



Regional Quarries & Concrete Pty Ltd
trading as Cleary Bros

ABN: 95 682 599 882

Modification Report (Modification 2)

for the

Gerroa Sand Quarry



Prepared by:

RWCorkery&co

August 2025



ACKNOWLEDGEMENT

R.W. Corkery & Co. acknowledge and pay our respects to the Traditional Custodians of the lands in NSW and Australia on which our projects are located.

We value the knowledge, advice and involvement of the Elders and extended Aboriginal community that contribute to our Projects and extend our respect to all Aboriginal and Torres Strait Islander peoples.





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Executive Summary

This *Modification Report* has been prepared by R.W. Corkery & Co. Pty Limited ('RWC') on behalf of Regional Quarries & Concrete Pty Ltd, trading as Cleary Bros ('Cleary Bros' or 'the Applicant') who is seeking a modification to Project Approval MP05_0099 (Mod 1) for the Gerroa Sand Quarry (the 'Quarry' or the 'Project Site') to permit an increase to the maximum rate of road transportation by 50% from 80,000tpa to 120,000tpa.

The Proposed Modification would represent Modification 2 to MP05_0099 and is sought under Section 4.56(1a) of the *Environmental Planning and Assessment Act 1979* (EP&A Act), as it is considered that the Proposed Modification would remain "substantially the same development" as the Project as last modified before transition to Part 4 of the EP&A Act.

The Proposed Modification would be wholly located within the existing, assessed, and approved disturbance areas of the Project Site and would not result in any additional surface disturbance.

Assessments and reviews undertaken for the Proposed Modification determined the following.

- Air Quality – Extraction operations would be undertaken using the same activities and methods as are currently approved and implemented, and the management and mitigations measures that would be implemented to control potential dust emissions. It has been assessed through modelling that dust emissions from the proposed Project Site operations would continue to be compliant with all relevant criteria and not significantly contribute to particulates at surrounding residences.
- Water and Acid Sulfate Soils – the Proposed Modification would result in an increase of 13.3ML of water take annually. No significant impacts to water quality, water levels, to GDEs or acid sulfate soils are expected and no additional water or acid sulfate soil management measures would be required.
- Traffic and Transportation – The Proposed Modification would not increase the maximum or average heavy vehicle movements for the Quarry from that modelled for MP05_0099 or the proportional distribution of Quarry-related traffic using the approved transport route. The Proposed Modification would not increase the maximum vehicle size or largest heavy vehicle configuration used for product despatch at the Quarry.

The Proposed Modification's effect on all other environmental aspects is considered to be minimal.

The Applicant contends that the Proposed Modification would be in the public interest as it would provide for the following.

- Sufficient production (i.e. extraction and processing) and road despatch capacity to meet increasing demand for Quarry products.
- Maintain downward pressure on prices and encourage competition.

- Provide for continued employment of local personnel both at the Quarry and within the construction industry and continue to provide flow-on benefits to the local community.
- The environmental outcomes would be consistent with existing Project Site operations resulting in no additional significant adverse impacts.

These benefits would be realised with no significant additional environmental or community impacts.

1. Introduction

1.1 Scope

This *Modification Report* has been prepared by R.W. Corkery & Co. Pty. Limited ('RWC') on behalf of Regional Quarries & Concrete Pty Ltd, trading as Cleary Bros ('Cleary Bros' or 'the Applicant') to support a modification application to Project Approval MP05_0099 (Mod 1) for the Gerroa Sand Quarry (the 'Quarry' or the 'Project Site').

The Project Site consists of Lot 2 DP1111012 and Lot A DP185785 and is located approximately 2km southwest of Gerroa, NSW, with areas of the Project Site located within both the Kiama Local Government Area (LGA) and the Shoalhaven LGA (**Figure 1**).

The Applicant proposes to modify MP 05_0099 (Mod 1) to increase the annual product transport limit at the Quarry by 50% from 80,000tpa to 120,000tpa (the 'Proposed Modification'). The increased transportation limit would also necessitate a respective increase in annual extraction and processing operations at the Project Site. The Proposed Modification would represent Modification 2 to MP05_0099.

As MP05_0099 was originally granted by the NSW Land and Environment Court, the Proposed Modification is sought under Part 4, Division 4.9, Section 5.56 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The consent authority for the modification application will be the Minister for Planning and Public Spaces (or delegate)¹.

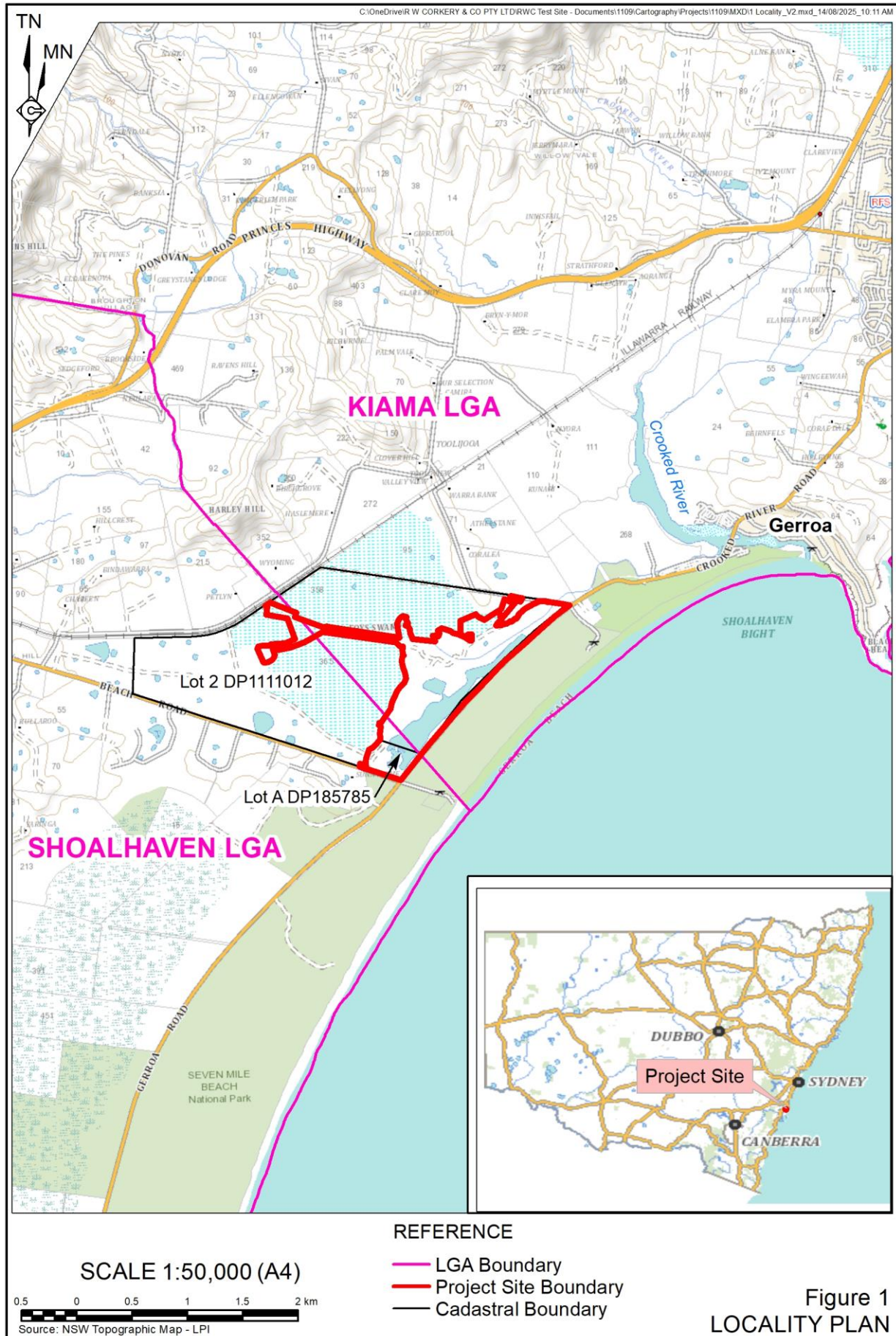
The information contained in this document relates only to those components of the approved development that would be the subject of the Proposed Modification. Aspects of the approved development that would not be modified would continue to be undertaken in accordance with MP05_0099, as approved.

This *Modification Report* has been prepared to support that application and is generally consistent with the *State Significant Development Guidelines – Preparing a Modification Report* published by the NSW Department of Planning and Environment dated October 2022.

1.2 The Applicant

The Applicant for the Proposed Modification, Regional Quarries & Concrete Pty Ltd trading as Cleary Bros, is part of the ASX-listed Maas Group Holdings (MGH), an Australian industrial service and real estate business with diversified exposures across the property, civil, infrastructure and mining sectors. MGH acquired the Gerroa Sand Quarry as part of the sale of a number of assets held by the former operator of the site (Bombo Operations Pty Ltd). Bridon Pty Ltd, an associated entity of Bombo Operations Pty Ltd, currently retains ownership of the site, subject to the completion of a subdivision of the landholdings currently under consideration by Kiama Municipal Council and Shoalhaven City Council.

¹ As the Applicant has not made a reportable political donation the Independent Planning Commission will not be the consent authority as per Clause 2.7(3) of the *State Environmental Planning Policy (Planning Systems) 2021*.



As part of the strategic development of the site, approval was sought and received in September 2008 for the extension of the Quarry in order to continue the supply of construction materials to the regional construction industry in the form of fine-grained sand. Further approval in the form of Modification 1 was sought and received in June 2022 to extend the extraction area and develop a new dredge pond.

1.3 Approved Operations

MP 05_0099 (Mod 1) permits the extension and continued operation of the Quarry, including:

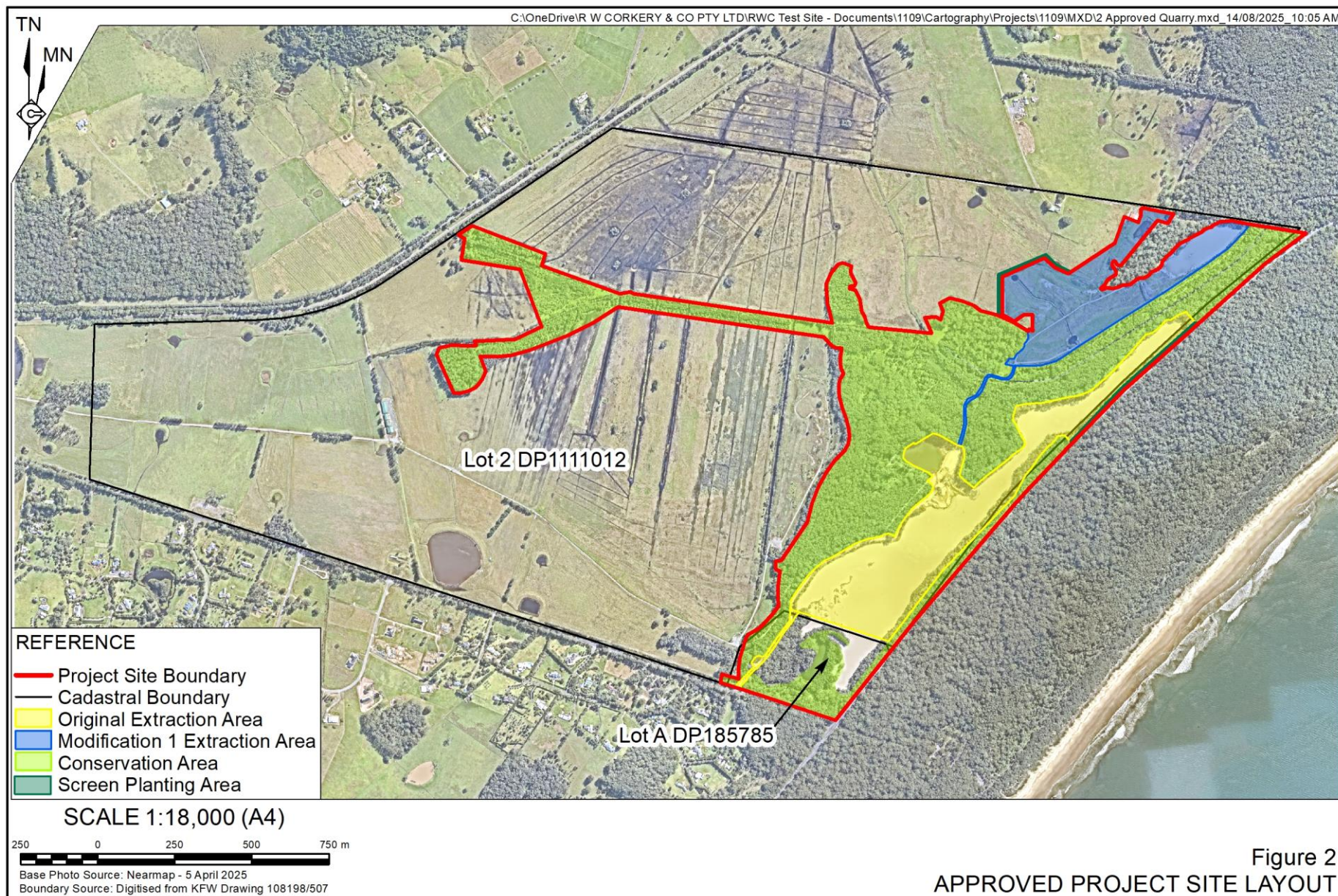
- extraction and processing operations until 31 July 2038 from the approved extraction areas (**Figure 2**);
- extraction using a floating suction dredge-based extraction system, including transfer of dredged slurry material to the on-site processing plant via a pipeline;
- material processing using a wet sorter containing multiple screens and a cyclone;
- return of process water and fines to the dredge pond;
- stockpiling of products;
- transportation of up to 80,000t of product from the Project Site per year using the approved transportation routes (**Figure 3**);
- rehabilitation works in areas where extraction has been completed; and
- operation within the following approved hours of operation.
 - 7:00am to 6:00pm, Monday to Friday.
 - 7:00am to 1:00pm, Saturdays.
 - At no time on Sundays or Public Holidays.

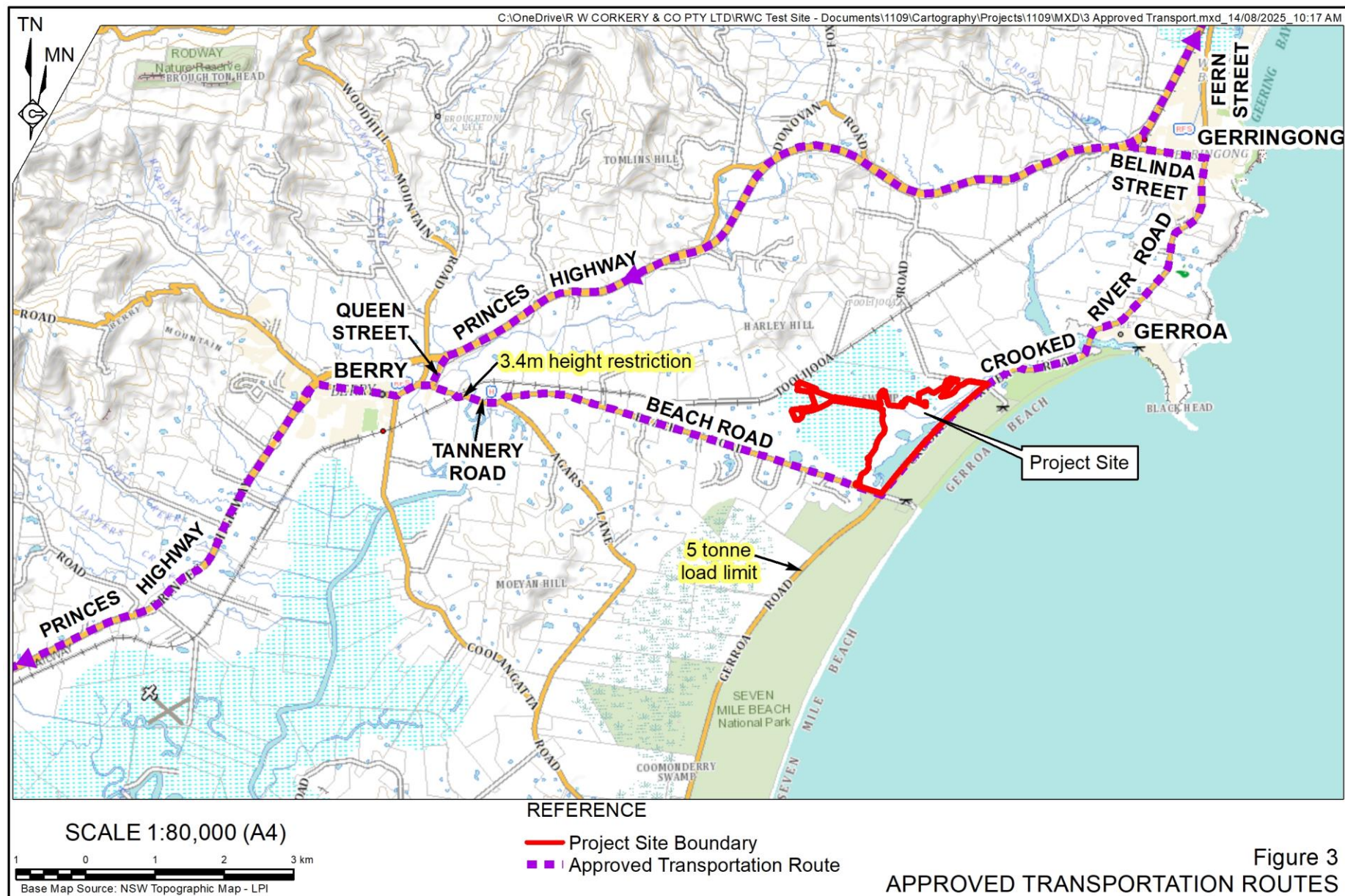
In addition to MP 05_0099 (MOD1) the Quarry also operates in accordance with Environment Protection Licence (EPL) 4146 and Water Access Licences (WAL) 43271 and 43272.

1.4 Project Need and Background

1.4.1 The Need for the Proposed Modification

The Quarry represents a reliable, cost-controlled source of readily extractable sand which is suitable for construction and concrete manufacturing purposes. Additionally, the fine-grained quality of the sand allows for it to be used in concrete mixes following blending with by-products from hard rock quarries, enabling the beneficial reuse of those by-products and reducing demand for virgin fine-grained sand products. The Quarry is therefore a vital component of the raw material supply chain which feeds into concrete production and construction businesses.





The Proposed Modification would support a 50% increase to the transportation rate from 80,000tpa to 120,000tpa. This increase would increase the Applicant's ability to supply concrete production and other construction projects during periods of high demand. Without the Proposed Modification, the Applicant's operations and the local and regional construction and infrastructure projects they supply would continue to be constrained by current sand supply limitations and increasing raw material costs.

1.4.2 Background

The Project Site is located within Lot 2 DP1111012 and Lot A DP185785 at Crooked River Road, Gerroa, NSW (**Figure 1**). The target resource consists of fine-grained sand with a very low silt content, allowing it to be used as a virgin sand product or blended with coarser manufactured sand. The Quarry was successfully operated by Cleary Bros for over 55 years as a source of sand for construction and concrete products produced by Cleary Bros at their plants in Albion Park, Bomaderry, and Coniston. Since 31 January 2025, the Quarry has been operated by Regional Quarries & Concrete Pty Ltd, a wholly owned subsidiary of MGH.

Operations at the Project Site have been authorised under a series of development approvals. The current development consent for the Project Site, Major Project Approval MP 05_0099 for the extension and continuation of the Project Site, was originally sought under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and determined by the Land and Environment Court on 2 September 2008. Following the repeal of Part 3A of the EP&A Act and under transitional arrangements provided by Schedule 6A of the EP&A Act, the consent has subsequently been modified once (Mod 1) under the former Section 75W of the EP&A Act (determined on 10 June 2022) to extend the extraction area and develop a new dredge pond.

1.5 Feasible Alternatives Considered

Potentially feasible alternatives to the Proposed Modification considered and why these are not preferable are outlined as follows.

Seek Approval for a new Quarry Operation

In lieu of increasing production at the Quarry, approval could be sought for a new Quarry operation to provide the additional output. This is not considered viable or preferable as it would result in greater environmental impacts (increased disturbance, likely biodiversity impacts, and potential amenity and traffic impacts in a location that does not already have such impacts approved), would result in greater costs (requiring purchase and operation of an additional fleet of plant and equipment), and would overall result in upward pressure on the cost of supply of Quarry products. It is also likely that the location would be further from the point of consumption, resulting in an increase in transportation costs and total vehicle kilometres travelled.

Not Proceeding with the Proposed Modification

The Quarry represents a reliable, cost-controlled source of readily extractable sand which is suitable for construction and concrete manufacturing purposes. Additionally, the fine-grained quality of the sand allows for it to be used in concrete mixes following blending with by-products

from hard rock quarries, enabling the beneficial reuse of those by-products and reducing demand for virgin fine-grained sand products. The Quarry is therefore a vital component of the raw material supply chain which feeds into concrete production and construction businesses.

The consequence of not proceeding with the Proposal include the following.

- Disadvantages to the Applicant, integrated construction projects, and other users of Quarry products.
- Lost opportunity to provide increased quantity of products to construction and manufacturing operations locally and regionally, potentially constraining the progression of some construction projects.
- Subsequent loss of income opportunity, supply opportunity and market alternatives for the Applicant and clients.
- Increased cost of products and construction projects locally and regionally as a result of decreased competition.

1.6 Management of Investigations

This document has been prepared by Mr Jack Flanagan (B.Sc, M.EnvSc), Senior Environmental Consultant with RWC, and Mr Samuel Wells (B. EnvSc), Environmental Consultant with RWC. Review and assistance was provided by Mr Scott Hollamby (B.EnvSc), Senior Environmental Consultant with RWC.

Information concerning the existing and proposed operations was provided by Mr Mark Hammond, Head of Sustainability with Clearly Bros.

An Air Quality Impact Assessment was undertaken to assess the potential environmental impacts of the Proposed Modification and identify relevant operational safeguards and measures. This assessment was undertaken by the following specialist consultant managed by RWC.

- Northstar Air Quality Pty Ltd – Air Quality Impact Assessment
Dr Martin Doyle, Ph.D, B.Sc. (Hons)

Collectively, the authors and contributors to the *Modification Report* have utilised both experience with similar projects and knowledge and information collected for the Proposed Modification to identify and address all relevant issues.

2. Strategic Context

2.1 Strategic Plans – Kiama Municipal Council

2.1.1 Kiama Municipal Council Community Strategic Plan 2022-2032

The Kiama Municipal Council *Community Strategic Plan 2022-2032* establishes broad goals for environmental and economic management in the region with various pillars and outcomes for achieving this goal.

“Kiama Council will work to create a Municipality that has a healthy, vibrant lifestyle, a beautiful environment and a harmonious, connected and resilient community”

The Plan sets out the vision of the community and the Council’s commitment to promote social connectedness for an ageing population, provide opportunities for young people, to maintain and expand tourism, agriculture and economic development whilst always considering the responsibility to protect and ensure the sustainability of the natural environment. The Plan identifies the use of natural resources in efficient and sustainable ways as a regional pillar by setting out targets for sustainable environmental management and natural resource use including the following.

- Protect and maintain our natural areas.
- Retain and promote our natural environment and our scenic rural landscapes.
- Develop strategies and plans for our current and future generations.
- Responsibly manage resources and waste.
- Understand climate risks and our impacts and take action against these.

The Applicant currently provides substantial contributions to the social and economic setting of the Kiama region. The Quarry generates local employment and spending on consumables and services. Based on the nature of the amendments proposed, it is anticipated that the Proposed Modification would not limit the natural resource management goals for the Kiama Municipal Council but would continue to support the Applicant’s contribution to social and economic outcomes. In particular, the Proposed Modification would permit the continued economic benefit provided by the Applicant’s business without increasing the development’s approved disturbance footprint or associated environmental impacts.

2.1.2 Kiama Regional Economic Development Strategy 2018-2022 – 2023 Update

The *Kiama Regional Economic Development Strategy 2018-2022 – 2023 Update* (the ‘Kiama Strategy’) published by Kiama Municipal Council aims to drive economic growth in the Kiama region. The Kiama Strategy identifies key strategies for the region consisting of the following.

- Drive tourism growth beyond its current seasonal peak and develop opportunities that will grow overnight visitor expenditure.

- Enhance the liveability of Kiama and capitalise on the region's unique opportunities in digital connectivity.
- Support growth in key industries and encourage twenty-first century industry and business models through well planned urban and rural land development.

The key strategy that interrelates with the Quarry's contributions to the region and the Proposed Modification is as follows.

Support growth in key industries and encourage twenty-first century industry and business models through well planned urban and rural land development

Construction is listed as an emerging specialisation of the Kiama region, with a growth rate above the NSW average. Cost and supply of materials and supply chain issues are listed as a vulnerability of this industry.

The Proposed Modification would support a 50% increase to the approved transportation rate from 80,000tpa to 120,000tpa. This increase would support the Applicant's ability to supply concrete production and other construction projects during periods of high demand. Without the Proposed Modification, the Applicant's operations and the local and regional construction and infrastructure projects they supply would continue to be constrained by current sand supply limitations and increasing raw material costs.

2.1.3 Kiama Municipal Council Local Strategic Planning Statement 2020 – Updated 2025

The Kiama Municipal Council *Local Strategic Planning Statement 2020 – Updated 2025* (the 'Kiama Statement') first published by the Kiama Municipal Council in 2020 sets out the roadmap of Kiama Municipal Council's 20-year vision for land use in the region, and how Council will manage to preserve and change the special character and values of the region. The Kiama Statement covers the entirety of the Kiama Local Government Area (LGA).

The Kiama Statement identifies the following five themes, each with multiple planning priorities.

- Manage sustainable growth.
- Develop a diverse and resilient economy.
- Protect rural landscapes.
- Mitigate and adapt to climate change and protect our environment.
- Foster vibrant and accessible places.

The themes and planning priorities that interrelate with the Proposed Modification include the following.

Theme 1 – Manage sustainable growth

The Kiama Statement identifies that growth within the Kiama LGA needs to be sustainably managed. The Proposed Modification would support these priorities through increasing local material availability for construction and concrete businesses, easing strain on supply chains, and

increasing competition within the industry. This is consistent with the planning priority aspects to plan for and balance housing supply and demand and support the delivery of required infrastructure.

Theme 2 – Develop a diverse and resilient economy

The Kiama Statement identifies that the Kiama LGA economy needs to manage growth and employment in emerging industries to be strong outside of holiday periods. The Proposed Modification would result in continued economic contributions to the Kiama LGA during operations through increased supply of products for local construction businesses. This is consistent with the planning priority of fostering economic diversity by facilitating development of suitable land.

The proposed increase in transportation would also allow the Quarry to maintain current employment rates while supporting increased employment in the construction industry. Additionally, the ability to supply up to 120,000tpa of product would increase competition in the industry, therefore providing downward pressure on prices and associated costs for construction and infrastructure projects. This is consistent with the planning priority aspect to foster economic diversity by supporting growth in a key industry.

Theme 3 – Protect rural landscapes

The Kiama Statement identifies the theme of protecting rural landscapes in the Kiama LGA. As the Proposed Modification would not alter the approved Project Site disturbance footprint, the impact to the surrounding rural landscape would be limited to environmental impacts assessed as part of the Proposed Modification (refer to Section 6). This is consistent with the planning priorities to protect viable agriculture and agricultural lands and protect scenic rural landscapes.

Theme 4 – Mitigate and adapt to climate change and protect our environment

The Kiama Statement identifies the theme of adapting to climate change and protecting the environment within the Kiama LGA. The Project Site includes Conservation Areas which would continue to be maintained and managed in accordance with the development consent. The Proposed Modification would not alter the approved disturbance footprint for the Project Site, with no additional land to be subject to vegetation clearing or sand extraction operations. This is consistent with the planning priority to conserve areas of environmental significance.

The Proposed Modification would support the Applicant's construction businesses, mitigating raw material supply bottlenecks and allowing the Applicant to commit to additional projects and supplying other customers. This is consistent with the planning priority to responsibly manage resources and waste, specifically the action to "*Continue to collaborate with Illawarra Shoalhaven Joint Organisation (ISJO) on regional approaches on environment, sustainability and climate change policy areas and collaborative regional purchasing.*" Additionally, a greenhouse gas emission assessment was conducted in conjunction with the Air Quality Impact Assessment (refer to Section 6.4). It was assessed that the Proposed Modification is unlikely to significantly increase greenhouse gas emissions.

2.2 Strategic Plans – Shoalhaven City Council

2.2.1 Shoalhaven 2032 Community Strategic Plan 2022-2032

The Shoalhaven City Council *Shoalhaven 2032 Community Strategic Plan* establishes broad goals for environmental and economic management in the region with various priorities/actions and outcomes for achieving this goal.

“We will work together in Shoalhaven to foster a safe & attractive community for people to live, work, stay & play; where sustainable growth, development & environmental protection are managed to provide a unique & relaxed lifestyle”

The Plan sets out the vision of the community and the Council’s commitment to balance sustainable development with protection of the environment. The Plan identifies protecting the natural environment and enhancing sustainability as well as strengthening and diversifying the economy as key priorities by setting out outcomes for environmental management and sustainable natural resource use and management including the following.

- Natural environment is improved.
- Resource consumption is reduced and waste minimised.
- Biodiversity and urban green cover are enhanced.
- Provision of employment for people of all ages and abilities.

The Applicant currently provides substantial contributions to the social and economic setting of the Shoalhaven region. The Project Site generates local employment and spending on consumables and services. Based on the nature of the amendments proposed, it is anticipated that the Proposed Modification would not limit the natural resource management goals for the Shoalhaven City Council but would continue to support the Applicant’s contribution to social and economic outcomes. In particular, the Proposed Modification would increase the economic benefits provided by the Applicant’s business without significantly increasing any adverse environmental impacts associated with the operation of the Quarry.

2.2.2 Shoalhaven Regional Economic Development Strategy – 2023 update

The *Shoalhaven Regional Economic Development Strategy 2018-2022 – 2023 Update* (the ‘Shoalhaven Strategy’) published by Shoalhaven City Council aims to drive economic growth in the Shoalhaven region. The Shoalhaven Strategy identifies the following strategies for the region.

- Build on the region’s strength in health and social assistance.
- Facilitate industrial development for the defence and manufacturing sectors.
- Increase the value of the visitor economy to the local economy by focussing on developing higher spend markets.
- Invest in rail, road and electronic infrastructure to address recognised connectivity opportunities.

- Focus on reducing unemployment by increasing local workforce engagement and investment in education and skills.

The strategies that interrelate with the Project Site's contributions to the region and the Proposed Modification is as follows.

Facilitate industrial development for the defence and manufacturing sectors

The following sole enabler is identified for this strategy: *"Identify opportunities and barriers to growing supply chain linkages, private business innovation and adjacencies for the defence, manufacturing and clean energy sectors"*. The Proposed Modification would support the supply chains of the Applicant's integrated businesses, allowing for the increased provision of materials to be used in the construction of infrastructure and the development of emerging businesses. Without the Proposed Modification, the Applicant's operations and the local and regional construction and infrastructure projects they supply would continue to be constrained by current sand supply limitations and increasing raw material costs.

Focus on reducing unemployment by increasing local workforce engagement and investment in education and skills.

The Proposed Modification would support achievement of this strategy by allowing the Quarry to maintain current employment rates while supporting increased employment in the construction industry.

2.2.3 Shoalhaven 2040 Our Strategic Land-use Planning Statement – Updated 2025

The Shoalhaven City Council *Shoalhaven 2040 Our Strategic Land-use Planning Statement* (the 'Shoalhaven Statement') published by the Shoalhaven City Council in 2020 and updated in March 2025 sets out the roadmap of Shoalhaven City Council's 20-year vision for land use in the region, and how Council will manage to preserve and change the special character and values of the region. The Shoalhaven Statement covers the entirety of the Shoalhaven Local Government Area (LGA).

The Shoalhaven Statement identifies the following two directions, each with multiple planning priorities.

- Managing Economic Growth.
- Natural & Built Environments and Lifestyles.

The directions and planning priorities that interrelate with the Project Site and Proposed Modification include the following.

Direction 1 – Managing Economic Growth

The Shoalhaven Statement identifies that the Shoalhaven LGA needs to enhance and manage the city's growing economy. The Proposed Modification would result in continued economic contributions to the Shoalhaven LGA during operations through increased supply of products and

the flow on economic effects of this supply for the construction industry. The Proposed Modification would also support the diversification of the economy through encouraging competition in the resources sector. This is consistent with the planning priority for industrial and defence related opportunities by safeguarding the existing industrial land use of the Applicant.

The Proposed Modification does not include any changes to the Project Site disturbance footprint and as such the impact to surrounding land uses will be limited to environmental impacts assessed as part of the Proposed Modification (refer to Section 6). This is consistent with the planning priority to support agriculture in the Shoalhaven LGA.

Direction 2 – Natural and Built Environments and Lifestyles

The Shoalhaven Statement identifies that the Shoalhaven LGA needs to preserve and enhance the city's environment. Daily traffic volumes generated as a result of the Proposed Modification would be unchanged compared to that approved for the existing Quarry. Additionally, a greenhouse gas emission assessment was conducted in conjunction with the Air Quality Impact Assessment (refer to Section 6.3). It was assessed that the Proposed Modification is unlikely to significantly increase greenhouse gas emissions. This is consistent with the planning priority to manage resources.

2.3 Land Ownership and Residences

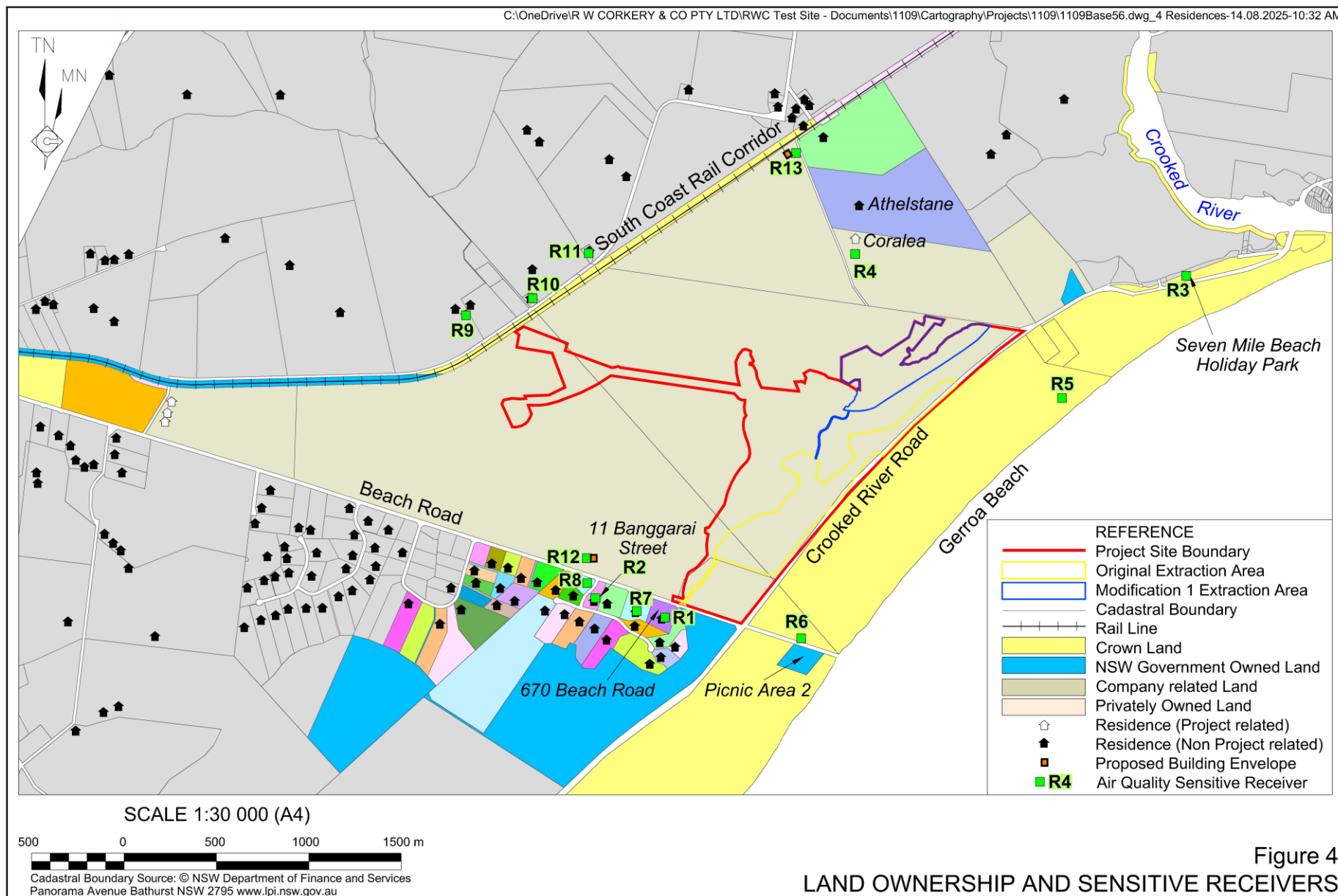
Figure 4 presents land ownership and sensitive receivers in the vicinity of the Project Site.

Land within the Project Site, consisting of Lot 2 DP1111012 and Lot A DP185785, is currently owned by Bridon Pty Limited, which is an associated entity of Bombo Operations Pty Ltd, the former operator of the site prior to the sale of the Quarry to MGH. All quarrying activities occur on land currently owned Bridon Pty Ltd. Access to the Project Site is provided directly from Beach Road and Crooked River Road.

The Proposed Modification would not alter the buffer distance between approved operations and surrounding landowners and sensitive receivers.

It is noted the Cleary Bros has submitted a subdivision application to Kiama Municipal Council (DA10.2024.182.1) and Shoalhaven City Council (DA2024/2388) to adjust lot boundaries associated with Lot 2 DP1111012 and Lot A DP185785. If approved, Lot A would be subsumed into the existing Lot 2 and Lot 2 would be divided into three separate lots, with all Project Site operations and Conservation Areas to be confined to a new smaller Lot 12. No changes to the approved Project Site Boundary are proposed as part of either the subdivision application or the Proposed Modification. Following approval of the proposed subdivision, the ownership of Lot 12 would be transferred to an entity controlled by MGH.

It is noted that two new building envelopes are associated with the subdivision (see **Figure 4**). Although no building application is currently associated with these building envelopes, potential impacts at these building envelopes have been assessed as part of the Proposed Modification.



2.4 Land Uses

Figure 5 shows land zoning within and surrounding the Project Site under both the *Shoalhaven Local Environmental Plan 2014* ('Shoalhaven LEP') and the *Kiama Local Environmental Plan 2011* (Kiama LEP). Land zoning within the Project Site includes the following.

- RU1 (Shoalhaven LEP) – Primary Production
- RU2 (Kiama LEP) – Rural Landscape
- C2 (Shoalhaven LEP & Kiama LEP) – Environmental Conservation
- C3 (Kiama LEP) – Environmental Management

In addition to the above, land zoning in the vicinity of the Project Site includes the following.

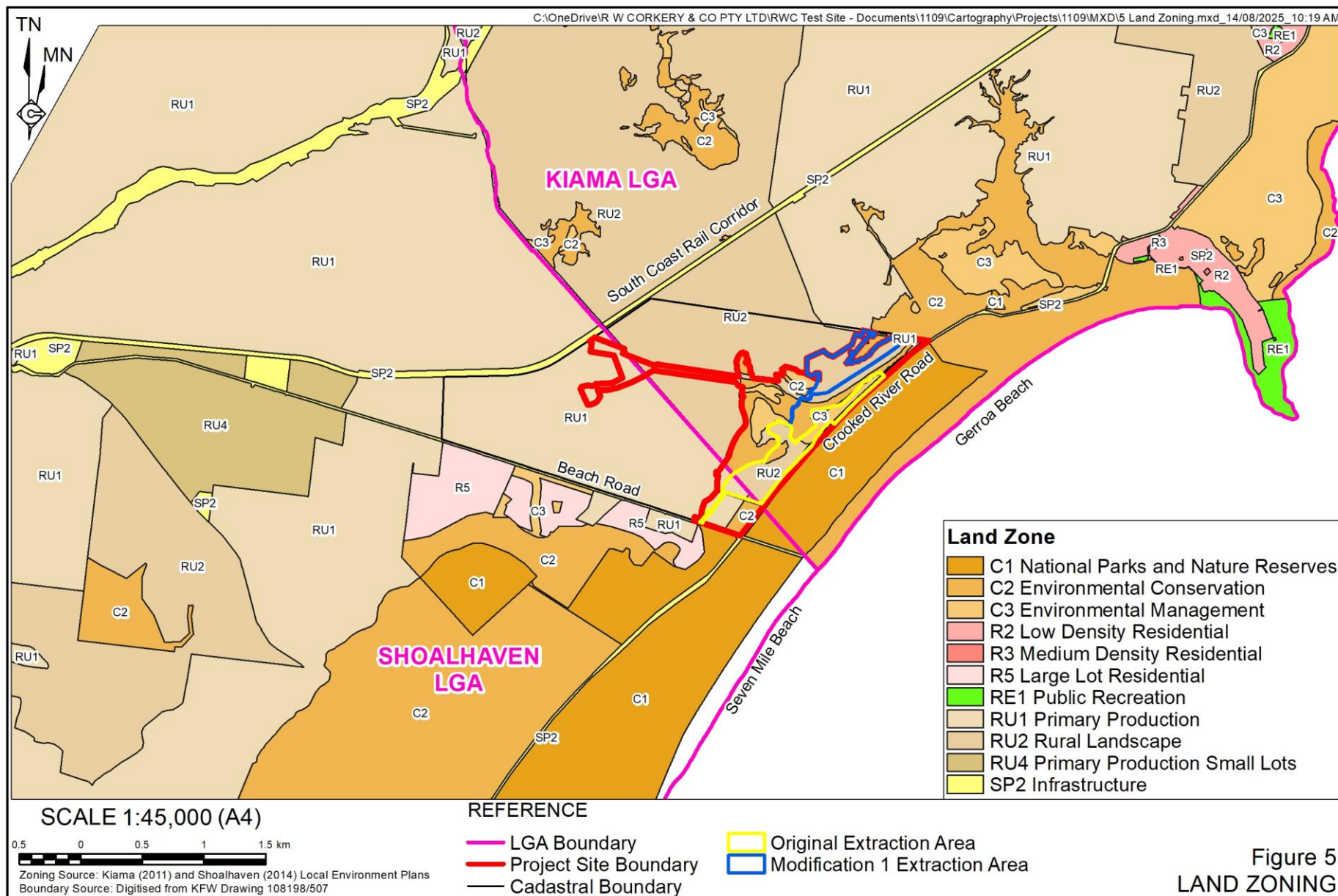
- SP2 (Shoalhaven LEP & Kiama LEP) – Infrastructure
 - Associated with the Crooked River Road and the South Coast railway corridor.
- C1 (Shoalhaven LEP & Kiama LEP) – National Parks and Nature Reserves
 - Associated with the Seven Mile Beach National Park.
- R5 (Shoalhaven LEP) – Large Lot Residential

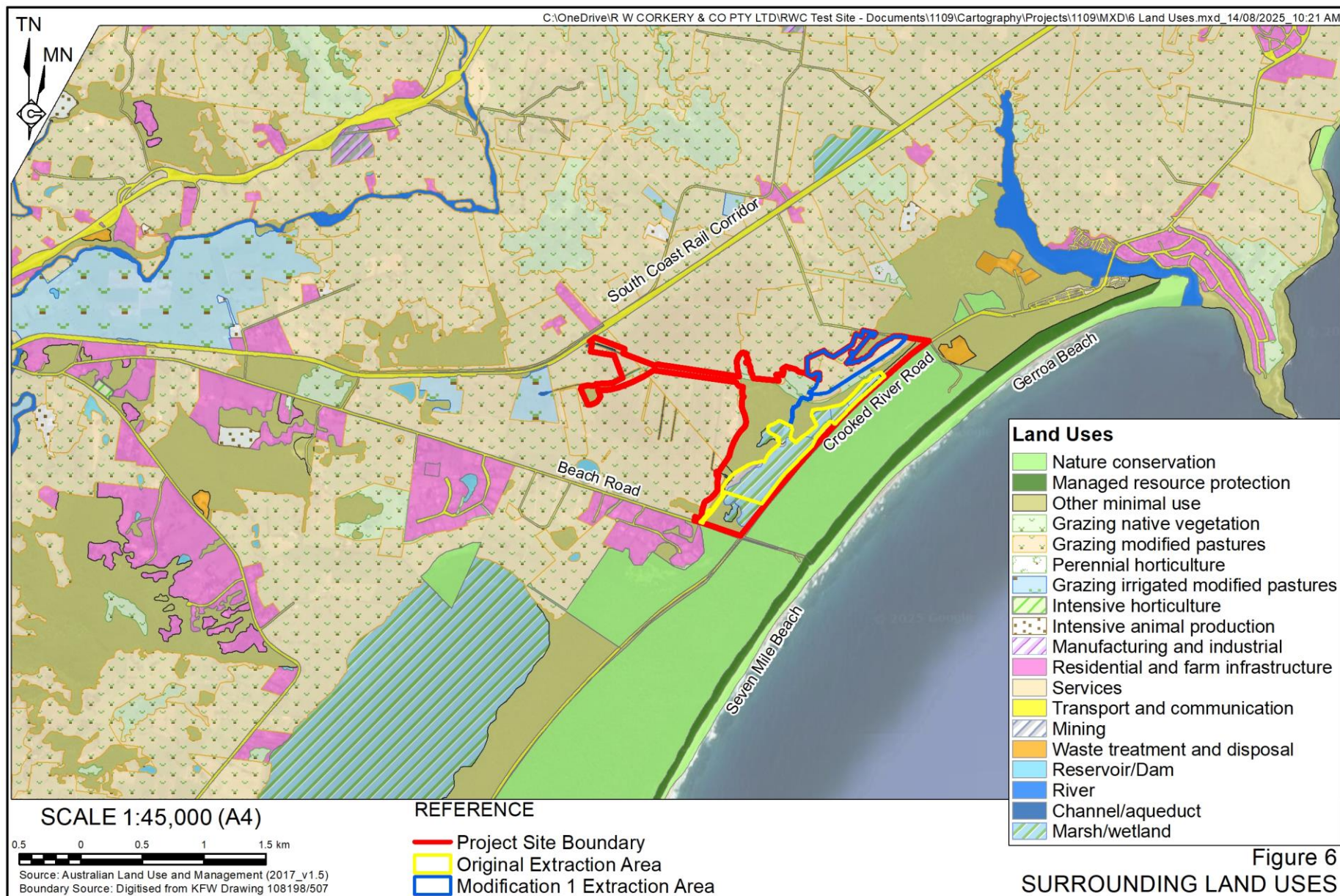
Figure 6 displays the range of land uses within and surrounding the Project Site. Land uses within the Project Site include:

- marsh/wetland;
- grazing modified pastures; and
- other minimal use;
- mining.
- grazing native vegetation;

In addition to the above, key land uses in the vicinity of the Project Site include:

- nature conservation;
- residential and farm infrastructure;
- managed resource protection;
- intensive animal production;
- waste treatment and disposal;
- grazing irrigated modified pastures; and
- transport and communication;
- reservoir/dam.
- perennial horticulture;





3. Description of the Modification

3.1 Introduction

The following subsections provide an overview of the Proposed Modification, a detailed description of each modification component, the conditions proposed to be modified, and outlines why the modified Project remains substantially the same.

A consolidated description of the modified Project is also included as **Appendix 1** of this report.

3.2 Overview of the Proposed Modification

Table 1 presents an overview of the Proposed Modification. In summary, the Proposed Modification would increase the maximum transportation rate by 50% from 80,000tpa to 120,000tpa. No changes to the extraction or processing methods, the approved disturbance footprint of the Quarry, or the rehabilitation objectives for the Project Site are proposed.

Table 1
Overview of the Proposed Modification

Page 1 of 2

Component	Approved Operations – MP05_0099 (Mod 1)	Current Application – Mod 2
Limits on Approval		
Life of Project	Extraction and processing operations up to 31 July 2038	No change. It is noted that increased production may reduce the life of the Project, however, it is proposed to retain the currently approved duration to provide for potential future fluctuations.
Maximum Dredge Pond Depth	Approximately up to 12m or to the base of the sand resource	No change
Extraction Operations		
Extraction Area	As per Figure 2 42.9ha footprint	No change
Extraction Method	Dredge-based extraction system	No change
Processing Operations		
Processing Method	Dredged material passes through the wet sorter	No change
Transportation Operations		
Product Transportation	Up to 80,000t of product per year	Increase to a maximum of 120,000tpa
Traffic Levels	Average of 19 laden trucks per day (38 truck movements per day)	No change
Transportation Route	As per Figure 3	No change
Heavy Vehicle Types	Range from small trucks (1t to 9t capacity) up to tri-axle, eight wheeler truck and dog vehicle configurations (32t to 42t capacity)	No change, although a greater proportion of larger capacity vehicles.

Table 1 (Cont'd)
Overview of the Proposed Modification

Page 2 of 2

Component	Approved Operations – MP05_0099 (Mod 1)	Current Application – Mod 2
Hours of Operation		
Operating Times	7:00am to 6:00pm, Monday to Friday 7:00am to 1:00pm, Saturdays - At no time on Sundays or Public Holidays	No change
Rehabilitation and Final Landform		
Rehabilitation Objectives	As per rehabilitation objectives included in Appendix 5 of MP05_0099	No change
Key Changes to Environmental Impacts		
Impacts and criteria	As approved	No significant change to environmental impacts and no change to impact criteria sought.

3.3 Extraction and Processing Operations

Material within the approved dredge pond / Extraction Areas at the Project Site (**Figure 2**) is extracted using a floating suction dredged-based extraction system. Dredged material, consisting primarily of fine sand and silt, is extracted from the base (up to 12m deep) and leading edge of the dredge pond and the resulting slurry mixture transferred to the Processing Area via a 250mm pipeline.

The slurry mixture is passed through various screens in a wet sorter and cyclone, as required, to separate sand material into different grade sand products. Screened sand is pushed into stockpiles adjacent to the processing plant. Fine silt particles are returned directly to the dredge pond together with process water.

Currently the existing dredging and processing equipment are not required to be operated for large portions of the approved hours of operation to meet the current transportation limit. To meet the proposed increased transportation limit, the existing dredging and processing equipment would be operated more frequently within the approved hours of operation. No additional equipment or larger models of existing equipment are proposed.

3.4 Product Despatch and Transportation

A traffic assessment was completed by Masson Wilson Twiney Traffic and Transport Consultants (MWT, 2001) to support the *Gerroa Sand Quarry Proposed Extension Environmental Assessment* (2006). MWT (2001) noted that a range of vehicles would be used for product transport purposes, including light vehicles and small trucks with capacities from 1t to 9t up to truck and dog heavy vehicle configurations with capacities from 32t to 42t. MWT (2001) concluded that an average of 14 laden trucks per day (28 truck movements per day) would be required to transport an average of 59,559t of product per annum.

An updated traffic impact statement was prepared by Cardno (NSW/ACT) Pty Ltd to support the *Gerroa Sand Quarry Modification Mod 1* application (Cardno, 2018a). Cardno noted that an average of 19 laden trucks per day (38 truck movements per day) would be required to transport 80,000t of product per annum.

The Applicant notes that current truck and dog vehicle configurations used at the Quarry, with capacities ranging between 32t and 42t (average load size of 35t), could support the transportation of 120,000tpa without increasing the number of vehicle movements modelled by Cardno (2018a). Assuming transportation operations at the Quarry occur 48 weeks per year and generate 19 laden trucks per day, six days per week, the proposed maximum transportation rate of 120,000tpa could be supported by heavy vehicles with an average capacity of just 22t.

As such, the Proposed Modification would not result in a net increase in traffic volumes (daily average) generated by the Quarry compared to those modelled under the original application. Furthermore, the Proposed Modification would not alter:

- the maximum traffic volumes generated at the Quarry (maximum per hour and maximum per day);
- the proportional distribution of laden and unladen vehicle traffic using the approved transport routes to travel to/from the north (~74%) or south (~26%) of the Project Site;
- the maximum vehicle size or largest heavy vehicle configuration used for product transportation (i.e. truck and dog vehicle configurations with maximum capacities of 42t); or
- the maximum traffic volumes generated at the Quarry (maximum per hour or maximum per day).

The Applicant would continue to comply with traffic and transportation related requirements listed under Conditions 31, 32 and 34 of Schedule 2 of MP05_0099 (Mod 1), including the following.

- All truck movements travelling to or originating from areas:
 - south of the Project Site will use the Princes Highway, via Beach Road (except as permitted for Gerroa Road below); and
 - north of the Project Site will use the Princes Highway, via Beach Road, Crooked River Road, Fern Street and Belinda Street.
- No Project-related trucks will use Gerroa Road, except where the destination lies along or adjacent to that road.
- All laden vehicles entering or leaving the Project Site will be covered.
- All laden vehicles exiting the Project Site will be cleaned of any materials that may fall on the road, before they leave the Project Site.

It is noted that the internal haul road and intersection upgrade requirements identified under Condition 33 of Schedule 2 of MP05_0099 (Mod 1) were completed prior to the approval of Modification 1.

3.5 Updated Statement of Commitments

The Applicant proposes to complete a single update to the Statement of Commitments to reflect the Proposed Modification and contemporary approach to use of management plans for specification of ongoing management measures. The proposed updated Statement of Commitments is provided as **Appendix 2**.

3.6 Conditions Proposed to be Modified

The Applicant anticipates that the following conditional modifications would be required to MP05_0099 (Mod 1) as a result of the Proposed Modification. Additions are marked as **red** text and deletions as **strikeouts**.

- Schedule 2 Condition 6
The Proponent shall not transport more than ~~8~~120,000 tonnes of products from the site in a year.
- The 'Statement of Commitments' presented as **Appendix 2** of this Modification Report would need to be updated to include the proposed changes.
- Global updates to terminology and agency names.

3.7 Substantially the Same Development

As MP 05_0099 was originally granted by the NSW Land and Environment Court, the Proposed Modification is being sought under Part 4, Division 4.9, Section 5.56 of the EP&A Act. In accordance with Section 4.56(1(a)) of the EP&A Act, the Proposed Modification must remain substantially the same development. It is noted that, as Mod 1 was approved under Section 75W (now repealed), the assessment for substantially the same development will be undertaken against MP 05_0099 (Mod 1).

Given the nature of the Proposed Modification, it is considered that the key issue for consideration of whether the Proposed Modification would result in substantially the same development is the proposed increase to the approved transportation limit. The proposed 50% increase to the annual transportation rates from 80,000tpa to 120,000tpa is considered substantially the same development for the following reasons.

- No changes to the Project Site disturbance footprint or infrastructure would be required to support the increased production rate of 120,000tpa.
- The increase in extraction and processing activities to support an increased transportation limit would be achieved within existing approved hours of operation using existing processing plant and extraction and processing methods.
- The 50% increase to product despatch would be accommodated well within the previously assessed and approved average daily truck movements (i.e. average of 19 laden trucks per day) with no changes the maximum heavy vehicle size employed for product transport operations.

- The Proposed Modification would not result in any significant increases in adverse environmental impacts associated with the Quarry compared to the approved development.

The following additional aspects relating to the ‘substantially the same development test’ have also been reviewed with consideration of Section 4 of the *Modifying an Approved Project Draft Environmental Impact Guidance Series June 2017*.

1. Development size, scale and footprint – The footprint of extraction and total extracted volume is not proposed to change as a result of the Proposed Modification.
2. Intensity including rates of production - The approved maximum annual transportation rate is 80,000tpa. The proposed maximum rate of 120,000tpa would be achieved using existing infrastructure and through extended operational periods within the approved hours of operation.
3. Primary, secondary and ancillary use - The Proposed Modification does not seek to change the primary, secondary or ancillary uses on site.
4. Project life and hours of operation - The Project life is not proposed to increase, and the approved hours of operation are not proposed to change.
5. Extent, duration and severity of impacts - The overall extent and duration of the Project are not proposed to change. The maximum severity of impact would not increase as a result of the Proposed Modification, with no increase in the applicable noise and air quality criteria proposed.

Based on the above, the Applicant contends that the Proposed Modification would be considered substantially the same development.

4. Statutory Context

4.1 Introduction

This section identifies the relevant statutory requirements that must be considered by the consent authority before the development application may be determined. The relevant statutory requirements are described in terms of power to grant approval, permissibility, and other required approvals. The section concludes with the statutory compliance matters that must be considered by the consent authority.

4.2 Power to Modify the Approval

Following the repeal of Part 3A of the EP&A Act and the winding up of transitional arrangements outlined under Schedule 2 Section 3BA(6)(b) of the *Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017* (formerly provided by Schedule 6A of the EP&A Act), the Part 3A development approved under MP 05_0099 (Mod 1) is now classified as State Significant Development and the Proposed Modification will need to remain “substantially the same” as the Project as last modified under the now repealed Section 75W of Part 3A.

As MP 05_0099 was originally granted by the NSW Land and Environment Court, the Proposed Modification would therefore be sought under Part 4, Division 4.9, Section 4.56 of the EP&A Act. In accordance with Section 4.56(1(a)) of the EP&A Act, the Proposed Modification must remain substantially the same development. As noted in Section 1.4.2, as Mod 1 was approved under Section 75W (now repealed), the assessment for substantially the same development is to be undertaken against MP 05_0099 (Mod 1).

4.3 Permissibility

The Extraction Areas of the Project Site are situated within land zoned as RU2 – Rural Landscape and C2 – Environmental Conservation under the *Shoalhaven Local Environment Plan 2014* (Shoalhaven LEP).

The objectives of Zone RU1 – Primary Production under the Shoalhaven LEP are as follows.

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.

- To conserve and maintain productive prime crop and pasture land.
- To conserve and maintain the economic potential of the land within this zone for extractive industries.

Extractive industries are identified as permissible with consent within this zone.

The objectives of Zone C2 – Environmental Conservation under the Shoalhaven LEP are as follows.

- To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values.
- To prevent development that could destroy, damage or otherwise have an adverse effect on those values.
- To protect water quality and the ecological integrity of water supply catchments and other catchments and natural waterways.
- To protect the scenic, ecological, educational and recreational values of wetlands, rainforests, escarpment areas and fauna habitat linkages.
- To conserve and, where appropriate, restore natural vegetation in order to protect the erosion and slippage of steep slopes.

Whilst industries are generally prohibited within zone C2, as oyster aquaculture (i.e. agriculture) is permissible with consent in this zone, extractive industries are also permissible with consent under Section 2.9, Clause 3(a) of *State Environmental Planning Policy (Resources and Energy) 2021*.

The Extraction Areas of the Project Site are also situated within land zoned as RU2 – Rural Landscape, C2 – Environmental Conservation, and C3 under the *Kiama Local Environment Plan 2014* (Kiama LEP).

The objectives of Zone RU2 – Rural Landscape under the Kiama LEP are as follows.

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To maintain the rural landscape character of the land.
- To provide for a range of compatible land uses, including extensive agriculture.
- To protect agricultural land for long term agricultural production.
- To provide opportunities for employment-generating development that adds value to local agricultural production through food and beverage processing and integrates with tourism.

Extractive industries are identified as permissible with consent within this zone.

The objectives of Zone C2 – Environmental Conservation under the Kiama LEP are as follows.

- To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values.

- To prevent development that could destroy, damage or otherwise have an adverse effect on those values.
- To ensure adequate environmental buffers are provided, maintained or rehabilitated in the vicinity of high ecological value areas and waterways.

Whilst industries are generally prohibited within zone C2, as oyster aquaculture (i.e. agriculture) is permissible with consent in this zone, extractive industries are also permissible with consent under Section 2.9, Clause 3(a) of *State Environmental Planning Policy (Resources and Energy) 2021*.

The objectives of Zone C3 – Environmental Management under the Kiama LEP are as follows.

- To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values.
- To provide for a limited range of development that does not have an adverse effect on those values.
- To allow limited types of agriculture subject to effective environmental safeguards and sound land management practices.

Whilst industries are generally prohibited within zone C3, as oyster aquaculture (i.e. agriculture) is permissible with consent in this zone, extractive industries are also permissible with consent under Section 2.9, Clause 3(a) of *State Environmental Planning Policy (Resources and Energy) 2021*.

4.4 Other Approvals

Table 2 presents the existing approvals held for the Project Site and identifies where modifications to those approvals would be required would be necessary as a result of the Proposed Modification. No new approvals are considered necessary for the Proposed Modification.

Table 2
Existing Quarry Approvals and Modification Requirements

Approval	Modification Required?	Justification/ Comment
Project Approval MP05_0099 (Mod 1)	Yes	This Modification Report is for the purposes of modifying this consent.
Environment Protection Licence 4146	Yes	Variation of the existing EPL conditions are expected to be required to ensure consistency with the modified Project.
Water Access Licence 43271	No	WAL 43271 provides for a 50ML share component and WAL 43272 provides for a 56ML share component from the Metropolitan Coastal Sands Groundwater Source. Modification to the existing WAL conditions are not anticipated to be required as a result of the Proposed Modification.
Water Access Licence 43272	No	
Water Supply Works and Use Approval	NA ¹	
¹ As a Part 3A project, a Water Use Approval and Water Management Work Approval are not required.		

4.5 Pre-Conditions to Granting Approval

Table 3 presents the pre-conditions to the granting of approval that apply to the Proposed Modification.

Table 3
Preconditions to the Granting of Approval

Page 1 of 5

Section/ Clause	Precondition	Relevance
Environmental Planning and Assessment Act 1979		
4.56(1)	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 the consent was originally granted and before that consent as originally granted was modified (if at all), and	The Proposed Modification is being sought under Section 4.56(1) of the EP&A Act as the Project would remain “substantially the same” as the Project as last modified under the former Section 75W of the EP&A Act (being the current consent last modified June 2022) and which the test for “substantially the same” is applied. Under the Proposed Modification, the Project would remain “substantially the same development” as that approved under PA MP05_0099 (Mod 1). Section 3.7 provides a detailed summary of the reasonings.
	(b) it has notified the application in accordance with— i) the regulations, if the regulations so require, or ii) a development control plan	This is a matter for DPHI to consider, however it is anticipated that DPHI will notify the application to relevant stakeholders. In accordance with Clause 2.10(1) of the <i>State Environmental Planning Policy (Planning Systems) 2021</i> , development control plans (DCP) do not apply to SSD applications.
	(c) it has notified, or made reasonable attempts to notify, each person who made a submission in respect of the relevant development application of the proposed modification by sending written notice to the last address known to the consent authority of the objector or other person, and	This is a matter for DPHI to consider during its assessment of the Proposed Modification.
	(d) it has considered any submissions made concerning the proposed modification within any period prescribed by the regulations or provided by the development control plan, as the case may be.	This is a matter for the DPHI to consider. However, the Applicant would prepare responses to any submissions received by DPHI during the assessment process.
Kiama Environmental Plan 2011 (Kiama LEP)		
Clause 2.3(2)	Zone objectives and Land Use Table The consent authority must have regard to the objectives for development in a zone when determining a development application in respect of land within the zone.	Not applicable. The application is to modify PA MP05_0099 (Mod 1) and is not an application for development consent.

Table 3 (Cont'd)
Preconditions to the Granting of Approval

Page 2 of 5

Section/ Clause	Precondition	Relevance
Kiama Local Environmental Plan 2011 (Kiama LEP) (Cont'd)		
Clause 6.1(3)	Acid Sulfate Soils Development consent must not be granted under this clause for the carrying out of works unless an acid sulfate soils management plan has been prepared for the proposed works in accordance with the Acid Sulfate Soils Manual and has been provided to the consent authority.	The Proposed Modification would not have any additional impacts or management implications for acid sulfate soils. The approved <i>Water Management Plan</i> for the Project Site contains the <i>Acid Sulfate Soil Management Plan</i> which was prepared in accordance with the relevant guidelines for Acid Sulfate Soils.
Clause 6.2(3)	Earthworks Before granting development consent for earthworks, the consent authority must consider the following matters a) the likely disruption of, or any detrimental effect on, existing drainage patterns and soil stability in the locality, b) the effect of the development on the likely future use or redevelopment of the land, (c) the quality of the fill or the soil to be excavated, or both, (d) the effect of the development on the existing and likely amenity of adjoining properties, (e) the source of any fill material and the destination of any excavated material, (f) the likelihood of disturbing relics, (g) the proximity to, and potential for adverse impacts on, any waterway, drinking water catchment or environmentally sensitive area, (h) any measures proposed to minimise or mitigate the impacts referred to in paragraph (g).	All disturbance would be restricted to previously approved areas of disturbance. Nil. The Proposed Modification would not alter future use or redevelopment within the Project Site. Fill quality would be assessed in accordance with the current development consent and associated management plans. The soil to be excavated is unchanged. The Proposed Modification would have a negligible effect on the existing approved Project Site's effect on the amenity of the surrounding area. Notwithstanding, potential for amenity impacts has been assessed in Section 6 of this <i>Modification Report</i>. Fill would be sourced in accordance with the current development consent and associated management plans. All disturbance would be restricted to areas of previously approved disturbance. All disturbance would be restricted to areas of previously approved disturbance, i.e. there would be no change in the currently approved proximity or impacts to these features. Potential impacts of the Proposed Modification have been addressed through design.

Table 3 (Cont'd)
Preconditions to the Granting of Approval

Page 3 of 5

Section/ Clause	Precondition	Relevance
Kiama Local Environmental Plan 2011 (Kiama LEP) (Cont'd)		
6.5(4)	Riparian land and watercourses Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that— (a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or (b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or (c) if that impact cannot be minimised—the development will be managed to mitigate that impact.	Nil. The Proposed Modification would not alter the design of the Quarry or environmental management practices within the Project Site.
6.12	Essential Services Development consent must not be granted to development unless the consent authority is satisfied that any of the following services that are essential for the proposed development are available or that adequate arrangements have been made to make them available when required— (a) the supply of water, (b) the supply of electricity, (c) the disposal and management of sewage, (d) stormwater drainage or on-site conservation, (e) suitable road access.	The Proposed Modification would not alter any impacts on essential services.
Shoalhaven Local Environmental Plan 2014 (Shoalhaven LEP)		
Clause 2.3(2)	Zone objectives and Land Use Table The consent authority must have regard to the objectives for development in a zone when determining a development application in respect of land within the zone.	Not applicable. The application is to modify PA MP05_0099 and is not an application for development consent.

Table 3 (Cont'd)
Preconditions to the Granting of Approval

Page 4 of 5

Section/ Clause	Precondition	Relevance
Shoalhaven Local Environmental Plan 2014 (Shoalhaven LEP)		
Clause 7.1(3)	Acid Sulfate Soils Development consent must not be granted under this clause for the carrying out of works unless an acid sulfate soils management plan has been prepared for the proposed works in accordance with the Acid Sulfate Soils Manual and has been provided to the consent authority.	The Proposed Modification would not have any additional impacts or management implications for acid sulfate soils. The approved <i>Water Management Plan</i> for the Project Site contains the <i>Acid Sulfate Soil Management Plan</i> which was prepared in accordance with the relevant guidelines for Acid Sulfate Soils.
Clause 7.2(3)	Earthworks Before granting development consent for earthworks (or for development involving ancillary earthworks), the consent authority must consider the following matters—	All disturbance would be restricted to previously approved areas of disturbance.
	(a) the likely disruption of, or any detrimental effect on, drainage patterns and soil stability in the locality of the development,	
	(b) the effect of the development on the likely future use or redevelopment of the land,	Nil. The Proposed Modification would not alter future use or redevelopment within the Project Site.
	(c) the quality of the fill or the soil to be excavated, or both,	Fill quality would be assessed in accordance with the current development consent and associated management plans. The soil to be excavated is unchanged.
	(d) the effect of the development on the existing and likely amenity of adjoining properties,	The Proposed Modification would have a negligible effect on the existing approved Project Site's effect on the amenity of the surrounding area. Notwithstanding, potential for amenity impacts has been assessed in Section 6 of this <i>Modification Report</i> .
	(e) the source of any fill material and the destination of any excavated material,	Fill would be sourced in accordance with the current development consent and associated management plans.
	(f) the likelihood of disturbing relics,	All disturbance would be restricted to areas of previously approved disturbance.
	(g) the proximity to, and potential for adverse impacts on, any waterway, drinking water catchment or environmentally sensitive area,	All disturbance would be restricted to areas of previously approved disturbance.
	(h) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.	Management and mitigation measures relevant to the Proposed Modification are outlined in Section 6 of this <i>Modification Report</i> .

Table 3 (Cont'd)
Preconditions to the Granting of Approval

Page 5 of 5

Section/ Clause	Precondition	Relevance
Shoalhaven Local Environmental Plan 2014 (Shoalhaven LEP)		
7.6(4)	Riparian land and watercourses Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that— (a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or (b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or (c) if that impact cannot be minimised—the development will be managed to mitigate that impact.	All disturbance would be restricted to areas of previously approved disturbance, i.e. there would be no change in the currently approved proximity or impacts to riparian land or watercourses. The Proposed Modification also would not require alteration to the existing environmental management practices.
7.11	Essential Services Development consent must not be granted for development unless the consent authority is satisfied that any of the following services that are essential for the development are available or that adequate arrangements have been made to make them available when required— (a) the supply of water, (b) the supply of electricity, (c) the disposal and management of sewage, (d) suitable vehicular access.	The Proposed Modification would not alter impacts on essential services.

4.6 Mandatory Matters for Consideration

Table 4 presents the mandatory matters for consideration by the consent authority that apply to the Proposed Modification.

Table 4
Mandatory Matters for Consideration

Page 1 of 5

Section/ Clause	Matter for Consideration	Relevance/Comment
Environmental Planning and Assessment Act 1979		
1.3	Relevant objects of the Act - to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources, - to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment, - to promote the orderly and economic use and development of land, - to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats, - to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage), - to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State, - to provide increased opportunity for community participation in environmental planning and assessment.	The Proposed Modification would not limit the achievement of the objects of the EP&A Act and would in effect assist with the achievement of objectives to: - promote the social and economic welfare of the local community through the efficient and continued economic benefits of the operation; and - promote orderly and economic development of the sand resource. Section 7.6 addresses matters relevant to Ecologically Sustainable Development in detail. The Proposed Modification would encourage the safe, efficient and environmentally responsible operation of the Project Site so that maximum benefit is achieved for the Applicant, Kiama Municipal Council, Shoalhaven City Council, the local community and the communities of the future. The design of the Proposed Modification achieves an overall benefit and sustainable outcome for the local and wider environment. The Proposed Modification would not result in significant adverse environmental outcomes or disturb areas not previously approved for disturbance. Section 6 presents a detailed analysis of the key environmental aspects that may be affected by the Proposed Modification.
4.15	Relevant environmental planning instruments.	See Table 3 .
	Proposed planning instrument	No additional planning instruments are proposed.
	Relevant development control plans	In accordance with Clause 12.10(a) of the <i>State Environmental Planning Policy (Planning Systems) 2021</i> , development control plans are not applicable to SSD applications.

Table 4 (Cont'd)
Mandatory Matters for Consideration

Page 2 of 5

Section/ Clause	Matter for Consideration	Relevance/Comment
<i>Environmental Planning and Assessment Act 1979 (Cont'd)</i>		
4.15 (Cont'd)	Any planning agreement	A Planning Agreement is currently being progressed in accordance with the conditions of PA MP05_0099 that will apply to the Project Site once executed. The Proposed Modification would not be affected by the proposed Planning Agreement or vice versa. There are no other Planning Agreements that currently apply to or affect the Project.
	The EP&A Regulation	The Regulations have been considered throughout this document.
	The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,	Section 6 presents an assessment of relevant impacts on the natural and built environment and social and economic impacts.
	The suitability of the site for the development,	Operations have been undertaken at the Project Site for ~55 years. The current development consent was determined on 2 September 2008 and the existing operation is approved to continue operating until 31 July 2038.
	Any submissions made in accordance with this Act or the regulations,	This is a matter for the DPHI to consider. However, the Applicant would be pleased to respond to any submissions received by DPHI during the assessment process.
	The public interest.	This is addressed in Section 7. In summary, the Proposed Modification is considered to be in the public interest through the continued operation of the Project Site in a safe and environmentally responsible manner and the provision of ongoing local economic benefits.
<i>Biodiversity Conservation Act 2016</i>		
7.14	The Minister for Planning, when determining in accordance with the <i>Environmental Planning and Assessment Act 1979</i> any such application, is to take into consideration under that Act the likely impact of the proposed development on biodiversity values as assessed in the biodiversity development assessment report.	No additional biodiversity impacts would occur with all disturbance contained within areas previously disturbed. Therefore further consideration of biodiversity values and offsetting obligations as part of a biodiversity development assessment report is not required.

Table 4 (Cont'd)
Mandatory Matters for Consideration

Page 3 of 5

Section/ Clause	Matter for Consideration	Relevance/Comment
State Environmental Planning Policy (Resources and Energy) 2021 (Resources and Energy SEPP)		
Clause 2.16	Consent authority must be satisfied that consideration is given to development standards on particular matters related to mining that, if complied with, prevents the consent authority from requiring more onerous standards for those matters.	The Proposed Modification would not result in changes to the environmental aspects relevant to the non-discretionary standards.
Clause 2.17	Consent authority must - consider the existing used and approved uses of land in the vicinity of the development, whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development and any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses. - evaluate and compare the respective public benefits of the development and the land uses - evaluate any measures proposed by the applicant to avoid or minimise any incompatibility.	The existing and approved use of the Project Site is Extractive Industry. The Proposed Modification is consistent with that use. Surrounding land uses include residential, rural and environmental land uses and the Project Site has co-existed with those uses since operations commenced approximately 55 years ago. The Proposed Modification would allow the current levels of employment to be maintained and provide for the existing industry supply chains. It is considered there would be a net increase from the existing public benefit arising from the Proposed Modification. Section 3 and 6 present measures proposed to avoid or minimise any incompatibility.
Clause 2.18	Consent authority must be satisfied that proper consideration is given to any applicable provisions of the voluntary land acquisition and mitigation policy.	The Proposed Modification would not result in changes to the environmental aspects relevant to the voluntary land acquisition and mitigation policy.
Clause 2.19	Consent authority must be satisfied that proper consideration is given to; - the existing uses and approved uses of land in the vicinity of the development, and - whether or not the development is likely to have a significant impact on current or future extraction or recovery of minerals, petroleum or extractive materials (including by limiting access to, or impeding assessment of, those resources), and - any ways in which the development may be incompatible with any of those existing or approved uses or that current or future extraction or recovery and, - evaluation of the respective public benefits of the development and the uses, extraction and recovery	Not relevant on the basis that the Project Site is an approved development and as such the compatibility of the Project Site with other mining, petroleum production or extractive industry has already been considered. Notwithstanding, cumulative impacts have been considered as applicable.

Table 4 (Cont'd)
Mandatory Matters for Consideration

Page 4 of 5

Section/ Clause	Matter for Consideration	Relevance/Comment
State Environmental Planning Policy (Resources and Energy) 2021 (Resources and Energy SEPP) (Cont'd)		
Clause 2.20	Consent authority must consider whether or not impacts on significant water resources and threatened species and biodiversity are avoided or minimised and that greenhouse gas emissions are minimised to the greatest extent practicable.	The Proposed Modification would not alter water management practices within the Project Site.
Clause 2.21	Consent authority must consider whether the Project will be carried out in such a way as to optimise the efficiency of recovery of minerals and to minimise the creation of waste in association with the extraction, recovery or processing of minerals.	The Proposed Modification would be consistent with the existing land uses and would ensure the most efficient recovery of identified resources whilst maximising the beneficial use of land for planned future development.
Clause 2.22	Consent authority consider whether the Proposal is subject to any conditions that; require all or some of the transport of materials to not be by public road, limit or preclude truck movements and/or require the preparation of a code of conduct for the transport of materials on public roads.	The Proposed Modification would not alter transportation operations beyond existing approvals for Mod 1.
Clause 2.23	Consent authority must consider whether or not the consent should be issued subject to conditions aimed at ensuring the rehabilitation of land that will be affected by the development.	The Proposed Modification would not materially alter the scale of land requiring rehabilitation or nature of the final landform and rehabilitation methods to be applied.
State Environmental Planning Policy (Resilience and Hazards) 2021		
Clause 3.12	In determining an application to carry out development to which this Part applies, the consent authority must consider (in addition to any other matters specified in the Act or in an environmental planning instrument applying to the development)— (a) current circulars or guidelines published by the Department of Planning relating to hazardous or offensive development, and (b) whether any public authority should be consulted concerning any environmental and land use safety requirements with which the development should comply, and (c) in the case of development for the purpose of a potentially hazardous industry—a preliminary hazard analysis prepared by or on behalf of the applicant, and	The Proposed Modification would not result in any additional use or storage of hazardous materials within the Project Site. As such, the outcomes from previous risk screening remain unchanged, i.e. that there is no need to undertake a Preliminary Hazard Assessment.

Table 4 (Cont'd)
Mandatory Matters for Consideration

Page 5 of 5

Section/ Clause	Matter for Consideration	Relevance/Comment
<i>State Environmental Planning Policy (Resilience and Hazards) 2021 (Cont'd)</i>		
Clause 3.12 (Cont'd)	(d) any feasible alternatives to the carrying out of the development and the reasons for choosing the development the subject of the application (including any feasible alternatives for the location of the development and the reasons for choosing the location the subject of the application), and	
	(e) any likely future use of the land surrounding the development.	

5. Engagement

5.1 Government Consultation

The Applicant has consulted with DPHI to seek assessment and information requirements for the Proposed Modification in accordance with the *State significant development guidelines – preparing a modification report October 2022*. A *Briefing Letter* describing the Proposed Modification, outlining the proposed application pathway, and seeking any assessment requirements was provided to DPHI via the NSW Major Projects Portal on 8 May 2025 and a range of follow up correspondence was sent.

DPHI did not request a briefing meeting following submission of the *Briefing Letter* and no assessment requirements were provided.

The Applicant also consulted with the following agencies and stakeholders and provided each with a copy of the *Briefing Letter* via email on 4 June 2025.

- NSW Department of Climate Change, Energy, the Environment and Water – Environment Protection Authority (EPA)
- NSW Department of Climate Change, Energy, the Environment and Water – Water Group (Water Group)
- Transport for NSW (TfNSW)
- NSW National Parks and Wildlife Service (NPWS)
- Kiama Municipal Council
- Shoalhaven City Council

The EPA provided assessment requirements for the Proposed Modification including:

- that an application to vary EPL 4146 be submitted following approval of the modification to increase the current activity limits for ‘extractive activities’ and ‘crushing, grinding, or separating’ (see Section 4.4);
- that the proposed air quality impact assessment be undertaken in accordance with the *Approved Methods for the modelling and assessment of air pollutants (2022)* (see Section 6.3);
- that the proposed noise impact assessment be undertaken in accordance with the *Noise Policy for Industry (2017)* (see Section 6.6); and
- that an updated Hydrological and Water Quality Impact Assessment, including an updated water balance, be undertaken for the Proposed Modification (see Section 6.5).

TfNSW responded to the consultation request to note that they would complete a comprehensive review of the modification application following referral of the application by DPHI. NPWS responded with a reference to the guideline document *Developments adjacent to National Parks*

and Wildlife Service lands – Guidelines for consent and planning authorities (DPIE, 2020). Shoalhaven City Council responded and indicated that they had no concerns or feedback at this stage. The Water Group and Kiama Municipal Council did not respond to the consultation request.

Copies of all return consultation correspondence, and a copy of the *Briefing Letter*, are provided as **Appendix 3**.

5.2 Community Consultation

The Applicant maintains an open-door policy regarding complaints, questions and feedback to the local community. The Applicant's website <http://www.clearybros.com.au/gerroa-sand-quarry/> is maintained to inform the community about the Gerroa Sand Quarry and related matters. There have been no substantiated complaints received since at least 2008.

The Applicant will notify landowners adjacent to the Project Site following submission of the Modification Report to ensure that they are aware of the public exhibition of the Proposed Modification, ability to provide submissions, and to provide the opportunity to discuss the Proposed Modification in more detail and any concerns or questions regarding the outcomes of the assessments.

Consultation with the Community Consultative Committee (CCC) for the Quarry will also be undertaken as part of an upcoming meeting on 28 August 2025, with the Proposed Modification included as an agenda item for this meeting.

5.3 Ongoing Engagement

Following an approval of the Proposed Modification the following engagement activities would be continued by the Applicant.

- Ongoing CCC meetings to provide an overview of Quarry operations and discuss matters relevant to the broader community.
- Ad hoc engagement with surrounding landowners and sensitive receivers regarding operations at the Project Site and the status of any rehabilitation works.

6. Assessment of Key Environmental Issues

6.1 Introduction

This section describes the specific environmental features of the Project Site and its surrounds that may be affected by the Proposed Modification. Information on existing conditions, proposed safeguards and controls, and potential impacts that the Proposed Modification may have, following the implementation of the proposed measures, is presented for all relevant environmental issues.

6.2 Environmental Setting

6.2.1 Introduction

The assessment of various environmental aspects of the Proposed Modification throughout this section is reliant upon a range of background information common to many of the key environmental issues. Information relating to the topography, drainage, and climate is provided in the following subsection.

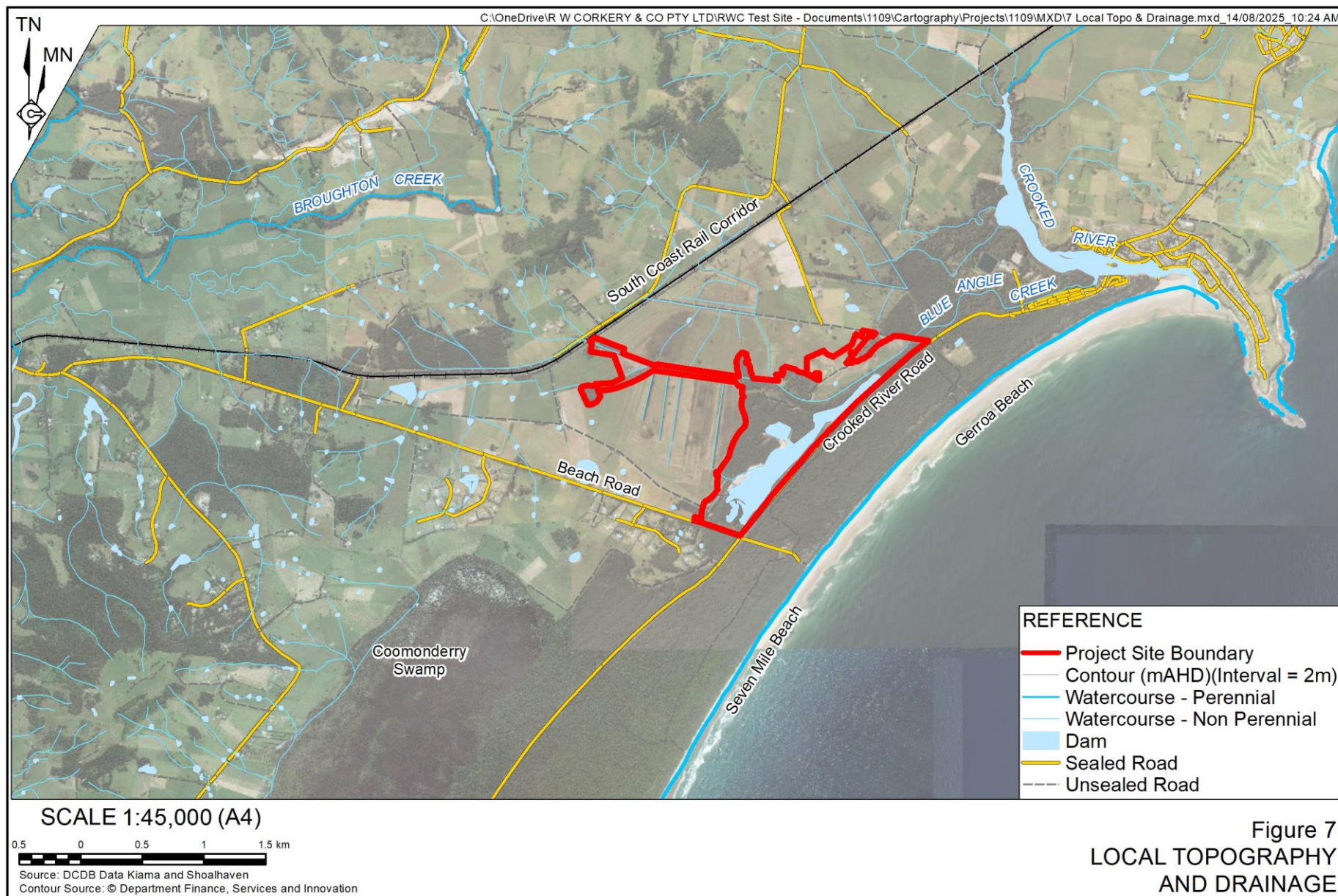
6.2.2 Topography and Drainage

Project Site Topography and Drainage

The Project Site is located within the catchment of Blue Angle Creek, a tributary of the Crooked River which occasionally discharges to the sea at Gerroa Beach (**Figure 7**). Land within the Project Site has an elevation ranging from 6m AHD to less than 2m AHD. A ridge spur is located to the northwest of the Project Site, with clean water drains around the base of the spur to direct runoff away from the new dredge pond. Operational areas at the Project Site drain internally to the dredge ponds. The dredge pond are bunded to prevent overtopping under the 100-year annual recurrence interval (ARI) flood event.

6.2.3 Climate

Climatic conditions have the potential to influence a range of Quarry-related impacts at surrounding residences and on the local environment. The climate in the vicinity of the Project Site is on the border of the Köppen climate classifications of “subtropical” (i.e. hot humid summer, with the rainfall pattern having a summer maximum) and “oceanic” (warm summers and mild winters with the wettest months during autumn and driest in spring).



This subsection provides a brief overview of the climatic conditions at the Project Site, focusing particularly on those aspects of the climate that are likely to influence the potential Quarry-related environmental impacts.

Data Sources

Meteorological data was sourced from the Scientific Information for Land Owners (SILO) database, managed by the Queensland Department of Environment and Science (DES) (**Table 5**). The program uses historical Bureau of Meteorology datasets and interpolation techniques to generate continuous daily time step synthetic climate data for any given location in Australia. Data was obtained for a point located at Latitude -34.80 degrees S, Longitude 150.80 degrees E, which is located approximately 2.5km south-east of the Project Site. The SILO dataset for the period January 1889 to August 2025 was generated on 14 August 2025.

The closest Bureau of Meteorology (BoM) station, Kiama Bowling Club (Station 068038), is located 17km to the north of the Project Site. SILO data obtained was compared to this BoM station to ensure the SILO data is consistent with recorded data at the station. The SILO data and Kiama Bowling Club BoM station had noticeable divergences in monthly rainfall averages, however, March remained the wettest month in both data sets. Other metrics had very limited divergences in the data averages recorded.

A meteorological station at the Project Site has been recording rainfall, wind and temperature since 2003. This information is collected for operational purposes and retained by the Applicant. Rainfall data recorded by the on-site meteorological station since September 2016 also indicates that March is the wettest month on average.

Table 5
Meteorological Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Temperature (°C) (1889 to 2025)													
Mean Maximum	25.2	25.2	24.2	22.1	19.5	17.1	16.5	17.6	19.7	21.5	22.9	24.4	21.3
Mean Minimum	17.7	17.9	16.7	14.1	11.6	9.5	8.3	8.9	10.4	12.5	14.4	16.3	13.2
Relative Humidity (%) (1889 to 2025)													
RH at Maximum Temperature	60.2	61.9	60.3	56.8	54.1	54.2	50.4	48.4	48.9	51.8	55.6	57.5	55.0
RH at Minimum Temperature	92.7	93.7	93.3	91.5	87.8	87.0	84.7	84.0	86.5	88.6	90.9	91.6	89.3
Rainfall (mm) (1889 to 2025)													
Mean Monthly Rainfall	124.0	140.4	159.8	132.0	119.5	127.7	95.8	80.3	73.9	91.0	94.9	91.6	1330.9
Mean Daily Rainfall	4.0	5.0	5.2	4.4	3.9	4.3	3.1	2.6	2.5	3.0	3.2	3.0	3.7
Evaporation (mm) (1889 to 2025)													
Mean Monthly Morton Evaporation	167.6	135.9	119.6	81.5	52.3	35.2	43.0	66.4	95.2	128.3	147.8	169.5	1242.3
Mean Daily Morton Evaporation	5.4	4.8	3.9	2.7	1.7	1.2	1.4	2.2	3.2	4.2	5.0	5.5	3.4
Source: SILO database (2025) – SILO grid point (Latitude: -34.80, Longitude: 150.80)													

Temperature and Humidity

Table 5 indicates that January is the hottest month, with a mean maximum temperature of 25.2°C and a mean minimum temperature of 17.7°C. July is the coldest month with a mean maximum temperature of 16.5°C and a mean minimum temperature of 8.3°C. Late summer and early autumn is typically the most humid time of the year.

Rainfall and Evaporation

Monthly average rainfall varies between 73.9mm and 159.8mm, with more rainfall in late summer and early autumn than late winter and early spring. Rainfall variability is greatest in the warmer months during Summer and Autumn. In general, monthly rainfall is generally quite consistent, with all months recording rainfall in nearly all years. Only 3 months within the SILO dataset recorded no rain.

Mean monthly evaporation varies throughout the year, from 35.2mm in June to 169.5mm in December. Mean yearly rainfall exceeds evaporation by approximately 88.6mm, indicating that the area is typically in water surplus.

Wind Conditions

Wind direction and speed information for the site was obtained from the Kiama (Bombo Headland) AWS. Prevailing winds throughout the year are from the north north-west, south south-west, and west north-west, with the highest wind speeds from southerly directions (Northstar, 2025).

6.3 Air Quality

6.3.1 Introduction

The following subsection provides an overview of the existing environment with respect to air quality at the Project Site. Potential impacts from the Proposed Modification are presented, and management and mitigation measures are proposed to reduce or prevent these impacts. This is followed by discussion of any residual impacts relating to the Proposed Modification.

An Air Quality Impact Assessment for the Proposed Modification was undertaken by Northstar Air Quality Pty Ltd (Northstar, 2025). The results of the assessment are detailed below and the full report is included as **Appendix 4**. For the purposes of this assessment, the undeveloped building envelopes (see Section 2.7) were included as sensitive receivers.

6.3.2 Existing Air Quality Setting and Assessment Criteria

The Project Site is located in an area with a climate where high rainfall rates minimise the majority of dust lift off from wind erosion and other ground-disturbing activities. In addition to the existing Quarry operations, other key sources of air pollution in the local area include:

- the Gerroa Water Recycling Plant;
- housing and other development activities; and
- various agricultural activities, including cropping and grazing.

For the purposes of defining background air quality, Northstar (2025) has utilised the deposited dust monitoring data for the Quarry and the closest air quality monitoring stations (Albion Park South and Wollongong AQMS) for particulates. **Table 6** presents the adopted background air quality utilised for assessment.

Table 6
Summary of Background Air Quality used in the Assessment

Pollutant	Ave Period and Units	Measured Value	Notes
Particles (as TSP) (derived from PM ₁₀)	Annual µg/m ³	29.1	Estimated on a TSP:PM ₁₀ ratio of 2.222:1
Particles (as PM ₁₀)	24-hour µg/m ³	Daily Varying	The maximum 24-hour PM ₁₀ concentration was 39.4µg/m ³
	Annual µg/m ³	13.1	
Particles (as PM _{2.5})	24-hour µg/m ³	Daily Varying	The maximum 24-hour PM _{2.5} concentration was 23.3µg/m ³
	Annual µg/m ³	4.8	
Dust deposition	Annual g/m ² /month ⁻¹	2.0	Difference in maximum allowable and incremental impact criteria

Source: Northstar (2025) – Table 8

Table 7 presents the air quality assessment criteria from the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2022) as relevant to this assessment.

Table 7
NSW EPA Impact Assessment Criteria

Pollutant	Averaging Period	Units ^(E)	Criterion	Notes
Particulates (as PM ₁₀)	24 hours	µg·m ⁻³ (A)	50	Numerically equivalent to the AAQ NEPM ^(B) standards and goals.
	annual	µg·m ⁻³	25	
Particulates (as PM _{2.5})	24 hours	µg·m ⁻³	25	
	annual	µg·m ⁻³	8	
Particulates (as TSP)	annual	µg·m ⁻³	90	
Particulates (as dust deposition)	annual ^(C)	g·m ⁻² ·month ⁻¹	2	Assessed as insoluble solids as defined by AS 3580.10.1
	annual ^(D)	g·m ⁻² ·month ⁻¹	4	

Notes:
(A): micrograms per cubic metre of air
(B): National Environment Protection (Ambient Air Quality) Measure
(C): Maximum increase in deposited dust level
(D): Maximum total deposited dust level

Source: Northstar (2025) – Table 3

NSW EPA do not provide air quality criteria for respirable crystalline silica (RCS). EPA VIC and EPA SA have adopted an annual average criterion for RCS of 3µg/m³ assessed as PM_{2.5} and PM₁₀ respectively. As PM₁₀ concentrations are shown to be greater than PM_{2.5} for the purposes of this assessment, EPA SA's conservative criterion of 3µg/m³ (assessed as PM₁₀) has been adopted. Northstar (2025) calculates RCS by adjusting the annual average PM₁₀ modelling results on a pro-rata basis for the determined maximum free silica content of the extracted material (conservatively assumed to be 95% weight for weight).

The NSW EPA classifies 'Large Emitters' of greenhouse gas as those emitting greater than 25,000t CO₂ per year. This trigger threshold has been adopted for the purposes of this assessment.

6.3.3 Assessment Methodology

Northstar (2025) undertook dispersion modelling using the NSW EPA approved CALPUFF atmospheric dispersion model. Modelling was performed in CALPUFF 3D mode, adopting a 'No-Obs' meteorological modelling simulation which allows for the inclusion of local topographical features and coastal fumigation effects.

Emission factors for activities including materials handling processes, truck movements on sealed and unsealed roads, screening, and wind erosion were adopted from the US EPA AP-42 emission factor compendium to represent particulate matter emissions resulting from Project operations.

Annual emission estimates were based on the assumption that operations proceed at a steady state throughout the year. Maximum potential 24-hour emission estimates were based on the assumption that maximum activity occurs on every day of the year, ensuring that potential worst-case meteorological conditions are assumed at the same time as potential worst-case emissions. Northstar (2025) note that worst-case emissions for the Project represent approximately 6.5 times the daily average emissions for the Project (highlighting the conservativeness of the adopted approach).

Potential impacts associated with off-site transportation activities were modelled as part of the assessment. To ensure a highly conservative assessment, Northstar (2025) assumed that all off-site truck movements followed the western route via Beach Road, as this route passes closer to surrounding receivers than the alternative northern route along Crooked River Road. Additionally, due to the proximity of several receivers to the Quarry operations, and therefore the cumulative exposure to dust from on-site activities, this route represents a worst-case scenario.

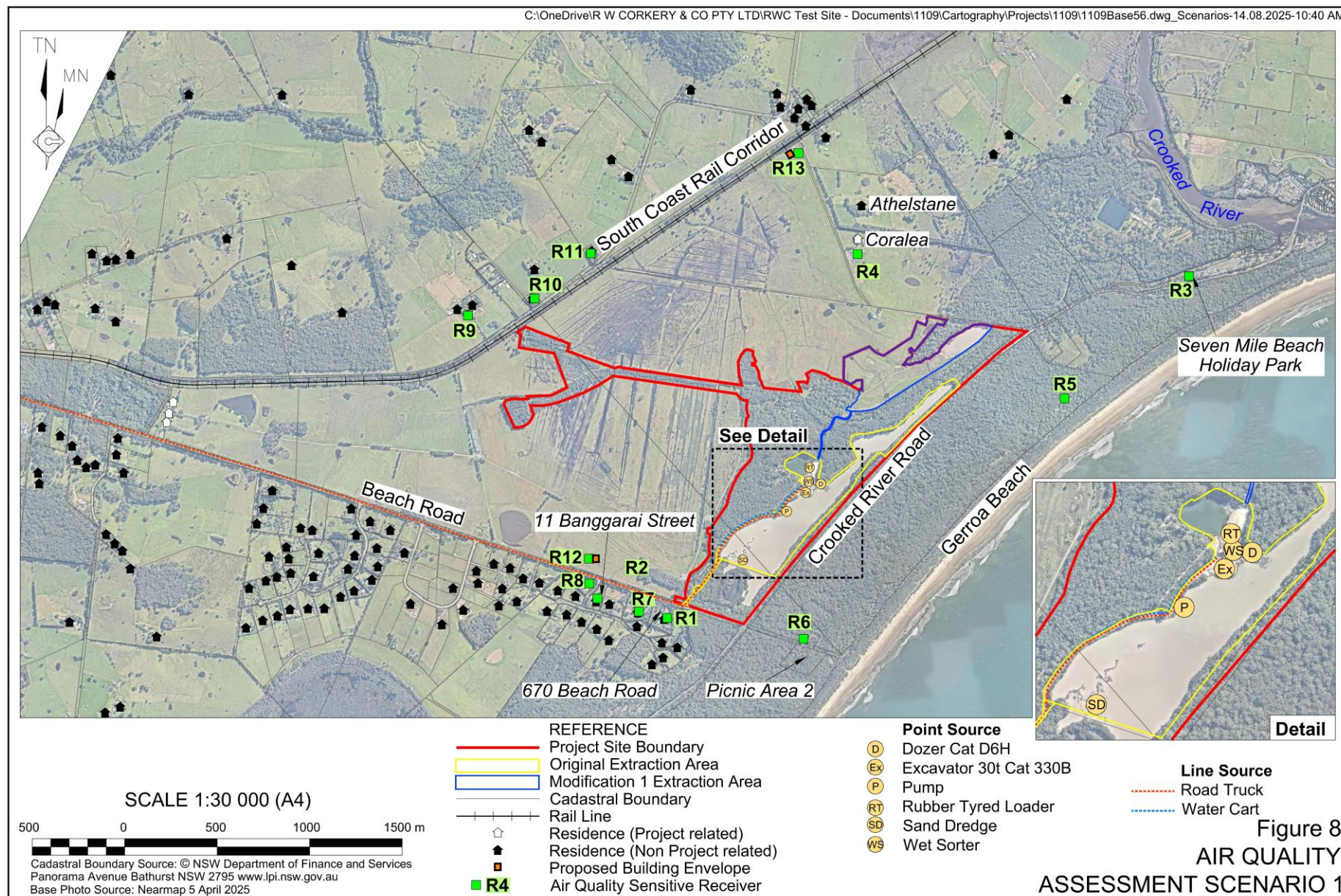
Figure 8 shows the scenario modelled by Northstar (2025) for the air quality impact assessment. Operations in the scenario focus on the extraction of material within the Original Extraction Area of the Project Site (i.e. the extraction area closest to residential receivers) and processing of dredged material. Site access and transportation remain via the existing transport route.

Further details relating to the assessment methodology and assumed emissions inventory are outlined in Northstar (2025).

6.3.4 Mitigation and Management Measures

The following management and mitigation measures would be implemented / would continue to be implemented as described within the *Air Quality Management Plan* included in the *Quarry Environmental Management Plan* for the Project Site.

- Seal the site access road 200m from the site entrance – complete.
- Minimise disturbance of land and undertake revegetation as soon as practicable.
- Restrict vehicle speeds on site to 20km/hr.
- Ensure all loads are covered with a tarpaulin or equivalent.
- Apply water on haulage routes (as required) to minimise dust generation.
- Minimise drop height during material unloading/loading.



- Limit load sizes to ensure material is not above the level of truck sidewalls.
- Continued monitoring of deposited dust emissions from the Project Site.
- Undertake all proposed activities in accordance with existing plans and approvals including the *Air Quality Management Plan* included in the *Quarry Environmental Management Plan*.

6.3.5 Assessment of Impacts

Particulates

Table 8 presents the predicted annual average TSP, PM₁₀, and PM_{2.5} concentrations (incremental and cumulative) for sensitive receivers in the vicinity of the Project Site as a result of the Proposed Modification. In summary, predicted annual average TSP, PM₁₀, and PM_{2.5} concentrations were all below the relevant criterion values. The highest predicted cumulative annual average TSP, PM₁₀ and PM_{2.5} concentrations (i.e. at the most affected sensitive receiver(s)) were:

- TSP: 29.6µg/m³ at R1 (compared with a criterion of 90µg/m³);
- PM₁₀: 13.3µg/m³ at R1 (compared with a criterion of 25µg/m³); and
- PM_{2.5}: 4.9µg/m³ at all receivers (compared with a criterion of 8µg/m³).

Table 8
Predicted Annual Average Concentrations – TSP, PM₁₀ and PM_{2.5}

Receiver	Annual Average Concentration (µg/m ³)								
	TSP			PM ₁₀			PM _{2.5}		
	Incremental	Background	Cumulative	Incremental	Background	Cumulative	Incremental	Background	Cumulative
Criterion	90			25			8		
Max. % of Criterion	0.5%	32.4%	32.9%	0.6%	52.5%	53.1%	<1.2%	59.6%	60.8%
R1	0.5	29.1	29.6	0.2	13.1	13.3	< 0.1	4.8	4.9
R2	0.2	29.1	29.3	< 0.1	13.1	13.2	< 0.1	4.8	4.9
R3	< 0.1	29.1	29.2	< 0.1	13.1	13.2	< 0.1	4.8	4.9
R4	< 0.1	29.1	29.2	< 0.1	13.1	13.2	< 0.1	4.8	4.9
R5	< 0.1	29.1	29.2	< 0.1	13.1	13.2	< 0.1	4.8	4.9
R6	< 0.1	29.1	29.2	< 0.1	13.1	13.2	< 0.1	4.8	4.9
R7	0.3	29.1	29.4	0.1	13.1	13.2	< 0.1	4.8	4.9
R8	0.4	29.1	29.5	0.1	13.1	13.2	< 0.1	4.8	4.9
R9	< 0.1	29.1	29.2	< 0.1	13.1	13.2	< 0.1	4.8	4.9
R10	< 0.1	29.1	29.2	< 0.1	13.1	13.2	< 0.1	4.8	4.9
R11	< 0.1	29.1	29.2	< 0.1	13.1	13.2	< 0.1	4.8	4.9
R12	0.3	29.1	29.4	< 0.1	13.1	13.2	< 0.1	4.8	4.9
R13	< 0.1	29.1	29.2	< 0.1	13.1	13.2	< 0.1	4.8	4.9

Source: Northstar (2025) – Table 15

As shown in **Table 8**, the maximum predicted incremental annual average PM₁₀ concentration at any sensitive receiver under the Proposed Modification is 0.2µg/m³ (at receiver R1). This predicted PM₁₀ concentration translated into a predicted respirable crystalline silica (RCS) impact of 0.15µg/m³ (i.e. 0.2µg/m³ x 75%). This result is significantly below the adopted annual average RCS criterion of 3µg/m³.

Table 9 presents the predicted annual average dust deposition rates (incremental and cumulative) as a result of the Proposed Modification. In summary, predicted annual average incremental and cumulative deposited dust rates were below the relevant criterion at all sensitive receivers (Northstar, 2025). The highest predicted cumulative annual average deposited dust rate was <0.1g/m²/month at all receivers compared with a criterion value of 4g/m²/month.

Table 9
Predicted Annual Average Dust Deposition Rates

Receiver	Annual average dust deposition (g/m ² /month)		
	Incremental	Background	Cumulative
Criterion	2.0	-	4.0
Max. % of Criterion	<0.1%	-	52.5%
R1	< 0.1	2.0	< 2.1
R2	< 0.1	2.0	< 2.1
R3	< 0.1	2.0	< 2.1
R4	< 0.1	2.0	< 2.1
R5	< 0.1	2.0	< 2.1
R6	< 0.1	2.0	< 2.1
R7	< 0.1	2.0	< 2.1
R8	< 0.1	2.0	< 2.1
R9	< 0.1	2.0	< 2.1
R10	< 0.1	2.0	< 2.1
R11	< 0.1	2.0	< 2.1
R12	< 0.1	2.0	< 2.1
R13	< 0.1	2.0	< 2.1
Source: Northstar (2025) – Table 16			

Tables 10 and **11** present the predicted maximum 24-hour average PM₁₀ and PM_{2.5} concentrations for the sensitive receivers at which the highest incremental impacts (R1) and highest cumulative impacts (R8) have been predicted. In summary, the results presented in **Tables 10** and **11** indicate that the Proposed Modification is not predicted to result in any exceedances of the maximum 24-hour average PM₁₀ and PM_{2.5} criteria at any sensitive receivers (Northstar, 2025).

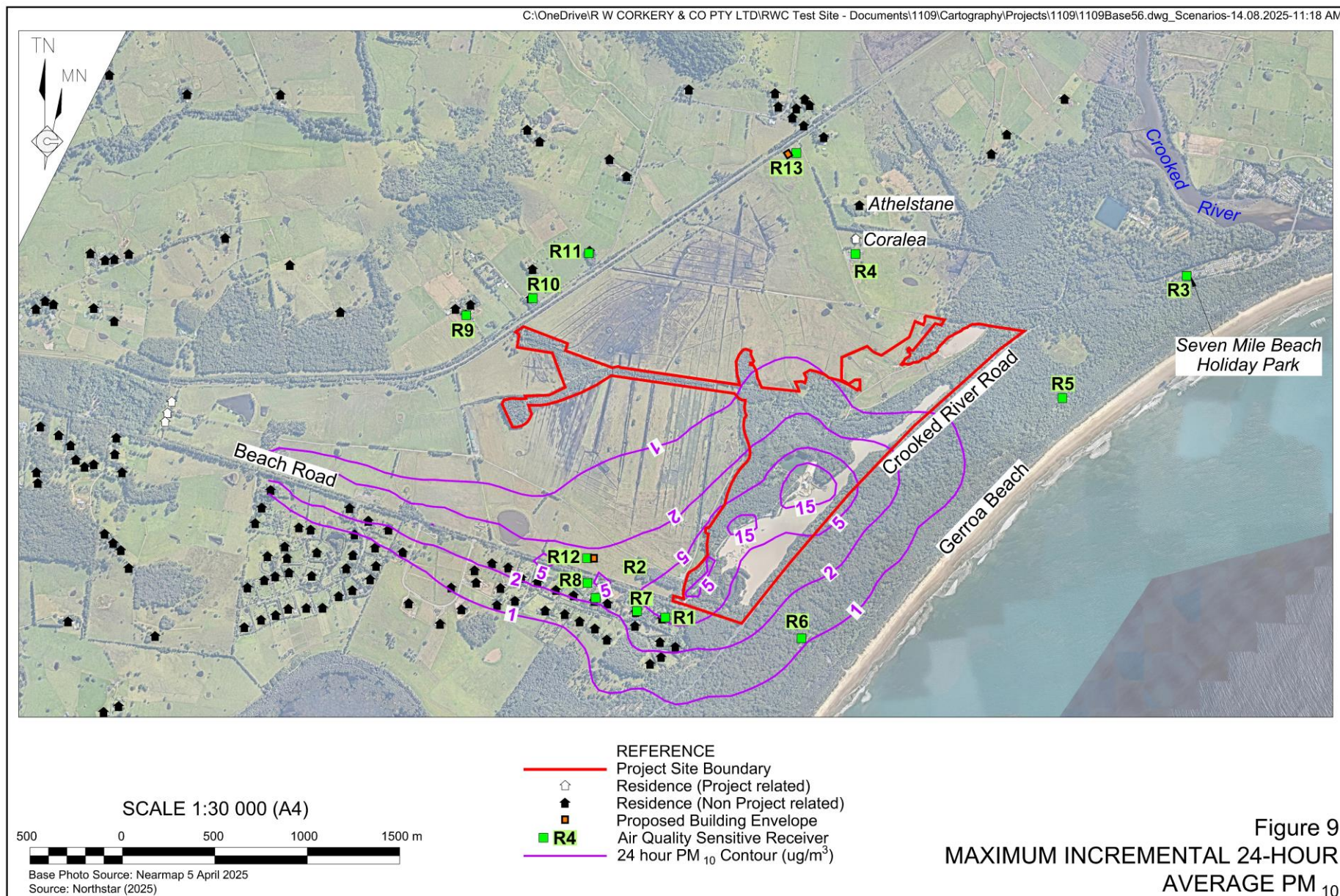
Table 10
Maximum 24-hour PM₁₀ Concentrations

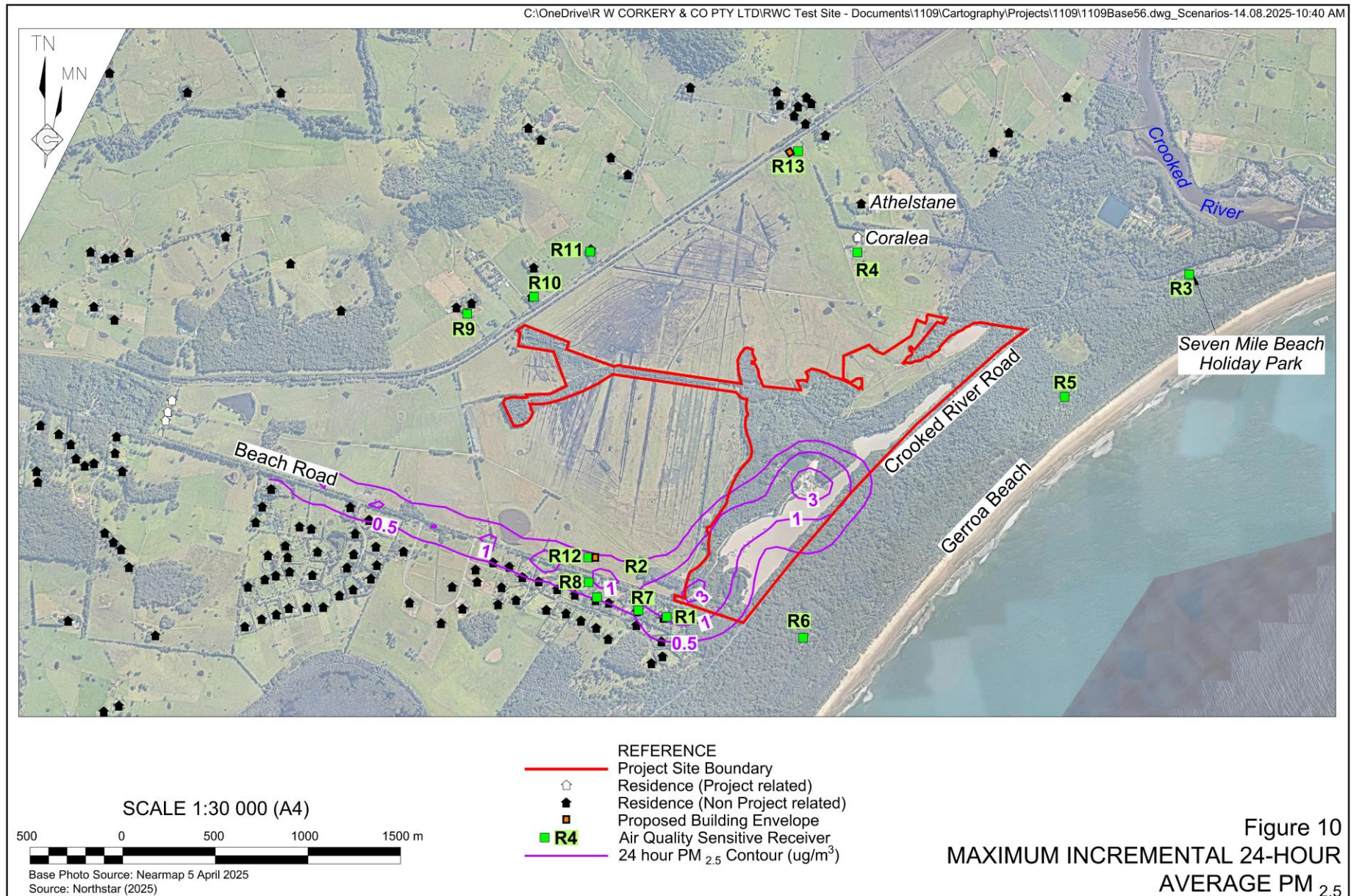
	24-hour average PM ₁₀ concentration (µg·m ³) Receptor 8				24-hour average PM ₁₀ concentration (µg·m ³) Receptor 1		
Date	Incr.	Bg.	Cumul.	Date	Incr.	Bg.	Cumul.
25/10/2021	1.1	39.4	40.5	30/06/2021	5.4	9.5	14.9
29/04/2021	2.3	33.9	36.2	8/07/2021	4.5	15.0	19.5
22/01/2021	1.5	33.1	34.6	14/07/2021	4.4	12.4	16.8
24/01/2021	1.3	33.1	34.3	22/06/2021	4.0	9.0	13.0
28/10/2021	1.1	30.6	31.7	22/05/2021	3.9	15.2	19.1
30/04/2021	2.2	27.4	29.6	24/06/2021	3.8	10.2	14.0
18/12/2021	1.3	28.3	29.6	1/07/2021	3.8	14.1	17.9
29/10/2021	0.1	28.6	28.7	24/05/2021	3.7	7.5	11.1
12/02/2021	1.4	26.4	27.8	2/06/2021	3.6	16.7	20.3
27/04/2021	<0.1	27.7	27.8	31/07/2021	3.1	14.2	17.3
These data represent the highest Cumulative Impact 24-hour PM ₁₀ predictions as a result of the operation of the Project.				These data represent the highest Incremental Impact 24-hour PM ₁₀ predictions as a result of the operation of the Project.			
Note: Incr. = incremental impact, Bg. = background, Cumul. = cumulative impact							
Source: Northstar (2025) – Table 18							

Table 11
Maximum 24-hour PM_{2.5} Concentrations

	24-hour average PM _{2.5} concentration (µg·m ³) Receptor 8				24-hour average PM _{2.5} concentration (µg·m ³) Receptor 1		
Date	Incr.	Bg.	Cumul.	Date	Incr.	Bg.	Cumul.
29/04/2021	0.4	23.3	23.8	30/06/2021	1.1	5.8	6.9
30/04/2021	0.3	21.9	22.4	8/07/2021	1.0	6.2	7.2
3/05/2021	0.4	13.4	13.8	22/05/2021	0.9	6.8	7.7
22/08/2021	0.3	12.6	12.9	14/07/2021	0.9	6.6	7.5
25/01/2021	0.2	12.4	12.6	22/06/2021	0.9	3.9	4.8
24/01/2021	0.2	12.4	12.6	24/05/2021	0.8	2.9	3.7
28/10/2021	0.1	12.0	12.2	2/06/2021	0.8	5.9	6.7
27/04/2021	<0.1	12.1	12.2	24/06/2021	0.8	3.1	3.9
18/12/2021	0.3	11.5	11.8	1/07/2021	0.7	5.6	6.3
29/08/2021	0.6	10.7	11.3	10/06/2021	0.7	3.5	4.2
These data represent the highest Cumulative Impact 24-hour PM _{2.5} predictions as a result of the operation of the Project.				These data represent the highest Incremental Impact 24-hour PM _{2.5} predictions as a result of the operation of the Project.			
Note: Incr. = incremental impact, Bg. = background, Cumul. = cumulative impact							
Source: Northstar (2025) – Table 19							

Figure 9 presents a contour plot showing the maximum predicted incremental 24-hour average PM₁₀ particulate emissions as a result of Quarry operations under the Proposed Modification. **Figure 10** presents a contour plot showing the maximum predicted incremental 24-hour average PM_{2.5} particulate emissions as a result of Quarry operations under the Proposed Modification.





Greenhouse Gas

Table 12 presents the calculated greenhouse gas emissions for operations at the Quarry under the Proposed Modification. In summary, Quarry operations under the Proposed Modification would generate annual direct greenhouse gas emissions (i.e. Scope 1 emissions) of 652.2t CO₂/year. Northstar (2025) concluded that the total annual greenhouse gas emissions generated by the Proposed Modification would be:

- significantly below the 25,000t NSW EPA threshold for Large Emitters;
- equivalent to approximately 0.001% of annual greenhouse gas emissions generated in NSW; and
- equivalent to approximately 0.00015% of annual greenhouse gas emissions generated in Australia.

Table 12
Calculated Greenhouse Gas Emissions for the Proposed Modification

Scope		Activity Rate	Units	Energy Content	Units	Emission Factor		Emissions (t CO ₂ /year)
1	Diesel fuel in plant and machinery on site	240.0	kL·yr ⁻¹	38.6	GJ·kL ⁻¹	70.2	kg CO ₂ -e·GJ ⁻¹	652.2
Scope 1 (subtotal)								652.2
2	Electricity consumption	6,000	kWh·yr ⁻¹	-	-	0.66	kg CO ₂ -e·kWh ⁻¹	4.0
Scope 2 (subtotal)								4.0
3	Diesel fuel in plant and machinery on site	240.0	kL·yr ⁻¹	38.6	GJ·kL ⁻¹	17.3	kg CO ₂ -e·GJ ⁻¹	160.3
	Material transport	152.4						101.7
	Employee travel	1.4						0.8
	Electricity consumption	6 000	kWh·yr ⁻¹	-		0.04	kg CO ₂ -e·kWh ⁻¹	0.2
Scope 3 (subtotal)								263.1
Source: Northstar (2025) – Table 21								

6.3.6 Conclusion

Northstar (2025) concludes that there are no predicted exceedances of the annual average TSP, PM₁₀, and PM_{2.5} criterion, annual average adopted RCS criterion, annual average deposited dust criterion, 24-hour PM₁₀ and PM_{2.5} criterion, or the greenhouse gas emission ‘Large Emitter’ threshold at surrounding sensitive receivers as a result on the Proposed Modified.

6.4 Water and Acid Sulfate Soils

6.4.1 Introduction

The following subsection provides an overview of the existing environment with respect to water and acid sulfate soils within and surrounding the Project Site. Potential impacts from the Proposed Modification are presented, and management and mitigation measures are proposed to reduce or prevent these impacts. This is followed by discussion of any residual impacts relating to the Proposed Modification.

A Surface and Groundwater Assessment for the Project Site was undertaken by Cardno Pty Ltd in 2018 (Cardno, 2018b) to support Modification 1. Additionally, water and acid sulfate soils at the Project Site is managed in accordance with the *Water Management Plan*, with routine monitoring results published each year in the Annual Review. A summary of the findings of previous assessment and annual testing are detailed below with consideration of the effects of the Proposed Modification.

6.4.2 Existing Setting

6.4.2.1 Hydrogeology

Quaternary alluvial sands form the shallow water table aquifer at the Project Site and surrounding low-lying areas, with local recharge primarily through direct rainwater infiltration and seepage of surface water from streams within the catchment. Prevailing groundwater flow is towards Blue Angle Creek from topographically higher areas to the south, west and east, with the Berry Siltstone aquifer to the southwest of the Project Site forming a topographical high point (Cleary Bros, 2023).

Water resources in the region are managed under the rules of the New South Wales *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023*. The Project Site is located within the Metropolitan Coastal Sands Groundwater Source.

6.4.2.2 Groundwater Levels

The Applicant maintains nine boreholes for the purpose of groundwater monitoring, including one monitoring location outside of the Project Site boundary approximately 1km west (**Figure 7**). Annual reporting for the Quarry provides a summary and analysis of water level changes within the groundwater monitoring network. Monitoring records indicate that groundwater levels at the Quarry vary between 0.08m AHD and to 3.44m AHD depending on the monitoring location (Cleary Bros, 2023).

Recorded groundwater level trends generally correlate with rainfall, indicating that groundwater levels at the Quarry are largely influenced by climate and rainfall. Analysis of groundwater monitoring conducted prior to Modification 1 indicated that groundwater levels at the Project Site had not been adversely affected by sand dredging operations (Cardno, 2018b). Since this time routine monitoring conducted monthly at the Project Site indicates that groundwater levels have remained consistent with long term averages (Cleary Bros, 2023). The monitoring data indicates the dredge-based sand extraction does not generate an obvious or significant decline in

groundwater levels around the Extraction Areas due to the return of processing water to the dredge ponds combined with the high permeability, high specific yield, and high rainfall recharge rates occurring with the sand aquifer system with the groundwater system remaining in equilibrium.

6.4.2.3 Groundwater Quality

Groundwater at the Quarry is typically of neutral to slightly acidic pH (noting that the bores further from the dredge ponds have consistently recorded acidic pH due to the influence of acid sulphate soils), and fresh to slightly brackish salinity. Salinity generally increases with proximity to Blue Angle Creek, while bores to the south within the Berry Siltstone unit also exhibit elevated salinity. Trace metals are typically present in relatively low concentrations, with some elevated concentrations of nutrients present due to the surrounding agricultural land uses.

The *Water Management Plan* for the Quarry provides a detailed summary of all baseline and operational monitoring data as well as water quality objectives.

6.4.2.4 Groundwater Dependent Ecosystems

The closest Groundwater Dependent Ecosystems (GDEs) noted within the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023* is the Coomonderry Swamp that is located approximately 2km southwest of the Project Site (**Figure 7**). Coomonderry Swamp is partially isolated from the Project Site by the Berry Siltstone aquifer to the southwest forming a topographical highpoint.

The High Priority Groundwater-Dependent Ecosystem Map within the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023* identifies groundwater dependent vegetation ecosystems within 200m of the Project Site. The NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW, 2025) High Ecological Value Aquatic Ecosystems (HEVAE) identifies vegetation areas within the Project Site as having a medium to high probability of being groundwater dependent. Some zones of vegetation surrounding the Project Site are identified as high to very high value potential GDEs.

Monitoring of groundwater levels has shown groundwater levels during Quarry operations to be generally consistent with long term averages, indicating no significant groundwater drawdown impact associated with operations at the Project Site (Cleary Bros, 2023).

No additional water supply works are planned under the Proposed Modification.

6.4.2.5 Existing Quarry Water Balance

The site water balance presented in the *Water Management Plan* is based on the following.

- Surface water data and predicted site usage data prepared by Dr Camilla West of Hydro Engineering and Consulting (HEC) as part of the *Gerroa Sand Quarry Dredge Pond Water Balance and Creek Impact Assessment* (HEC, 2019).
- The Aquifer Interference Assessment prepared by Iain Hair of Douglas Partners (DP) as part of the *Groundwater Issues Report* (DP, 2019).
- Rainfall and evaporation data sourced from the SILO database.

The volumes of the two dredge pond Extraction Areas are variable in response to rainfall, groundwater level fluctuations, and dredging operations. Movement of water between the two dredge ponds and the underlying/surrounding groundwater aquifer is dependent upon:

- rainfall inflow into the dredge ponds;
- evaporation from the dredge ponds;
- pumping of water to/from the dredge ponds (e.g. as part of dredging operations, and to balance water levels between the two dredge ponds);
- runoff of water from the processing plant back into the dredge pond (e.g. waste slurry water, runoff from product stockpiles);
- extraction of material from the dredge pond below the groundwater level, creating a void;
- water entrained in product and exported from the Project Site; and
- water extracted and used for other operational purposes (e.g. dust suppression, vegetation watering).

Table 13 presents a comparison of groundwater take at the Quarry under the approved operations and under the Proposed Modification. Values for rainfall and evaporation are taken from the *Water Management Plan* (SILO data up to January 2023) and represent values for the Project Site where each of the two dredge pond Extraction Areas are at their maximum extent. As shown in **Table 13**, the Proposed Modification would result in a net annual increase in groundwater take of approximately 13.3ML compared to approved operations.

The Applicant currently holds Water Access Licence (WAL) 43272 with a share allocation of 56 units (ML) from the water source Metropolitan Coastal Sands Groundwater Source. In addition, the Applicant also holds WAL 43271 with a share allocation of 50 units from the same source. Each individual WAL allocation is greater than the 26.1ML expected to be taken from the groundwater aquifer annually under the Proposed Modification.

In the event that the Proposed Modification is approved, the water balance presented in the *Water Management Plan* will be updated using the latest available data.

6.4.2.6 Acid Sulphate Soils

The Project Site is located on low lying coastal land with alluvial and estuarine sediments, including the topsoil layer having been confirmed as acid sulfate soils (Douglas Partners, 2018).

Routine testing of pH in stockpiled material, surface water, and groundwater at the Project Site is conducted, including continuous monitoring stations (Cleary Bros, 2023). While no compliance issues related to acid sulphate soils were reported in the most recent Annual Review, monitoring has indicated multiple instances of background levels exceeding the current triggers (Cleary Bros, 2023).

Table 13
Annual Average Groundwater Take – Existing Operations and Proposed Modification

Water Component	Assumption/Source	Existing Operations (80,000tpa)	Proposed Modification (120,000tpa)
MOD 1 Extraction Area Pond			
Water Outflows			
Evaporation	Maximum 15.4ha extent	191.3ML	191.3ML
Water in Dredge Slurry	Water proportion in slurry = 0.00029 of tonnage	23.2ML	34.8ML
Water Entrained in Product	Product sand moisture content of 5% Sand density of 2.3t/m ³	(1.7ML) ¹	(2.6ML) ¹
Water Inflow to Replace Removed Sand	Sand density of 2.3t/m ³ Average groundwater level is 1m below the surface. At 80,000t rate: – sand removal creates 34,783m ³ void; – void surface area increases by 1ha per year; – void below groundwater table is 24,783m ³ At 120,000t rate: – sand removal creates 52,174m ³ void; – void surface area increases by 1.5ha per year; – area of void below groundwater table is 37,174m ³	24.8ML	37.2ML
<i>Water Outflow (subtotal)</i>		241.3ML	263.3ML
Water Inputs			
Rainfall	Maximum 15.4ha extent	205.0ML ²	205.0ML
Return Water from Processing Plant (pumped slurry return and stockpile drainage)	All slurry water returns to dredge pond minus water entrained in product	21.5ML	32.2ML
<i>Water Input (subtotal)</i>		226.5ML	237.2ML
Net Water Take – MOD 1 Extraction Area Pond		12.8ML	26.1ML
Original Extraction Area Pond			
Water Outflows			
Evaporation	Exposed Pond area 18.5ha	229.8ML	229.8ML
On-site Dust Suppression	Reported Value	1.1ML	1.1ML
Vegetation Watering	Reported Value	0.1ML	0.1ML
<i>Water Outflow (subtotal)</i>		231.0ML	231.0ML
Water Inputs			
Rainfall	Exposed Pond area 18.5ha	246.2ML	246.2ML
<i>Water Input (subtotal)</i>		246.2ML	246.2ML
Net Water Take – Original Extraction Area Pond		-15.2ML	-15.2ML
Cumulative Water Take			
Net Water Take – MOD 1 Extraction Area Pond		12.8ML	26.1ML
Net Water Take – Original Extraction Area Pond		(-15.2ML) ²	(-15.2ML) ²
Cumulative Net Water Take		12.8ML	26.1ML
Notes			
1: Water entrained within products is encompassed by the “Water in Dredge Slurry”.			
2: The <i>Greater Metropolitan Region Groundwater Sources Water Sharing Plan</i> does not permit crediting of water returned to an aquifer. Therefore, whilst the Original Extraction Area has a negative water take (i.e. net positive inputs) this is assumed to be zero for the purposes of calculating cumulative water take.			
Source: Cleary Bros			

6.4.3 Mitigation and Management Measures

Mitigation and management measures relating to water and acid sulfate soils would include the continued implementation of existing management measures and monitoring programs outlined within the *Water Management Plan*, and the *Acid Sulphate Soil Management Plan*, which forms part of the *Water Management Plan*.

Key ongoing water and acid sulfate soil management measures would include:

- ongoing regular monitoring of groundwater levels to identify trends and potential Quarry-related drawdown;
- ongoing real-time monitoring of water levels and pH within the dredge ponds, including automated alerts to provide for proactive management / intervention to prevent excessive drawdown or pH levels beyond objectives;
- transfer of water between dredge ponds to ensure water levels are balanced;
- treatment of pond water with lime, if required, to buffer pH levels;
- monitoring and management acid sulphate soils, including treatment of exposed dredge pond batters, treatment of stockpiled material, return of fines at sufficient depth to limit oxidation, and monitoring of leachate from stockpiled material; and
- regular review of operational water use and groundwater take calculations to ensure correct reporting of groundwater take against the allocations held to cover Quarry operations.

These management measures would provide for effective management of both groundwater quality and would ensure that water take remains within licenced limits with no adverse impacts to surrounding groundwater dependent ecosystems.

6.4.4 Assessment of Impacts

6.4.4.1 Groundwater Take

Changes that would occur as a result of the Proposed Modification that are relevant to assessing groundwater impacts include:

- an increase to the product transportation rate from 80,000tpa to 120,000tpa, and related increases in the extraction and processing of raw materials.

The primary direct impacts of the Proposed Modification on groundwater would include a net annual increase in water take of 13.3ML composing:

- an increase in water take in the form of water entrained in product from 1.7ML to 2.6ML (net increase of 0.9ML) annually; and
- an increase in water take in the form of inflow from the surrounding groundwater aquifer to occupy the void created by sand removal below the water table from 24.8ML to 37.2ML (net increase of 12.4ML) annually.

The Proposed Modification would result in a net annual groundwater take increase of 13.3ML, with the annual operational groundwater demand of the Quarry under the Proposed Modification equivalent to approximately 26.1ML².

The total predicted groundwater take for the Quarry would therefore remain well below the available allocation of 56ML held for the *Metropolitan Coastal Sands Groundwater Source* under WAL 43272 (and significantly below the total allocation of 106ML held by the Applicant for the same source). This satisfies the requirement under the *Aquifer Interference Policy 2012* (AIP) for mining activities to account for water take through purchase of Water Access Licences (WALs) within affected water sources.

6.4.4.2 Groundwater Levels and Quality

As noted in Section 6.4.2.2, the recorded groundwater level trends are largely influenced by climate and rainfall occurrence (Cleary Bros, 2023) with historic modelling indicating sand dredging operations have had minimal impact on groundwater levels (Cardno, 2018b). Based on the continued low overall water take and historic and ongoing monitoring indicating no significant impact to groundwater levels, it is anticipated that any risk of impacts to Groundwater Dependent Ecosystems in the vicinity of the Project Site would not be significantly increased by the Proposed Modification.

The Proposed Modification is also expected to have no significant impact upon water quality given the:

- Proposed Modification does not propose to change the depth or extent of extraction (and therefore no materials or areas of groundwater with differing chemical / geochemical properties would be encountered);
- Proposed Modification would result in a minimal change in total water take or groundwater levels (and therefore minimal change in the existing levels of exchange of water between the dredge pond and surrounding aquifer); and
- continued implementation of the existing water quality monitoring and management measures.

The Proposed Modification would also have no significant influence upon the frequency or volume of any discharges which would continue to be dictated by significant rain events or floods events exceeding the 1 in 100 year ARI event. It is noted no controlled discharges have been required to date.

6.4.4.3 Minimal Impact Considerations

In addition to the requirement of the *Aquifer Interference Policy 2012* (AIP) to account for water take mining activities must comply with the minimal impact considerations which comprise a series of thresholds for water levels and water quality. **Table 14** presents the AIP Minimal Impact Considerations for Coastal Sands water sources in NSW and assesses the Proposed Modification against these considerations.

² At maximum 120,000tpa, maximum extent of dredge ponds and average climatic conditions.

Table 14
Minimal Impact Considerations for Coastal Sands Water Sources

Minimal Impact Consideration	Assessment
Water table Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic “post-water sharing plan” variations, 40m from any: a) high priority groundwater dependent ecosystem; or b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan. A maximum of a 2m decline cumulatively at any water supply work.	The closest high priority GDE identified within Schedule 4 of the <i>Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023</i> is the Coomonderry Swamp that is located approximately 1.4km southwest of the Project Site (Figure 7). The Coomonderry Swamp is partially isolated from the Quarry Site by the Berry Siltstone aquifer to the southwest forming a topographical highpoint. No high priority groundwater dependent culturally significant sites are listed under the <i>Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023</i>. The High Priority Groundwater-Dependent Ecosystem Map within the <i>Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023</i> identifies groundwater dependent vegetation ecosystems (not high priority) within 200m of the Project Site. Monitoring of groundwater levels has shown groundwater levels during Quarry operations to be generally consistent with long term averages, indicating no significant groundwater drawdown impact associated with operations at the Project Site (Cleary Bros, 2023). Therefore, given the low increase in total water take and large surface area of the dredge ponds a 2m decline in the water table at any surrounding water supply works could not practically occur.
Water pressure A cumulative pressure head decline of not more than a 2 m decline, at any water supply work.	Not applicable in an unconfined aquifer.
Water quality Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity.	Monitoring of water quality in the dredge pond has been undertaken on a monthly basis since 2007, with additional groundwater quality monitoring via a series of groundwater monitoring bores occurring since 2009. Groundwater quality in the vicinity of the Project Site is highly variable, largely as a result of seasonal changes and influences from naturally occurring acid sulphate soils and brackish estuary water. Variability in water quality within the dredge pond (primarily parameters driven by changes in water nutrient balance) has largely been attributed to agricultural activities (e.g. use of fertiliser, stock) upgradient and outside of the Project Site (Cleary Bros, 2023). Potential impacts associated with acid sulphate soil at the Project Site are managed in accordance with the <i>Acid Sulphate Soil Management Plan</i> which forms part of the approved <i>Water Management Plan</i>. Given the low increase in water take and previous monitoring results, it is considered that the Proposed Modification would not result in any significant change to these existing conditions.

6.4.4.4 Acid Sulfate Soils

The Proposed Modification would not expose any additional areas of acid sulfate soils nor require the management of a greater volume of acid sulfate soil material. The principal change with the potential to impact acid sulfate soil management is the greater rate of extraction and processing. However, it is considered that this would not result in any increased risk of acidification or require any change to the currently approved approach to management of acid sulfate soils as detailed in the *Water Management Plan*. This is concluded on the basis of the following.

- There would not be a significant increase in water take or reduction in groundwater levels. Therefore, there would be a minimal risk of increased acidification of surrounding acid sulfate soils.

- The increased rate of fines production would continue to be managed through sub-aqueous disposal within the dredge pond which would ensure the risk of oxidation remains limited.

6.5 Other Environmental Considerations

The Applicant considers that the remaining environmental impacts associated with the ongoing operations under MP05_0099 (Mod 1), as modified, would be unaffected and remain generally consistent with existing approved operations. **Table 15** presents a brief assessment for each of these issues.

Table 15
Assessment of Impacts for Remaining Environmental Issues

Page 1 of 2

Environmental Aspect	Assessment of Impacts
Traffic and Transportation	The Proposed Modification would not alter the approved maximum or average heavy vehicle movement limits for the Quarry or the proportional distribution of Quarry-related traffic using the approved transport routes to/from the north or south of the Project Site. The Proposed Modification would also not increase the maximum vehicle size or largest heavy vehicle configuration used for product despatch at the Quarry. However, the proportion of larger vehicles used for product despatch may increase as a result of the Proposed Modification.
Noise and Vibration	The Proposed Modification would not result in changes to existing plant (i.e. there would be no new or larger items of equipment), equipment/plant sound power levels, or the maximum intensity of simultaneous operations at the Project Site as modelled for the previous noise impact assessment. Rather, the increase in production would result in a greater number of operational hours during the year. However, there would be no change to the nature and extent of noise impacts as a result of the Proposed Modification. Noise management, including compliance with existing noise criteria for sensitive receivers under Condition 2 of Schedule 3 of MP05_0099 (Mod 1), would continue to be managed in accordance with the <i>Noise Management Plan</i> which forms Appendix C of the approved <i>Quarry Environmental Management Plan</i>.
Surface Water	Surface water management would continue to be undertaken in accordance with the approved measures outlined within the <i>Water Management Plan</i> . These measures have been considered in light of the Proposed Modification and no further measures are considered necessary. No change in impacts to surface water are expected to occur as part of the Proposed Modification.
Flooding	The Proposed Modification would not result in any change in the flood storage capacity of the Project Site and therefore would have no effect on flooding impacts.
Visibility	The Proposed Modification would not result in any changes to the visibility of the Project Site and would therefore not change visual amenity impacts for surrounding receivers.
Soil Contamination, and Agricultural Suitability	All disturbance would remain within the approved limit of disturbance at the Project Site. No additional vegetation clearing or soil stripping would be required as a result of the Proposed Modification. Management of these aspects would continue to be undertaken in accordance with the approved management plan(s). No change in impacts to these aspects are expected to occur as a result of the Proposed Modification.
Aboriginal Heritage	
Biodiversity	

Table 15 (Cont'd)
Assessment of Impacts for Remaining Environmental Issues

Page 2 of 2

Environmental Aspect	Assessment of Impacts
Hazards and Chemicals	The Proposed Modification would not introduce any additional hazards or chemicals to the Project Site. Existing hazards and chemicals would continue to be managed in accordance with relevant management plans and Australian Standards.
Socio-Economic	Given that the proposed impacts are assessed as remaining within the existing approved impacts and/or remaining within applicable criteria, it is considered that the Proposed Modification would not result in any additional negative social impacts. From an economic perspective it is considered that the Proposed Modification would have a positive effect. Further discussion in relation to the public interest is provided in Section 7.10.

7. Justification of the Proposed Modification

7.1 Introduction

As a conclusion to the *Modification Report*, the Proposed Modification has been evaluated and justified through consideration of its potential impacts on the environment and potential benefits to the local and wider community.

The evaluation of the Proposed Modification is undertaken by firstly assessing the statutory requirements that apply to the modification through consideration of:

- Section 4.56(1) of the EP&A Act in relation to the permissibility of the Proposed Modification to development consent for State Significant Development;
- Section 4.15(1) of the EP&A Act in relation to the evaluation of applications for development in general; and
- Section 1.3 of the EP&A Act in relation to the objects of the Act.

The Proposed Modification is then evaluated as a whole against the principles of Ecologically Sustainable Development (ESD) in order to provide further guidance as to the acceptability of the Proposed Modification.

In assessing whether the development and operation of the Proposed Modification is justified, consideration has been given both to biophysical and socio-economic factors including the predicted residual impacts on the local and broader environment and the potential benefits of the Proposed Modification. This section also considers the consequences of the Proposed Modification not proceeding.

7.2 Action Taken to Avoid/Minimise Impacts

The following presents the actions that have been or would be taken to avoid and minimise impacts associated with the Proposed Modification.

- The various management and mitigation measures outlined within the existing approved management plans and those identified in Section 6 would be implemented.
- The Applicant would continue to consult with the community regarding Project Site related impacts.

7.3 Consistency with Strategic Context

The Proposed Modification is generally consistent with the various strategic documents for the Kiama and Shoalhaven LGAs, as described in Section 2. In particular, the Proposed Modification would:

- continue to provide economic support to the Kiama and Shoalhaven LGAs through the employment of local people, payment of contributions, and spending on consumables and services for the Project Site; and
- continue to provide construction materials for use in continued development within the LGAs including housing, infrastructure, and businesses, thereby supporting continued population growth and the facilities required to support that growth.

7.4 Statutory Requirements

7.4.1 Section 4.56(1) Considerations (EP&A Act)

As described in Section 1.1, the Proposed Modification is being made under Section 4.56(1) of the EP&A Act which is provided in full below.

- (1) *A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the Court and subject to and in accordance with the regulations, modify the development 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 the consent was originally granted and before that consent as originally granted was modified (if at all), and*
 - (b) *it has notified the application in accordance with—*
 - (i) *the regulations, if the regulations so require, and*
 - (ii) *a development control plan, if the consent authority is a council that has made a development control plan that requires the notification or advertising of applications for modification of a development consent, and*
 - (c) *it has notified, or made reasonable attempts to notify, each person who made a submission in respect of the relevant development application of the proposed modification by sending written notice to the last address known to the consent authority of the objector or other person, and*
 - (d) *it has considered any submissions made concerning the proposed modification within any period prescribed by the regulations or provided by the development control plan, as the case may be.*

The following provides an evaluation of the Proposed Modification against these provisions.

Substantially the Same Development

Section 3.7 provides a detailed justification for the Proposed Modification remaining “substantially the same development” as that currently approved under MP05_0099 (Mod 1).

Consultation with the relevant Minister, public authority or approval body

This is a matter for DPHI to consider during its assessment of the Proposed Modification.

Notification of the Application

This is a matter for DPHI to consider, however, it is anticipated that DPHI will notify the application to relevant stakeholders.

Submissions Regarding the Proposed Modification

This is a matter for the DPHI to consider, however, the Applicant would be pleased to respond to any submissions received by DPHI during the assessment process.

7.4.2 Section 4.15(1) Considerations (EP&A Act)

Section 4.15(1) of the EP&A Act sets out the matters for consideration by a consent authority when determining an application for development consent.

(1) *Matters for consideration—general*

In determining a development application, a consent authority is to take into consideration such of the following matters as are of relevance to the development the subject of the development application:

(a) *the provisions of:*

- (i) *any environmental planning instrument, and*
- (ii) *any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and*
- (iii) *any development control plan, and*
- (iiia) *any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and*
- (iv) *the regulations (to the extent that they prescribe matters for the purposes of this paragraph), and*
- (v) *(Repealed)*

that apply to the land to which the development application relates,

- (b) *the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,*
- (c) *the suitability of the site for the development,*
- (d) *any submissions made in accordance with this Act or the regulations,*
- (e) *the public interest.*

The following provides an evaluation of the Proposed Modification against these provisions.

Environmental Planning Instruments, Plans and Regulations (Section 4.15(1a))

All relevant environmental planning instruments, plans and regulations are addressed in Section 4. In summary, the Proposed Modification is permissible and consistent with the aims and objectives of relevant local and State environmental legislation and guidelines.

Likely Impacts of the Development (Section 4.15(1b))

Section 6 provides an assessment of the environmental factors potentially impacted by the Proposed Modification. The proposed management and mitigation measures would limit potential environmental impacts and the Proposed Modification would not generate adverse environmental impacts beyond those already approved.

Suitability of the Site (Section 4.15(1c))

Operations have been undertaken at the Project Site for approximately 55 years and the existing operation is approved to continue operating until 31 July 2038.

Submissions (Section 4.15(1d))

It is anticipated that DPHI will take any submissions into consideration during the assessment of this application.

The Public Interest (Section 4.15(1e))

The Applicant considers that the Proposed Modification serves the public interest as it would allow for the continued safe and efficient operation of the Project Site. The increased supply of raw materials for the construction industry would maintain downward pressure on prices and encourage competition. Employment of local personnel at the Project Site also provides additional flow-on benefits to the local community. Additionally, the environmental outcomes would be consistent with existing Project Site operations resulting in no additional significant adverse impacts.

The alternative of seeking approval for a separate and additional quarry operation in order to supply the required raw material volumes would likely result in greater environmental impacts and increased costs of supply. Not proceeding with the Proposed Modification would also result in constrained raw material supply and upward pressure on supply costs.

It is therefore concluded that the Proposed Modification is in the public interest through the continued operation of the Project Site in a safe and environmentally responsible manner and the provision of ongoing and improved local economic benefits.

7.4.3 Environmental Planning and Assessment Act 1979 (EP&A Act)

The objects of the EP&A Act are described in Section 1.3 of the Act as follows.

The objects of this Act are as follows:

- a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,*
- b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,*
- c) to promote the orderly and economic use and development of land,*
- d) to promote the delivery and maintenance of affordable housing,*
- e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,*
- f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),*
- g) to promote good design and amenity of the built environment,*
- h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,*
- i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,*
- j) to provide increased opportunity for community participation in environmental planning and assessment.*

The Proposed Modification would not limit the achievement of the objects of the EP&A Act and would in effect assist with the achievement of objectives to:

- promote the social and economic welfare of the local community through the efficient and continued economic benefits of the operation; and
- promote orderly development of the sand resource.

7.5 Consistency with Community Views

Key matters of interest relating to the Quarry that have been raised by the community through the CCC since approval of the previous modification include the following.

- Status of the required Planning Agreement (which relates the management and maintenance of the Conservation Area, including establishment of a Conservation Area Protection Bond).

- Implementation of biodiversity measures including tree plantings / regeneration, screening, and weed control (in accordance with the Landscape and Rehabilitation Management Plan).
- Cultural heritage, including completion of archaeological investigations and recovery of artefacts (in accordance with the Aboriginal Cultural Heritage Management Plan).

The Applicant contends that, given the Proposed Modification does not impact upon biodiversity, heritage or the Planning Agreement, the Proposed Modification is consistent with community feedback and views.

7.6 Scale and Nature of Anticipated Impacts

7.6.1 Ecologically Sustainable Development

7.6.1.1 Introduction

Sustainable practices by industry, all levels of government and the community are recognised to be important for the future prosperity and well-being of the world. The principles of ESD are based upon meeting the needs of the current generation while conserving our ecosystems for the benefit of future generations. In order to achieve sustainable development, recognition needs to be placed upon the integration of both short-term and long-term environmental, economic, social and equitable objectives.

The four principles of ESD are as follows.

- The precautionary principle.
- The principle of intergenerational equity.
- The principle of the conservation of biodiversity and ecological integrity.
- The principle for the improved valuation, pricing and incentive mechanisms.

The Proposed Modification is evaluated in the following sub-sections against each of these principles.

7.6.1.2 Precautionary Principle

Satisfaction of the precautionary principle rests on the available understanding of environmental risk and the assessment of consequences of management. In order to satisfy this principle, emphasis must be placed on anticipation and prevention of environmental damage where uncertainty exists, rather than reacting to it. The Applicant has applied extensive experience, developed through existing operations and comprehensive knowledge of the existing environment, to plan the Proposed Modification and to mitigate potential risks to the environment. Where uncertainty existed, a conservative approach to assessment was adopted and justified with management and mitigation measures and programs for ongoing management and monitoring to occur in the event of unexpected outcomes.

The Applicant has adopted control measures to anticipate and minimise potential environmental impacts relating to activities proposed under the Proposed Modification. These control measures are detailed in Section 6.

The precautionary principle has been considered during all stages of the design and assessment of the Proposed Modification. The approach adopted provides a high degree of certainty that the Proposed Modification would not result in any major unforeseen impacts.

7.6.1.3 Social Equity

Inter-generational equity embraces value concepts of justice and fairness so that the basic needs of all sectors of society are met and there is a fair distribution of costs and benefits to the community. This provides for both inter-generational (between generations) and intra-generational (within generations) equity considerations.

As demonstrated throughout Section 6, the Proposed Modification would have little effect on those considerations. On this basis, it is considered there would not be any change to impacts on social equity as a result of the Proposed Modification.

7.6.1.4 Conservation of Biodiversity and Ecological Integrity

The protection of biodiversity and maintenance of ecological processes and systems are central goals of sustainability. It is important that developments do not threaten the integrity of the ecological system as a whole or the conservation of threatened species in the short- or long-term.

The Proposed Modification would not lead to additional vegetation clearing and it is considered that the Proposed Modification would not result in any significant negative impacts to biodiversity.

7.6.1.5 Improved Valuation and Pricing of Environmental Resources

The issues that form the basis of this principle relate to the acceptance that the polluter pays, all resources are appropriately valued, cost-effective environmental stewardship is adopted, and the adoption of user-pays principles based upon the full life cycle of the costs.

The value placed by the Applicant on environmental resources is evident in the following elements of the Proposed Modification.

- The Proposed Modification would allow for extraction and processing operations to continue in a profitable, safe and environmentally responsible manner.
- The Proposed Modification has been designed to maintain the recovery of a valuable resource whilst optimising future land uses and avoiding additional impacts to the Conservation Areas within the Project Site.
- The assessment of various potential impacts has addressed the likely residual effects on the environment. This assessment has considered the necessary environmental safeguards and measures to be implemented to prevent irreversible damage to the environment within and surrounding the Project Site.

7.6.1.6 Conclusion

The Proposed Modification would encourage the safe, efficient and environmentally responsible operation of the Quarry so that maximum benefit is achieved for the Applicant, Kiama Municipal Council, Shoalhaven City Council, the local community, and the communities of the future. The design of the Proposed Modification achieves a significant overall benefit and sustainable outcome for the local and broader environment.

7.6.2 Biophysical Considerations

Potential biophysical impacts of the Proposed Modification have been assessed in Section 6. The following provides a brief overview of the residual biophysical impacts of the Proposed Modification.

- Air Quality – Extraction operations would be undertaken using the same activities and methods as are currently approved and implemented, and the management and mitigations measures that would be implemented to control potential dust emissions. It has been assessed through modelling that dust emissions from the proposed Project Site operations would continue to be compliant with all relevant criteria and not significantly contribute to particulates at surrounding residences.
- Groundwater – the Proposed Modification would result in an increase of 13.3ML of water take. No significant impacts to water quality, water levels or to GDEs are expected.
- Traffic and Transportation – Excluding the proposed increase in transported material there would be no change to traffic and transportation associated with the Proposed Modification beyond the limitations of the existing approval.

All other environmental aspects are unlikely to be affected by the Proposed Modification.

7.6.3 Socio-economic Considerations

The social and economic implications of the Proposed Modification are on balance positive. The Proposed Modification would enable the continued efficient operation of the Project Site and consequently the continued distribution of the economic benefits of the Project Site, including an increase in economic benefits through increased productive output. Any changes to local amenity or the local experience of the Project Site operations would be difficult to discern from existing approved operations and therefore social impacts are considered to be limited.

7.7 Compliance Monitoring and Communication

The Applicant would continue to monitor and report on the environmental performance of its operations and compliance with the relevant conditional requirements of all approvals, licences and consents in accordance with current procedures.

7.8 Remaining Uncertainties

Given the minor nature of the Proposed Modification, limited uncertainties remain. Notwithstanding, the proposed management and monitoring of various environmental aspects would ensure that unanticipated events would be adequately and appropriately managed by the Applicant both during and following the completion of extraction operations.

7.9 Consequences of Not Proceeding with the Proposed Modification

The consequences of not proceeding with the Proposed Modification are outlined in Section 1.5.

7.10 The Public Interest

The Applicant contends that the Proposed Modification would be in the public interest as it would provide for the following.

- Sufficient production (i.e. extraction and processing) and road despatch capacity to meet increasing demand for Quarry products.
- Maintain downward pressure on prices and encourage competition.
- Provide for continued employment of local personnel both at the Quarry and within the construction industry and continue to provide flow-on benefits to the local community.
- The environmental outcomes would be consistent with existing Project Site operations resulting in no additional significant adverse impacts.

7.11 Conclusion

In light of the assessment presented throughout the *Modification Report*, it is concluded that the Proposed Modification to the Gerroa Sand Quarry could be implemented and operated in a manner that would satisfy all relevant statutory goals and criteria, environmental objectives, and reasonable community expectations and is overall in the public interest.

8. References

- Cardno (NSW/ACT) Pty Ltd (Cardno) (2018a).** *Updated Traffic Impact Statement* to support the *Gerroa Sand Quarry Modification Mod 1* application
- Cardno (NSW/ACT) Pty Ltd (Cardno) (2018b).** *Surface and Groundwater Assessment* to support the *Gerroa Sand Quarry Modification Mod 1* application
- Cleary Bros (Bombo) Pty Ltd (2023).** *Gerroa Sand Resource Water Management Plan*. Version 2 Revision 3. Issued February 2023.
- Department of Planning, Industry and Environment (DPIE) (2020).** *Developments adjacent to National Parks and Wildlife Service lands – Guidelines for consent and planning authorities*
- Douglas Partners (DP) (2019).** *Groundwater Issues Report*.
- Environment Protection Authority (EPA) (2017).** *Noise Policy for Industry*
- Environment Protection Authority (EPA) (2022).** *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*
- Hydro Engineering and Consulting (HEC) (2019).** *Gerroa Sand Quarry Dredge Pond Water Balance and Creek Impact Assessment*.
- Masson Wilson Twiney Traffic and Transport Consultants (MWT) (2001).** *Traffic Assessment* to support the *Gerroa Sand Quarry Proposed Extension Environmental Assessment (2006)*.
- Northstar Air Quality Pty Ltd (2025).** *Air Quality Impact Assessment*
- NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW, 2025).** Spatial layer of HEVAE (High Ecological Value Aquatic Ecosystems) Vegetation Groundwater Dependent Ecosystems Value in NSW.
- SILO database (2025).** *Scientific Information for Land Owners*. Queensland Department of Environment and Science (DES). Accessed 19 May 2025.

Appendices

- Appendix 1 Updated Project Description
- Appendix 2 Updated Statement of Commitments
- Appendix 3 Consultation Records
- Appendix 4 Air Quality Impact Assessment

Appendix 1

Updated Project Description

(Total No. of pages including blank pages = 6)

Table A1.1
Gerroa Sand Quarry (Mod 2) – Updated Project Description

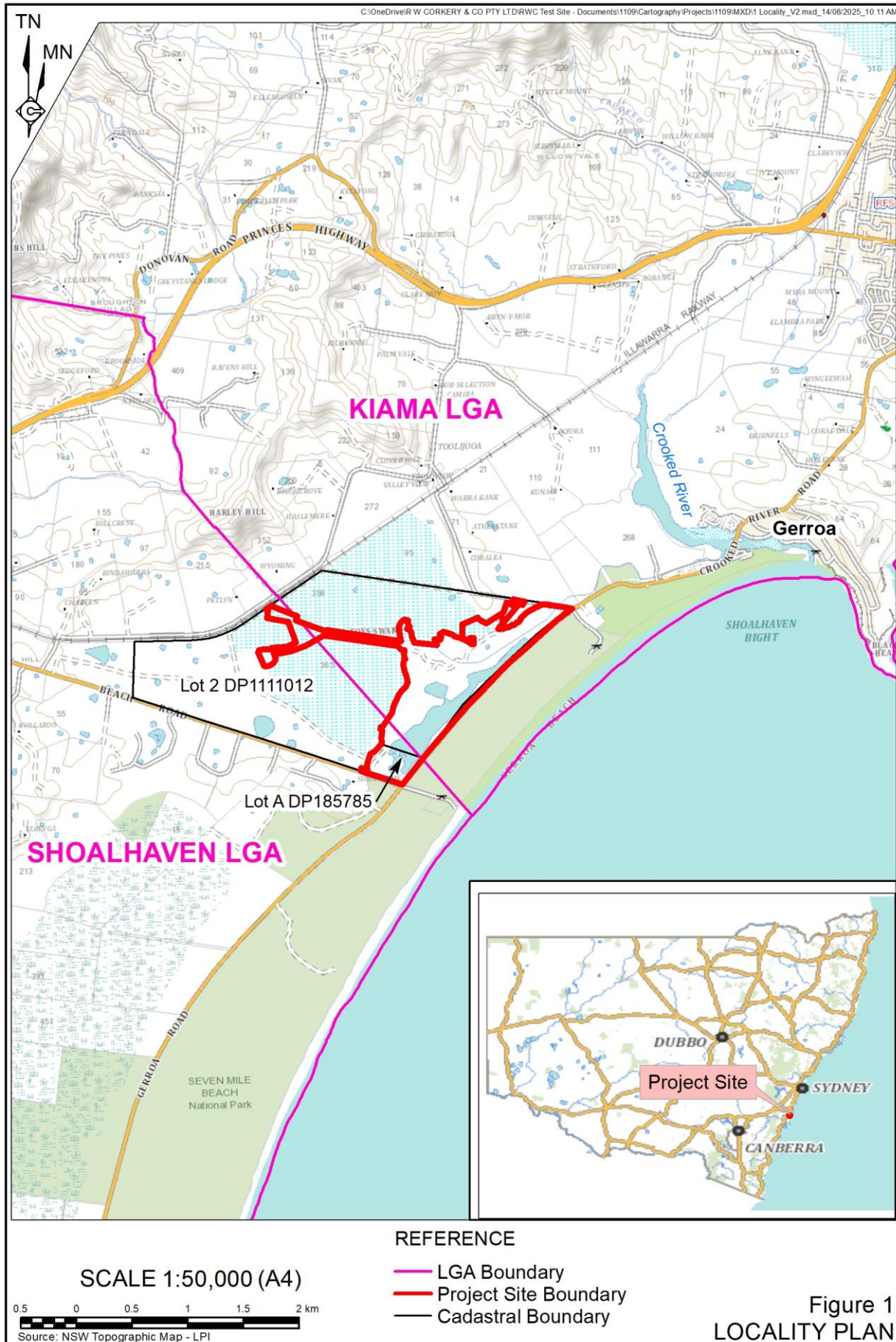
Page 1 of 2

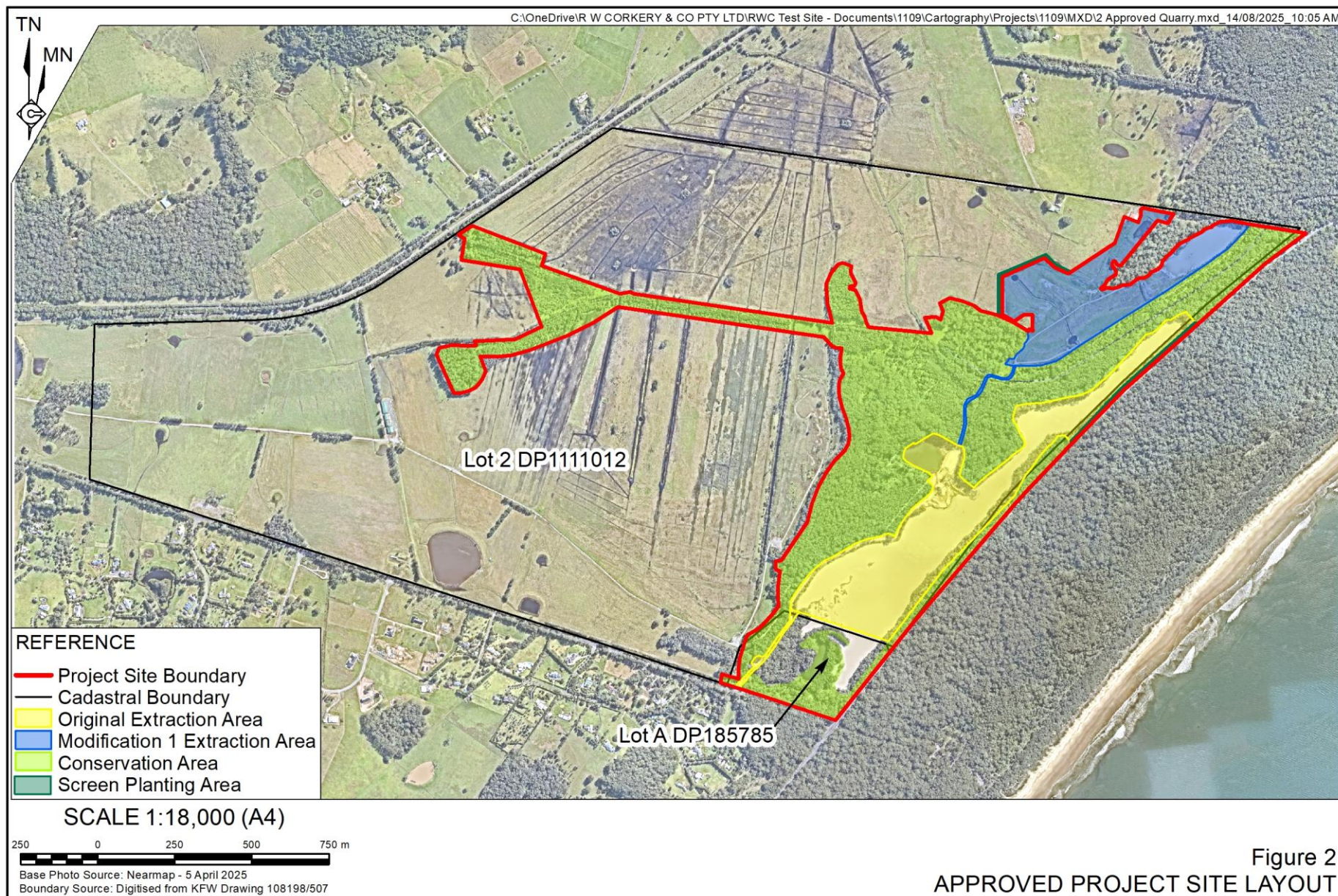
Component	Project Description – MOD 2 (this Modification Report)
Project Life	Extraction and processing operations up to 31 July 2038.
Operational Hours	7:00am to 6:00pm, Monday to Friday. 7:00am to 1:00pm, Saturdays. - At no time on Sundays or Public Holidays.
Site Layout and Disturbance	- Schedule of land (see Figure 1): - Part Lot 2 DP1111012 - Lot A DP185785 - Approved Project Site Layout as per Figure 2.
Extraction	- Development of two dredge pond Extraction Areas (combined 42.9ha footprint): - Original Extraction Area - Modification 1 Extraction Area - Extraction to a maximum depth of approximately 12m below the surface or to the base of the sand resource. - Floating suction dredge-based extraction or similar modern systems.
Waste Management	Fines and oversize material returned to dredge ponds together with process water.
Processing Operations	- Dredged material passed through a wet sorter and cyclones. - Screened and sorted sand products pushed into stockpiles.
Water Management	- Operational water uses including material processing (i.e. sand washing), dust suppression, and vegetation watering. - WAL 43273 (56ML allocation) and WAL 43271 (50ML allocation) – both from the <i>Metropolitan Coastal Sands Groundwater Source</i>. - Dredge pond Extraction Areas are bunded to prevent runoff entry and uncontrolled discharge (up to the 1:100 year ARI flood event).
Transportation Operations	- Road transportation of up to 120,000tpa. - Site access via Beach Road – sealed for 200m. - Approved Transportation Route – as per Figure 3. - Various product transportation vehicle sizes up to maximum vehicle size truck and dog configuration (maximum capacity 42t). - Average of 19 laden trucks (38 truck movements) per day.

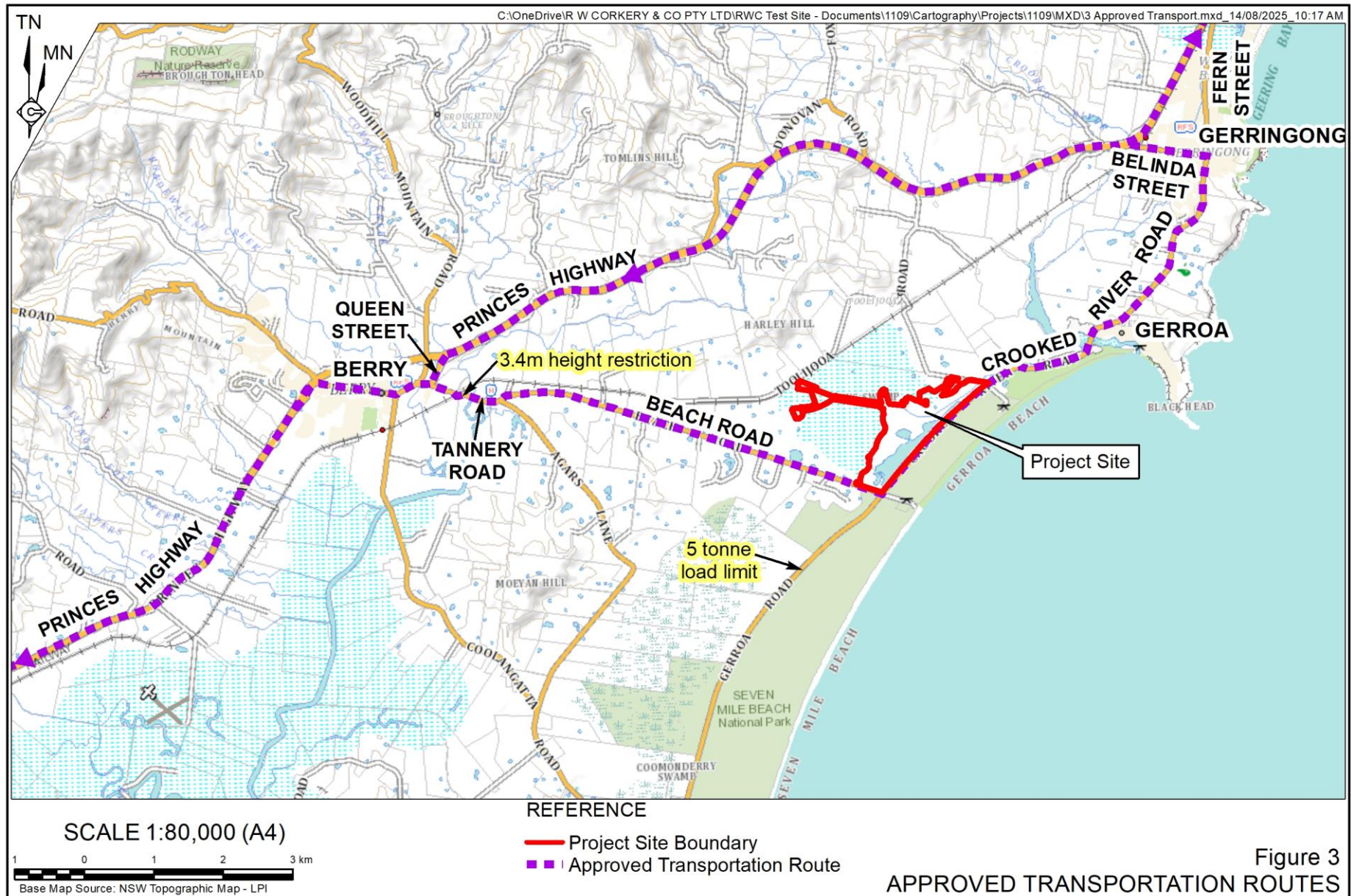
Table A1.1 (Cont'd)
Gerroa Sand Quarry (Mod 2) – Updated Project Description

Page 2 of 2

Component	Project Description – MOD 2 (this Modification Report)
Employment	• Employment: – 6 full-time equivalent employees and contractors to support on site operations. – 6 truck drivers.
Final Landform and Land Use	• Rehabilitation objectives (as per MP05_0099 Appendix 5): – after the conclusion of sand mining, leave the site free from all sand mining artefacts including machinery, structures, buildings, signage, products and roads, except as required for rural purposes; – create safe and stable landforms with a natural appearance designed for low maintenance; – establish indigenous vegetation on all land areas disturbed by the sand quarry to create wildlife habitat including wetland habitat within and around the shoreline of the dredge pond; – nurture to maturity vegetation screens and compensatory planting established during the sand mining operation; – control weed growth within the rehabilitation areas and compensatory planting areas; – retain a minimum of access tracks for maintenance or as required for ongoing rural use of the property; – progressively rehabilitate sections of the site when they are no longer required for operations to minimise the extent of work remaining when extraction ceases; and – continue rehabilitation beyond closure of the sand mine until these objectives have been achieved. Final landform design characteristics include the following. • Dredge pond batters excavated to 2H:1V. • Progressive backfilling with reject material or imported VENM to: – create an irregular shoreline with shallow areas and islands; – establish a final gradient of 6H:1V in the beach zone extending from the design minimum pond level (RL 0.7) to the design maximum pond level (RL 2.0); and – create a maximum batter gradient of 3H:1V between the beach zone and the natural surface or crest of the flood bund. • Progressive revegetation of disturbance areas, including reprofiling, topsoiling, and vegetation establishment in the stockpiling and processing area. • Remove all machinery and Quarry artefacts from the Project Site except where required for ongoing rural management. • Weed control and replanting where necessary until 5 years after cessation of dredging and development of a stable profile.







Appendix 2

Updated Statement of Commitments

(Total No. of pages including blank pages = 3)

Updated Statement of Commitments

1. Undertake the extension of the Gerroa sand quarry in a manner consistent with the Environmental Assessment and Statement of Commitments;
2. Comply with obligations under any Act;
3. Update the Environmental Management Plan (EMP) for the site to include all relevant matters contained in the Environmental Assessment and any requirements emanating from the Land and Environment Court for the project;
4. Operate the sand quarry within the requirements of the EMP as updated in 3) above (Note: the existing EMP embraces the requirements of the existing development consent with regard to such matters as environmental management, monitoring, auditing, reporting and community consultation. These requirements will be retained except where superseded in the approval for the current application).
5. Survey and mark at regular intervals the approved boundary of the proposed extension and ensure that all activities associated with sand extraction other than rehabilitation or approved mitigation works remain within the marked area;
6. Maintain annual production within an upper limit of 8120,000 tonnes per year;
7. Progressively rehabilitate all areas disturbed by the sand mining operations in accordance with the Environmental Assessment and the EMP;
8. Protect from disturbance and maintain existing native vegetation around the periphery of the sand quarry;
9. Undertake compensatory planting in the locations identified in the Environmental Assessment and nurture the vegetation and created habitat to maturity in accordance with the Landscape and Rehabilitation Management Plan, to be incorporated in the EMP;
10. Protect from disturbance Area A (shown on the figure in Appendix 8), of significance for potential Aboriginal relics;
11. Arrange for targeted salvage excavations for Aboriginal artefacts to take place as recommended by Navin Officer and to include the shell midden deposit situated at the South Western corner of the extraction area prior to mining occurring in the nominated locations (shown on the figure in Appendix 8);
12. Prior to extending workings into any part of the extension, ensure that a screen of vegetation, with or without bunding, effectively prevents viewing of the land to be disturbed from any publicly accessible locations;
13. Ensure that the requirements of the acid sulphate soils management plan are incorporated in the EMP and implemented where indicated to prevent degeneration of water quality in the dredge pond and in groundwater
14. Include a section on fish management in the dredge pond in the revised EMP for the site.
15. Forward annual production data to the Department of Primary Industries.

16. Prior to finalising the revised EMP, forward a draft to DECC for comment.
 - a) In surveying the boundary of the extraction area (see 5 above) include a minimum of 5 metres buffer to protect vegetation.
 - b) The external areas of the vegetation shall be fenced so as to exclude access by any farm animals to the satisfaction of the Planning Secretary.
17. Include a requirement to monitor compliance with the approved boundary in the revised EMP.
18. Revegetate and maintain the buffer area in conjunction with adjoining vegetation, except where the buffer is used for access.
19. Update the groundwater monitoring program in the revised EMP.
20. Include a tree clearance protocol in the revised EMP incorporating pre-clearing inspection for koalas.
21. Incorporate in the revised EMP a standard of revegetation to be achieved to the north and south of the extraction area before the existing east-west link can be severed. Do not completely remove the existing link until a qualified ecologist has confirmed that the required standard of revegetation has been achieved including the establishment of 60% of the plants species representative of the plant communities in the quarry area and in accordance with Appendix 6.
22. Include a revegetation monitoring program in the revised EMP to include all areas being revegetated as part of the project.
23. Define the compensatory vegetation land by survey and include an appropriate plan in the EMP.
24. Include a detailed site rehabilitation program in the EMP addressing the matters listed in item 5a) of the submission from DECC dated 22 December 2006 (and shown in Appendix 8).
25. Maintain ongoing consultation with the Aboriginal community including notification of approvals and requirements that relate to Aboriginal heritage with an invitation to contribute to any heritage management activities.
26. Submit updated site information to DECC's AHIMS register when archaeological salvage is complete.
27. Include in the revised EMP, reference to protection of Aboriginal heritage items located in Area A as part of management of that land and consult the Aboriginal community in developing and implementing the management protocols.
28. Should any sand mining impacts occur within Area A, consult DECC and the Aboriginal community as soon as possible in developing an appropriate response.
29. Investigate and if practicable, install "clacker" reversing alarms on mobile plant within the sand quarry site.

Appendix 3

Consultation Records

(Total No. of pages including blank pages = 19)

8 May 2025

Ms Jessie Evans
Director Resource Assessments
Department of Planning, Housing and Infrastructure
4 Parramatta Square, 12 Darcy Street
PARRAMATTA NSW 2124

Submitted via Major Project Portal

Dear Jessie,

**Re: Proposed Modification (Modification 2) – Gerroa Sand Quarry –
Increased Product Transportation Rate**

Background

Regional Quarries & Concrete Pty Ltd, trading as Cleary Bros ('Cleary Bros'), operate the Gerroa Sand Quarry (the 'Quarry' or the 'Project Site') located within Lot 2 DP1111012 and Lot A DP185785 at Crooked River Road, Gerroa, NSW (**Figure 1**). The target resource consists of fine-grained sand with a very low silt content, allowing it to be used as a virgin sand product or blended with coarser manufactured sand. The Quarry has been successfully operated by Cleary Bros for over 55 years as a source of sand for construction and concrete products produced by Cleary Bros at their plants in Albion Park, Bomaderry, and Coniston.

Operations at the Project Site have been authorised under a series of development approvals. The current development consent for the Quarry, Major Project Approval MP 05_0099 for the extension and continuation of the Quarry, was originally sought under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and determined by the Land and Environment Court on 2 September 2008. Following the repeal of Part 3A of the EP&A Act and under transitional arrangements provided by Schedule 6A of the EP&A Act, the consent has subsequently been modified once (Mod 1) under the former Section 75W of the EP&A Act (determined on 10 June 2022) to extend the extraction area and develop a new dredge pond.

Existing Operations

MP 05_0099 (Mod 1) permits the extension and continued operation of the Quarry, including:

- extraction and processing operations until 31 July 2038 from the approved extraction areas (**Figure 2**);
- extraction using a floating suction dredge-based extraction system, including transfer of dredged slurry material to the on-site processing plant via a pipeline;
- material processing using a wet sorter containing multiple screens and a cyclone;
- return of process water and fines to the dredge pond;
- stockpiling of products;
- loading and transportation of up to 80,000t of product from the Project Site per year using the approved transportation route (**Figure 3**);
- rehabilitation works in areas where extraction has been completed; and

- operation within the following approved hours of operation.
 - 7:00am to 6:00pm, Monday to Friday.
 - 7:00am to 1:00pm, Saturdays.
 - At no time on Sundays or Public Holidays.

Environment Protection Licence (EPL) 4146 currently licences activities at the Project Site including extraction (>50,000 to 100,000t annually) and crushing, grinding or separating (>30,000 to 100,000t annually).

Proposed Modification

Cleary Bros propose to modify MP 05_0099 (Mod 1) to increase the annual product transport limit at the Quarry by 50% from 80,000tpa to 120,000tpa (the 'Proposed Modification'). The increased transportation limit would also necessitate a respective increase in annual extraction and processing operations at the Project Site. The Proposed Modification would represent Modification 2 to MP05_0099.

A traffic assessment¹ accompanying the original application for the Quarry noted that transportation operations at the Project Site generated an average of 14 loads per day (28 truck movements), with an average load size of 19t. The assessment also noted that a range of vehicle sizes were used to transport product, from utes, box trailers and small trucks (1t to 9t capacity) up to tri-axle, eight wheeler and truck and dog vehicle configurations (32t to 42t capacity).

Cleary Bros note that current truck and dog vehicle configurations used at the Quarry, with capacities ranging between 30t and 42t (average load size of 35t), could support the transportation of 120,000tpa without increasing the number of vehicle movements modelled in the original traffic assessment. As such, the Proposed Modification would not result in a net increase in traffic volumes generated by the Quarry compared to that modelled under the original application. Additionally, the Proposed Modification would not change the maximum vehicle size used for product transportation compared to the vehicle configurations identified in the original application.

No further changes to approved operations are proposed as part of the Proposed Modification. However, it is noted that Cleary Bros has submitted a subdivision application to Kiama Municipal Council and Shoalhaven City Council to adjust lot boundaries associated with Lot 2 DP1111012 and Lot A DP185785. All Quarry operations and associated conservation areas would be confined to a single lot, while much of the surrounding agricultural land unrelated to the Quarry would be transferred into separate lots. Importantly, the Project Site Boundary is not proposed to change, however, if the subdivision application is determined prior to submission of the modification application the updated cadastral boundaries and any changes to Lot references will be reflected in the Proposed Modification application.

The Need for the Proposed Modification

The Quarry represents a reliable, cost-controlled source of readily extractable sand which is suitable for construction and concrete manufacturing purposes. Additionally, the fine-grained quality of the sand allows for it to be used in concrete mixes following blending with by-products from hard rock quarries, enabling the beneficial reuse of those by-products and reducing demand for virgin fine-grained sand products. The Quarry is therefore a vital component of the raw material supply chain which feeds into Cleary Bros' vertically integrated concrete production and construction business.

¹ Masson Wilson Twiney Traffic and Transport Consultants (February 2001). *Gerroa Sand Resource Southern Extraction Area Extension to Period of Extraction*. Appendix O to the 'Gerroa Sand Quarry Proposed Extension Environmental Assessment' (October 2006).

The Proposed Modification would support a 50% increase to the extraction, processing and transportation rate from 80,000tpa to 120,000tpa. This increase would support Cleary Bros' ability to supply concrete production and other construction projects during periods of high demand. Without the Proposed Modification, Cleary Bros' operations and the local and regional construction and infrastructure projects they supply would continue to be constrained by current sand supply limitations and increasing raw material costs.

Application Pathway

Following the repeal of Part 3A of the EP&A Act and the winding up of transitional arrangements outlined under Schedule 2 of the *Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017* (formerly provided by Schedule 6A of the EP&A Act), the Part 3A development approved under MP 05_0099 (Mod 1) is now classified as State Significant Development.

As MP 05_0099 was originally granted by the NSW Land and Environment Court, the Proposed Modification would therefore be sought under Part 4, Division 4.9, Section 5.56 of the EP&A Act. In accordance with Section 4.56(1(a)) of the EP&A Act, the Proposed Modification must remain substantially the same development. It is noted that, as Mod 1 was approved under Section 75W (now repealed), the assessment for substantially the same development will be undertaken against MP 05_0099 (Mod 1).

In accordance with Part 5, Division 1, Section 99 of the *Environmental Planning and Assessment Regulation 2021* (EP&A Reg), a modification application for State Significant Development (SSD) must be in the approved form with regards to the *State Significant Development Guidelines* (SSD Guidelines). Appendix E of the SSD Guidelines provides form and content requirements for the preparation of a Modification Report to support the modification application.

The consent authority for the modification application would be either the Minister for Planning and Public Spaces or, if at least 50 submissions objecting to the modification are received or the Applicant has made a reportable political donation in connection with the application, the Independent Planning Commissioner.

EPL 4146 currently limits extraction (>50,000 to 100,000t annually) and crushing, grinding or separating (>30,000 to 100,000t annually) activities at the Quarry. A variation to EPL 4146 would therefore also be required following successful determination of the Proposed Modification and prior to activities exceeding the existing upper 100,000tpa limits.

Environmental Assessments

It is anticipated that the Proposed Modification would require specialist assessments of the following key potential environmental impacts.

- Air Quality – preparation of an Air Quality Impact Assessment to address potential impacts associated with the increased production (extraction, processing and truck loading) rate.
- Noise – preparation of a Noise Impact Assessment to address potential impacts associated with the increased production (extraction, processing and truck loading) rate.

In addition to the above, it is anticipated that the Quarry water balance will need to be updated to reflect increased water take (e.g. dust suppression, water loss due to water contained in exported product) as a result of the Proposed Modification.

No changes to other environmental impacts including total disturbance footprint, biodiversity, heritage, traffic, surface water, groundwater, visual amenity, or bushfire risk and hazards are anticipated as a result of the Proposed Modification. Therefore, detailed assessment of these aspects is not expected to be required.

Consultation

Consultation with the following stakeholders will be undertaken during preparation of the modification application to identify environmental assessment requirements for the Proposed Modification.

- NSW Department of Planning, Housing and Infrastructure (DPHI)
- NSW Department of Climate Change, Energy, the Environment, and Water
 - NSW EPA
 - Water Group
 - NSW National Parks and Wildlife Service
- Transport for NSW
- Kiama Municipal Council
- Shoalhaven City Council

Consultation will also be undertaken with the Community Consultative Committee (CCC) for the Quarry as well as with sensitive receivers in the vicinity of the Project Site. Depending on the outcomes of the specialist assessments, further consultation regarding the Proposed Modification may be undertaken.

Next Steps

A copy of this Briefing Letter will be provided to each of the key stakeholders identified above to initiate consultation regarding the Proposed Modification. A copy of this Briefing Letter will also be uploaded to the NSW Major Project Portal. Given that environmental assessment requirements are not issued for modification applications it would be appreciated if DPHI can provide feedback, including confirmation of the approvals pathway and any specific matters to be addressed in the Modification Report.

We would be pleased to hold a briefing meeting with DPHI and any other interested stakeholders upon request.

Following the Department's feedback, specialist assessments will be undertaken and a Modification Report prepared to support the submission of the modification application. It is expected that the Modification Report would be lodged in or around July 2025.

Conclusion

We trust that this Briefing Letter provides you with the information that you require at this stage. Please do not hesitate to contact me (email: jack@rwcorkery.com, mobile: 0402 060 522) should you require additional information.

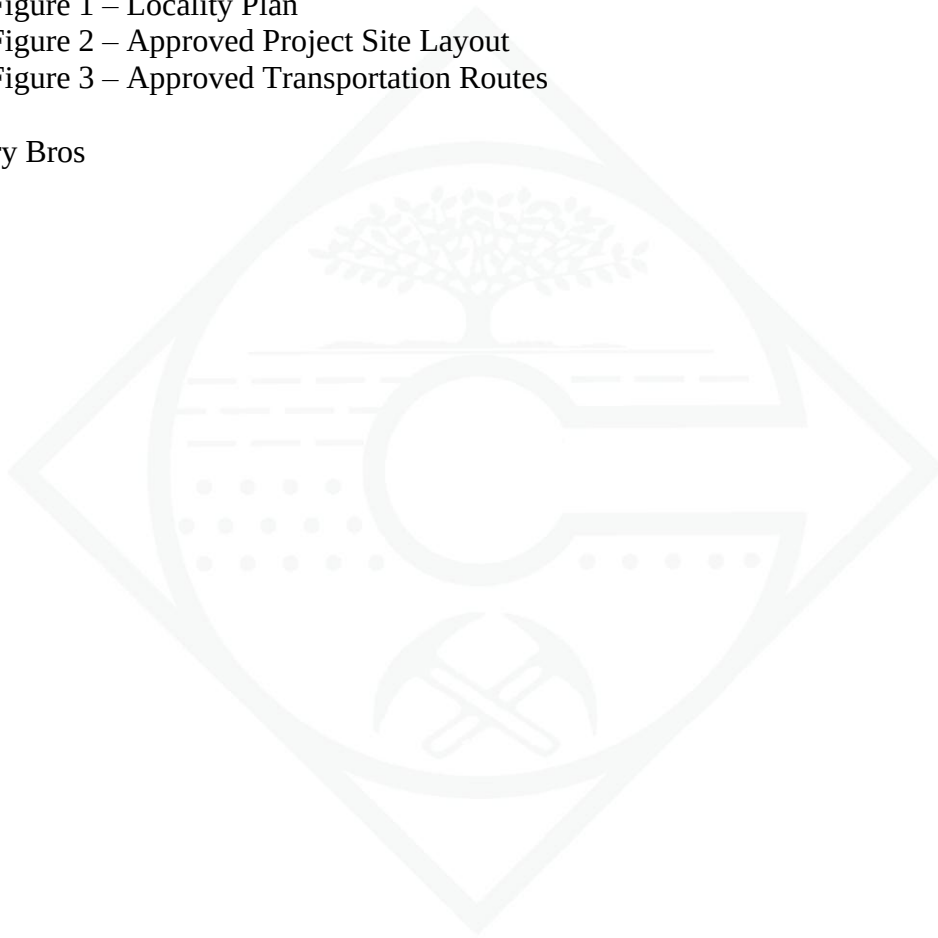
Yours sincerely

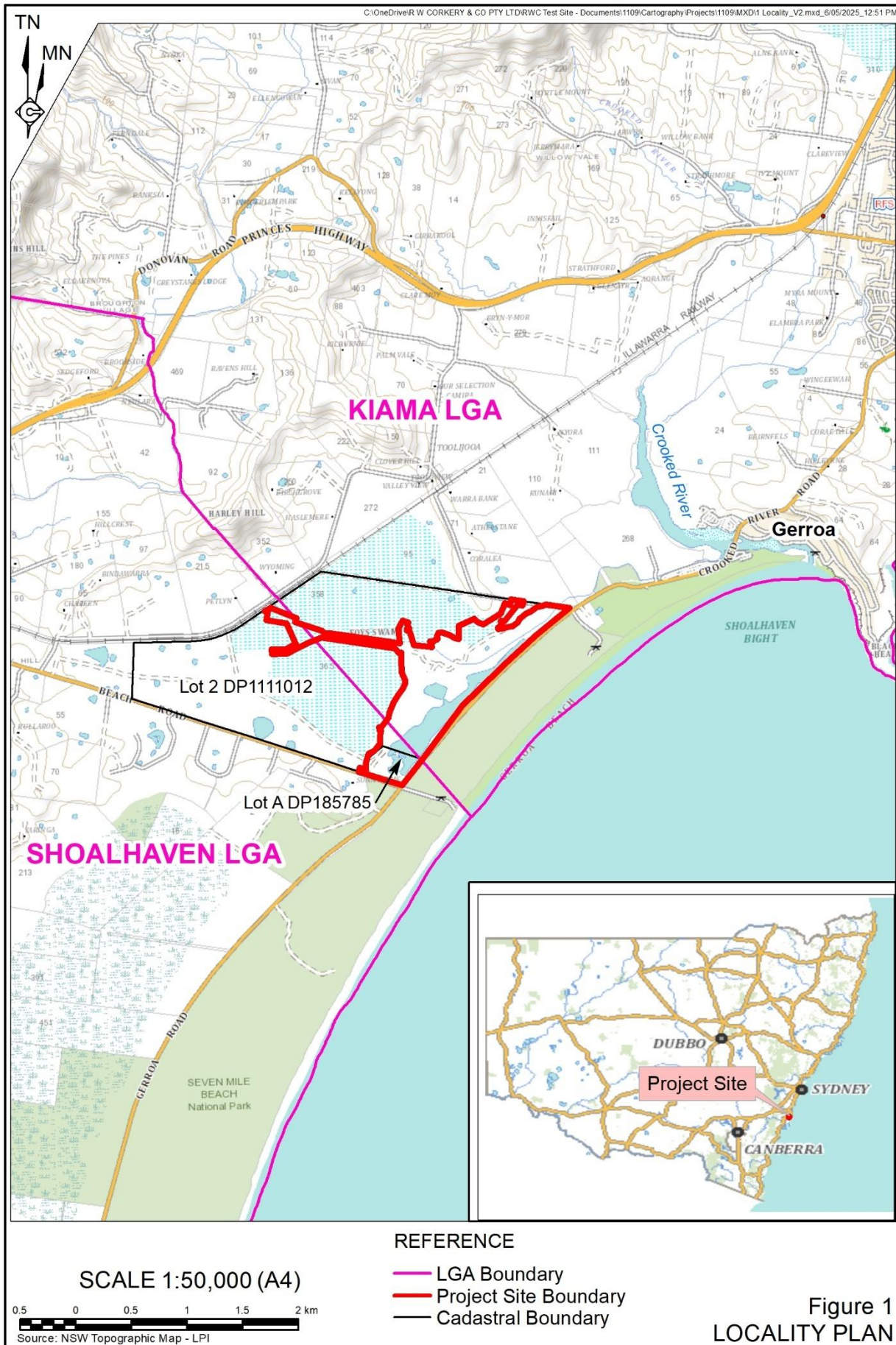


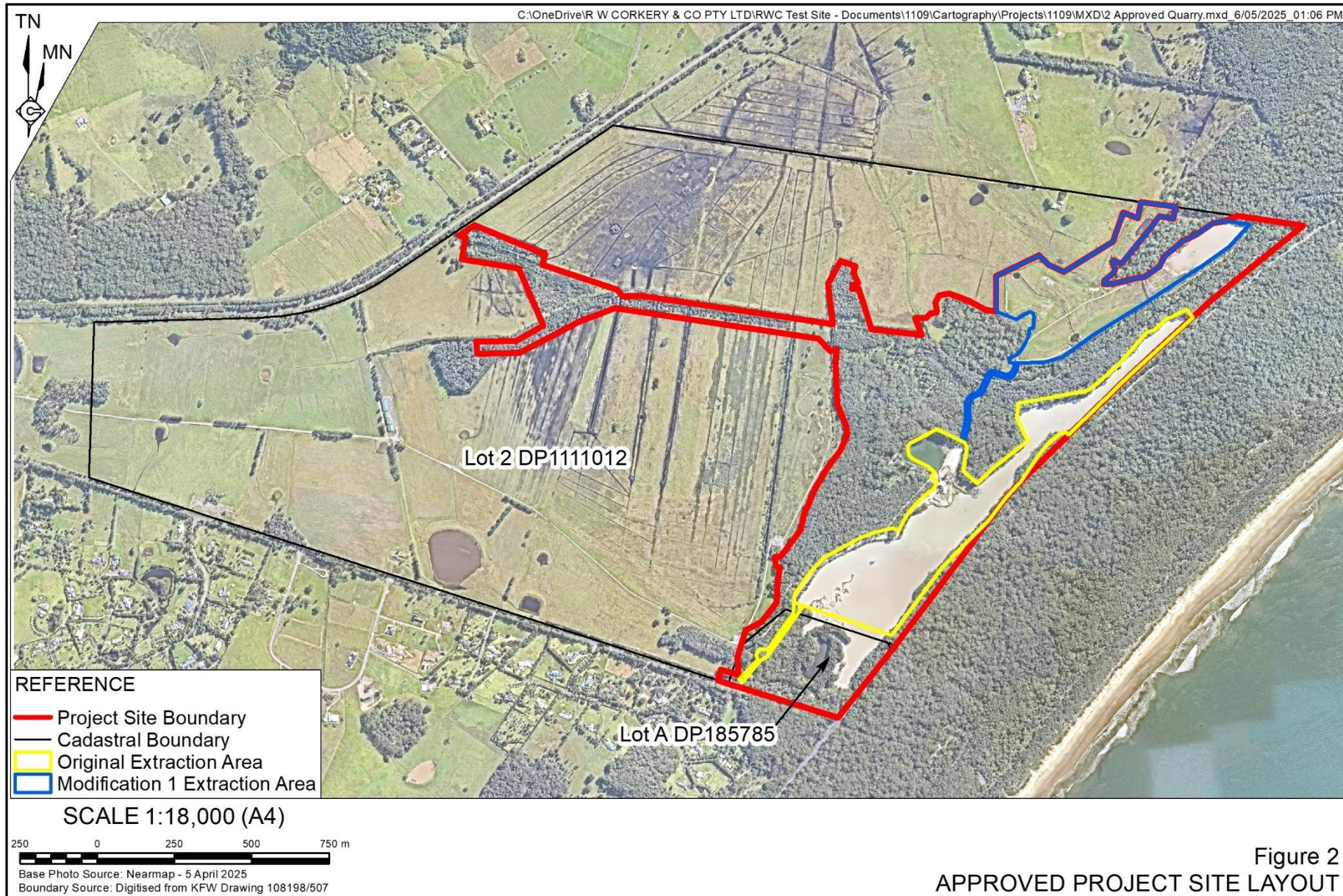
Jack Flanagan
Senior Environmental Consultant

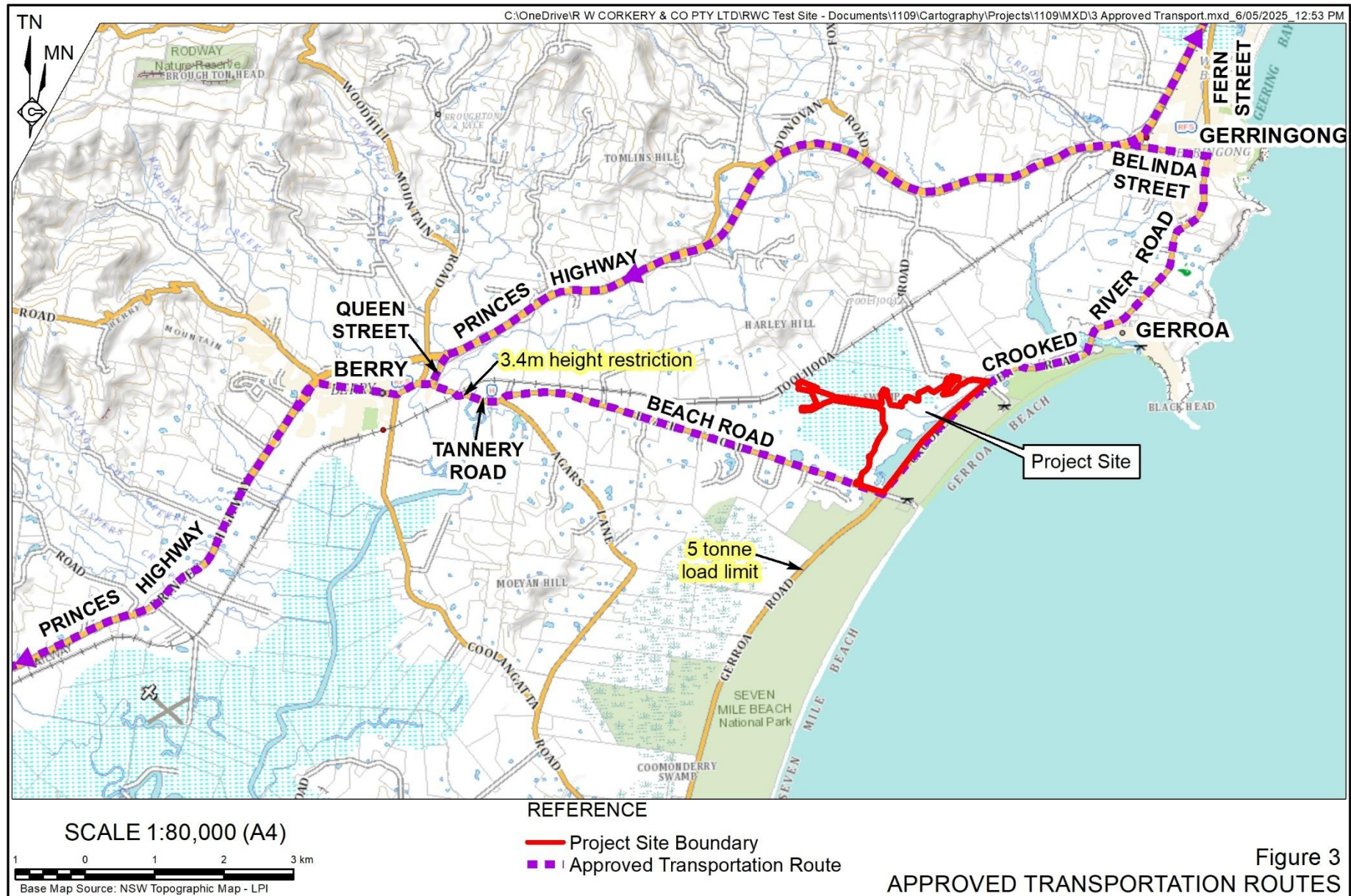
Attached: Figure 1 – Locality Plan
Figure 2 – Approved Project Site Layout
Figure 3 – Approved Transportation Routes

Copy: Cleary Bros











EPA Reference: DOC25/451012-1

Mr Jack Flanagan
Senior Environmental Consultant
R.W. Corkery
PO Box 1796
CHATSWOOD NSW 2057

By email: scott@rwcorkery.com; jack@rwcorkery.com; samw@rwcorkery.com

Dear Mr Flanagan

**Environment Protection Licence 4146 - Regional Quarries & Concrete Pty Ltd
Proposed Modification – Gerroa Sand Quarry - MP05_0099 (MOD 2)**

I refer to the Gerroa Sand Quarry located at Beach Road, Gerroa (Premises). The Premises operates under Environment Protection Licence 4146 (Licence) that the Environment Protection Authority (EPA) has issued to by Regional Quarries & Concrete Pty Ltd who operate the Premises for the scheduled activities of crushing, grinding or separating and other extractive activities.

This letter is in response to your email to the EPA dated 4 June 2025 seeking advice on environmental assessment requirements for a proposed modification to the Project Approval for the Gerroa Sand Quarry (MP05_0099). Your email was accompanied by a Briefing Letter prepared by RW Corkery & Co, on behalf of Regional Quarries & Concrete Pty Ltd, trading as Cleary Bros, outlining the proposed modification.

The EPA understands that the proposed modification:

- seeks to increase the annual product transport limit at the Quarry by 50% from 80,000 tonnes per annum (tpa) to 120,000tpa. The increased transportation limit would also necessitate an equivalent increase in annual extraction and processing rates at the Premises.
- does not suggest further changes to approved operations. Specifically, no changes are proposed to the currently approved extraction footprint.

The EPA has reviewed the Briefing Letter and provides its environment assessment requirements in an attachment to this letter (**Attachment 1**).

Should a Modification Report be submitted, the EPA will conduct a more detailed assessment and will supply further comments at that stage.

If you have any further questions about this issue, please contact Nick Feneley on (02) 4224 4144.

Yours sincerely

LARA BARRINGTON

Unit Head – Operations

Attachment 1 – Gerroa Sand Quarry - NSW EPA advice- MP05_0099 (MOD 2)

NSW Environment Protection Authority
As the environmental steward and regulator of our
State we are committed to a sustainable future.
Join us on our mission to protect tomorrow together.

Phone:
131 555
Website:
epa.nsw.gov.au

Email:
info@epa.nsw.gov.au
Mail:
Locked Bag 5022
Parramatta NSW 2124



Attachment 1 – Gerroa Sand Quarry - NSW EPA Advice - MP05_0099 (MOD 2)

General Advice

Environment Protection Licence

Environment Protection Licence 4146 limits “Extractive activities” and “Crushing, grinding or separating” activities at the Premises to 100,000 tonnes per annum. Should the modification be approved, the Licensee will need to apply for a variation to the Licence to increase these limits.

Environmental Assessment Requirements for Modification Report

Air Quality Impact Assessment

Your Briefing Letter states that Air Quality Impact Assessment (AQIA) will be prepared to address potential impacts associated with the increased production (extraction, processing and truck loading) rate.

The EPA requests that the AQIA be prepared in accordance with the [Approved Methods for the modelling and assessment of air pollutants in NSW \(2022\)](#).

Noise Impact Assessment

Your Briefing Letter states that a Noise Impact Assessment (NIA) will be prepared to address potential impacts associated with the increased production (extraction, processing and truck loading) rate.

The EPA requests that the NIA be prepared in accordance with the [Noise Policy for Industry \(2017\)](#).

Hydrology and Water Quality Impact Assessment

Your Briefing Letter states that the Quarry water balance will need to be updated to reflect increased water take (e.g. dust suppression, water loss due to water contained in exported product) from the Proposed Modification.

The EPA requests that this be included as part of an updated Hydrological and Water Quality Impact Assessment. The assessment should consider any potential impacts to hydrological regimes and local water quality associated with the increased extraction and processing rate. Specific consideration should be given to potential impacts on:

- groundwater levels and associated impacts on groundwater dependent ecosystems
- groundwater levels and associated impacts on acid sulphate soils and potential acid sulphate soils
- the expected quality of discharges from the extraction area in terms of concentrations and loads of constituents to groundwater and surrounding waterways
- the likely frequency and volume of discharges
- the environmental values of the receiving waterways with reference to the relevant ANZECC & ARMCANZ (2000) trigger values.

From: Anna Paul
Sent: Tuesday, 10 June 2025 3:50 PM
To: Sam Wells
Cc: Scott Hollamby; Jack Flanagan
Subject: TfNSW ref STH25/00216/001 - 1109_Gerroa Sand Quarry Proposed Modification MP05_0099: Briefing Letter for Consultation
Attachments: 110901a_Gerroa Sand Quarry_Mod 2 Letter_20250508.pdf

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Hi Sam

TfNSW appreciates the early consultation regarding the proposed modification to Gerroa Sand Quarry.

TfNSW notes the following:

1. The proposed modification has been issued to the Department of Planning to seek the environmental assessment requirements. We have had a quick discussion with the Department regarding this modification and it is understood that a referral will be issued to TfNSW.
2. The proposed number of heavy vehicles, and size of the largest vehicle, will remain the same, in line with the original approval.
3. The approved transport routes are proposed to remain unchanged (Figure 3 of the attached).

Noting the above, TfNSW will complete a comprehensive review of this modification application, if/when requested by the Department.

Should you have any questions, please let me know.

Kind regards,
Anna

Anna Paul

Development Services Case Officer, Development Services
Transport Planning - Planning, Integration and Passenger
Transport for NSW

Working days Monday, Tuesday, Wednesday



I acknowledge the Aboriginal people of the country on which I work, their traditions, culture and a shared history and identity. I also pay my respects to Elders past and present and recognise the continued connection to country.

OFFICIAL

From: Sam Wells
Sent: Wednesday, 4 June 2025 9:28 AM
To: Development South
Cc: Jack Flanagan Scott Hollamby
Subject: 1109_Gerroa Sand Quarry Proposed Modification MP05_0099: Briefing Letter for Consultation

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Good morning,

Please find attached a copy of a Briefing Letter prepared by RW Corkery & Co, on behalf of Regional Quarries & Concrete Pty Ltd trading as Cleary Bros, outlining a proposed modification to MP05_0099 for the Gerroa Sand Quarry. A copy of this letter was provided to the NSW Department of Planning, Housing and Infrastructure via the Major Projects Portal on 8 May 2025.

As one of the key stakeholders identified in the Briefing Letter, could you please review the details provided and respond with any environmental assessment requirements which should be assessed as part of the proposed modification?

Please don't hesitate to contact Jack Flanagan (CC'd, mobile: 0402 060 522) or myself if you have any questions or require any additional information.

Kind regards,

Sam Wells



Environmental Consultant



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From: Julieanne Doyle
Sent: Tuesday, 10 June 2025 11:00 AM
To: Sam Wells
Cc: Anna Mueller
Subject: FW: Case:01148072 1109_Gerroa Sand Quarry Proposed Modification MP05_0099: Briefing Letter for Consultation
Attachments: 110901a_Gerroa Sand Quarry_Mod 2 Letter_20250508.pdf
Follow Up Flag: Follow up
Flag Status: Flagged

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Hi Sam,

Your letter attached has made it to the Shoalhaven area office of NSW National Parks as the works are adjacent to Seven Mile Beach National Park.

We have clear guidelines for development adjacent to National Parks on our [website](#).

Kind Regards,



Julieanne Doyle
Team Leader Rangers Shoalhaven,
South Coast Branch
NSW National Parks and Wildlife Service

104 Flat Rock Rd, West Nowra NSW 2541
T 02 4428 6300
NPWS.Shoalhaven@environment.nsw.gov.au
W nationalparks.nsw.gov.au

----- Forwarded Message -----

From: Sam Wells
Sent: 04/06/2025, 09:28
To: parks.info@environment.nsw.gov.au
Cc:
Subject: 1109_Gerroa Sand Quarry Proposed Modification MP05_0099: Briefing Letter for Consultation

Good morning,

Please find attached a copy of a Briefing Letter prepared by RW Corkery & Co, on behalf of Regional Quarries & Concrete Pty Ltd trading as Cleary Bros, outlining a proposed modification to MP05_0099 for the Gerroa Sand Quarry. A copy of this letter was provided to the NSW Department of Planning, Housing and Infrastructure via the Major Projects Portal on 8 May 2025.

As one of the key stakeholders identified in the Briefing Letter, could you please review the details provided and respond with any environmental assessment requirements which should be assessed as part of the proposed modification?

Please don't hesitate to contact Jack Flanagan (CC'd, mobile: 0402 060 522) or myself if you have any questions or require any additional information.

Kind regards,



Sam Wells

Environmental Consultant



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From: Environmental Services Management
<Environmental.Services@shoalhaven.nsw.gov.au>
Sent: Friday, 4 July 2025 7:59 AM
To: Sam Wells; Council Email
Cc: Jack Flanagan; Scott Hollamby
Subject: RE: 1109_Gerroa Sand Quarry Proposed Modification MP05_0099: Briefing Letter for Consultation

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Good morning

Thank you for your email.

Councils Environmental Services Department advises there are no concerns or feedback on this issue.

Regards



Environmental Services Management

[1300 293 111](tel:1300293111)

Bridge Road (PO Box 42) Nowra NSW 2541

shoalhaven.nsw.gov.au

RESPECT | INTEGRITY | ADAPTABILITY | COLLABORATION



From: Sam Wells
Sent: Wednesday, 4 June 2025 9:25 AM
To: Council Email <Council@shoalhaven.nsw.gov.au>
Cc: Jack Flanagan Scott Hollamby
Subject: 1109_Gerroa Sand Quarry Proposed Modification MP05_0099: Briefing Letter for Consultation

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Good morning,

Please find attached a copy of a Briefing Letter prepared by RW Corkery & Co, on behalf of Regional Quarries & Concrete Pty Ltd trading as Cleary Bros, outlining a proposed modification to MP05_0099 for the Gerroa Sand Quarry. A copy of this letter was provided to the NSW Department of Planning, Housing and Infrastructure via the Major Projects Portal on 8 May 2025.

As one of the key stakeholders identified in the Briefing Letter, could you please review the details provided and respond with any environmental assessment requirements which should be assessed as part of the proposed modification?

Please don't hesitate to contact Jack Flanagan (CC'd, mobile: 0402 060 522) or myself if you have any questions or require any additional information.

Kind regards,



Sam Wells

Environmental Consultant



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Appendix 4

Air Quality and Greenhouse Gas Assessment

(Total No. of pages including blank pages = 81)



northstar



This document has been prepared for **Regional Quarries & Concrete Pty Ltd** by:

Northstar Air Quality Pty Ltd,

Head Office: Suite 1504, 275 Alfred Street, North Sydney, NSW 2060

Riverina Office: PO Box 483, Albury, NSW 2640

northstar-env.com | Tel: 1300 708 590

Proposed Modification 2 – Gerroa Sand Quarry

Air Quality and Greenhouse Gas Assessment

Addressee(s): Regional Quarries & Concrete Pty Ltd

Site Address: Lot 2 DP1111012, Lot A DP185785

Report Reference: 25.1116.FR2V2

Date: 15 August 2025

Status: Final

Quality Control

Report	Reference	Status	Prepared by	Checked by	Authorised by
Proposed Modification 2 – Gerroa Sand Quarry - Air Quality and Greenhouse Gas Assessment	25.1116.FR2V2	Final	Northstar	GCG	MD

Report Status

Northstar References		Report Status	Report Reference	Version
Year	Job Number	(Draft: Final)	(R ~~x~~)	(V ~~x~~)
2025	1116	Final	2	2
Based upon the above, the specific reference for this version of the report is:				25.1116.FR2V2

Final Authority

This report must be regarded as draft until the above study components have been each marked as final, and the document has been signed and dated below. A draft report is a working document, is issued without prejudice and is subject to change.



Martin Doyle

15 August 2025

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NON-TECHNICAL SUMMARY

Regional Quarries & Concrete Pty Ltd, trading as Cleary Bros has engaged Northstar Air Quality Pty Ltd to perform an Air Quality Impact Assessment and Greenhouse Gas Assessment for the continued operation and increased product transport rate of the Gerroa Sand Quarry.

The Air Quality Impact Assessment and Greenhouse Gas Assessment forms part of the Modification Report prepared to accompany the development application for the Project under Part 4 of the *Environmental Planning and Assessment Act 1979*.

The Air Quality Impact Assessment has been performed in accordance with the requirements of the NSW Environment Protection Authority Approved Methods for the Modelling and Assessment of Air Pollutants in NSW document and meets the requirements of the Secretary's Environmental Assessment Requirements. The Air Quality Impact Assessment provides a detailed description of:

- Proposed activities which form the Project which reflect peak activity rates during site operation.
- Legislative requirements which are required to be met, including NSW Environment Protection Authority air quality criteria, Protection of the Environment Operations Act, and Protection of the Environment Operations (Clean Air) Regulations, and any policies and guidelines as they relate to air quality impacts of the Project.
- Existing conditions surrounding the Quarry Site, including the definition of sensitive receptor locations, prevailing meteorology, air quality, and topography.
- The approach to assessment, including justification for the approach adopted.
- Emissions controls proposed to be employed as part of the Project operation.
- Predicted air quality impacts during the scenario modelled.
- Air quality management and mitigation measures which would continue to be employed to ensure that the environmental objectives associated with the Project are achieved.

The results of the Air Quality Impact Assessment indicate that predicted incremental concentrations associated with the operation of the Project at surrounding sensitive receptors are minor, and no exceedances of the annual average particulate matter criteria are predicted. No additional exceedances of the 24-hour particulate matter criteria are predicted, even during the assessment of maximum throughput and off-site transport.

The Greenhouse Gas Assessment concludes that the NSW Environment Protection Authority 'Large Emitter' threshold of 25 000 tonnes per year of carbon dioxide equivalent would not be triggered by this Project. A detailed outline of the assumptions adopted, calculations performed, and a comparison with NSW and Australian direct emissions totals is provided, in addition to further options to reduce greenhouse gas emissions.

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1. INTRODUCTION

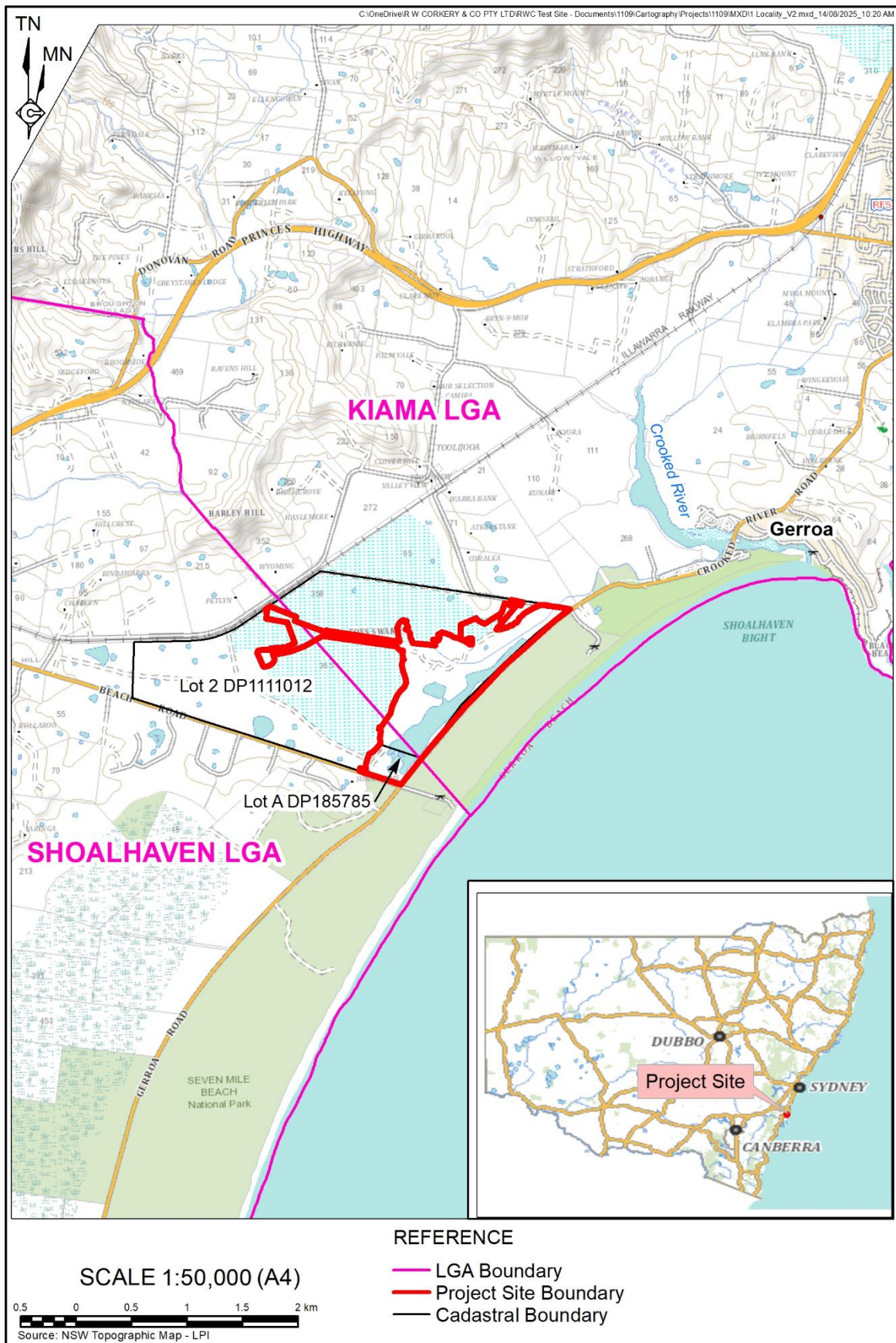
Regional Quarries & Concrete Pty Ltd, trading as Cleary Bros (the Applicant) has commissioned Northstar Air Quality Pty Ltd (Northstar) to perform an air quality impact assessment (AQIA) and Greenhouse Gas Assessment (GHGA) to support a Modification Report for the continued operation and increased product transport rate (the Project) of the Gerroa Sand Quarry (the Quarry) located within Lot 2 Deposited Plan (DP) 1111012 and Lot A DP185785, at Crooked River, Gerroa NSW (the Project Site), as shown in Figure 1.

The AQIA presents an assessment of the impacts of activities associated with the operational phase of the Project. The AQIA has used a quantitative dispersion modelling approach, performed in accordance with the relevant NSW Environment Protection Authority (NSW EPA) guidelines. The results of the assessment are presented as predicted incremental change, and as a cumulative impact accounting for the prevailing background air quality conditions.

The GHGA has been incorporated as part of this over-arching AQIA report. The GHGA presents a quantification of the likely greenhouse gas (GHG) emissions associated with the operation of the Project and presents a comparison of these emissions with National and State GHG emissions totals. Opportunities for GHG reduction are also provided.

This AQIA (including the GHGA) forms part of the Modification Report prepared to accompany the modification application for the Project under Part 4 of the *Environmental Planning and Assessment Act 1979*.

Figure 1 Project Site location



Source: RWC

1.1. Assessment Requirements

Given that the Project is a proposed modification to an existing State Significant Development (SSD) approval, no NSW Planning Secretary's Environmental Assessment Requirements (SEARs) have been provided for the Project by the Department of Planning, Housing, and Infrastructure (NSW DPHI).

However, the AQIA has been prepared in general accordance with the NSW Environment Protection Authority (EPA) 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW' document (NSW EPA, 2022). The GHGA has been performed with reference to the NSW EPA 'Large Emitters Guideline', although emissions are shown to be well below the 25 000 t CO₂-e-yr⁻¹ threshold requiring a detailed assessment to be performed.

Further to the above, the policies, guidelines and plans which have been referenced during the performance of the AQIA include (in no order):

- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Protection of the Environment Operations Act 1997* (POEO Act);
- Environmental Planning and Assessment Regulation 2021 (EP&A Regulation);
- Protection of the Environment Operations (Clean Air) Regulation 2022 (POEO CAR); and
- Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA, 2022).

The policies, guidelines and plans which have been referenced during the performance of the GHGA include (in no order):

- National Greenhouse and Energy Reporting Scheme, under the *National Greenhouse and Energy Reporting Act* (2007);
- *Climate Change (Net Zero Future) Act* 2023,
- Emissions Reduction Fund, under the Carbon Credits (Carbon Farming Initiative) Act (2011);
- Renewable Energy Target, under the *Renewable Energy (Electricity) Act* (2000);
- NSW Climate Change Policy (2023);
- Australian Government Department of Climate Change, Energy, the Environment and Water, Australian National Greenhouse Accounts, National Greenhouse Accounts Factors, 2024 (DCCEEW, 2024c);
- The World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) GHG Protocol: A Corporate Accounting and Report Standard (WRI, 2004);
- ISO 14064-1:2018 (Greenhouse Gases – Part 1: Specification with guidance at the organisation level for quantification and reporting of GHG emissions and removal);
- ISO 14064-2:2019 (Greenhouse Gases – Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of GHG emission reductions or removal enhancements);
- ISO 14064-3:2019 (Greenhouse Gases – Part 3: Specification with guidance for the validation and verification of GHG assertions) guidelines (internationally accepted best practice); and

- Australian National Registry of Emissions Units, under the *Australian National Registry of Emissions Units Act* (2011).

Appendix A presents a common list of abbreviations, nomenclature and specified units referenced within this AQIA and GHGA.

2. PROJECT DESCRIPTION

A full description of the Project is provided in section 3 of the Modification Report. Details relevant to the AQIA / GHGA are presented in this section.

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

2.1. Project Summary

2.1.1. Historical and Current Operations

The Quarry has been successfully operated by the Applicant for over 55 years as a source of sand for construction and concrete products produced by Cleary Bros at their plants in Albion Park, Bomaderry and Coniston.

Operations at the Project Site have been authorised under a series of development approvals. The current development consent for the Quarry, Major Project Approval MP 05_0099 for the extension and continuation of the Quarry, was originally sought under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and determined by the Land and Environment Court on 2 September 2008. Following the repeal of Part 3A of the EP&A Act and under transitional arrangements provided by Schedule 6A of the EP&A Act, the consent has subsequently been modified once (Mod 1) under the former Section 75W of the EP&A Act (determined on 10 June 2022) to extend the extraction area and develop a new dredge pond.

MP 05_0099 (Mod 1) permits the extension and continued operation of the Quarry, including:

- extraction and processing operations until 31 July 2038 from the approved extraction areas (Figure 2);
- extraction using a floating suction dredge-based extraction system, including transfer of dredged slurry material to the on-site processing plant via a pipeline;
- material processing using a wet sorter containing multiple screens and a cyclone;
- return of process water and fines to the dredge pond;
- stockpiling of products;
- loading and transportation of up to 80 000 tonnes (t) of product from the Project Site per year using the approved transportation route(s);
- rehabilitation works in areas where extraction has been completed; and
- operation within the following approved hours of operation.
 - 7:00 am to 6:00 pm, Monday to Friday.

- 7:00 am to 1:00 pm, Saturdays.
- At no time on Sundays or Public Holidays.

Environment Protection Licence (EPL) 4146 currently licences activities at the Project Site including extraction (>50,000 to 100 000 t annually) and crushing, grinding or separating (>30 000 to 100 000 t annually).

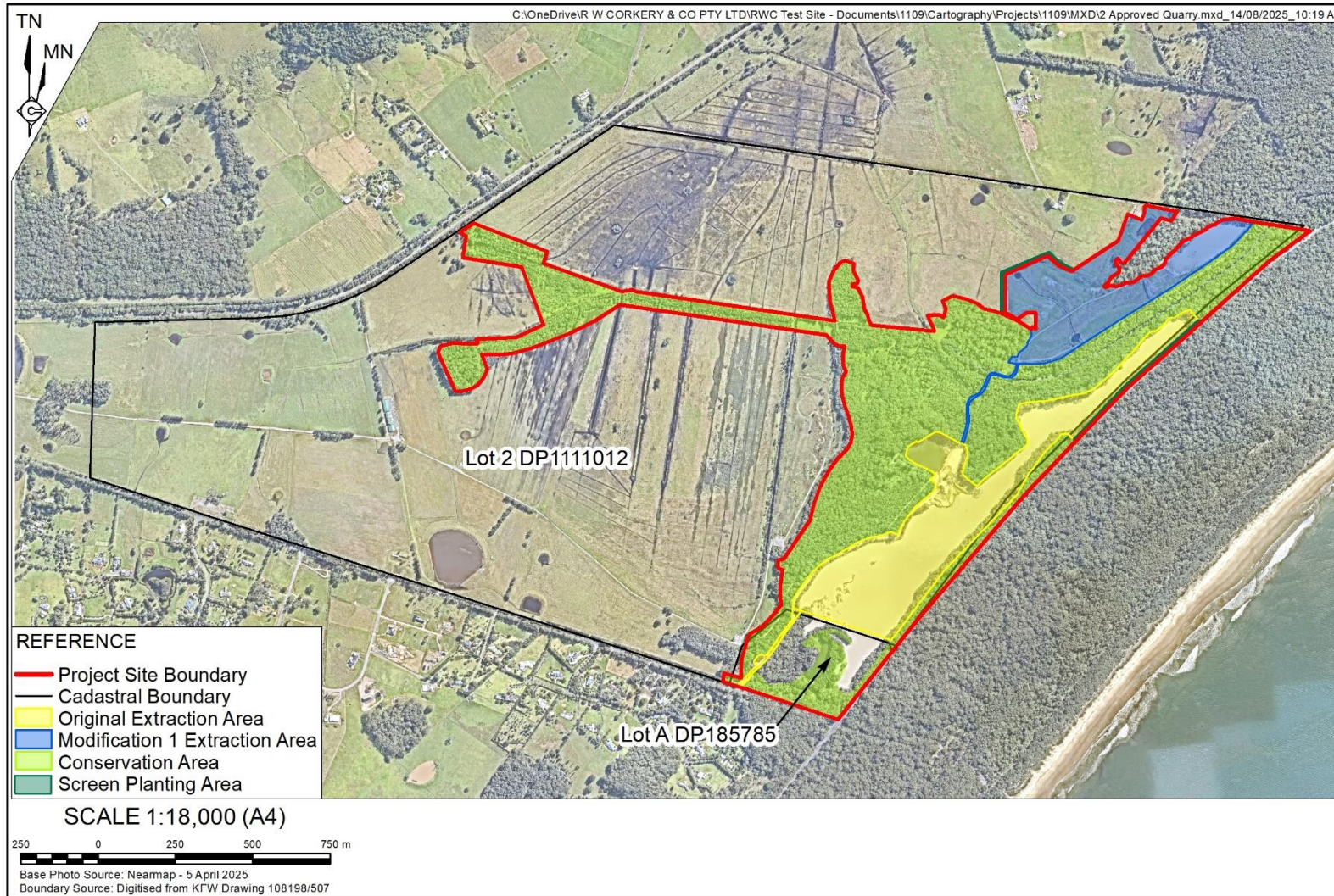
2.1.2. Proposed Modification

The Applicant proposes to modify MP 05_0099 (Mod 1) to increase the annual product transport limit at the Quarry by 50 % from 80 000 tonnes per year ($\text{t}\cdot\text{yr}^{-1}$) to 120 000 $\text{t}\cdot\text{yr}^{-1}$ (the 'Proposed Modification'). As the annual product transportation limit would largely determine annual extraction and processing operations at the Project Site, the Proposed Modification would include an intensification of these production activities. The Proposed Modification would represent Modification 2 to MP05_0099.

No further changes to approved operations are proposed as part of the Proposed Modification.

Separate to the Proposed Modification, Cleary Bros has submitted a subdivision application with Kiama Municipal Council and Shoalhaven City Council. If approved, Lot A DP185785 will be subsumed into Lot 2 DP1111012 and Lot 2 will be divided into three lots, with Quarry operations confined to a single lot. A new lot adjacent to Beach Road will include two building envelope which have been assessed as sensitive receptors for the purposes of the AQIA (receptors R12 and R13, refer Section 4.2).

Figure 2 Approved Project Site layout



Source: RWC

2.2. Project Overview

A description of the Quarry activities is provided below. The process would be largely unchanged from that approved under MP 05_0099 (Mod 1), with only increases in the extraction, production, and transport rates proposed.

2.2.1. Dredge Extraction

The methodology used to extract the sand from the dredge pond extension would be the same as that currently in use. The pipeline (250 mm polypipe) that connects the dredge to the separation system travels along the eastern edge of an existing access track that connects the extraction area approved under Mod 1 with the original extraction area. The pipeline is laid directly on the ground or raised on concrete plinths as required. Short sections of the pipe are buried where necessary (for example at track intersections or crossings).

2.2.2. Extraction Area

The dredge pond approved under Mod 1 is located to the north-west and west of the original dredge pond. The area of the dredge pond extension approved under Mod 1 is approximately 15 hectares (ha) and contains an estimated 1.2 million tonnes (Mt) of sand as estimated by exploratory boreholes. Exploratory drilling of the site has shown that immediately below the shallow layer of sandy topsoil lies a beneficial sand resource. The sand resource varies in thickness across the site and includes a clay band of up to 2 metres (m) deep in parts.

2.2.3. Material Processing

The existing cyclone plant would be used to sort the wet sand. There would be no changes to the material processing or handling of fine material nor the location of the process, other than the processing rate increase to support the increased transportation limit from 80 000 t·yr⁻¹ to 120 000 t·yr⁻¹.

2.2.4. Stockpiles

Sand extracted from the extraction area would be stockpiled in the same location currently in use. There will be no changes to the material stockpiling processes.

2.2.5. Material Transport

The loading and transport of sand would be carried out using the same process and transport routes as that currently in use. There will be no changes to the loading and transport of the sand, other than the rate increase from 80 000 t·yr⁻¹ to 120 000 t·yr⁻¹.

2.2.6. Equipment List

The typical equipment used on the site includes:

- Sand dredge;
- Cyclones and screens (wash plant);
- A number of water pumps;
- Rubber-tyred loader (CAT 972H or equivalent)
- 30 t excavator (CAT 330B or equivalent);
- Water cart;
- Articulated dump truck (CAT 740A or equivalent);
- Dozer (Cat D6 or equivalent); and
- Road-going trucks (for offsite transport, site deliveries, and maintenance).

2.2.7. Hours of Operation

The proposed hours of operation for the Project would be consistent with those currently permitted under MP 05_0099 (Mod 1). Table 1 lists the hours of operation within which operational activities would be performed throughout the life of the Project.

Table 1 Proposed hours of operation

Activity	Hours
All activities	7:00 am to 6:00 pm Monday to Friday
	7:00 am to 1:00 pm Saturday

2.3. Identification of Potential Emissions to Air

The processes which may result in the emission of pollutants to air during Project operations would include:

- Wet processing of dredged sand;
- Loading of product to stockpiles;
- Loading of road trucks with product;
- Haulage of product from stockpiles offsite via unpaved and paved haulage route;

- Wind erosion of disturbed areas; and
- Emissions from vehicle and equipment exhaust.

Extraction of sand from the dredge pond is a wet process and would not result in emissions of particulate matter to air.

The specific pollutants of interest associated with the activities above are:

- Total suspended particulate (TSP);
- Particulate matter with an aerodynamic diameter of 10 microns (PM_{10});
- Particulate matter with an aerodynamic diameter of 2.5 microns ($PM_{2.5}$); and
- Silica (Si).

Emissions of oxides of nitrogen (NO_x), carbon monoxide (CO) and sulphur dioxide (SO_2) would be anticipated related to diesel combustion from Quarry plant, in addition to particulates considered above from processing and material handling activities.

Given the quantity of equipment operating at any one time at the Quarry, it is not anticipated that emissions associated with diesel combustion (other than particulate matter which have been assessed) would be a significant contributor to total site emissions and have not been addressed further.

Odour is not anticipated to result in any significant quantity from the operations at the Project Site, and this has not been assessed.

2.4. Air Quality Management

2.4.1. Mitigation Measures

The Quarry operates in accordance with the Quarry Environmental Management Plan (QEMP), which includes an Air Quality Management Plan (AQMP) (Cleary Bros, 2022). The AQMP was prepared to meet the requirements of the Consolidated Approval for MP 05_0099 as modified and approved by the Minister for Planning on 10 June 2022.

In addition to a meteorological and dust deposition monitoring program (refer Section 4.3 and Section 4.4), a range of mitigation measures are employed at the Quarry to minimise air emissions (as outlined in section 6 of the AQMP):

- Siting the processing plant and truck loading area in the central part of the site, away from the rural residential receivers.
- The first 200 m of the access road within the site has been sealed to limit dust generation closest to the rural residential area to the south.

- The intersection of the access road with Beach Road has been upgraded with sealed shoulders.
- Equipment utilised at the Quarry has been specifically selected to be fit for purpose.

Other operational controls implemented to minimise air quality impacts include:

- Keep to a minimum the area of land disturbed for operational purposes at any one time. When a disturbed area is no longer to be used, revegetate it as soon as practicable.
- Restrict the speed of vehicles operating within the site to 20 km·hr⁻¹ to minimise wheel-generated dust.
- Cover the loads of all loaded vehicles carrying materials to or from the site.
- Keep unsealed internal roads and loading areas moist when in use to minimise vehicle-generated dust.
- Regulate sand production to avoid excessive product stockpiling.
- Monitor weather forecasts on a regular basis (minimum twice weekly) to enable proactive measures to be planned, such as increased haul road watering, altering certain activities, or cease loading and transport on the site.
- Continually watch for any visible air pollution and if necessary, minimise dust generation by modifying operations, such as closing the site for loading and transport in extreme weather conditions.
- Maintain plant and equipment to manufacturers' specifications.
- Ensure all truck drivers leaving the site are familiar with and adhere to the requirements of Cleary Bros Drivers Code of Conduct, which includes driver behaviour training relating to turning off truck engines when parked or waiting for an extended period of time.
- Implement an air quality monitoring program to ensure compliance with the air quality criteria (refer Section 2.4.2).
- Advertise the contact number at the front of the site, to provide community members with a contact point should they wish to raise concerns regarding dust generation.
- Cleary Bros complaints management process ensures all community complaints are investigated and followed up as relevant to each complaint.
- Conduct regular Community Consultative Committee meetings to ensure dissemination of project information and to provide a forum for community members to raise any concerns regarding air quality.

2.4.2. Monitoring Program

As outlined in the AQMP, the current Consent requires the operation of air quality monitoring procedures (schedule 3, condition 8(c)). Dust deposition gauges (DDG) are positioned at 3 locations as outlined in Section 4.4.2):

- DDG 1A adjacent to the site entrance;

- DDG 2A on the site boundary east of the processing plant; and
- DDG 4A to the north of the modification 1 dredge pond.

An Automatic Weather Station (AWS) is also co-located with DDG 4A.

The performance targets for dust deposition are the same as those outlined in Table 3, which have been adopted for the purposes of Project assessment.

3. LEGISLATION, REGULATION AND GUIDANCE

This section outlines the relevant legislative requirements for the Project under applicable State and Commonwealth legislation and planning instruments.

The Quarry's Environment Protection Licence (EPL) under the POEO Act, and respective planning approvals under the EP&A Act, regulate the impact of mining on the environment.

3.1. Protection of the Environment Operations Act 1997

The POEO Act sets the statutory framework for managing air quality in NSW, including establishing the licensing scheme for major industrial premises (scheduled activities) and a range of air pollution offences and penalties.

Should the Project modification gain approval, the operations would continue to be classified as a scheduled activity under the POEO Act and as such the Quarry would require a variation to its EPL.

3.2. Protection of the Environment (Clean Air) Regulation 2022

The Protection of the Environment Operations (POEO) (Clean Air) Regulation 2022 sets standards of concentration for emissions to air from both scheduled and non-scheduled activities. For the activities performed at the Quarry Site, the POEO (Clean Air) Regulation 2022 provides general standards of concentration for scheduled premises which are presented in Table 2 for the pollutants of relevance.

Table 2 POEO (Clean Air) Regulation – General standards of concentration

Air Impurity	Activity	Standard of concentration (Group 6) ^(a)
Solid particles (total)	Any activity or plant (except as listed below)	50 mg·m ⁻³
	Any crushing, grinding, separating, or materials handling activity	20 mg·m ⁻³

Note: (a) Group 6 – pursuant to application made on or after 1 September 2005

Further to the requirements in Table 2, Part 4 Clause 20 of the POEO (Clean Air) Regulation 2022 requires that motor vehicles do not emit excessive air impurities which may be visible for a period of more than 10 seconds (s) when determined in accordance with the relevant standard.

All vehicles, plant, and equipment to be used either at the Project Site or to transport materials to and from the Project Site will be maintained regularly and in accordance with manufacturers' requirements, where these vehicles are under the operational control of the Applicant.

3.3. NSW EPA Air Quality Criteria

3.3.1. Criteria Air Pollutants

State air quality guidelines adopted by the NSW EPA are published in the 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW' (NSW EPA, 2022) (the 'Approved Methods') which has been consulted during the preparation of this report.

The Approved Methods lists the statutory methods that are to be used to model and assess emissions of criteria air pollutants from stationary sources in NSW. Section 7.1 of the Approved Methods outlines the impact assessment criteria to be applied.

The criteria listed in the Approved Methods are derived from a range of sources (including National Health and Medical Research Council [NHMRC], National Environment Protection Council [NEPC], and World Health Organisation [WHO]).

The criteria specified in the Approved Methods are the defining ambient air quality criteria for NSW. The standards adopted to protect members of the community from health impacts in NSW are presented in Table 3.

Table 3 NSW EPA air quality impact assessment criteria

Pollutant	Averaging period	Units ^(e)	Criterion	Notes
Particulates (as PM ₁₀)	24 hours	µg·m ⁻³	50	Numerically equivalent to the AAQ NEPM ^(b) standards and goals.
	1 year	µg·m ⁻³	25	
Particulates (as PM _{2.5})	24 hours	µg·m ⁻³	25	
	1 year	µg·m ⁻³	8	
Particulates (as TSP)	1 year	µg·m ⁻³	90	
Particulates (as dust deposition)	1 year ^(c)	g·m ⁻² ·month ⁻¹	2	Assessed as insoluble solids as defined by AS 3580.10.1
	1 year ^(d)	g·m ⁻² ·month ⁻¹	4	

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

3.3.2. Respirable Crystalline Silica

Given the nature of the material to be extracted and processed at the Project Site, respirable crystalline silica (RCS) may be generated during those activities. NSW EPA do not provide air quality criteria for RCS, although Environment Protection Authority Victoria (EPA VIC) in their State Environmental Planning Policy (SEPP) Protocol for Environmental Management: Mining and Extractive Industries (PEM) (EPA VIC, 2007) do include

an annual average criterion for RCS (assessed as $PM_{2.5}$) as $3 \mu\text{g}\cdot\text{m}^{-3}$, which has been adopted from the California EPA Office for Environmental Health Hazard Assessment Reference Exposure Levels.

Furthermore, EPA South Australia (SA EPA) provide an interim criterion for RCS concentrations in ambient air associated with mining and extractive industries (EPA SA, 2022). SA EPA, with input from SA Health, performed a literature review of the modern criteria for RCS in ambient air associated with mining and extractive industries. Based on that review, the SA EPA is adopting an interim respirable crystalline silica (RCS) criterion of $3 \mu\text{g}\cdot\text{m}^{-3}$ (annual average) for the PM_{10} size fraction of dust in ambient air.

It is noted that EPA VIC and SA EPA have adopted the same averaging period and concentration ($3 \mu\text{g}\cdot\text{m}^{-3}$, annual average) although the size fraction of particulate to which the criterion applied differs, with EPA VIC referencing the $PM_{2.5}$ size fraction, and SA EPA referencing the PM_{10} fraction. PM_{10} concentrations are shown to be greater than $PM_{2.5}$ concentrations (refer Section 5.2.5), and therefore this AQIA has adopted the SA EPA criterion which is a conservative assumption.

This criterion is referenced in this assessment and calculates RCS by adjusting annual average PM_{10} modelling results on a *pro-rata* basis to account for the determined maximum free silica content of the extracted material (conservatively taken to be 95 % [w/w]). RCS is generally an occupational health and safety issue (i.e. on-site) rather than an environmental issue (i.e. off-site) when considering mining/extractive activities but has been presented within this AQIA for completeness.

3.4. Greenhouse Gas Legislation and Guidance

The Australian Government Clean Energy Regulator (CER) administers schemes legislated by the Australian Government for measuring, managing, reducing or offsetting Australia's carbon emissions.

Schemes administered by the Clean Energy Regulator include:

- National Greenhouse and Energy Reporting Scheme, under the *National Greenhouse and Energy Reporting Act* (2007).
- Emissions Reduction Fund, under the Carbon Credits (Carbon Farming Initiative) Act (2011).
- Renewable Energy Target, under the *Renewable Energy (Electricity) Act* (2000).
- Australian National Registry of Emissions Units, under the *Australian National Registry of Emissions Units Act* (2011).

3.4.1. National Greenhouse and Energy Reporting Scheme

The National Greenhouse and Energy Reporting (NGER) scheme, established by the *National Greenhouse and Energy Reporting Act* (2007) (NGER Act), is a national framework for reporting and disseminating

company information about greenhouse gas emissions, energy production, energy consumption and other information specified under NGER legislation.

The objectives of the NGER scheme are to:

- Inform government policy;
- Inform the Australian public;
- Help meet Australia's international reporting obligations;
- Assist Commonwealth, state and territory government programmes and activities; and,
- Avoid duplication of similar reporting requirements in the states and territories.

Further information on the NGER scheme, specifically the definitions of various scopes and types of GHG emissions which have also been adopted for the purposes of this assessment, is provided in Section 5.2.

3.4.2. Relevant NSW Legislation

NSW Government has enacted the *Climate Change (Net Zero Future) Act 2023*, which aims to:

- Establish guiding principles for action to address climate change;
- Set targets for the reduction in net GHG emissions in NSW until 2050;
- Set an objective for NSW to be more resilient to a changing climate; and
- Establish the Net Zero Commission to independently monitor, review, and report on progress in NSW towards the targets, the adaptation objective and other matters.

NSW EPA also published their Climate Change Policy in 2023, and in January 2025 released the guide for 'large emitters' (emitting greater than 25 000 t CO₂-e per year), with a further guideline for general projects (emitting less than 25 000 t CO₂-e per year) to be published (currently being developed by the EPA) (NSW EPA, 2025).

The Project is anticipated to result in significantly less than 25 000 t CO₂-e emissions per year (refer Section 7), and given that guidelines for assessment are currently being developed for projects of this nature, the methodology outlined in Section 5.2 has been adopted.

3.4.3. Guidance

The GHG accounting and reporting principles adopted within this GHGA are based on the following financial accounting and reporting standards:

- Australian Government Department of Climate Change, Energy, the Environment and Water, Australian National Greenhouse Accounts, National Greenhouse Accounts Factors, 2024 (DCCEEW, 2024c);

- The World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) GHG Protocol: A Corporate Accounting and Report Standard (WRI, 2004);
- ISO 14064-1:2018 (Greenhouse Gases – Part 1: Specification with guidance at the organisation level for quantification and reporting of GHG emissions and removal);
- ISO 14064-2:2019 (Greenhouse Gases – Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of GHG emission reductions or removal enhancements); and
- ISO 14064-3:2019 (Greenhouse Gases – Part 3: Specification with guidance for the validation and verification of GHG assertions) guidelines (internationally accepted best practice).

4. EXISTING CONDITIONS

The following information provides context around the location of sensitive receptor locations surrounding the Project Site, the prevailing meteorology and air quality of the surrounding area and identifies other sources of air pollutants which have the potential to impact cumulatively with the Project.

4.1. Surrounding Land Sensitivity

The Project Site is situated within land zoned under the Kiama Local Environmental Plan (LEP) 2011 as:

- RU1 - Primary Production;
- RU2 – Rural Landscape;
- C2 – Environmental Conservation; and
- C3 – Environmental Management.

Other land use zones within the surrounding area include those above plus R5 – Large Lot Residential along the western side of Beach Road.

4.2. Sensitive Receptor Locations

Air quality assessments include a desktop mapping exercise to identify 'discrete receptor locations', which are intended to represent a selection of locations that may be susceptible to changes in air quality. In broad terms, the identification of sensitive receptors refers to places at which humans may be present for a period representative of the averaging period for the pollutant being assessed.

The Approved Methods (NSW EPA, 2022) denotes a sensitive receptor location to be:

'A location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area'.

The focus of the AQIA has been on discrete receptor locations, which are specified in consideration of the Approved Methods and are broadly representative of those areas or sites that may experience the greatest, or most likely levels of exposure on account of the Project operations.

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

To ensure that the selection of discrete receptors for the AQIA are reflective of the locations in which the population of the area surrounding the Project Site reside, population density data has been examined.

Population density data based on the 2021 census have been obtained from the Australian Bureau of Statistics (ABS) for a 1 square kilometre (km²) grid, covering mainland Australia (ABS, 2022). Using a Geographical Information System (GIS), the locations of sensitive receptor locations have been confirmed with reference to their population densities.

For clarity, the ABS use the following categories to analyse population density (persons·km⁻²):

- | | |
|--------------------------------|-------------------------------------|
| • No population – Zero (0). | • Medium – Between 2 000 and 5 000. |
| • Very low – Up to 500. | • High – Between 5 000 and 8 000. |
| • Low – Between 500 and 2 000. | • Very high – More than 8 000. |

The population density of the area surrounding the Project Site are presented in Figure 3. The Project Site is located in an area of very low population density (between zero and less than 500 persons·km⁻²).

In accordance with the requirements of the NSW EPA, several receptors have been identified and the receptors adopted for use within this AQIA are presented in Table 4 and illustrated in Figure 3.

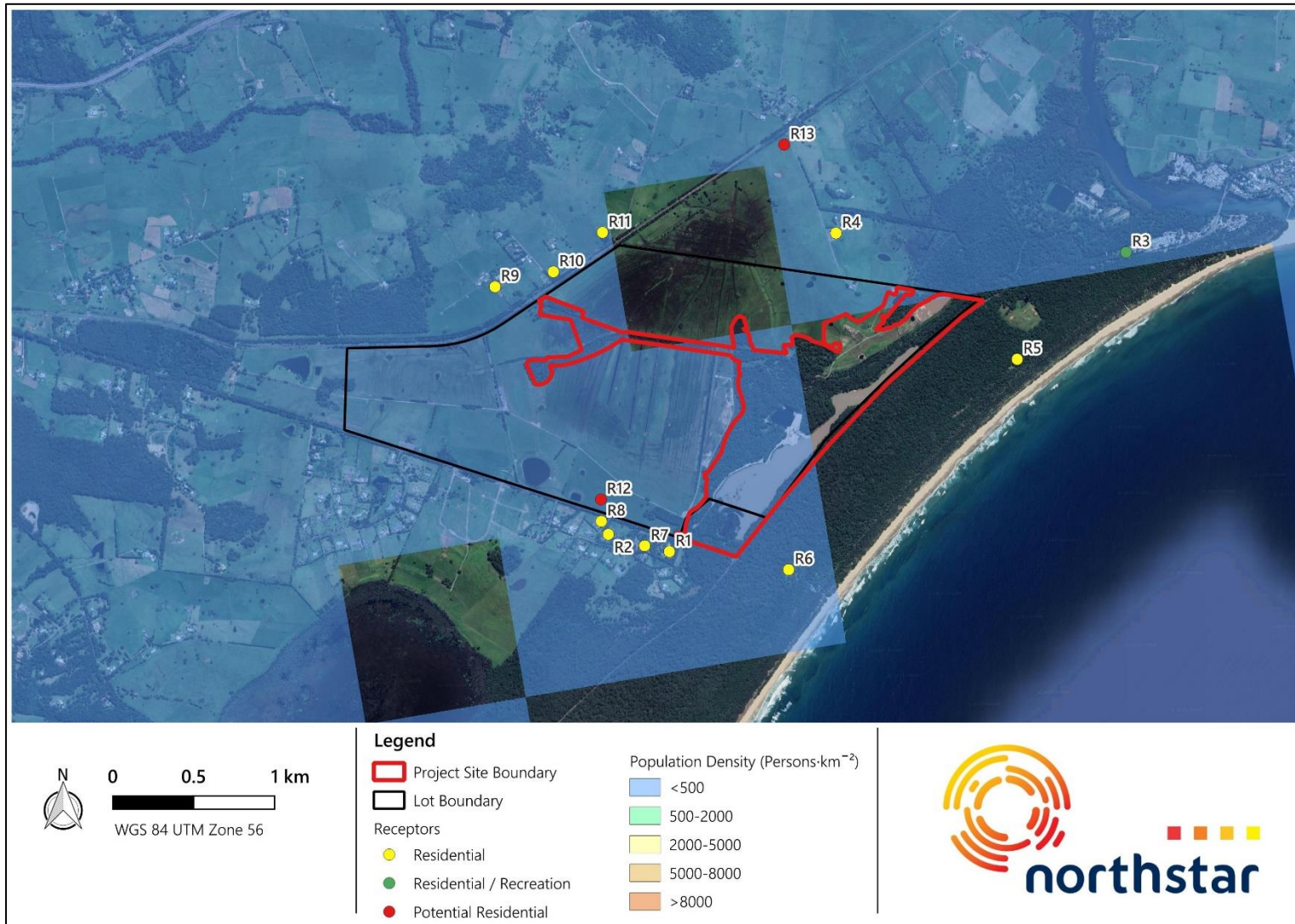
Whilst a quantitative air quality assessment was not performed to support Modification 1, a Noise Impact Assessment (NIA) was performed (Renzo Tonin, 2005). The NIA identified six sensitive receptors surrounding the Project Site, and in the interests of maintaining consistency with previous technical studies, those six receptors and receptor numbering have been adopted within this AQIA. In addition, a further five existing sensitive receptors have been identified for the purposes of this AQIA, and a further two receptors have been identified to be representative of potential residential development, should the separate subdivision application (refer Section 2.1.2) be successful.

Table 4 Identified discrete sensitive receptors

Receptor ID	Location	Land Use	Coordinates (UTM)	
			mE	mS
R1	670 Beach Road	Residential	296 011	6 148 026
R2	11 Bangarra Street	Residential	295 634	6 148 132
R3	Seven Mile Beach Holiday Park	Residential / Recreation	298 833	6 149 874
R4	Coralea Property	Residential	297 041	6 149 992
R5	Picnic Area 1	Recreation	298 160	6 149 213
R6	Picnic Area 2	Recreation	296 748	6 147 914
R7	640B Beach Road	Residential	295 859	6 148 061
R8	10 Bangarra Street	Residential	295 591	6 148 213
R9	215 Toolijooa Road	Residential	294 934	6 149 661
R10	364 Toolijooa Road	Residential	295 295	6 149 753
R11	330 Toolijooa Road	Residential	295 598	6 149 997
R12	Potential residential development	Residential	295 588	6 148 347
R13	Potential residential development	Residential	296 721	6 150 538

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

Figure 3 Population density and discrete sensitive receptor locations



Source: Northstar

4.3. Meteorology

The meteorology experienced within an area can govern the generation (in the case of wind-dependent emission sources), dispersion, transport, and eventual fate of pollutants in the atmosphere. The meteorological conditions surrounding the Project Site have been characterised using data collected from surrounding Automatic Weather Stations (AWS) operated by the Australian Government Bureau of Meteorology (BoM), or by the Applicant.

Three stations have been identified located proximate to the Project Site. A summary of the identified AWS operated by BoM and the Applicant is provided below in Table 5 (listed by proximity).

Table 5 Details of meteorological monitoring surrounding the Quarry Site

Site name	Source	Approximate location		Approximate distance from Project Site (km)
		mE	mS	
Project Site	Applicant	297 123	6 149 690	On-site
Kiama (Bombo Headland) AWS – Station #068242	BoM	303 967	6 163 333	14.9
Nowra RAN Air Station AWS – Station #068072	BoM	274 923	6 130 071	27.9

4.3.1. Bureau of Meteorology Data

The Kiama (Bombo Headland) Airport AWS is noted to be the most proximate BoM operated AWS, located approximately 14.9 km to the north northeast of the Project Site. As such, it is considered that data collected at Kiama (Bombo Headland) Airport AWS is most likely to represent the conditions in the broader area, based upon its proximity. Whilst the AWS at the Project Site provides a site-specific representation of meteorological conditions (see Section 4.3.2) which are useful in validation of modelled meteorological conditions, the quality of data obtained from an AWS operated by the BoM, and the longer record length of the BoM AWS is considered to be of key importance when identifying representative data for use in the AQIA.

Corresponding, data from Kiama (Bombo Headland) AWS for the 5-year period between 2020 and 2024 have been analysed for use in this AQIA. The wind roses presented in Appendix B indicate that from 2020 to 2024, winds at the Kiama (Bombo Headland) AWS show generally similar wind distribution patterns across the years assessed, with predominant north north-easterly, south south-westerly, and west north-westerly components evident.

The majority of wind speeds experienced at the Kiama (Bombo Headland) AWS between 2020 and 2024 are generally in the range 1.5 meters per second ($\text{m}\cdot\text{s}^{-1}$) to $8 \text{ m}\cdot\text{s}^{-1}$ with the highest wind speeds (greater than

8 m·s⁻¹) occurring from southerly directions. Winds of this speed occur during 10.2 % of the observed hours during the years while calm winds (less than 0.5 m·s⁻¹) occur during 1.2 % of hours on average across the years between 2020 and 2024.

An analysis of the correlation coefficients between each year for wind speed, wind direction and particulate matter data distribution was performed to select a representative year for the meteorological modelling (refer Appendix B). Following this analysis, the calendar year 2021 was selected as the most suitable for further assessment.

To provide a characterisation of the meteorology which would be expected at the Project Site, a meteorological modelling exercise has also been performed. A summary of the inputs and outputs of the meteorological modelling assessment, including validation of those outputs with BoM AWS and Project specific meteorological data is presented in Appendix B.

4.3.2. On-Site Meteorological Data

Meteorological conditions are currently monitored at the Project Site by the Applicant in accordance with the Project's air quality monitoring program (refer Section 4.4.2). The location of the monitoring station is illustrated in Figure 5.

Meteorological data between 1 July 2022 and 25 May 2025 have been provided by the Applicant. An analysis of the data has been performed as part of this study to verify the accuracy of the meteorological data adopted for the purposes of dispersion modelling (refer Appendix B).

As outlined in Appendix B, comparison of the on-site meteorological data and the modelled CALMET data indicate that the modelled data is suitable to be adopted for the purposes of this assessment.

4.4. Air Quality

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

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

4.4.1. DCCEEW Air Quality Data

Data from air quality monitoring stations (AQMS) operated by NSW Department of Climate Change, Energy, Environment and Water (NSW DCCEEW) have been considered within this AQIA. The locations of the nearest AQMS (listed by proximity) are briefly summarised in Table 6 and illustrated in Figure 4.

Table 6 Closest AQMS to the Project Site

AQMS location	Source	Distance to Project Site (km)	2021 data	Measurements		
				PM ₁₀	PM _{2.5}	TSP
Albion Park South	NSW DCCEEW	21.8	✓	✓	✓	✗
Wollongong	NSW DCCEEW	40.7	✓	✓	✓	✗

It is noted that there are no AQMS within 20 km of the Project Site. However, adoption of air quality monitoring data, often collected at significant distances from proposed projects, to represent conditions at those locations is a routinely adopted approach in NSW. NSW DCCEEW operate extensive air quality monitoring networks, generally reflective of the most populated areas of the States. Site specific air quality monitoring funded by proponents can sometimes be used, although for the purposes of use within an AQIA, at least a full year of continuous measurement is required.

The closest active AQMS that records particulate matter (PM) data is noted to be located at Albion Park South and is considered to be the most reflective of the conditions at the Project Site.

Given the wind distributions and PM concentrations measured at Kiama (Bombo Headland) AWS and Albion Park South AQMS across the years 2020 to 2024, data for the year 2021 has been selected as being appropriate for further assessment (refer Appendix B).

It is noted that none of the identified AQMS measure Total Suspended Particulate (TSP) which is of relevance to the expected emissions from the Project Site. Other sources of data have been adopted to allow representation of the TSP environment in the area surrounding the Project Site, and a full discussion is provided in Appendix C. The analysis concludes that a TSP:PM₁₀ ratio specific to the Illawarra region of 2.222 : 1 (i.e. PM₁₀ represents ~45 % of TSP) is appropriate.

Figure 4 Locations of proximate AQMS



Source: Northstar

4.4.2. On-Site Air Quality Data

Dust deposition rates are measured by the Applicant at the Quarry for the purposes of ongoing air quality management. There are currently three dust monitoring sites located within the boundary of the Project Site with their respective locations shown in Figure 5. Historically, an additional dust deposition gauge (3A) was located at the east of the Project Site, which was relocated to site 4A in 2023. Results of the dust deposition monitoring (as total insoluble solids, $\text{g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$) over the most recent five complete years of monitoring (2021 to 2024), plus the most recent five months of data in 2025 is presented in Table 7.

Table 7 Quarry dust deposition results

Year	Annual average total insoluble solids deposition rate ($\text{g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$)				
	1A	2A	3A	4A	All sites
2020	2.4 (12)	2.1 (12)	2.4 (12)	N/A	2.3
2021	1.2 (12)	0.7 (12)	0.5 (12)	N/A	0.8
2022	2.3 (12)	1.3 (12)	0.6 (12)	N/A	1.4
2023	1.4 (12)	1.8 (12)	0.3 (8)	0.3 (4)	1.0
2024	1.1 (12)	1.6	N/A	0.6 (12)	1.1
2025	0.9 (5)	0.2 (5)	N/A	0.3 (5)	0.5

Note: Number of measurements shown in brackets.

Given that the site average annual average total insoluble solids deposition rates have been measured to be below $2\text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$ over the last 4 complete years of monitoring, with the 2021 (representative year for modelling) rate being $0.8\text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$, the adopted annual average total insoluble solids deposition rate of $2\text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$ (the difference in NSW EPA maximum allowable and incremental impact criterion) is considered appropriate to allow the presentation of a conservative assessment.

A summary of the air quality data and assumptions used in this assessment are presented in Table 8.

Table 8 Summary of background air quality used in the AQIA

Pollutant	Averaging period	Units	Measured Value	Notes
Particles (as TSP) (derived from PM_{10})	Annual	$\mu\text{g}\cdot\text{m}^{-3}$	29.1	Estimated on a TSP: PM_{10} ratio of 2.222 : 1 (refer Appendix C)
Particles (as PM_{10})	24-hour	$\mu\text{g}\cdot\text{m}^{-3}$	Daily Varying	The max. 24-hour PM_{10} concentration was $39.4\text{ }\mu\text{g}\cdot\text{m}^{-3}$
	Annual	$\mu\text{g}\cdot\text{m}^{-3}$	13.1	
Particles (as $\text{PM}_{2.5}$)	24-hour	$\mu\text{g}\cdot\text{m}^{-3}$	Daily Varying	The max. 24-hour $\text{PM}_{2.5}$ concentration was $23.3\text{ }\mu\text{g}\cdot\text{m}^{-3}$
	Annual	$\mu\text{g}\cdot\text{m}^{-3}$	4.8	
Dust deposition	Annual	$\text{g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$	2.0	Difference in maximum allowable and incremental impact criteria

The AQIA has been performed to assess the contribution of the Project to the air quality of the surrounding area. A full discussion of how the Project impacts upon the air quality of the area is presented in Section 6.

4.5. Topography

The elevation at the Project Site ranges between 0 m to 6 m Australian Height Datum (AHD). The topography between the Project Site and identified sensitive receptor locations is uncomplicated (from an AQIA perspective).

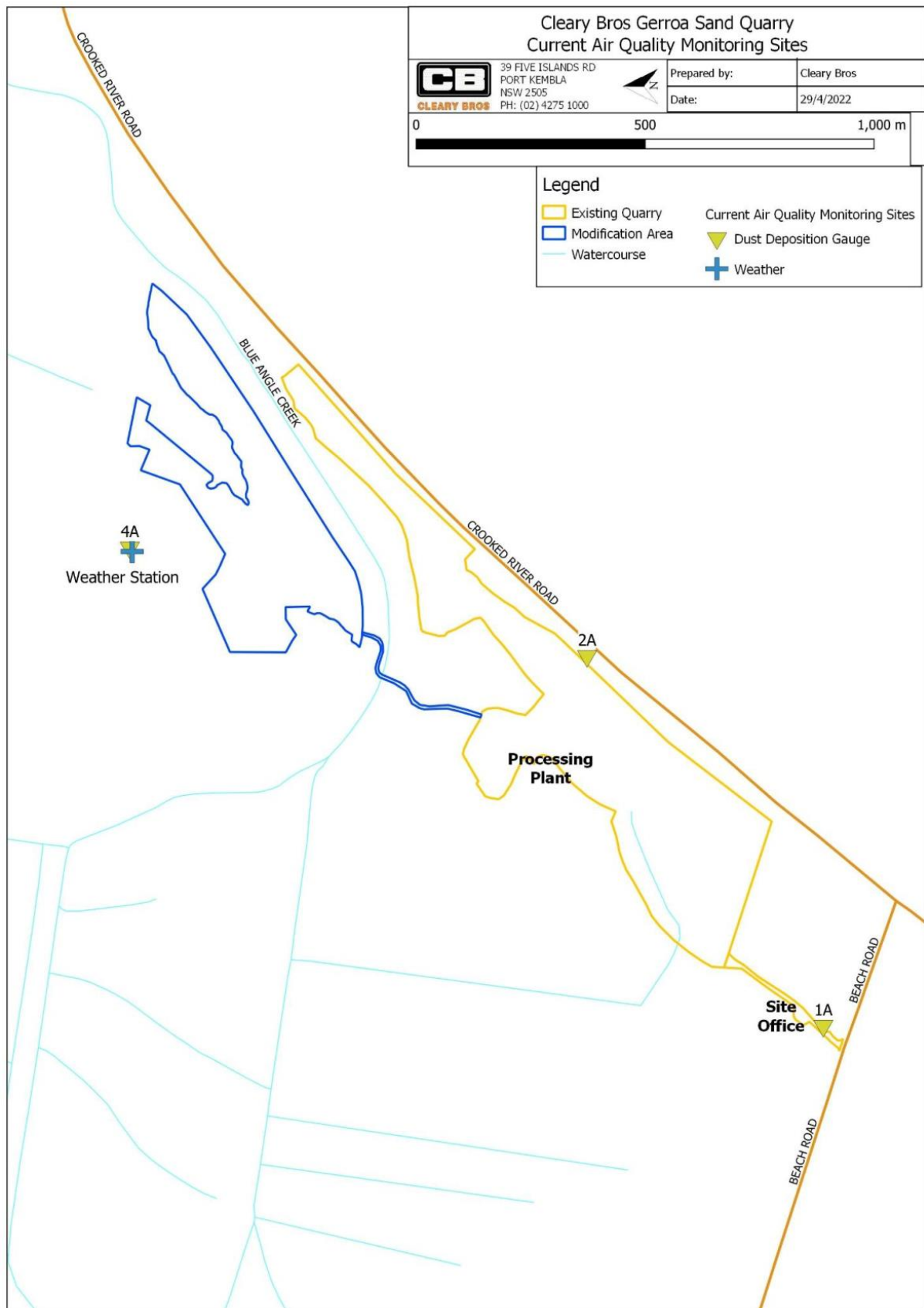
The topography surrounding the Project Site is presented in Figure 6.

4.6. Potential for Cumulative Impacts

The area surrounding the Project Site is generally rural in nature, with no other facilities with the potential to result in cumulative particulate matter impacts identified. The adoption of the background air quality data as discussed in Section 4.3.2 is considered to be appropriate to provide an assessment of cumulative impacts.

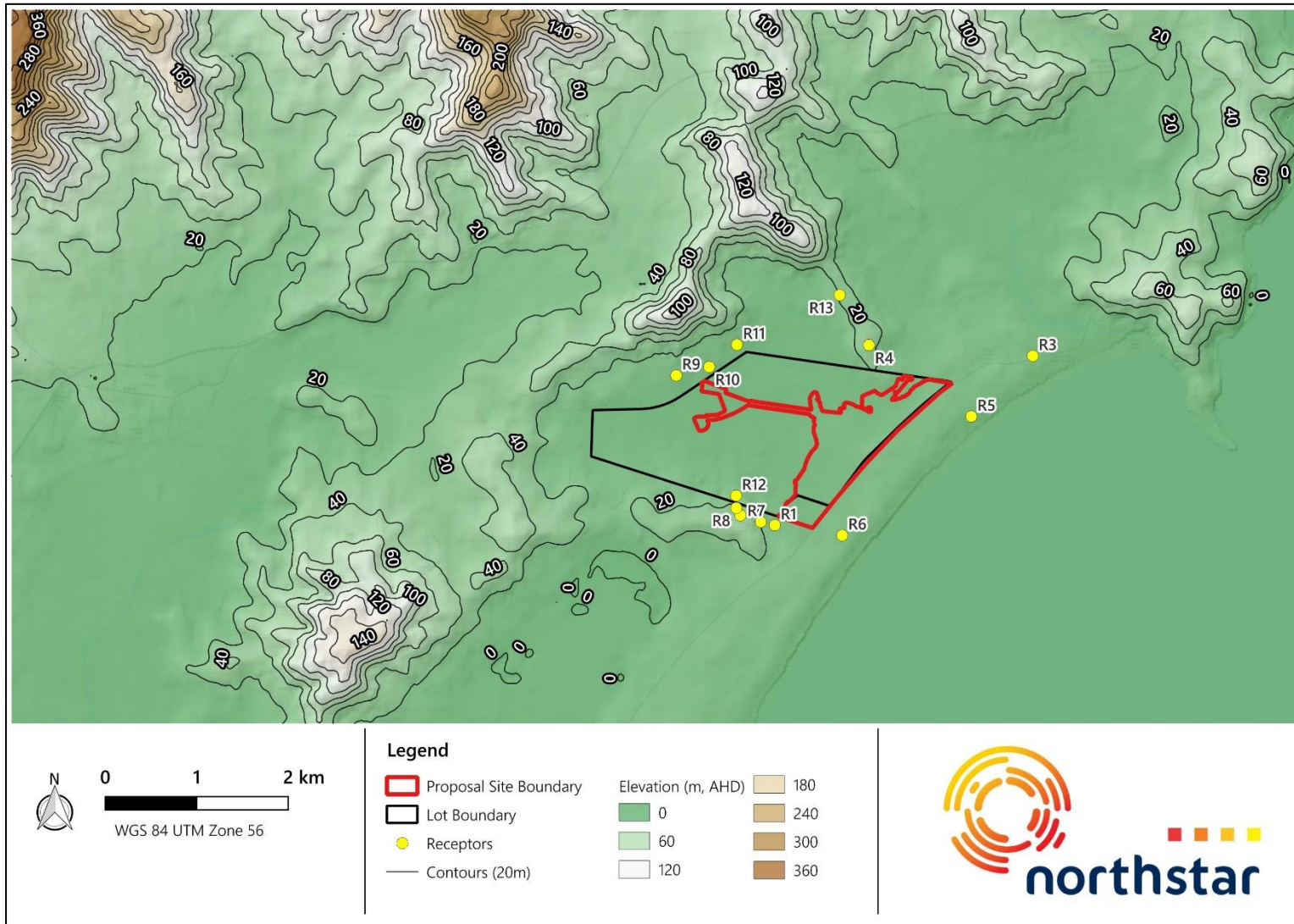
Furthermore, given the difference in environments surrounding the Project Site and the Albion Park South AQMS, with a greater level of urbanisation around the Albion Park South AQMS, the adoption of data from that location to approximate background conditions at the Project Site is likely to be conservative.

Figure 5 Deposited dust monitoring locations at the Quarry



Source: (Cleary Bros, 2022)

Figure 6 Topography of the Project Site and surrounds



Source: Northstar

4.7. Greenhouse Gases

Emissions of greenhouse gases (GHG) are tracked by the Commonwealth of Australia via the Australian National Greenhouse Accounts program. This program, and the reports and data submitted as part of the program, fulfils Australia's international and domestic reporting requirements. Carbon emission totals by State and Territory by year and by sector are reported in the 'State and Territory Greenhouse Gas Inventories' report each year.

These data are used to:

- Meet Australia's reporting commitments under the United Nations Framework Convention on Climate Change (UNFCCC);
- Track progress against Australia's emission reduction commitments; and
- Inform policy makers and the public.

Data from the 2022 report for Australia (DCCEEW, 2024a) and NSW (DCCEEW, 2024b) have been obtained for the purposes of this GHG assessment. These reports are the most recent available at the time of reporting.

Scope 1 emissions of GHG from Australia in 2022 across all economic sectors were 440.62 Mt carbon dioxide equivalent (CO₂-e) (including land use, land use change and forestry [LULCF]). Scope 1 GHG emissions in NSW in 2022 were 107.44 Mt CO₂-e (including LULCF)¹.

¹ <https://greenhouseaccounts.climatechange.gov.au>

5. APPROACH TO ASSESSMENT

The following outlines the approach taken in the assessment of air quality and greenhouse gas impacts associated with the Project.

5.1. Air Quality Impact Assessment

5.1.1. Dispersion Modelling Approach

A dispersion modelling assessment has been performed using the NSW EPA approved CALPUFF atmospheric dispersion model. The modelling has been performed in CALPUFF 3-dimensional (3-D) mode, adopting a 'No-Obs' meteorological modelling simulation, in accordance with NSW DPHI guidance (Barclay & Scire, 2011) (please refer to Appendix B for further information). This approach allows the inclusion of topographical features which are present in the area surrounding the Project Site as discussed in Section 4.5 and coastal fumigation effects and is therefore considered to be an appropriate approach for the AQIA.

An assessment of the impacts of the operation of activities at the Project Site has been performed which characterises the likely day-to-day operation of the Project, approximating average operational characteristics which are appropriate to assess against longer term (annual average) criteria for particulate matter. The likely peak activities at the Project Site have also been characterised to allow comparison of potential impacts against shorter term (24-hour) criteria for particulate matter.

The modelling scenarios provide an indication of the air quality impacts of the operation of activities at the Project Site. Added to these impacts are background air quality concentrations (where available and discussed in Section 4.4 and Appendix C) which represent the air quality which may be expected within the area surrounding the Project Site, without the impacts of the Project itself.

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

5.1.2. Emissions Estimation

The estimation of emissions from a process is typically performed using direct measurement or through the application of factors which appropriately represent the processes under assessment. This assessment has adopted emission factors for materials handling processes, movement of trucks on paved and unpaved site roads, screening, and wind erosion contained within the US EPA AP-42 emission factor compendium (US EPA, 1995 and updates) to represent the emission of particulate matter resulting from the operations occurring at the Project Site as described in Section 2.2. These factors are appropriate for adoption in Australia and are routinely adopted in the assessment of operations of this nature.

Potential emissions of particulate matter during each scenario have been quantified, with an emissions inventory associated with the average operational characteristics, and peak characteristics during each stage calculated.

The estimation of annual emissions associated with the Project has assumed that operations are being performed at a steady rate across the year which is appropriate.

In the assessment of maximum potential 24-hour impacts, it has been assumed that the day of maximum activity occurs on every day of the year. The assessment is required to be performed in this way to ensure that potential worst-case meteorological conditions are assumed at the same time as potential worst-case emissions (which represent approximately 3.8 times the daily average emissions), although the resulting impacts should be viewed with that conservatism in mind. Furthermore, for the purposes of this assessment, each activity operating at the Project Site is assumed to be operating at the maximum rate concurrently.

AQIA generally assess activities within and up to the entrance of a premises. In this case, given that one of the offsite haulage route travels close to sensitive receptor locations along Beach Road, the potential impacts associated with this offsite transportation of material has been included in the modelling assessment. Whilst the silt loading of the road is not known, an approximation consistent with 'worst case' conditions on a low annual daily traffic (ADT) road, in accordance with the US EPA AP-42 guidance (US EPA, 1995) has been adopted.

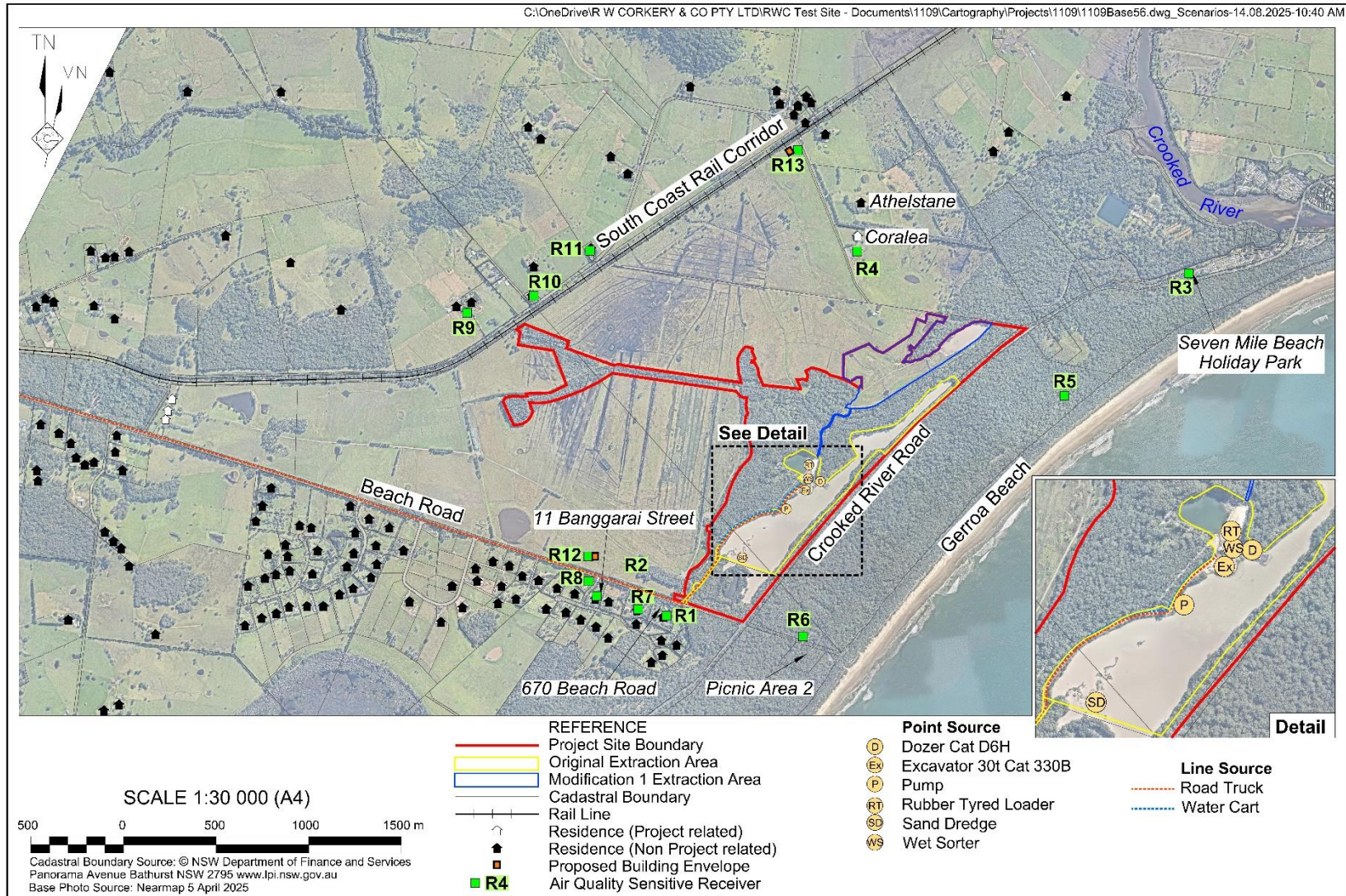
To ensure a highly conservative assessment, the AQIA has assumed that all off-site truck movements follow the western route via Beach Road, as this route passes closer to surrounding sensitive receptors than the alternative northern route along Crooked River Road. Additionally, due to the proximity of several sensitive receptors to the Quarry operations, and therefore the cumulative exposure to dust from on-site activities, this route represents a worst-case scenario. In this way, and once again, the AQIA can be viewed as presenting a highly conservative assessment.

The performance of the AQIA in this manner allows confidence that the predicted impacts would be lower than modelled and confirm that the Project can be operated to be compliant with the air quality criteria outlined in Section 2.4.

One modelling scenario has been selected to characterise the activities being performed at the Project Site, and the layout of the Project under that scenario is presented in Figure 7. It is noted that the locations of equipment have been selected to represent the likely worst-case, in relation to their realistic proximity to sensitive receptors.

A full description of the emission sources included in the AQIA, and the emission factors and assumptions adopted are presented in Appendix D.

Figure 7 Project Site layout assessed



Source: RWC

5.1.3. Air Quality Management Measures

As discussed in Section 2.4, emissions controls are currently and will continue to be employed at the Project Site. The application of these controls results in quantifiable reductions in the quantity of particulate matter being emitted as part of the Project operation.

A summary of the emissions reductions measures that are adopted as part of the Project operation is presented in Table 9. These emission reductions are outlined in the NPI EETM for Mining (NPI, 2012), relevant AP-42 documentation (US EPA, 1995), or other industry guidance (Katestone, 2011). No emissions controls have been assumed to be applied along the length of Beach Road assessed.

Table 9 Summary of emission reduction methods adopted as part of Quarry operation

Emission control method	Control efficiency (%)
Sealing of access road 200 m from site entrance	Assessed through emission factor (refer Appendix D)
Minimise disturbance of land and revegetation as soon as practicable	Assessed through dispersion modelling assessment
Restriction of vehicle speeds on site to 20 km·hr ⁻¹	85 (unpaved) 89 (paved)
Covering loads with a tarpaulin	Not quantified
Application of water on haulage routes	50
Minimise drop height during material unloading/loading	30
Limit load sizes to ensure material is not above the level of truck sidewalls	Not quantified

Note: It is noted that reduction in vehicle speeds from 80 km·hr⁻¹ to 32 km·hr⁻¹ was measured by (Fitz and Bufalino, 2002) to result in PM₁₀ emissions reductions at 0.8 m above the road surface of 89 %, which has been correspondingly adopted in this assessment.

5.2. Greenhouse Gas Assessment

The purpose of the GHGA is to examine the potential impacts of the operation of the Project relating to emissions of GHG. A quantitative assessment of emissions is performed with direct emissions compared with total national and NSW GHG emissions for context (refer Section 4.7).

The scope of the GHGA is to provide a quantitative assessment of GHG emissions arising from the operation of the Project. This report does not provide a definitive quantification of GHG emissions arising from the Project operation but provides the general context of the likely quantum of emissions.

Opportunities for reduction of GHG emissions are discussed.

5.2.1. Emission Types

The Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW) document, "National Greenhouse Accounts Factors" Workbook (NGA Factors) (DCCEEW, 2024c), defines two types of GHG emissions (see Table 10), namely 'direct' and 'indirect' emissions. This assessment considers both direct emissions and indirect emissions resulting from the operation of the Project.

Table 10 GHG emission types

Emission Type	Definition
Direct	Produced from sources within the boundary of an organisation and as a result of that organisation's activities (e.g. consumption of fuel in on-site vehicles)
Indirect	Generated in the wider economy as a consequence of an organisation's activities (particularly from its demand for goods and services), but which are physically produced by the activities of another organisation (e.g. consumption of purchased electricity).

Note: Adapted from NGA Factors Workbook (DCCEEW, 2024c)

5.2.2. Emission Scopes

The NGA Factors (DCCEEW, 2024c) identifies two 'scopes' of emissions for GHG accounting and reporting purposes as shown in Table 11.

Table 11 GHG emission scopes

Emission Scope	Definition
Scope 1	Direct (or point-source) emission factors give the kilograms of carbon dioxide equivalent (CO ₂ -e) emitted per unit of activity at the point of emission release (i.e. fuel use, energy use, manufacturing process activity, mining activity, on-site waste disposal, etc.). These factors are used to calculate Scope 1 emissions.
Scope 2	Indirect emission factors are used to calculate Scope 2 emissions from the generation of the electricity purchased and consumed by an organisation as kilograms of CO ₂ -e per unit of electricity consumed. Scope 2 emissions are physically produced by the burning of fuels (coal, natural gas, etc.) at the power station.

Note: Adapted from NGA Factors Workbook (DCCEEW, 2024c)

A third scope of emissions, Scope 3 Emissions, are also recognised in some GHG assessments. The Greenhouse Gas Protocol (GHG Protocol) (WRI, 2004) defines Scope 3 emissions as "other indirect GHG emissions":

"Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the company but occur from sources not owned or controlled by the company. Some

examples of Scope 3 activities are extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services.”

Scope 3 emissions related to the extraction and transport of fuels, and the use of fuels in employee transport have been considered. Emissions associated with the transport of materials from the Quarry are considered in this assessment as Scope 3 emissions as they are under the operational control of a separate entity to the Applicant.

5.2.3. Emission Source Identification

The geographical boundary set for this GHG assessment covers the Quarry Site and also includes the transport of materials from the Project Site to point-of-use or market. All Scope 1, Scope 2 and Scope 3 emissions within the defined boundary have been identified and reported as far as possible.

The GHG emission sources associated with the operation of the Project have been identified through the review of the proposed broad activities as described in Section 2.2. The activities/operations being performed as part of the Project, which have the potential to result in emissions of GHG, are presented in Table 12.

Table 12 GHG emission sources

Project component	Scope	Emission source description
Consumption of diesel fuel in mobile plant and equipment at the Project Site	1, 3	Emissions from combustion of fuel (Scope 1) Emissions associated with the extraction and processing of fuel (Scope 3)
Consumption of electricity at the Project Site	2, 3	Emissions associated with the generation of electricity (Scope 2) Upstream and downstream emissions associated with electricity generation (Scope 3)
Consumption of diesel fuel / unleaded fuel for material transport purposes	3	Emissions from combustion of fuel (Scope 3) Emissions associated with the extraction and processing of fuel (Scope 3)
Consumption of diesel fuel / unleaded fuel for employee transport purposes	3	Emissions associated with the extraction and processing of fuel (Scope 3)

5.2.4. Emissions Estimation

Emissions of GHG from the sources identified in Table 12 have been calculated using activity data for the source per annum (i.e. per kilowatt (kW) of electricity, per kilolitre (kL) of diesel) and the relevant emission factor for each source. The assumptions used in the calculation of activity data for the emission source and emission factors, are presented in Table 13

Table 13 Calculated activity data

Component	Assumptions	Activity	Units
Consumption of diesel fuel in mobile plant and equipment at the Quarry	The Applicant indicates that they anticipate a total of 240 000 L of diesel to be used at the Quarry for the purposes of extraction and processing of 120 000 t-yr ⁻¹ . This is extrapolated from historical site-specific material extraction rates and diesel consumption data.	240.0	kL-yr ⁻¹
Consumption of diesel fuel / unleaded fuel for employee transport purposes	Four full-time equivalent positions to be continued at the Quarry (with a further 10 truck drivers). Assume employees reside in Bomaderry (44 km as a two-way journey). Truck drivers assumed to reside in Albion Park but would collect vehicles from depot and not the Quarry. It is noted that truck drivers are not included in employee transport estimations. 302 days per year. 10.6 L per 100 km fuel efficiency (ABS, 2017).	1.4	kL-yr ⁻¹
Consumption of diesel fuel / unleaded fuel for material transport purposes	120 000 t-yr ⁻¹ of product (3 429 loads [in 35 t trucks]) transported to Cleary Bros operations at either Albion Park, Bomaderry, or Coniston. For the purposes of this assessment, a third has been assumed to be transported to each (1 143 trucks loads). - 76.6 km return trip to travel to Albion Park; - 45.0 km return trip to Bomaderry; and - 115.2 km return trip to Coniston. 56.3 L per 100 km fuel efficiency (ABS, 2017)	152.4	kL-yr ⁻¹
Electricity	The Applicant indicates that they anticipate a total of approximately 6 000 kWh of electricity to be used at the Quarry for the purposes of extraction and processing of 120 000 t-yr ⁻¹ . This is independent of extraction and processing rate.	6 000	kWh yr ⁻¹

5.2.5. GHG Emission Factors

GHG emission factors are published in the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW) document 'Australian National Greenhouse Accounts Factors 2024' (NGA Factors) (DCCEEW, 2024). This is the most up to date version of the NGA Factors at the time of writing.

The relevant emission factors associated with the anticipated emissions sources associated with the Project are presented in Table 14.

Table 14 Emission factors adopted for assessment

Emission source	Scope	Emission factor	Units	Source (DCCEEW, 2024)
Diesel combustion in plant and equipment	1	2 717.44	kg CO ₂ -e·kL ⁻¹	Table 9
	3	667.78	kg CO ₂ -e·kL ⁻¹	Table 9
Product transport	3	667.78	kg CO ₂ -e·kL ⁻¹	Table 9
Employee transport	3	558.24	kg CO ₂ -e·kL ⁻¹	Table 9
Electricity consumption (NSW)	2	0.66	kg CO ₂ -e·kWh ⁻¹	Table 1
	3	0.04	kg CO ₂ -e·kWh ⁻¹	Table 1

Note: Some emission factors presented as kg CO₂-e·kL⁻¹ including the relevant energy content of the fuel as provided in (DCCEEW, 2024)

6. AIR QUALITY IMPACT ASSESSMENT

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

- Incremental impact – relates to the concentrations predicted as a result of the operation of the Project in isolation.
- Cumulative impact – relates to the incremental concentrations predicted as a result of the operation of the Project PLUS the background air quality concentrations discussed in Section 4.3.2.

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

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

Model prediction	Pollutant concentration / deposition rate less than the relevant criterion	Pollutant concentration / deposition rate equal to, or greater than the relevant criterion
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6.1. Particulate Matter – Annual Average PM₁₀ and PM_{2.5}

The predicted annual average particulate matter concentrations (as TSP, PM₁₀ and PM_{2.5}) resulting from the operations at the Project Site are presented in Table 15.

The addition of existing background concentrations (refer Section 4.3.2) results in predicted concentrations of annual average TSP being below the relevant criteria at all privately owned residences.

Table 15 Predicted annual average TSP, PM₁₀ and PM_{2.5} concentrations

Receptor	Annual average concentration ($\mu\text{g}\cdot\text{m}^{-3}$)								
	TSP			PM ₁₀			PM _{2.5}		
	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.
Criterion	90			25			8		
Max. % of criterion	0.5	32.4	32.9	0.6	52.5	53.1	<0.1	59.6	60.8
R1	0.5	29.1	29.6	0.2	13.1	13.3	<0.1	4.8	4.9
R2	0.2	29.1	29.3	<0.1	13.1	13.2	<0.1	4.8	4.9
R3	<0.1	29.1	29.2	<0.1	13.1	13.2	<0.1	4.8	4.9
R4	<0.1	29.1	29.2	<0.1	13.1	13.2	<0.1	4.8	4.9
R5	<0.1	29.1	29.2	<0.1	13.1	13.2	<0.1	4.8	4.9
R6	<0.1	29.1	29.2	<0.1	13.1	13.2	<0.1	4.8	4.9
R7	0.3	29.1	29.4	0.1	13.1	13.2	<0.1	4.8	4.9
R8	0.4	29.1	29.5	0.1	13.1	13.2	<0.1	4.8	4.9
R9	<0.1	29.1	29.2	<0.1	13.1	13.2	<0.1	4.8	4.9
R10	<0.1	29.1	29.2	<0.1	13.1	13.2	<0.1	4.8	4.9
R11	<0.1	29.1	29.2	<0.1	13.1	13.2	<0.1	4.8	4.9
R12	0.3	29.1	29.4	<0.1	13.1	13.2	<0.1	4.8	4.9
R13	<0.1	29.1	29.2	<0.1	13.1	13.2	<0.1	4.8	4.9

Note: Incr. = incremental impact, Bg. = background, Cumul. = cumulative impact

No contour plots of annual average TSP, PM₁₀ or PM_{2.5} are presented, given the minor predicted contribution from the operations at the Project Site at the nearest relevant sensitive receptors.

6.2. Respirable Crystalline Silica – Annual Average

As outlined in Section 3.3.2, RCS concentrations have conservatively been taken to be 75 % of the annual average PM₁₀ concentration. This is applied to the incremental impact only and assumes that the background air quality environment is not impacted by RCS, which is considered to be a reasonable assumption. The maximum predicted incremental annual average PM₁₀ concentration at any sensitive receptor under Project operations is $0.2 \mu\text{g}\cdot\text{m}^{-3}$ which results in a predicted impact of $0.15 \mu\text{g}\cdot\text{m}^{-3}$ of RCS ($0.2 \mu\text{g}\cdot\text{m}^{-3} \times 75\%$). This is significantly below the adopted annual average RCS criterion of $3 \mu\text{g}\cdot\text{m}^{-3}$.

6.3. Particulate Matter – Annual Average Dust Deposition Rates

Table 16 presents the annual average dust deposition rates predicted as a result of the operations at the Project Site.

An assumed background dust deposition of $2 \text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$ is presented in Table 16, although comparison of the incremental concentration with the incremental criterion of $2 \text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$ is also valid (as discussed

within Section 3.3). In either case, the resulting conclusions drawn are identical. Achievement of the incremental and cumulative dust deposition rates is predicted at all surrounding receptors.

No contour plots of annual average dust deposition are presented, given the minor predicted contribution from the operations at the Quarry at the nearest sensitive receptors.

Table 16 Predicted annual average dust deposition

Receptor	Annual average dust deposition (g·m ⁻² ·month ⁻¹)		
	Incr.	Bkg.	Cumul.
Criterion	2.0	-	4.0
Max. % of criterion	<0.1	-	52.5
R1	<0.1	2.0	<2.1
R2	<0.1	2.0	<2.1
R3	<0.1	2.0	<2.1
R4	<0.1	2.0	<2.1
R5	<0.1	2.0	<2.1
R6	<0.1	2.0	<2.1
R7	<0.1	2.0	<2.1
R8	<0.1	2.0	<2.1
R9	<0.1	2.0	<2.1
R10	<0.1	2.0	<2.1
R11	<0.1	2.0	<2.1
R12	<0.1	2.0	<2.1
R13	<0.1	2.0	<2.1

Note: Incr. = incremental impact, Bg. = background, Cumul. = cumulative impact

6.4. Particulate Matter - Maximum 24-hour Average

Presented in Table 17 are the maximum 24-hour average PM₁₀ and PM_{2.5} concentrations predicted to occur at the nearest sensitive receptors as a result of the operations at the Project Site. No background concentrations are included within this table.

The predicted incremental concentrations are minor, and as previously noted in Section 5.1.2, the assessment has been performed in a highly conservative manner, with all activities assumed to be operating at their maximum rates on every day of the year.

Table 17 Predicted maximum incremental 24-hour PM₁₀ and PM_{2.5} concentrations

Receptor	Maximum 24-hour average concentration (µg·m ⁻³)	
	PM ₁₀	PM _{2.5}
Criterion	50	25
Max. % of criterion	10.8	4.4
R1	5.4	1.1
R2	2.3	0.5
R3	0.2	<0.1
R4	0.3	<0.1
R5	0.5	<0.1
R6	1.1	0.2
R7	2.9	0.6
R8	3.8	0.8
R9	0.3	<0.1
R10	0.3	<0.1
R11	0.3	<0.1
R12	2.5	0.6
R13	0.3	<0.1

The following tables present the predicted maximum 24-hour average PM₁₀ and PM_{2.5} concentrations resulting from the operation of the Project, with background included. These allow an assessment of whether the Project can be operated to not result in exceedances of the air quality criteria outlined in Section 2.4, with the addition of existing ('background') air quality conditions.

Results are presented for the sensitive receptor at which the highest incremental PM₁₀ and PM_{2.5} impacts have been predicted, and also for the sensitive receptors at which the highest cumulative impacts (increment plus background) have been predicted, which are indicated within each table.

The left side of the tables show the predicted concentration on days with the highest cumulative impacts (typically driven by the days with the highest contemporaneous background), and the right side shows the total predicted cumulative impact on days with the highest predicted incremental concentrations.

Model predictions presented in Table 18 and Table 19 indicate that there are not predicted to be any exceedances of the maximum 24-hour average PM₁₀ or PM_{2.5} criteria at any surrounding receptor.

To allow a visualisation of the extent of any impacts surrounding the Project Site, a contour plot of the incremental contribution to the 24-hour average PM₁₀ and PM_{2.5} concentrations during Project operations is presented in Figure 8 and Figure 9 respectively.

Table 18 Summary of contemporaneous impact and background – PM₁₀

Date	24-hour average PM ₁₀ concentration (µg·m ⁻³)			Date	24-hour average PM ₁₀ concentration (µg·m ⁻³)		
	Receptor R1				Receptor R1		
	Incr.	Bg.	Cumul.		Incr.	Bg.	Cumul.
25-01-21	1.1	39.4	40.5	30-06-21	5.4	9.5	14.9
29-04-21	2.3	33.9	36.2	08-07-21	4.5	15.0	19.5
22-01-21	1.5	33.1	34.6	14-07-21	4.4	12.4	16.8
24-01-21	1.3	33.1	34.4	22-06-21	4.0	9.0	13.0
28-10-21	1.1	30.6	31.7	22-05-21	3.9	15.2	19.1
30-04-21	2.2	27.4	29.6	24-06-21	3.8	10.2	14.0
18-12-21	1.3	28.3	29.6	01-07-21	3.8	14.1	17.9
29-10-21	0.1	28.6	28.7	24-05-21	3.7	7.5	11.2
12-02-21	1.4	26.4	27.8	02-06-21	3.6	16.7	20.3
27-04-21	<0.1	27.7	27.8	31-07-21	3.1	14.2	17.3
These data represent the highest Cumulative Impact 24-hour PM ₁₀ predictions (outlined in red) as a result of the operation of the project.				These data represent the highest Incremental Impact 24-hour PM ₁₀ predictions (outlined in blue) as a result of the operation of the project.			

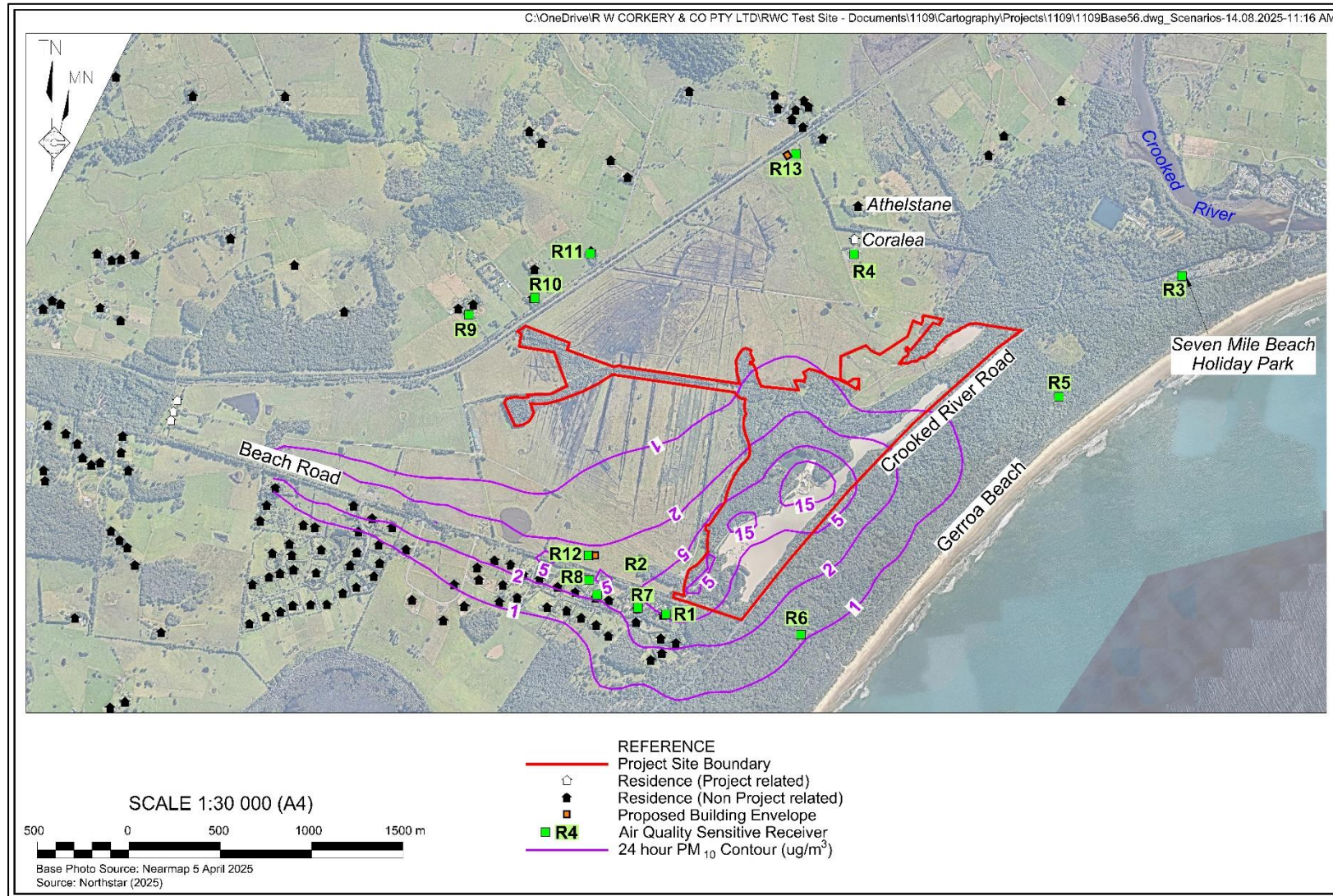
Note: Incr. = incremental impact, Bg. = background, Cumul. = cumulative impact

Table 19 Summary of contemporaneous impact and background – PM_{2.5}

Date	24-hour average PM _{2.5} concentration (µg·m ⁻³)			Date	24-hour average PM _{2.5} concentration (µg·m ⁻³)		
	Receptor R1				Receptor R1		
	Incr.	Bg.	Cumul.		Incr.	Bg.	Cumul.
29-04-21	0.5	23.3	23.8	30-06-21	1.1	5.8	6.9
30-04-21	0.5	21.9	22.4	08-07-21	1.0	6.2	7.2
03-05-21	0.4	13.4	13.8	22-05-21	0.9	6.8	7.7
22-08-21	0.3	12.6	12.9	14-07-21	0.9	6.6	7.5
24-01-21	0.2	12.4	12.6	22-06-21	0.9	3.9	4.8
25-01-21	0.2	12.4	12.6	24-05-21	0.8	2.9	3.7
28-10-21	0.2	12.0	12.2	02-06-21	0.8	5.9	6.7
27-04-21	<0.1	12.1	12.2	24-06-21	0.8	3.1	3.9
18-12-21	0.3	11.5	11.8	01-07-21	0.7	5.6	6.3
29-08-21	0.6	10.7	11.3	10-06-21	0.7	3.5	4.2
These data represent the highest Cumulative Impact 24-hour PM _{2.5} predictions (outlined in red) as a result of the operation of the project.				These data represent the highest Incremental Impact 24-hour PM _{2.5} predictions (outlined in blue) as a result of the operation of the project.			

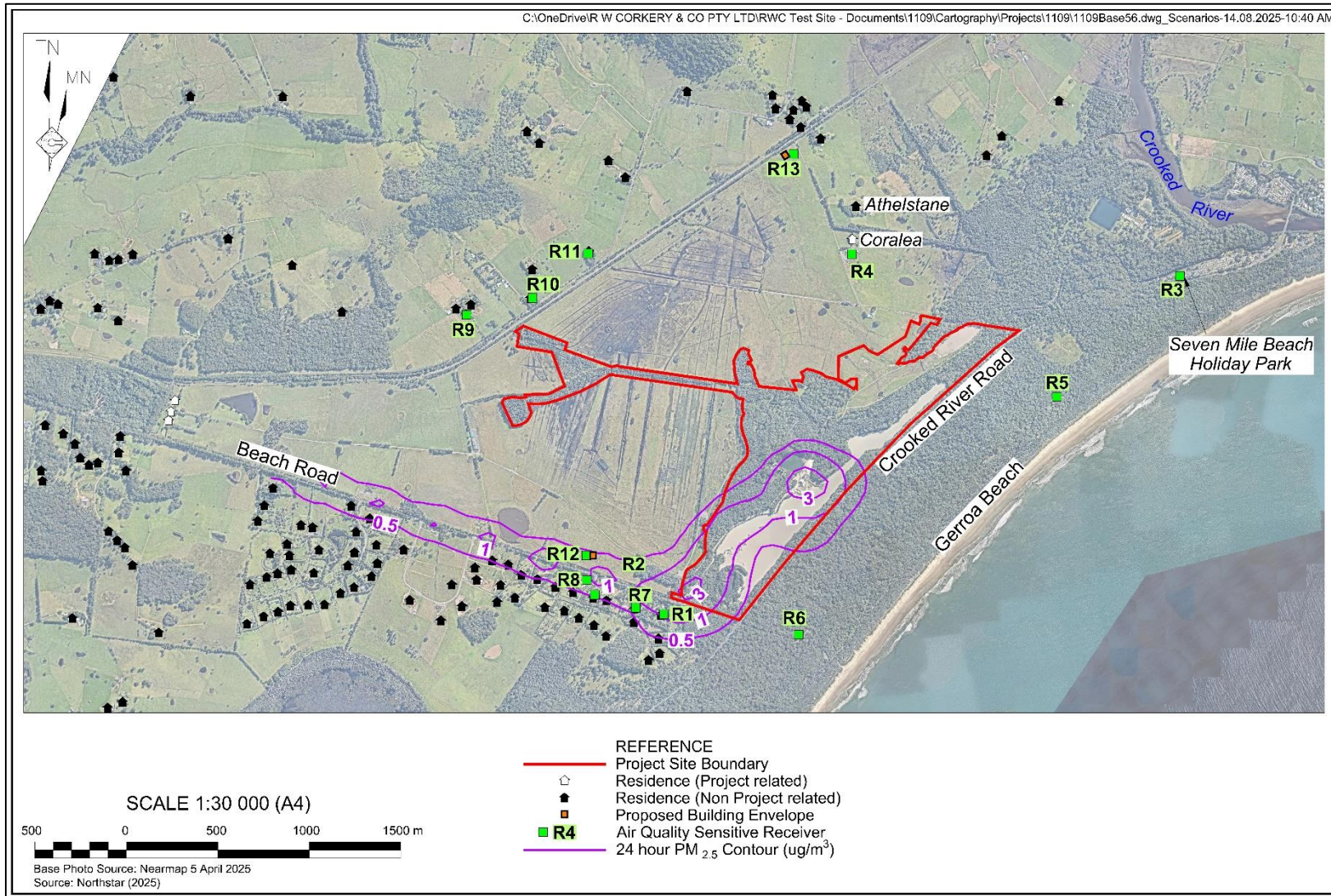
Note: Incr. = incremental impact, Bg. = background, Cumul. = cumulative impact

Figure 8 Maximum incremental 24-hour average PM₁₀



Note Criterion = 50 µg·m⁻³ (cumulative)

Figure 9 Maximum incremental 24-hour average PM_{2.5}



Note Criterion = 25 µg·m⁻³ (cumulative)

7. GREENHOUSE GAS ASSESSMENT

This section presents the results of the GHGA and compares direct emissions with NSW and Australian totals and provides a range of measures which might be considered to reduce GHG emissions.

7.1. Calculation of GHG Emissions

Based on the activity data for the operation of the Quarry and the emission factors outlined in Section 5.2, maximum annual GHG emissions have been calculated and are presented in Table 21. The Project is calculated to result in direct (Scope 1) GHG emissions of 652.2 t CO₂-e·yr⁻¹.

7.2. Greenhouse Gas Emissions in Context

A comparison of the calculated GHG emissions associated with the Project against Australian (DCCEEW, 2024a) and NSW (DCCEEW, 2024b) total emissions in 2022 is presented Table 20.

These data indicate that the operation of the Project would contribute less than 0.001 % of NSW total GHG emissions and less than 0.00015 % of Australian total GHG emissions in 2022 (including LULCF).

The total annual emission value is significantly lower than the NSW EPA 'Large Emitter' trigger threshold of 25 000 t CO₂-e·yr⁻¹.

Table 20 Project GHG emissions in context

Project Phase	Emissions (t CO ₂ -e·yr ⁻¹)		
	Quarry	NSW (2022)	Australia (2022)
		Total – 107.44 Mt	Total – 440.62 Mt
Maximum operation	652.2	0.001 %	0.00015 %

Table 21 Calculated Project GHG emissions

Scope		Activity Rate	Units	Energy Content	Units	Emission Factor		Emissions CO ₂ -e (t·yr ⁻¹)
1	Diesel fuel in plant and machinery on site	240.0	kL·yr ⁻¹	38.6	GJ·kL ⁻¹	70.2	kg CO ₂ -e·GJ ⁻¹	652.2
Scope 1 (subtotal)								652.2
2	Electricity consumption	6 000	kWh·yr ⁻¹	-	-	0.66	kg CO ₂ -e·kWh ⁻¹	4.0
Scope 2 (subtotal)								4.0
3	Diesel fuel in plant and machinery on site	240.0	kL·yr ⁻¹	38.6	GJ·kL ⁻¹	17.3	kg CO ₂ -e·GJ ⁻¹	160.3
	Material transport	152.4						101.7
	Employee travel	1.4		34.2		17.2		0.8
	Electricity consumption	6 000	kWh·yr ⁻¹	-	0.04	kg CO ₂ -e·kWh ⁻¹	0.2	
Scope 3 (subtotal)								263.1

Note: the estimated emissions (expressed as t CO₂-e·yr⁻¹) may be presented to a greater precision than the product of the input values (activity rate, energy content and emission factors) which may be rounded for presentation purposes.

8. MITIGATION AND MONITORING

8.1. Air Quality Mitigation

Based on the findings of the AQIA, it is considered that the particulate control measures implemented as part of the Quarry operation are sufficient to ensure that air quality impacts at surrounding receptor locations are adequately controlled.

A number of mitigation measures will continue to be implemented as part of the Quarry operation. Where defensible quantification of the control efficiencies afforded by these measures can be determined, these have been applied within the assessment.

The mitigation measures which are used as part of the Quarry activities are summarised in Table 22.

Table 22 Summary of emission reduction methods adopted as part of Quarry operation

Emission control method	Control efficiency (%)
Sealing of access road 200 m from site entrance	Assessed through emission factor (refer Appendix D)
Minimise disturbance of land and revegetation as soon as practicable	Assessed through dispersion modelling assessment
Restriction of vehicle speeds on site to 20 km·hr ⁻¹	85 (unpaved) 89 (paved)
Covering loads with a tarpaulin	Not quantified
Application of water on haulage routes	50
Minimise drop height during material unloading/loading	30
Limit load sizes to ensure material is not above the level of truck sidewalls	Not quantified

As previously discussed, the Quarry operates in accordance with the Quarry Environmental Management Plan (QEMP), which includes an Air Quality Management Plan (AQMP) (Cleary Bros, 2022). The Quarry will continue to be operated in accordance with the QEMP and AQMP.

This AQIA indicates that additional controls would not be required to meet the air quality criteria, and only minor updates to the AQMP may be required. The Quarry Manager will continue to be responsible for ensuring that no operations are performed without the inclusion of the relevant controls.

8.2. GHG Emissions Management

The GHGA indicates that GHG emissions resulting from the operation of the Quarry are anticipated to be small, although emissions could be further reduced through the application of a number of measures:

- All vehicles/plant and machinery should be turned off when not in use and regularly serviced to ensure efficient operation, including the optimisation of tyre pressures;
- Truck routes and loading capacity should be designed to reduce the distance and effort required by the vehicles;
- Maintenance of roads in good condition to avoid meandering of vehicles; and
- Reducing gradients around site where feasible.

8.3. Monitoring

The predictions presented in this AQIA indicate that there would be no predicted exceedances of the adopted air quality criteria as a result of the Quarry operation, even adopting worst case assumptions. However, the air quality monitoring which is currently performed as part of Quarry operations would be continued. Furthermore, it is recommended that regular audits are performed to ensure that the Quarry is implementing the air quality control measures appropriately, as outlined within this report, and in accordance with the QEMP and AQMP.

Ongoing measurement of diesel and electricity consumption would continue to be performed by the Applicant to meet corporate NGER reporting requirements.

9. CONCLUSION

The Applicant has engaged Northstar to perform an AQIA and GHGA for the proposed Project.

The AQIA forms part of the Modification Report prepared to accompany the development application for the Project under Part 4 of the *Environmental Planning and Assessment Act 1979*.

The AQIA has been performed in accordance with the requirements of the NSW Approved Methods document and meets the requirements of the SEARs. The AQIA provides a detailed description of:

- Proposed activities which form the Project which reflect peak activity rates during site operation.
- Legislative requirements which are required to be met, including NSW EPA air quality criteria, POEO Act, and POEO (Clean Air) Regulations, and any policies and guidelines as they relate to air quality impacts of the Project.
- Existing conditions surrounding the Quarry Site, including the definition of sensitive receptor locations, prevailing meteorology, air quality, and topography.
- The approach to assessment, including justification for the approach adopted.
- Emissions controls proposed to be employed as part of the Project operation.
- Predicted air quality impacts during the scenario modelled.
- Air quality management and mitigation measures which would continue to be employed to ensure that the environmental objectives associated with the Project are achieved.

The results of the AQIA indicate that predicted incremental concentrations associated with the operation of the Project at surrounding sensitive receptors are minor, and no exceedances of the annual average TSP, PM₁₀, or PM_{2.5} concentration or dust deposition criteria are predicted. No additional exceedances of the 24-hour PM₁₀ and PM_{2.5} concentration criteria are predicted, even during the assessment of maximum throughput and off-site transport.

The GHGA assessment concludes that the NSW EPA 'Large Emitter' threshold of 25 000 t CO₂-e-yr⁻¹ would not be triggered by this Project. A detailed outline of the assumptions adopted, calculations performed, and a comparison with NSW and Australian direct emissions totals is provided, in addition to further options to reduce GHG emissions.

10. REFERENCES

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APPENDIX A

Commonly used units and abbreviations

Units Used in the Report

Units presented in the report follow the International System of Units (SI) conventions, unless derived from references using non-SI units.

Commonly used SI units

The following units are commonly used in Northstar reports.

Symbol	Name	Quantity
SI base units		
K	Kelvin	thermodynamic temperature
kg	kilogram	mass
m	metre	length
mol	mole	amount of substance
s	seconds	time
Non-SI units mentioned in the SI or accepted for use		
°	degree	plane angle
d	day	time
h	hour	time
ha	hectare	area
J	joule	energy
L	litre	volume
min	minute	time
N	newton	force or weight
t	tonne	mass
V	volt	electrical potential
W	watt	power

Multiples of SI and non-SI units

The following prefixes are added to unit names to produce multiples and sub-multiples of units:

Prefix	Symbol	Factor	Prefix	Symbol	Factor
T	tera-	10^{12}	p	pico-	10^{-12}
G	giga-	10^9	n	nano-	10^{-9}
M	mega-	10^6	μ	micro-	10^{-6}
k	kilo-	10^3	m	milli-	10^{-3}
h	hector-	10^2	c	centi-	10^{-2}
da	deca-	10^1	d	deci-	10^{-1}

In this report, units formed by the division of SI and non-SI units are expressed as a negative exponent, and do not use the solidus (/) symbol. For example:

- 50 micrograms per cubic metre would be presented as $50 \mu\text{g}\cdot\text{m}^{-3}$ and not $50 \mu\text{g}/\text{m}^3$; and,
- 0.2 kilograms per hectare per hour would be presented as $0.2 \text{ kg}\cdot\text{ha}^{-1}\cdot\text{hr}^{-1}$ and not $0.2 \text{ kg}/\text{ha}/\text{hr}$.

Commonly used SI-derived and non-SI units

$\text{g}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$	gram per square metre per second	rate of mass deposition per unit area
$\text{g}\cdot\text{s}^{-1}$	gram per second	rate of mass emission
$\text{kg}\cdot\text{ha}^{-1}\cdot\text{hr}^{-1}$	kilogram per hectare per hour	rate of mass deposition per unit area
$\text{kg}\cdot\text{m}^{-3}$	kilogram per cubic metre	density
$\text{L}\cdot\text{s}^{-1}$	litres per second	volumetric rate
m^2	square metre	area
m^3	cubic metre	volume
$\text{m}\cdot\text{s}^{-1}$	metre per second	speed and velocity
$\text{mg}\cdot\text{m}^{-3}$	milligram per cubic metre	mass concentration per unit volume
$\text{mg}\cdot\text{Nm}^{-3}$	milligram per normalised cubic metre (of air)	mass concentration per unit volume
$\mu\text{g}\cdot\text{m}^{-3}$	microgram per cubic metre	mass concentration per unit volume
$\text{mg}\cdot\text{m}^{-3}$	milligram per cubic metre	mass concentration per unit volume
Pa	pascal	pressure
ppb	parts per billion (1×10^{-9})	volumetric concentration
pphm	parts per hundred million (1×10^{-5})	volumetric concentration
ppm	parts per million (1×10^{-6})	volumetric concentration

Commonly used abbreviations

Abbreviation	Term
ABS	Australian Bureau of Statistics
ACT	Australian Commonwealth Territory
AGL	above ground level
AHD	Australian height datum
APC	air pollution control
AQI	air quality index
AQIA	air quality impact assessment
AQMS	air quality monitoring station
AQRA	air quality risk assessment
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
AS/NZS	Australian Standard / New Zealand Standard
AWS	automatic weather station
BCA	Building Code of Australia
BGL	below ground level
BOM	Bureau of Meteorology
CEMP	construction environment management plan
CH ₄	methane

Abbreviation	Term
CO	carbon monoxide
CO ₂	carbon dioxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEM	digital elevation model
EETM	emission estimation technique manual
EPA VIC	Environmental Protection Authority Victoria
EPBC	Environment Protection and Biodiversity Conservation Act
FIBC	flexible intermediate bulk container
GIS	geographical information system
IAQM	UK Institute of Air Quality Management
IBC	intermediate bulk container
ID	internal diameter
LLV	low level waste
LoM	life of mine
MSDS	Material Safety Data Sheet
NCAA	National Clean Air Agreement
NEPM	National Environment Protection Measure
NH ₃	ammonia
NO	nitric oxide
NO _x	oxides of nitrogen
NO ₂	nitrogen dioxide
NORM	naturally occurring radioactive material
NSW	New South Wales
NSW DCCEEW	New South Wales Department of Climate Change, Energy, the Environment and Water
NSW EPA	New South Wales Environment Protection Authority
NT	Northern Territory
OEMP	operational environmental management plan
O ₃	ozone
OU	odour unit
OU·m ³ ·s ⁻¹	odour units times metres cubed per second
OU·s ⁻¹	odour units per second
Pb	lead
PM	particulate matter
PM ₁₀	particulate matter with an aerodynamic diameter of 10 µm or less
PM _{2.5}	particulate matter with an aerodynamic diameter of 2.5 µm or less
ROM	run of mine
SA	South Australia
SEPP	State Environmental Protection Policy
SO _x	oxides of sulphur
SO ₂	sulphur dioxide
SRTM3	Shuttle Radar Topography Mission

Abbreviation	Term
SVOC	semi-volatile organic compound
TAPM	The Air Pollution Model
TAS	Tasmania
TEU	twenty-foot equivalent unit
TSP	total suspended particulates
TVOC	total volatile organic compounds
TWA	time weighted average
US EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
VIC	Victoria
VLLW	very low level waste
VOC	volatile organic compound

APPENDIX B

Meteorology

Meteorological Stations

As discussed in Section 4.3, a meteorological modelling exercise has been performed to characterise the meteorology of the Project Site. The meteorological monitoring has been based on measurements acquired from surrounding automatic weather stations (AWS) operated by the Australian Government Bureau of Meteorology (BoM).

A summary of the relevant monitoring sites is provided in Table B1.

Table B1 Meteorological monitoring stations proximate to the Project Site

Site name	Source	Approximate location		Approximate distance from Project Site (km)
		mE	mS	
Project Site	Applicant	297 123	6 149 690	On-site
Kiama (Bombo Headland) AWS – Station #068242	BoM	303 967	6 163 333	14.9
Nowra RAN Air Station AWS – Station #068072	BoM	274 923	6 130 071	27.9

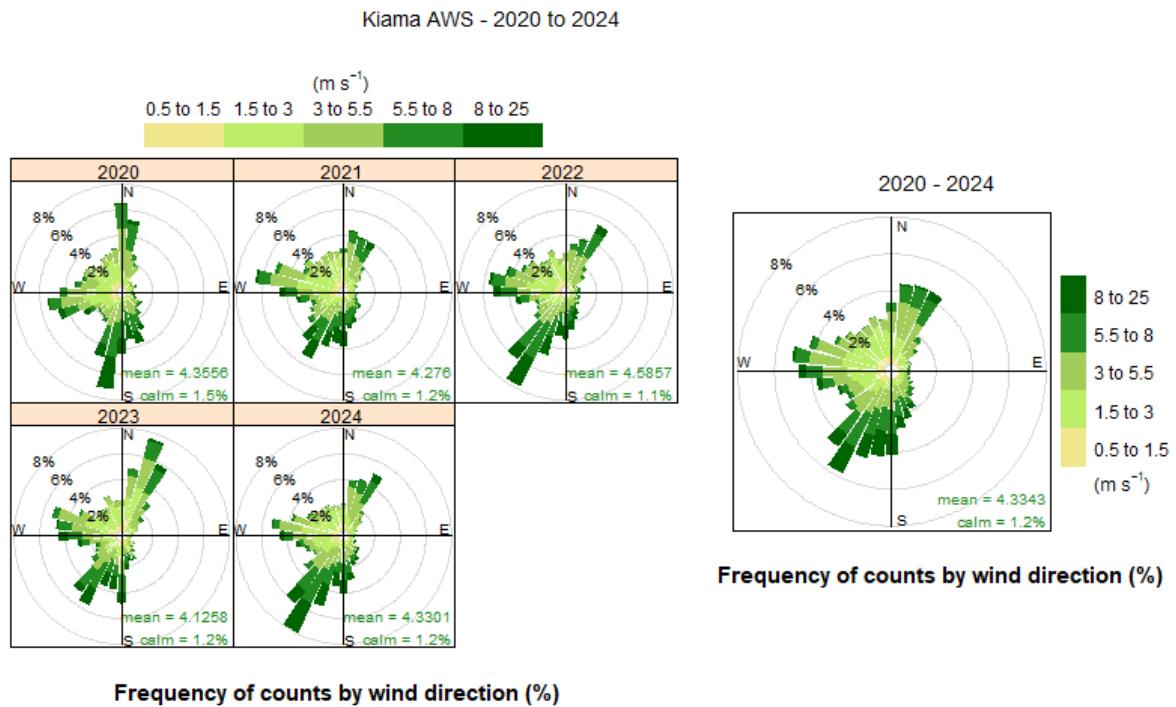
As discussed in Section 4.3, meteorological conditions at Kiama AWS have been examined to determine a 'typical' or representative dataset for use in dispersion modelling. Annual wind roses for the most recent years of data (2020 to 2024) are presented in Figure B1. The annual wind speed frequency distribution for the five-year period is presented in Figure B2.

The wind roses indicate that from 2020 to 2024, winds at Kiama AWS show generally similar wind distribution patterns across the years assessed, with predominant north north-easterly, south south-westerly, and west north-westerly components evident.

The majority of wind speeds experienced at the Kiama AWS between 2020 and 2024 are generally in the range 1.5 meters per second ($\text{m}\cdot\text{s}^{-1}$) to $8 \text{ m}\cdot\text{s}^{-1}$ with the highest wind speeds (greater than $8 \text{ m}\cdot\text{s}^{-1}$) occurring from mostly southerly directions. Winds of this speed occur during 10.2 % of the observed hours during the years while calm winds (less than $0.5 \text{ m}\cdot\text{s}^{-1}$) occur during 1.2 % of hours on average across the years 2020 to 2024.

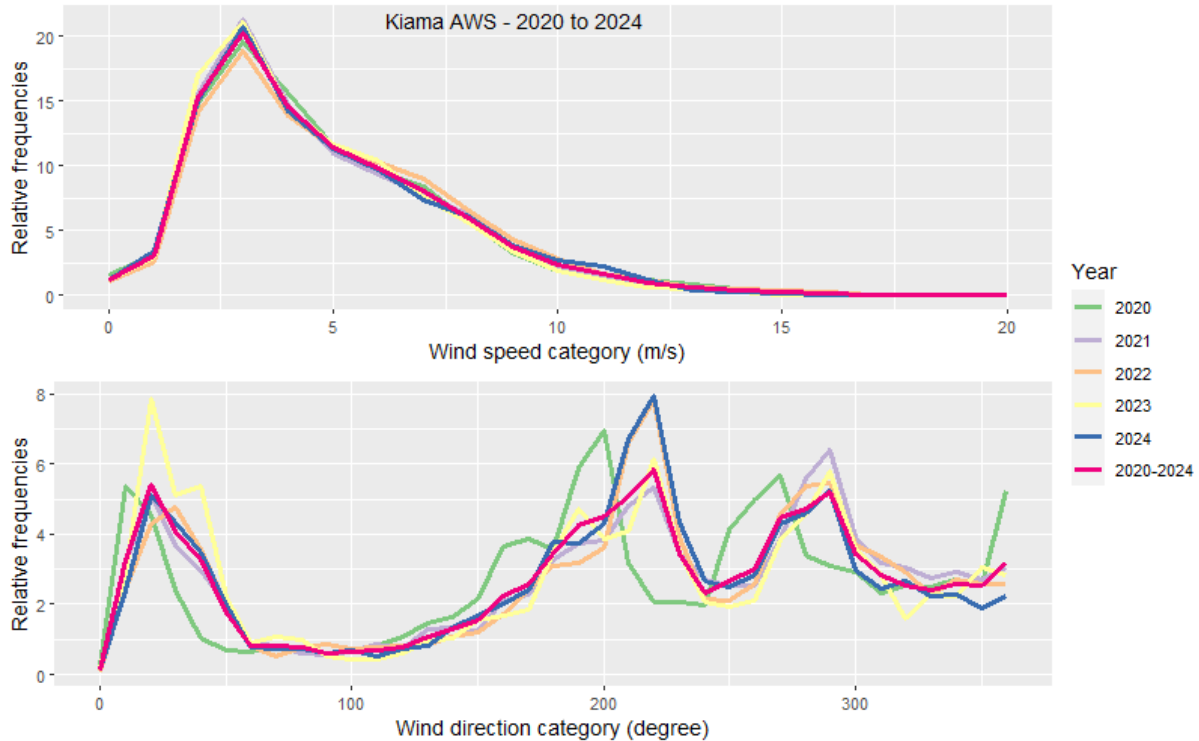
The correlation coefficient between each year and the five-year period for the distribution of wind speed, wind direction, PM_{10} and $\text{PM}_{2.5}$ are summarised in Table B2. The correlation coefficients were ranked and aggregated to select the representative year for the meteorological modelling. The rankings are also presented in Table B2.

Figure B1 Annual wind roses – Kiama AWS (2020 to 2024)



Source: Northstar

Figure B2 Wind direction and speed distributions Kiama AWS (2020 to 2024)



Source: Northstar

Table B2 Correlation coefficient analysis – Kiama AWS & Albion Park South AQMS (2020 to 2024)

Parameter	Wind speed		Wind direction		PM ₁₀		PM _{2.5}		Aggregated rank
	Corr.	Rank	Corr.	Rank	Corr.	Rank	Corr.	Rank	
2020	0.998	4	0.672	5	0.990	3	0.993	3	4
2021	0.999	1	0.968	1	0.999	1	0.999	1	1
2022	0.997	5	0.941	3	0.951	5	0.960	5	5
2023	0.998	3	0.926	4	0.991	2	0.997	2	2
2024	0.999	2	0.953	2	0.969	4	0.963	4	3
2020-2024	1	-	1	-	1	-	1	-	-

Wind speed observations for each year correlated well against the wind speed over the five-year period, with each year having a correlation coefficient greater than 0.99. The year 2021 is the highest ranked for correlation against the wind speed over the three-year period.

Wind direction observations for each year are also reasonably well correlated against the wind direction over the five-year period, with each year having a correlation coefficient greater than of 0.92, with the exception of 2020 which has a correlation coefficient of 0.672. The year 2021 is the highest ranked for correlation against the wind direction over the five-year period.

Particulate matter concentrations for each year are reasonably well correlated against particulate matter concentrations over the five-year period. Each year resulted in having a correlation coefficient greater than 0.95. The year 2021 is the highest rank for both PM₁₀ and PM_{2.5}.

The correlation coefficient analysis indicates that 2021 is the most representative year for meteorological modelling.

Meteorological Processing

The BoM data adequately covers the issues of data quality assurance; however, it is limited by its location compared to the Project Site. To address these uncertainties, a multi-phased assessment of the meteorology data has been performed.

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

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

applied to the winds at each grid point to develop a final wind field and thus the final wind field reflects the influences of local topography and current land uses.

In this study, CALMET has been run in no-observations (no-obs) mode using gridded prognostic data generated by The Air Pollution Model (TAPM, v 4.0.5), developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

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

The parameters used in TAPM and CALMET modelling are presented in Table B3.

Table B3 Meteorological parameters used for this study

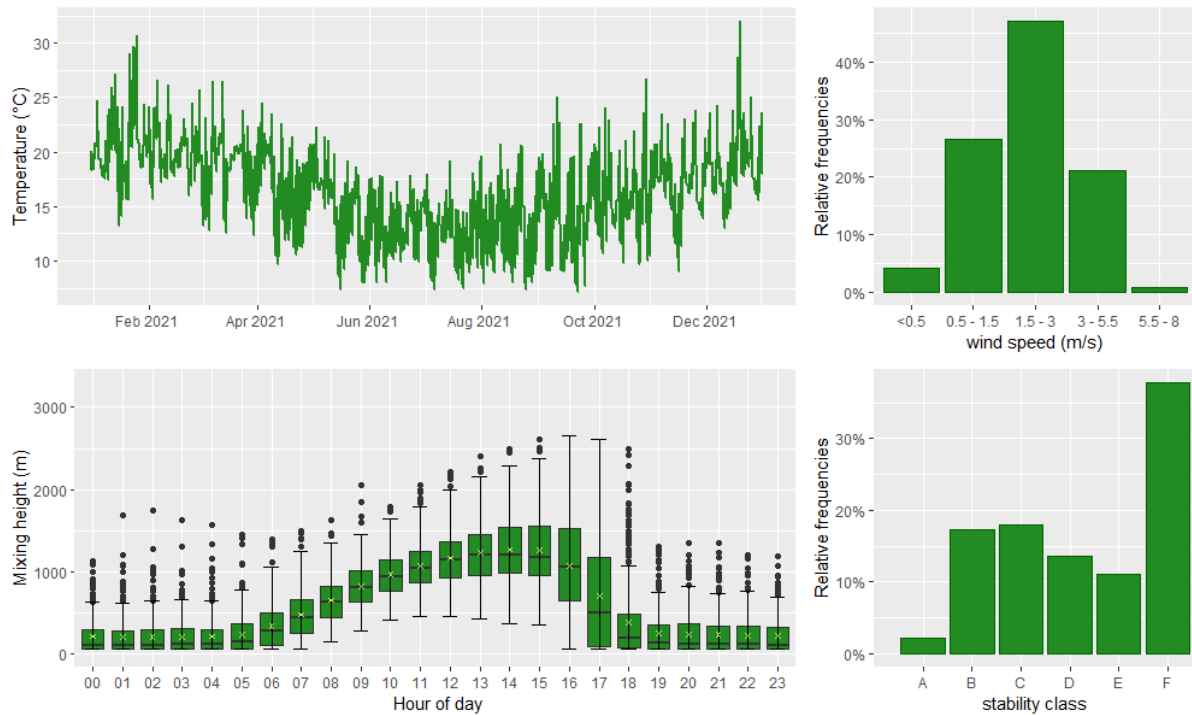
TAPM v 4.0.5	
Modelling period	1 January 2021 to 31 December 2021
Centre of analysis	294 167 mE, 6 146 829 mS (UTM Coordinates)
Number of grid points	45 × 45 × 25
Number of grids (spacing)	5 (30 km, 10 km, 3 km, 1 km, 0.3 km)
Terrain	AUSLIG 9 second DEM
Data assimilation	No data assimilation
CALMET	
Modelling period	1 January 2021 to 31 December 2021
South-West corner of analysis	293 814 mS, 6 145 780 mS (UTM Coordinates)
Meteorological grid domain (resolution)	1.6 km × 1.6 km (0.1 km)
Vertical resolution (cell heights)	10 (0 m, 20 m, 40 m, 80 m, 160 m, 320 m, 640 m, 1200 m, 2000 m, 3000 m, 4000 m)
Data assimilation	No-obs approach using TAPM – 3D.DAT file

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

Diurnal variations in maximum and average mixing heights predicted by CALMET at the Project Site during 2021 are illustrated in Figure B3.

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

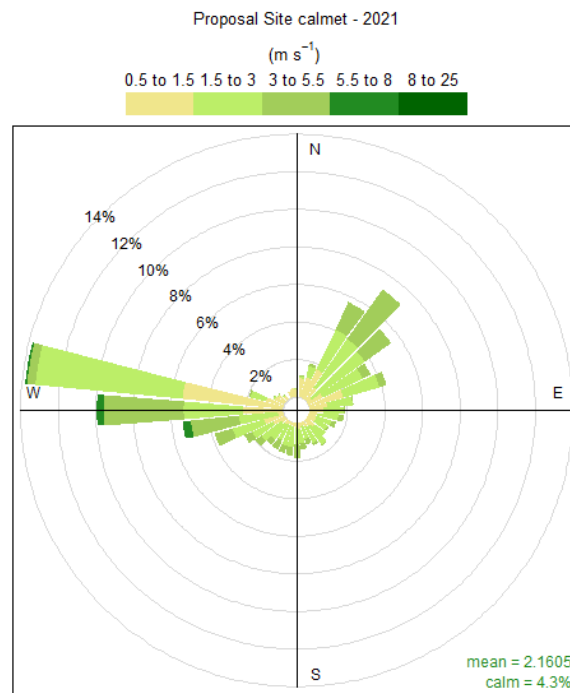
Figure B3 Predicted temperature, mixing height, stability class and wind characteristics – Project Site (2021)



Source: Northstar

The modelled wind speed and direction at the Project Site during 2021 are presented in Figure B4.

Figure B4 Predicted wind direction and speed – Project Site (2021)



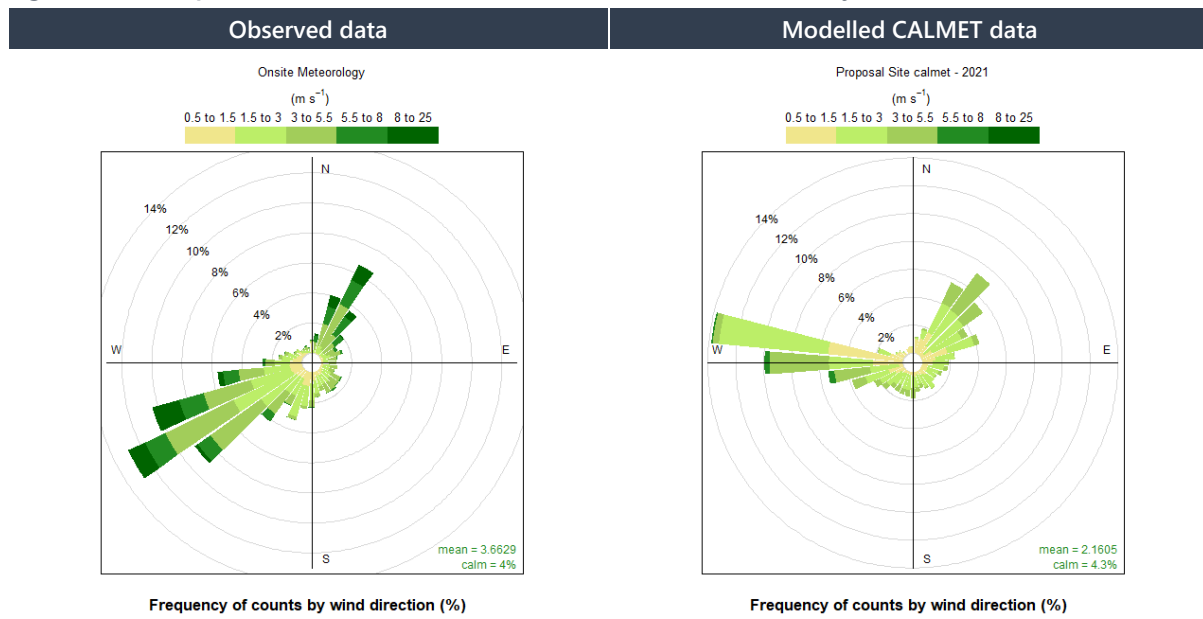
Frequency of counts by wind direction (%)

Source: Northstar

As discussed in Section 4.3.2, meteorological conditions are currently monitored at the Project site and meteorological data between 1 July 2022 and 25 May 2025 have been provided by the Applicant. A wind rose of the data has been produced to compare the meteorological conditions observed at the Project site against the data modelled in CALMET as illustrated in Figure B5.

Figure B5 indicates that the data compares reasonably well and correspondingly, it is considered that the modelled CALMET data is suitable for use within the dispersion modelling assessment.

Figure B5 Comparison of observed data and CALMET data at the Project site



APPENDIX C

Background Air Quality

Background Air Quality

TSP, PM₁₀ and PM_{2.5} concentrations are not monitored at the Project Site and therefore air quality monitoring data measured at a representative location has been adopted for the purposes of this assessment. Determination of data to be used as a location representative of the Project Site and during a representative year can be complicated by factors which include:

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

Data from air quality monitoring stations (AQMS) operated by the NSW Department of Climate Change, Energy, Environment and Water (NSW DCCEEW) have been considered within this AQIA. The locations of the nearest AQMS (listed by proximity) are briefly summarised in Table C1.

Table C1 Closest AQMS to the Project Site

AQMS location	Source	Distance to Project Site (km)	2021 data	Measurements		
				PM ₁₀	PM _{2.5}	TSP
Albion Park South	NSW DCCEEW	21.8	✓	✓	✓	✗
Wollongong	NSW DCCEEW	40.7	✓	✓	✓	✗

It is noted that there are no AQMS within 20 km of the Project Site. However, adoption of air quality monitoring data, often collected at significant distances from proposed projects, to represent conditions at those locations is a routinely adopted approach in NSW. NSW DCCEEW operates an extensive air quality monitoring network, generally reflective of the most populated areas of the State. Site specific air quality monitoring funded by proponents can sometimes be used, although for the purposes of use within an AQIA, at least a full year of continuous measurement is required.

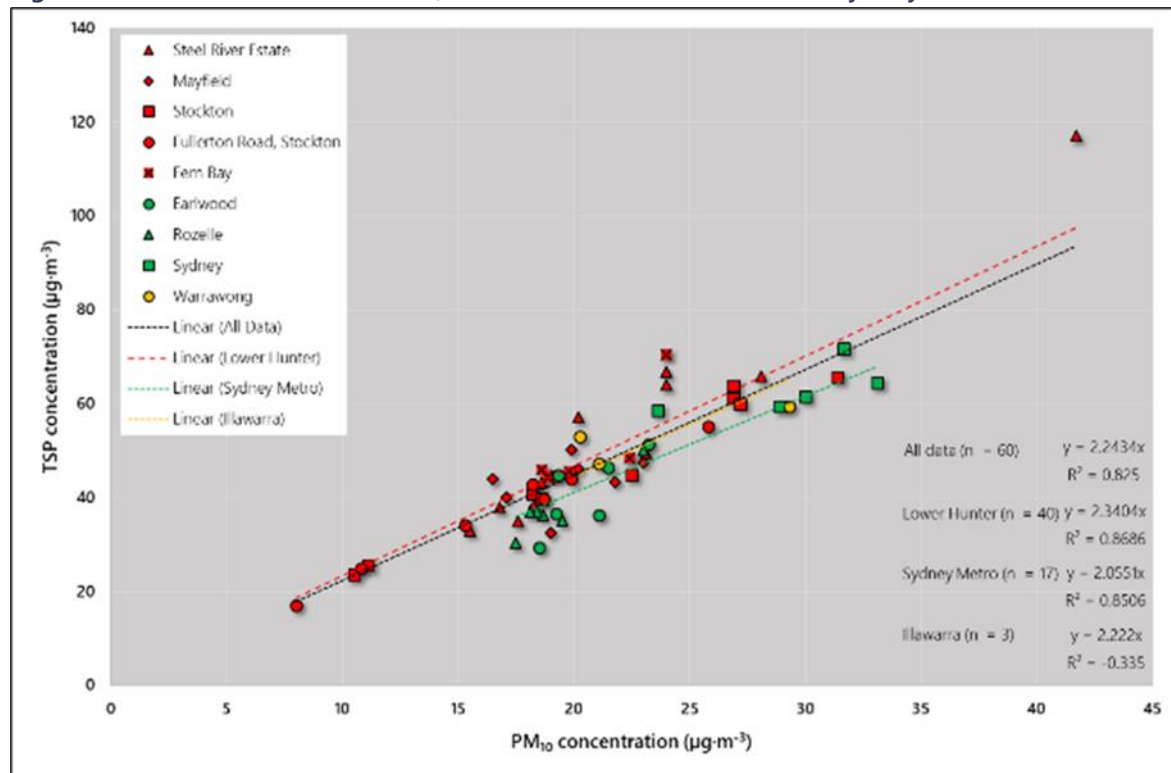
The closest active AQMS that records PM data is noted to be located at Albion Park South and is considered to be the most reflective of the conditions at the Project Site.

The results of the correlation coefficient analysis provided in Appendix B indicates that meteorological and PM data measured in 2021 is an appropriate dataset for use within this study. Reference should be made to Appendix B for justification.

Concentrations of TSP are not measured at any AQMS surrounding the Project Site. An analysis of co-located measurements of TSP and PM₁₀ in the Lower Hunter (1999 to 2011), Illawarra (2002 to 2004), and Sydney Metropolitan (1999 to 2004) regions is presented in Figure C1.

The analysis concludes that, on the basis of the measurements collected in the Illawarra Region between 1999 to 2011, the derivation of a broad TSP:PM₁₀ ratio of 2.222 : 1 (i.e. PM₁₀ represents ~45% of TSP) from all data is appropriate. In the absence of any more specific information, this ratio has been adopted within this AQIA, resulting in a background annual average TSP concentration of 29.1 µg·m⁻³ being adopted.

Figure C1 Co-located TSP and PM₁₀ measurements – Lower Hunter, Sydney Metro, and Illawarra



Source: Northstar

Dust deposition rates are measured by the Applicant at the Quarry for the purposes of ongoing air quality management. There are currently three dust monitoring sites located within the boundary of the Project Site with their respective locations shown in Figure 5. Historically, an additional dust deposition gauge (3A) was located at the east of the Project Site, which was relocated to site 4A in 2023. Results of the dust deposition monitoring (as total insoluble solids, $\text{g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$) over the most recent five complete years of monitoring (2021 to 2024), plus the most recent five months of data in 2025 is presented in Table C2.

Table C2 Quarry dust deposition results

Year	Annual average total insoluble solids deposition rate ($\text{g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$)				
	1A	2A	3A	4A	All sites
2020	2.4 (12)	2.1 (12)	2.4 (12)	N/A	2.3
2021	1.2 (12)	0.7 (12)	0.5 (12)	N/A	0.8
2022	2.3 (12)	1.3 (12)	0.6 (12)	N/A	1.4
2023	1.4 (12)	1.8 (12)	0.3 (8)	0.3 (4)	1.0
2024	1.1 (12)	1.6	N/A	0.6 (12)	1.1
2025	0.9 (5)	0.2 (5)	N/A	0.3 (5)	0.5

Note: Number of measurements shown in brackets.

Given that the annual average total insoluble solids deposition rates have been measured to be below $2\text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$ over the last 3 complete years of monitoring, with the 2021 (representative year for modelling) rate being $0.8\text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$, the adopted annual average total insoluble solids deposition rate of

$2 \text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$ (the difference in NSW EPA maximum allowable and incremental impact criterion) is considered appropriate to allow the presentation of a conservative assessment.

Summary statistics for the selected data monitoring at Albion Park AQMS are presented in Table C3. Graphs presenting the daily varying PM_{10} and $\text{PM}_{2.5}$ data recorded at Albion Park AQMS in 2021 are presented in Figure C2 and Figure C3 respectively.

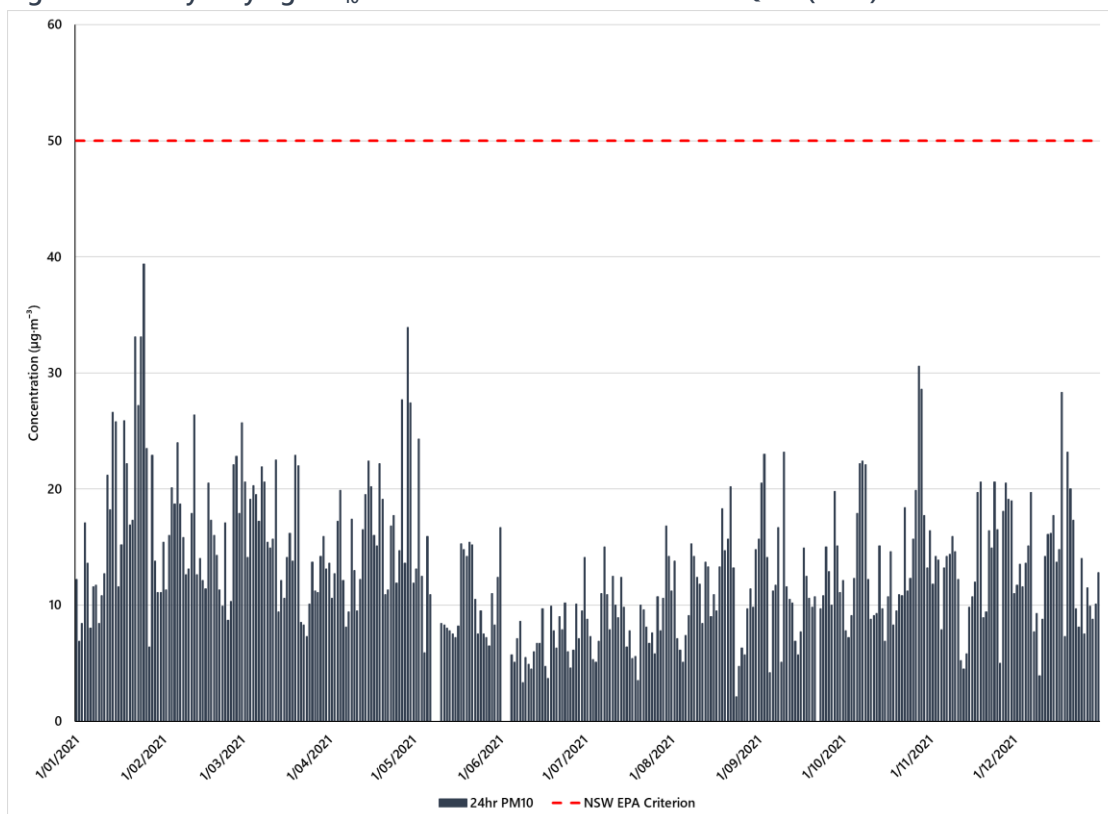
Table C3 Background air quality statistics for Albion Park AQMS (2022)

Pollutant	TSP	PM_{10}	$\text{PM}_{2.5}$
Averaging period	Annual	24-hour	24-hour
Units	$\mu\text{g}\cdot\text{m}^{-3}$	$\mu\text{g}\cdot\text{m}^{-3}$	$\mu\text{g}\cdot\text{m}^{-3}$
Data points (nb)	358	358	356
Mean	29.1	13.1	4.8
Standard deviation	-	5.9	2.6
Skew ¹	-	1.0	2.4
Kurtosis ²	-	1.5	11.9
Minimum	-	2.1	-0.6
Percentiles			
25 th	-	8.8	3.2
50 th	-	12.1	4.2
75 th	-	16.1	5.9
90 th	-	20.6	7.8
95 th	-	23.2	8.9
97 th	-	26.5	9.9
98 th	-	27.7	12.0
99 th	-	31.7	12.5
Maximum	29.1	39.4	23.3
Data Capture (%)	97.8	97.8	97.3

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

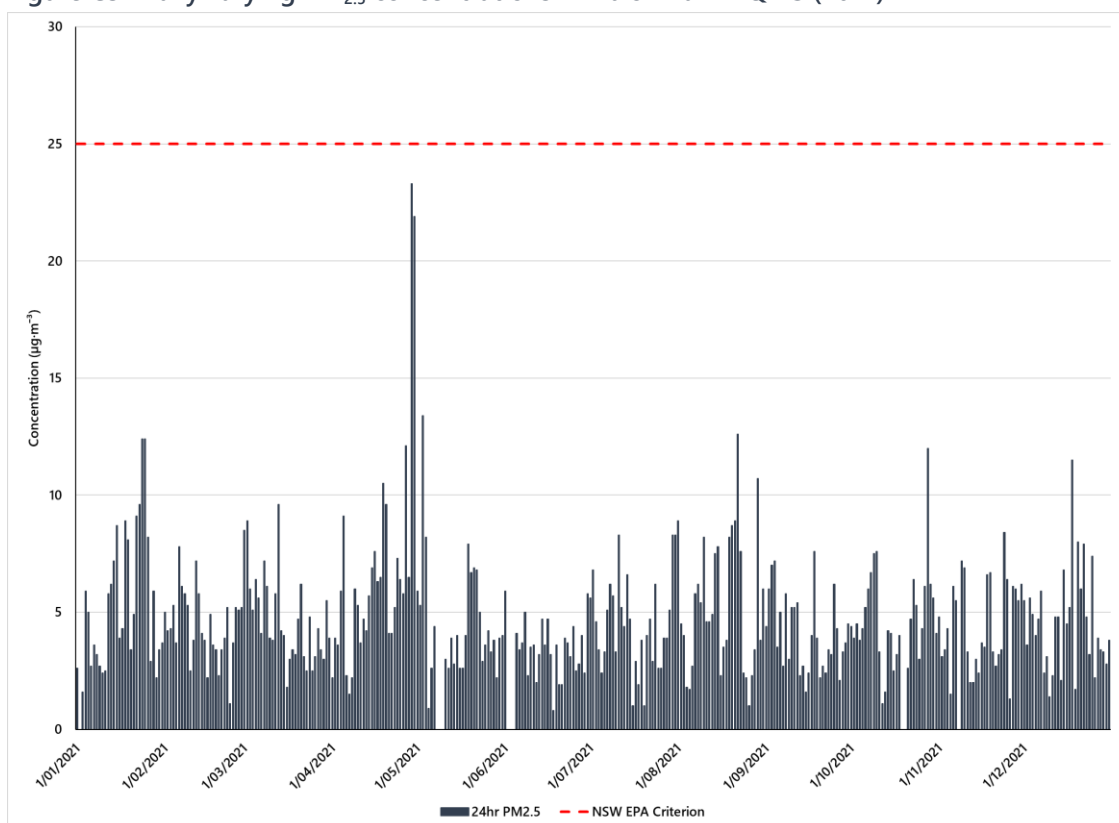
2: Kurtosis represents an expression of the value of measured values in relation to a normal distribution. Positive skew represents a more peaked distribution, and negative skew represents a distribution more flattened than a normal distribution. Kurtosis is dimensionless.

Figure C2 Daily varying PM₁₀ concentrations – Albion Park AQMS (2021)



Source: Northstar

Figure C3 Daily varying PM_{2.5} concentrations – Albion Park AQMS (2021)



Source: Northstar

APPENDIX D

Emissions Inventory

Table D1 Parameters adopted in emissions calculations

Parameter	Value	Notes
Mean wind speed	3.7 m·s ⁻¹	Meteorological station at Quarry – used in preference to CALMET data as resulting emissions totals were greater. CALMET data used in modelling
Pre-processed material silt and moisture content	2 %, 12 %	Assumed silt content, Applicant provided moisture content
Post-processed material silt and moisture content	2 %, 5 %	Assumed silt content, Applicant provided moisture content
Onsite unpaved haulage road silt content	7.1 %	AP-42 value for haul road at sand and gravel processing facility
Onsite paved haulage road silt content	70 g·m ²	AP-42 value for haul road at sand and gravel processing facility
Offsite paved haulage road silt content	0.6 g·m ²	US EPA AP42 <500 trucks per day
Average weight of wheel loader on site	20.86 t	Assumed CAT 972H or similar (8.3 t payload)
Average weight of product trucks	32.5 t or 39.0 t	Assumed payload of 35 t (used in annual average assessment) or Assumed payload of 42 t (used in peak daily assessment)

Table D2 Material quantities adopted in emissions calculations

Parameter	Value	Notes
Quantity of dredged and processed material	126 316 t·yr ⁻¹ 3 006 t·day ⁻¹ (peak)	Assumed 1 m ³ of dredged material results in 0.95 m ³ of product (Applicant provided)
Quantity of product	120 000 t·yr ⁻¹ 2 856 t·day ⁻¹ (peak)	Applicant provided. Peak daily production rate is over 6.5 times the daily average
Average laden trucks per day	19	Equating to 665 t·day ⁻¹
Maximum laden trucks per day	68	Equating to 2 856 t·day ⁻¹

Table D3 Emissions estimates - volume sources - peak daily and annual activity rates

Source ID	Description	Emission factor	Activity rate	
			t·day ⁻¹	t·yr ⁻¹
VOL1	Sand dredging	AP-42 - Batch drop - Section 13.2.4.3	3,006.3	126,315.8
VOL2	Pumping via pipe to processing area	AP-42 - Conveyor transfer point - Table 11.19.2.1	3,006.3	126,315.8
VOL3	Washing plant	AP-42 - Screening - Table 11.19.2.1	3,006.3	126,315.8
VOL4	Loading to product stockpiles	AP-42 - Batch drop - Section 13.2.4.3	2,856.0	120,000.0
VOL5	Loading from product stockpiles to trucks	AP-42 - Batch drop - Section 13.2.4.3	2,856.0	120,000.0
VOL6	Loading rejects stockpile	AP-42 - Batch drop - Section 13.2.4.3	150.3	6,315.8
VOL7	Loading rejects to truck	AP-42 - Batch drop - Section 13.2.4.3	150.3	6,315.8
VOL8	Unloading rejects in dredged area	AP-42 - Batch drop - Section 13.2.4.3	150.3	6,315.8

Table D4 Emissions estimates - volume sources - annual emission rates

Source ID	Emission Factor				Emission Controls	Controlled emission (kg.yr-1)		
	TSP	PM ₁₀	PM _{2.5}	Units		TSP	PM ₁₀	PM _{2.5}
VOL1	1.89E-04	8.96E-05	1.36E-05	kg t-1	Wet process (100%)	0.00E+00	0.00E+00	0.00E+00
VOL2	1.50E-03	5.50E-04	1.54E-04	kg t-1	Wet process (100%)	0.00E+00	0.00E+00	0.00E+00
VOL3	1.25E-02	4.30E-03	3.01E-04	kg t-1	Wet process (100%)	0.00E+00	0.00E+00	0.00E+00
VOL4	1.89E-04	8.96E-05	1.36E-05	kg t-1	-	2.27E+01	1.08E+01	1.63E+00
VOL5	6.45E-04	3.05E-04	4.62E-05	kg t-1	-	7.74E+01	3.66E+01	5.55E+00
VOL6	1.89E-04	8.96E-05	1.36E-05	kg t-1	-	1.20E+00	5.66E-01	8.57E-02
VOL7	6.45E-04	3.05E-04	4.62E-05	kg t-1	-	4.08E+00	1.93E+00	2.92E-01
VOL8	6.45E-04	3.05E-04	4.62E-05	kg t-1	Loading into water (100%)	0.00E+00	0.00E+00	0.00E+00

Table D5 Emissions estimates - volume sources - peak daily emission rates

Source ID	Emission Factor				Emission Controls	Controlled emissions (kg.day-1)		
	TSP	PM ₁₀	PM _{2.5}	Units		TSP	PM ₁₀	PM _{2.5}
VOL1	1.89E-04	8.96E-05	1.36E-05	kg t-1	Wet process (100%)	0.00E+00	0.00E+00	0.00E+00
VOL2	1.50E-03	5.50E-04	1.54E-04	kg t-1	Wet process (100%)	0.00E+00	0.00E+00	0.00E+00
VOL3	1.25E-02	4.30E-03	3.01E-04	kg t-1	Wet process (100%)	0.00E+00	0.00E+00	0.00E+00
VOL4	1.89E-04	8.96E-05	1.36E-05	kg t-1	-	5.41E-01	2.56E-01	3.87E-02
VOL5	6.45E-04	3.05E-04	4.62E-05	kg t-1	-	1.84E+00	8.72E-01	1.32E-01
VOL6	1.89E-04	8.96E-05	1.36E-05	kg t-1	-	2.85E-02	1.35E-02	2.04E-03
VOL7	6.45E-04	3.05E-04	4.62E-05	kg t-1	-	9.70E-02	4.59E-02	6.95E-03
VOL8	6.45E-04	3.05E-04	4.62E-05	kg t-1	Loading into water (100%)	0.00E+00	0.00E+00	0.00E+00

Table D6 Emissions estimates - road sources - peak daily and annual activity rates

Source ID	Description	Emission factor	Activity rate	
			VKT.year ⁻¹	VKT.day ⁻¹
ROAD1	Material haulage on unpaved road	AP-42 Unpaved roads - Section 13.2.2	7,754.7	105.1
ROAD2	Material haulage on paved road (site)	AP-42 Paved roads - Section 13.2.1	2,197.0	29.8
ROAD3	Material haulage on paved road (offsite)	AP-42 Paved roads - Section 13.2.1	24,528.2	332.5
ROAD4	Loader moving rejects	AP-42 Unpaved roads - Section 13.2.2	198.3	4.7

Table D7 Emissions estimates - road sources - annual emission rates

Source ID	Emission factor				Emission Controls	Controlled emission (kg.yr-1)		
	TSP	PM ₁₀	PM _{2.5}	Units		TSP	PM ₁₀	PM _{2.5}
ROAD1	2.92E+00	8.05E-01	8.05E-02	kg VKT-1	Haul road watering (50%), Speed limits (85%)	1.13E+04	3.12E+03	3.12E+02
ROAD2	5.37E+00	1.03E+00	2.50E-01	kg VKT-1	Haul road watering (50%), Speed limits (85%)	5.90E+03	1.13E+03	2.74E+02
ROAD3	3.68E-01	7.07E-02	1.71E-02	kg VKT-1	-	9.04E+03	1.73E+03	4.20E+02
ROAD4	2.39E+00	6.59E-01	6.59E-02	kg VKT-1	Haul road watering (50%), Speed limit (85%)	2.37E+02	6.54E+01	6.54E+00

Table D8 Emissions estimates - road sources - peak daily emission rates

Source ID	Emission factor				Emission Controls	Controlled emissions (kg.day-1)		
	TSP	PM ₁₀	PM _{2.5}	Units		TSP	PM ₁₀	PM _{2.5}
ROAD1	3.17E+00	8.74E-01	8.74E-02	kg VKT-1	Haul road watering (50%), Speed limits (85%)	1.67E+02	4.59E+01	4.59E+00
ROAD2	6.47E+00	1.24E+00	3.01E-01	kg VKT-1	Haul road watering (50%), Speed limits (89%)	9.64E+01	1.85E+01	4.48E+00
ROAD3	3.68E-01	7.07E-02	1.71E-02	kg VKT-1	-	1.22E+02	2.35E+01	5.69E+00
ROAD4	2.39E+00	6.59E-01	6.59E-02	kg VKT-1	Haul road watering (50%), Speed limit (85%)	5.65E+00	1.56E+00	1.56E-01

Table D9 Emissions estimates - open area wind erosion sources - peak activity rates

Source ID	Description	Emission factor	Peak activity rate	
			Area (ha)	hr.day ⁻¹
WE1	Wind erosion of exposed areas	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	1.4	24

Table D10 Emissions estimates - open area wind erosion sources - peak daily emission rates

Source ID	Emission factor				Emission Controls	Controlled emissions (kg.day-1)		
	TSP	PM ₁₀	PM _{2.5}	Units		TSP	PM ₁₀	PM _{2.5}
WE1	8.50E+02	4.25E+02	6.38E+01	kg ha-1yr-1	-	3.16E+00	1.58E+00	2.37E-01

Table D11 Emissions estimates - open area wind erosion sources - annual emission rates

Source ID	Emission factor				Emission Controls	Controlled emission (kg.yr-1)		
	TSP	PM ₁₀	PM _{2.5}	Units		TSP	PM ₁₀	PM _{2.5}
WE1	8.50E+02	4.25E+02	6.38E+01	kg ha-1yr-1	-	1.15E+03	5.77E+02	8.66E+01

air quality | environment | sustainability

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