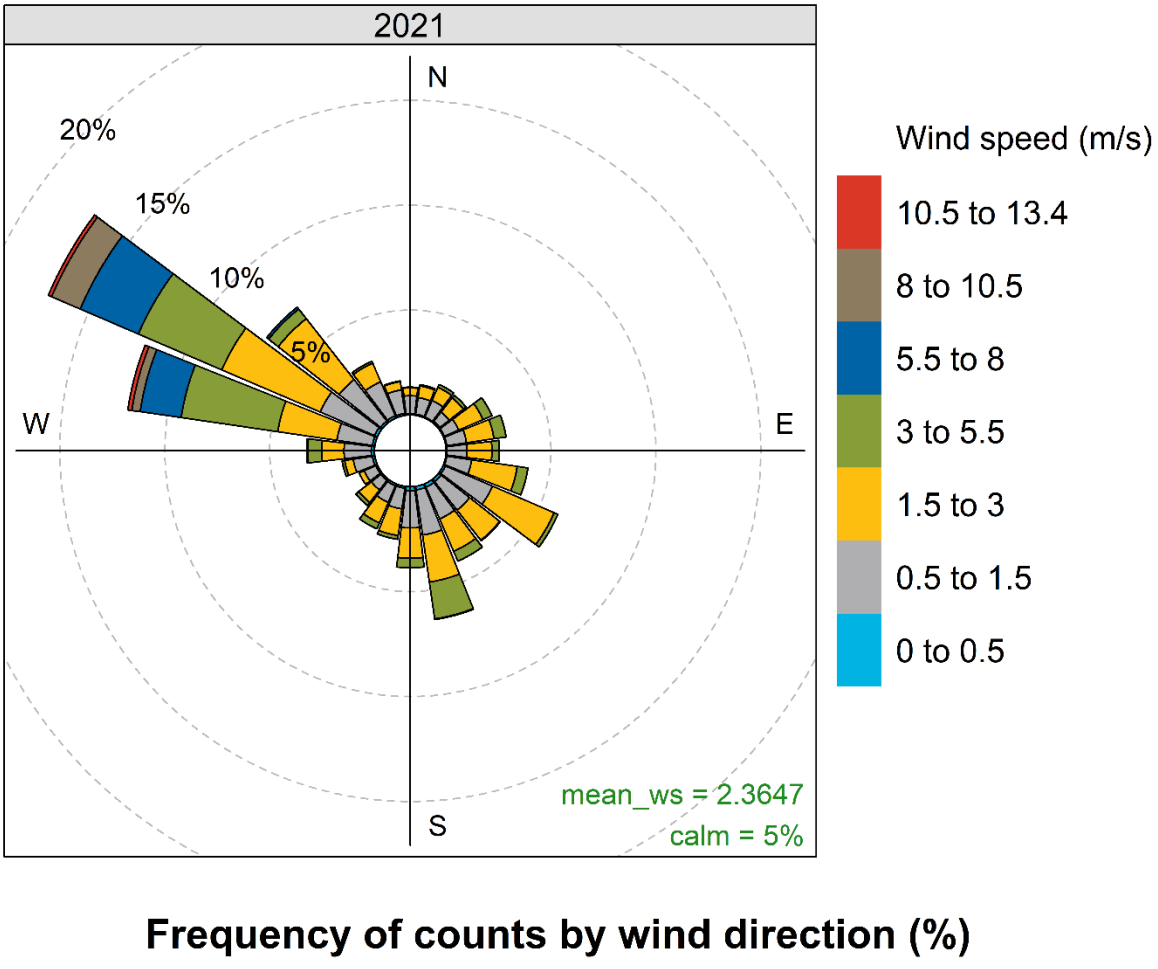


Figure 4.1 Annual wind speed and direction – DPE Beresfield AQMS - 2021

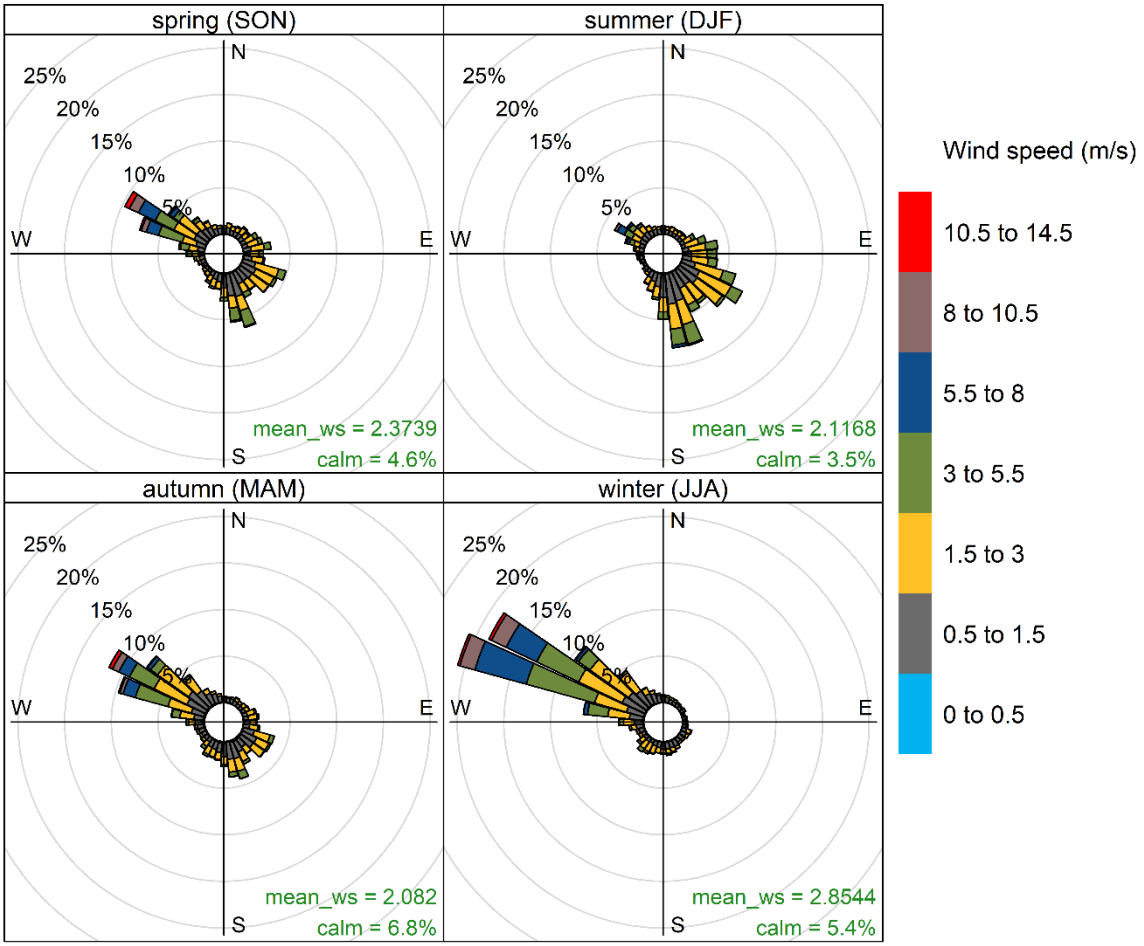


Figure 4.2 Seasonal wind speed and direction – DPE Beresfield AQMS - 2021

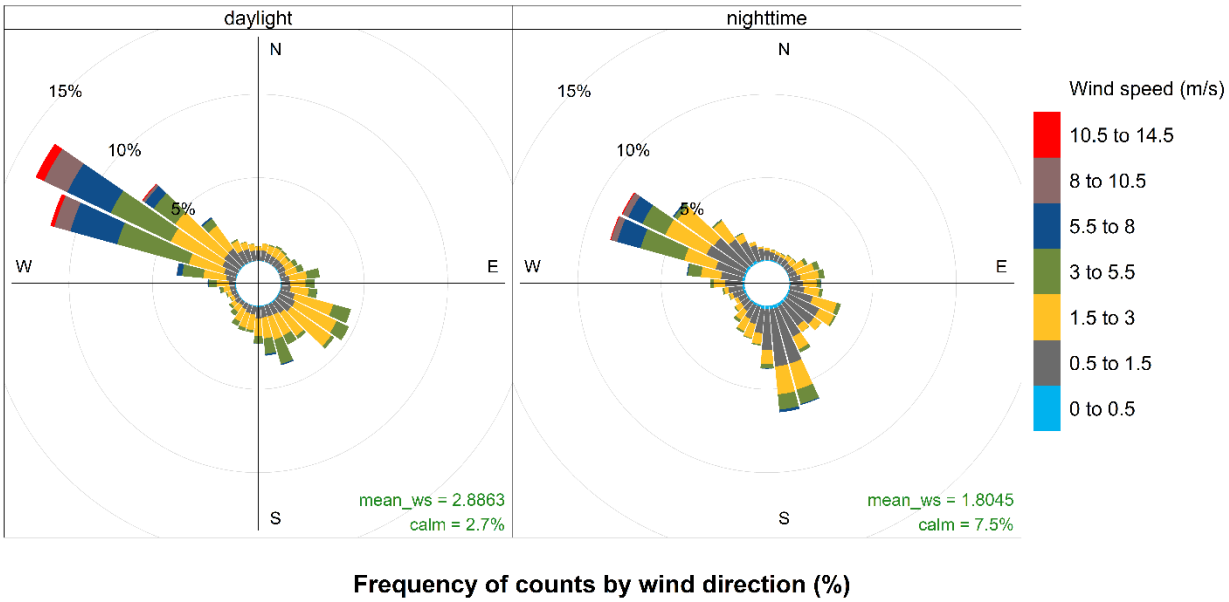


Figure 4.3 Diurnal wind speed and direction – DPE Beresfield AQMS – 2021

4.4 Atmospheric stability and mixing depth

Atmospheric stability refers to the degree of turbulence or mixing that occurs within the atmosphere and is a controlling factor in the rate of atmospheric dispersion of pollutants.

The Monin-Obukhov length (L) provides a measure of the stability of the surface layer (ie the layer above the ground in which vertical variation of heat and momentum flux is negligible; typically about 10% of the mixing height). Negative L values correspond to unstable atmospheric conditions, while positive L values correspond to stable atmospheric conditions. Very large positive or negative L values correspond to neutral atmospheric conditions.

Figure 4.4 illustrates the diurnal variation of atmospheric stability, derived from the Monin-Obukhov length calculated by AERMET based on observation data collected from the DPE Beresfield AQMS in 2021.

The diurnal profile presented illustrates that atmospheric instability increases during daylight hours as convective energy increases, whereas stable atmospheric conditions prevail during the night-time. This profile indicates that the potential for atmospheric dispersion of emissions would be greatest during daytime hours and lowest during evening through to early morning hours.

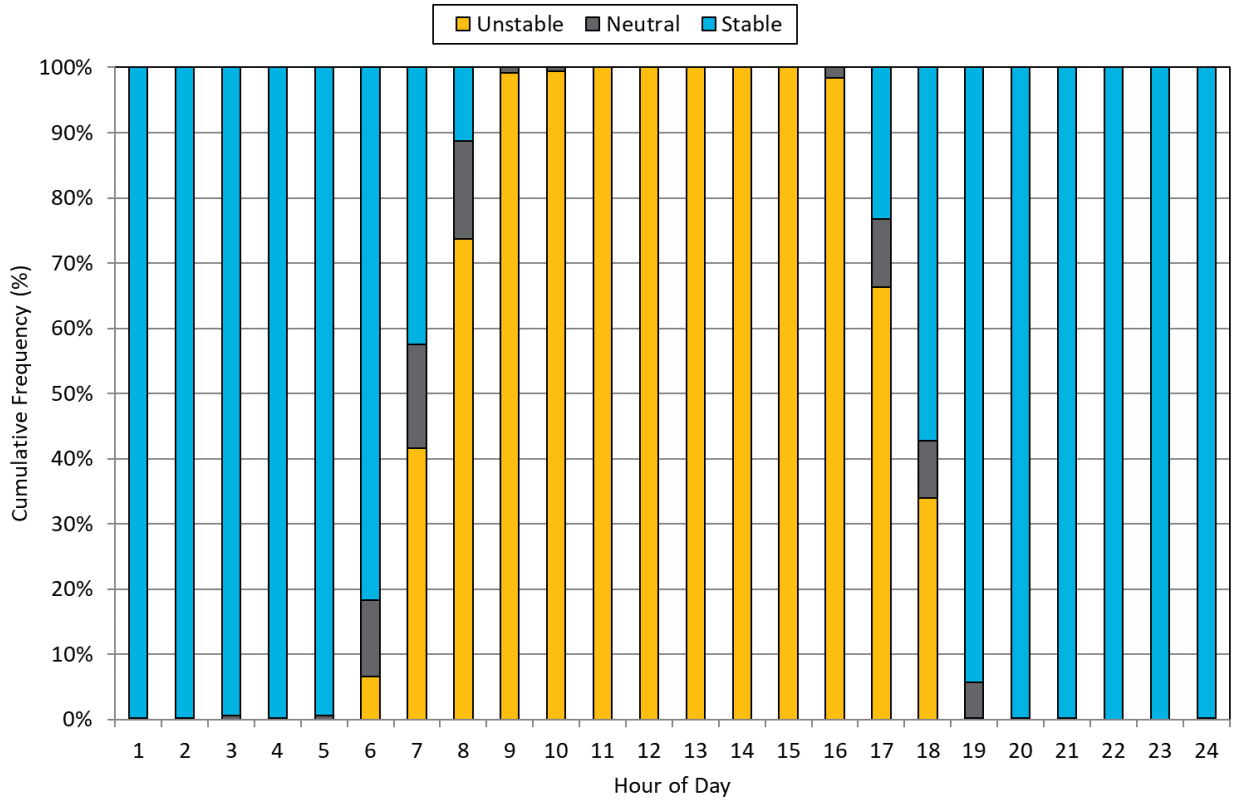


Figure 4.4 AERMET-generated diurnal variation in atmospheric stability – DPE Beresfield AQMS - 2021

Hourly-varying atmospheric boundary layer depths were calculated by AERMET and refers to the height of the atmosphere above ground level within which the dispersion of air pollution occurs. The variation in boundary layer depth by hour of the day is illustrated in Figure 4.5. The profile presented in Figure 4.5 shows that greater boundary layer depths are experienced during the daytime hours between mid-morning and late afternoon. Higher day-time wind velocities and the onset of incoming solar radiation increases the amount of mechanical and convective turbulence in the atmosphere. As turbulence increases so too does the depth of the boundary layer, generally contributing to higher mixing depths and greater potential for atmospheric dispersion of pollutants.

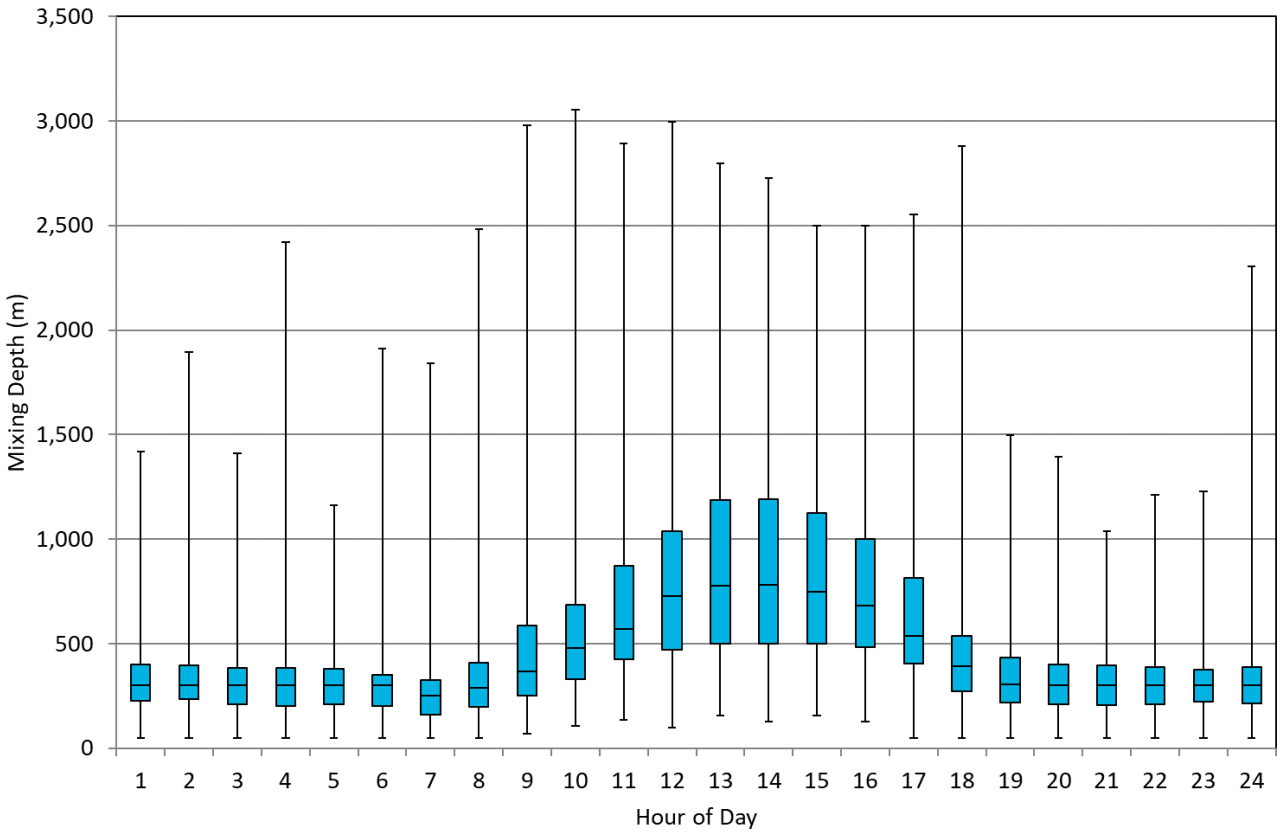


Figure 4.5 **AERMET-generated diurnal variation in atmospheric boundary layer depth – DPE Beresfield AQMS - 2021**

Note: blue bars indicate the interquartile range (IQR), or middle 50% of the data, while the whiskers indicate highest and lowest values.

5 Background air quality

5.1 Existing sources of emissions

The site is located in south-western Thornton, with the predominant surround land use being industrial and business properties. Regarding neighbouring sources of industrial air pollution emissions, the site is located north-west of the Hunter Ready mixed Concrete batching site.

Other sources that contribute to particulate matter concentrations in the vicinity of the site include:

- dust entrainment and tire break wear due to vehicle movements along public roads
- petrol and diesel emissions from vehicle movements along public roads
- wind-generated dust from exposed areas within the surrounding region
- seasonal emissions from household wood burning fires.

Other remote sources which contribute episodically to suspend particulates in the region include dust storms and bushfires.

5.2 Air quality monitoring data resources

There are no air quality measurements available for the site. The NSW DPE maintains an AQMS at Beresfield approximately 3.2 km southeast of the site. Daily average concentrations of PM_{10} and $PM_{2.5}$ from the Beresfield AQMS were collated for the period between January 2018 and December 2022. Data was also collated from the DPE AQMS locations at Wallsend (located approximately 12.6 km south-east from the site) and Mayfield (located approximately 14.3 km south-east from the site).

Throughout the collated data period, there were a number of missing data points for both PM_{10} and $PM_{2.5}$ at the Beresfield AQMS. To complete the gaps in the Beresfield AQMS dataset for 2018 to 2022, missing data points were substituted with the corresponding measurements at the nearby DPE Wallsend and Mayfield AQMS locations (approximately 11 km south-south-east and 11.7 km south-east of the DPE Beresfield AQMS respectively).

5.3 Baseline air quality environment

5.3.1 PM_{10}

A time series of 24-hour average PM_{10} concentrations recorded at the DPE Beresfield AQMS between 2018 and 2022 is presented in Figure 5.1. Recorded 24-hour average PM_{10} concentrations fluctuate through the presented period.

Exceedances of the 24-hour average criterion occurred in multiple years between 2018 and 2022, ranging from no days in 2021 and 2022 to 30 days in 2019. There was an increasing trend in the magnitude of recorded concentrations from 2018 through to early 2020, coinciding with an intensification of drought conditions across NSW and the Black Summer bushfires between October 2019 and February 2020.

The recorded PM_{10} concentrations decrease during 2020 relative to 2018 and 2019, associated with the onset of La Niña conditions (ie increasing rainfall and reduction in drought conditions). The annual average PM_{10} concentration in 2019 exceeded the applicable criterion of 25 µg/m³, however for all other years analysed, the annual average concentrations were below the criterion.

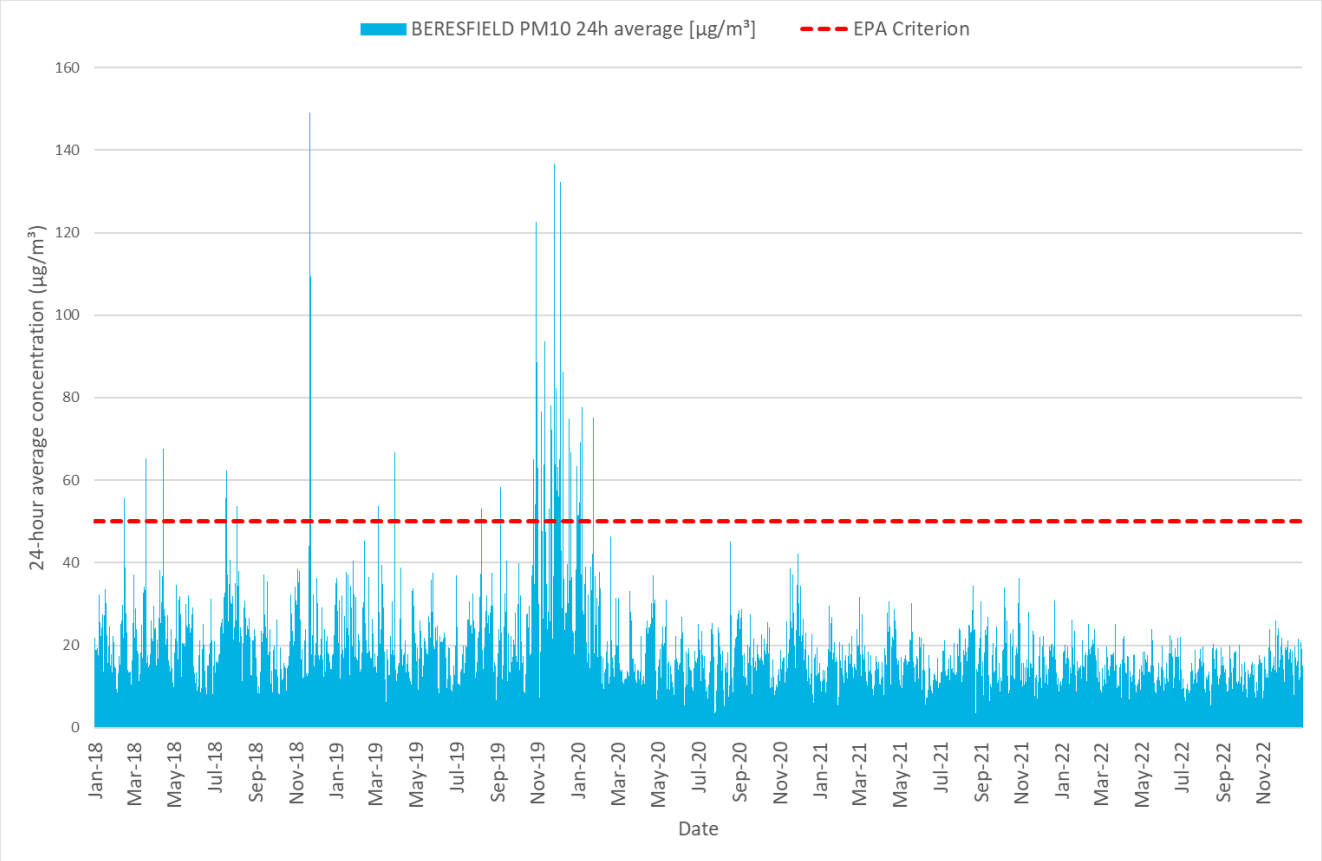


Figure 5.1 Time series of 24-hour average PM_{10} concentrations – DPE Beresfield AQMS – 2018 to 2022

Key statistics for the five years of data from the DPE Beresfield AWMS dataset are presented in Table 5.1.

For the purpose of this AQIA, the 2021 calendar year monitoring dataset has been adopted as a representation of local background PM_{10} concentrations, coincident with the adopted meteorological year.

Table 5.1 Statistics for PM_{10} concentrations – DPE Beresfield AQMS dataset – 2018 to 2022

Year	Maximum	99th percentile	75th percentile	Median	Average	Days > 50 µg/m³	Data recovery
	24-hour average PM_{10} concentration (µg/m³)						
2018	149.1	63.3	25.3	19.5	21.5	8	99.5
2019	136.7	97.8	29.5	20.8	25.6	30	98.6
2020	77.7	52.7	22.2	16.3	18.4	6	99.2
2021	36.3	31.2	19.3	15.3	15.8	0	99.5
2022	26.2	24.8	17.2	13.9	14.1	0	98.4

5.3.2 $PM_{2.5}$

A time series of recorded 24-hour average $PM_{2.5}$ concentrations from the Beresfield AQMS dataset recorded between 2018 and 2022 is presented in Figure 5.2. Similar to PM_{10} concentrations, the recorded 24-hour average $PM_{2.5}$ concentrations fluctuate throughout the presented period. Recorded 24-hour average $PM_{2.5}$ concentrations were generally bellow the NSW EPA impact assessment criterion of 25 µg/m³.

Multiple NSW EPA criterion exceedances were experienced for the two years of 2019 and 2020 (ranging from 8 days in 2020 to 23 days in 2019). Exceedances were associated with regional scale events such as dust storms, hazard reduction burns and during 2019 and 2020, extensive bushfire events across NSW. Annual average $PM_{2.5}$ concentrations were at or below the applicable criterion of 8 µg/m³ for all years excluding 2018 and 2019.

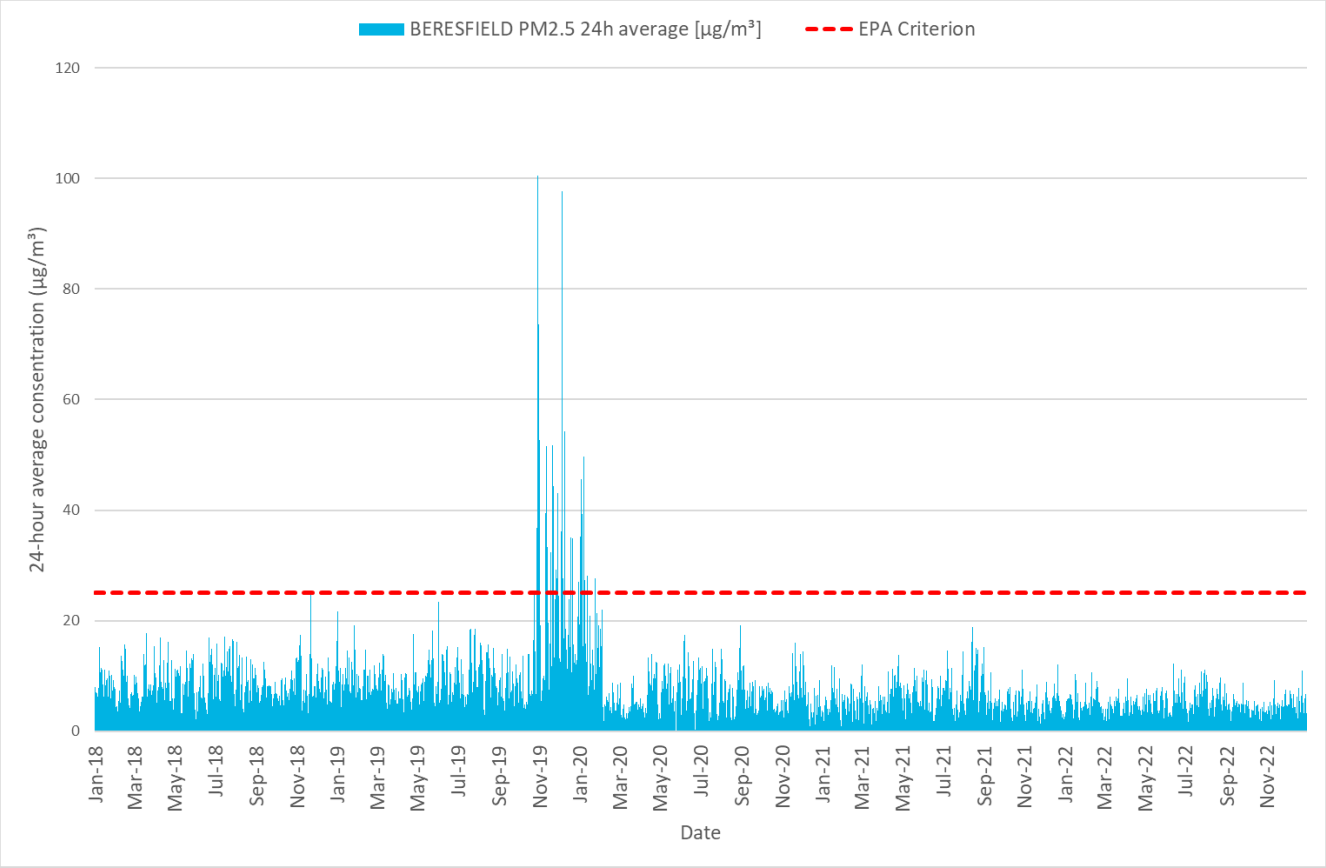


Figure 5.2 Time series of 24-hour average $PM_{2.5}$ concentrations – DPE Beresfield AQMS – 2018 to 2022

Key statistics for the five years of analysed $PM_{2.5}$ monitoring data from the Beresfield AQMS are presented in Table 5.2.

Consistent with PM_{10}, the 2021 calendar year $PM_{2.5}$ dataset from the Beresfield AQMS has been adopted to represent background conditions.

Table 5.2 Statistics for $PM_{2.5}$ concentrations – DPE Beresfield AQMS dataset – 2018 to 2022

Year	Maximum	99th percentile	75th percentile	Median	Average	Days > 25 µg/m³	Data recovery
	24-hour average $PM_{2.5}$ concentration (µg/m³)						
2018	24.9	17.0	10.5	8.0	8.3	0	95.3
2019	100.5	56.0	12.9	9.0	11.6	23	96.2
2020	49.7	33.0	9.1	6.2	7.4	8	96.7
2021	18.9	14.9	7.4	5.4	5.8	0	99.2
2022	12.3	10.9	6.0	4.7	4.9	0	98.1

5.3.3 TSP

There are no measurements of TSP available at the site. The NSW DPE (then Office of Environment and Heritage 2012) presents monitoring data from co-located TSP and PM_{10} monitoring stations in the Lower Hunter region for the period between 1999 and 2011. Across the collated stations, the typical ratio between annual average PM_{10} and TSP concentrations was 0.44. In the absence of locally sourced TSP monitoring data, a ratio of 0.44 has been applied to the adopted annual average PM_{10} concentration for 2021 of 15.8 µg/m³, returning an annual average TSP background concentration of 35.9 µg/m³.

5.3.4 Dust deposition

There are no measurements of dust deposition available at the site. This assessment therefore focuses on the incremental contribution from site emissions only. This approach is suitable for assessment against the NSW EPA incremental criterion of 2.0 g/m^2/month, expressed as an annual average.

5.3.5 Adopted background summary

In summary, the following background values were adopted for cumulative assessment:

- 24-hour PM_{10} concentration – daily varying with a maximum of 36.3 µg/m^3
- annual average PM_{10} concentration – 15.8 µg/m^3
- 24-hour $PM_{2.5}$ concentration – daily varying with a maximum of 18.9 µg/m^3
- annual average $PM_{2.5}$ concentration – 5.8 µg/m^3
- annual average TSP concentration – 35.9 µg/m^3.

6 Emissions inventory

6.1 Existing sources of operational emissions

Sources of atmospheric emissions associated with the site include:

- the movement of vehicles across paved and unpaved surfaces around the site (eg raw material delivery, forklift and FEL movements, pipe product transport truck movements)
- unloading of sand and aggregate material to the raw material stockpiles
- transfer of cement to silos under vacuum
- concrete batching processes (weigh hopper, conveying and central mixing)
- wind erosion from stockpiles and exposed surfaces
- diesel fuel combustion by on-site equipment and trucks.

Fugitive dust sources associated with the operation of the pipe factory were quantified through the application of National Pollution Inventory (NPI) emission estimation techniques and United States Environmental Protection Agency (US-EPA) AP-42 emission factor equations. Particulate matter emissions were quantified for various particle size fractions, with the TSP fraction being estimated to provide an indication of dust deposition rates. Coarse particles (PM_{10}) and fine particle ($PM_{2.5}$) were estimated using ratios for the different particle size fractions available within the literature (principally the US-EPA AP-42).

6.2 Emissions scenario

To assess the potential impacts associated with the Project, two emissions scenarios were configured, accounting for the following:

- Scenario 1 – single shift (12-hour day) operations at the site, with a proposed annual concrete production rate of 12,500 m^3 per year (30,000 tonnes per annum (tpa)) – without the inclusion of additional proposed paved section
- Scenario 2 – double shift (24-hour day) operations at the site, with a proposed annual concrete production rate of 25,000 m^3 per year (60,000 tpa) – with additional proposed paved section of currently unpaved access roads between sand and aggregate storage bays and connecting with the current paved site entry/exit onto Kestrel Avenue (additional details see Section 1.2.3).

Under 60,000 tpa concrete production operations, RCPA estimates the following annual throughput of raw materials:

- 25,481 tpa of coarse aggregates
- 15,100 tpa of sand
- 16,044 tpa of cement and flyash.

Expected daily truck movements by truck type for the proposed operations of the site are presented in Table 6.1 and are expected to remain the same for both scenarios.

Table 6.1 Indicative daily truck loads

Truck load type	Average daily
Aggregate loads	4
Sand loads	4
Cement/fly ash loads	3
Pipe product loads	15

6.3 Emission reduction factors

A range of particulate matter emission mitigation measures will be integrated into the design of the site. Based on information provided by RCPA, the following emissions reduction factors were applied to account for controls at the project site:

- use of sweepers on paved roads and surfaces (Scenario 2 only) – 70% reduction for sweeping (US-EPA 2006)
- use of water carts on unpaved roads and yard area – 75% reduction for water application (NPI 1999)
- cement silo loading under vacuum – controlled emission factors applied for pneumatic loading of silos
- water sprays at storage bunkers – 50% reduction for water applications and 70% for three-sided walls (NPI 1999) – combined reduction factor of 85% applied
- acoustic cladding at sand/aggregate transfer hopper – 70% reduction applied (NPI 1999)
- enclosure at weigh hopper and central mix loader – 90% reduction applied (NPI 1999).

6.4 Particulate matter emissions

A summary of calculated single shift and double shift emission rates by source type is presented in Table 6.2 while the significance of key source types by particle size for each scenario is illustrated in Figure 6.1 and Figure 6.2. Particulate matter control measures, as documented in Section 6.3 are accounted for in these daily emissions totals. From this data, it can be seen that the movements of trucks and equipment on paved and unpaved surfaces, and fuel combustion activities are the key contributing sources to daily project emissions.

Further details regarding emission estimation factors and assumptions are provided in Appendix B.

Table 6.2 Daily emissions for the site by emission source

Source name	Single shift emission rates (kg/day)			Double shift emissions rates (kg/day)		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Vehicle movements – material delivery paved site entry	0.68	0.13	0.03	0.21	0.04	0.01
Vehicle movements – paved site exit (onto Firebrick Dr)	0.62	0.12	0.03	0.62	0.12	0.03
Vehicle movements – paved site exit (onto Kestrel Ave)*	-	-	-	0.14	0.03	0.01
Vehicle movements – unpaved materials delivery	2.32	0.59	0.06	1.14	0.29	0.03
Vehicle movements – unpaved pipe product outgoing	1.86	0.47	0.05	1.86	0.47	0.05
FEL movements	1.78	0.49	0.05	0.72	0.14	0.03
Forklift movements	3.61	0.92	0.09	7.22	1.84	0.18
Unloading of sand to storage bunker	0.0018	0.0009	0.0001	0.0037	0.0017	0.0003
Unloading of aggregate to storage bunker	0.0103	0.0049	0.0007	0.0206	0.0098	0.0015
FEL sand handling at storage bunker	0.0018	0.0009	0.0001	0.0037	0.0017	0.0003
FEL aggregate handling at storage bunker	0.0103	0.0049	0.0007	0.0206	0.0098	0.0015
FEL sand transfer to hopper bin	0.0123	0.0058	0.0009	0.0246	0.0116	0.0018
FEL aggregate transfer to hopper bin	0.0688	0.0326	0.0049	0.1376	0.0651	0.0099
Sand transfer – weigh hopper conveyer	0.0037	0.0017	0.0003	0.0074	0.0035	0.0005
Aggregate transfer – weigh hopper conveyer	0.0206	0.0098	0.0015	0.0413	0.0195	0.0030
Weigh hopper loading	0.0183	0.0092	0.0014	0.0366	0.0183	0.0028
Central mixer loading	0.0003	0.0001	0.00001	0.0005	0.0001	0.00001
Wind erosion – storage bins	0.0006	0.0003	0.00005	0.0006	0.0003	0.00005
Wind erosion – Yard	0.12	0.06	0.01	0.11	0.05	0.01
Diesel combustion – FEL/Forklifts	0.57	0.57	0.51	0.57	0.57	0.51
Diesel combustion - Trucks	0.0011	0.0011	0.0010	0.0011	0.0011	0.0010
Total daily emission rate	**11.71**	**3.43**	**0.84**	**12.9**	**3.7**	**0.88**

*Note: Double shift emissions incorporate additional paved section on southern side of main shed.

Totals may not add up exactly due to rounding.

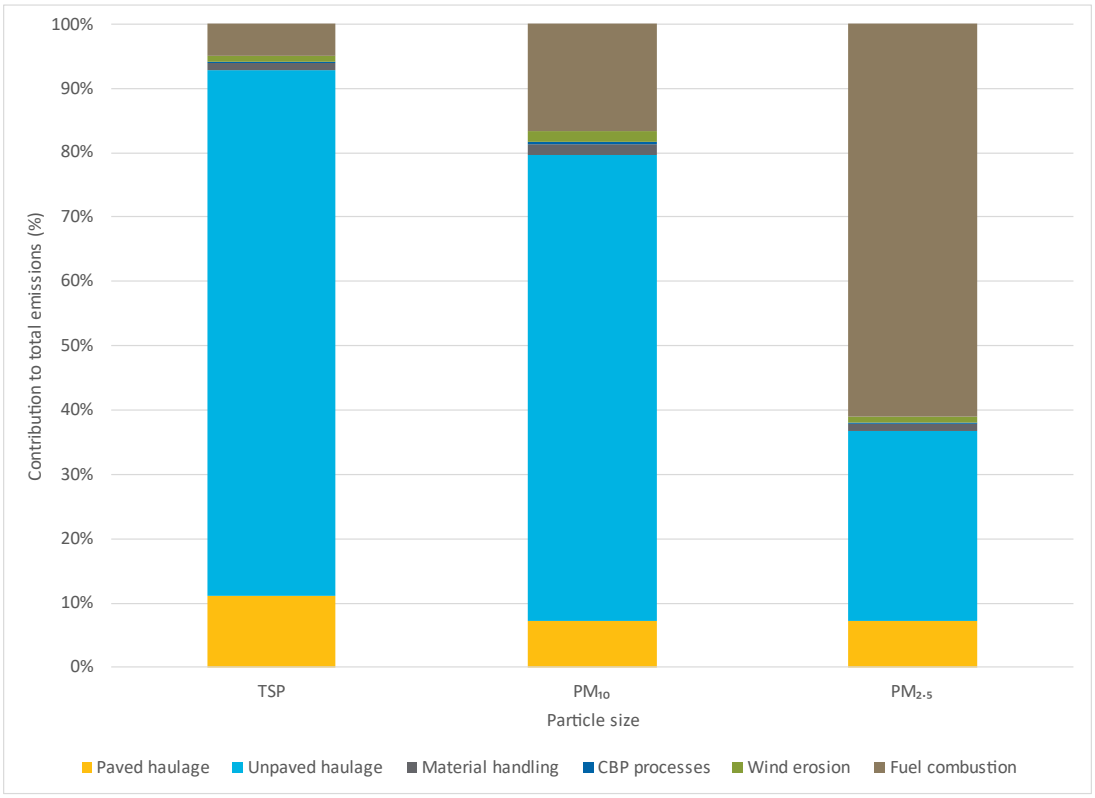


Figure 6.1 **Significance of emission sources to daily emissions – single shift operations – TSP, PM_{10} and $PM_{2.5}$**

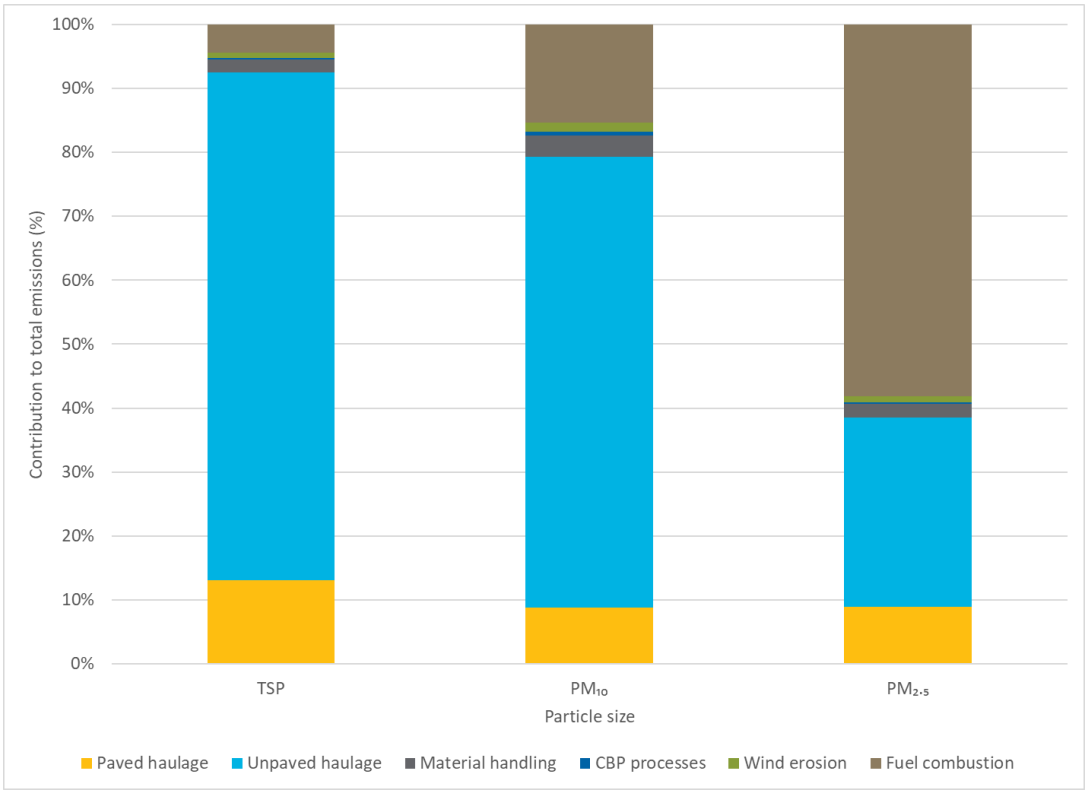


Figure 6.2 **Significance of emission sources to daily emissions – double shift operations – TSP, PM_{10} and $PM_{2.5}$**

7 Air dispersion modelling

7.1 Dispersion model selection and configuration

The atmospheric dispersion modelling completed for this assessment used the AERMOD dispersion model (version v22112). AERMOD is designed to handle a variety of pollutant source types, including surface and buoyant elevated sources, in a wide variety of settings such as rural and urban as well as flat and complex terrain.

In addition to the 25 individual assessment locations (documented in Section 2.2), air pollutant concentrations were predicted of a nested grid domain of 10 km by 10 km with spacing ranging from 500 m to 50 m decreasing with proximity to the site (totalling 2018 receptor points).

Simulations were undertaken for January to December 2021 using the AERMET-generated file using the DPE Beresfield AWS as input (see Chapter 4 for a description of input meteorology).

7.2 Incremental (project-only) results

Predicted incremental TSP, PM_{10} and $PM_{2.5}$ concentrations and dust deposition rates from proposed operations at the site under expected single shift production are presented in Table 7.1 for each of the assessment locations. Further, Table 7.2 presents maximum predicted incremental 24-hour average PM_{10} and $PM_{2.5}$ concentrations under double shift production at the site.

The predicted concentrations and deposition rates for all pollutants and averaging periods are below the applicable NSW EPA assessment criterion at all assessment locations. Aside from dust depositions, the assessment criteria listed are applicable to cumulative concentrations. Analysis of cumulative impact compliance is presented in Section 7.3.

Isopleth plots, illustrating spatial variations in project-related incremental TSP, PM_{10} and $PM_{2.5}$ concentrations and dust depositions rates are provided in Appendix C. Isopleth plots of the maximum 24-hour average concentrations presented in Appendix C do not represent the dispersion pattern on any individual day, but rather illustrate the maximum daily concentration that was predicted to occur at each model calculation point given the range of meteorological conditions occurring over the 2021 modelling period.

Table 7.1 Incremental (project-only) concentration and deposition results – single shift

Assessment location ID	Predicted incremental concentrations (µg/m³) or dust deposition rates (g/m²/month)					
	TSP	PM_{10}		$PM_{2.5}$		Dust deposition
	Annual	24-hour maximum	Annual	24-hour maximum	Annual	Annual
Criterion	**90**	**50**	**25**	**25**	**8**	**2**
I1	9.3	17.5	3.7	5.2	1.1	0.8
I2	5.7	11.4	2.3	3.1	0.6	0.5
I3	2.1	5.4	1.0	1.3	0.2	0.2
I4	1.3	4.5	0.6	1.1	0.1	0.1
I5	1.8	4.0	0.7	0.9	0.2	0.2
I6	3.0	8.1	1.4	1.9	0.3	0.2
I7	3.1	8.7	1.6	2.1	0.3	0.3
I8	0.4	2.2	0.3	0.5	0.1	<0.1
I9	0.7	3.7	0.4	0.8	0.1	0.1
I10	3.0	5.7	1.3	1.4	0.3	0.3
I11	1.6	3.9	0.9	1.0	0.2	0.1
I12	1.5	3.5	0.8	1.0	0.2	0.1
I13	2.2	4.0	1.1	1.2	0.3	0.1
I14	2.2	6.2	1.1	1.6	0.3	0.2
I15	3.9	12.5	1.7	3.6	0.5	0.3
I16	0.8	4.6	0.5	1.1	0.1	0.1
I17	0.3	2.2	0.2	0.5	<0.1	<0.1
I18	0.2	1.4	0.1	0.4	<0.1	<0.1
R19	0.2	1.3	0.1	0.3	<0.1	<0.1
R20	0.2	1.3	0.1	0.3	<0.1	<0.1
R21	0.1	0.8	0.0	0.2	<0.1	<0.1
R22	0.1	0.7	0.0	0.1	<0.1	<0.1
R23	0.1	0.8	0.0	0.2	<0.1	<0.1
C24	0.1	0.4	0.0	0.1	<0.1	<0.1
R25	0.1	0.5	0.0	0.1	<0.1	<0.1

Notes: Criteria for PM_{10} and $PM_{2.5}$ is applicable to cumulative (increment + background) concentrations and is provided for comparison purposes only.

Table 7.2 Incremental (project-only) concentration and deposition results – double shift

Assessment location ID	Predicted incremental concentrations (µg/m³) or dust deposition rates (g/m²/month)					
	TSP	PM_{10}		$PM_{2.5}$		Dust deposition
	Annual	24-hour maximum	Annual	24-hour maximum	Annual	Annual
Criterion	**90**	**50**	**25**	**25**	**8**	**2**
I1	10.1	13.7	4.9	4.7	2.0	0.6
I2	5.9	10.8	3.2	3.8	1.1	0.4
I3	2.5	6.9	1.7	1.9	0.5	0.1
I4	1.6	6.1	1.2	1.4	0.3	0.1
I5	2.7	6.9	1.3	1.5	0.3	0.2
I6	7.3	15.0	3.7	3.0	0.8	0.4
I7	7.3	15.0	4.2	3.0	0.9	0.4
I8	0.8	2.7	0.6	0.5	0.1	<0.1
I9	1.3	4.0	0.9	0.9	0.2	0.1
I10	4.1	7.6	2.1	1.6	0.5	0.3
I11	2.1	5.4	1.4	1.3	0.4	0.1
I12	1.9	5.0	1.3	1.4	0.4	0.1
I13	2.5	6.3	1.6	1.6	0.5	0.1
I14	3.0	7.1	1.8	2.0	0.6	0.2
I15	5.1	12.5	2.8	4.0	1.0	0.3
I16	1.7	5.7	1.2	1.3	0.3	0.1
I17	0.7	2.6	0.6	0.5	0.1	<0.1
I18	0.4	1.7	0.3	0.5	0.1	<0.1
R19	0.4	1.7	0.3	0.5	0.1	<0.1
R20	0.4	1.5	0.3	0.4	0.1	<0.1
R21	0.2	1.4	0.1	0.3	<0.1	<0.1
R22	0.2	1.2	0.1	0.3	<0.1	<0.1
R23	0.2	0.9	0.1	0.2	<0.1	<0.1
C24	0.2	0.6	0.1	0.1	<0.1	<0.1
R25	0.1	0.5	0.1	0.1	<0.1	<0.1

Notes: Criteria for PM_{10} and $PM_{2.5}$ is applicable to cumulative (increment + background) concentrations and is provided for comparison purposes only.

7.3 Cumulative (project + background) results

Predicted cumulative TSP, PM_{10} and $PM_{2.5}$ concentrations associated with the site for single and double shift operations are presented in Table 7.3 and Table 7.4 respectively for each of the assessment locations.

Cumulative impacts at the assessment locations surrounding the site have been quantified in the following way:

- for 24-hour average concentrations, each daily varying model predicted PM_{10} and $PM_{2.5}$ concentrations from both single shift and double shift operations at the site have been combined with the corresponding concentration from the adopted 2021 Beresfield AQMS background dataset (Section 5.3).
- for annual average concentrations, the predicted annual average concentrations from single shift and double shift operations have been paired with the corresponding background annual average concentrations (Section 5.3.5).

The predicted cumulative concentrations and deposition rates for all pollutants and averaging periods are below the applicable NSW EPA assessment criterion at all assessment locations for both single and double shift scenarios.

Table 7.3 Cumulative (Project + background) concentrations – single shift operations

Assessment location ID	Predicted incremental concentrations (µg/m³)				
	TSP	PM_{10}		$PM_{2.5}$	
	Annual	24-hour maximum	Annual	24-hour maximum	Annual
Criterion	**90**	**50**	**25**	**25**	**8**
I1	49.0	38.8	19.5	19.1	7.0
I2	45.4	37.4	18.2	19.0	6.5
I3	41.8	36.6	16.9	18.9	6.1
I4	41.0	36.4	16.5	18.9	6.0
I5	41.5	36.4	16.5	18.9	6.0
I6	42.7	36.6	17.3	18.9	6.2
I7	42.8	36.6	17.5	19.0	6.2
I8	40.1	36.4	16.1	18.9	5.9
I9	40.4	36.4	16.3	18.9	6.0
I10	42.7	37.6	17.2	19.7	6.2
I11	41.3	37.2	16.8	19.5	6.1
I12	41.2	37.2	16.7	19.5	6.1
I13	41.9	37.6	17.0	19.6	6.2
I14	41.9	38.0	16.9	19.1	6.2
I15	43.7	38.3	17.6	19.0	6.4
I16	40.5	36.4	16.3	18.9	6.0

Table 7.3 Cumulative (Project + background) concentrations – single shift operations

Assessment location ID	Predicted incremental concentrations (µg/m³)				
	TSP	PM_{10}		$PM_{2.5}$	
	Annual	24-hour maximum	Annual	24-hour maximum	Annual
Criterion	**90**	**50**	**25**	**25**	**8**
I17	40.0	36.3	16.1	18.9	5.9
I18	39.9	36.3	16.0	18.9	5.9
R19	39.9	36.3	16.0	18.9	5.9
R20	39.9	36.3	16.0	18.9	5.9
R21	39.8	36.3	15.9	18.9	5.9
R22	39.8	36.3	15.9	18.9	5.9
R23	39.8	36.3	15.9	18.9	5.9
C24	39.8	36.3	15.9	18.9	5.9
R25	39.8	36.3	15.9	18.9	5.9

Table 7.4 Cumulative (Project + background) concentrations – double shift operations

Assessment location ID	Predicted incremental concentrations (µg/m³)				
	TSP	PM_{10}		$PM_{2.5}$	
	Annual	24-hour maximum	Annual	24-hour maximum	Annual
Criterion	**90**	**50**	**25**	**25**	**8**
I1	49.8	39.5	20.8	20.7	7.8
I2	45.6	38.0	19.1	19.9	7.0
I3	42.3	37.1	17.6	19.4	6.4
I4	41.4	36.8	17.0	19.2	6.2
I5	42.4	36.9	17.2	19.1	6.2
I6	47.0	38.1	19.6	19.7	6.7
I7	47.0	39.1	20.1	19.8	6.8
I8	40.5	36.9	16.5	19.1	6.0
I9	41.0	36.9	16.8	19.4	6.1
I10	43.8	38.1	18.0	19.9	6.3
I11	41.8	39.0	17.3	19.5	6.2
I12	41.6	37.8	17.1	19.5	6.2

Table 7.4 Cumulative (Project + background) concentrations – double shift operations

Assessment location ID	Predicted incremental concentrations (µg/m³)				
	TSP	PM_{10}		$PM_{2.5}$	
	Annual	24-hour maximum	Annual	24-hour maximum	Annual
Criterion	**90**	**50**	**25**	**25**	**8**
I13	42.2	37.7	17.5	19.7	6.3
I14	42.7	38.3	17.7	19.6	6.4
I15	44.8	38.5	18.7	20.0	6.9
I16	41.4	37.7	17.1	19.2	6.1
I17	40.5	37.2	16.5	19.1	6.0
I18	40.1	36.5	16.2	19.0	6.0
R19	40.1	36.5	16.2	19.0	6.0
R20	40.1	36.5	16.2	19.0	6.0
R21	39.9	36.4	16.0	18.9	5.9
R22	39.9	36.4	16.0	18.9	5.9
R23	39.9	36.4	16.0	18.9	5.9
C24	39.9	36.4	16.0	18.9	5.9
R25	39.8	36.4	16.0	18.9	5.9

To illustrate the daily variation in the predicted incremental concentration from the project and corresponding background concentrations, time series plots of cumulative concentration breakdowns have been generated for the most impacted assessment locations under single shift and double shift operations at the site, specifically the assessment location I1. Daily varying 24-hour average PM_{10} concentrations are illustrated for single shift operations in Figure 7.1 and double shift operations in Figure 7.2. Daily varying 24-hour average $PM_{2.5}$ concentrations are illustrated for single shift operations in Figure 7.3 and for double shift operations in Figure 7.4.

These charts demonstrate that, even at the most impacted assessment location, the background concentrations are generally the dominant contributor to cumulative concentrations on a daily basis.

Predicted cumulative annual average TSP, PM_{10} and $PM_{2.5}$ concentrations by assessment location for single shift and double shift operations associated with the site are presented in Figure 7.5 to Figure 7.10.

As shown in Figure 7.5 to Figure 7.10, compliance with the applicable impact assessment criterion is predicted for annual average TSP, PM_{10} and $PM_{2.5}$ concentrations.

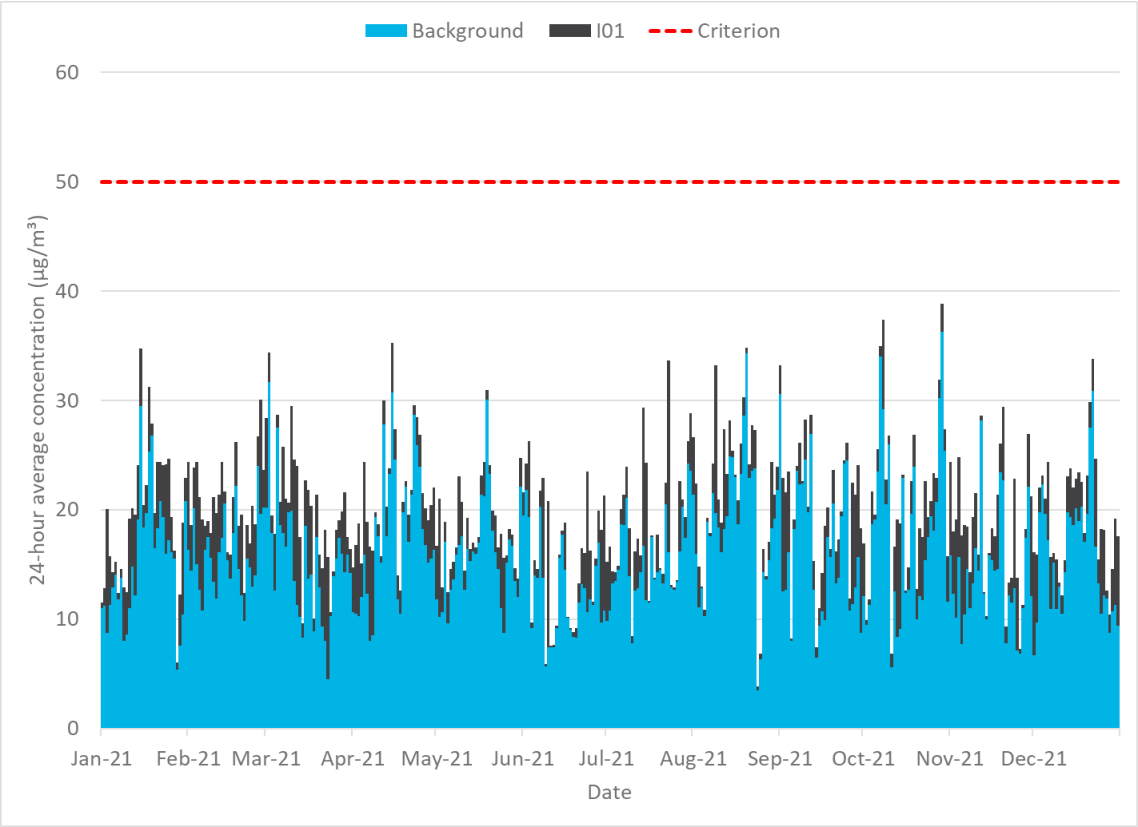


Figure 7.1 **Daily varying cumulative 24-hour average PM_{10} concentrations – I1 – Single shift operations**

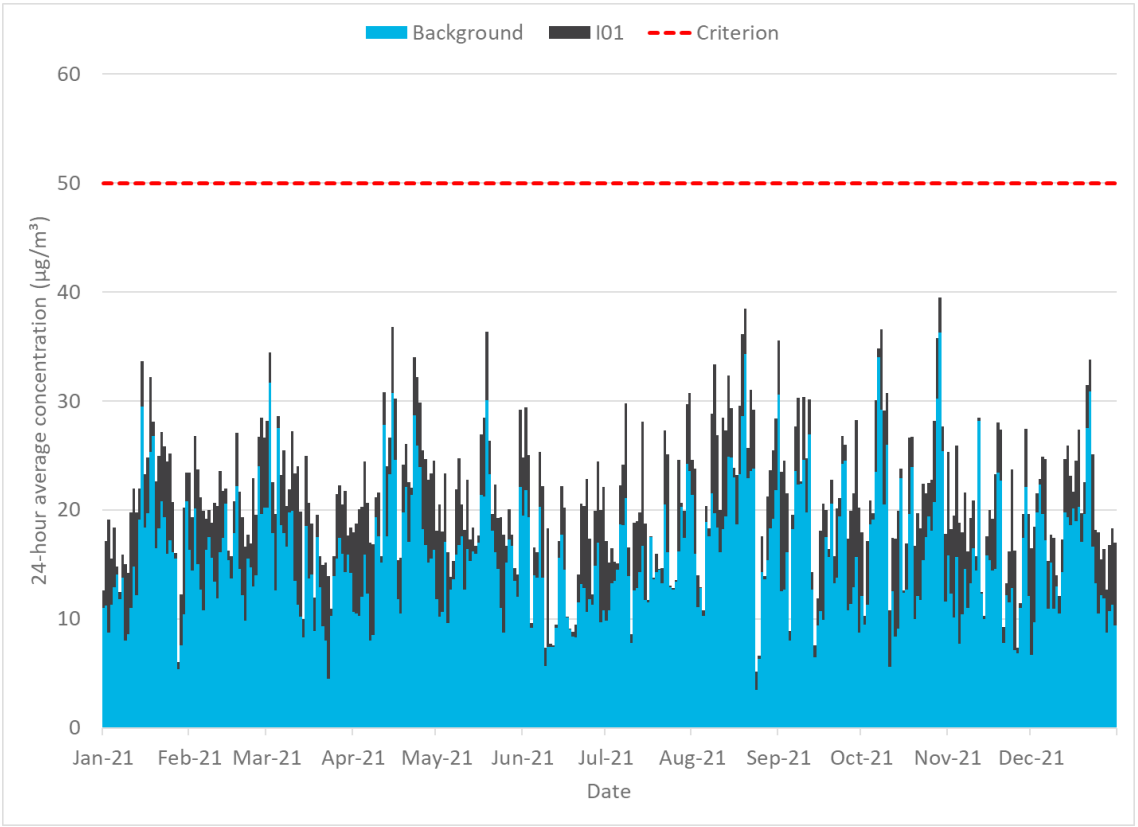


Figure 7.2 **Daily varying cumulative 24-hour average PM_{10} concentrations – I1 – Double shift operations**

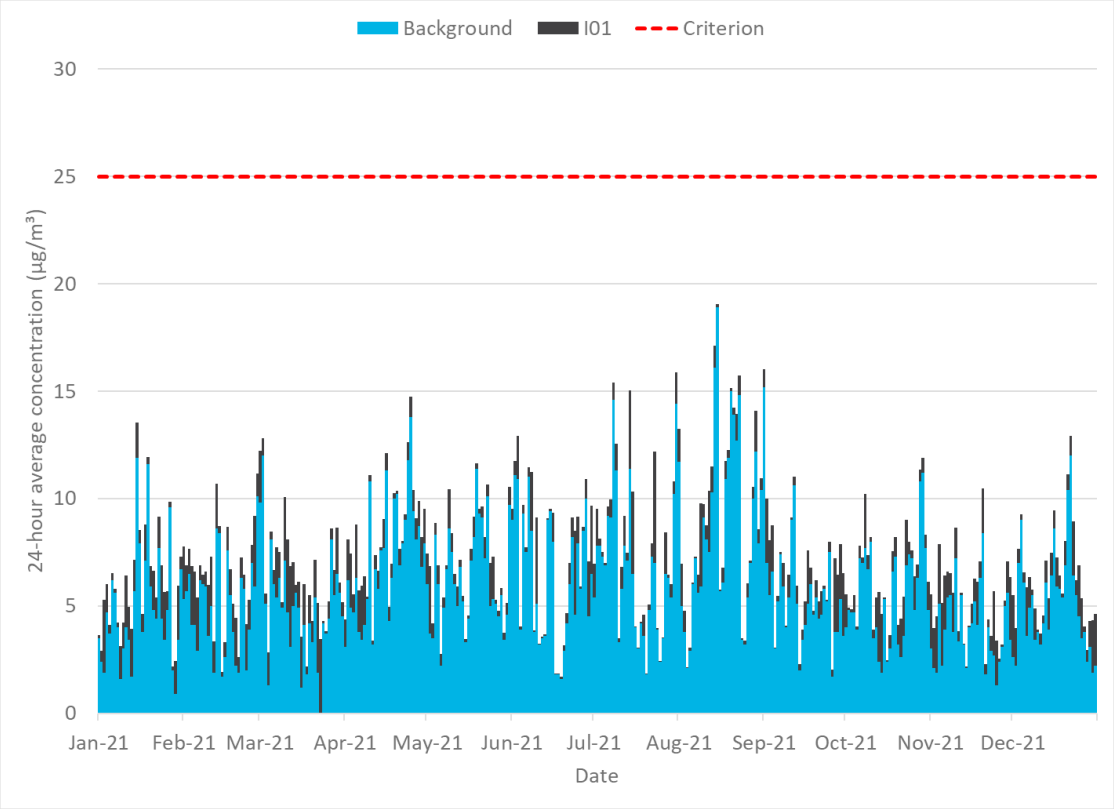


Figure 7.3 **Daily varying cumulative 24-hour average $PM_{2.5}$ concentrations – I1 – Single shift operations**

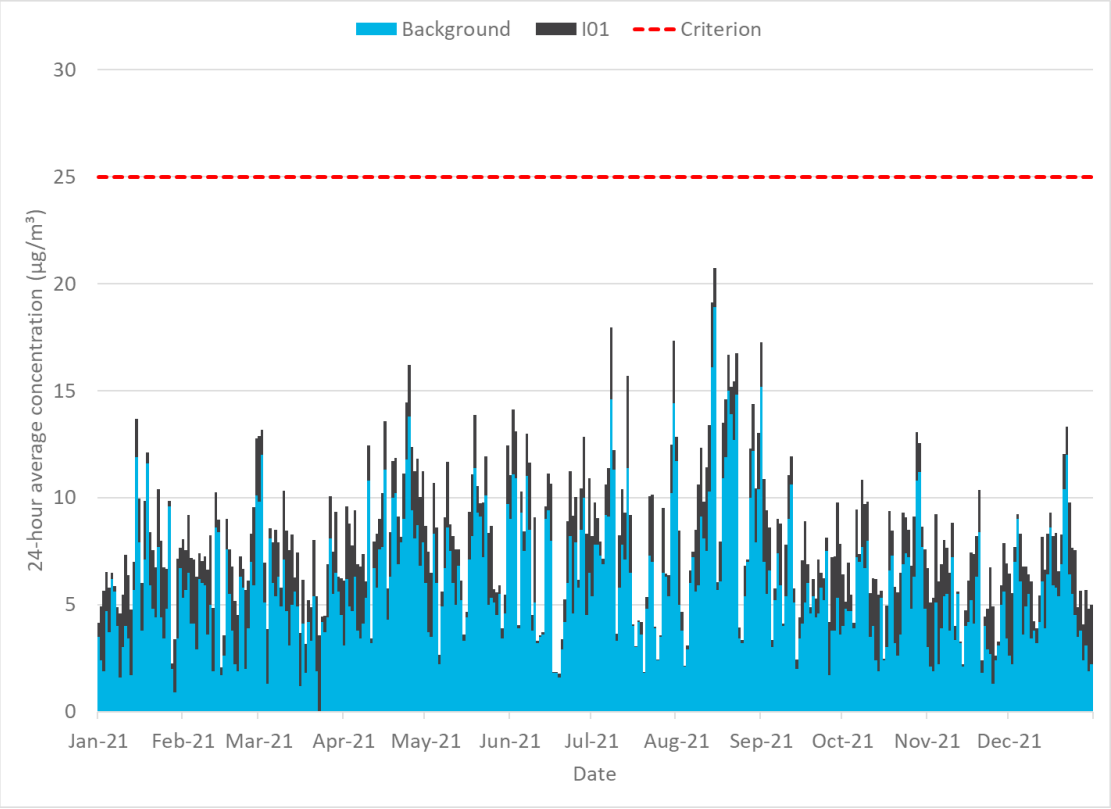


Figure 7.4 **Daily varying cumulative 24-hour average $PM_{2.5}$ concentrations – I1 – Double shift operations**

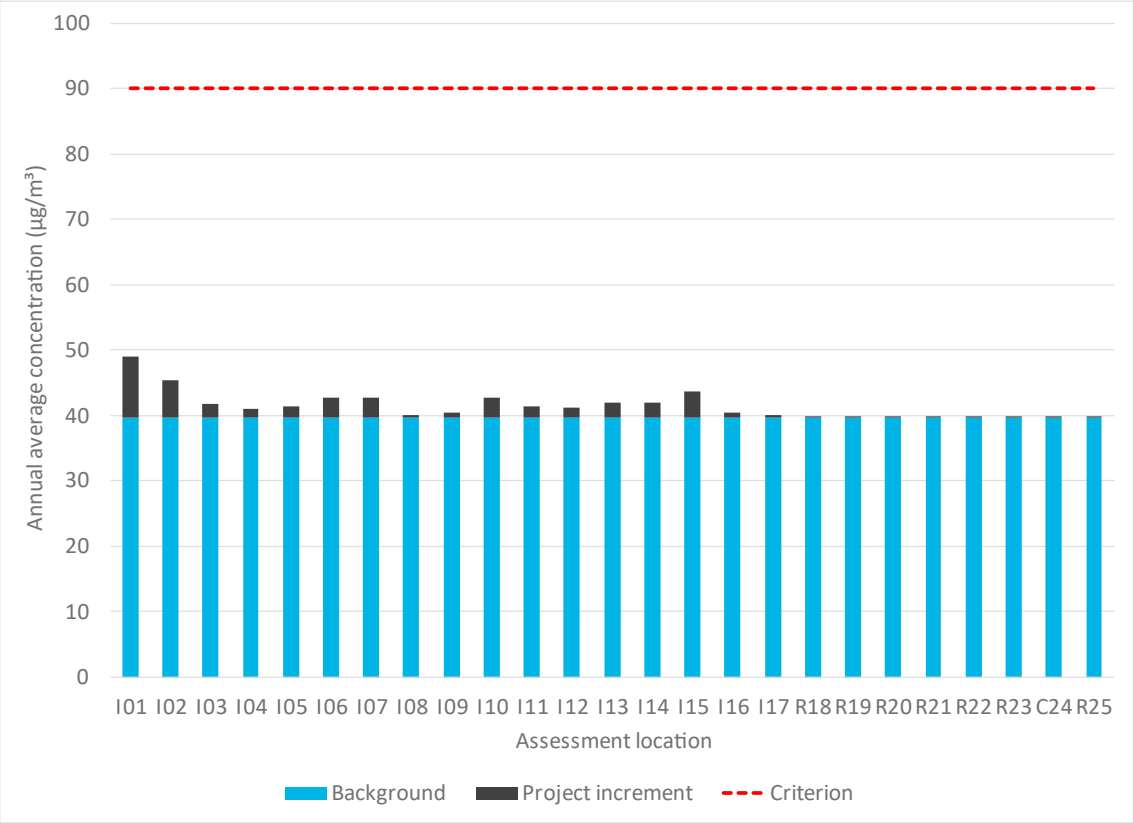


Figure 7.5 **Predicted cumulative annual average TSP concentrations – single shift operations**

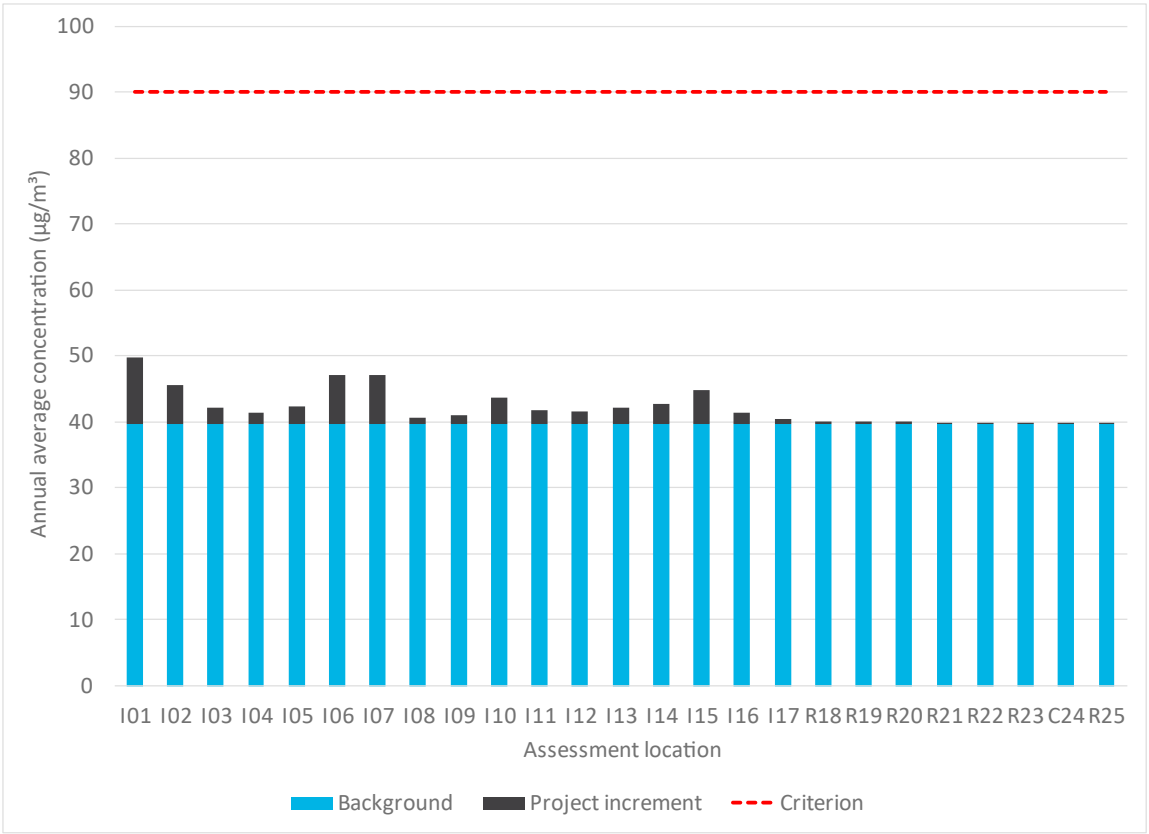


Figure 7.6 **Predicted cumulative annual average TSP concentrations – double shift operations**

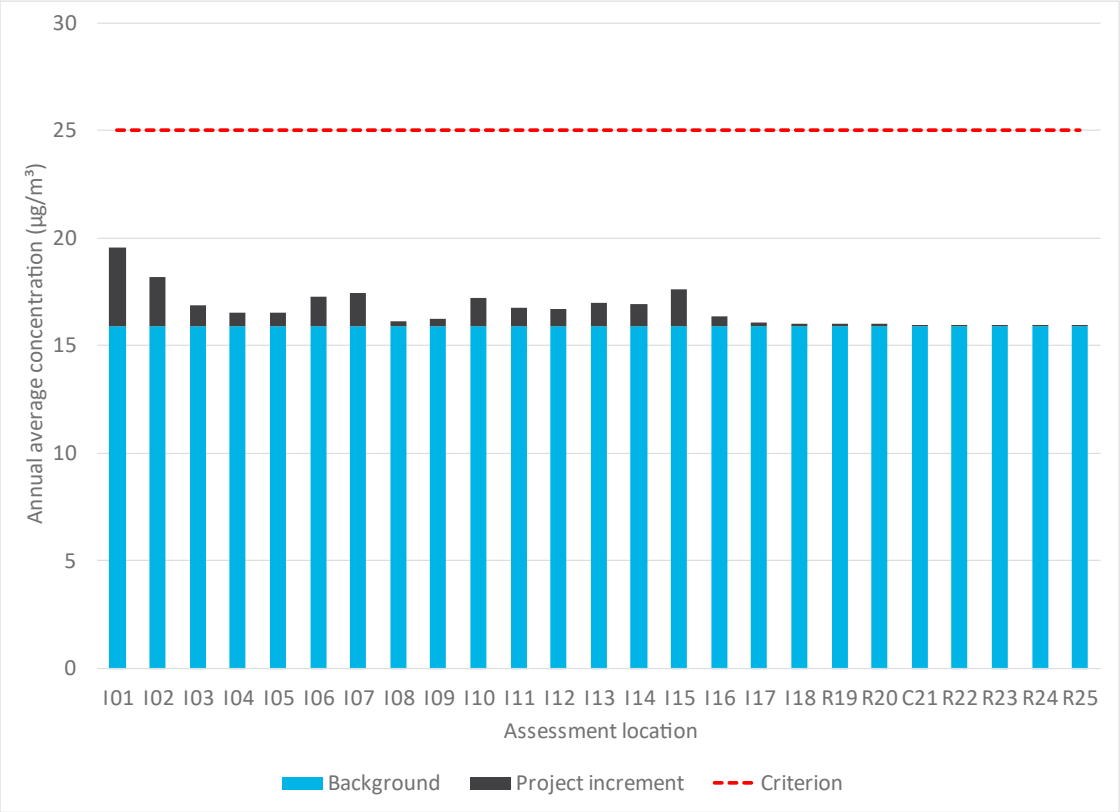


Figure 7.7 **Predicted cumulative annual average PM_{10} concentrations – single shift operations**

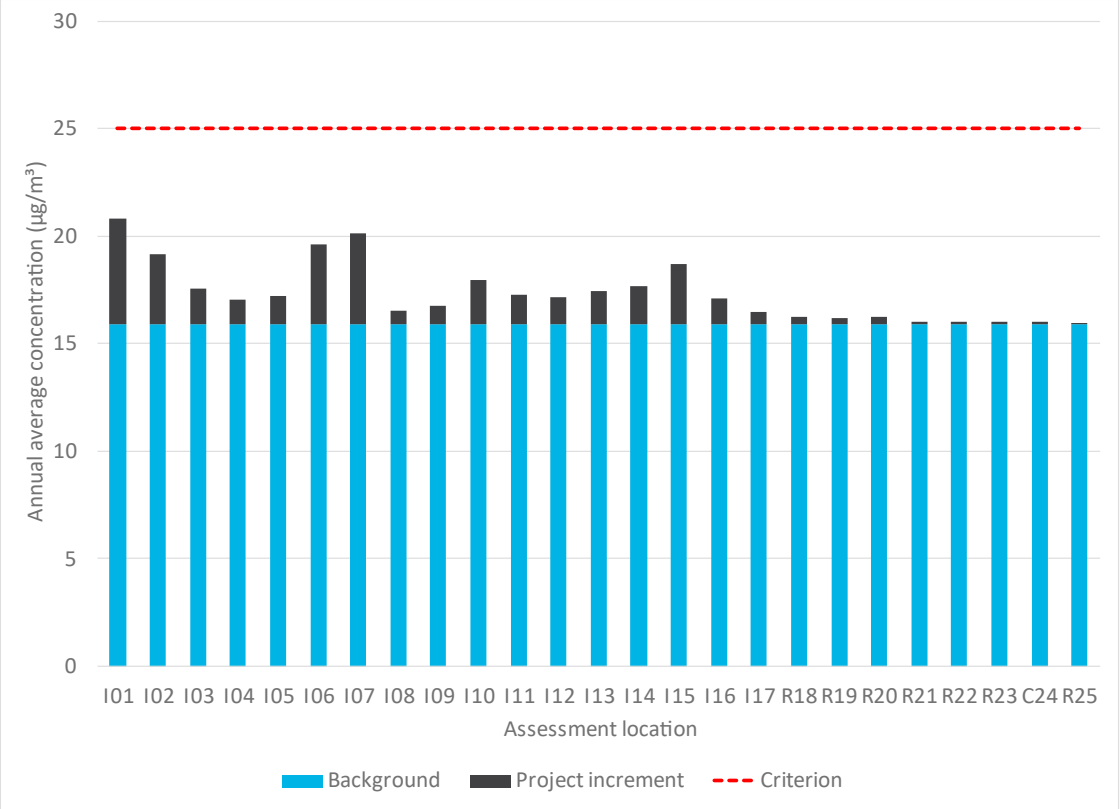


Figure 7.8 **Predicted cumulative annual average PM_{10} concentrations – double shift operations**

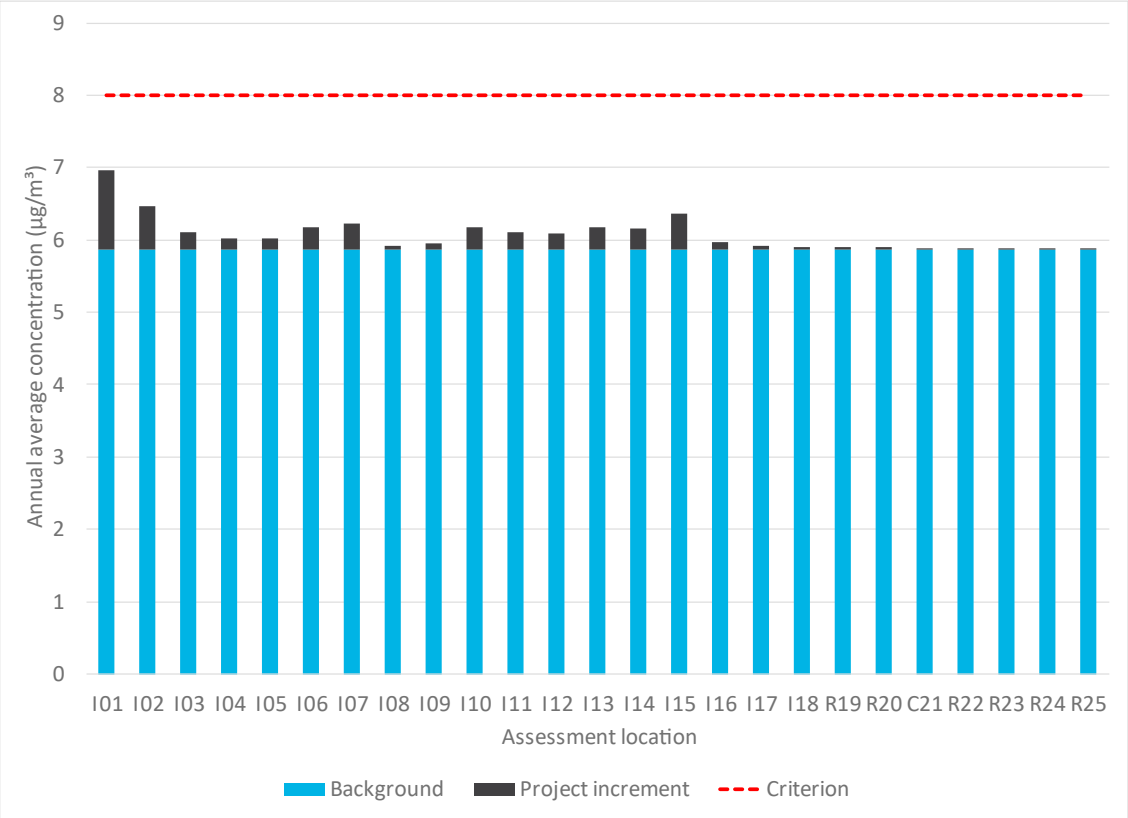


Figure 7.9 **Predicted cumulative annual average $PM_{2.5}$ concentrations – single shift operations**

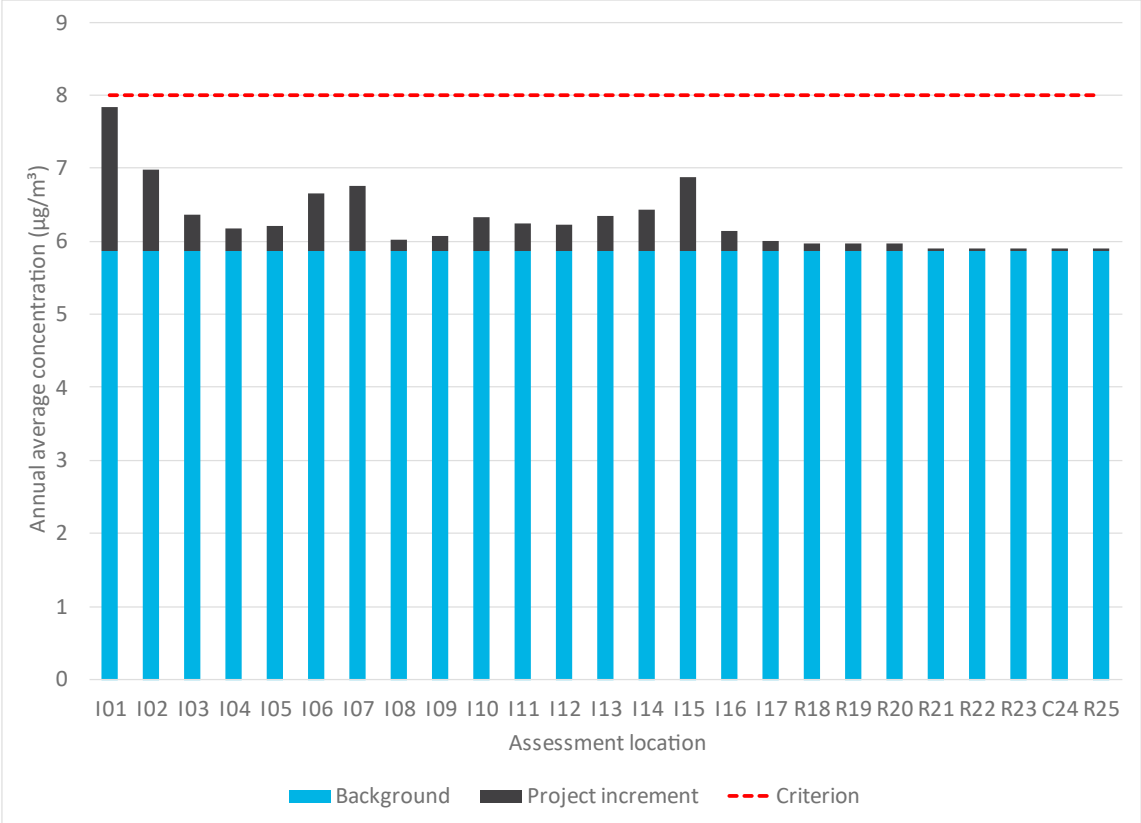


Figure 7.10 **Predicted cumulative annual average $PM_{2.5}$ concentrations – double shift operations**

8 Conclusion

An AQIA focusing on the quantification of emissions and resultant air quality impacts from the site has been conducted by EMM.

Emissions of TSP, PM_{10} and $PM_{2.5}$ associated with both single shift and double shift operations at the site were quantified using public available emission estimation techniques.

Atmospheric dispersion modelling of air pollution emissions was undertaken using the AERMOD dispersion model. The results of the dispersion modelling highlighted the following:

- Single shift operations at the site are not predicted to result in any additional exceedance of applicable 24-hour average criterion for PM_{10} and $PM_{2.5}$ criteria at any surrounding assessment locations under current site configuration.
- Double shift operations at the site are not predicted to result in any additional exceedance of applicable 24-hour average criterion for PM_{10} and $PM_{2.5}$ criteria at any surrounding assessment locations with the inclusion of a paved road section between the sand and aggregate storage bays and the currently paved site entry/exit onto Kestrel Avenue.
- Cumulative annual average concentrations of TSP, PM_{10} and $PM_{2.5}$ are predicted to comply with applicable impact assessment criterion for single shift days under current procedures, and for double shift days following the inclusion of the proposed paved section.

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US-EPA 2006, AP-42 *Chapter 13.2.2 – Unpaved Roads.*

US-EPA 2011, AP-42 *Chapter 13.2.1 – Paved Roads.*

US-EPA 2012, AP-42 *Chapter 11.12 – Concrete Batching.*

Abbreviations

AQIA	Air quality impact assessment
AQMS	air quality monitoring station
AWS	Automatic weather station
BoM	Bureau of Meteorology
CBP	Concrete batching plant
CO	carbon monoxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DoE	Department of Planning and Environment
DPE	NSW Department of Planning and Environment
EMM	EMM consulting Pty Limited
FEL	Front end loader
ha	Hectares
kg	kilograms
km	kilometres
LGA	local government area
NSW EPA	NSW Environment Protection Authority
No_x	oxides of nitrogen
NPI	National Pollution Inventory
PM_{10}	Particulate matter less than 10 microns in aerodynamic diameter
$PM_{2.5}$	Particulate matter less than 2.5 microns in aerodynamic diameter
SO_2	sulphur dioxide
TAPM	The Air Pollution Model
tpa	tonnes per annum
TSP	Total suspended particles
US-EPA	United States Environmental Protection Agency
VKT	Vehicle kilometres travelled
VOC	Volatile organic compounds

Appendix A
Meteorological modelling

EMM
creating opportunities

A.1 Meteorological data analysis for the Beresfield AWS, 2018-2022

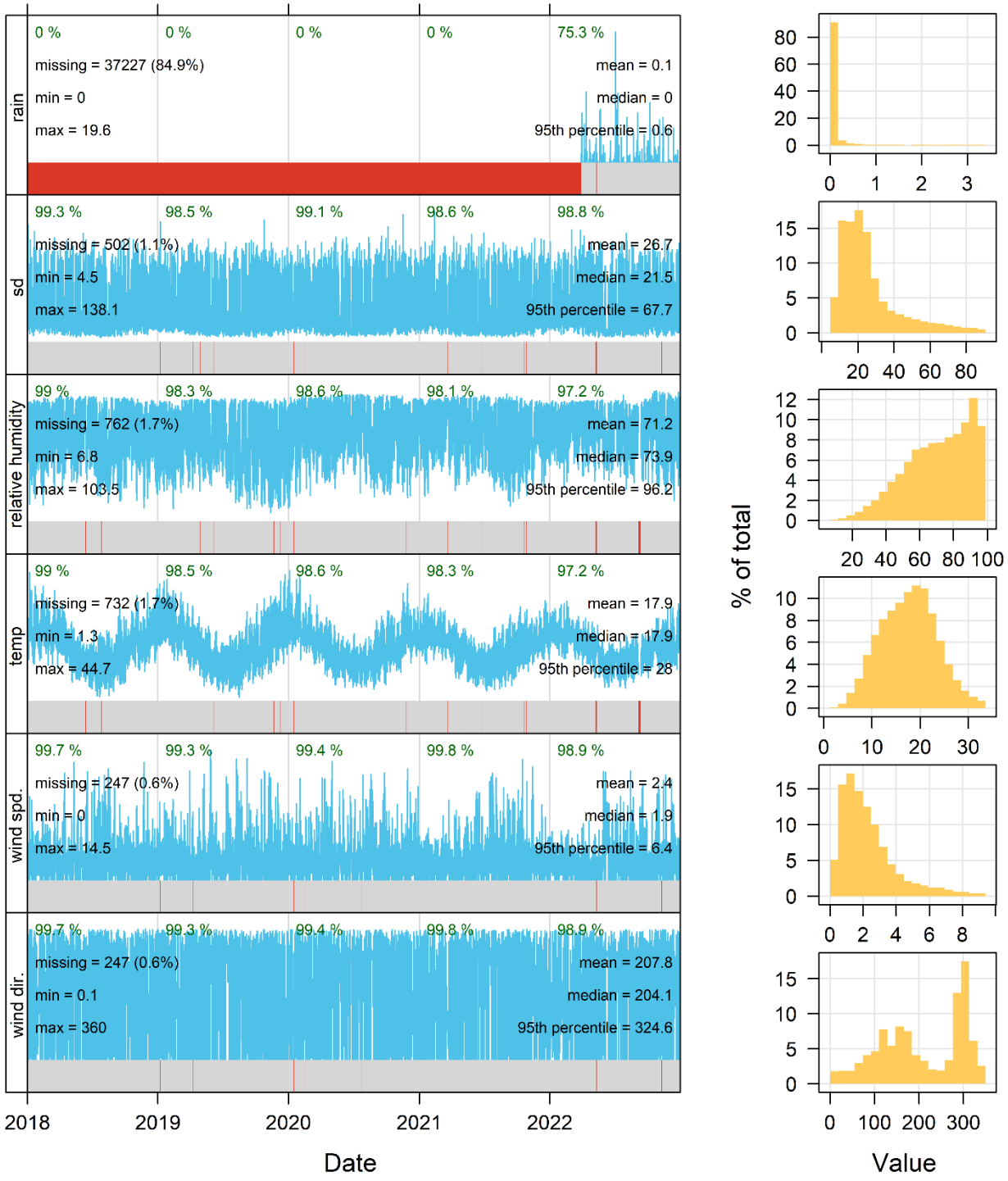


Figure A.1 Data completeness analysis plot – Beresfield AWS – 2018 to 2022

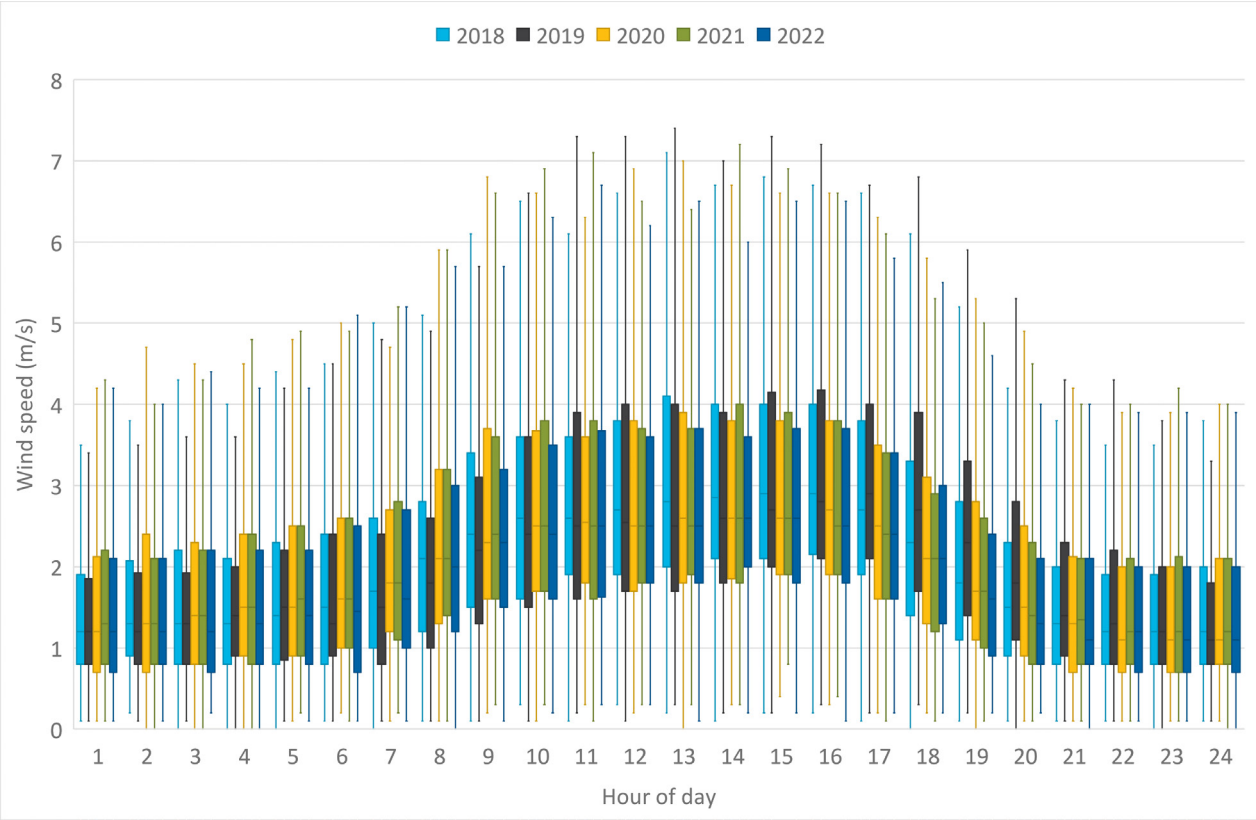


Figure A.2 **Inter-annual variability in diurnal wind speed – Beresfield AWS – 2018 to 2022**

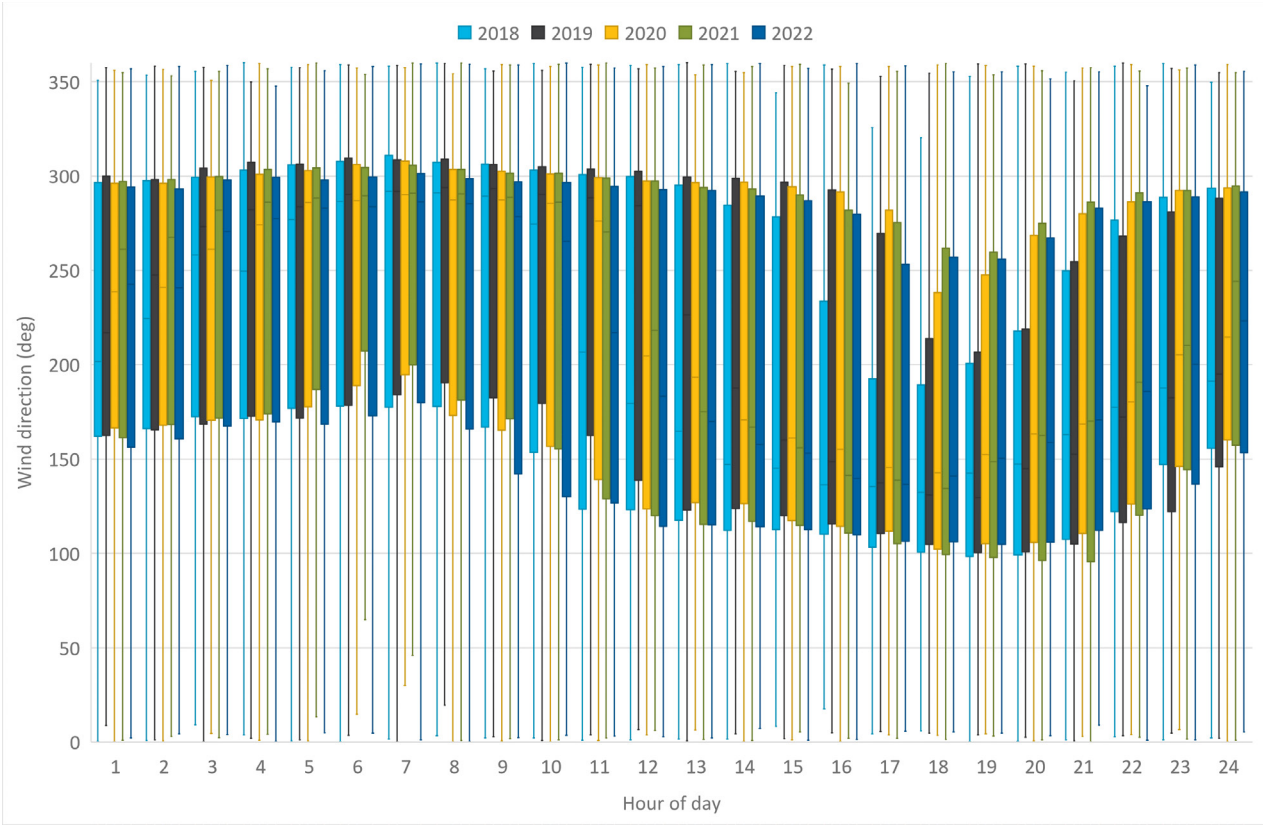


Figure A.3 **Inter-annual variability in diurnal wind direction – Beresfield AWS – 2018 to 2022**

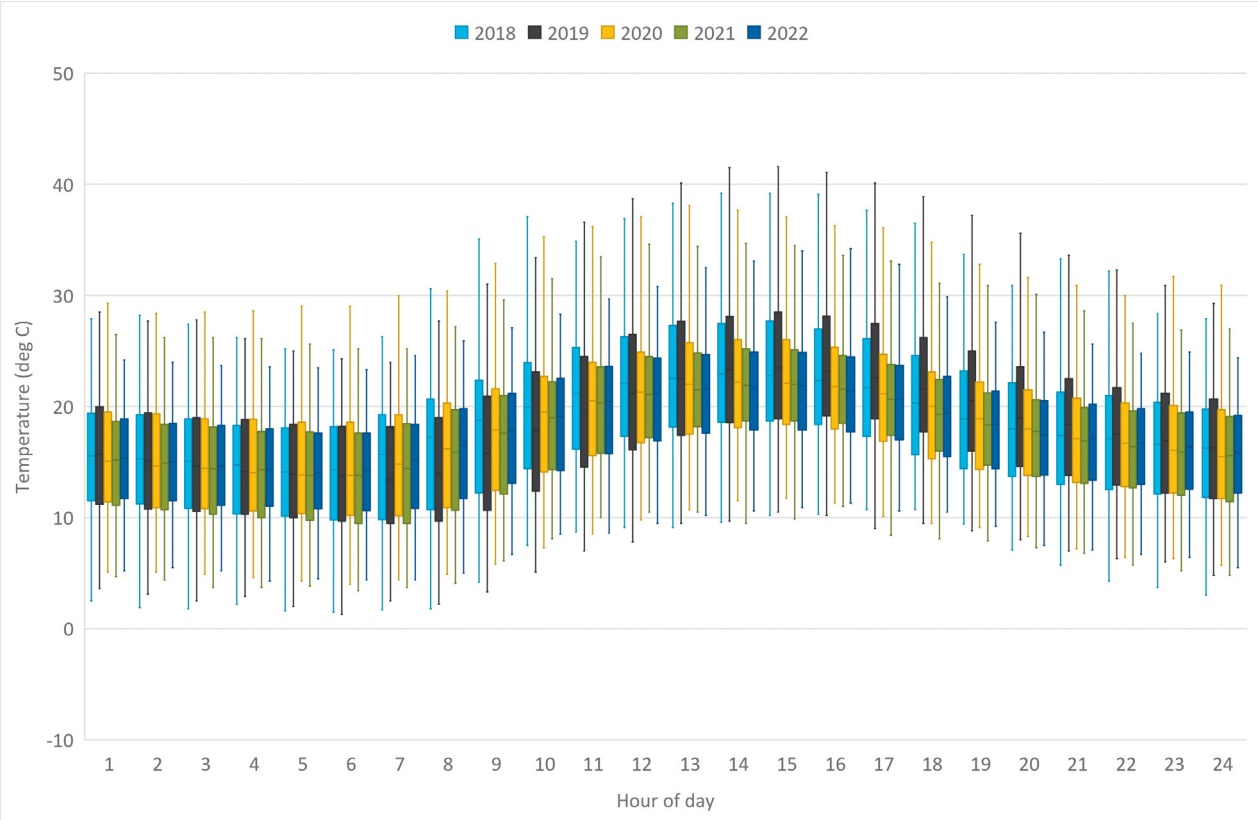


Figure A.4 **Inter-annual variability in diurnal air temperature – Beresfield AWS – 2018 to 2022**

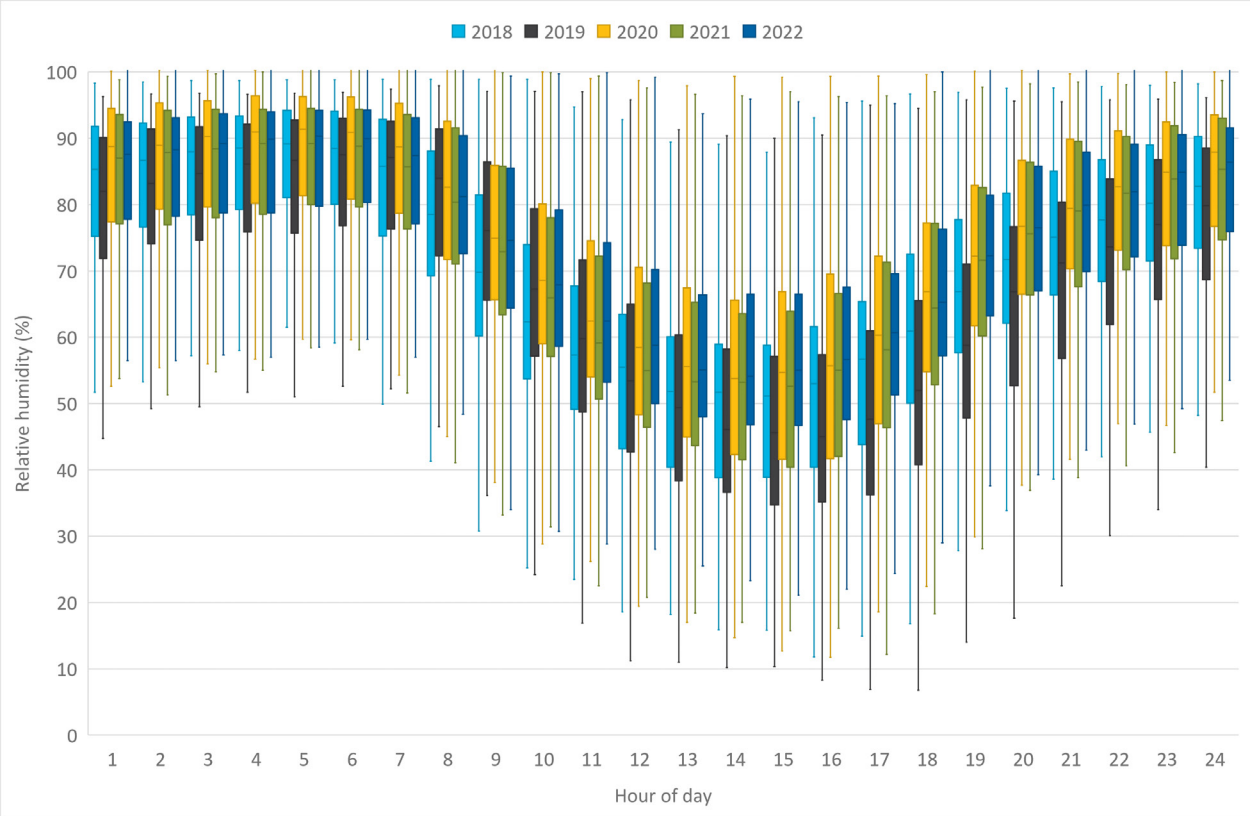


Figure A.5 **Inter-annual variability in diurnal relative humidity – Beresfield AWS – 2018 to 2022**

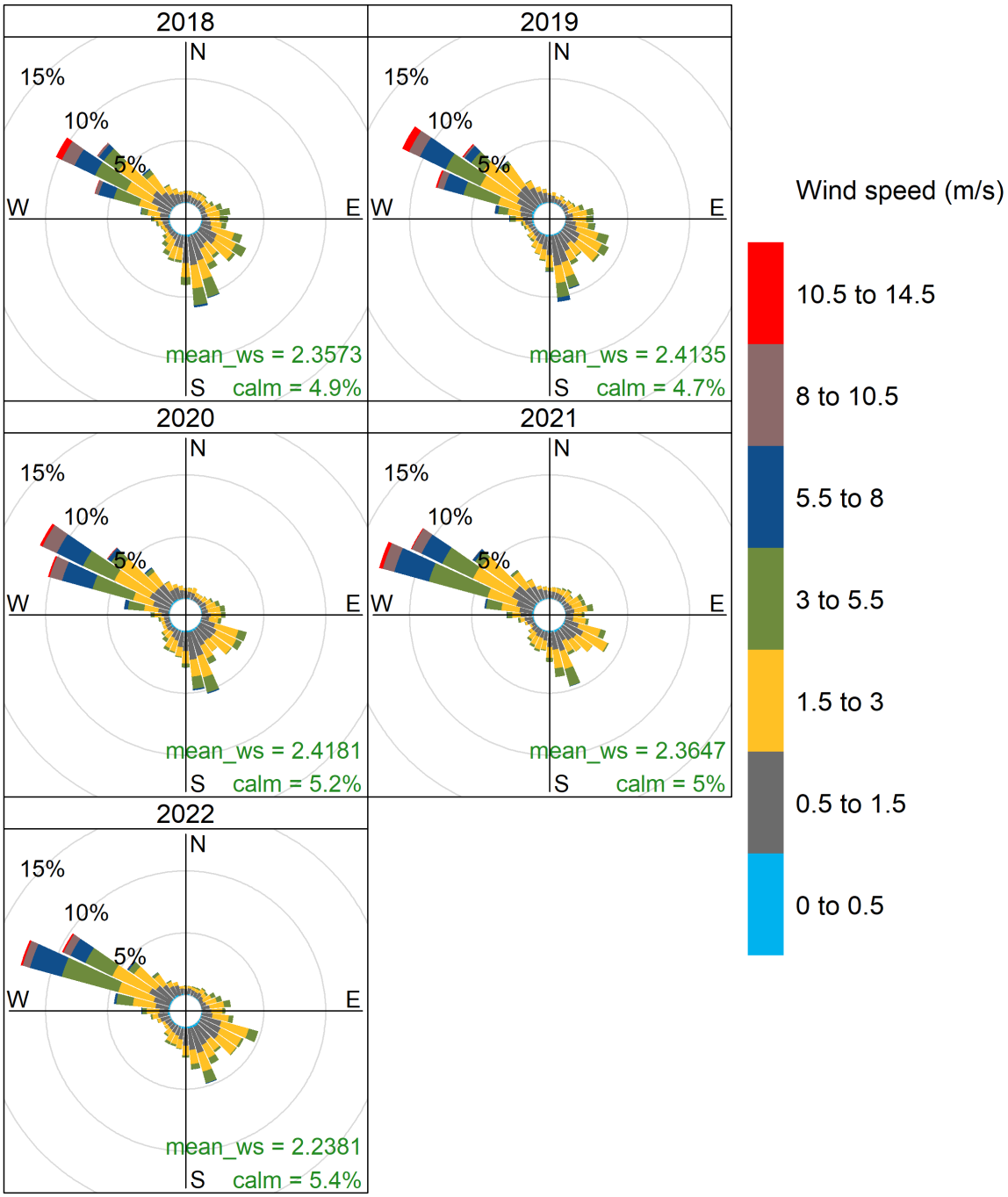


Figure A.6 **Inter-annual comparison of recorded wind speed and direction – Beresfield AWS – 2018 to 2022**

A.2 Meteorological modelling

A.2.1 TAPM modelling

The CSIRO prognostic meteorological model TAPM was used to generate the required upper air prognostic dataset required for AERMET modelling.

TAPM was configured and run as follows:

- TAPM version 4.0.4
- inclusion of high resolution (90 m) regional topography (improvement over default 250 m resolution data)
- grid domains with cell resolutions of 30 km, 10 km, 3 km, 1 km and 0.3 km. Each grid domain features 25 x 25 horizontal grid points and 35 vertical levels
- TAPM default databases for land use, synoptic analyses and sea surface temperature
- TAPM defaults for advanced meteorological inputs
- surface meteorological data from the DPE Beresfield AWS location were incorporated into the modelling
- two 'spin-up' days allowed at the beginning and end of the run.

A.2.2 AERMET meteorological processing

The meteorological inputs for AERMOD were generated using the AERMET meteorological processor. The following sections provide an overview of meteorological processing completed for this assessment.

A.2.3 Surface characteristics

Prior to processing meteorological data, the surface characteristics of the area surrounding the adopted monitoring station require parameterisation. The following surface parameters are required by AERMET:

- surface roughness length
- albedo
- Bowen ratio.

As detailed by USEPA (2013), the surface roughness length is related to the height of obstacles to the wind flow (e.g. vegetation, built environment) and is, in principle, the height at which the mean horizontal wind speed is zero based on a logarithmic profile. The surface roughness length influences the surface shear stress and is an important factor in determining the magnitude of mechanical turbulence and the stability of the boundary layer. The albedo is the fraction of total incident solar radiation reflected by the surface back to space without absorption. The daytime Bowen ratio, an indicator of surface moisture, is the ratio of sensible heat flux to latent heat flux and is used for determining planetary boundary layer parameters for convective conditions driven by the surface sensible heat flux.

The land cover of the 10 km by 10 km area surrounding the site was mapped (see Figure A.7). Using the AERSURFACE tool and following the associated guidance of USEPA (2013), surface roughness was determined for 12 (30 degree) sectors grouped by similar land use types within a 1 km radius around the on-site meteorological station, while the Bowen ratio and albedo were determined for the total area. Monthly-varying values for surface roughness, Bowen ratio and albedo were allocated to each sector based on the values prescribed by USEPA (2013).

Surface moisture characteristics for the 2021 modelling period was determined by comparing the period rainfall total to the previous 30-year rainfall records from the following BoM long term rainfall stations:

- Williamtown RAFF (061078)
- Raymond Terrace (Kinross) (061031).

Annual rainfall modelling was 1,556 mm, which places the 12-month period greater than the 70th percentile rainfall totals for the previous 30 years, and there form a 'wet' surface moisture classification was allocated. It is noted that the rainfall records are not incorporated into dispersion model predictions (i.e. no wet deposition is modelled).

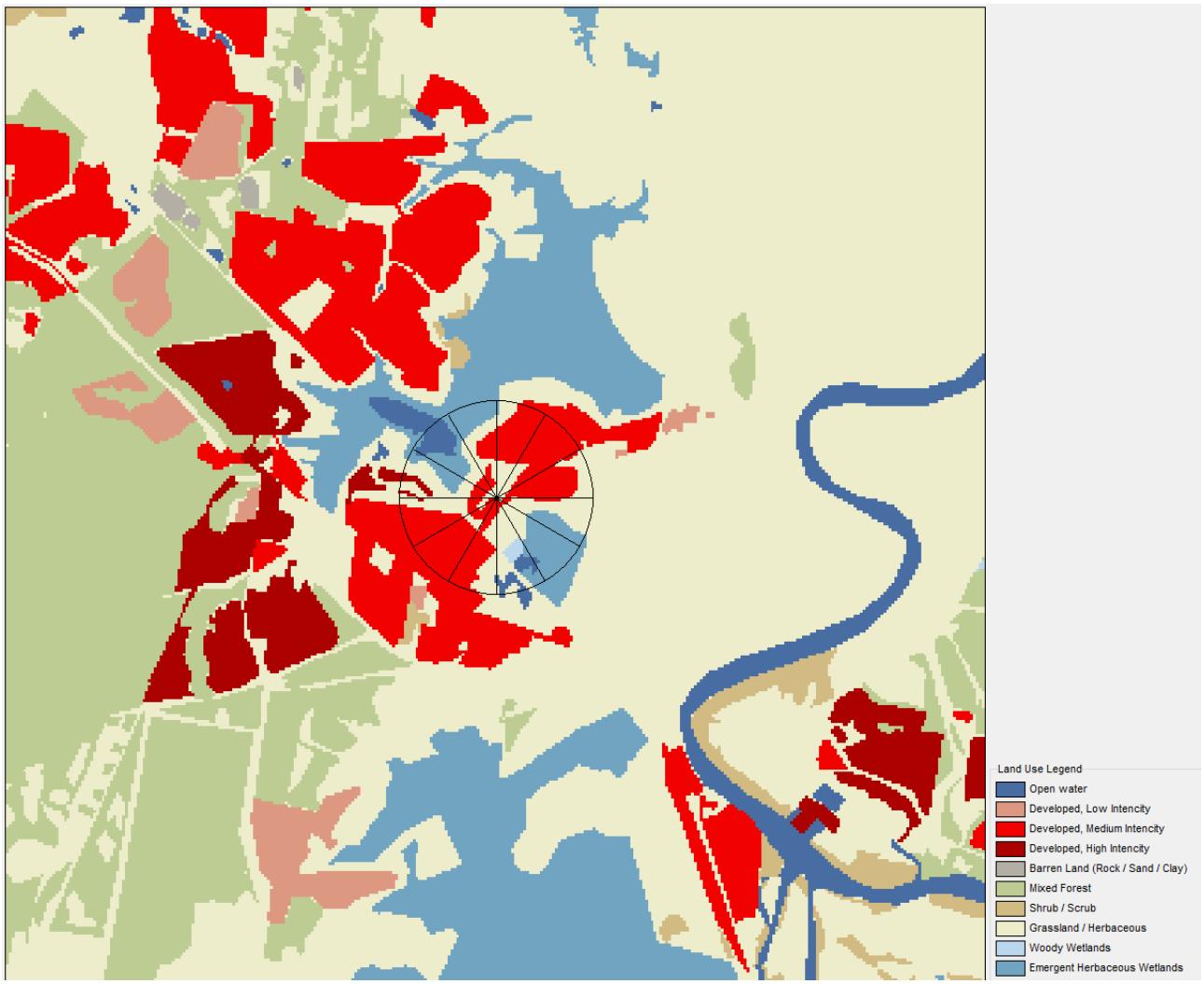


Figure A.7 Land use map for AERSURFACE processing

Note: Marked in figure are the 1 km radius for surface roughness (12 sectors defined) and 10 km x 10 km for albedo/Bowen ratio (total image shown)

Table A.1 Monthly surface roughness length values by sector

Month	Surface roughness length (m) by sector (degrees)											
	0-30	30-60	60-90	90-120	120-150	150-180	180-210	210-240	240-270	270-300	300-330	330-0
Jan	0.191	0.208	0.213	0.134	0.152	0.066	0.207	0.266	0.191	0.151	0.053	0.164
Feb	0.191	0.208	0.213	0.134	0.152	0.066	0.207	0.266	0.191	0.151	0.053	0.164
Mar	0.191	0.208	0.213	0.134	0.152	0.066	0.207	0.266	0.191	0.151	0.053	0.164
Apr	0.191	0.208	0.213	0.134	0.152	0.066	0.207	0.266	0.191	0.151	0.053	0.164
May	0.191	0.208	0.213	0.134	0.152	0.066	0.207	0.266	0.191	0.151	0.053	0.164
Jun	0.075	0.097	0.103	0.031	0.07	0.018	0.102	0.206	0.074	0.039	0.024	0.056
Jul	0.075	0.097	0.103	0.031	0.07	0.018	0.102	0.206	0.074	0.039	0.024	0.056
Aug	0.075	0.097	0.103	0.031	0.07	0.018	0.102	0.206	0.074	0.039	0.024	0.056
Sep	0.144	0.165	0.171	0.086	0.12	0.045	0.168	0.246	0.144	0.101	0.042	0.119
Oct	0.144	0.165	0.171	0.086	0.12	0.045	0.168	0.246	0.144	0.101	0.042	0.119
Nov	0.144	0.165	0.171	0.086	0.12	0.045	0.168	0.246	0.144	0.101	0.042	0.119
Dec	0.191	0.208	0.213	0.134	0.152	0.066	0.207	0.266	0.191	0.151	0.053	0.164

Table A.2 Monthly Bowen ratio and albedo values (all sectors)

Month	Monthly value (all sectors)	
	Bowen ratio	Albedo
January	0.34	0.17
February	0.34	0.17
March	0.42	0.17
April	0.42	0.17
May	0.42	0.17
June	0.42	0.18
July	0.42	0.18
August	0.42	0.18
September	0.31	0.17
October	0.31	0.17
November	0.31	0.17

A.2.4 Meteorological inputs

Monitoring data from the DPE Beresfield AWS and BoM Williamtown RAAF AWS were combined with TAPM meteorological modelling outputs for input to AERMET. The following parameters were input as on-site data to AERMET:

- Wind speed and directions – DPE Beresfield AWS
- Temperature (heights of 10 m and 50 m) – DPE Beresfield AWS (10 m) and TAPM (50 m)
- Relative humidity – DPE Beresfield AWS
- Station level pressure – BoM Williamtown RAAF AWS
- Solar insolation – BoM Williamtown RAAF AWS
- Mixing depth – DPE Beresfield AWS

The period of meteorological data input to AERMET was 1 January 2021 to 31 December 2021.

A.2.5 Upper air profile

Due to the absence of necessary local upper air meteorological measurements, the hourly profile generated by TAPM at the DPE Beresfield AWS location was adopted. Using the temperature difference between levels, the TAPM-generated vertical temperature profile for each hour was adjusted relative to the hourly surface (10 m) temperature observations from the DPE Beresfield AWS.

Appendix B
Emissions inventory background

EMM
creating opportunities

B.1 Introduction

Particulate matter emissions from the site were quantified through the application of accepted published emission estimation factors, collated from a combination of United States Environmental Protection Agency (US-EPA) AP-42 Air Pollutant Emission Factors and NPI emission estimation manuals, including the following:

- NPI Emission Estimation Technique Manual for Concrete Batching and Concrete Product Manufacturing (NPI 1999)
- NPI Emission Estimation Technique Manual for Combustion Engines (NPI 2008)
- NPI Emission Estimation Technique Manual for Mining (NPI 2012)
- AP-42 Chapter 11.9 – Western surface coal mining (US-EPA 1998)
- AP-42 Chapter 11.12 – Concrete Batching (US-EPA 2012)
- AP-42 Chapter 13.2.1 – Paved Roads (US-EPA 2011)
- AP-42 Chapter 13.2.2 – Unpaved Roads (US-EPA 2006)
- AP-42 Chapter 13.2.4 – Aggregate Handling and Storage Piles (US-EPA 2006b).

Particulate releases were quantified for TSP, PM_{10} and $PM_{2.5}$ as documented in subsequent sections.

B.2 Emissions inventory assumptions

Material parameters adopted within the emissions inventory are presented in Table B.1. A breakdown of vehicle movement calculations is presented in Table B.2.

Table B.1 Assumed material parameters

Material/site area	Parameter	Value	Source
Aggregate	Moisture content (%)	1.77	Default moisture content taken from AP-42 S11.12, background document Table 16.1
Sand	Moisture content (%)	4.17	Default moisture content taken from AP-42 S11.12, background document Table 16.1
Cement	Moisture content (%)	0.5	Default moisture content taken from AP-42 S11.12, background document Table 16.1
Paved access routes	Silt loading (g/m^2)	1.5	EMM collected sample for similar CBP site access road
Unpaved access routes	Silt content (%)	4.8	Default moisture content taken from AP-42 S13.2.2, background document Table 13.2.2-1
Stockpile area	Silt content (%)	7.1	Default moisture content taken from AP-42 S13.2.2, background document Table 13.2.2-1

Table B.2 Emissions inventory parameters – haulage calculations

Road segment	Distance (m) – Total trip	Truck capacity (t)	Truck average weight (t)	Loads per day	VKT/day average
Tipper trucks (agg/sand)	570	32	35	8	4.6
Cement/flyash deliveries	570	20	28	3	1.7
Pipe product trucks	580	16.7	33	15	8.7

Note: VKT = vehicle kilometres travelled

B.3 Onsite diesel combustion emissions

Emissions generated by onsite plant and equipment diesel combustion was quantified through the following assumptions:

- FEL and forklift diesel combustion emissions were quantified by applying a diesel consumption rate of 156 L/day for single shift operations and a rate of 313 L/day for double shift operations in combination with the NPI (2008) emissions factors for wheeled loader (conservative factors).

Daily diesel combustion emissions from materials delivery trucks and outgoing pipe product trucks from the site were quantified through the following assumptions:

- emissions from road trucks were quantified through calculated annual VKT and the NSW EPA PM_{10} Emission Factor for road trucks (EPA 2012), based on the specifications of 2011 ADR80/03
- the PM emissions standard is assumed to correspond to PM_{10}, with $PM_{2.5}$ emissions derived from the relationship between PM_{10} and $PM_{2.5}$ emission factors presented in Table 35 in NPI, 2008 (91.7%)
- proposed operations with average day vehicle kilometres travelled of 15 km per day for concrete pipe production were quantified for movements along internal transport routes.

B.4 Emissions inventory table

A summary of the emissions inventory for single shift and double shift concrete pipe production operations are presented in Table B.3 and Table B.4.

Table B.3 Emissions inventory – site - single shift

Source name	Source Type	Emission estimate TSP (kg/day)	Emission estimate PM_{10} (kg/day)	Emission estimate $PM_{2.5}$ (kg/day)	Activity rate	Units	TSP emission factor	PM_{10} emission factor	$PM_{2.5}$ emission factor	Unit	Parameter 1	Unit	Parameter 2	Unit	Parameter 3	Unit	Parameter 4	Unit	Reduction factor	Emission control
Vehicle movements - Paved site entry materials	Paved haulage	0.68	0.13	0.03	3.8	VKT/day	0.18	0.03	0.01	kg/VKT	1.5	Road silt loading (g/m2)	145	Distance (m)	26	Loads/day	33	Average weight (t)		
Vehicle movements - Paved site exit materials	Paved haulage	0.62	0.12	0.03	3.3	VKT/day	0.18	0.04	0.01	kg/VKT	1.5	Road silt loading (g/m2)	223	Distance (m)	15	Loads/day	33	Average weight (t)		
Vehicle movements - Materials delivery	Unpaved haulage	2.32	0.59	0.06	4.2	VKT/day	2.23	0.57	0.06	kg/VKT	4.8	Silt content (%)	379	Distance (m)	11	Loads/day	33	Average weight (t)	0.75	Water cart
Vehicle movements - Pipe Product outgoing	Unpaved haulage	1.86	0.47	0.05	3.32	VKT/day	2.25	0.57	0.06	kg/VKT	4.8	Silt content (%)	221	Distance (m)	15	Loads/day	33	Average weight (t)	0.75	Water cart
FEL movements - storage bin to hopper	Unpaved haulage	1.78	0.49	0.05	3.19	VKT/day	2.23	0.61	0.06	kg/VKT	7.1	Silt content (%)	230	Distance (m)	13.9	Loads/day	18	Average weight (t)	0.75	Water cart
Forklift movements - pipes into yard	Unpaved haulage	3.61	0.92	0.09	7.67	VKT/day	1.88	0.48	0.05	kg/VKT	4.8	Silt content (%)	230	Distance (m)	33.3	Loads/day	23	Average weight (t)	0.75	Water cart
Unloading of sand to storage bunker	Material handling	0.0018	0.0009	0.0001	26.2	t/day sand	0.0005	0.0002	0.00003	kg/t sand	2.38	Average wind speed (m/s)	4.17	Moisture content (%)					0.85	Water sprays and 3 sided bunkers
Unloading of aggregate to storage bunker	Material handling	0.0103	0.0049	0.0007	44.2	t/day agg	0.0016	0.0007	0.00011	kg/t agg	2.38	Average wind speed (m/s)	1.77	Moisture content (%)					0.85	Water sprays and 3 sided bunkers
FEL sand handling at storage bunker	Material handling	0.0018	0.0009	0.0001	26.2	t/day sand	0.0005	0.0002	0.00003	kg/t sand	2.38	Average wind speed (m/s)	4.17	Moisture content (%)					0.85	Water sprays and 3 sided bunkers
FEL aggregate handling at storage bunker	Material handling	0.0103	0.0049	0.0007	44.2	t/day agg	0.0016	0.0007	0.00011	kg/t agg	2.38	Average wind speed (m/s)	1.77	Moisture content (%)					0.85	Water sprays and 3 sided bunkers
FEL sand transfer to hopper bin	Material handling	0.0123	0.0058	0.0009	26.2	t/day sand	0.0005	0.0002	0.00003	kg/t sand	2.38	Average wind speed (m/s)	4.17	Moisture content (%)						

Table B.3 Emissions inventory – site - single shift

Source name	Source Type	Emission estimate TSP (kg/day)	Emission estimate PM_{10} (kg/day)	Emission estimate $PM_{2.5}$ (kg/day)	Activity rate	Units	TSP emission factor	PM_{10} emission factor	$PM_{2.5}$ emission factor	Unit	Parameter 1	Unit	Parameter 2	Unit	Parameter 3	Unit	Parameter 4	Unit	Reduction factor	Emission control
FEL aggregate transfer to hopper bin	Material handling	0.0688	0.0326	0.0049	44.2	t/day agg	0.0016	0.0007	0.00011	kg/t agg	2.38	Average wind speed (m/s)	1.77	Moisture content (%)						
Sand transfer - transfer to weigh hopper conveyer	Material handling	0.0037	0.0017	0.0003	26.2	t/day sand	0.0005	0.0002	0.00003	kg/t sand	2.38	Average wind speed (m/s)	4.17	Moisture content (%)					0.7	Acoustics cladding - enclosure
Aggregate transfer - transfer to weigh hopper conveyer	Material handling	0.0206	0.0098	0.0015	44.2	t/day agg	0.0016	0.0007	0.00011	kg/t agg	2.38	Average wind speed (m/s)	1.77	Moisture content (%)					0.7	Acoustics cladding - enclosure
Weigh hopper loading	CBP processes	0.0183	0.0092	0.0014	70.5	t/day sand&agg	0.0026	0.0013	0.00020	kg/t sand&agg									0.9	Enclosure
Central mixer loading	CBP processes	0.0003	0.0001	0.00001	19.7	t/day	0.1291	0.0361	0.0032	kg/t	5.32	Average wind speed (mph)	0.5	Moisture content (%)					0.9	Enclosure
Wind erosion - storage bins	Wind erosion	0.0006	0.0003	0.00005	0.020	Area (ha)	0.10	0.05	0.01	kg/ha/hour	769	Hours >5.4m/s							0.85	Water sprays and 3 sided bunkers
Wind erosion - Yard	Wind erosion	0.12	0.06	0.01	2.380	Area (ha)	0.10	0.05	0.01	kg/ha/hour	769	Hours >5.4m/s							0.75	Water cart
Diesel combustion - FEL	Fuel combustion	0.28	0.28	0.26																
Diesel combustion - Forklifts	Fuel combustion	0.28	0.28	0.26																
Diesel combustion - trucks	Fuel combustion	0.0011	0.0011	0.0010																

Table B.4 Emissions inventory – site - double shift

Source name	Source Type	Emission estimate TSP (kg/day)	Emission estimate PM_{10} (kg/day)	Emission estimate $PM_{2.5}$ (kg/day)	Activity rate	Units	TSP emission factor	PM_{10} emission factor	$PM_{2.5}$ emission factor	Unit	Parameter 1	Unit	Parameter 2	Unit	Parameter 3	Unit	Parameter 4	Unit	Reduction factor	Emission control
Vehicle movements - Paved site entry materials	Paved haulage	0.21	0.04	0.01	3.8	VKT/day	0.18	0.03	0.01	kg/VKT	1.5	Road silt loading (g/m2)	145	Distance (m)	26	Loads/day	33	Average weight (t)	0.70	Sweepers
Vehicle movements - Paved site exit pipes	Paved haulage	0.62	0.12	0.03	3.3	VKT/day	0.18	0.04	0.01	kg/VKT	1.5	Road silt loading (g/m2)	223	Distance (m)	15	Loads/day	33	Average weight (t)		
Vehicle movements - Paved site exit materials	Paved haulage	0.14	0.03	0.01	2.6	VKT/day	0.18	0.03	0.01	kg/VKT	1.5	Road silt loading (g/m2)	235	Distance (m)	11	Loads/day	33	Average weight (t)	0.70	Sweepers
Vehicle movements - Materials delivery	Unpaved haulage	1.14	0.29	0.03	2.0	VKT/day	2.23	0.57	0.06	kg/VKT	4.8	Silt content (%)	186	Distance (m)	11	Loads/day	33	Average weight (t)	0.75	Water cart
Vehicle movements - Pipe Product outgoing	Unpaved haulage	1.86	0.47	0.05	3.32	VKT/day	2.25	0.57	0.06	kg/VKT	4.8	Silt content (%)	221	Distance (m)	15	Loads/day	33	Average weight (t)	0.75	Water cart
FEL movements - storage bin to hopper	Paved haulage	0.72	0.14	0.03	6.39	VKT/day	0.38	0.07	0.02	kg/VKT	6.6	Road silt loading (g/m2)	230	Distance (m)	27.8	Loads/day	18	Average weight (t)	0.70	Sweepers
Unloading of sand to storage bunker	Material handling	0.0037	0.0017	0.0003	52.4	t/day sand	0.0005	0.0002	0.00003	kg/t sand	2.38	Average wind speed (m/s)	4.17	Moisture content (%)					0.85	Water sprays and 3 sided bunkers
Unloading of aggregate to storage bunker	Material handling	0.0206	0.0098	0.0015	88.5	t/day agg	0.0016	0.0007	0.00011	kg/t agg	2.38	Average wind speed (m/s)	1.77	Moisture content (%)					0.85	Water sprays and 3 sided bunkers
FEL sand handling at storage bunker	Material handling	0.0037	0.0017	0.0003	52.4	t/day sand	0.0005	0.0002	0.00003	kg/t sand	2.38	Average wind speed (m/s)	4.17	Moisture content (%)					0.85	Water sprays and 3 sided bunkers
FEL aggregate handling at storage bunker	Material handling	0.0206	0.0098	0.0015	88.5	t/day agg	0.0016	0.0007	0.00011	kg/t agg	2.38	Average wind speed (m/s)	1.77	Moisture content (%)					0.85	Water sprays and 3 sided bunkers
FEL sand transfer to hopper bin	Material handling	0.0246	0.0116	0.0018	52.4	t/day sand	0.0005	0.0002	0.00003	kg/t sand	2.38	Average wind speed (m/s)	4.17	Moisture content (%)						

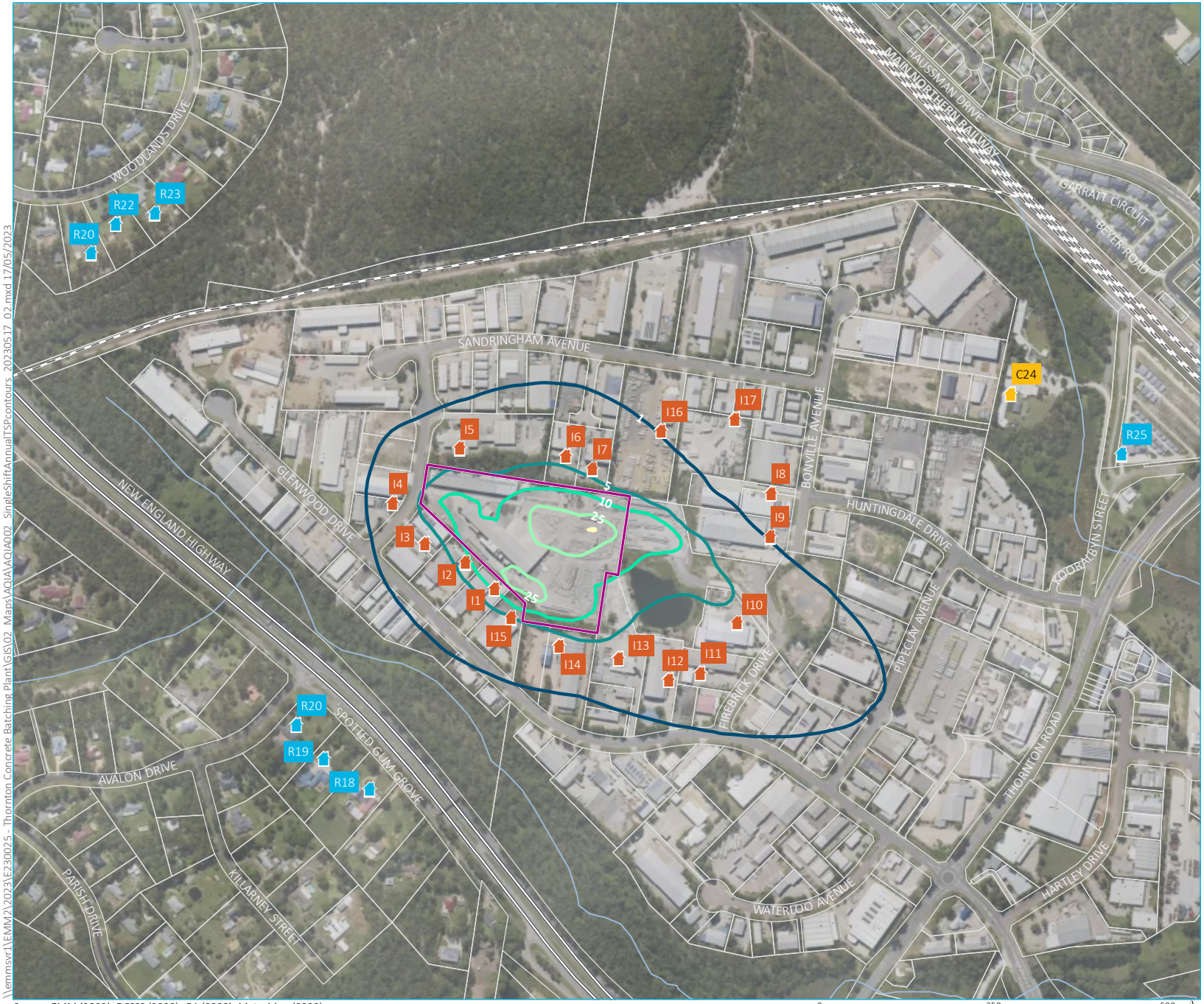
Table B.4 Emissions inventory – site - double shift

Source name	Source Type	Emission estimate TSP (kg/day)	Emission estimate PM_{10} (kg/day)	Emission estimate $PM_{2.5}$ (kg/day)	Activity rate	Units	TSP emission factor	PM_{10} emission factor	$PM_{2.5}$ emission factor	Unit	Parameter 1	Unit	Parameter 2	Unit	Parameter 3	Unit	Parameter 4	Unit	Reduction factor	Emission control
FEL aggregate transfer to hopper bin	Material handling	0.1376	0.0651	0.0099	88.5	t/day agg	0.0016	0.0007	0.00011	kg/t agg	2.38	Average wind speed (m/s)	1.77	Moisture content (%)						
Sand transfer - transfer to weigh hopper conveyer	Material handling	0.0074	0.0035	0.0005	52.4	t/day sand	0.0005	0.0002	0.00003	kg/t sand	2.38	Average wind speed (m/s)	4.17	Moisture content (%)					0.7	Acoustics cladding - enclosure
Aggregate transfer - transfer to weigh hopper conveyer	Material handling	0.0413	0.0195	0.0030	88.5	t/day agg	0.0016	0.0007	0.00011	kg/t agg	2.38	Average wind speed (m/s)	1.77	Moisture content (%)					0.7	Acoustics cladding - enclosure
Weigh hopper loading	CBP processes	0.0366	0.0183	0.0028	140.9	t/day sand&agg	0.0026	0.0013	0.00020	kg/t sand&agg									0.9	Enclosure
Central mixer loading	CBP processes	0.0005	0.0001	0.00001	39.3	t/day	0.1291	0.0361	0.0032	kg/t	5.32	Average wind speed (mph)	0.5	Moisture content (%)					0.9	Enclosure
Wind erosion - storage bins	Wind erosion	0.0006	0.0003	0.00005	0.020	Area (ha)	0.10	0.05	0.01	kg/ha/hour	769	Hours >5.4m/s							0.85	Water sprays and 3 sided bunkers
Wind erosion - Yard	Wind erosion	0.11	0.05	0.01	2.060	Area (ha)	0.10	0.05	0.01	kg/ha/hour	769	Hours >5.4m/s							0.75	Water cart
Diesel combustion - FEL	Fuel combustion	0.28	0.28	0.26																
Diesel combustion - Forklifts	Fuel combustion	0.28	0.28	0.26																
Diesel combustion - trucks	Fuel combustion	0.0011	0.0011	0.0010																

Appendix C

Incremental (project-only) isopleth plots

EMM
creating opportunities



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Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

Predicted annual average
TSP concentrations (µg/m³)
project only - Single shift operations

Thornton Pipe Factory
Air Quality Impact Assessment
Figure C.1

EMM
creating opportunities

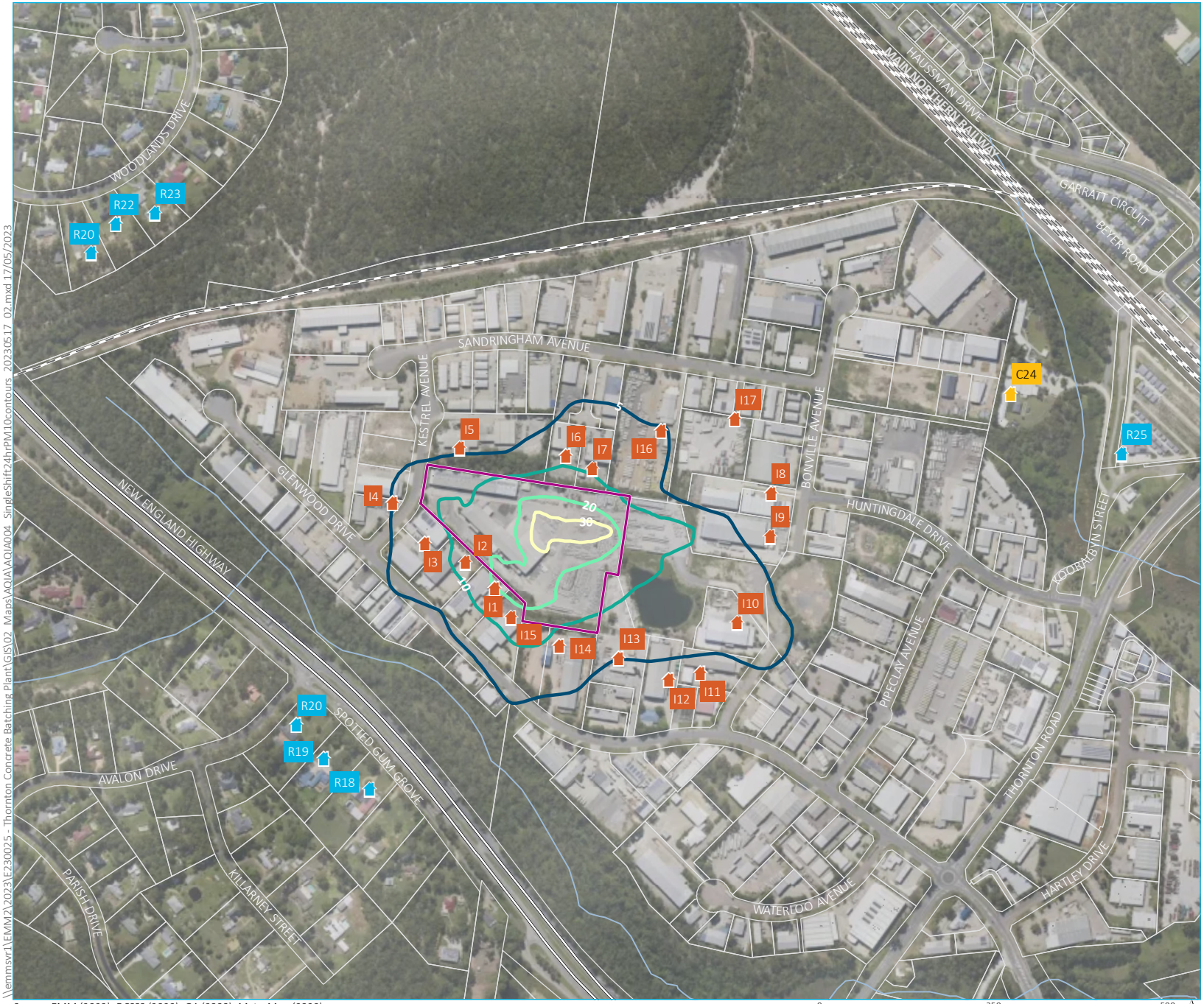
Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

\\emmsvr1\EMM2\2023\E230025 - Thornton Concrete Batching Plant\GIS\02 Maps\AQIA\AQIA003 DoubleShiftAnnualTSPcontours 20230517 02.mxd 17/05/2023

Predicted annual average
TSP concentrations (µg/m³)
project only - Double shift operations

Thornton Pipe Factory
Air Quality Impact Assessment
Figure C.2

EMM
creating opportunities



KEY

- Site boundary

Assessment location

- Residential
- Education
- Industrial

PM_{10} concentration (µg/m³)

- 5
- 10
- 20
- 30

Existing environment

- Rail line
- Major road
- Watercourse/drainage line
- Cadastral boundary

Maximum predicted 24-hour average PM_{10} concentrations (µg/m³) project only - Single shift operations

Thornton Pipe Factory
Air Quality Impact Assessment
Figure C.3

Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

0 250 500 m

GDA2020 MGA Zone 56

N

creating opportunities

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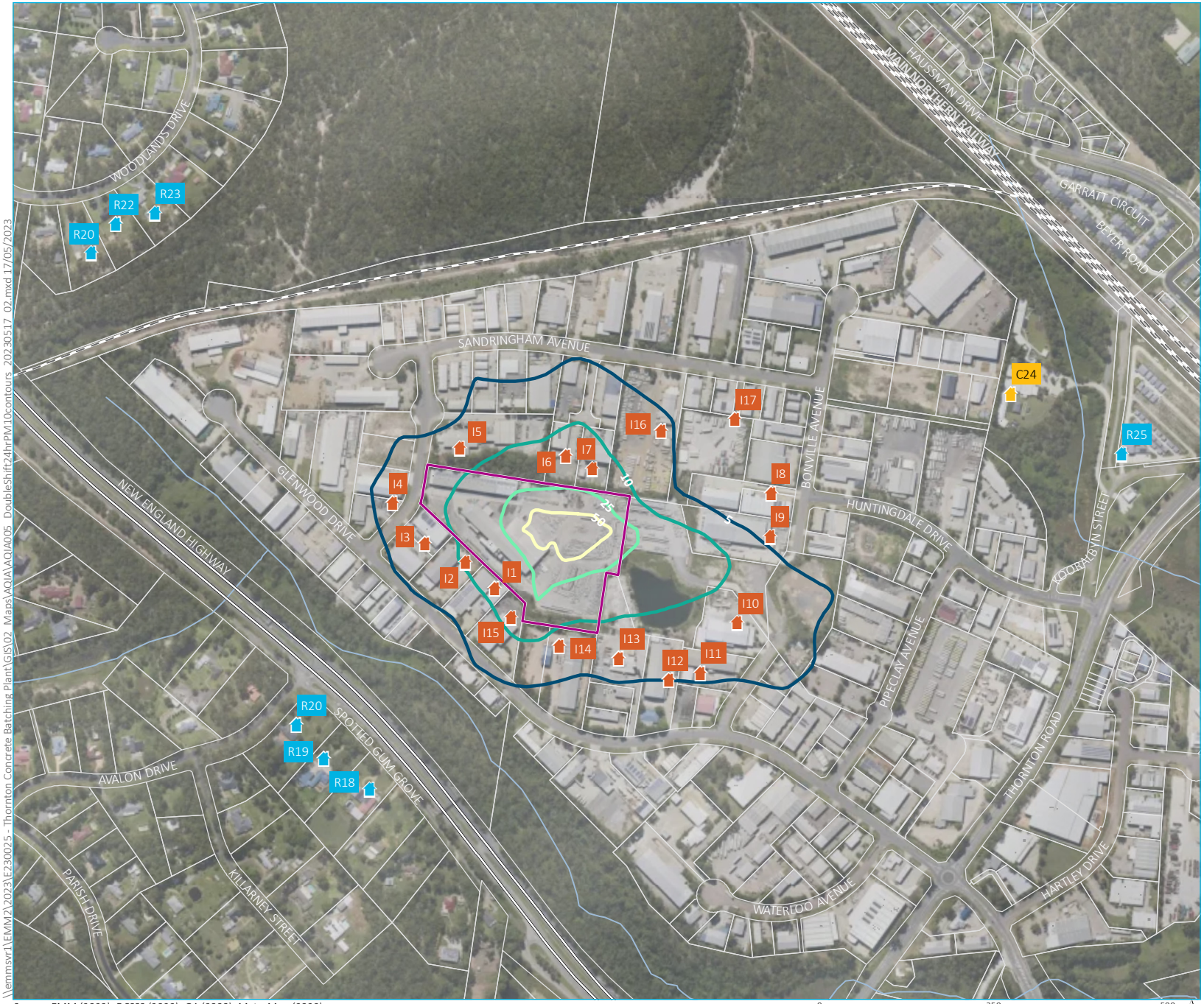

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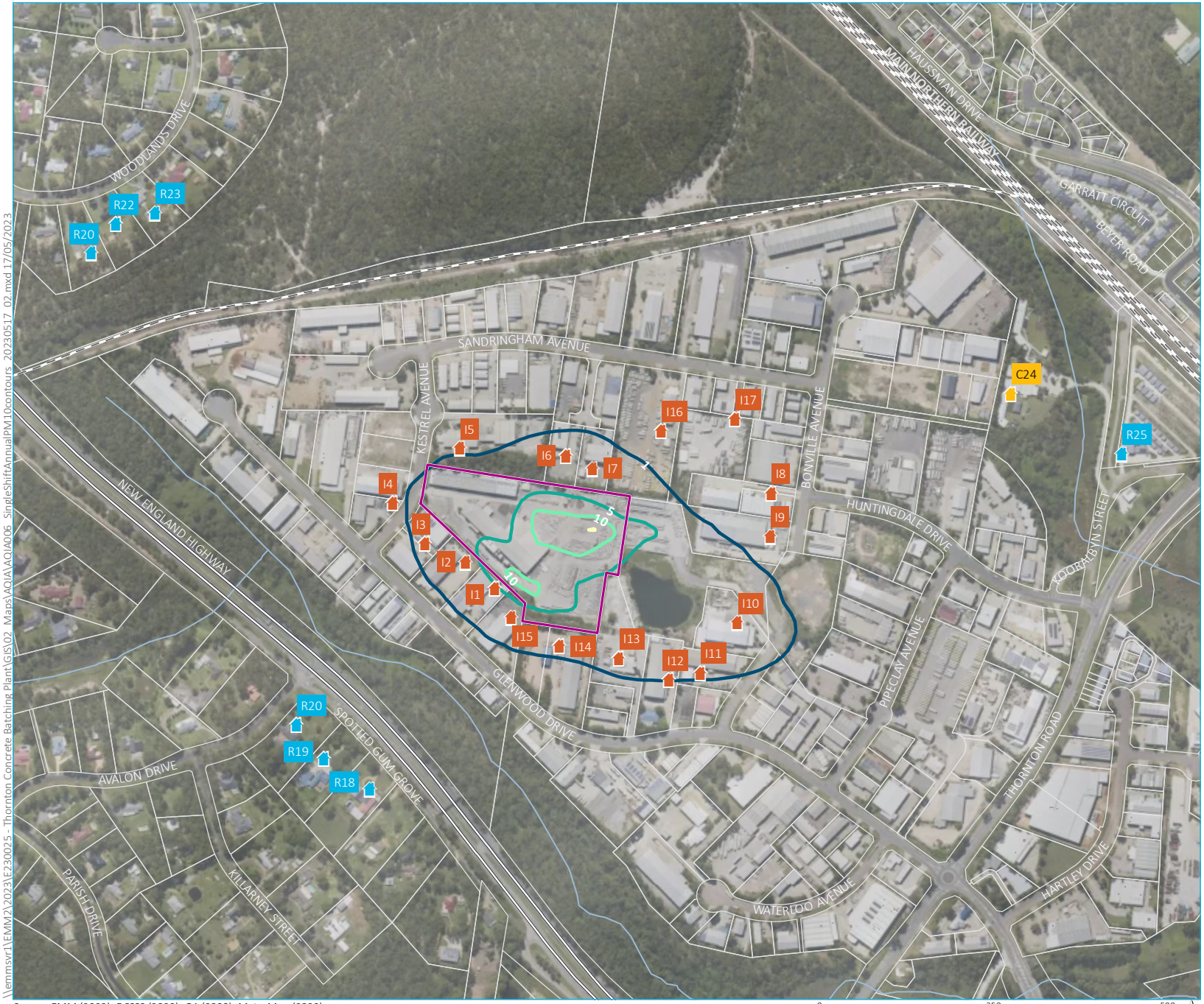
Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

Maximum predicted 24-hour average PM_{10} concentrations (µg/m^3) project only - Double shift operations

Thornton Pipe Factory
Air Quality Impact Assessment
Figure C.4

EMM
creating opportunities



KEY

- Site boundary

Assessment location

- Residential
- Education
- Industrial

PM_{10} concentration (µg/m³)

- 1
- 5
- 10
- 15

Existing environment

- Rail line
- Major road
- Watercourse/drainage line
- Cadastral boundary

Predicted annual average PM_{10} concentrations (µg/m³) project only - Single shift operations

Thornton Pipe Factory
Air Quality Impact Assessment
Figure C.5

EMM creating opportunities

Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

0 250 500 m

GDA2020 MGA Zone 56

N

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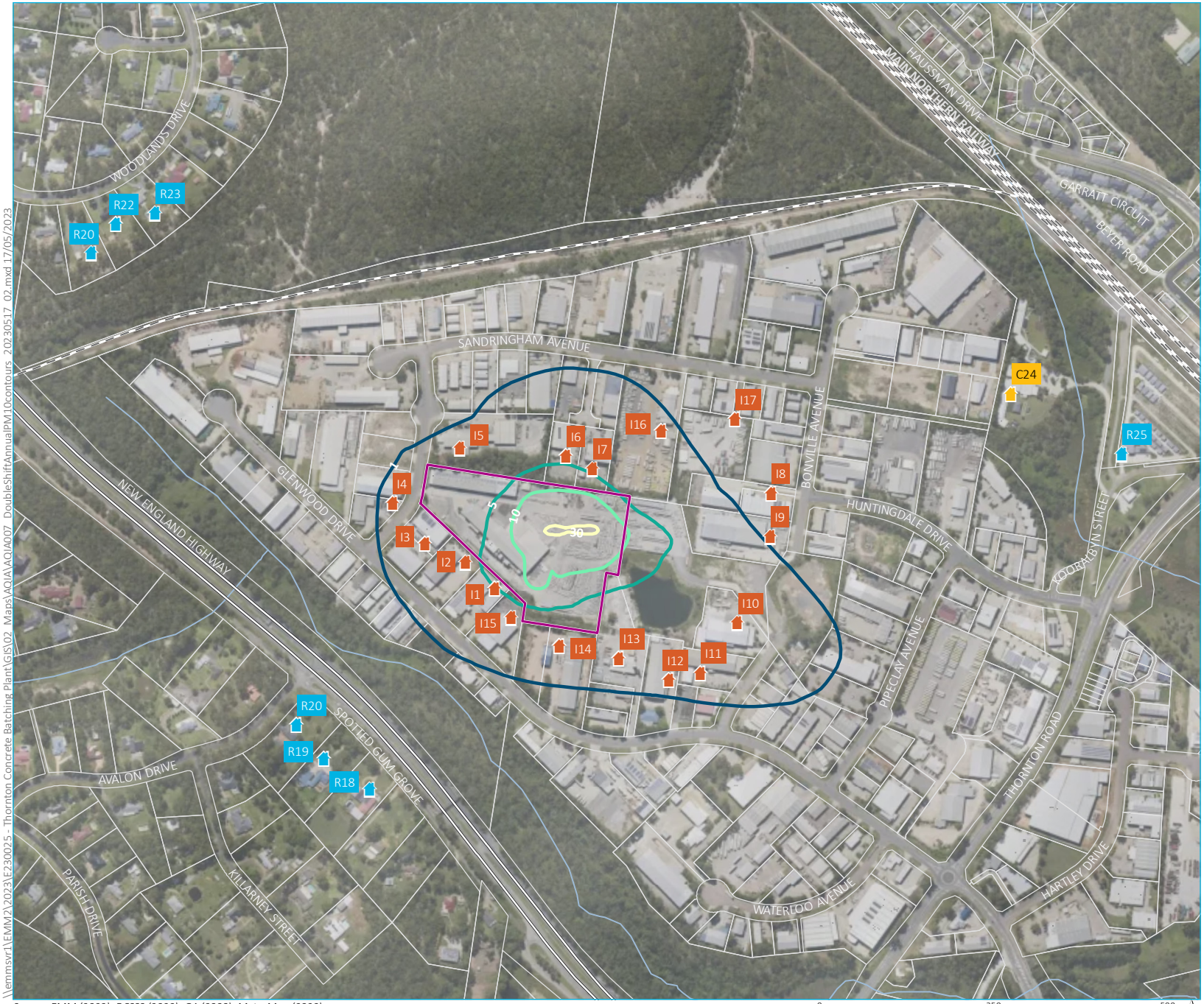

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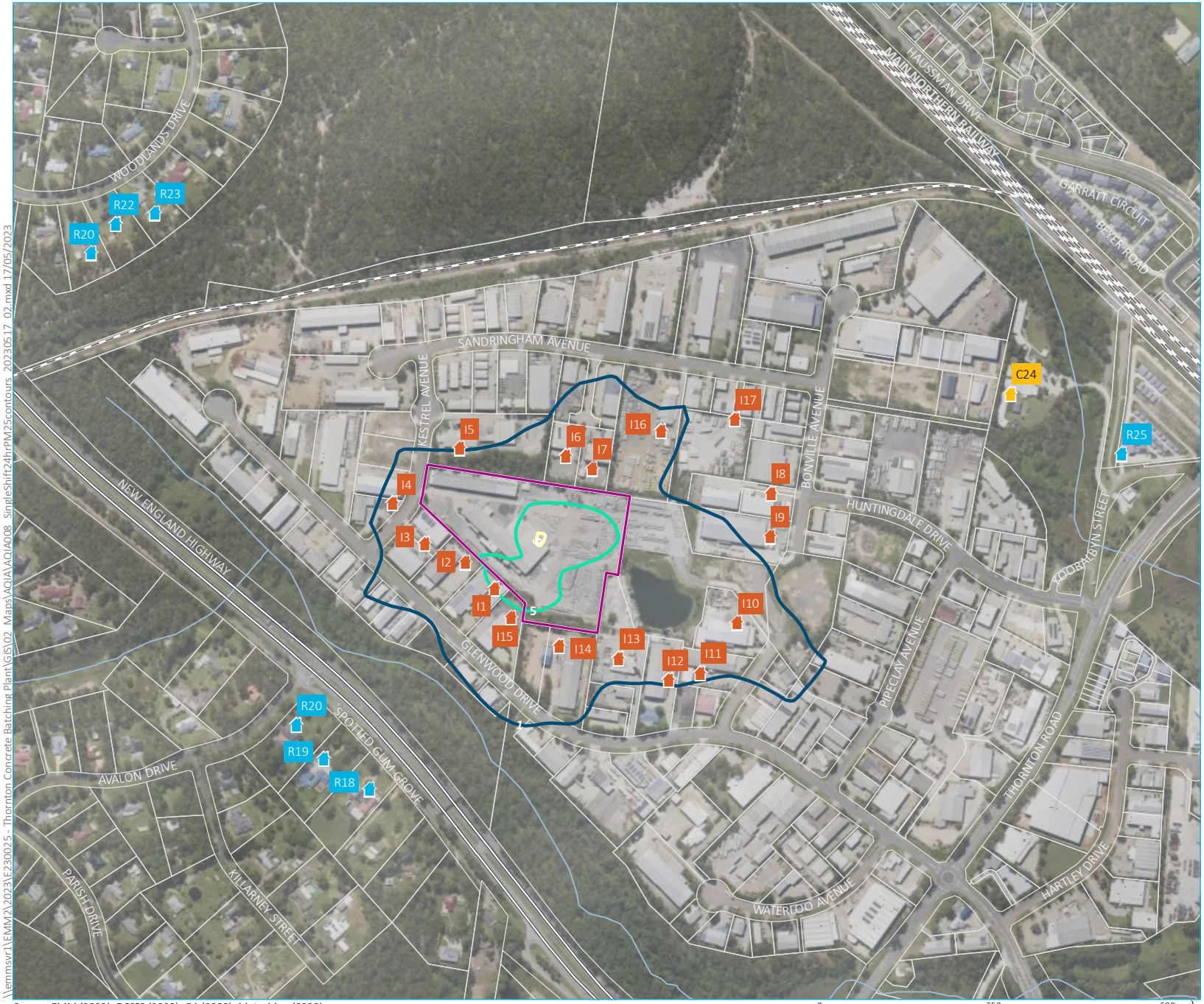
Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

Predicted annual average PM_{10} concentrations (µg/m^3) project only - Double shift operations

Thornton Pipe Factory
Air Quality Impact Assessment
Figure C.6

EMM
creating opportunities



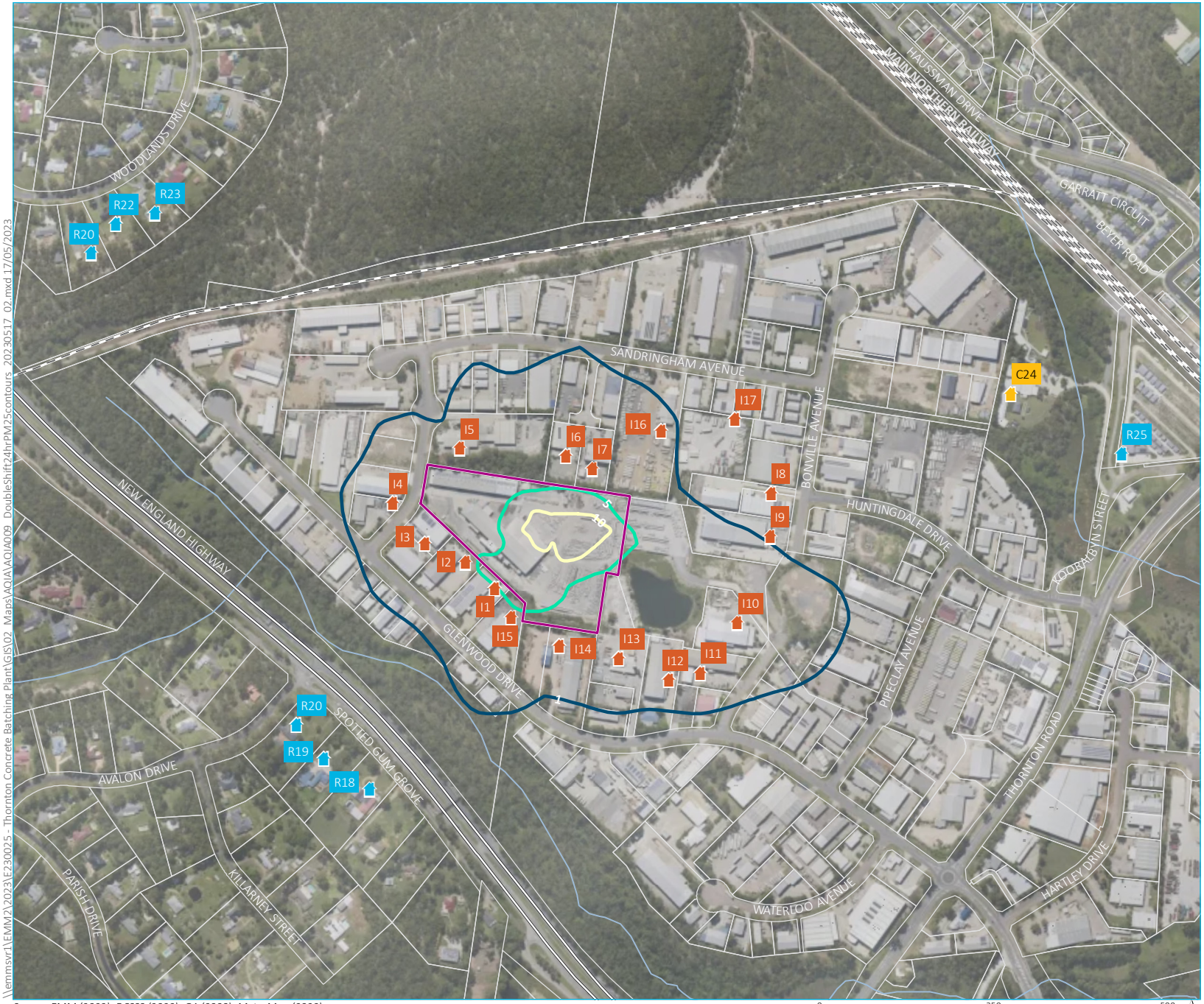
\\emmsvr1\EMM2\2023\E230025 - Thornton Concrete Batching Plant\GIS\02_Maps\AQIA\AQIA008_SingleShift24hrPM25contours_20230517_02.mxd 17/05/2023

Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

Maximum predicted 24-hour average $PM_{2.5}$ concentrations (µg/m^3) project only - Single shift operations

Thornton Pipe Factory
Air Quality Impact Assessment
Figure C.7

EMM
creating opportunities



KEY

- Site boundary
- Assessment location
  - Residential
  - Education
  - Industrial
- $PM_{2.5}$ concentration (µg/m³)
  - 1
  - 5
  - 10
- Existing environment
  - Rail line
  - Major road
  - Watercourse/drainage line
  - Cadastral boundary

Maximum predicted 24-hour average $PM_{2.5}$ concentrations (µg/m³) project only - Double shift operations

Thornton Pipe Factory
Air Quality Impact Assessment
Figure C.8

EMM creating opportunities

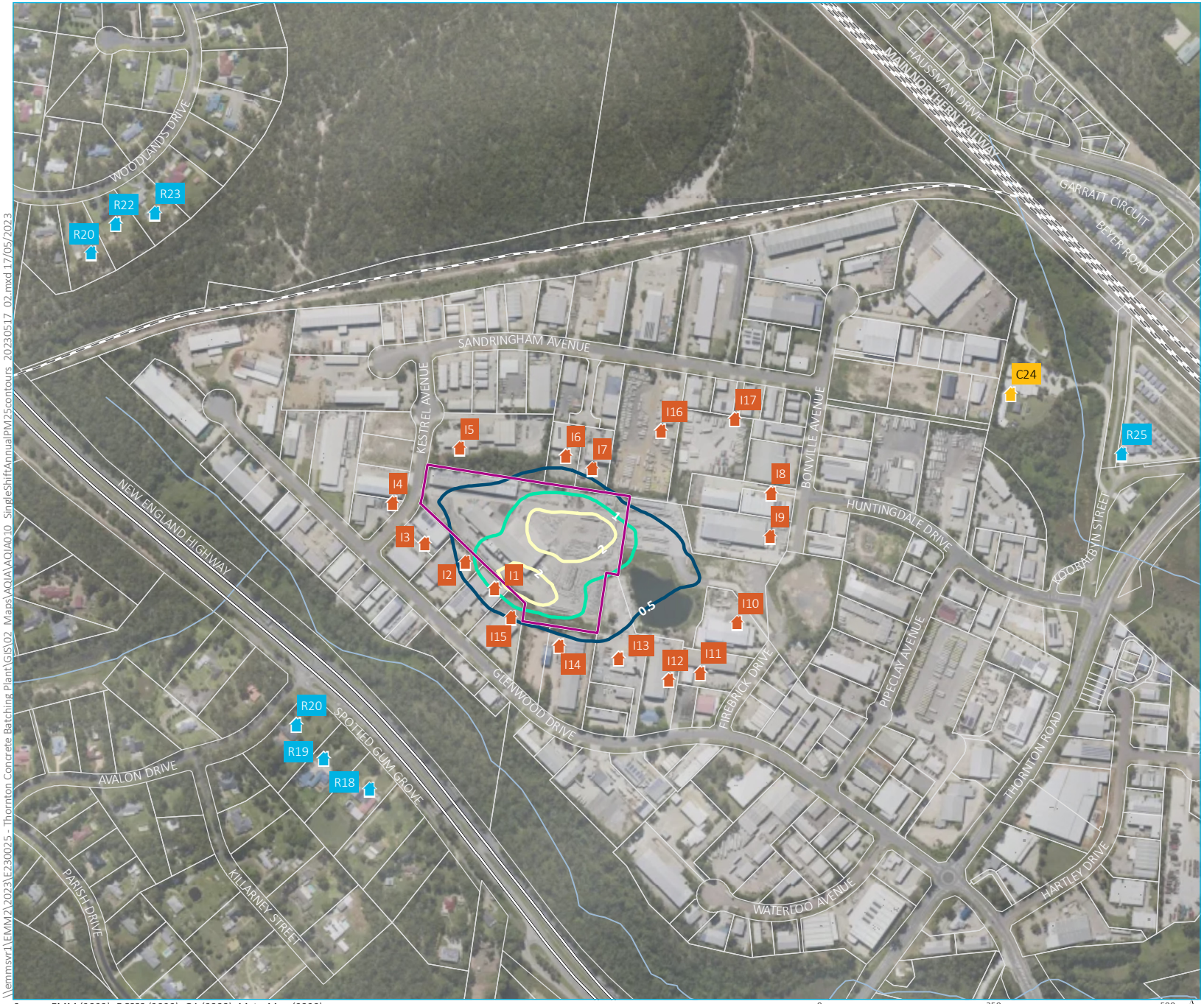
Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

0 250 500 m

GDA2020 MGA Zone 56

N

\\emmsvr1\EMM2\2023\E230025 - Thornton Concrete Batching Plant\GIS\02 Maps\AQIA\AQIA009 DoubleShift24hrPM25contours 20230517 02.mxd 17/05/2023



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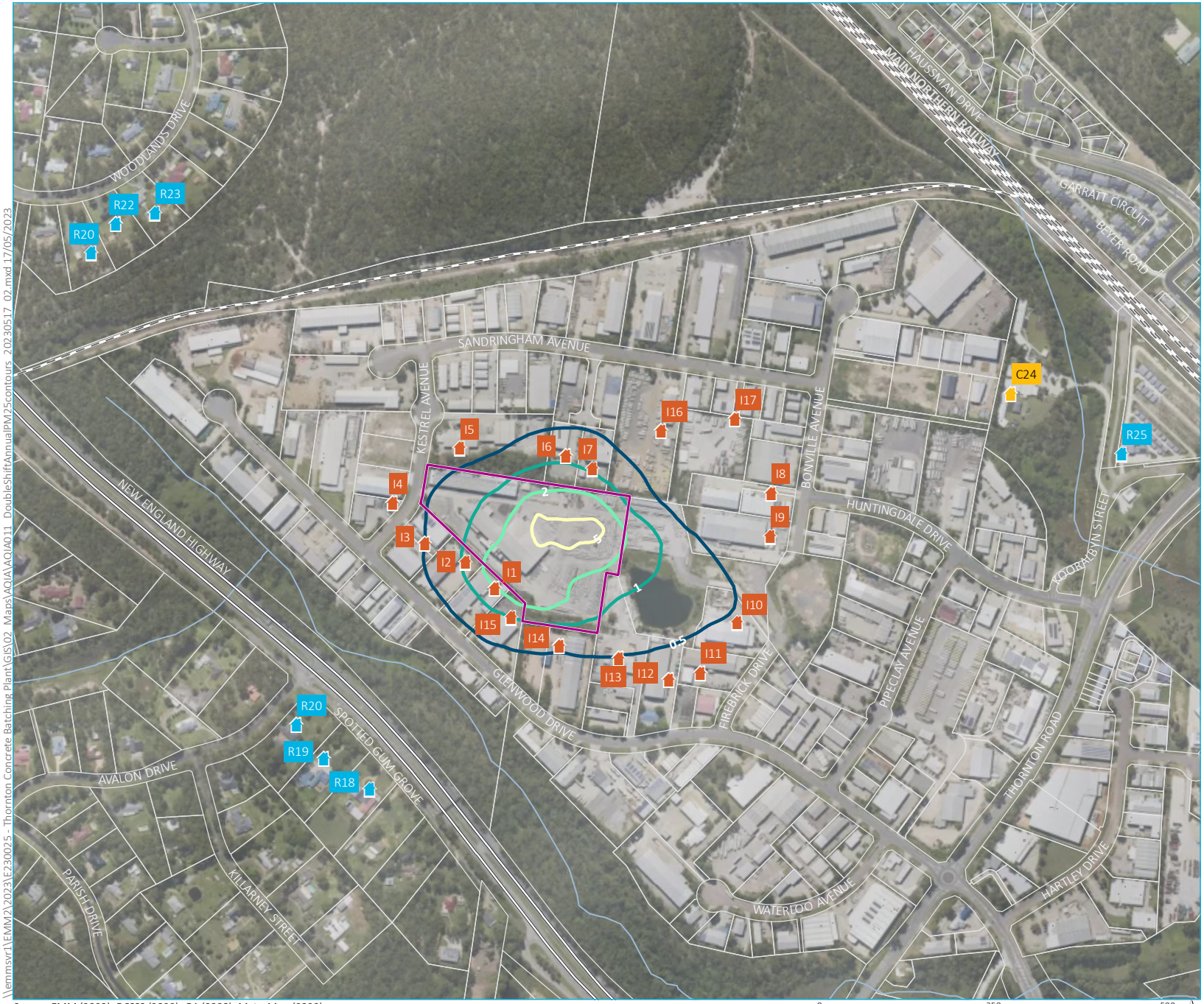
Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

Predicted annual average $PM_{2.5}$ concentrations (µg/m^3) project only - Single shift operations

Thornton Pipe Factory
Air Quality Impact Assessment
Figure C.9

EMM
creating opportunities



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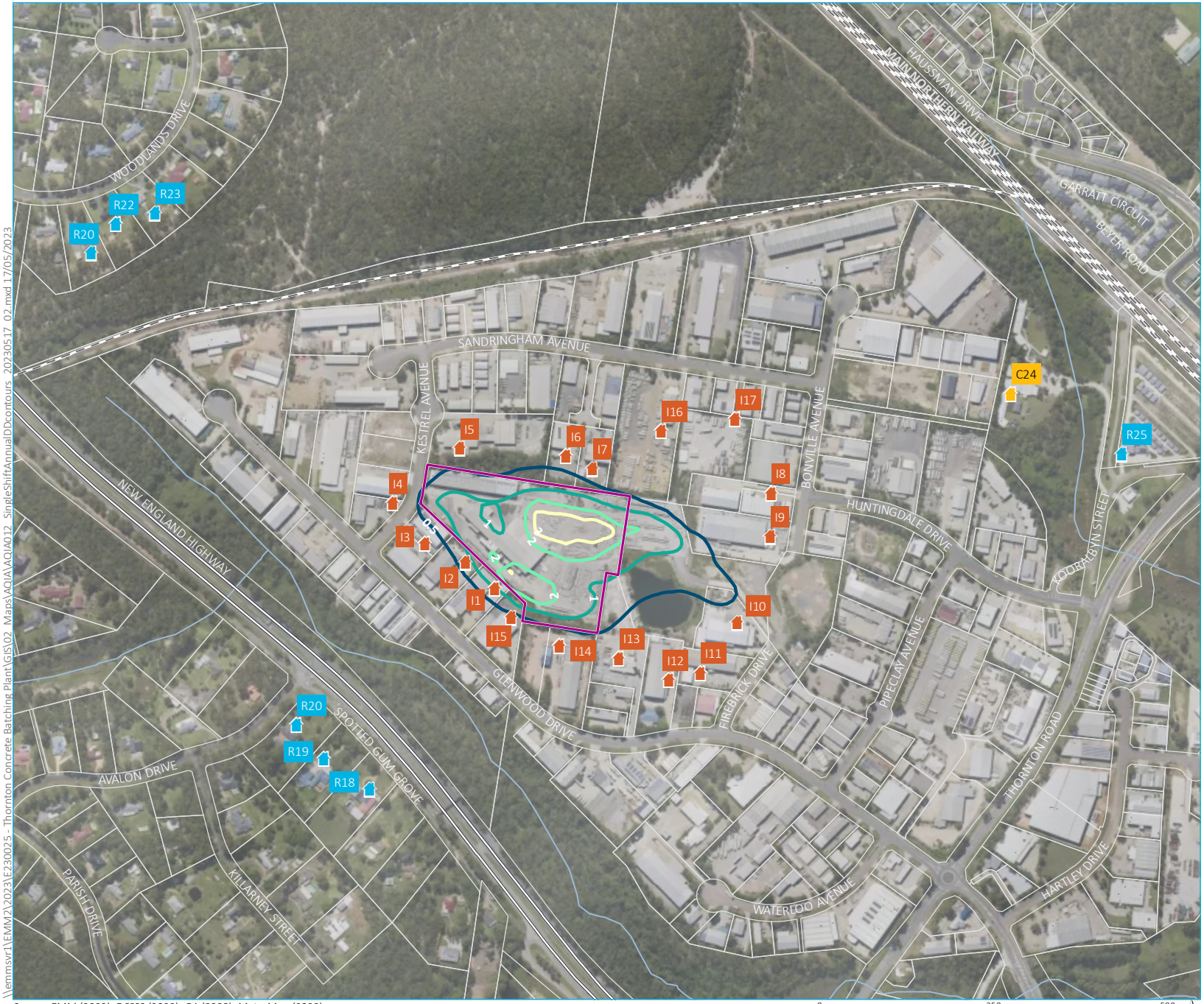
Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

Predicted annual average $PM_{2.5}$ concentrations (µg/m^3) project only - Double shift operations

Thornton Pipe Factory
Air Quality Impact Assessment
Figure C.10

EMM
creating opportunities



KEY

- Site boundary
- Assessment location
  - Residential
  - Education
  - Industrial
- Dust deposition level (g/m²/month)
  - 0.5
  - 1
  - 2
  - 3
- Existing environment
  - Rail line
  - Major road
  - Watercourse/drainage line
  - Cadastral boundary

Predicted annual average dust deposition levels (g/m²/month) project only - Single shift operations

Thornton Pipe Factory
Air Quality Impact Assessment
Figure C.11

Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

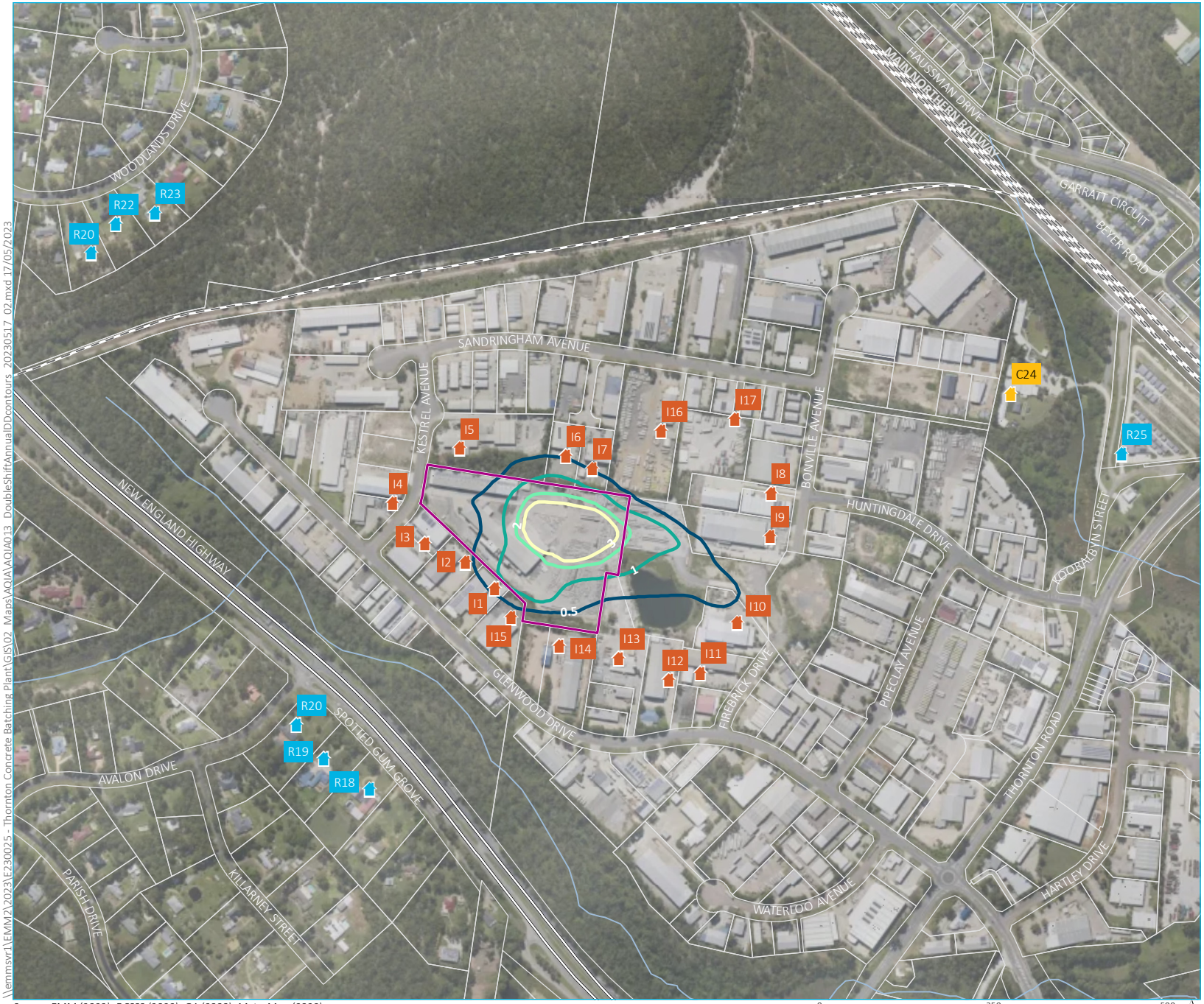
0 250 500 m

GDA2020 MGA Zone 56

N

\\emmsvr1\EMM2\2023\E230025 - Thornton Concrete Batching Plant\GIS\02 Maps\AQIA\AQIA012 SingleShiftAnnualDDcontours 20230517 02.mxd 17/05/2023

creating opportunities



KEY

- Site boundary

Assessment location

- Residential
- Education
- Industrial

Dust deposition level (g/m²/month)

- 0.5
- 1
- 2
- 3

Existing environment

- Rail line
- Major road
- Watercourse/drainage line
- Cadastral boundary

Predicted annual average dust deposition levels (g/m²/month) project only - Doube shift operations

Thornton Pipe Factory
Air Quality Impact Assessment
Figure C.12

EMM creating opportunities

Source: EMM (2023); DCSSS (2023); GA (2009); MetroMap (2023)

0 250 500 m

GDA2020 MGA Zone 56

N

\\emmsvr1\EMM2\2023\E230025 - Thornton Concrete Batching Plant\GIS\02 Maps\AQIA\AQIA013 DoubleShiftAnnualDDcontours 20230517 02.mxd 17/05/2023

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Newcastle NSW 2300
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Spring Hill QLD 4000
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15 London Circuit
Canberra City ACT 2601

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Adelaide SA 5000
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Melbourne VIC 3000
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Perth WA 6000
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Vancouver BC V5Y 1K1
T 604 999 8297

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Appendix C
Land owner consent

EMM
creating opportunities

KESTREL AVENUE PTY LTD
ACN 655 339 263 ABN 11 655 339 263
c/- Mainspring Property Group, Level 5, 4 Freshwater Place, Southbank VIC 3006

18 May 2023

Attention: Neil Kingan
RCPA (NSW) Pty Ltd
8B Kestrel Avenue
Thornton NSW 2322

Dear Neil

8B Kestrel Avenue, Thornton NSW 2322 (Property)

I confirm that Kestrel Avenue Pty Ltd is the owner/registered proprietor of the Property.

Pursuant to section 98(1)(b) of the *Environmental Planning and Assessment Regulation 2021,* please consider this to be the written consent of the land owner to the making of a development application.

The application seeks to modify Development Consent DA 06/1324, relating to the Property, so as to provide for the relocation of the concrete batching plant, installation of an acoustic wall, hardstand areas and related matters.

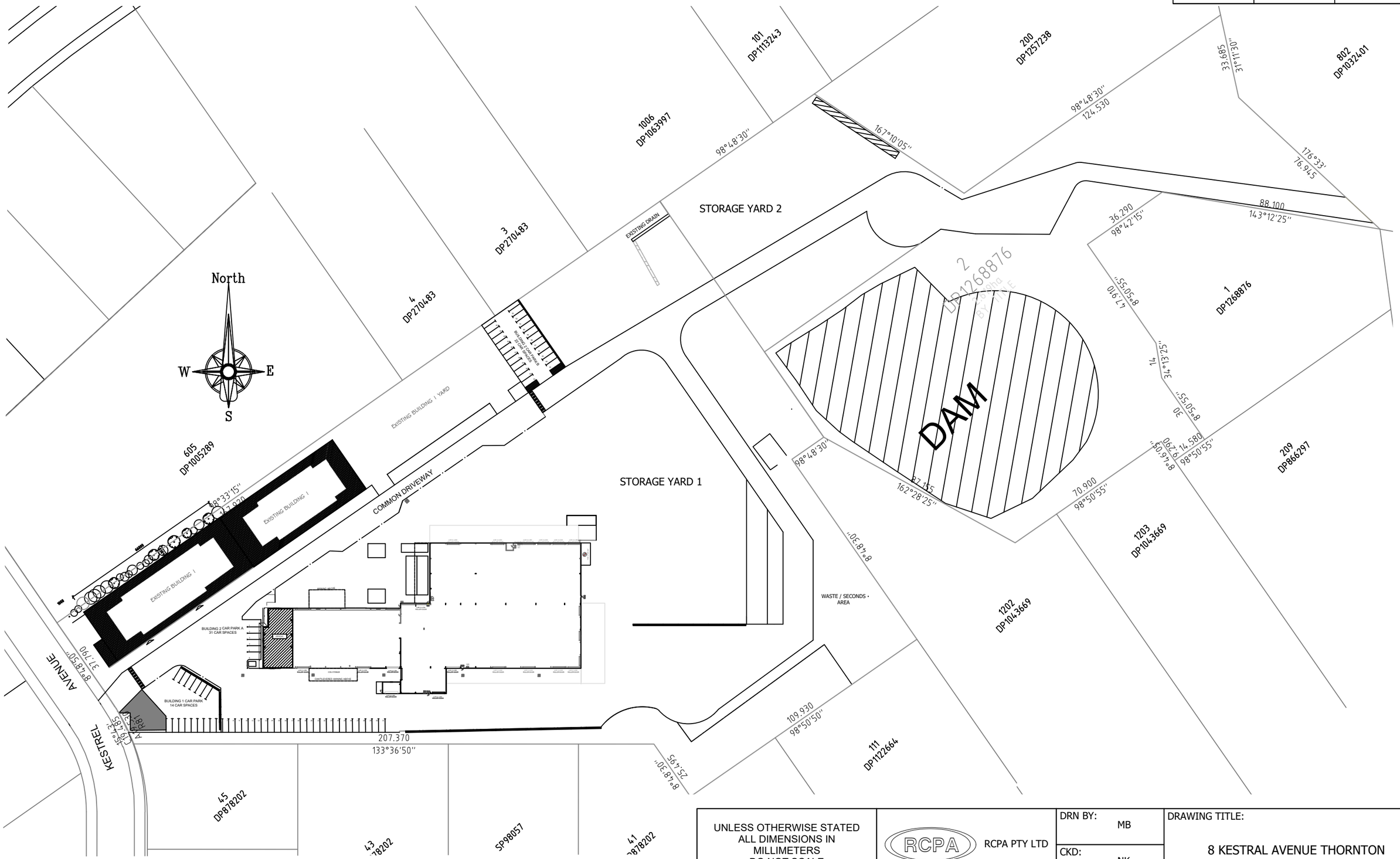
Regards

Dino Strano
Sole Director/Secretary
Kestrel Avenue Pty Ltd

Appendix D
Architectural drawings

EMM
creating opportunities

REVISION HISTORY		
REV	DESCRIPTION	DATE
A	APPROVED	16/05/2023



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		CKD: NK	
DRAFTING STANDARD: AS1100 UNLESS OTHERWISE STATED	THIS DRAWING IS CONFIDENTIAL. THIS DRAWING AND ITS COPYRIGHT ARE THE PROPERTY OF OR LICENCES TO THE ABOVE COMPANY AND MUST NOT BE REPRODUCED IN ANY FORM WHATSOEVER EXCEPT AS AUTHORISED IN WRITING BY THE ABOVE COMPANY.	APD: NK	
		REV: A	DWG NO: 70-42-0040
SCALE: 1:1500 / SHEET SIZE: A3		STATUS: APPROVED	DATE: 16-05-2023 / SHEET SIZE A3 / SHEET 1 OF 3

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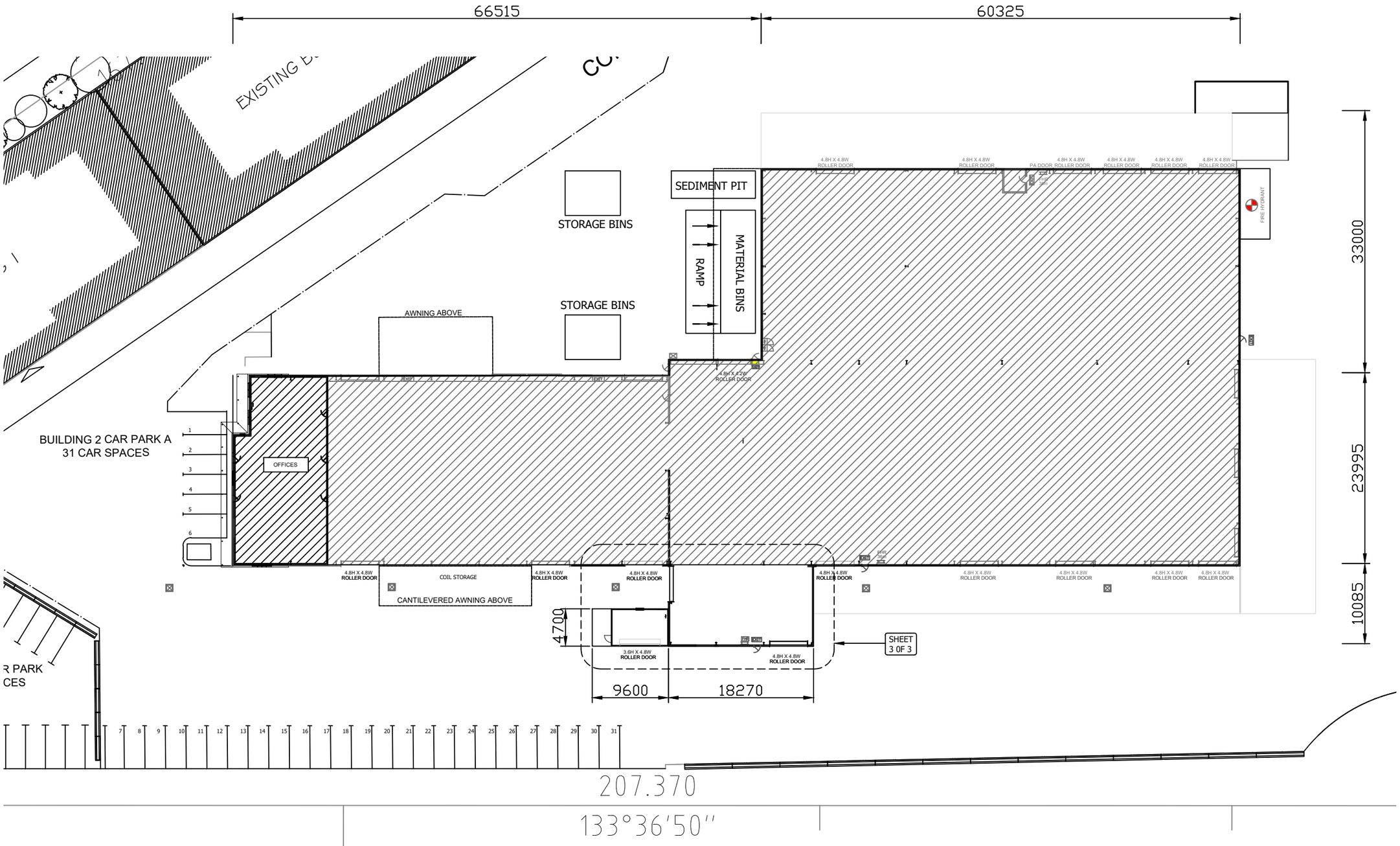

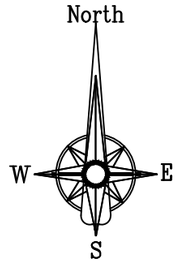

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		CKD: NK	
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		REV: A	DWG NO: 70-42-0040
SCALE: 1:500 / SHEET SIZE: A3		STATUS: APPROVED	DATE: 16-05-2023 / SHEET SIZE: A3 / SHEET: 2 OF 3

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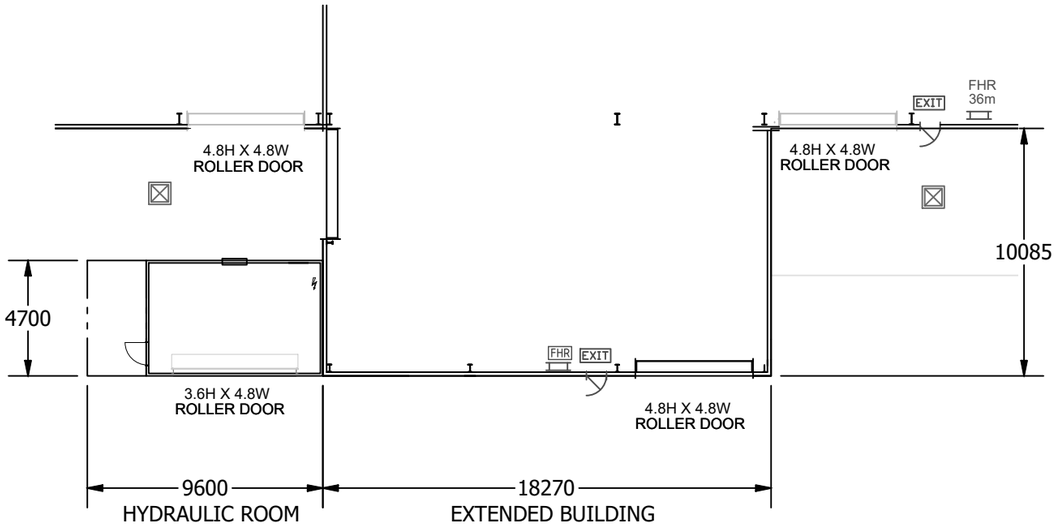
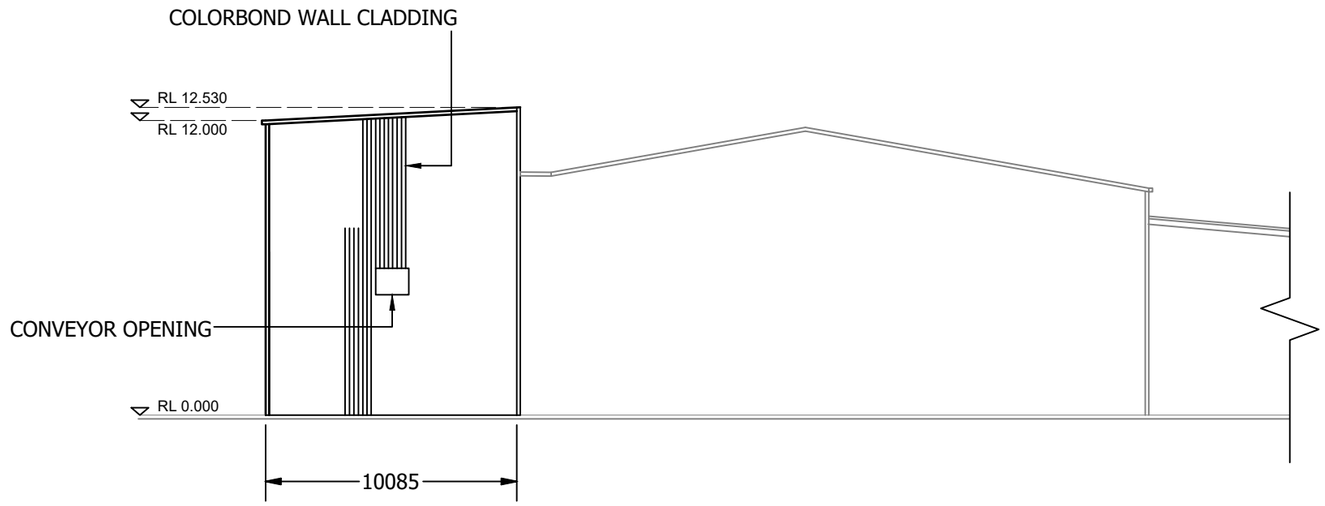
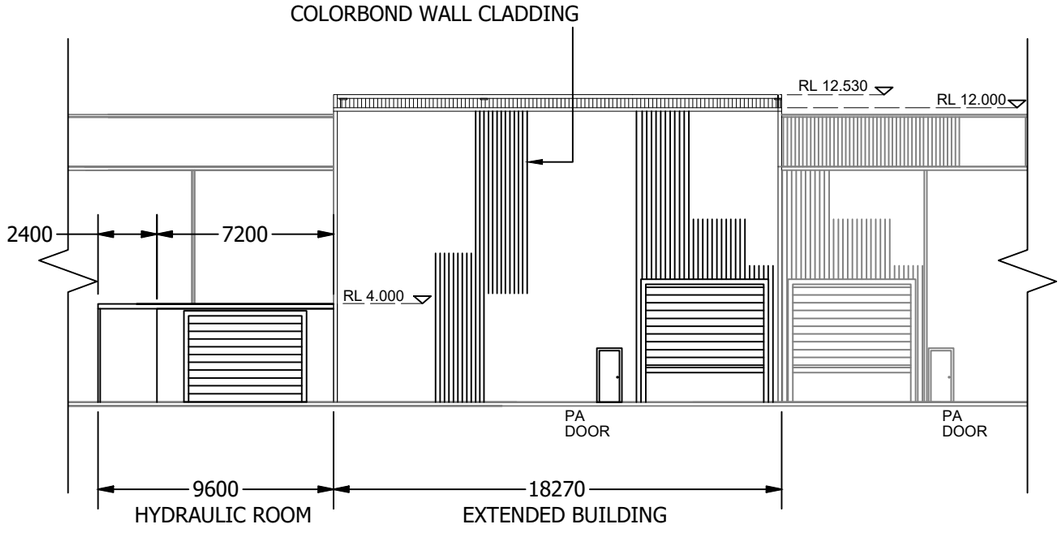


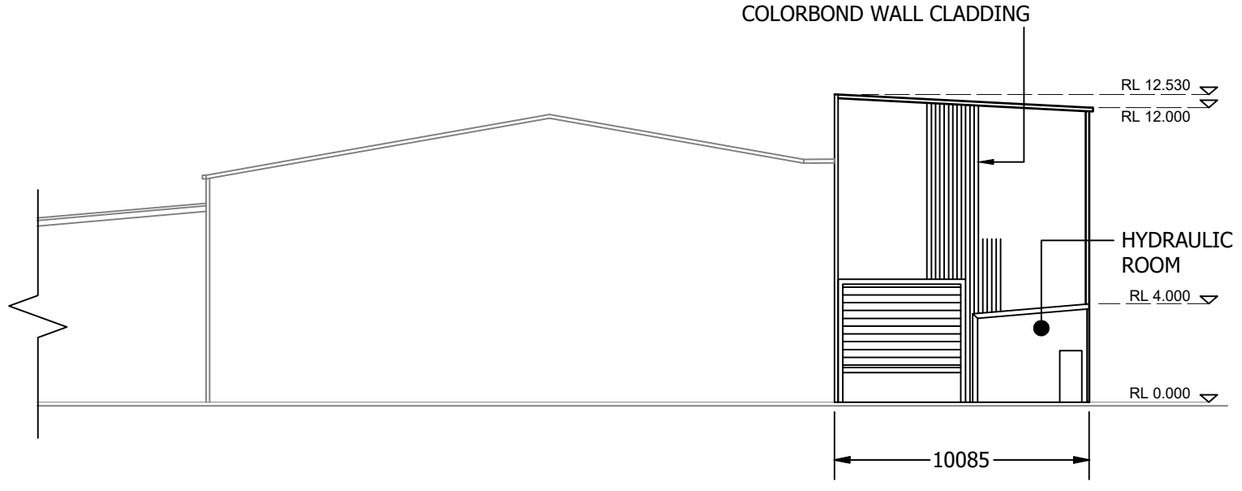
PLAN VIEW



WEST ELEVATION VIEW



SOUTH ELEVATION VIEW



EAST ELEVATION VIEW

UNLESS OTHERWISE STATED ALL DIMENSIONS IN MILLIMETERS DO NOT SCALE	RCPA PTY LTD	DRN BY: MB	DRAWING TITLE: 8 KESTRAL AVENUE THORNTON EXTENDED FACTORY DETAILS SECTION VIEWS
		CKD: NK	
DRAFTING STANDARD: AS1100 UNLESS OTHERWISE STATED	THIS DRAWING IS CONFIDENTIAL. THIS DRAWING AND ITS COPYRIGHT ARE THE PROPERTY OF OR LICENCES TO THE ABOVE COMPANY AND MUST NOT BE REPRODUCED IN ANY FORM WHATSOEVER EXCEPT AS AUTHORISED IN WRITING BY THE ABOVE COMPANY.	APD: NK	
		REV: A	DWG NO: 70-42-0040
SCALE: 1:250 / SHEET SIZE: A3		STATUS: APPROVED	DATE: 16-05-2023 / SHEET SIZE: A3 / SHEET: 3 OF 3

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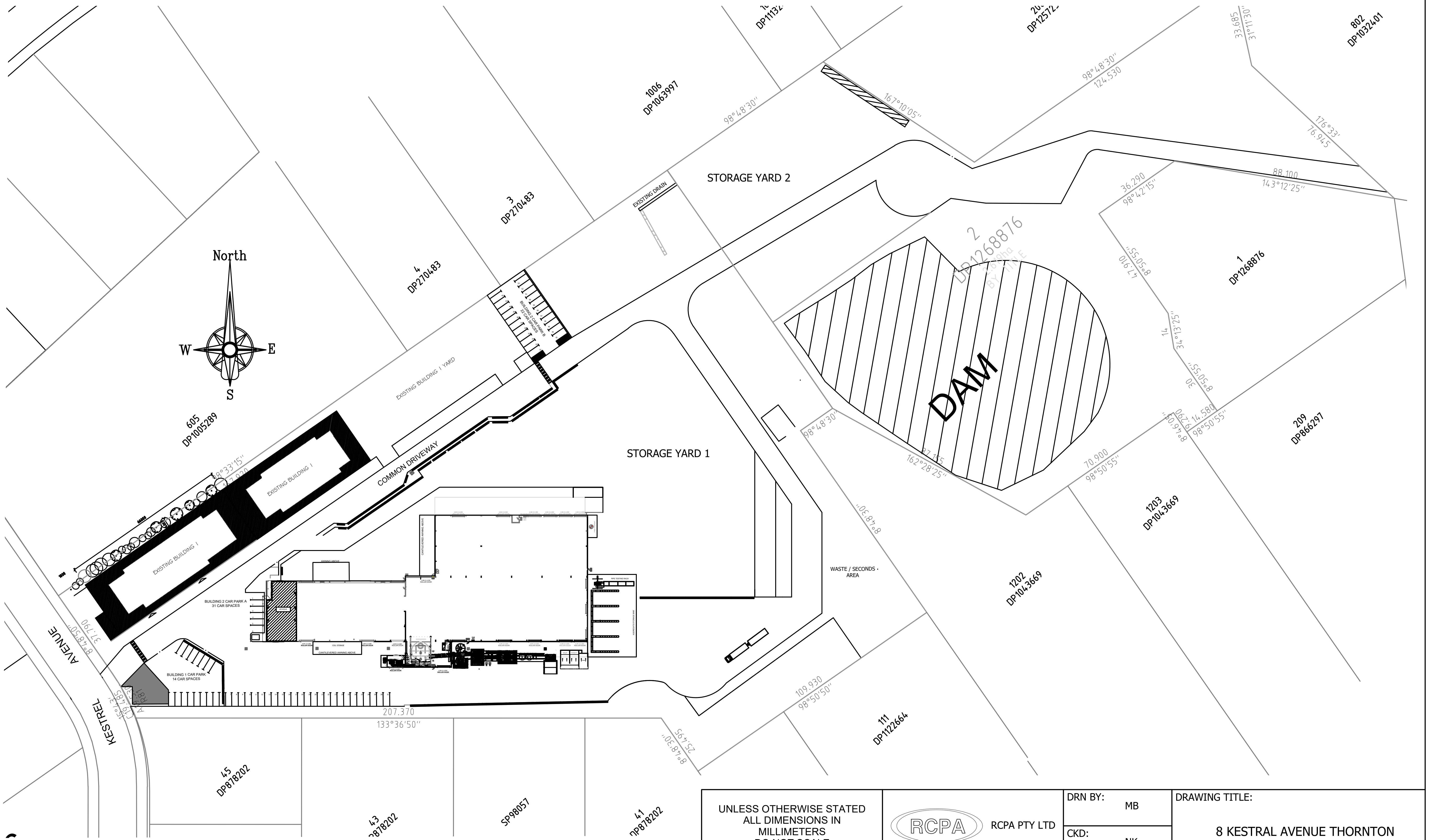
B	APPROVED	16/05/2023



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		CKD: NK			
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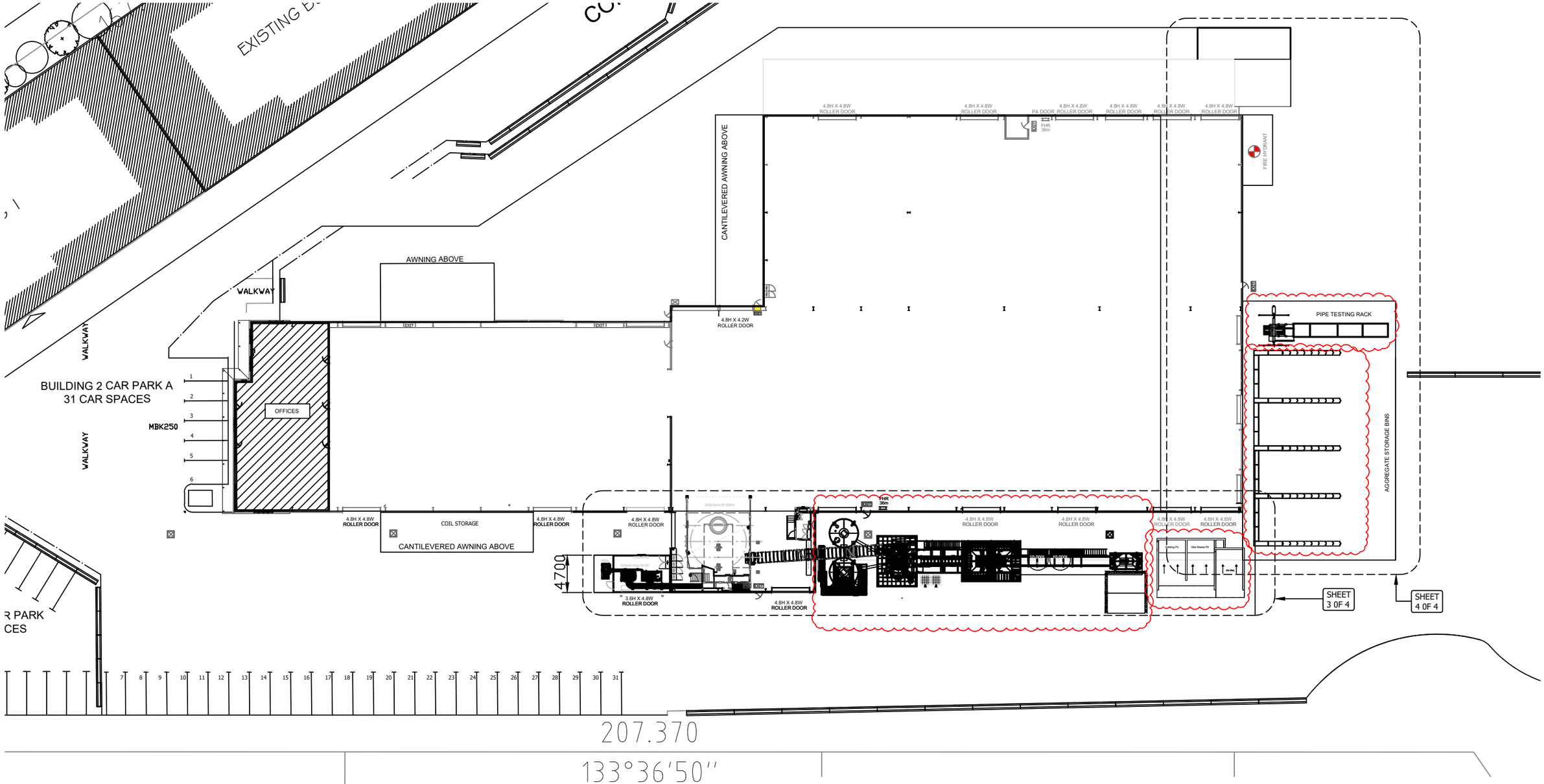
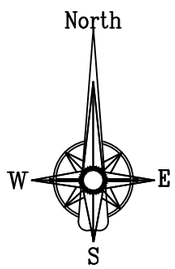


NOTES:

- PROPOSED CHANGES



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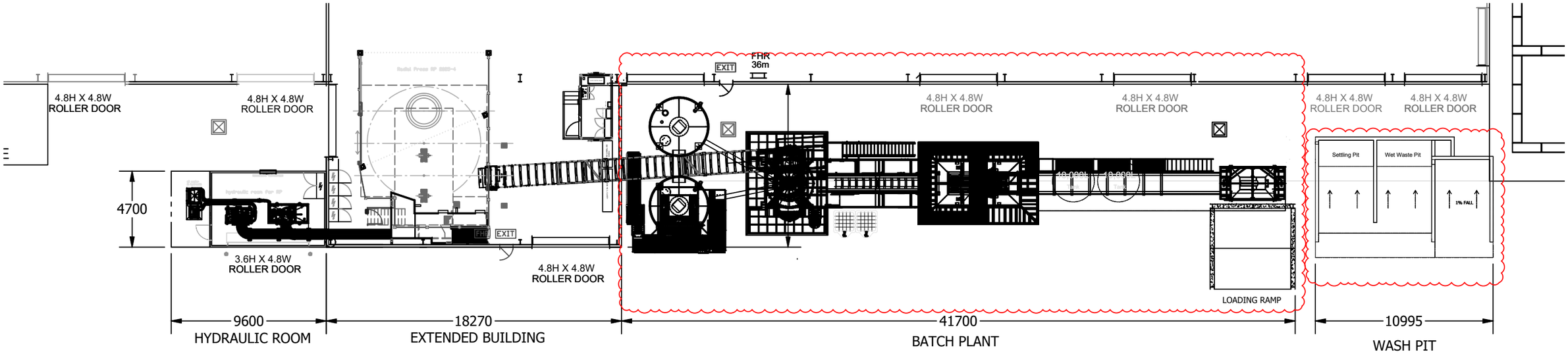
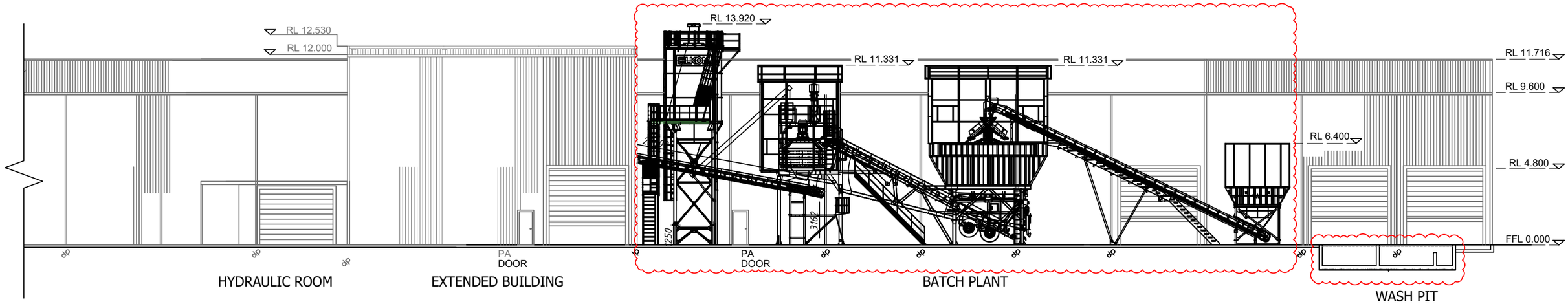


BATCH PLANT PLAN VIEW



SOUTHERN ELEVATION VIEW

NOTES:

- PROPOSED CHANGES

UNLESS OTHERWISE STATED ALL DIMENSIONS IN MILLIMETERS DO NOT SCALE	RCPA PTY LTD	DRN BY: MB	DRAWING TITLE: 8 KESTRAL AVENUE THORNTON BATCH PLANT DETAILS
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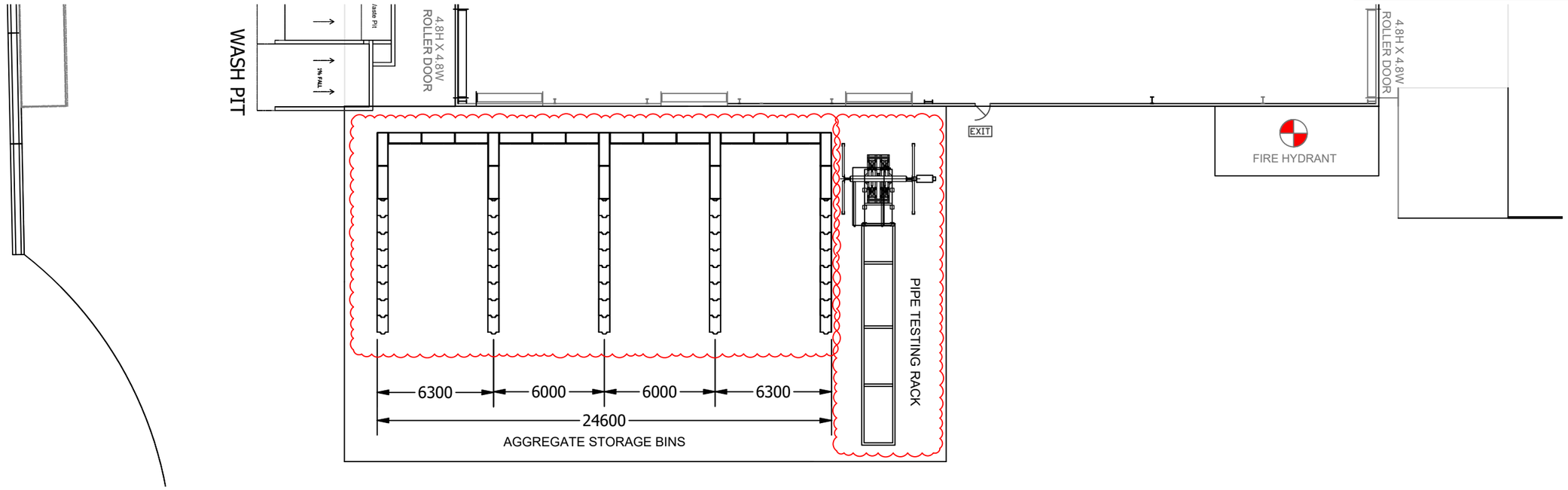
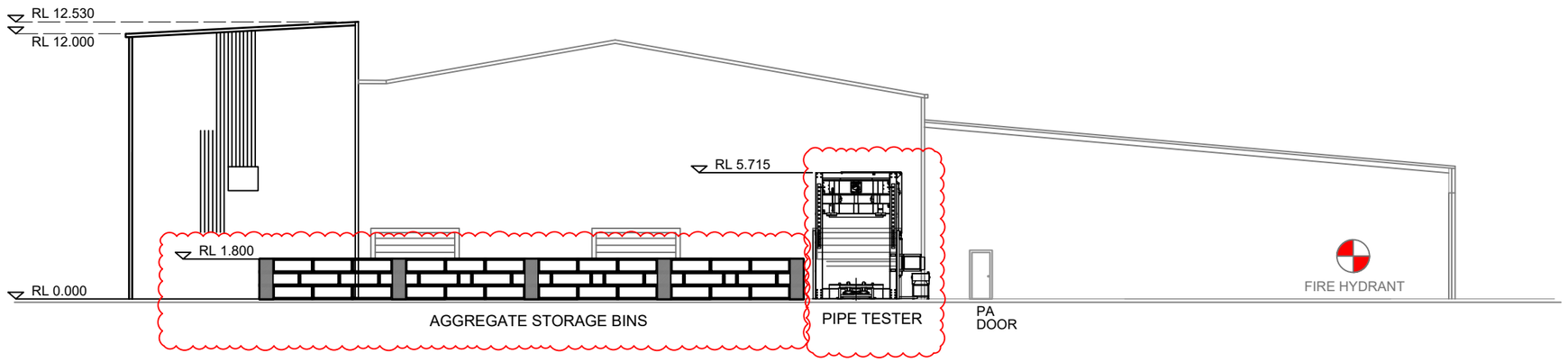
B	APPROVED	16/05/2023



EASTERN FACTORY PLAN VIEW



EASTERN ELEVATION VIEW

NOTES:

- PROPOSED CHANGES

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REVISION HISTORY		
REV	DESCRIPTION	DATE
A	FOR APPROVAL	21/04/2023
B	APPROVED	16/05/2023

North
W
E
S

STORAGE YARD 2
STORAGE YARD 1
DAM
EXISTING DRAIN
EXISTING BUILDING 1 YARD
COMMON DRIVEWAY
EXISTING BUILDING 1
EXISTING BUILDING 1
BUILDING 2 CAR PARK A
31 CAR SPACES
BUILDING 1 CAR PARK
14 CAR SPACES
WASTE / SECONDS
AREA
AVENUE
KESTREL

605
DP1005289

1006
DP1063997

3
DP270483

4
DP270483

2
DP1268876

1
DP1268876

802
DP1032401

209
DP886297

1203
DP1043669

1202
DP1043669

111
DP1122664

45
DP878202

43
DP878202

SP98057

41
DP878202

98°48'30"
124.530
167°10'05"
33.685
31°11'30"
176°33'
76.945
88.100
143°12'25"
36.290
98°42'15"
98°48'30"
162°28'25"
70.900
98°50'55"
109.930
98°50'50"
25.495
98°48'30"
31.790
98°48'50"
98°33'15"
98°48'30"

UNLESS OTHERWISE STATED ALL DIMENSIONS IN MILLIMETERS DO NOT SCALE	RCPA PTY LTD	DRN BY: MB	DRAWING TITLE: 8 KESTRAL AVENUE THORNTON EXISTING SITE PLAN
		CKD: NK	
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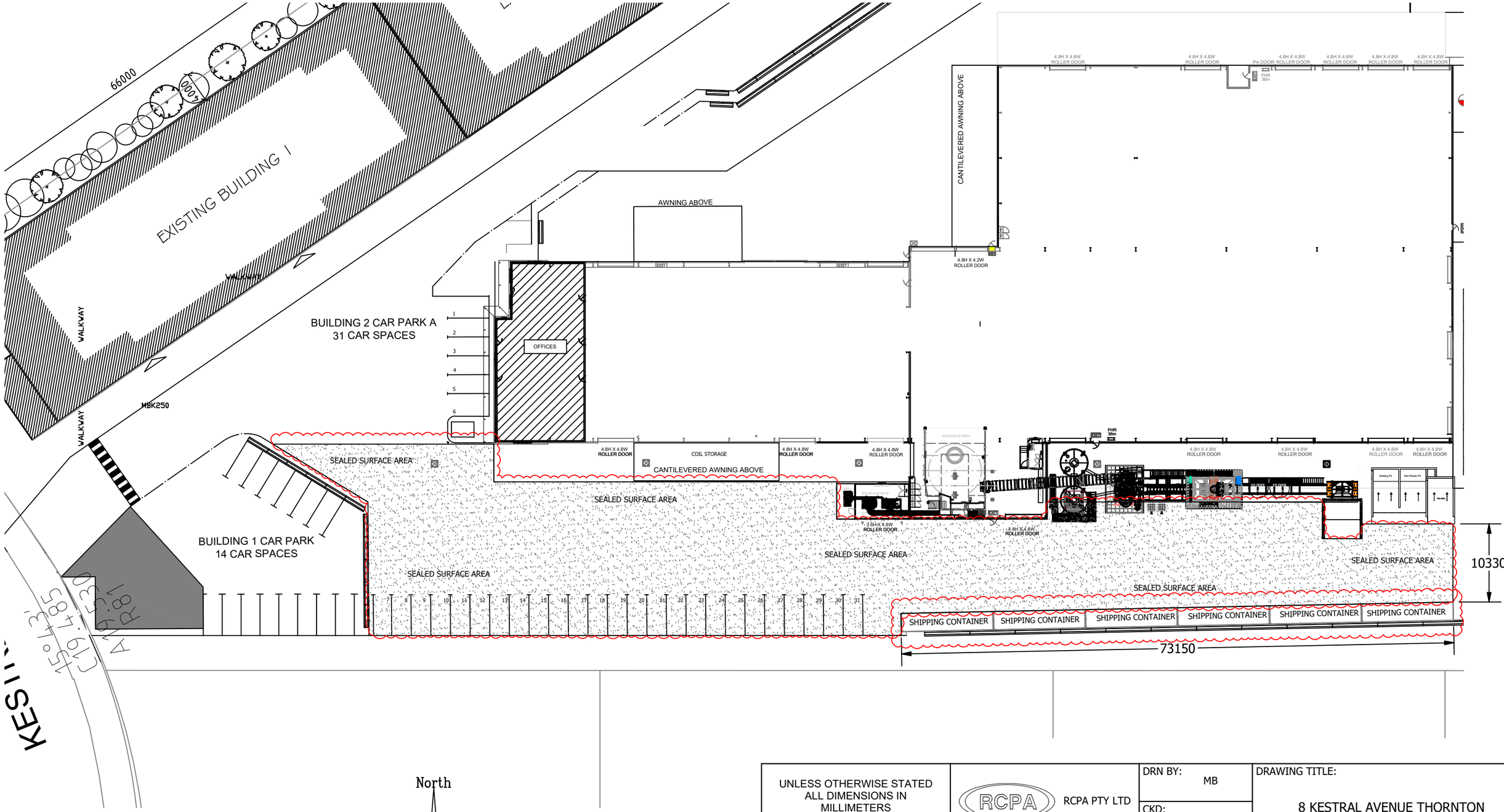

NOTES:

- PROPOSED CHANGES

- SEALED SURFACE AREA

North

W E

S

UNLESS OTHERWISE STATED ALL DIMENSIONS IN MILLIMETERS DO NOT SCALE	RCPA PTY LTD	DRN BY: MB	DRAWING TITLE: 8 KESTRAL AVENUE THORNTON SOUTHERN BORDER NOISE & DUST CONTROL LAYOUT
		CKD: NK	
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		REV: B	DWG NO: 70-42-0042
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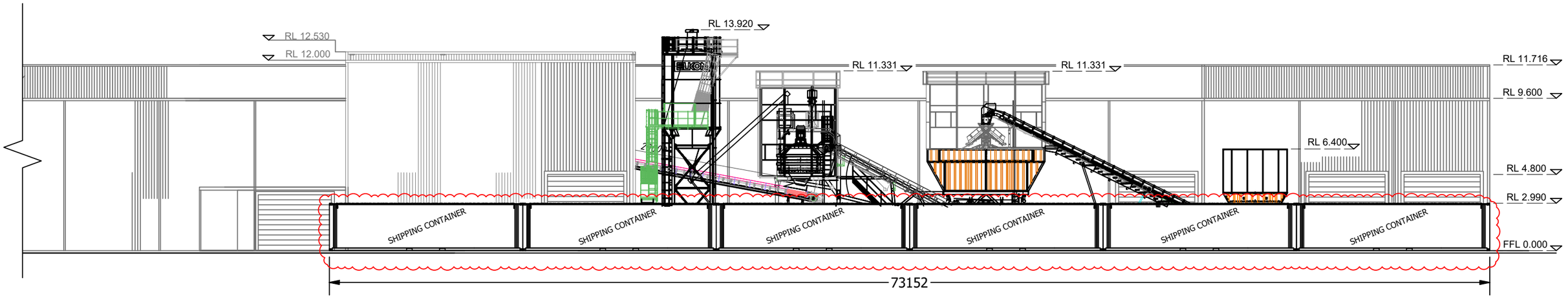
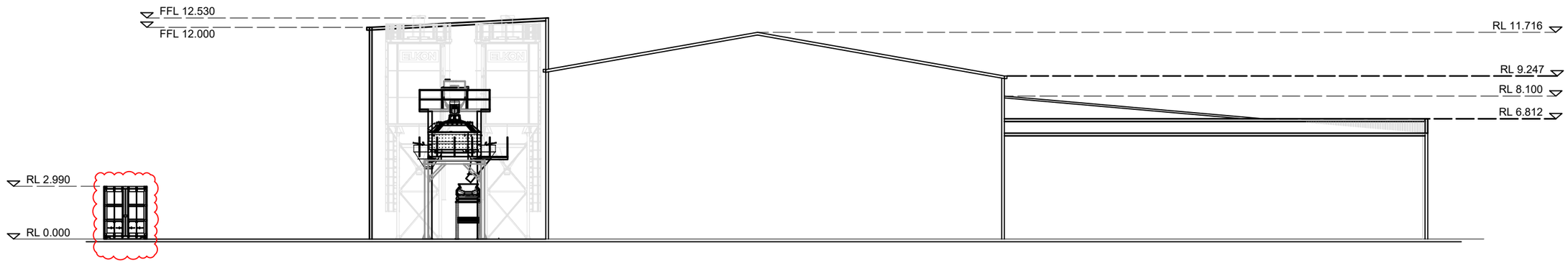


SOUTHERN ELEVATION VIEW



EASTERN ELEVATION VIEW

NOTES:

- PROPOSED CHANGES

UNLESS OTHERWISE STATED ALL DIMENSIONS IN MILLIMETERS DO NOT SCALE	RCPA PTY LTD	DRN BY: MB	DRAWING TITLE: 8 KESTRAL AVENUE THORNTON CONTAINER NOISE WALL DETAILS
		CKD: NK	
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SCALE: 1:250 / SHEET SIZE: A3		STATUS: APPROVED	DATE: 16-05-2023 / SHEET SIZE: A3 / SHEET: 3 OF 3

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