Appendices

Appendix A

SEARS Compliance

Table A1 Compliance with SEARs for application number SSI-22545215

Category	SEARs requirement	Section addressed
General Requirements	The Environmental Impact Statement (EIS) for the project must be prepared in accordance with Part 3 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (the Regulation).	Section 6.1.1, Appendix B
	The EIS must include: – an executive summary	Executive summary
	– a detailed description of the project, including: • an accurate history of the site, including development consents and approved plans previously and/or currently applicable to the site	Section 2.1, 2.2
	• the strategic need for the project with regard to its critical State significance	Section 3.1
	• the justification for the project and an analysis of other options or alternatives considered and the reasons for selecting the preferred option	Section 4.1, 4.3 and 4.4
	• likely staging of the project, including construction, commissioning, operation, maintenance and decommissioning	Section 5
	• likely interactions between the project and existing, approved and proposed operations in the vicinity of the site	Section 5.1
	• site plans and maps at an adequate scale showing the location and design of all project components, the footprint, existing infrastructure and environmental features	Section 5.8, Appendix B
	• any contributions required to offset the impacts of the project, and	Section 8 and 9
	• infrastructure upgrades or items required to facilitate the project, including measures to ensure these upgrades are appropriately maintained.	Section 5.2
	– consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments	Section 6.1.2
	– consideration of issues discussed in Attachment 2 (public authority responses to key issues)	Appendix A
	– a risk assessment of the potential environmental impacts of the project, identifying the key issues for further assessment	Section 7.4 and project Scoping Report
	– a detailed assessment of the key issues specified below, and any other significant issues identified in the risk assessment, which includes: • a description of the existing environment, using sufficient baseline data • an assessment of the potential impacts of all stages of the project, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes, and • a description of the measures that would be implemented to avoid, minimise, mitigate and if necessary, offset the potential impacts of the project, including proposals for adaptive management and/or contingency plans to manage significant risks to the environment.	Section 8 and 9
	– a consolidated summary of all the proposed environmental management and monitoring measures, highlighting commitments included in the EIS.	Appendix D
	The EIS must also be accompanied by: – high quality files of maps and figures of the subject site and proposal	Throughout the EIS

Category	SEARs requirement	Section addressed
	– a report from a qualified quantity surveyor providing: • a detailed calculation of the capital investment value (CIV) of the project (as defined in Clause 3 of the Regulation, including details of all assumptions and components from which the CIV calculation is derived. The report shall be prepared on company letterhead and indicate the applicable GST component of the CIV • an estimate of the jobs that will be created by the project during the construction and operational phases, and certification that the information provided is accurate at the date of preparation.	A CIV report will be provided under separate cover to DPIE. Total CIV is outlined in Section **Error! Reference source not found.**
Key issues	The EIS must address the specific matters:	-
	Community and stakeholder following engagement – including: – a community and stakeholder participation strategy identifying key community stakeholders – clear evidence of how each stakeholder has been consulted and details of the issues raised – clear details of how issues raised during consultation have been addressed and whether they have resulted in changes to the development.	Section 7, Appendix C
	Air quality and odour – including: – a quantitative assessment of the potential air quality, dust and odour impacts of construction, commissioning and operation, in accordance with relevant Environment Protection Authority guidelines – cumulative assessment of air quality emissions from operation of the site as a whole and comparison with background data and impact assessment criteria – details of all air quality and odour control equipment, benchmarked against best practice, and monitoring for all discharge points and fugitive emissions – an assessment of the greenhouse gas emissions of the project and any measures to minimise emissions intensity, improve energy efficiency and adopt new technologies to reduce emissions in the medium to long term – details of proposed mitigation, management and monitoring measures.	Section 8.1, 9.8, 9.9, Appendix E
	Hazards and risk – including: – a preliminary risk screening completed in accordance with *State Environmental Planning Policy No.33 – Hazardous and Offensive Development* and Applying SEPP 33 (DoP, 2011), with a clear indication of class, quantity and location of all dangerous goods and hazardous materials associated with the development. Should preliminary screening indicate that the project is “potentially hazardous” a Preliminary Hazard Analysis (PHA) must be prepared in accordance with Hazardous Industry Planning Advisory Paper No.6 – Guidelines for Hazard Analysis (DoP, 2011) and Multi-Level Risk Assessment (DoP, 2011). – Systems and procedures to prevent and manage all types of emergencies.	Section 8.3, Appendix G
	Noise and vibration – including: – a quantitative assessment of potential construction, operational and transport noise and vibration impacts of the project prepared in accordance with the relevant Environment Protection Authority guidelines – identification of sensitive receivers and consideration of cumulative noise from approved and/or proposed development on site and in the vicinity of the site – details and justification of proposed noise mitigation and monitoring measures.	Section 8.2, Appendix F

Category	SEARs requirement	Section addressed
	Traffic and transport – including: – include a traffic impact assessment addressing construction and operational traffic impacts of the project, details of traffic types and volumes, access roads and haul routes – an assessment of the predicted impacts of project traffic on road safety and capacity, including consideration of cumulative traffic and the need for any road upgrades or infrastructure works to support the project – Details of internal road layouts and vehicle movement plans to demonstrate that all vehicle sizes can be safely accommodated on site	Section 8.5, Appendix I
	Soils and water – including: – an assessment of potential surface and groundwater impacts of the project – characterisation of water quality discharges, including quality and quantity of all pollutants from the project for comparison against relevant water quality criteria and details of proposed water quality controls – a detailed site water balance and any water licensing requirements – details of the stormwater and wastewater management systems and measures to treat, reuse or dispose of water – description of the proposed erosion and sediment controls during construction – characterisation of the nature and extent of any contamination on the site and surrounding area.	Section 8.4, 9.1, Appendix H
	Biodiversity – including an assessment of the proposal's biodiversity impacts in accordance with the *Biodiversity Conservation Act 2016*, including the preparation of a Biodiversity Development Assessment Report (BDAR) where required under the Act, except where a waiver for preparation of a BDAR has been granted.	Section 9.2, Appendix K
	Heritage (Aboriginal) – including identification of potential impacts on Aboriginal cultural heritage values through consultation with the Aboriginal community.	Section 9.3
	Waste – including details of the quantities and classification of all waste streams to be generated on site and details of waste storage, handling and disposal	Section 9.9
	Visual Amenity – including an assessment of the potential visual impacts of the project on the amenity of the surrounding area and sensitive receivers.	Section 9.10
	Infrastructure requirements – including details and plans of all infrastructure required to service the project and any impacts on existing utility infrastructure and assets.	Section 5
	Socio-economic – including: – a social impact assessment in accordance with the Department's *Social Impact Assessment Guideline – State significant projects* (July 2021) – an analysis of any potential economic impacts of the development, including a discussion of any potential economic benefits to the local and broader community.	Section 9.7
	Ecologically sustainable development – including a description of how the project will incorporate the principles of ecologically sustainable development in the design, construction and ongoing operation of the development.	Section 11.1.3
	Planning agreement/development contributions – demonstration that satisfactory arrangements have been or would be made to provide, or contribute to the provision of, necessary local and regional infrastructure required to support the development.	Section 6.1.1

Category	SEARs requirement	Section addressed
Consultation	During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners. In particular you must consult with: – NSW Ports – Wollongong City Council – BlueScope Community Consultative Committee and other relevant community groups – Environment Protection Authority – Transport for NSW – DPIE Water and Natural Resources Access Regulator – Environment, Energy and Science Group – Heritage NSW – NSW Fire and Rescue – Sydney Trains – surrounding local landowners and stakeholders, including the Illawarra Local Aboriginal Land Council – any other public transport, utilities or community service providers. The EIS must describe the consultation process and the issues raised and identify where the design of the project has been amended in response to these issues. Where amendments have not been made to address an issue, an explanation should be provided.	Section 7 and Appendix C
Further consultation after 2 years	If you do not lodge a Development Application and EIS for the project within two (2) years of the issue date of these SEARs, you must consult further with the Secretary in relation to the preparation of the EIS.	Noted.
References	The assessment of the key issues listed above must take into account relevant guidelines, policies, and plans as identified. While not exhaustive, Attachment 1 contains a list of some of the guidelines, policies, and plans that may be relevant to the environmental assessment of this proposal.	Section 12

Table A2 Agency comments attached to SEARs

Agency	Comment	Where addressed
Biodiversity and Conservation Division	We note the project occurs within a heavily industrialised area. We have no specific comments in relation to the SEARs and are supportive of the draft advice in relation to assessing any biodiversity impacts associated with the proposal. That is, as per Part 7 of the *Biodiversity Conservation Act 2016*, a BDAR is prepared or a BDAR waiver is requested for the proposal.	Section 9.2
DPIE Water and NRAR	The SEARS should include: – The identification of an adequate and secure water supply for the life of the project. This includes confirmation that water can be sourced from an appropriately authorised and reliable supply. This is also to include an assessment of the current market depth where water entitlement is required to be purchased.	Section 8.4
	– A detailed and consolidated site water balance.	Section 8.4
	– Assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts.	Section 9.2
	– Proposed surface and groundwater monitoring activities and methodologies.	Section 9.1
	– Consideration of relevant legislation, policies and guidelines, including the NSW Aquifer Interference Policy (2012), the Guidelines for Controlled Activities on Waterfront Land (2018) and the relevant Water Sharing Plans (available at https://www.industry.nsw.gov.au/water).	
EPA	The Environmental Impact Statement (EIS) should document how the following outcomes will be achieved: – there is no pollution of waters (including surface & groundwater) except in accordance with an Environment Protection Licence (EPL) issued by the EPA. – provides development that maintains or restores the community's environmental uses and values of water through the achievement of the relevant NSW Water Quality and Flow Objectives – promotes integrated water cycle management that optimises opportunities for sustainable water – supply, wastewater and stormwater management and reuse initiatives where it is safe and practicable to do so – bunding is designed in accordance with the EPA's Bunding and Spill Management Guidelines	Section 8.4, 9.1,
EPA	– This assessment should incorporate process discharges and any proposed controls from the operational blast furnace as well as from the relevant premises discharge drain to the receiving environment	Section 8.4
	– State the ambient NSW Water Quality Objectives (NSW WQO) and environmental values for the receiving waters relevant to the project, including the indicators and associated guideline values or criteria for the identified environmental values;	Section 8.4
	– Where site specific studies are proposed to tailor the ANZG (2018) guideline values to reflect local conditions, obtain prior agreement from the EPA on the approach and study design;	Section 8.4
	– Identify and estimate the quality and quantity of all pollutants that may be introduced into the water cycle by source and discharge point (including cooling and process wastewater) and describe the nature and degree of impact that discharge(s) may have on the receiving environment, including consideration of all pollutants that pose a risk of non-trivial harm to human health and the environment and taking into account the ANZG (2018) guidelines.	Section 8.4

Agency	Comment	Where addressed
	– Where relevant, identify the rainfall event that the water quality protection measures will be designed to contain (including first flush systems, integrated water cycle management, etc)	
	– Demonstrate how construction and operation of the project will, to the extent that the project can influence, ensure that: • where the NSW WQOs for receiving waters are currently being met they will continue to be protected; and • where the NSW WQOs are not currently being met, activities will work toward their achievement over time	Section 8.4
	– justify, if required, why the WQOs cannot be maintained or achieved over time	Section 8.4
	– demonstrate that all practical measures to avoid or minimise water pollution and protect human health and the environment from harm are investigated and implemented	Section 8.4,
	– provide details of measures to minimise and mitigate potential impacts of discharges on the receiving waterway such as recycling, wastewater treatment and/or optimising the location, depth and mode of discharge to maximise dilution, mixing and dispersion;	Sections 8.4, 9.9
	– specify the location of discharge points, including but not limited to drains at the #6BF, on the broader premises, Allans Creek and Port Kembla Harbour release location(s) for dry and wet weather justifying why the location was selected over other potential discharge points, including discussion of waterway characteristics at each point (e.g. depth, water quality, hydrodynamics) and consideration of the relative water quality risks	Section 8.4
	– assess the significance of any identified impacts including consideration of the relevant ambient water quality outcomes;	Section 8.4
	– include the results of water quality modelling and analysis including descriptions of water quality impacts under the full range of operating scenarios, including average or typical through to worst case for each discharge point during wet and dry weather	Section 8.4
	– identify any sensitive receiving environments (which may include estuarine and marine waters downstream) and develop a strategy to avoid or minimise impacts on these environments	Sections 8.4, 9.2
	– identify proposed water quality monitoring locations, monitoring frequency and indicators of water quality	
	– in wastewater management systems for the proposal, take into account the current Pollution Reduction Programs (including PRP 182 Condition U4 and PRP 183 Condition U5) on Environment Protection Licence 6092 related to improving wastewater discharges from the premises. The Reline Project should consider options to improve wastewater discharge quality, and implement any necessary treatment systems or controls, to achieve a discharge standard consistent with the objectives of these PRPs	Section 8.4
	– describe how stormwater will be managed during the construction phase. The proponent should provide a commitment in the EIS that a Soil and Water Management Plan will be developed and implemented prior to construction in accordance with the Managing urban stormwater: soils and construction, vol. 1 (Landcom 2004) and vol. 2 (A. Installation of services; B. Waste landfills; C. Unsealed roads; D. Main Roads; E. Mines and quarries) (DECC 2008)	Sections 9.1, 9.9
	– Describe how stormwater will be managed during the operational phase of the project. This should include collecting, assessing, and treating (where necessary), first flush stormwater to achieve the relevant environmental discharge standard.	Sections 8.4, 9.1

Agency	Comment	Where addressed
EPA	The environmental outcome for the project should ensure: – emissions do not cause adverse impact upon human health or the environment – no offensive odour beyond the boundary of the premises – compliance with the requirements of the POEO Act and its associated regulations – maintains or improves air quality to ensure National Environment Protection Measures for ambient air quality are not compromised • any dust emissions are prevented or minimised.	Section 8.1
	Assess the risk associated with potential discharges of fugitive and point source emissions for all stages of the proposal. Assessment of risk relates to environmental harm, risk to human health and amenity	Section 8.1
	Justify the level of assessment undertaken on the basis of risk factors, including but not limited to: a. proposal location; b. characteristics of the receiving environment; and c. type and quantity of pollutants emitted.	Section 8.1
	Describe the receiving environment in detail. The proposal must be contextualised within the receiving environment. The description must include but need not be limited to: d. meteorology and climate; e. topography; f. surrounding land-use; receptors; and ambient air quality	Sections 8.1, 9.10
	Include a detailed description of the proposal. All processes that could result in air emissions must be identified and described. Sufficient detail to accurately communicate the characteristics and quantity of all emissions must be provided.	Section 8.1
	Identify and provide a detailed discussion regarding emission control techniques/practices that will be employed by the proposal. All emission controls must be benchmarked against best practice process design and emission control. Nominated controls must be explicitly linked to calculated emission reductions adopted in the air quality impact assessment emissions inventory, with all assumptions documented and justified.	Section 8.1
	Include consideration of ‘worst case’ emission scenarios & impacts at proposed emission limits.	Section 8.1
	Account for cumulative impacts associated with existing emission sources as well as any currently approved developments linked to the receiving environment.	Section 8.1
	Air dispersion modelling must be conducted in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (2016)	Section 8.1
	Demonstrate the proposal’s ability to comply with the relevant regulatory framework, specifically the POEO Act and the POEO (Clean Air) Regulation (2010), including compliance with Group 6 limits.	Section 8.1
	The EIS should include a commitment that the proponent will develop and implement an Air Quality Management Plan prior to expansion of operations.	Section 8.1

Agency	Comment	Where addressed
	In particular the assessment must include, but not necessarily limited to: g. The identification and assessment of all potential noise sources associated with the development, the location of all sensitive receptors, and proposed noise mitigation measures. h. Accounting for adverse weather conditions including temperature inversions. i. Sound power levels measured or estimated for all plant and equipment must be clearly stated and justified. j. An assessment of cumulative noise impacts, having regard to existing surrounding industrial activities and development. k. Consideration of impacts to sensitive receivers and include consideration of sleep disturbance and, as relevant, the characteristics of noise and vibration (for example, low frequency noise). l. Demonstrating that blast impacts are capable of complying with the current guidelines, if blasting is required.	Section 8.2, 9.10
	With the proposed activity being potentially traffic generating, the EIS should identify the transport route(s) to be used, the hours of operation and assess any potential road traffic noise impacts in accordance with the “NSW Road Noise Policy”.	Section 8.2
	The goal of the development should be to ensure: – it is in accordance with the principles of the waste hierarchy and circular economy – the handling, processing and storage of all materials used at the premises does not have negative environmental or amenity impacts – the beneficial reuse of all wastes generated at the premises are maximised where it is safe and practical to do so – no waste disposal occurs on site except in accordance with an EPL.	Section 8.2
	The EIS should also provide details of how waste will be handled and managed both onsite and offsite to minimise pollution. This should include information on the infrastructure (e.g. bunding and containment) as well as the procedures and protocols to be implemented to ensure that any waste leaving the site is transported and disposed of lawfully and does not pose a risk to human health or the environment.	Section 9.9
	The EIS should document systems and procedures to prevent and manage all types of emergencies. This includes systems and infrastructure to manage incidents (for example, spills, explosions or fire) that may occur at the premises or that may be associated with activities that occur at the premises and which are likely to cause harm to the environment. This should also include appropriate measures to protect the environment during these emergencies such as on-site containment measures for fire water and communication strategies that involves reporting of any incidents to appropriate regulatory authorities.	Section 8.3
Heritage NSW	The subject site is not listed on the State Heritage Register (SHR), nor is it in the immediate vicinity of any SHR items. Further, the site does not contain any known historical archaeological relics. Therefore, no heritage comments are required. The Department does not need to refer subsequent stages of this proposal to the Heritage Council of NSW.	Section 9.4
	Notwithstanding the highly disturbed nature of the site, Heritage NSW advise that the process described in the Due Diligence Code of Practice for the protection of Aboriginal objects in NSW (DECCW 2010) is not sufficient to assess the impacts on Aboriginal cultural heritage for Major Projects. In this instance, this is because no consultation would be required to be undertaken with the Aboriginal community which may provide more information about cultural values of the land. Heritage NSW recommend that the SEARs provide an avenue for consultation with the Aboriginal community.	Section 9.3

Agency	Comment	Where addressed
TfNSW	– Input has been requested by the Secretary under Schedule 2 of the Environmental Planning and Assessment Regulation 2000	Section 8.5
	– The development proposes to undertake major maintenance works in order to reline, commission and operate 6BF, located in the southern sector of the No.2 Works of Port Kembla Steelworks	Section 5.3
	– Traffic associated with the Steelworks currently accesses the site via Five Islands Road, Flinders Street and Springhill Road, with heavy vehicles additionally using Masters Road, Shellharbour Road, the Princes Highway and the Princes Motorway to transport goods to the wider road network.	Section 5.4
	– The construction phase will require materials and equipment to be transported to the Steelworks via road and will increase light and heavy vehicle road movements. The impact of this increased traffic needs to be considered and adequately mitigated.	Section 5.4
	Traffic Impact Study (TIS): TfNSW notes that a Traffic Impact Study (TIS) is planned to be prepared as part of the EIS (Scoping Report Section 5.2.5). TfNSW supports this proposed methodology. The RTA Guide to Traffic Generating Developments (Table 2.1) should also be considered when preparing the TIS.	Section 8.5
	Traffic Impact Study (TIS): TfNSW notes that a Traffic Impact Study (TIS) is planned to be prepared as part of the EIS (Scoping Report Section 5.2.5). TfNSW supports this proposed methodology. The RTA Guide to Traffic Generating Developments (Table 2.1) should also be considered when preparing the TIS.	Section 8.5
	State Environmental Planning Policy (Infrastructure) 2007: The provisions of 104 need to be addressed.	Section 8.5
	Consultation with Sydney Trains: Given that the proposed development is within close proximity to the rail corridor managed by Sydney Trains on behalf of TAHE, it is recommended that consultation with Sydney Trains (as a separate Agency) is undertaken during the preparation of the EIS.	Section 7
WCC	Wollongong City Council declared a Climate Emergency in August 2019. The EIS should detail how BlueScope has the capability and flexibility to adopt new technologies and iron making configurations in the medium to longer term. The EIS should also detail opportunities to reduce the emissions intensity from its existing operations by outlining how progressive investment in complementary technologies such as use of renewable energy and additional on-site electricity might be implemented in line with Council targets.	Sections 0
	Under Section 7.9 of the Biodiversity Conservation Act an application to carry out State Significant Infrastructure is to be accompanied by a Biodiversity Development Assessment Report (BDAR) unless the Planning Agency Head and the Environment Agency Head determine that the proposed development is not likely to have any significant impact on biodiversity values.	Section 9.2
	Any stormwater runoff from the site as a result of this proposal must be managed in accordance with the controls in the Wollongong DCP 2009 Chapter E14: Stormwater Management.	Section 8.4
	The applicant should refer to Chapter E3 – Car Parking, Access, Servicing/ Loading Facilities and Traffic Management of the Wollongong Development Control Plan 2009 (WDCP 2009) for merit guidance on car parking and servicing. A Traffic Impact Assessment needs to be prepared by a suitably qualified consultant in accordance with Table 2.1 of the RTA Guide to Traffic Generating Development.	Section 8.5

Agency	Comment	Where addressed
	– The applicant will need to provide an assessment of the proposed traffic generation based on the expected construction/delivery requirements, vehicle capacities etc. The different types of heavy vehicle and passenger vehicles need to be identified and quantified as part of the assessment. – The analysis should determine the peak operating hours of the development and provide details of the split of vehicle types, as well as a multi modal analysis across a 24-hour period for both weekdays and weekends. – If changes are proposed to the access arrangements, the proposed access design must comply with the AS2890 series and be designed for the largest anticipated vehicle to enter the site with adequate clearances.	Sections 5.4, 0, 8.5
	– Where possible, construction deliveries should be sent by rail freight to reduce heavy vehicle impacts on the surrounding road network. – For road access, heavy vehicle routes are to be outlined ensuring that construction traffic is directed to the State Road Network, and not Councils local roads. – The applicant will need to assess the capacity of the existing road network/access to and from the site and the capacity and level of service at relevant intersections under baseline conditions and a future 10-year scenario with background traffic growth. – The applicant needs to provide details of likely traffic impacts at all relevant intersections and provide details of any required upgrades that are required to ensure an acceptable level of service. The applicant will need to demonstrate acceptable management of any potential safety and capacity impacts as a result of the expected traffic increase. – Details of required upgrades to the road network will need to be put forward by the applicant to ensure that the network is able to accommodate future background traffic growth as well as development-generated traffic. The applicant will also need to demonstrate how the safety of all road users will be maintained i.e. a review of relevant pedestrian and cyclist infrastructure.	Sections 5.4, 8.5, 9.10
	– The applicant should provide all internal access dimensions on the site plan, including grades, access widths, parking aisle widths which comply with AS2890.1 and AS2890.2. – The applicant should refer to Schedule 1 of Chapter E3 of WDCP 2009 for merit guidance on car parking, bicycle parking and motorcycle parking. – Disabled car parking also needs to be provided in accordance with BCA requirements and the design specification must meet the requirements of AS2890.6. – A series of vehicle movement plans will be required to demonstrate that the internal road network is able to accommodate all sizes of vehicles likely to enter the site and access all areas with forward ingress and egress. As per the requirements of AS2890.1, a B99 vehicle must be shown passing a B85 vehicle on all critical corners. A service vehicle must also be shown passing a B85 vehicle throughout the development. – The applicant will need to clarify emergency access arrangements.	Appendix I
	– The applicant should refer to Chapter E3 of WDCP 2009 for merit guidance on loading and servicing arrangements. – AS2890.2 requires a maximum grade of 15.4% for service vehicles which should also be taken into consideration.	Appendix I

Appendix B

Statutory Compliance Table

Table C1 Statutory compliance

Statutory reference	Consideration	Section of EIS
EP&A Act		
Section 1.3	Objects of the Act	Section 6.1.1.
Section 5.13	Critical State significant infrastructure *Any State significant infrastructure may also be declared to be critical State significant infrastructure if it is of a category that, in the opinion of the Minister, is essential for the State for economic, environmental or social reasons. Any such declaration may be made by the instrument that declared the development to be State significant infrastructure or by a subsequent such instrument.*	Section 6.1.1
Section 5.14	Minister's approval required for State significant infrastructure	Section 6.1.1
Section 5.15	Application for approval of State significant infrastructure	This EIS
Section 5.16	Environmental assessment requirements for approval	Appendix A
Section 5.17	Environmental assessment and public consultation	This EIS
Section 5.28(5)	*A condition of the approval of State significant infrastructure under this Division may require any one or more of the following—* *a. a) the surrender under this section of any other approval under this Division (or under Part 3A) relating to the infrastructure or the land concerned,* *b. b) the surrender under section 4.63 of any development consent relating to the infrastructure or the land concerned,*	Section 6.1.1
Section 4.6.3(3)	*If a development consent is to be surrendered as a condition of a new development consent and the development to be authorised by that new development consent includes the continuation of any of the development authorised by the consent to be surrendered:* *a) the consent authority is not required to re-assess the likely impact of the continued development to the extent that it could have been carried out but for the surrender of the consent, and* *b) the consent authority is not required to re-determine whether to authorise that continued development under the new development consent (or the manner in which it is to be carried out), and* *c) the consent authority may modify the manner in which that continued development is to be carried out for the purpose of the consolidation of the development consents applying to the land concerned.*	Section 6.1.1
EP&A Regulation		
Part 3 of Schedule 2 Clause 6	***Form of an environmental impact statement*** *An environmental impact statement must contain the following information:*	
(a)	*The name, address and professional qualifications of the person by whom the statement is prepared,*	Declaration
(b)	*The name and address of the responsible person,*	Declaration
(c)	*The address of the land:* *In respect of which the development application is to be made, or* *On which the activity or infrastructure to which the statement relates is to be carried out,*	Section 2.2.5
(d)	*A description of the development, activity or infrastructure to which the statement relates,*	Section 5
(e)	*An assessment by the person by whom the statement is prepared of the environmental impact of the development, activity or infrastructure to which the statement relates, dealing with the matters referred to in this Schedule,*	Declaration

Statutory reference	Consideration	Section of EIS
(f)	*A declaration by the person whom the statement is prepared to the effect that:* *The statement has been prepared in accordance with this Schedule, and* *The statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure to which the statement relates, and* *That the information contained in the statement is neither false nor misleading.*	Declaration
Part 3 of Schedule 2 Clause 7	*Content of an environmental impact statement* *An environmental impact statement must also include each of the following:*	
1(a)	*A summary of the environmental impact statement,*	Executive Summary
1(b)	*A statement of the objectives of the development, activity or infrastructure,*	Section 1.2
1(c)	*An analysis of the feasible alternatives to the carrying out of the development, activity or infrastructure, having regard to its objectives, including the consequences of not carrying out the development, activity or infrastructure,*	Section 4
1(d)	*An analysis of the development, activity or infrastructure, including:*	
1(d)(i)	*A full description of the development, activity or infrastructure, and*	Section 5
1(d)(ii)	*A general description of the environment likely to be affected by the development, activity or infrastructure, together with a detailed description of those aspects of the environment that are likely to be significantly affected, and*	Section 5, 8 and 9
1(d)(iii)	*The likely impact on the environment of the development, activity or infrastructure, and*	Section 8 and 9
1(d)(iv)	*A full description of the measures proposed to mitigate any adverse effects of the development, activity or infrastructure on the environment, and*	Section 8 and 9
1(d)(v)	*A list of any approvals that must be obtained under any other Act or law before the development, activity or infrastructure may lawfully be carried out,*	Section 6
1(e)	*A compilation (in a single section of the environmental impact statement) of the measures referred to in item (d) (iv),*	Appendix D
1(f)	*The reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development set out in subclause (4).*	Section 11
(2)	*Subclause (1) is subject to the environmental assessment requirements that relate to the environmental impact statement.*	Appendix A
(3)	Not applicable	
(4)	*The principles of ecologically sustainable development*	Section 11.1.3
Relevant considerations under EPIs		
SRD SEPP	Division 4.36 of the EP&A Act enables an EPI to declare a development to be SSD. The project has been declared CSSI and is listed in Schedule 5.	Section 6.1.2
Three ports SEPP	While the project is permissible with consent under the provisions of the Three Ports SEPP, it has also has been declared CSSI and will therefore be assessed under Division 5.2 of the EP&A Act and can be undertaken without consent under Part 4 of the EP&A Act.	Section 6.1.2
SEPP 33	A Preliminary Hazard Analysis (PHA) has been undertaken in accordance with SEPP 33	Section 8.3
Coastal Management SEPP	The project is located partially within the coastal use and coastal environment area mapped under the Coastal Management SEPP. While the CSSI declaration overrides the need for consent under the Coastal Management SEPP, consideration as been given to the requirements of the SEPP.	Section 6.1.2

Statutory reference	**Consideration**	**Section of EIS**
SEPP 55	The project represents a continuation of the existing industrial land use and the management of any contaminated land and the suitability of the site for the project is considered in this EIS.	Section 9.1
Consideration under other NSW legislation		
POEO Act	PKSW, is operated under EPL 6092, which applies to a range of scheduled activities carried out at the site. It is expected that this license will be varied to incorporate any new or discontinued scheduled activities associated with the project. Section 5.24 of the EP&A Act provides that an EPL cannot be refused if it is necessary for carrying out an approved CSSI project and is consistent with the development consent.	Section 6.2.1
BC Act	The project will be unlikely to have a significant impact on any threatened species, populations or ecological communities listed under the BC Act, therefore the requirement for a BDAR has been waived.	Section 6.2.1
NPW Act	Under section 5.23 of the EP&A Act, an AHIP under Section 90 of the NPW Act is not required for approved CSSI. The project will be restricted to a highly disturbed industrial site of the existing PKSW and would not impact on Aboriginal heritage.	Section 6.2.1 and 9.3
Heritage Act	The project is not expected to impact upon any identified heritage item or relic. Under section 5.23 of the EP&A Act, approval under Section 59 or Section 139 is not required for approved CSSI.	Section 6.2.1 and 9.4
CLM Act	The PKSW site is listed as a contaminated site by the EPA. The site has had four notices issued to it, the last being in March 2018, which was a notification to cease the Voluntary Management Plan for the site on the basis that regulation of the site under the Contaminated Land Management Act 1997 (CLM Act) is no longer warranted.	Section 6.2.1
Consideration under Commonwealth legislation		
EPBC Act	No impacts to MNES have been identified that are considered likely to be significant and consequently a referral to DAWE under the EPBC Act has not been made.	Section 6.2.1
Native Title Act	Under the Native Title Act, the valid grant of a freehold estate on or before 23 December 1996 is known as a 'previous exclusive possession act'. This means that native title has been extinguished over the area and native title claimants can not include this land in their applications. The project is located on freehold land and therefore native title does not exist within the project site.	Section 6.2.1

Appendix C

Stakeholder engagement table

Table D1 Stakeholder engagement

Stakeholder	Engagement activity	Issues raised	Response/ where addressed in EIS
BlueScope's Community Consultative Committee (CCC)	Quarterly meeting updates	Supportive of the project and appreciative of the regular updates at each meeting.	Quarterly meeting updates to continue
Investors, Shareholders and Analysts	Full Year Results Briefings and AGM	Timing and capital spend. Opportunity for climate action to be built in.	Regular updates to be provided at Half-Year and Full-Year Results roadshows and AGM.
Wollongong City Council	Briefing for Mayor, GM, Executives and Councillors	Environmental – climate change action Surplus land and property – plans to unlock employment lands	Factor in more environmental improvements if 6BF Reline base case + commitment to climate change action Surplus land and property - Property Master Planning commissioned
National and Local Media	Various media events	Interested in BlueScope's Climate Action Report and MOUs with Shell and Rio Tinto regarding decarbonisation and new pilot projects	Continue to provide regular media stories on updates with regards 6BF and the future of steelmaking at Port Kembla
General Public	Virtual Town Hall	Mainly climate change related	Over 1 hour of Q&A addressed concerns and reassured commitment to action on Climate change.
Illawarra Local Aboriginal Land Council (ILALC)	Briefing	Environmental and climate change. Surplus land and Property. Opportunities to partner.	
Illawarra Aboriginal Corporation (IAC)	Briefings	Interested in employment and supply opportunities for the indigenous community as well as exploring property-related opportunities.	Follow up workshops conducted with Colony Six (BlueScope's Land Transformation Master planning consultants) to explore opportunities.
Regional Development Australia (RDA) Illawarra	CEO and Board briefing	Supportive of economic benefits and opportunities for the region	Regular updates.
Local Businesses	Business Illawarra (Illawarra First) panel discussion	Businesses supportive of economic benefits and opportunities to participate where possible	Ongoing updates through Business Illawarra existing forums
Contractors and suppliers	i3net Supplier Town Hall Breakfast presentation	Opportunity to maximise procurement from local suppliers	Ongoing information sessions to help connect local contractors and suppliers to the project team
University of Wollongong	Vice Chancellor and Executive Team briefing	Opportunity to partner on researching new technology. Also follow workshop up re: opportunities on BSL land transformation.	Agreed on ongoing dialogue. BlueScope backed UoW submission for R&D funding re: new technology
Environmental Groups	Concerned residents of the Illawarra	Climate action was the focus. Requested to hold over any decisions on 6BF until 2022 and extend community consultation period.	Ongoing engagement agreed. Community consultation extended into 2022 and decision to move to Feasibility for 6BF reline project delayed until Feb 2022.

Stakeholder	Engagement activity	Issues raised	Response/ where addressed in EIS
Port Kembla Pollution Group	BlueScope CCC	No major issues raised. Very interested in Shell and Rio Tinto MOU announcements re: Hydrogen and pilot ‘Green Steel’ plant	Continued updates at quarterly meetings
Recharge Illawarra	Regular Committee Meetings	How can Recharge Illawarra attract more Government funding to coordinate the new Hydrogen industry in Port Kembla	Ongoing discussions
NSW Ports	Briefing	As neighbours, Interested in the Port Kembla property precinct.	Agreed on ongoing discussions to ensure alignment on property-related opportunities
Local Industry	Inside Industry Board and Executive Quarterly Briefings	Industry very supportive of securing the future of steel and helping with the transition to decarbonisation.	Ongoing updates at quarterly meetings
EPA	CCC and Regular Briefings	Request to utilise best available proven Environmental improvement technology on 6BF where it makes commercial sense	Project team have researched best available environmental technology and recommended several inclusions into 6BF Reline base case.
Utility suppliers	Correspondence and briefings	No real concerns. Interested in opportunities around a Clean Manufacturing Precinct at Port Kembla and what that means for them.	Ongoing updates. Opportunities to partner in Clean Manufacturing Precinct
NSW Government	Briefings and site visits	How can they support researching and expediting new technology for decarbonisation	Ongoing updates requested
NSW Opposition	Briefings and site visits	How can they support the future of manufacturing	Ongoing updates requested
BlueScope Employees	Quarterly Briefings with Chief Executive	No concerns. Interested in decarbonisation roadmap.	Ongoing updates through existing channels (email and Workplace – Facebook for organisations)
Federal Government	Briefings and site visits with Ministers and bureaucrats	Policy changes to support steelmaking in Australia	Continue regular briefings

Appendix D

Proposed mitigation measures

Table E1 Consolidated list of management measures for 6BF reline project

Impact	ID	Measure	Timing
Air quality			
Dust control	AQ1	A dust management plan for use during construction activities will be prepared prior to works commencing.	Pre- Construction
Dust control	AQ2	Existing ambient air quality stations will be used to monitor dust generating construction activities.	Construction
Dust control	AQ3	During demolition of any contaminated areas, extra measures will be implemented to prevent dust leaving the work area.	Construction
Dust control	AQ4	Dust generating activities will be ceased or reduced if a visual plume of dust leaves the site or monitoring shows excessive particulate levels.	Construction
Dust control	AQ5	Blasting or heavy demolition which may lead to excessive dust will only be undertaken in conditions not likely to disperse dust towards sensitive receptors.	Construction
Dust control	AQ6	Operations conducted in areas with low moisture content material will be suspended during high speed wind events or water sprays will be used.	Construction
Dust control	AQ7	Stockpile sizes will be kept to a minimum, where practical.	Construction
Dust control	AQ8	Limit cleared areas of land and stockpiles, and clear only when necessary to reduce fugitive dust emissions.	Construction
Dust control	AQ9	Control on-site traffic by following specific routes for haulage and access in accordance with signposted speeds.	Construction
Dust control	AQ10	All trucks hauling material will be covered on the way to the site and should maintain a reasonable amount of vertical space between the top of the load and top of the trailer.	Construction
Additional emission controls	A11	BlueScope intends to provide the following additional process and emission controls as part of the project: – Cast house floor fugitives - manipulator and trough covers, extraction from main trough, extraction at taphole with primary and secondary hood (5BF only has a primary hood so this is an improvement), lowered tilting platforms during casting (also an improvement on 5BF). – Iron Kish - extraction at iron ladles and slag tilting spouts, both the iron ladles and Slag Pots will have level sensors to ensure they are filled in a controlled manner. – Slag Handling - Coldwater slag granulation with condensing stack - BAT and improvement on 5BF. Slag pits - air cooling for up to 24 hours before applying water to minimise H_2S generation during watering. – Dust catcher - A lock-hopper will be installed at the base of the dust catcher and will minimise BFG and dust emissions to the atmosphere. – Dust suppression - Sealed roads, street sweepers and truck wheel washes from stock house and slag handling areas.	Construction
Commissioning phase impacts	AQ12	If there is potential for local residents to experience impacts, they will be notified about the proposed commissioning timetable and provide advice on what they can expect regarding emissions including smoke.	Operation
Commissioning phase impacts	AQ13	Where practicable, any commissioning activities that may lead to excessive emissions or visible smoke (excluding blow-in) will be timed as much as possible to occur when winds are not blowing towards residential areas.	Operation

Impact	ID	Measure	Timing
Operational Air Quality Management	AQ14	– BlueScope will develop and implement an Air Quality Management Plan prior to commencement of operations including: – Identify all major sources of air emissions and associated proactive and reactive mitigation measures to ensure air pollution is prevented or minimised – Describe protocols for regular maintenance of plant and equipment – Outline procedures for monitoring and reporting air emissions – Describe measures to regularly review the effectiveness of air pollution control measures.	Operation
Operational Air Quality Management	AQ15	Conduct ongoing emission sampling in accordance with conditions of approval and EPL 6092.	Operation
Noise and vibration			
Construction Noise and Vibration Management Plan	NV1	A construction noise and vibration management plan (CNVMP) will be developed once a detailed construction methodology has been prepared. The plan will include: – details of the construction methodology – updated noise predictions at sensitive receivers based on finalised construction methodology – a noise monitoring procedure and program for the duration of works in accordance with the construction noise and vibration management plan and any approval or licence conditions. Monitoring reports will be prepared in accordance with the requirements of the noise monitoring procedures. – feasible and reasonable mitigation measures to be implemented to mitigated predicted impacts to sensitive receivers that may be noise affected – a community consultation plan to liaise with the noise affected receivers, including: • Notification to residences a minimum of 7 calendar days prior to the start of high noise generating works, including information such as total building time, what works are expected to be noisy, their duration, what is being done to minimise noise and when respite periods will occur. • A procedure for complaints, including maintaining a complaints register on site.	Pre-construction
Site induction	NV2	All employees, contractors and subcontractors are to receive an environmental induction. The site induction must at least include: – All project specific and relevant standard noise and vibration mitigation measures. – Relevant licence and approval conditions. – Permissible hours of work – Any limitations on high noise generating activities – Location of nearest sensitive receivers – Construction employee parking areas – Designated loading/unloading areas and procedures – Site opening/closing times (including deliveries) – Environmental incident procedures.	Pre-construction Construction
At source mitigation measures – pre - construction	NV3	Quieter and less vibration emitting construction methods will be used where feasible and reasonable.	Pre-construction

Impact	ID	Measure	Timing
At source mitigation measures – pre - construction	NV4	The noise levels of plant and equipment will have an operating sound power lower or similar to the levels presented in Table 8.18 and Table 8.19.	Pre-construction
At source mitigation measures – pre - construction	NV5	The size of the vibratory compactor will be limited to 18 tonnes or less to maintain the safe work buffer distances.	Pre-construction
At source mitigation measures - construction	NV6	Where practical noise generating activities with potential to impact any nearby receivers would be scheduled during standard hours.	Construction
At source mitigation measures - construction	NV7	As much distance as possible will be placed between the plant or equipment and residences and other sensitive land uses.	Construction
At source mitigation measures – construction	NV8	Equipment with directional noise characteristics will be oriented away from noise sensitive receivers.	Construction
At source mitigation measures – construction	NV9	Where additional activities or plant may only result in a marginal noise increase and speed up works, the duration of impact will be limited by concentrating noisy activities at one location and moving to another as quickly as possible.	Construction
At source mitigation measures – construction	NV10	Only the necessary size and power of equipment will be used.	Construction
At source mitigation measures – construction	NV11	Loading and unloading of materials/deliveries will occur as far as practically possible from sensitive receivers.	Construction
At source mitigation measures - construction	NV12	The use of engine compression brakes will be limited in proximity to residences.	Construction
At source mitigation measures - construction	NV13	Equipment will not be operated until it is maintained or repaired, where maintenance or repair would address the annoying character of noise identified.	Construction
At source mitigation measures – road noise	NV14	Construction traffic travelling along Emily Road: need to ensure that traffic remains below the speed limit of 40 km/hr.	Construction
Rock breaking	NV15	– All rock-breaking and pile driving activities to be confined between the hours: daytime hours of 7:00 am to 6:00 pm from Monday to Friday and 8:00 am to 1:00 pm on Saturday, with the exception of the following activities: – The delivery of oversized plant or structures – Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm Removal of the salamander and staves from inside the furnace will likely be carried out 24 hours a day to minimise the hire time and maximise the utilisation of the specialised wreck out equipment sourced from overseas.	Construction

Impact	ID	Measure	Timing
Out of hours work	NV16	Out of hours movements will be minimised where possible. The need for out of hours work will be justified in the CEMP from the project and assessed against the noise requirements of the ICNG.	Construction
	NV17	Approval in writing from the EPA will be sought for construction activities outside of the standard hours of construction per EPL 6092 requirements.	Construction
Noise validation	NV18	All conclusions from the operational noise assessment are based on a combination of similar noise sources from 5BF, alongside additional noise measurements where required. To check that noise model predictions are representative of 6BF operational noise emissions at sensitive receivers, noise validation measurements will be undertaken at an intermediate location in the path between source equipment and Cringila receivers. Refer to section 8.2 in Appendix F.	Operation
In transmission path mitigation measures	NV19	Temporary site buildings and materials stockpiles will be used as noise barriers.	Construction
Operational noise management plan	NV20	An operational noise management plan to be developed to minimise the risk of adverse noise impacts during the operation.	Operation
Hazard and risk			
Explosives	HR1	Explosives will be stored in a non-ferrous receptacle clearly marked ‘Explosives’ that is kept closed and locked (except during use by authorised personnel) and stored in the original containers which are securely sealed. The storage area will be a well-ventilated magazine licenced for Class 1.1 explosives, which protects the explosives from the weather, contamination, sources of ignition and access from unauthorised individuals. Storage will be isolated from other dangerous good stores and the area free of debris, waste and combustibles. The explosives containers will be protected against physical damage and regularly checked for spills and leaks.	Construction
Explosives	HR2	Explosive storage magazines will comply with the requirements of AS 2187.1 *Explosives – Storage, transport and use – Storage*.	Construction
Explosives	HR3	Where more than 2.5 kg of Class 1.1 explosives are stored onsite, every perimeter entrance to the site must be labelled with a ‘Hazchem’ placard in accordance with the Explosives Regulation 2013. Adequate security will be provided for the explosives storage area, and only those who are authorised for unsupervised access to the area will have means to unlock the explosive storage magazine.	Construction
Explosives	HR4	There will be no smoking, naked light, heat or ignition source present at the explosives storage area.	Construction
Explosives	HR5	The explosives stock will be rotated to prevent ageing (use on first in-first out basis).	Construction
Explosives	HR6	Explosives will be stored at least 90 metres from the site boundary.	Construction
Fire or explosion from gas leak.	HR7	An inspection and maintenance regime for the gas reducing station and the blast furnace gas pipework and associated fittings will be implemented to prevent leaks.	Construction Operation
Fire or explosion from gas leak.	HR8	The site gas reticulation line will be suspended from the wall or roof above and away from the reach of any mobile equipment.	Detailed design Construction
Fire or explosion from gas leak.	HR9	Barriers will be erected around the gas pipe in key areas.	Construction Operation

Impact	ID	Measure	Timing
Molten metal-water explosion	HR10	Any water use will be separated from the blast furnace area where possible. Any use of water within proximity to the blast furnace area will be tightly controlled to prevent mixing of water with molten metal.	Operation
Molten metal-water explosion	HR11	Furnace will be designed to avoid inadvertent water leakage into the furnace and casting areas.	Detailed design Construction
Toxic gas release	HR12	An inspection and maintenance regime for the BFG system will be implemented to prevent leaks.	Construction Operation
Dangerous goods and chemical spills	HR13	All chemicals and DGs will have appropriate labelling, be separated where necessary, contained within a bund and be disposed of in accordance with Australian Standards.	Construction Operation
Dangerous goods and chemical spills	HR14	A copy of the Safety Data Sheet (SDS) for all chemicals present on site will be made readily accessible to emergency services.	Construction Operation
Dangerous goods and chemical spills	HR15	Appropriate safe work procedures will be implemented for safe handling of all chemicals and dangerous goods, including transfer, storage, spill prevention and clean up requirements.	Construction Operation
Water and hydrology			
Surface Water General	WQ1	To manage impacts to water quality during the construction phase, it is recommended that the CEMP include a site specific SWMP outlining site management requirements, specific controls, environmental inspection requirements, roles and responsibilities, health and safety, incident management and emergency response including arrangements for managing wet weather events. The SWMP will include an Erosion and Sediment Control Plan (ESCP) which will be prepared in accordance with the *Blue Book -Managing Urban Stormwater: Soils and Construction* (4th edition, Landcom, 2004).	Pre-construction
Surface Water General	WQ2	A commissioning Water Quality Management Plan (WQMP) will be developed following investigations during detailed design to assess the likely composition of initial flushing water, the potential for foaming, the characteristics of the start-up blowdown water and commissioning of the granulator. Where required monitoring programs and corrective measures will be developed to ensure that discharges to groundwater, No.2 Blower Station Drain and Allans Creek are in accordance with EPL 6092. The commissioning WQMP may be a standalone document or may form part of the SWMP.	Pre-construction
Surface Water General	WQ3	The only direct discharge to 2BS drain will be from the effluent treatment system. All other discharges will be directed to Ironmaking East Drain (IMED), a secondary containment basin, which will then be pumped to 2BS.	Operation
Process Water / Stormwater	WQ4	The slag handling area will include: – Hardstand surfaces graded to internal drains in the area so surface water will flow into either the new slag pit settling pond or the granulator settling pond – Collected water from the water sprays in the area will be recycled as make up water to the granulator or as slag pit sprays In a rain event the first flush will be collected in the new slag pit settling pond, which will flow into the plant stormwater drain before draining to IMED and subsequently being pumped to 2BS for release to Allans Creek.	Operation
Process Water / Stormwater	WQ5	The effluent treatment system will be above ground and bunded underneath to capture any flows. Any spillage will be captured and directed to the effluent treatment system. Additional paving between the effluent treatment system and the road on the east side of the plant will cover the unsealed area.	Operation

Impact	ID	Measure	Timing
Process Water / Stormwater	WQ6	COG and BFG condensate will be managed with the controls that have previously been identified as part of PRP181-Seal Pot Risk Assessment. ‘No-blow’ seal pots will be installed for BFG seal pots which will improve the risk of gas condensate overflows, collection tanks will be bunded and level detection with alarming installed to avoid over fill events.	Operation
Process Water / Stormwater	WQ7	The effluent treatment system will discharge cleaned and treated water to 2BS, however if the water quality is variable, this will be directed to contingency storage for further treatment and reassessment.	Operation
Process Water / Stormwater	WQ8	All process wastewater within the 6BF area will be either captured or treated and then discharged as per below: – Blowdown water from the effluent treatment system is discharged to 2BS drain following the treatment process – Contingency storage for all discharges will be used when water quality is variable – Collection of blast furnace gas seal pot water and return to the effluent treatment system – Collection of COG seal pot water with pick up by truck – Seal pot tanks will have bunds installed and level detection with alarming on collection tanks to avoid over fill events Online treatment for cyanide is currently under investigation at 5BF. Outcomes and Learnings will be applied to 6BF.	Operation
Process Water / Stormwater	WQ9	In high rainfall events water in the IMED may overflow the weir into Port Kembla Harbour at licensed discharge point 89.	Operation
Process Water / Stormwater	WQ10	Surface and groundwater monitoring will be undertaken in accordance with EPL conditions and the outcomes of any Pollution Reduction Plans requirements.	Operation
Process Water / Stormwater	WQ11	Spill management will involve: – EPA compliant bunding of all hazardous chemicals – Spill kits readily available – High risk process areas sealed – All runoff, including spills, from the gas cleaning and effluent treatment plants will be collected and returned to the water treatment plant during normal operation – Spill containment and additional paving between effluent treatment system and road on the east side of the plant – No-blow seal pots installed on blast furnace gas mains reducing the chance of make-up water being left on for extended periods of time – Level detection and alarming on gas condensate collection tanks – Seal pot tanks will have bunds installed and level detection with alarming on collection tanks to avoid over fill events Above ground effluent treatment system clarifier with bunding underneath to capture any overflows.	Construction and Operation
Decommissioning	WQ12	A rundown and decommissioning strategy (or similar) will be developed prior to decommissioning, in consultation with the EPA. The strategy will describe the water dosage and treatment processes during the rundown phase and management measures that will be implemented during decommissioning to ensure that water quality in the No.2 Blower Station drain meets EPL conditions throughout the rundown process.	Pre-Decommissioning

Impact	ID	Measure	Timing
Traffic			
Construction Traffic Management Plan	TT1	A Construction Traffic Management Plan (CTMP) will need to be prepared prior to the commencement of works. The CTMP will provided measures to: – Minimise the impact of the construction vehicle traffic on the overall operation of the road network. – Provide continuous, safe, and efficient movement of traffic for both the general public and construction workers. – Details regarding installation of appropriate advance warning signs to inform users of the changed traffic condition. – A description of the construction vehicles and the volume of these construction vehicles accessing the construction site. – Include information regarding the changed access arrangement and a description of the proposed external routes for vehicles, including the construction vehicles, accessing the site. – Establishment of a safe pedestrian environment in the vicinity of the site. – All staff and subcontractors engaged on site should be required to undergo site induction. The induction will outline the requirements on the CTMP, including site access routes, environmental and occupational health and safety responsibilities, emergency procedures, potential carpooling opportunities and vehicle height restriction under the power lines, among others. Additionally, the Site Manager will discuss CTMP requirements regularly as a part of “toolbox talks”.	Pre-construction
Traffic management measures	TT2	Key stakeholders, including owners/operators of adjacent lands and emergency service providers, will be notified of any changes to the traffic management arrangements prior to the commencement of works.	Pre-construction
Traffic management measures	TT3	The construction site access will be reviewed during design development to consider the turn path required for the construction vehicles.	Pre-construction
Traffic management measures	TT4	Construction works should occur within the standard hours defined by the Interim Construction Noise Guideline (DECC, 2009) where practical. As discussed in section 5.12, some works may occur outside of these hours.	Construction
Traffic management measures	TT5	Truck drivers will be directed to follow the predetermined haulage routes	Construction
Traffic management measures	TT6	Workers required to undertake works or traffic control will be suitably trained and hold the required accreditation to carry out works on site and will also be site inducted	Construction
Traffic management measures	TT7	Protection will be provided to workers and road users through advanced warning of roadworks, speed changes, safety barriers with adequate offsets and deflection allowance, where necessary	Construction
Traffic management measures	TT8	Site access should be restricted to authorised personnel only and existing employees on site. Pedestrian access to and around the site will be maintained at all times.	Construction

Impact	ID	Measure	Timing
Traffic management measures	TT9	– Roadwork speed zones must be logical, credible, and enforceable. They should only be used where they are self-enforcing or will be enforced. – Roadwork speed zones will be used with traffic control signs and devices and should not be used in place of more effective traffic controls. They will be used only while road works are in progress or the lower speed road conditions exist.	Construction
Traffic management measures	TT10	A Transport Access Guide (TAG) should be prepared to identify alternate travel options for visitors and staff to encourage sustainable transport and reduce parking demand. The TAG summarises alternate transport options to access the development, outlining where and how these services can be accessed and the frequency of the service. This could include but is not limited to: – Public transport locations (bus and train connection). – Active transport (cycle / walking) opportunities. – Bicycle infrastructure facilities. – Carpooling between workers (subject to COVID-19 safe practices).	Construction
Traffic management measures	TT11	The following environmental requirements should be adhered to: – All vehicles transporting loose materials will have the entire load covered and/or secured to prevent any large items, excess dust or debris depositing onto the roadway during travel to and from the site, including but not limited to construction rumble strips/wheels wash at the site egress location. – The lead contractors will monitor the roads leading to and from the site and take all necessary steps to rectify any road deposits caused by site vehicles, to maintain the safety of all road users. – Vehicles operating to, from and within the site shall do so in a manner, which does not create unreasonable or unnecessary noise or vibration. – Public roads and access points will not be obstructed by any materials, vehicles, refuse skips or the like, under any circumstances.	Construction

Impact	ID	Measure	Timing
Soils, geology and groundwater			
Erosion and sedimentation	S1	Prior to construction commencing, a site specific Soil and Water Management Plan (SWMP) will be prepared. The plan will include arrangements for managing wet weather events, specific controls and environmental inspection requirements. The SWMP will include an Erosion and Sediment Control Plan (ESCP) which will be prepared in accordance with the Blue Book -Managing Urban Stormwater: Soils and Construction (4th edition , Landcom, 2004) and Volume 2 (DECC, 2008a).	Pre-construction
Erosion and sedimentation	S2	The ESCP will detail the erosion controls used for the project and where they will be established. The ESCP will include soil specific measures to: – Prevent sediment moving off-site and sediment laden water entering any watercourse, drainage lines, or drain inlets – Prevent mixing of soils – Ensure soils are replaced in their pre-existing configuration during rehabilitation – Reduce water velocity overland and capture sediment on site – Minimise the amount of material transported from site to surrounding pavement surfaces – Divert clean water around the site – Install measures and site entry and exit points to minimise movement of material onto public roads.	Pre-construction
Erosion and sedimentation	S3	Erosion and sediment controls will be established prior to works commencing on site.	Pre-construction
Erosion and sedimentation	S4	Erosion and sediment controls will be inspected on a regular basis and replaced when their function is compromised.	Construction
Erosion and sedimentation	S5	Erosion and sediment controls will be inspected promptly after rainfall events.	Construction
Erosion and sedimentation	S6	If excavations are required during demolition works, soil generated will be reused where applicable. Excess spoil not required or able to be reused onsite will be disposed of appropriately as per the EPA’s Waste Classification Guidelines (2014).	Construction
Erosion and sedimentation	S7	Vehicles will be restricted to existing access routes where practical.	Construction
Erosion and sedimentation	S8	Disturbed areas will be returned to pre-existing condition following the completion of construction.	Post-construction
Contamination	C1	An incident emergency spill plan will be detailed in the CEMP	Pre-construction
Contamination	C2	Spill response kits will be provided on site and be located in a clearly defined location.	Construction
Contamination	C3	Plant and machinery will be inspected regularly to ensure that they are in sound working order	Construction

Impact	ID	Measure	Timing
Contamination	C4	If soils that appear to be contaminated are exposed during construction of the project, works will cease in the area until further investigation can be undertaken. The following factors are indications of potential contamination on site: – Stained or discoloured fill – Hydrocarbon or chemical odour – Construction wastes such as concrete, bricks, timber, tiles, fibre cement sheeting, fragments and pipes – Imported material such as ash, slag or coal chitter. – Contaminated soils requiring disposal will be classified under the Waste Classification Guidelines (EPA,2014) prior to disposal.	Construction
Contamination	C5	All chemical/fuel storage and loading areas will be bunded or otherwise contained.	Construction, Operation
Contamination	C6	All plant personnel that may encounter chemicals/fuels will be trained in required handling procedures.	Construction, Operation
Biodiversity			
General biodiversity	B1	The following measures will be implemented to manage general biodiversity impacts: – Measures proposed in the SWMP will be implemented to ensure appropriate sediment control measures are put in place to ensure run-off during construction does not result in indirect impacts to surrounding habitats – Construction machinery will be cleaned prior to entering and leaving site to ensure weed propagules are not transported – No native flora will be cleared during the establishment of laydown areas – Laydown areas will be placed on existing hardstand, and where possible, as far away from drainage lines and places where surface water can pool. – These measures will be implemented in the CEMP and may be revised at any time to manage potential environmental impacts.	Pre-construction Construction
Green and Golden Bell Frog	B2	All measures outlined in Management of Threatened Species, The Green and Golden Bell Frog, Litoria Aurea (BlueScope, 2020) will be implemented during construction of the project.	Construction
Green and Golden Bell Frog	B3	All workers will be trained in the procedures outlined in Management of Threatened Species, The Green and Golden Bell Frog, Litoria Aurea (BlueScope, 2020) and their responsibilities under the BC Act and EPBC Act in the project induction. This will also be discussed periodically during the toolbox talks.	Construction
Green and Golden Bell Frog	B4	If a GGBF is found in the project site or laydown area, work in the vicinity will cease immediately. Work will not recommence until clearance from a qualified ecologist can be provided. Following confirmation of the sighting of GGBF either by a local ecologist or by means of identification using the GGBF Audit / Inspection Checklist, the sighting must be registered with the EPA and NSW BioNet Species sightings via the web or telephone.	Construction
Unexpected species discovery	B5	If other endangered species are discovered on the project site or in laydown areas, work will cease in the vicinity and a qualified ecologist will be employed to assess the discovery. Additional mitigation measures presented by the ecologist will be incorporated into the CEMP. Work in the area will not commence unless clearance is given by the ecologist.	Construction

Impact	ID	Measure	Timing
Aboriginal heritage			
Unexpected Aboriginal heritage finds	AH1	In the event of an unexpected find of potential Aboriginal object/s (or suspected item), work will cease in the area and DPIE notified. Works will not recommence until continuation is authorised by DPIE.	Construction
Historic heritage			
Unexpected finds	HH1	In the unlikely event that unexpected historical (non-Aboriginal) archaeological remains are discovered during works they will be managed with reference to the standard protocols and procedures of Section 146 of the *Heritage Act 1977*.	Construction
Visual amenity			
Visual amenity – construction works	LV1	Temporary boarding, barriers, traffic management and signage will be removed when no longer required.	Construction
Visual amenity – construction works	LV2	Roads providing access to the site and work areas will be maintained free of dust and mud as far as reasonably practicable.	Construction
Visual amenity – construction works	LV3	Materials and machinery will be stored neatly during construction works.	Construction
Visual amenity – construction works	LV4	Temporary lighting required during the construction period will be sited and designed to avoid light spill into the surrounding area.	Construction
Visual amenity – construction works	LV5	Existing site features will be utilised as screening when positioning plant where practical.	Construction
Land use and property			
Land use	LU1	Management and mitigation strategies presented in the following sections will be implemented during construction of the project: – Air quality (Section 8.1.5) – Noise and vibration (Section 8.2.6) – Traffic (Section 8.5.5) – Visual amenity (Section 9.5.3) – Waste management (Section 9.9.3)	Pre-construction Construction Operation
Land use	LU2	BlueScope will coordinate project activities to minimise the impact to land use and services within the PKSW site.	Construction

Impact	ID	Measure	Timing
Social and economic			
Investment and employment	SE1	A contracting and procurement strategy focusing on maximising local content will be prepared to support local employment and business opportunities during construction. During operation, the project should seek to work with interested local parties to fulfil workforce requirements.	Construction, operation
Investment and employment	SE2	BlueScope will continue to invest into the local community through the continuation of the BlueScopeWIN Community Partners Program.	Construction, operation
Community engagement	SE3	The project will include a comprehensive, multi-stakeholder engagement program to inform decisions regarding the project.	Construction
Community engagement	SE4	A Community Consultative Committee (CCC) will continue to be operated by BlueScope for the PKSW	Construction
Community engagement	SE5	BlueScope will provide a contact number and email address for the community to make comments on throughout the project.	Construction
Amenity	SE6	Ensure that measures discussed in other sections that reduce environmental impacts are implemented effectively for the duration of the project.	Construction, operation
Greenhouse gas and energy			
Construction GHG emissions	GHG1	All plant and equipment used during the construction works shall be regularly maintained to comply with the relevant exhaust emission guidelines	Construction
Construction GHG emissions	GHG2	Sustainable procurement practices will be adopted where feasible	Construction
Construction GHG emissions	GHG3	Where reasonable and feasible, measures to be implemented by contractors may include, but not be limited to: – Construction materials sourced locally where possible – Construction materials that have minimal embodied energy be selected – Use of PVC plastic minimised – Construction materials that are low maintenance and durable – Plant and equipment will be switched off when not in constant use and not left idling – Plant and equipment brought onsite will be regularly serviced and energy efficient vehicles or equipment will be selected where available – Any plant and equipment that is not working efficiently (i.e. emitting excessive smoke) will be removed from site and replaced as soon as possible Construction works will be planned to ensure minimal movement of plant and equipment, including barges	Construction
Operational GHG emissions	GHG4	Subject to confirmation of engineering suitability, the following elements will be incorporated into the operation of the project: – Dual lance tuyeres. – Waste gas heat recovery unit installed on 6BF stoves – Top Recovery turbine installed to extract energy from gases vented from the top of the blast furnace.	Detailed design
Operational GHG emissions	GHG5	All operational equipment will be operated and maintained to minimise leaks, accidental venting of gases or other fugitive GHG emissions to the extent practical.	Operation

Impact	ID	Measure	Timing
Operational GHG emissions	GHG6	– Annually report on total PKSW net energy consumption and GHG emissions under the NGERS in accordance with the methodology prescribed by the National Greenhouse and Energy Reporting (Measurement) Determination 2008 (Measurement Determination).	Operation
Operational GHG emissions	GHG7	BlueScope will seek to maximise the use of steel manufacturing co-products to offset carbon intensive material inputs into industrial processes e.g the use of Granulated Blast Furnace Slag as a cementitious replacement for Portland Cement in concrete construction to lower GHG emissions	Operation
Waste management			
Construction waste	WM1	A waste management plan for the project will be prepared prior to construction commencing. The waste management plan will detail: – Statutory requirements for waste in NSW – Systems to sort and track the actual types and quantities of waste generated – Measures for separating waste based on classification of management options including colour coded bins – Options for offsite reuse, reprocessing, recycling and energy recovery	Pre-construction
Construction waste	WM2	Awareness of waste minimisation practices will be included in the project induction.	Construction
Construction waste	WM3	Waste will be classified, managed and disposed of in accordance with the *Waste Classification Guidelines* (EPA, 2014).	Construction
Operational waste	WM4	Operational waste streams will continue to be managed in accordance with EPL 6092.	Operation
Operational waste	WM5	Recycling and resource recovery activities will continue to be managed by a slag service provider.	Operation
Cumulative impacts			
General impact reduction	CI1	The mitigation measures presented in Appendix D will be implemented effectively to reduce the project's impact on the environment.	Pre-construction Construction Operation

Appendix E

Air quality impact assessment

Blast Furnace No. 6 Reline Project

Air Quality Impact Assessment

BlueScope Steel (AIS) Pty Ltd

7 March 2022

→ **The Power of Commitment**

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The Power of Commitment

Executive summary

GHD has conducted an air quality impact assessment to assess the construction, commissioning and operation of the No. 6 Blast Furnace at the Port Kembla Steelworks. The assessment was undertaken in accordance with relevant legislation and government guidance.

A qualitative based approach was adopted to assess the construction and commissioning of the project. The construction assessment identified a low risk of potential air quality impacts as there will be a large separation distance between construction activities and sensitive receptors, and emissions to air during construction are expected to be relatively minor.

The commissioning assessment concluded that there is potential for elevated emission of combustion products including carbon monoxide, carbon dioxide, and particulates to occur for a relatively short period of time during commissioning. As the commissioning procedure aligns with the industry standard approach and adopts best practice methods where possible, emissions during commissioning are considered to be minimised as far as reasonably practicable. Due to the relatively short duration of commissioning and implementation of industry standard and best practice methods, although the potential impact for any elevated emissions to air cannot be quantified, the commissioning process is considered to pose a low risk of potential adverse air quality impacts to surrounding receptors.

The quantitative operational air quality assessment consisted of three parts, an emission limit assessment, an air quality impact assessment and a best practice assessment.

The emission limit assessment identified that all No. 6 Blast Furnace air quality emission sources assessable to the standard of concentration limits will comply with the standard of concentration limits stipulated in the POEO Clean Air Regulation.

The air quality impact assessment used air quality dispersion modelling to predict incremental and cumulative pollutant concentrations from the existing and proposed future operating scenarios. The findings of the dispersion modelling are summarised below:

- Existing scenario (operation of 5BF and PKSW) findings:
  - A minor cumulative exceedance of the 24 hour PM_{10} criteria was predicted for one 24 hour period in the modelled year at R05. This exceedance was primarily attributed to elevated background concentrations which accounted for 93% of the criteria while existing scenario incremental concentrations accounted for 7% of the criteria.
  - Compliance was predicted for 1 hour and annual NO_2 concentrations against both EPA and NEPM assessment criterions at sensitive receptor locations.
  - Compliance was predicted for 1 hour and 24 hour SO_2 concentrations against the EPA assessment criteria at sensitive receptor locations.
  - An incremental exceedance of the 1 hour SO_2 NEPM criteria was predicted at R06 and cumulative exceedances were predicted at R05 and R06. These exceedances of the NEPM criteria require interpretation in the context that the 1 hour SO_2 standard was reduced in a recent revision (May 2021) of the Air NEPM.
  - Exceedance of the 1 second H_2S criteria was predicted at R05 and R06. Compliance was predicted for the 1 hour H_2S criteria at all sensitive receptors.
- Future scenario (operation of 6BF and PKSW) findings:
  - Minor cumulative exceedance of the 24 hour PM_{10} criteria were predicted at R03 and R05 for one day of the year only. These exceedances were primarily attributed to elevated background concentrations which accounted for 91% and 93% of the criteria, while future scenario incremental concentrations accounted for 9% and 7% of the criteria for receptors R03 and R05 respectively. 6BF sources account for approximately 1% and 3%of the maximum cumulative 24 hour PM_{10} contribution at R03 and R05 respectively.
  - Compliance was predicted for 1 hour and annual NO_2 concentrations against both EPA and NEPM assessment criterions at sensitive receptor locations.

- Compliance was predicted for 1 hour and 24 hour SO_2 concentrations against the EPA assessment criteria at sensitive receptor locations.
- An incremental and cumulative exceedance of the 1 hour SO_2 NEPM criteria was predicted at R06. This exceedance of the NEPM criteria requires interpretation in the context that the 1 hour SO_2 standard was reduced in a recent revision (May 2021) of the Air NEPM. These exceedances are attributed mostly to existing sources on the PKSW site and predicted concentrations comply with the existing NSW EPA criteria. 6BF sources account for approximately 21% of the maximum cumulative 1 hour SO_2 contribution at R06.
- An exceedance of the 1 second H_2S criteria was predicted at R06 only. Compliance was predicted for the 1 hour H_2S criteria at all sensitive receptors. The predicted incremental H_2S concentration from 6BF only, shows that it contributes about one third of total H_2S emissions at the receptor locations (contributions range from 28% to 33% depending on receptor). Given that modelled emissions from 6BF are conservative, the project is unlikely to lead to offsite odour impacts and is predicted to reduce odour impacts at the sensitive receptor locations compared to the existing scenario. 6BF sources account for approximately 28% of the maximum 1 second H_2S contribution at R06.

Comparatively, the future scenario was predicted to result in a reduction of all pollutant concentrations (NO_2, SO_2 and H_2S) except for particulate matter, in relation to which a minor increase was predicted due to assumptions in the assessment. The project includes a number of measures anticipated to reduce particulates compared to the existing scenario.

The best practice assessment benchmarked proposed No. 6 Blast Furnace emissions control measures against European Union Best Available Techniques. The best practice assessment concluded that the project conforms with best available techniques and for each BAT requirement offers a beneficial or at least neutral impact compared with existing No. 5 Blast Furnace operations.

From an air quality perspective, the project is generally considered an improvement (reduction in pollutant concentrations) compared with existing operations.

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.3 and the assumptions and qualifications contained throughout the Report.

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Terms and abbreviations

Term/acronym	Definition
$\mu g/m^3$	Micrograms per cubic metre
5BF	No. 5 Blast Furnace
6BF	No. 6 Blast Furnace
AMO	Aeronautical Meteorological Office
AQIA	Air Quality Impact Assessment
AQMS	Air Quality Monitoring Station
Background concentrations	Ambient pollutant concentrations
BFG	Blast Furnace Gas
BlueScope	BlueScope Steel (AIS) Pty Ltd
BoM	Bureau of Meteorology
CALMET	CALMET is a meteorological model which includes a diagnostic wind find generator containing objective analysis and parameterised treatments of slope flows, kinematic terrain effects, terrain blocking effects, a divergence minimisation procedure, and a micro-meteorological model for overland and overwater boundary layers.
CALPUFF	CALPUFF is a non-steady-state Lagrangian Gaussian puff model which contains modules for complex terrain effects, overwater transport, coastal interaction effects, building downwash, wet and dry removal, and simple chemical transformation.
CO	Carbon Monoxide
CO_2	Carbon Dioxide
Cumulative impact	Incremental impact plus background
DPIE	Department of Planning, Industry and Environment
EPA	NSW Environment Protection Authority
GHD	GHD Pty Ltd
H_2S	Hydrogen Sulfide
Incremental impact	Predicted impact from the PKSW site (includes 5BF and PKSW sources for existing scenario and includes 6BF and PKSW sources for future scenario).
NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen - a mixture of nitric oxide and nitrogen dioxide
Pasquill-Gifford	Stability classification used in atmospheric dispersion models to define the turbulent state of the atmosphere
peak-to-mean ratio	A conversion factor that adjusts mean dispersion-model predictions to the peak concentrations perceived by the human nose
PKSW	Port Kembla Steel Works
PM_{10}	Particulate matter with an equivalent aerodynamic diameter of 10 micrometres or less
$PM_{2.5}$	Particulate matter with an equivalent aerodynamic diameter of 2.5 micrometres or less
POEO Act	Protection of the Environment Operations Act 1997
SEARs	Requirements and specifications for an environmental assessment prepared by the Secretary of the Department of Planning, Industry and Environment
Sensitive receptor	A location where people are likely to work or reside; this may include a residential dwelling, school, hospital, office or public recreational area. An odour assessment should also consider the location of known or likely future receptors.
SO_2	Sulphur Dioxide

Term/acronym	Definition
SS projects	State Significant projects
TAPM	TAPM is an air pollution model that predicts three-dimensional meteorology and air pollution concentrations.
TSP	Total Suspended Particulates
UTM	Universal Transverse Mercator coordinate system
WRF	Weather Research and Forecast model is a next-generation mesoscale numerical weather prediction system designed for both atmospheric research and operational forecasting applications

1. Introduction

1.1 Background and project overview

BlueScope Steel (AIS) Pty Ltd (BlueScope) is one of Australia's leading manufacturers and with its parent company, BlueScope Steel Limited, is a global leader in finished and semi-finished steel products. BlueScope's Port Kembla Steelworks (PKSW) operation in NSW includes two blast furnaces. No. 5 Blast Furnace (5BF) is currently operating, while No. 6 Blast Furnace (6BF) is currently in care and maintenance.

5BF is expected to continue to produce (molten) iron on a continuous basis until it reaches the end of its operational life at some stage between 2026 and 2030. BlueScope is proposing a move of iron manufacture from 5BF to 6BF, after 5BF ceases operation.

6BF last produced iron in 2011, at which point it was taken out of service and placed into care and maintenance. To prepare 6BF to become operational again, major maintenance works are required (the project). The project aims to return 6BF to service through a reline process that will be carried out while 5BF continues to operate. 5BF will be decommissioned prior to operation of 6BF commencing such that there will be no concurrent ironmaking from both 5BF and 6BF.

The project enables critical steelmaking operations to continue whilst BlueScope evaluates innovative "green steel" technologies that are starting to be piloted globally but will not be commercialised at scale in time to maintain production once the current campaign of the 5BF concludes. The project has been declared Critical State Significant Infrastructure (CSSI) in accordance with section 5.13 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and Schedule 5 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP).

This air quality impact assessment report has been prepared by GHD Pty Ltd (GHD) as part of the EIS for the project. The EIS has been prepared to support the application for project approval and addresses the environmental assessment requirements of the Secretary's Environmental Assessment Requirements (SEARs) pertaining to air quality.

1.2 Purpose of this report

GHD Pty Ltd (GHD) has been commissioned by BlueScope to prepare an Air Quality Impact Assessment (AQIA). This report will support the preparation of an Environmental Impact Statement (EIS) under the EP&A Act for the project.

This report addresses the relevant criteria in the NSW Secretary's Environmental Assessment Requirements (SEARs) for the project issued in July 2021 (as outlined in Section2.2) and assesses the potential air quality related impacts associated with construction and operation of the project.

The purpose of this report is to document the results of the AQIA which included:

- Review of project information related to sources of emissions to air. This includes construction methodology, operation of the project and emission controls, process drawings and flow and emission rates.
- Definition of the existing environment at the project site, including identification of air quality sensitive receptors, and completing a review of available ambient air quality monitoring data for the previous 5 years.
- Preparation of a site-representative meteorological data set based on review of site-based weather station, and local Bureau of Meteorology data. Meteorological modelling was completed using the Weather Research and Forecast model (WRF) and CALMET models.
- Air dispersion modelling using the CALPUFF model for existing and future scenarios to quantitatively predict the change in ground level pollutant concentrations for comparison against the EPA criteria.
- Conducting a Best Available Techniques Assessment (BAT) for the proposed design and operation of the relined blast furnace and associated infrastructure.

- Discussion of the findings of dispersion modelling and an overview of proposed mitigation measures and controls associated with the project.
- A qualitative construction air quality assessment of potentially emission generating construction activities and providing management measures to minimise potential air quality impacts at sensitive receptors during project construction activities.

1.3 Limitations

The preparation of this AQIA relied on the following assumptions or was limited by the following:

- Project description including details of the construction, commissioning and operation of the project were provided by BlueScope.
- An emissions inventory for the existing and proposed operation of the project was provided by BlueScope.
- Meteorological and dispersion modelling was undertaken in accordance with the methodology outlined in Section 3.3.
- Cumulative impacts with the Port Kembla Gas Terminal project including ship and Floating Storage and Regasification Unit (FSRU) configuration (including fuel type) has been assumed based on best available information however is subject to change. GHD has assumed a moderate worst case of FSRU using gas and a LNG carrier running on marine diesel oil. Some LNG carriers may run on gas which has lower emissions and the FSRU can run on marine diesel oil for up to 72 hours per year only.

This report has been prepared by GHD for BlueScope Steel (AIS) Pty Ltd and may only be used and relied on by BlueScope Steel (AIS) Pty Ltd for the purpose agreed between GHD and BlueScope Steel (AIS) Pty Ltd as set out in Section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than BlueScope Steel (AIS) Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of air emissions) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

GHD has prepared this report on the basis of information provided by BlueScope Steel (AIS) Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2. Legislative and policy context

2.1 Secretary’s Environmental Assessment Requirements

The SEARs relevant to air quality, together with a reference to where they are addressed in this report, are outlined in Table 2.1.

Table 2.1 Air quality SEARs

Requirement	Where address in report
Planning Secretary’s Environmental Assessment Requirements (SEARs) (SSI-22545215)	
Air quality and odour – including:	
– a quantitative assessment of the potential air quality, dust and odour impacts of construction, commissioning and operation, in accordance with relevant Environment Protection Authority guidelines	This report
– cumulative assessment of air quality emissions from operation of the site as a whole and comparison with background data and impact assessment criteria	Section 9
– details of all air quality and odour control equipment, benchmarked against best practice, and monitoring for all discharge points and fugitive emissions	Section 10
– an assessment of the greenhouse gas emissions of the project and any measures to minimise emissions intensity, improve energy efficiency and adopt new technologies to reduce emissions in the medium to long term	Refer GHG chapter of the EIS
– details of proposed mitigation, management and monitoring measures.	Section 11

2.2 Legislative and policy context to the AQIA

The relevant legislation and government guidance for the air quality assessment of the project are:

- NSW *Protection of the Environment Operations Act 1997* (POEO Act)
- NSW Protection of the Environment Operations (Clean Air) Regulation 2021 (POEO Clean Air Regulation)
- National Environment Protection Council (NEPC) National Environment Protection (Ambient Air Quality) Measure 2021 (the Air NEPM)
- Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DEC, 2007)
- Technical framework - Assessment and management of odour from stationary sources in NSW (the Technical Framework), NSW Department of Environment and Conservation (DECC 2006)
- NSW EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (2017) (the Approved Methods)
- Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management (2016) (IAQM guidance)

The POEO Act provides the statutory framework for managing pollution in NSW, including the procedures for issuing licences for environmental protection on aspects such as waste, air, water and noise pollution control. The POEO Act requires that no occupier of any premises causes air pollution (including odour) through a failure to maintain or operate equipment or deal with materials in a proper and efficient manner. For point source emissions where no standard of concentration and/or rate has been set, and for non-point source emissions, the operator must also take all practicable means to minimise and prevent air pollution (sections 124, 125, 126 and 128 of the POEO Act). The POEO Act includes the concept of ‘offensive odour’ (section 129) and states it is an offence for scheduled activities to emit ‘offensive odour’, subject to limited defences.

The POEO Clean Air Regulation provides regulatory measures to control emissions from motor vehicles, fuels, and industry.

The National Environment Protection Council of Environmental Ministers, now the National Environment Protection Council (NEPC), set uniform national standards for ambient air quality in February 2016. The document containing these standards is known as the Air NEPM, which also contains goals for the identified relevant pollutants inclusive of particulates and concentration limits, averaging periods and number of allowed exceedances for each of the identified pollutants.

The Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DEC, 2007) lists the methods to be used for the sampling and analysis of air pollutants in NSW for statutory purposes. While no emission sampling was conducted as part of this assessment, BlueScope has a responsibility to undertake, where possible, all sampling in accordance with requirements outlined in the Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DEC, 2007). This includes sampling type, duration, location and a number of other requirements.

The Technical Framework provides a legislative context for the control of odour and presents odour assessment criteria guidelines. It provides a framework for different levels of odour assessment, strategies to mitigate odour, and guidance for performance monitoring, regulation and enforcement.

The Approved Methods lists the statutory methods for modelling and assessing emissions of air pollutants from stationary sources in NSW. It considers the above-mentioned legislation and guidance to provide pollutant assessment criteria.

The IAQM guidance provides guidance on the assessment of dust from demolition and construction activities. It provides a qualitative step by step process to assess the risk of dust impacts.

2.3 Emission limits

2.3.1 POEO Clean Air Regulation

The POEO Clean Air Regulation outlines air quality standards of concentration that apply to general and specific activities and plant for both scheduled and non-scheduled premises. Standards of concentration relevant to the project have been reproduced in Table 2.2 and were sourced from the Iron and steel: primary production (Group 6) category. Emissions to air from relevant project operations must comply with these emission limits.

Table 2.2 Relevant standards of concentration

Air impurity	Plant	Standard of concentration (Dry, 273 K, 101.3 kPa)
Iron and steel: primary production (group 6)		
Solid particles (Total)	Any fuel burning equipment Any sinter plant Any kiln Any power-generating plant Any furnace	50 mg/m^3
	Any crushing, grinding, separating or materials handling activity	20 mg/m^3
Nitrogen dioxide (NO_2) or nitric oxide (NO) or both, as NO_2 equivalent	Any fuel burning equipment Any sinter plant Any kiln Any power-generating plant Any furnace	500 mg/m^3

Air impurity	Plant	Standard of concentration (Dry, 273 K, 101.3 kPa)
Hydrogen sulfide (H_2S)	Any fuel burning equipment Any sinter plant Any kiln Any power-generating plant Any furnace Any reduction control system not followed by combustion	5 mg/m^3
Volatile organic compounds (VOCs), as n-propane equivalent	Any activity or plant using a non-standard fuel	40 mg/m^3 VOCs or 125 mg/m^3 CO
Type 1 substances and Type 2 substances (in aggregate)	Any activity or plant	1 mg/m^3
Cadmium (Cd) or mercury (Hg) individually	Any activity or plant	0.2 mg/m^3
Dioxins or furans	Any sinter plant	0.1 ng/m^3
Smoke	Any fuel burning equipment Any sinter plant Any kiln Any power-generating plant Any furnace	Ringelmann 1 or 20% opacity

2.3.2 Environmental Protection Licence conditions

The PKSW site operates under NSW EPA issued Environmental Protection Licence (EPL) number 6092, which establishes conditions and discharge limits that the site must operate in accordance with. The EPL conditions relevant to the project and air quality have been identified below.

Under special condition E1 (Approval for Alternative Standard of Concentration for Hydrogen Sulphide Emissions) of EPL6092, the EPA authorises use of an alternative standard of concentration for H_2S from the processes carried out at the 5BF slag granulators. The limit conditions stipulated in condition E1.2 are reproduced in Table 2.3.

Table 2.3 EPL limit conditions

Discharge Point	Pollutant	Unit of Measure	100% Limit	Averaging Period
Discharge Point 10, No.5 Blast Furnace, No.2 Slag Granulator	H_2S	g/s	1.2	Block average (Minimum of 15 minutes)
Discharge Point 11, No.5 Blast Furnace, No.1 Slag Granulator	H_2S	g/s	1.2	Block average (Minimum of 15 minutes)
Discharge Point 129, No.5 Blast Furnace, No.3 Slag Granulator	H_2S	g/s	1.2	Block average (Minimum of 15 minutes)

As part of the project and proposed future operations of PKSW, H_2S emissions will no longer be released from slag granulator stacks however, some H_2S emissions may be released via the 6BF slag granulation cooling tower. For this assessment, a conservative approach to modelling of the 6BF slag granulation cooling tower emissions was used, applying the current emissions from the 5BF slag granulator stack. This is anticipated to be an overestimation of future emissions.

2.4 Air quality impact assessment

Assessment criteria for the project was predominantly taken from the NSW EPA's Approved Methods, with the exception of NO_2 and SO_2 which were sourced from the Air NEPM air quality objectives as they represent the most recent and stringent standards for protection of the air quality environment. The outcome of the criteria is ambient air quality that minimises the risk of adverse health impacts from exposure to air pollution. Achieving compliance with the impact assessment criteria will help demonstrate the project will operate in a manner that protects human and environmental health.

An alternative 1 hour H_2S criteria was sourced from the California Ambient Air Quality Standards for comparative purposes. This additional hourly H_2S criteria has been included based on an earlier review at the site by Environ (2012) which concluded that the Californian EPA 1 hour average (public welfare) criterion of 42 ug/m^3 should be considered for adoption for the assessment of cumulative impacts due to other H_2S sources in the region including PKSW. Environ states that given the uncertainty in short-term measured and modelled concentrations, the longer 1 hour averaging period is considered to provide a more robust basis for a criterion. It is noted that this approach was previously submitted to and accepted by the NSW EPA. GHD therefore has included both the short-term NSW H_2S criteria for odour nuisance and the hourly criterion for health impacts.

The adopted air quality assessment criteria are summarised in Table 2.4.

The application of each impact assessment criteria is variable for each pollutant based on the following factors:

- **Averaging period** – the period over which modelled concentrations are averaged.
- **Statistic** – the statistic of the modelled concentrations. As an example for a 1-hour averaging period, the 'maximum statistic' would be the highest predicted value at any receptor for the entire modelling period. The 99.9th percentile statistic would be (approximately) the ninth highest hour in a one year modelling period.
- **Impact location** – the location at which the impacts are to be assessed. For some pollutants, impacts are assessable only at sensitive receptor locations, while some impacts are assessable at and beyond the boundary of the site. The criteria apply at ground level where receptors are likely to be exposed.
- **Impact type** – the type of impact assessed. For some pollutants, the impacts are assessable only for the project's and PKSW contribution to pollutant concentrations at the relevant impact location (referred to as 'incremental impacts'). For other pollutants, the cumulative impact (which includes both the incremental concentration as well as the background concentration) is assessed.

Table 2.4 Air quality impact assessment criteria

Pollutant	Averaging period	Statistic	Impact location	Impact type	Criteria (µg/m^3)	
					EPA Assessment Criteria	Air NEPM
Airborne particulate matter and common gaseous pollutants						
TSP	Annual	Maximum	Sensitive receptor	Cumulative	90	-
PM_{10}	24 hour	Maximum	Sensitive receptor	Cumulative	50	50
	Annual	Maximum	Sensitive receptor	Cumulative	25	25
NO_2	1 hour	Maximum	Sensitive receptor	Cumulative	246	164
	Annual	Maximum	Sensitive receptor	Cumulative	62	31
SO_2	1 hour	Maximum	Sensitive receptor	Cumulative	570	286 (planned to be reduced to 215 in 2025)
	24 hour	Maximum	Sensitive receptor	Cumulative	228	57

Pollutant	Averaging period	Statistic	Impact location	Impact type	Criteria (µg/m³)	
					EPA Assessment Criteria	Air NEPM
Principal air toxics						
Benzene	1 hour	99.9th percentile	At or beyond site boundary	Incremental	29	-
Dioxins and furans	1 hour	99.9th percentile	At or beyond site boundary	Incremental	2.00E-06	-
Individual air toxics						
Ammonia	1 hour	99.9th percentile	At or beyond site boundary	Incremental	330	-
Benzo[a]pyrene equivalent	1 hour	99.9th percentile	At or beyond site boundary	Incremental	0.4	-
Chlorine	1 hour	99.9th percentile	At or beyond site boundary	Incremental	50	-
Cyanide (as CN)	1 hour	99.9th percentile	At or beyond site boundary	Incremental	90	-
Ethyl-benzene	1 hour	99.9th percentile	At or beyond site boundary	Incremental	8000	-
Odorous air pollutants						
H_2S	1 second	99.9th percentile	Sensitive receptor	Incremental	1.38	-
	1 hour	Maximum	Sensitive receptor	Cumulative	42	-
Phenol	1 hour	99.9th percentile	Sensitive receptor	Incremental	20	-
Styrene	1 hour	99.9th percentile	Sensitive receptor	Incremental	120	-
Toluene	1 hour	99.9th percentile	Sensitive receptor	Incremental	360	-
Xylene	1 hour	99.9th percentile	Sensitive receptor	Incremental	190	-

3. Methodology

3.1 General

This AQIA of the construction, commissioning and operation of the project was completed in accordance with EPA and contemporary guidance to assess air quality impacts from the project. Atmospheric dispersion modelling was undertaken to evaluate the potential worst-case impacts from the project under routine operations and inform recommendations of appropriate mitigation measures to minimise any potential impacts.

3.2 Approach

3.2.1 Air quality species of interest

The air pollutants examined in this report include:

- Airborne particulate matter ('particulates'), including Total Suspended Particulates (TSP) and particulate matter with diameter smaller than 10 microns (PM_{10})
- Common gaseous pollutants including nitrogen dioxide (NO_2) and sulphur dioxide (SO_2)
- Odour in the form of hydrogen sulphide (H_2S)

PKSW emits air toxics including ammonia, benzene, benzo[a]pyrene, chlorine, cyanide (as CN), dioxins and furans, ethyl-benzene, polycyclic aromatic hydrocarbon (as benzo[a]pyrene equivalent) and xylene, however the blast furnaces are not a significant source of these emissions. These pollutants have therefore not been included in the assessment of 6BF as the project will not contribute to cumulative emissions.

While the PKSW site will emit fine particulates ($PM_{2.5}$), the project is replacing the operation of 5BF with the newer 6BF, and therefore $PM_{2.5}$ emissions are not likely to increase due to the project. Ambient air quality including $PM_{2.5}$ concentrations are discussed in Section 5.4. A review of the last five years of data shows annual average $PM_{2.5}$ levels below the ambient air quality goal of 8 $\mu g/m^3$ at the three nearest DPIE sites (Kembla Grange, Albion Park South and Wollongong) for all years except 2019 which was heavily influenced by bushfires.

Improvements on current operations proposed as part of the project, such as the operation of a secondary dedusting hood to capture emissions at tapholes, are expected to result in a reduction of particulate emissions from the cast house which would otherwise be anticipated to be one of the primary sources of fine particulates. It is noted that $PM_{2.5}$ is not identified as a substance likely to trigger NPI reporting thresholds in the *National Pollutant Inventory Emission Estimation Technique Manual for Iron and Steel Production (1999)*. $PM_{2.5}$ from the project and has therefore not been included in the emission inventory or dispersion modelling.

3.2.2 Construction and commissioning assessment methodology

Construction assessment

Based on a review of the proposed construction methodology, agency requirements, and identification of emissions to air that could occur during construction, a qualitative-based approach that focused on management was adopted to assess the construction of the project. A risk-based approach in accordance with IAQM guidance was adopted to assess potential particulate impacts during the construction of the project.

Commissioning assessment

Emissions to air during commissioning will occur for a relatively short period of time at the beginning of the project's operational phase. Where possible, engineering controls will be used to reduce any emissions during this period. No air emissions sampling data from commissioning was available at the time of this assessment and therefore emissions to air during commissioning cannot be accurately quantified. On this basis, a qualitative approach that focused on management was adopted to assess the commissioning of the project.

3.2.3 Operation assessment methodology

The quantitative assessment of the operation of the project comprised of three parts:

- Air quality impact assessment
- Emission limit assessment
- Best practice assessment

3.2.3.1 Air quality impact assessment

A quantitative air quality assessment utilising air quality dispersion modelling was undertaken to assess potential worst case air quality impacts from operation of the project in accordance the Approved Methods. The modelling methodology adopted for this assessment is outlined in Section 3.3.

Air quality dispersion modelling was undertaken for two scenarios:

- **Existing operations (Existing)** – includes operation of 5BF, sources associated with operation of 5BF, and general site operations and does not include sources associated with the operation of 6BF. The existing scenario was included to provide a ‘baseline’ that allows a comparative assessment of the project against existing PKSW operations.
- **Future operations (Future)** – includes operation of 6BF, sources associated with operation of 6BF, and general site operations and does not include sources associated with the operation of 5BF.

Potential cumulative air quality impacts with existing industry and facilities in the area were accounted for by including background air quality data recorded from Department of Planning, Industry and Environment (DPIE) Air Quality Monitoring Stations (AQMS). It is noted that monitoring data at these AQMS include emissions from the existing PKSW operations. Using these as a baseline will at times double up the predicted cumulative emissions, and it is a complex process to determine the ambient air quality without PKSW in operation. To be conservative, and unless stated later in this report, GHD has added the ambient air quality data to predicted concentrations from PKSW to predict a total cumulative level for comparison with criteria.

Potential cumulative air quality impacts with proposed and approved major projects in the area were reviewed on a case by case basis and potential cumulative impacts were incorporated where considered appropriate.

3.2.3.2 Emission limit assessment

An assessment of air emission concentrations against the relevant air emission limits was carried out for the operation of the project. Emission limits which are considered relevant to assessment of the project were sourced from the POEO Clean Air Regulation.

The findings of the emission limit assessment are summarised in Section 7.

3.2.3.3 Best practice assessment

The best practice assessment was carried out with consideration of the European Union Best Available Techniques (BAT) Reference Document (BREF) for Iron and Steel Production Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control).

The best practice assessment benchmarked the proposed operations for the project against industry best practices. The findings of the best practice assessment are summarised in Section 10.

3.3 Modelling methodology

3.3.1 Dispersion model selection

A review of the surrounding terrain, air quality emission sources and distance to nearby receptors was undertaken to inform the choice of dispersion model used for this assessment.

Given the site's location which may be subject to coastal fumigation events, and the scale of the site where non-steady state wind fields will likely be occurring (i.e. the 10 m high weather station is not likely representative at all areas of the model domain, including heights) GHD found CALPUFF to be the most appropriate dispersion modelling software to use for the project.

CALPUFF is an advanced non-steady-state, Gaussian puff dispersion model that uses a three dimensions spatially varying wind field that is capable of accounting for complex terrain features and varying wind fields.

3.3.2 Emission inventory development

A detailed air emissions inventory for the site was provided by BlueScope. It is understood that the emissions inventory was developed based on sampling data where available and Load Base Licencing approved emission factors or National Pollutant Inventory emissions estimation techniques where sampling data was not available. Emissions data used in the assessment represents the site operating under typical operating conditions.

Emissions used for 6BF operation are based on historical sampling data.

H_2S emissions applied to the 6BF slag granulation cooling tower are based on emissions measured at the 5BF slag granulatior stacks and are expected to be an over-estimation of actual future emissions.

It is considered likely that upgrades to the stoves will result in an improvement (reduction) of emissions to air. The improvements cannot be quantified until the project is operational and sampling can be undertaken. As such, historical data from 6BF was used and is expected to be conservative.

A review of historical sampling data of 6BF sources was undertaken for Type 1 and 2 substances, mercury and cadmium. Measured concentrations were very low and were found to represent less than 1% of the emission standard of concentration limits stipulated in the POEO Clean Air Regulation for mercury and cadmium, and 4% for Type 1 and 2 substances. These have been assessed in the emissions limit assessment in Section 7, however were not included in dispersion modelling.

3.3.3 Dispersion modelling

Predicted air quality impacts were modelled in accordance with the Approved Methods using an approved computer software model CALPUFF.

CALPUFF model settings were selected based on the recommendations provided in the *Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the Approved Methods for the Modelling and Assessments of Air Pollutants in NSW, Australia* (J Barclay and J Scire, Atmospheric Studies Group TRC Environmental Corporation, 2011), with the exception of the MDISP parameter for which the model default value was used.

For this assessment, the CALPUFF dispersion model was used to predict ground-level concentrations from the project. The CALPUFF dispersion model utilised a meteorological dataset of one year in duration. The grid size used in the CALPUFF model was equivalent to the CALMET domain (use of CALMET further discussed in Section 3.3.4). The same grid resolution of 250 metres used for the CALMET model was used in CALPUFF.

Building wake effects from existing buildings and large structures on site were included through use of the Building Profile Input Program (BPIP) PRIME algorithm. The dispersion model accounted for wake effects from approximately 1,400 building and structures.

The source properties and emission rates utilised in the dispersion modelling are detailed in Section 6.

The dispersion model was configured to predict pollutant concentrations at identified sensitive receptor locations and for a sampling grid centred on the PKSW site. Impacts at and beyond the site boundary were calculated using the sampling grid.

3.3.4 Meteorological modelling

Local meteorology including long term wind speed and direction, as well as atmospheric stability, influence how air pollutants are dispersed into the local environment.

Site specific meteorological data used to drive the dispersion model was generated by use of the WRF and CALMET meteorological models to produce a three-dimensional wind field which also accounts for local variations in the terrain. Prognostic WRF data was used as an ‘initial guess field’ for the CALMET meteorological model.

A representative year was chosen for modelling purposes based on review of Southern Oscillation Index (SOI) for the past 10 years and an analysis of BoM data recorded at Port Kembla Automatic Weather Station (AWS) for the last 5 calendar years (01/01/2016 – 31/12/2020). The review resulted in the selection of the 2017 calendar year (01/01/2017 – 01/01/2018) as the representative year for modelling purposes.

Details of the procedure undertaken to produce the site-specific meteorology are provided in Appendix A.

4. Description of the project

4.1 Project overview

This section provides a high level summary of the project from an air quality context. The EIS should be referred to for more detailed description. Additional details of air emissions from the project are provided in Section 6 and details on emission controls and the best practice review are provided in Section 10.

The project includes the reline of 6BF over a period of approximately three years to return it to service and commence ironmaking shortly after 5BF ceases operation.

The reline of the furnace initially involves removal of remaining burden material and iron skull, followed by stripping of the staves, refractories and hearth from inside the shell. In places, repairs to the furnace shell will be required. Once stripped, installation of the new hearth, sidewall refractories and staves will be completed, together with repairs/replacement of the tuyeres, tapholes, furnace cooling systems and instrumentation. Significant work will also be required to prepare each of the 6BF ancillary systems for continuous operation across the length of the new campaign. Following construction, 6BF will be commissioned and ramped up for operation. Cold commissioning of 6BF will occur while 5BF remains operational, however ironmaking at 5BF will conclude prior to ironmaking commencing at 6BF.

The project will see advances in technology being used including several improvements in 6BF compared to the currently operating 5BF, resulting in lower overall emissions from the site.

A summary of the project relevant to the assessment of construction and operational air quality is provided in Table 4.1.

Table 4.1 Project summary

Project element	Summary
Construction	Major construction work will be required within the blast furnace and surrounding facilities and will involve removing the remaining burden materials, refractory bricks and blocks and staves within the interior of the blast furnace for replacement. Any required repairs or replacement of ancillary equipment or structures will also be carried out.
Access	The majority of the construction traffic will access the site via the major roads that service the Port Kembla industrial area, including the Princes Motorway and Princes Highway, Shellharbour Road, Springhill Road, Five Islands Road and Masters Road. No changes to existing access arrangements are proposed.
Ironmaking components and systems	– Raw materials handling – Sinter plant – Blast furnace – Stockhouse and charging system – Blast furnace vessel – Cooling system – Casthouse – Hot blast system – Off gas system – Slag handling
Air emissions	– Flue gas discharged from the stoves waste heat stack – Filtered and unfiltered air from the casthouse and stockhouse – Steam and H_2S from the slag granulation cooling tower – Blast furnace gas (BFG) from furnace top bleeders during maintenance and overpressure events – BFG discharged through primary relief valve via a silencer during charging – H_2S and SO_2 from slag pits – SO_2 from casthouse – Dust from the raw materials and charging conveyors, off gas system, dust handling system, and traffic

Project element	Summary
Blast furnace slag	Two types of slag are produced from the blast furnace, granulated slag and rock slag. Slag is sold for use in other products, such as cement and road base.
Commissioning	Commissioning involves the following: – All services brought back into live condition – Various parts of plant re heated – Pressure and leak tests conducted – Cooling systems filled and flushed – Furnace dried out and charged with kindling and burden material – Gas system purged and furnace 'blown in' – Furnace progressively heated until regular casting of iron and slag commences – Full production reached within one to two months
Operations	Operation of 6BF will be generally the same as existing operations utilised at 5BF, including: – Processing and transport of raw materials (iron ore, coal, coke, fluxes) – Production of sinter (agglomeration of iron ore, coke and limestone dust) for use within the blast furnace. – Production of approximately 2.7 Mtpa of iron from 6BF – Processing of approximately 0.88 Mtpa of blast furnace slag for use as construction products
Construction work hours	Where practical, and subject to the final construction program, construction will be carried out during the following construction hours: – Monday to Friday: 7.00 am to 6.00 pm. – Saturday: 7.00 am to 6.00 pm. – Sundays and public holidays: no work. – A number of construction activities will be scheduled to be undertaken as night works. – Final construction phase will require 24 hour construction (estimated to be a period of 5 months). Further, 24 hour construction may be required for an extended period if 6BF is required online earlier than 2026.
Construction duration	Approximately 3 years
Operational duration	Approximately 20 years

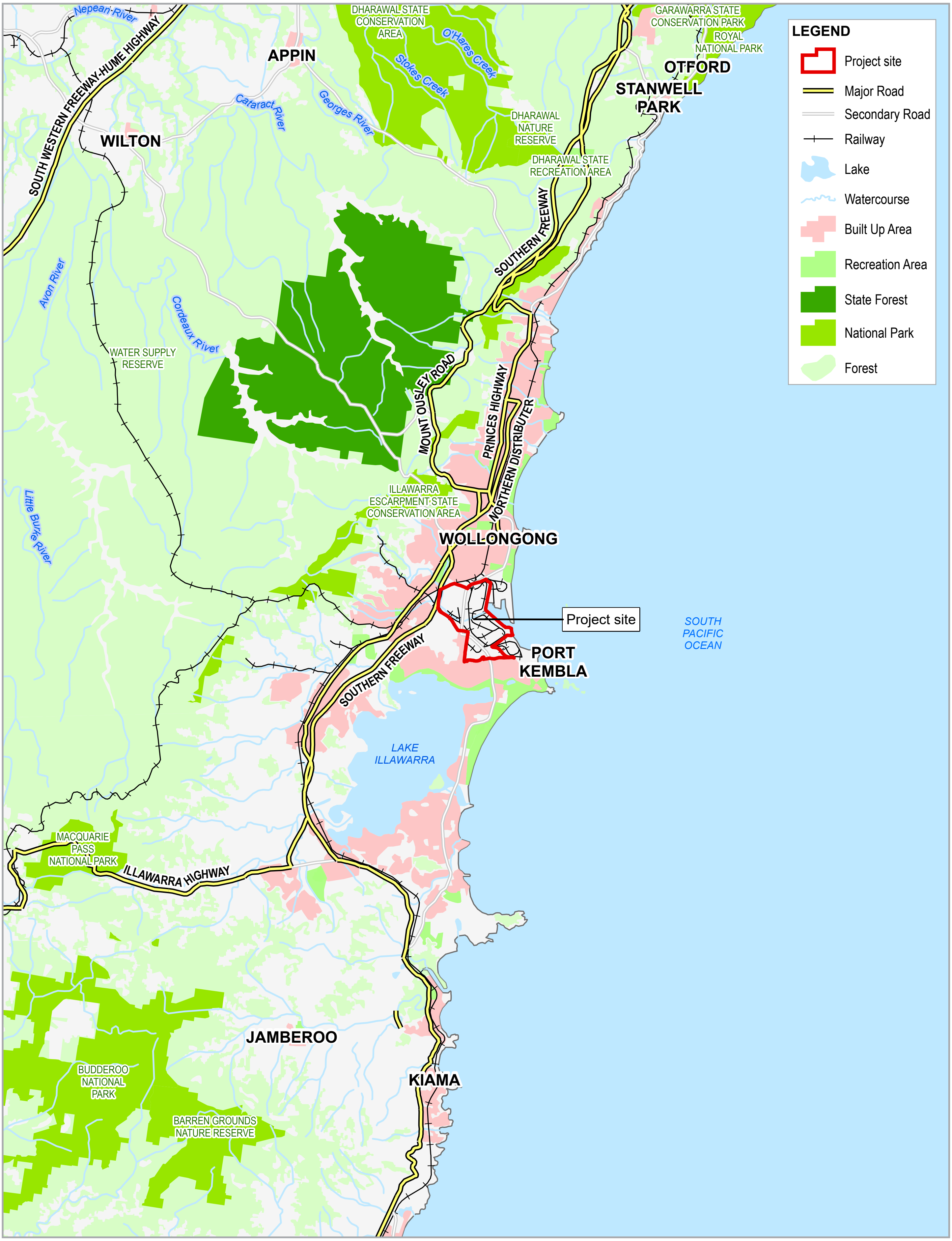
5. Existing environment

5.1 Project location

PKSW is located within an industrial site of approximately 750 hectares in the Wollongong Local Government Area (LGA), approximately 80 kilometres from Sydney and 2.5 kilometres from the City of Wollongong (refer to Figure 5.1).

The PKSW site comprises the No.1 Works, No.2 Works, Steelhaven and the Recycling area. The No.2 Works is divided into two sections by Allans Creek. The southern half of the No.2 Works comprises the Cokemaking, Ironmaking and Steelmaking facilities, while the northern half includes the Rolling Mills and Recycling Area. All sectors of PKSW are internally linked by road and rail and are currently supplied with electricity, water and gas services.

The land to which this project applies, including all connecting infrastructure and materials handling elements that require upgrades as part of the project, is within the southern section of the No.2 Works, being part of the land on which ironmaking facilities are located. The relevant land title is Lot 1 DP 606434. Ancillary construction facilities will also be required and will be located within the wider PKSW site as shown in Figure 5.2.



Paper Size ISO A4

0 1.5 3 4.5 6

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Project No.	**12541101**
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Regional Location

FIGURE 5.1

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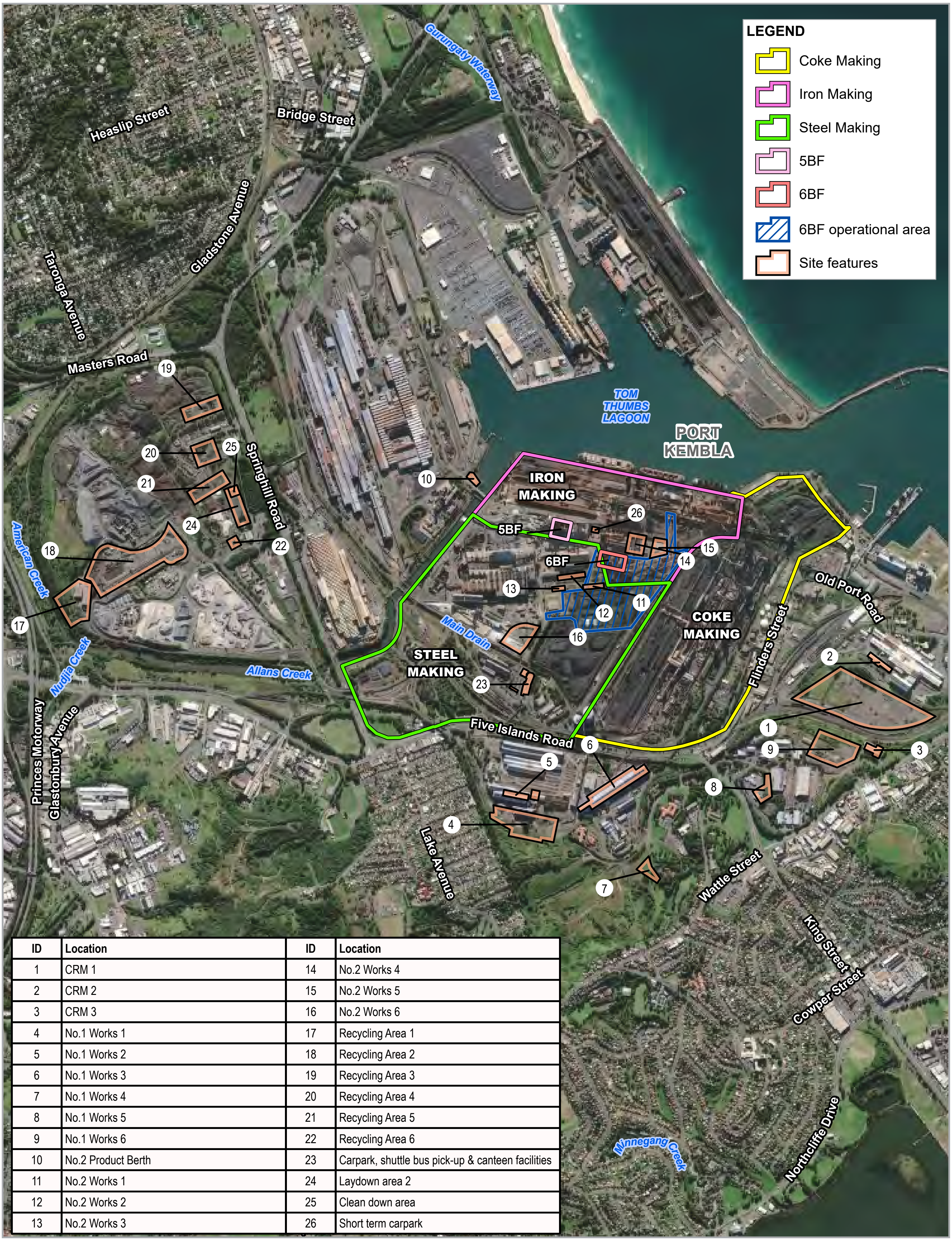
Print date: 15 Oct 2021 - 09:24

Data source: Commonwealth of Australia (Geoscience Australia): 250K Topographic Data Series 3, 2006. .
Created by: tmorton



ID	Location	ID	Location
1	CRM 1	14	No.2 Works 4
2	CRM 2	15	No.2 Works 5
3	CRM 3	16	No.2 Works 6
4	No.1 Works 1	17	Recycling Area 1
5	No.1 Works 2	18	Recycling Area 2
6	No.1 Works 3	19	Recycling Area 3
7	No.1 Works 4	20	Recycling Area 4
8	No.1 Works 5	21	Recycling Area 5
9	No.1 Works 6	22	Recycling Area 6
10	No.2 Product Berth	23	Carpark, shuttle bus pick-up & canteen facilities
11	No.2 Works 1	24	Laydown area 2
12	No.2 Works 2	25	Clean down area
13	No.2 Works 3	26	Short term carpark

Paper Size ISO A4

0 0.2 0.4 0.6 0.8 1

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Key project features

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FIGURE 5.2

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Print date: 15 Oct 2021 - 09:25

Data source: LPI: DTDB/DCDB, 2017. World Imagery: Maxar.
Created by: tmorton

5.2 Receiving environment

The receiving environment plays a critical role in the potential for air emissions to lead to air impacts. The terrain and land use within the receiving environment have an influence on the local meteorological conditions and subsequently impact how air pollutants disperse within an environment. The location and densities of land uses sensitive to air quality impacts (sensitive receptors) relative to the source of air emissions plays a significant role in the magnitude and extent of potential impacts.

The land use, terrain and sensitive receptors surrounding the project location are discussed in the following report sections.

5.2.1 Land use

The PKSW site is zoned IN3 – Heavy Industrial under *State Environmental Planning Policy (Three Ports) 2013* (Three Ports SEPP). PKSW and the adjacent Springhill Works together comprise the largest site in the Port Kembla industrial area, occupying approximately 750 ha, and are mostly built around the western and northern side of Port Kembla’s Inner Harbour. The PKSW site is a multi-use industrial area which includes storage, manufacturing, port berths, private internal roads and offices. Access to PKSW is provided by Springhill Road, Five Islands Road, Flinders Street and Christy Drive, and then private internal roads in PKSW.

The port of Port Kembla is located between the Pacific Ocean and the Port Kembla heavy industrial area and is zoned SP1 – Special Activities. The Inner Harbour, specifically developed as an all-weather shipping port, covers approximately 60 ha with around 2,900 m of commercial shipping berths. BlueScope operates five berths in the Inner Harbour that supply materials for the PKSW.

The area surrounding the Port Kembla industrial area is primarily occupied by residential development. These urban areas provide small and large-scale retail outlets, community services (e.g. medical facilities, hospital, schools and sporting facilities) and commercial facilities (e.g. banking and post office). The closest urban developments to PKSW are the suburbs of Cringila, Berkeley, Lake Heights, Warrawong and Port Kembla to the south, Unanderra, Cobblers Hill, Mount St Thomas, Coniston and Figtree to the north and west. The urban area of Cringila is located adjacent to the No. 1 Works and No. 2 Works areas and is nearest to the project area, being approximately 1.2 kilometres to the southwest.

5.2.1 Terrain

The PKSW site is generally flat and resides upon a base of artificial fill, including dredged sand and mud, rocks and local soil materials. The terrain within 10 km of the PKSW site is considered complex due to a land-sea interface bordering the site to the east and the Illawarra escarpment which is located approximately 6 kilometres to the northwest.

5.2.2 Sensitive receptors

The Approved Methods defines a sensitive receptor as:

‘A location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area. An air quality impact assessment should also consider the location of known or likely future sensitive receptors.’

The selection of identified sensitive receptors is consistent with the previous air quality assessment undertaken by *BlueScope Steel, Port Kembla Site Air Emissions Modelling – PRP131* (Environ, 2012) to readily allow comparison of predicted impacts between assessments and to analyse changes in predictions over time.

The locations of identified sensitive receptors are listed in Table 5.1 with universal transverse Mercator coordinates (eastings and northings), receptor type, locality with respect to the project and description. The locations of representative sensitive receptors in the surrounding area are shown in Figure 5.2.

ERM (2021) also conducted a peer review of the BSL Air Emission Site Wide Model produced in 2011. In its review ERM states that there have been no material changes to land use or occupancy surrounding the facility since the production of the 2011 model. Based on this, ERM concluded that sensitive receptor locations did not require significant review or amendment.

In addition to the identified sensitive receptor locations, the assessment predicted pollutant concentrations for a sampling grid centred on PKSW so that results can be determined at any location within the sampling grid.

Table 5.1 Location of identified sensitive receptors

Receptor ID	UTM coordinates (m)		Receptor type	Approximate distance and direction from project boundary	Description
	Easting	Northing			
R01	303054	6186079	Residential	~410 m northwest	Residence 1
R02	304458	6186662	Residential	~180 m north	Residence 2
R03	305835	6187128	Educational	~360 m northwest	Coniston Primary School
R04	301769	6185029	Residential	~1,630 m west	Unanderra Community Centre
R05	304332	6183457	Educational	~460 m west	Cringila Primary School
R06	307138	6182455	Residential	~400 m south	Warrawong Community Centre

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0 0.2 0.4 0.6 0.8 1

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Air Quality Impact Assessment

Location of identified sensitive receptors

Project No.	**12541101**
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FIGURE 5.3

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Print date: 21 Oct 2021 - 19:03

Data source: LPI: DCDB/DTDB, 2017. Commonwealth of Australia (Geoscience Australia) 250K Topographic Data Series 3, 2006. World Imagery: Earthstar Geographics
World Imagery: Maxar. Created by: tmorton

5.3 Existing and future sources of air pollutants

5.3.1 Facilities reporting to the NPI

The National Pollutant Inventory (NPI), operated under the *National Environment Protection (National Pollutant Inventory) Measure 1998*, provides publicly available information about emissions of 93 pollutants throughout Australia. Facilities that exceed prescribed threshold values are required to report their emissions to the NPI on a yearly basis.

A review of facilities reporting to the NPI in the area surrounding the project site revealed 18 facilities within a 5 km radius of the site; of these, five were identified to emit emissions of relevant pollutants that are assessable as cumulative impacts (pollutants including oxides of Nitrogen ($NO_{x)}$ and SO_2). These five facilities are described in Table 5.2. Annual emissions of relevant pollutants from each facility are presented in Table 5.3.

Table 5.2 Existing operations reporting emissions to the NPI

Name of operation	Proximity to the PKSW boundary	Description of operation
Bisalloy Steels Unanderra	~550 m west	Manufacture of quenched and tempered steel plate
BOC Gases Port Kembla	~50 m west	Refines atmospheric gases to produce saleable products.
Boral Asphalt Port Kembla	Within PKSW site boundary	Hot mix asphalt manufacturing
IXOM Port Kembla Site	~1,500 m southeast	Sulfuric acid regeneration/manufacture, sodium bisulfite manufacture, sulfuric acid import, storage and despatch
Port Kembla Milling	~50 m southeast	Cement milling

Table 5.3 Annual emissions reported to NPI for each facility for the 2019/2020 reporting period (kg/year)

Name of operation	NO_X	SO_2
Bisalloy Steels Unanderra [Unanderra-NSW]		67
BOC Gases Port Kembla [Cringila-NSW]		10
Boral Asphalt Port Kembla [Port Kembla-NSW]		0.5
IXOM Port Kembla Site [Port Kembla-NSW]	3,189	23,567
Port Kembla Milling [Port Kembla-NSW]		2,130

5.3.2 State significant projects

A review of the DPIE Major Projects website was completed to understand future sources of air pollutants which may contribute to cumulative impacts with the project. New state significant projects (SS projects), that is, both State Significant Developments and State Significant Infrastructure, with potential for air emissions are summarised in Table 5.4.

Table 5.4 Summary of nearby state significant projects with emissions to air

Name of SS project	Proximity to the PKSW boundary	Project status	Description of project	Expected impact on air quality at project sensitive receptors
Port Kembla Gas Terminal	~500 m east	Approved	Development of a liquefied natural gas (LNG) import terminal to receive and distribute LNG shipments sourced from global suppliers.	Emissions of particulates, combustion pollutants (NOx and SO_2) and volatile organic compounds from engines on board the Floating Storage and Regasification Unit (FSRU) and LNG carrier vessels.
Tallawarra B Power Station	~8 km southwest	Approved	Construction and operation of the proposed Tallawarra Stage B Gas Turbine Power Station. The power station will consist of 2 or 3 open cycle gas turbine generators with a nominal capacity of 300-450MW, or one combined cycle gas turbine generator with a nominal capacity of 400MW.	Emissions of particulates, combustion pollutants (NOx and SO_2) and volatile organic compounds from operation of gas turbine(s).
Name unknown, project proposed by Australian Industrial Power (AIP) / Squadron Energy group	N/A	N/A	Development of a dual-fuel (gas and green hydrogen) power station at Port Kembla.	Project is in its early stages and information about the anticipated emissions is not yet available.

Based on a review of project characteristics, the following was determined for each SS project:

- Port Kembla Gas Terminal – there is potential for cumulative impacts from the Port Kembla Gas Terminal due to close proximity of the 6BF reline project. Background pollutant concentrations from the Port Kembla Gas Terminal project should be included in the cumulative assessment.
- Tallawarra B Power Station – it is considered unlikely that cumulative impacts will occur from the Tallawarra B Power Station project due to significant separation distance between projects and relative location of sensitive receptors with respect to both projects (i.e. sensitive receptors are located between both projects, therefore receptors will only be impacted by one project at a time based on prevailing meteorological conditions). No allowance for pollutant concentrations from the future operating Tallawarra B Power Station is considered necessary.

It is noted that a sub-project of the No. 6 Blast Furnace Upgrade is the Commodity Logistics and Import Project (CLIP), which involves an upgrade of the raw materials unloading berth infrastructure at PKSW. The CLIP is a critical component of the No. 6 Blast Furnace Upgrade. Installation and commissioning of the infrastructure is required as early as November 2024. As it is a separate stage of the overall project, CLIP will be assessed separately (in a separate EIS) and is not included in this assessment.

5.4 Background air quality

An assessment of the total impact, which includes the project impact as well as the background concentrations, is required for the following pollutants:

- TSP
- PM_{10}
- $PM_{2.5}$
- NO_2
- SO_2
- H_2S

To assess the total impact, representative background levels of each pollutant must be established.

5.4.1 Background DPIE AQMS data

DPIE operates air quality monitoring stations (AQMS) in many locations across NSW. A summary of data available from the nearest DPIE AQMS is provided in Table 5.5.

Table 5.5 Summary of data reviewed as part of the assessment

Station name	Distance to the PKSW boundary	Pollutants of interest that are measured
Wollongong	~4 km north	PM_{10}, $PM_{2.5}$, NO_2, O_3 and SO_2
Kembla Grange	~6.5 km west	PM_{10}, $PM_{2.5}$, NO_2 and O_3
Albion Park South	~17 km southwest	PM_{10}, $PM_{2.5}$, NO_2, O_3 and SO_2

Based on proximity to the PKSW site, use of data from the Wollongong AQMS was prioritised, followed by Kembla Grange, then lastly data from Albion Park South.

A summary of the ambient air quality data recorded at each AQMS over the last 5 years is provided in Table 5.6.

Table 5.6 5 year summary of available background air quality data recorded by DPIE

Pollutant	Averaging period	Recorded background concentration by year (µg/m^3)				
		2016	2017	2018	2019	2020
Wollongong						
PM_{10}	24 hour maximum	52.9	55.2	59.7	117.6	121.6
	Maximum 24 hour (below assessment criteria)	49.5	47.2	47.3	48.7	48.1
	70th percentile	20.7	20.6	23.1	25.1	20.4
	Annual average	17.3	18.1	19.8	22.6	18.8
$PM_{2.5}$	24 hour maximum	33.7	24.7	47.6	81.5	100.9
	Maximum 24 hour (below assessment criteria)	20.1	24.7	21.8	24.5	22.0
	70th percentile	8.3	8.3	8.3	9.0	7.4
	Annual average	7.4	7.1	7.3	9.0	7.8
NO_2	1 hour maximum	88.2	116.9	88.2	82.0	84.1
	Annual average	13.0	12.9	13.8	12.2	13.2
SO_2	1 hour maximum	57.2	134.4	65.8	97.2	57.2
	24 hour maximum	13.1	10.5	10.5	13.1	23.6
	Annual average	1.7	2.3	2.6	2.6	1.7
Kembla Grange						
PM_{10}	24 hour maximum	56.3	67.7	71.8	115.8	187.7
	Maximum 24 hour (below assessment criteria)	47.3	48.0	49.1	49.8	48.3
	70th percentile	23.9	23.5	26.4	29.5	22.5
	Annual average	20.0	20.5	22.7	25.5	21.5
$PM_{2.5}$	24 hour maximum	32.0	21.3	21.9	70.1	100.4
	Maximum 24 hour (below assessment criteria)	18.2	21.3	21.9	24.6	22.6
	70th percentile	7.8	8.0	8.0	8.9	6.5
	Annual average	6.6	6.9	7.1	8.8	6.8
NO_2	1 hour maximum	80.0	75.9	75.9	86.1	77.9
	Annual average	10.0	9.2	10.0	10.3	8.2
SO_2	1 hour maximum	-	-	-	-	-
	24 hour maximum	-	-	-	-	-
	Annual average	-	-	-	-	-

Pollutant	Averaging period	Recorded background concentration by year (µg/m^3)				
		2016	2017	2018	2019	2020
Albion Park South						
PM$_{10}$	24 hour maximum	43.1	44.6	94.4	104.3	153.3
	Maximum 24 hour (below assessment criteria)	43.1	44.6	49.9	47.0	45.4
	70th percentile	18.3	17.5	20.4	21.3	17.7
	Annual average	14.9	15.3	17.8	19.5	17.1
PM$_{2.5}$	24 hour maximum	30.7	19.3	29.4	49.4	96.3
	Maximum 24 hour (below assessment criteria)	20.8	19.3	20.6	24.8	21.4
	70th percentile	8.0	7.3	7.7	9.4	6.5
	Annual average	7.2	6.6	6.8	8.6	6.8
NO$_2$	1 hour maximum	88.2	77.9	80.0	84.1	80.0
	Annual average	7.7	7.4	8.1	7.8	5.8
SO$_2$	1 hour maximum	62.9	85.8	88.7	71.5	62.9
	24 hour maximum	15.7	21.0	21.0	21.0	13.1
	Annual average	1.7	1.9	2.0	2.2	0.8
"-" indicates pollutant not monitored						

5.4.2 Background BlueScope collected data

BlueScope currently operates two air quality monitoring stations, North Gate and Scouts Hall, and has undertaken historic air quality sampling in a number of locations. North Gate AQMS is located approximately 2 km northwest of the 6BF and has been in operation since December 2015. Scouts Hall AQMS is located approximately 1.8 km southwest of the 6BF and has been in operation for approximately 34 years. Refer Figure 5.3 for station locations.

A summary of the ambient PM$_{10}$ data recorded at North Gate AQMS and Scouts Hall AQMS over the last 5 years is provided in Table 5.7. It is noted that the air quality monitoring stations are not fully compliant with the Australian Standard, and therefore are included for comparative purposes only.

Table 5.7 5 year summary of available background PM$_{10}$ data recorded by BlueScope[1]

Pollutant	Averaging period	Recorded background concentration by year (µg/m^3)				
		2016	2017	2018	2019	2020
North Gate						
PM$_{10}$	24 hour maximum	176.5	499.7	205.8	499.7	499.4
	Maximum 24 hour (below assessment criteria)	49.0	49.7	49.5	48.8	49.1
	70th percentile	26.0	24.4	29.2	31.4	27.1
	Annual average	22.6	26.2	27.8	39.1	37.4
Scouts Hall						
PM$_{10}$	24 hour maximum	63.1	76.2	79.5	109.5	131.2
	Maximum 24 hour (below assessment criteria)	48.3	47.9	49.6	48.1	49.1
	70th percentile	21.2	21.4	27.1	28.7	21.3
	Annual average	17.6	18.8	22.7	24.2	19.9

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[1] Extraneous data was removed from dataset. Due to unrepresentative 'spikes' identified in the recorded data, any 3 minute average PM$_{10}$ concentration greater than 500 ug/m^3 was filtered out of dataset.

The maximum and average 1 hour averaged H_2S concentrations recorded by BlueScope at Cringila and Scouts Hall for the most recent three years of data are summarised in Table 5.8 and Table 5.9 respectively.

Based on the recorded average 1 hour averaged H_2S concentrations, a background 1 hour H_2S concentration of 2 µg/m^3 (equal to the highest monthly average H_2S concentration recorded) was adopted.

Table 5.8 Maximum 1 hour averaged H_2S concentration

Month	Maximum 1 hour average H_2S concentration recorded (µg/m^3)					
	Cringila			Scouts Hall		
	2013	2014	2015	2013	2014	2015
Jan	10.6	15.2	7.9	30.3	7.8	20.4
Feb	3.5	10.1	2.6	9.2	9.7	9.4
Mar	4.3	7.8	1.4	12.8	7.1	9.5
Apr	5.0	35.7	-	9.7	83.2	-
May	14.5	5.4	4.4	3.4	79.8	5.5
Jun	31.0	9.6	10.6	6.1	3.9	5.3
Jul	9.0	3.6	4.2	5.4	2.5	5.5
Aug	3.0	3.9	7.8	6.1	3.2	4.8
Sep	10.9	4.7	-	8.9	4.0	2.6
Oct	12.3	4.0	-	8.7	50.7	7.1
Nov	5.6	5.2	-	7.5	12.7	13.2
Dec	7.2	5.7	-	5.7	9.6	-
"-" denotes sampling was not undertaken during this time period.						

Table 5.9 Average 1 hour H_2S concentration

Month	Average 1 hour H_2S concentration recorded (µg/m^3)					
	Cringila			Scouts Hall		
	2013	2014	2015	2013	2014	2015
Jan	1.8	1.1	1.0	1.6	0.9	0.8
Feb	0.8	1.4	0.5	0.9	1.0	0.7
Mar	0.8	1.8	1.3	0.8	0.9	1.1
Apr	1.0	1.6	-	0.6	0.8	-
May	1.0	1.0	0.7	0.6	0.7	0.7
Jun	2.0	0.9	0.9	0.6	0.6	0.6
Jul	1.1	0.9	1.0	0.7	0.5	0.6
Aug	1.1	0.8	1.2	0.7	0.4	0.5
Sep	1.2	0.9	-	0.9	0.5	0.6
Oct	1.4	0.9	-	0.8	0.9	0.9
Nov	1.0	1.1	-	0.9	0.8	0.9
Dec	1.1	1.0	-	0.8	0.8	-
"-" denotes sampling was not undertaken during this time period.						

5.4.3 Adopted background data

A summary of the background air quality data adopted in this assessment is provided in Table 5.10. As noted in Section 3.2.3.1, inclusion of background data is considered conservative as the background data contains contributions from existing PKSW operations. Using the background data may result in a 'doubling up' of concentrations from PKSW, however it was decided to include the background data in this assessment to provide a conservative assessment.

Table 5.10 Adopted background air quality data

Pollutant	Averaging period	Adopted background value
TSP	Annual	36.2 µg/m^3, equal to twice the annual PM_{10} concentration recorded at Wollongong AQMS for the modelling period
PM_{10}	24 hour	Daily variable from Wollongong AQMS (i.e. a different value was used for each 24 hour period, refer to Table 5.6 for general statistics including; 24 hour maximum, maximum 24 hour (below assessment criteria), 70th percentile and annual average)
NO_2	1 hour	Hourly variable from Wollongong AQMS, if unavailable then from Kembla Grange AQMS, if unavailable from either station then from Albion Park South AQMS (refer to Table 5.6 for general statistics including; 1 hour maximum and annual average)
O_3	1 hour	Hourly variable from Wollongong AQMS, if unavailable then from Kembla Grange AQMS, if unavailable from either station then from Albion Park South AQMS
SO_2	1 hour	Hourly variable from Wollongong AQMS (refer to Table 5.6 for general statistics including; 1 hour maximum, 24 hour maximum and annual average)
	24 hour	Daily variable from Wollongong AQMS (refer to Table 5.6 for general statistics including; 1 hour maximum, 24 hour maximum and annual average)
H_2S	1 hour	2 µg/m^3, equal to the highest monthly average H_2S concentration recorded by BlueScope

5.5 Climate and meteorology

The local climate and meteorology (weather) within the study area is of critical importance when assessing the potential for air quality impacts at sensitive receptors.

The meteorological environment relevant to a project site is best understood through review of data collected from long-running monitoring weather stations, most commonly operated by the Bureau of Meteorology (BoM) as well as state authorities (DPIE in this case) and in some instances private entities (such as BlueScope). Simulation of the meteorological environment (modelling) is a useful tool in understanding the environment where suitable meteorological observations are not available.

5.5.1 Available observations

The BoM operates a network of Automatic Weather Stations (AWS) across Australia. A BoM AWS typically measure critical meteorological parameters including wind speed, wind direction, temperature, relative humidity, and pressure, with some stations also measuring cloud coverage.

The nearest AWS to the project site include:

- Port Kembla AWS (068253) – 2 km southeast
- Bellambi AWS (068228) – 11 km north
- Albion Park (Shellharbour Airport) (068241) – 15 km southwest

It is noted that long term climate statistics of temperature and rainfall are not available from the closest BoM station (Port Kembla AWS), therefore climate statistics were sourced from the second closest station (Bellambi AWS).

BlueScope's Northgate and Scouts Hall air quality monitoring stations record wind speed and direction, however they do not include temperature or rainfall and are not fully compliant with Australian Standards for wind speed and direction and therefore weren't referenced in this section. A review of the wind roses recorded at BlueScope's Northgate and Scouts Hall air quality monitoring stations is provided in Appendix A.

5.5.1.1 Temperature

Figure 5.4 shows monthly temperature statistics for data measured at BoM Bellambi AWS for the period 1997 through 2021. The median monthly maximum temperature and median monthly minimum temperature are used to show the typical temperature range for each month of the year. This is shown along with the monthly average temperature.

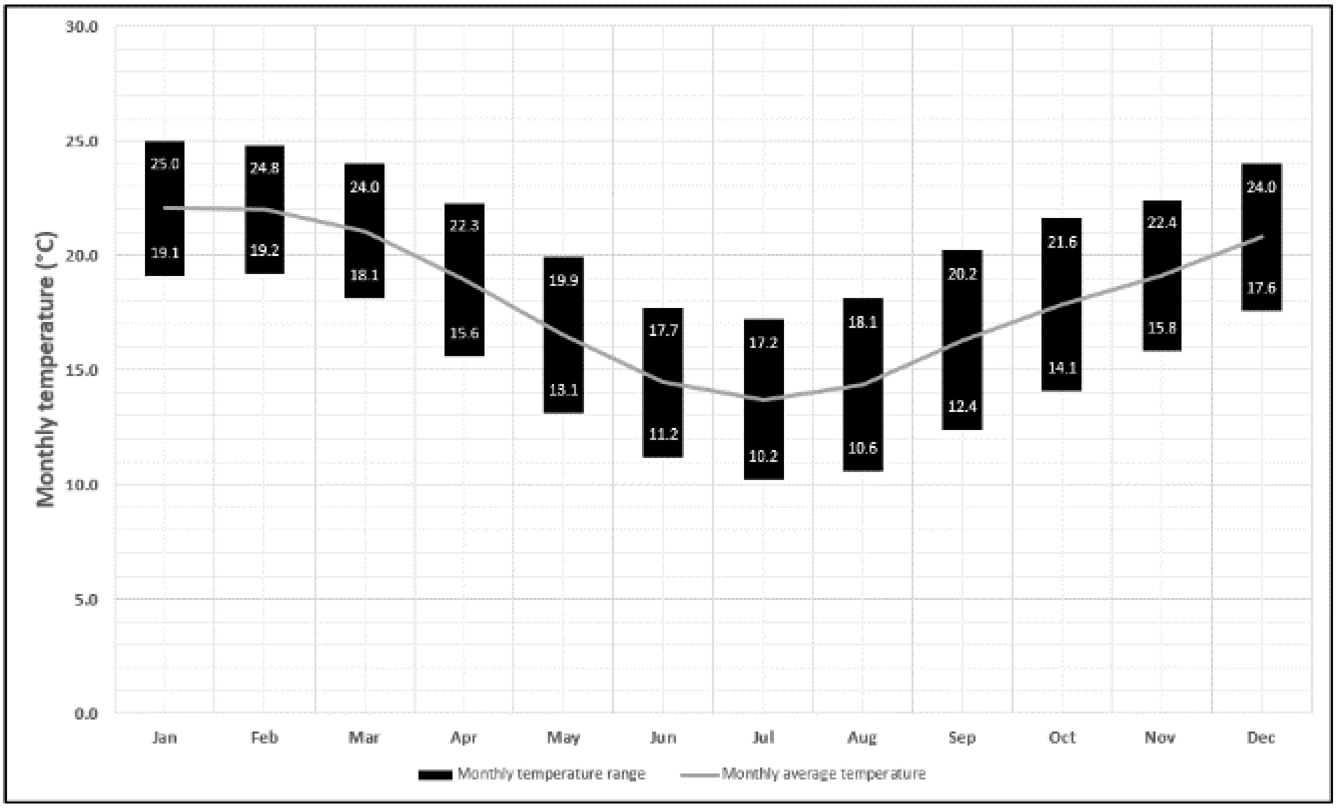


Figure 5.4 Monthly climate temperature statistics from BoM Bellambi AWS (1997-2021)

5.5.1.2 Rainfall

Figure 5.5 shows monthly rainfall statistics for data measured at BoM Bellambi AWS for the period 1997 through 2021. The statistics shown include average monthly rainfall amount (mm) and average number of days per month where rainfall is greater than 1 mm (number of ‘rain days’).

The data shows that the number of rain days and the total rainfall amounts are greater during the summer and autumn months.

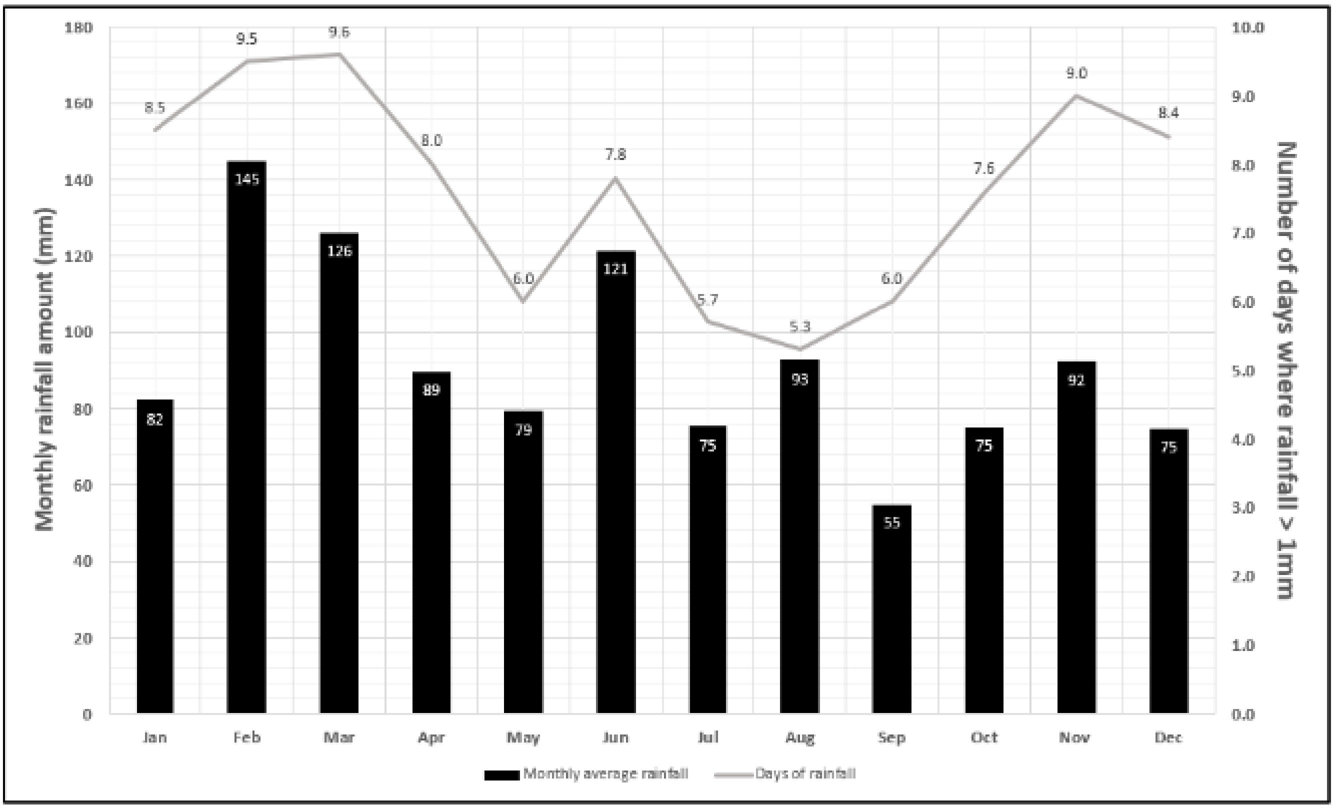


Figure 5.5 Monthly climate rainfall statistics from BoM Bellambi AWS (1997-2021)

6. Project air emissions

6.1 Project construction

6.1.1 Construction overview

The reline and transition to operation of 6BF will be completed in approximately three years which, assuming a construction start during 2023, will see completion of construction in 2026. The actual construction start and completion dates will depend on factors including the operational performance of the 5BF facility, and the timing of when furnace condition requires that it be decommissioned.

Major construction work will be required within the blast furnace and surrounding facilities and will involve removing the remaining burden materials, refractory bricks and blocks and staves within the interior of the blast furnace for replacement. Any required repairs or replacement of ancillary equipment or structures will also be carried out.

Construction activities will indicatively involve the following tasks:

- Removal of the remaining burden materials
- Removal of the iron skull
- Removal of worn carbon block refractories in the hearth
- Removal of worn refractories in the remainder of the vessel
- Demolition of other equipment including:
  - Cooling staves which protect the blast furnace shell
  - Hot blast main refractory lining where required, including the expansion joints
  - Clarifier tank and associated equipment where required
- Repairs to the blast furnace shell where required
- Installation of a new clarifier tank and associated equipment
- Installation of the new hearth, sidewall refractories and staves
- Replacement of tuyeres, tapholes and instrumentation
- Repair, maintenance and/or upgrade of ancillary equipment including:
  - Furnace cooling systems
  - Hot blast system including the stoves, with the addition of a Stove Waste Gas Heat Recovery (WGHR) system
  - Gas system, with addition of a Top Gas Recovery Turbine (TRT)
  - Furnace top, including the charging equipment, bleeder valves and outrigger crane
  - Casthouse floors and associated equipment
  - Stockhouse (raw materials feed system)
  - Automation and power systems
  - Services
- Installation of a new slag granulation system

A list of indicative equipment required for the reline construction activities is presented in Table 6.1.

Table 6.1 Indicative equipment list at Blast Furnace and surrounding facilities

Indicative construction equipment			
Excavators ranging from 5t to 40t	Bobcats (skid steer loaders)	Water blasters	Rail tamper
Cranes of various capacity ranging from 15t to 800t	Plate compactors	Grit blasters	Various brick saws and mixers
Dump trucks	Explosives equipment (drilling rig)	Semi trailers	Material hoists and winches
Front end loaders	Air compressors	Abbey hoists	Refractory gunning machine
Telescopic boom excavator	Diesel welders	Forklifts	Temporary stove burners, fuel pipe and fans.
Liquids tankers	Welding Machines	Sykes pumps	Alimak passenger and goods lifts
Tear-Out machine	Temporary conveyors	Nitrogen welding and cutting gases	Scaffolding
Boom and scissor lifts	Vacuum loading (suck) trucks	Concrete mixers	Concrete pumps
Fuel trucks	Flat Bed Trucks	Vibratory roller	Rock-breaker
Piling Rigs	Concrete saw		

Where practical, and subject to the final construction program, construction will be carried out during the following construction hours:

– Monday to Friday: 7.00 am to 6.00 pm
– Saturday: 7.00 am to 6.00 pm
– Sundays and public holidays: no work

A number of construction activities will be scheduled to be undertaken as night works.

The final construction phase will require 24 hour construction (estimated to be a period of 5 months). Further, 24 hour construction may be required for an extended period if 6BF is required to be online earlier than 2026.

The project will require approximately 31,000 m^2 of indoor storage and 57,000 m^2 of outdoor storage. The delivery of materials and equipment to the work sites will be staged as required with minimal storage available in the area immediately adjacent to 6BF. Indicative laydown areas are shown on Figure 5.2.

Construction support facilities, car parks and laydown areas identified are on areas of the site which have been historically used for similar activities including during previous reline events. A summary of proposed laydown areas is provided in Table 6.2.

Table 6.2 Ancillary facilities

ID	Location	Activity	Size (m^2)	Indoor/Outdoor	Comments
4	No.1 Works 1	Storage	28,500	Outdoor	Currently used as coke storage (rarely used)
5	No.1 Works 2	Storage	5,000	Indoor	No change to the use of the space as it is used today
6	No.1 Works 3	Storage	36,500	20,000 indoor 16,500 outdoor	No change to the use of the space as it is used today
7	No.1 Works 4	Storage	6,400	Outdoor	-
8	No.1 Works 5	Storage	4,000	500 indoor 3,500 outdoor	-

ID	Location	Activity	Size (m^2)	Indoor/Outdoor	Comments
9	No.1 Works 6	Storage	17,000	Outdoor	No change to the use of the space as it is used today
1	CRM 1	Storage	80,000	Outdoor	-
2	CRM2	Storage	3,000	Indoor	Operations indoor
3	CRM3	Storage	2,800	Indoor	Operations indoor
11	No.2 Works 1	Construction	1,000	Outdoor	-
12	No.2 Works 2	Construction	3,000	Outdoor	-
13	No.2 Works 3	Construction	1,500	Outdoor	-
14	No.2 Works 4	Storage	3,000	Outdoor	-
15	No.2 Works 5	Storage	7,000	Outdoor	-
16	No.2 Works 6	Storage	7,000	Outdoor	-
10	No.2 Products Berth	Storage	2,500	Outdoor	-
17	Recycling Area 1	Storage / cleaning	14,000	3,000 indoor 11,000 outdoor	No change to the use of the space as it is used today
18	Recycling Area 2	Processing	88,000	Outdoor	No change to the use of the space as it is used today
19	Recycling Area 3	Processing	25,000	Outdoor	No change to the use of the space as it is used today
20	Recycling Area 4	Storage / Processing	11,000	Outdoor	-
21	Recycling Area 5	Storage / Processing	20,000	Outdoor	
22	Recycling Area 6	Storage	4,500	Outdoor	No change to the use of the space as it is used today
23	Springhill Electrical	Storage	3,000	Indoor	Operations indoor

6.1.2 Construction emissions

The key emissions to air from the construction of the project were identified upon review of the construction methodology. It is anticipated that particulates (TSP and PM_{10}) including some contaminants and vehicle exhaust emissions may occur during construction.

Relatively minor particulate emissions are expected from removal, demolition, repair and installation activities with the use of localised emission controls such as watering. Construction particulate emissions will vary based on the specific activities being undertaken at any time (i.e. particulate emissions will not occur at all times).

It is anticipated that some particulate emissions may include contaminants and heavy metals from removal of infrastructure. With dust management measures in place, contaminant emission will be relatively minor and will be controlled at the source.

Some activities will have a higher potential for particulate emissions including blasting, heavy demolition and use of rock breaking equipment. Activities with a higher potential for particulate emissions will be managed by implementation of a construction dust management plan including management measures outlined in Section 11.

Minor vehicle exhaust emissions are expected throughout the construction period however, sources will be discontinuous, transient, and mobile, and therefore the air quality risk associated with vehicle emissions during construction is low.

An overview of potential emissions to air that could occur during construction of the project is summarised in Table 6.3.

Table 6.3 Summary of potential construction emissions to air

Construction activity	Activity description	Overview of emission sources
Removal activities including removal of remaining burden materials, iron skull, worn carbon block refractories, worn refractories in the remainder of the vessel	– Use of mobile plant and equipment to remove burden materials – Iron skull demolition using explosives (noting that only small sections of the skull will be blasted away at any one time to minimise the amount of explosive used) – Jack picking and breaking up refractory material into smaller pieces for extraction – Removal of material by the telescopic boom excavator	– Minor particulate emissions from use of plant/equipment – Particulate emissions from blasting and heavy demolition
Demolition activities including demolition of cooling staves, hot blast main refractory lining, clarifier tank and associated equipment where required	– Use of power tools and mobile plant/equipment to undertake demolition as required	– Minor particulate emissions from use of plant/equipment
Repair, maintenance and upgrade activities including repairs to the blast furnace shell and repair, maintenance and/or upgrade of ancillary equipment	– Use of power tools and mobile plant/equipment to undertake repairs, maintenance and upgrades as required	– Minor particulate emissions from use of plant/equipment
Installation activities including installation of a new clarifier tank (and associated equipment), the new hearth, sidewall refractories and staves and a new slag granulation system	– Use of power tools and mobile plant/equipment to install new equipment as required	– Minor particulate emissions from use of plant/equipment
General construction activities and preparation of construction areas including stockpiles, storage and laydown	– Use of power tools and mobile plant/equipment to install new equipment as required	– Minor particulate emissions from use of plant/equipment

It is anticipated that the majority of particulate emissions will occur from:

- Construction areas (No.2 Works 1, No.2 Works 2 and No.2 Works 3)
- Processing areas (Recycling Area 4 and Recycling Area 5)

Material and plant storage areas (which account for majority of ancillary areas) are not expected to emit significant particulate emissions. It is assumed that any material with potential to release particulate emissions will be stored in designated storage areas away from the site boundary.

6.2 Project commissioning

6.2.1 Commissioning overview

Prior to operation, the project will undergo a period of commissioning, a once off procedure that is necessary to allow commencement of operation. It is anticipated the commissioning process will take several months to occur, after which, the furnace will be blown in and then gradually uprated over a period of approximately 6 weeks until full production is achieved.

The commissioning process is outlined as follows:

- Quality assurance documentation checked.
- Handover from construction to commissioning.
- Cooling systems filled and flushed.
- Hydraulic and lubrication systems filled and flushed.
- System pressure and leak tests conducted.
- All services brought back into live condition.

- Cold commissioning of all equipment e.g. running of conveyors, drives, vibro-feeders, screens, probes, stockrods, tapping drills, clayguns, manipulators, tilting spouts, tilting platforms, fans, blowers, pumps, stroking valves and cylinders, setting limits, speeds and flows, etc.
- Control system commissioning including interlock and functionality testing for each plant area.
- Furnace pressure and leak tests conducted. Various parts of plant reheated.
- The furnace proper will be dried out using hot blast at limited temperatures, then charged with kindling (comprising firewood/railway sleepers and coke) and filled with a mix of burden material (coke and iron ore).
- The gas systems will be purged ready for use and the furnace will be 'blown in'. This involves the introduction of hot blast air through the tuyeres, with gas initially discharged through the furnace bleeders until its composition is satisfactory for internal use, at which time the gas is then diverted into the gas cleaning system.
- The furnace is progressively heated until regular casting of iron and slag commences, although the iron quality is not usable initially and it will take several days to produce useable iron which can be converted to steel.
- The furnace is then uprated to target production over the following weeks, reaching full production after a period of approximately 6 weeks.

6.2.2 Commissioning emissions

During commissioning, the primary emissions to air are expected to comprise of combustion pollutants including carbon monoxide (CO), carbon dioxide (CO_2), hydrogen (H_2), and particulates, that will occur during charging, purging and heating of the furnace.

During blow-in, gas generated during the initial combustion period varies slightly in composition when compared to blast furnace gas and is unable to be re-used in other areas at PKSW. As a result, this gas will be vented through the furnace top bleeders being directed through the gas cleaning system. This will result in visible emissions for a period of approximately two to three hours. Once the composition of the blast furnace gas is suitable for re-use in other areas at PKSW, it will be reintroduced to the interworks gas system and the bleeding to atmosphere will stop.

During blow-in, the tapholes at the bottom of the blast furnace are open allowing the escape of combusting gas mixtures, which will be ignited, until enough slag is generated to seal the tapholes. As soon as the tapholes are sealed off, ironmaking will commence and runner covers will be installed as operations allow. Molten liquids will be diverted to temporary pits external to the casthouse until such time as the quality is deemed sufficient to return to normal ladle operations. It is estimated it will take 3-4 days before the normal de-dusted casthouse cover arrangement can be adopted. Casthouse dedusting system will be operating throughout the recovery with reduced capacity initially due to the removal of the runner covers.

It is noted that emissions control at 6BF is expected to be an improvement over that of 5BF due to the presence of the secondary dedusting hood, including during commissioning.

No air emissions sampling data from commissioning was available at the time of this assessment and therefore emissions to air during commissioning were not able to be quantified.

6.3 Project operation

6.3.1 Operational overview

Normal operation of PKSW will result in emissions to air from stacks, flares, and fugitive emissions from buildings and outdoor sources. Emissions to air are created by various operational activities including:

- Processing and transport of raw materials (iron ore, coal, coke, fluxes)
- Production of sinter (agglomeration of iron ore, coke and limestone dust) for use within the blast furnace
- Production of approximately 2.7 Mtpa of iron from 6BF
- Processing of approximately 0.88 Mtpa of blast furnace slag for reuse as construction products

The ironmaking process produces a number of point-source and fugitive air emissions, including:

- Flue gas discharged from the stoves waste heat stack
- Filtered and unfiltered air from the casthouse and stockhouse
- Steam and H_2S from the slag granulation cooling tower
- BFG from furnace top bleeders during maintenance and overpressure events
- BFG and nitrogen gas discharged through primary relief valve via a silencer during charging
- H_2S and SO_2 from slag pits
- SO_2 from the casthouse
- Dust from the raw materials and charging conveyors, off gas system and traffic

Surplus gases produced from the blast furnace vessel are directed from the top of the furnace to be treated by the gas cleaning system.

The gas cleaning system comprises a raw gas main, dust collector and a high energy scrubber. Collected dust is periodically discharged into a hopper, and agglomerated for transfer to the sinter plant feed beds via trucks.

Impurities are removed from the gas via washing with high velocity, recycled, closed loop water. This creates a slurry which is thickened and transferred via a pipeline to the sinter plant dewatering plant. The cleaned gas, BFG, is then piped to the 6BF hot blast stoves for use as a heating fuel, or to the BFG gas main to be used as an energy source for other processes throughout PKSW.

6.3.2 Operation emissions

A detailed emissions inventory including source properties and pollutant mass emissions for the site was provided by BlueScope based on site sampling data and NPI estimation techniques. The detailed emission inventory is provided across the following tables:

- Table 6.5 – Source properties for stack sources
- Table 6.6 – Mass emission rates for stack sources
- Table 6.7 – Source properties for fugitive sources
- Table 6.8 – Mass emission rates for fugitive sources

The ‘scenario’ column indicates which scenario the source was modelled in. An explanation of scenario naming is provided below:

- **PKSW** – Sources located within the wider PKSW site. These sources are unaffected by the project and occur during the existing scenario and will continue to occur during the future scenario.
- **5BF** – 5BF sources related with use of 5BF, these sources will cease operation when 6BF starts operating.
- **6BF** – 6BF sources related with use of 6BF, these sources will be operating when 5BF has ceased ironmaking operation.

Sources unique to 5BF or 6BF scenarios are identified in Table 6.4.

Table 6.4 Summary of sources exclusive to 5BF or 6BFscenarios

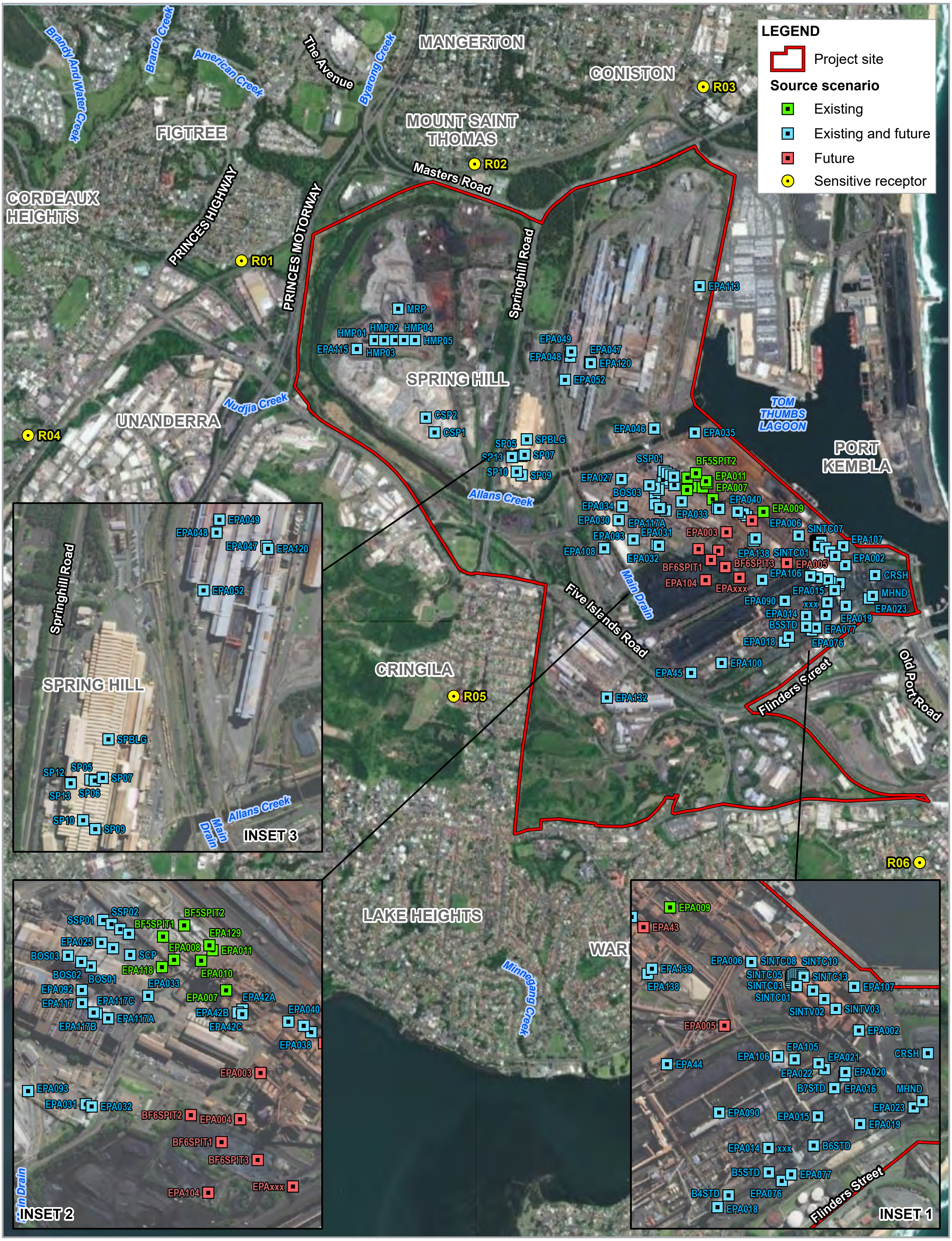
5BF scenario sources	6BF scenario sources
Stack sources: – EPA007 – No 5 Blast Furnace Stove Heating Stack – EPA008 – No 5 Blast Furnace Cast House Dedusting Stack 1 – EPA009 – No 5 Blast Furnace Stock House Dedusting Stack – EPA010 – No 5 Blast Furnace - No 2 Slag Granulator Stack – EPA011 – No 5 Blast Furnace - No 1 Slag Granulator Stack	Stack sources: – EPA003 – No 6 Blast Furnace Stove Waste Gas Stack – EPA004 – No 6 Blast Furnace Cast House Dedusting Stack – EPA005 – No 6 Blast Furnace Stock House Dedusting Stack – EPA43 – 6BF BFG excess gas bleeder stack A – 6BF BFG excess gas bleeder stack B – 6BF Slag Granulation Cooling Towers

5BF scenario sources	6BF scenario sources
– EPA129 – No 5 Blast Furnace - No 3 Slag Granulator Stack – EPA118 – No 5 Blast Furnace Casthouse Dedusting Stack – EPA42A – BFG Flare Stack A – EPA42B – BFG Flare Stack B – EPA42C – BFG Flare Stack C	
Fugitive sources: – BF5SPIT1 – Blast Furnace 5 Slag Pit 1 – BF5SPIT2 – Blast Furnace 5 Slag Pit 2	Fugitive sources: – BF6SPIT1 – Blast Furnace 6 Slag Pit 1 – BF6SPIT2 – Blast Furnace 6 Slag Pit 2 – BF6SPIT3 – Blast Furnace 6 Slag Pit 3 – BF6SPIT4 – Blast Furnace 6 Slag Pit 4 – BF6SPIT5 – Blast Furnace 6 Slag Pit 5
The following sources do not yet have an assigned ID: – Gas Processing VRS Outlet (Nº5 WHS) – 6BF BFG excess gas bleeder stack B – 6BF Slag Granulation Cooling Tower	

The slag granulating system proposed for 6BF includes a condensing unit which uses water sprays to condense steam generated during granulation. This condensate is collected and circulated through a cooling tower with the water from slag dewatering. H_2S emissions from the granulation process may be emitted from the slag granulation cooling tower. It is expected that a reduction in H_2S concentration will be achieved by this process in comparison to existing operations, as the H_2S will be dissolved into the cooling tower water. H_2S emissions for this source were based on sampling of 5BF and no reductions were applied, which is likely to be conservative.

6.3.3 Site layout

The location of all sources are shown on Figure 6.1.



Paper Size ISO A4

0 0.2 0.4 0.6 0.8 1

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Air Quality Impact Assessment

Project No. 12541101
Revision No. 0
Date 14/10/2021

PKSW layout and source locations

FIGURE 6.1

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Print date: 14 Oct 2021 - 16:33

Data source: LPI: DCDB/DTDB, 2017. Commonwealth of Australia (Geoscience Australia) 250K Topographic Data Series 3, 2006. World Imagery: Maxar. Created by: tmorton

Table 6.5 Source properties for stack sources

Scenario	ID	Description	Source properties					
			X coordinate (m)	Y coordinate (m)	Stack height (m)	Diameter (m)	Exhaust velocity (m/s)	Exhaust temperature (K)
PKSW	EPA002	Sinter Machine Room Dedusting Stack	306690	6184247	45	5.0	12.1	329
6BF	EPA003	No 6 Blast Furnace Stove Heating Stack	305975	6184445	70	4.0	7.6	400
6BF	EPA004	No 6 Blast Furnace Cast House Dedusting Stack	305926	6184334	36	3.7	25.2	337
6BF	EPA005	No 6 Blast Furnace Stock House Dedusting Stack	306339	6184260	26	3.0	28.3	304
PKSW	EPA006	No 6 Blast Furnace Highline Dedusting Stack	306409	6184426	30	1.8	26.8	303
5BF	EPA007	No 5 Blast Furnace Stove Heating Stack	305892	6184645	61	5.9	3.5	400
5BF	EPA008	No 5 Blast Furnace Cast House Dedusting Stack 1	305767	6184718	23	3.3	13.0	337
5BF	EPA009	No 5 Blast Furnace Stock House Dedusting Stack	306197	6184569	25	2.4	13.9	300
5BF	EPA010	No 5 Blast Furnace - No 2 Slag Granulator Stack	305832	6184716	70	4.0	3.3	340
5BF	EPA011	No 5 Blast Furnace - No 1 Slag Granulator Stack	305859	6184741	70	4.0	3.3	340
5BF	EPA129	No 5 Blast Furnace - No 3 Slag Granulator Stack	305852	6184753	70	4.0	3.3	340
PKSW	EPA014	No 5 Coke Oven Battery Heating Stack	306454	6183941	90	2.6	14.4	442
PKSW	EPA015	No 6 Coke Oven Battery Heating Stack	306583	6184023	90	2.8	16.5	447
PKSW	EPA016	No 7a Coke Oven Battery Heating Stack	306653	6184128	140	7.7	2.2	423
PKSW	EPA018	No 4/5 Coke Oven Battery Quench Tower Stack	306321	6183786	52	5.5	14.7	338
PKSW	EPA019	No 6 Coke Oven Battery Quench Tower Stack	306693	6184003	52	5.1	15.4	339
PKSW	EPA020	No 7a Coke Oven Battery Quench Tower Stack	306655	6184139	35	14.0	2.0	339
PKSW	EPA021	No 7a Battery Fume Suppression Plant No 1 Stack	306601	6184147	26	3.0	9.9	315
PKSW	EPA022	No 7a Battery Fume Suppression Plant No 2 Stack	306585	6184162	26	3.0	11.4	312
PKSW	EPA023	Coke Screen House Dedusting Stack	306833	6184047	17	1.8	17.1	301
PKSW	EPA024	BOS No 1 Vessel Flare Stack	305620	6184746	114	8.0	20.4	1273
PKSW	EPA025	BOS No 2 Vessel Flare Stack	305591	6184759	114	8.0	20.4	1273
PKSW	EPA027	BOS No 2 Secondary Dedusting Stack	305342	6184766	30	4.5	23.7	327
PKSW	EPA030	Lime Kiln Waste Heat Stack	305326	6184519	28	2.4	18.9	434
PKSW	EPA031	Lime Kiln Storage bins - Enacon Baghouse Stack	305554	6184370	11	0.6	10.9	303
PKSW	EPA032	Lime Kiln Storage bins - Bahco Baghouse Stack	305568	6184365	3	0.7	11.5	297
PKSW	EPA033	Lime Kiln Transfer House Stack	305704	6184631	56	0.4	7.6	295
PKSW	EPA034	Slab Handling - Slab Scarfing Machine Stack	305348	6184602	37	2.6	5.6	301
PKSW	EPA035	Raw Material Road Rail Dump Station Stack	305784	6185046	52	1.7	14.5	299

Scenario	ID	Description	Source properties					
			X coordinate (m)	Y coordinate (m)	Stack height (m)	Diameter (m)	Exhaust velocity (m/s)	Exhaust temperature (K)
PKSW	EPA038	No 2 Blower Station 23 Boiler Stack	306097	6184544	60	3.7	8.9	400
PKSW	EPA039	No 2 Blower Station 24 Boiler Stack	306079	6184559	60	3.7	8.9	400
PKSW	EPA040	No 2 Blower Station 25 Boiler Stack	306042	6184569	61	3.7	8.9	400
PKSW	EPA046	Hydrogen Reformer Furnace Stack	305540	6185070	32	0.5	20.7	979
PKSW	EPA047	No 1 Walking Beam Furnace Stack	305153	6185471	97	4.7	5.5	400
PKSW	EPA048	3500mm Furnace No 1 Stack	305033	6185503	25	2.5	19.5	400
PKSW	EPA049	3500mm Furnace No 2 Stack	305040	6185534	19	3.2	11.9	353
PKSW	EPA052	GEGA M/C Cut to Length Stack	305002	6185364	15	1.2	16.9	304
PKSW	EPA076	No 4/5 Battery Fume Control Stack	306489	6183855	24	2.8	10.7	318
PKSW	EPA077	No 6 Battery Fume Control Stack	306513	6183872	24	2.8	9.7	317
PKSW	EPA090	No 5 & 6 Hammer Mills Dedusting Stack	306326	6184033	12	0.6	12.0	294
PKSW	EPA092	CAS Baghouse Stack	305544	6184645	30	0.7	10.6	330
PKSW	EPA093	Lime Kiln Discharge Building Baghouse Stack	305415	6184402	5	0.7	17.1	313
PKSW	EPA100	Gas Processing Sulphate Plant Stack	305946	6183659	18	0.9	8.6	344
PKSW	EPA105	PCI Hot Gas Exhaust Stack	306522	6184172	62	1.3	8.4	435
PKSW	EPA106	PCI Facility - Stacks Serving Depressurising Bag Filters	306479	6184180	55	0.5	8.1	404
PKSW	EPA107	Sinter Plant Waste Gas Cleaning	306678	6184361	100	6.5	16.7	414
PKSW	EPA108	Scrap Cutting Dust Collector Baghouse	305238	6184349	15	1.0	10.5	337
PKSW	EPA113	Ecocem Slag Dryer Dust Collector	305813	6185928	10	0.8	14.5	375
PKSW	EPA115	Metserv Iron Dumping/Cutting Shed Baghouse Stack	303749	6185549	20	1.6	12.3	315
PKSW	EPA117	No 1, 2 & 3 Slab Caster Stacks	305545	6184614	40	0.4	50.0	330
PKSW	EPA117A	No 1, 2 & 3 Slab Caster Stacks	305608	6184577	40	0.4	50.0	330
PKSW	EPA117B	No 1, 2 & 3 Slab Caster Stacks	305580	6184588	40	0.4	50.0	330
PKSW	EPA117C	No 1, 2 & 3 Slab Caster Stacks	305573	6184591	40	0.4	50.0	330
5BF	EPA118	No 5 Blast Furnace Casthouse Dedusting Stack	305737	6184700	22	2.8	17.0	335
PKSW	EPA120	No 2 Walking Beam Furnace Stack	305158	6185464	45	3.1	10.1	548
PKSW	EPA132	OzRock Rotary Kiln Drier Stack	305255	6183450	25	0.6	16.0	358
PKSW	EPA138	No2 Blower Station Package Boiler No. 11	306139	6184395	30	1.9	4.5	397
PKSW	EPA139	No2 Blower Station Package Boiler No. 12	306150	6184408	30	1.9	4.5	397
PKSW	EPA44[2]	COG Flare Stacks (42" Bleeder)	306189	6184159	57	0.6	20.0	1273
PKSW	EPA45[2]	COG Flare Stacks (30" Bleeder)	305762	6183599	29	0.8	20.0	1273
5BF	EPA42A[2]	BFG Flare Stack A	305931	6184598	85	1.6	20.0	1273
5BF	EPA42B[2]	BFG Flare Stack B	305920	6184591	85	1.6	20.0	1273
5BF	EPA42C[2]	BFG Flare Stack C	305931	6184587	85	0.9	20.0	1273
PKSW		Gas Processing VRS Outlet (Nº5 WHS)	306454	6183941	90	0.5	2.9	348
PKSW	SP05	Springhill 5 (MCL1 Selas Stack)	304730	6184908	39	1.6	5.6	479

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[2] Due to modelling constraints, model default velocity and temperature were adopted for flare sources

Scenario	ID	Description	Source properties					
			X coordinate (m)	Y coordinate (m)	Stack height (m)	Diameter (m)	Exhaust velocity (m/s)	Exhaust temperature (K)
PKSW	SP06	Springhill 6 (MCL2 Selas Stack)'	304740	6184906	39	1.7	13.0	813
PKSW	SP07	Springhill 7 (MCL2 Selas Stack)	304759	6184912	28	1.5	9.9	1440
PKSW	SP09	Springhill 9 (MCL2 Passivation Stack)	304741	6184789	10	0.4	6.3	307
PKSW	SP10	Springhill 10 (MCL1 Passivation Exhaust)	304712	6184810	10	0.4	9.9	296
PKSW	SP12	Springhill 12 (CPL3 Prime Oven Incinerator)	304682	6184902	35	1.2	11.3	650
PKSW	SP13	Springhill 13 (CPL3 Finish Oven Incinerator)	304682	6184899	35	1.2	14.8	641
6BF	EPA43	6BF BFG excess gas bleeder stack A	306128	6184517	88	1.6	20.0	1273
6BF		6BF BFG excess gas bleeder stack B	306131	6184514	88	1.6	20.0	1273
6BF		6BF Slag Granulation Cooling Tower	306053	6184172	35	15.6	3.8	323

Table 6.6 ***Mass emission rates for stack sources***

Scenario	ID	Description	Pollutant emission rates (g/s)				
			TSP	PM_{10}	SO_2	NOx	H_2S
PKSW	EPA002	Sinter Machine Room Dedusting Stack	1.1	0.64			
6BF	EPA003	No 6 Blast Furnace Stove Heating Stack	1.1	0.85	20	6.1	0.02
6BF	EPA004	No 6 Blast Furnace Cast House Dedusting Stack	3.7	1.6			
6BF	EPA005	No 6 Blast Furnace Stock House Dedusting Stack	3	0.59			
PKSW	EPA006	No 6 Blast Furnace Highline Dedusting Stack	0.036	0.036			
5BF	EPA007	No 5 Blast Furnace Stove Heating Stack	0.88	0.29	23	9.8	
5BF	EPA008	No 5 Blast Furnace Cast House Dedusting Stack 1	0.68	0.3			
5BF	EPA009	No 5 Blast Furnace Stock House Dedusting Stack	1.4	0.28			
5BF	EPA010	No 5 Blast Furnace - No 2 Slag Granulator Stack		0.13			0.16
5BF	EPA011	No 5 Blast Furnace - No 1 Slag Granulator Stack		0.13			0.16
5BF	EPA129	No 5 Blast Furnace - No 3 Slag Granulator Stack		0.13			0.16
PKSW	EPA014	No 5 Coke Oven Battery Heating Stack	0.84	0.46	6.3	20	0.0017
PKSW	EPA015	No 6 Coke Oven Battery Heating Stack	1.9	1.2	7.4	24	0.0024
PKSW	EPA016	No 7a Coke Oven Battery Heating Stack	1.1	0.76	10	17	0.0019
PKSW	EPA018	No 4/5 Coke Oven Battery Quench Tower Stack	2.4	0.37	0.14	0.08	0.24
PKSW	EPA019	No 6 Coke Oven Battery Quench Tower Stack	3.4	0.53	0.2	0.12	0.24
PKSW	EPA020	No 7a Coke Oven Battery Quench Tower Stack	3.2	0.5	0.19	0.11	0.24
PKSW	EPA021	No 7a Battery Fume Suppression Plant No 1 Stack	0.051	0.033	0.45	0.13	0.0089
PKSW	EPA022	No 7a Battery Fume Suppression Plant No 2 Stack	0.051	0.033	0.45	0.13	0.0089
PKSW	EPA023	Coke Screen House Dedusting Stack	0.25	0.2			
PKSW	EPA024	BOS No 1 Vessel Flare Stack	0.16	0.16	0.045	0.52	0.00091
PKSW	EPA025	BOS No 2 Vessel Flare Stack	0.33	0.33	0.04	0.52	0.00091
PKSW	EPA027	BOS No 2 Secondary Dedusting Stack	0.68	0.21	1.3	0.61	
PKSW	EPA030	Lime Kiln Waste Heat Stack	0.15	0.077	3.9	7.1	
PKSW	EPA031	Lime Kiln Storage bins - Enacon Baghouse Stack	0.037	0.023			
PKSW	EPA032	Lime Kiln Storage bins - Bahco Baghouse Stack	0.019	0.011			
PKSW	EPA033	Lime Kiln Transfer House Stack	0.0015	0.00072			
PKSW	EPA035	Raw Material Road Rail Dump Station Stack	0.26	0.063			
PKSW	EPA038	No 2 Blower Station 23 Boiler Stack	0.57	0.18	13	5.4	
PKSW	EPA039	No 2 Blower Station 24 Boiler Stack	0.57	0.18	13	5.4	
PKSW	EPA040	No 2 Blower Station 25 Boiler Stack	0.28	0.28	20	9.5	
PKSW	EPA047	No 1 Walking Beam Furnace Stack	0.11	0.1	13	7.2	
PKSW	EPA048	3500mm Furnace No 1 Stack	0.028	0.028	3.6	1.9	
PKSW	EPA049	3500mm Furnace No 2 Stack	0.028	0.028	3.6	1.9	
PKSW	EPA052	GEGA M/C Cut to Length Stack	0.07	0.06	0.05	0.04	
PKSW	EPA076	No 4/5 Battery Fume Control Stack	0.037	0.032	0.21	0.11	0.0062
PKSW	EPA077	No 6 Battery Fume Control Stack	0.037	0.032	0.21	0.11	0.0062
PKSW	EPA090	No 5 & 6 Hammer Mills Dedusting Stack	0.045	0.022			
PKSW	EPA092	CAS Baghouse Stack	0.022	0.021			
PKSW	EPA093	Lime Kiln Discharge Building Baghouse Stack	0.1	0.014		1.2	
PKSW	EPA100	Gas Processing Sulphate Plant Stack	0.066	0.045			

Scenario	ID	Description	Pollutant emission rates (g/s)				
			TSP	PM_{10}	SO_2	NOx	H_2S
PKSW	EPA105	PCI Hot Gas Exhaust Stack	0.053	0.033			
PKSW	EPA106	PCI Facility - Stacks Serving Depressurising Bag Filters	0.0056	0.014			
PKSW	EPA107	Sinter Plant Waste Gas Cleaning	1.2	0.84	46	82	
PKSW	EPA113	Ecocem Slag Dryer Dust Collector		0.074		0.051	
PKSW	EPA115	Metserv Iron Dumping/Cutting Shed Baghouse Stack	0.086	0.046		0.1	
PKSW	EPA117	No 1, 2 & 3 Slab Caster Stacks	0.21	0.18			
PKSW	EPA117A	No 1, 2 & 3 Slab Caster Stacks	0.21	0.18			
PKSW	EPA117B	No 1, 2 & 3 Slab Caster Stacks	0.21	0.18			
PKSW	EPA117C	No 1, 2 & 3 Slab Caster Stacks	0.21	0.18			
5BF	EPA118	No 5 Blast Furnace Casthouse Dedusting Stack	0.85	0.36			
PKSW	EPA120	No 2 Walking Beam Furnace Stack	0.55	0.55	15	8	
PKSW	EPA132	OzRock Rotary Kiln Drier Stack	0.27				
PKSW	EPA138	No2 Blower Station Package Boiler No. 11	0.00051	0.00038	0.0026	0.039	0.00079
PKSW	EPA139	No2 Blower Station Package Boiler No. 12	0.00051	0.00038	0.0026	0.039	0.00079
PKSW	EPA44	COG Flare Stacks (42" Bleeder)	0.022	0.022	2.9	0.38	
PKSW	EPA45	COG Flare Stacks (30" Bleeder)	0.022	0.022	2.9	0.38	
5BF	EPA42A	BFG Flare Stack A	0.047	0.0095	0.32	0.012	
5BF	EPA42B	BFG Flare Stack B	0.047	0.0095	0.32	0.012	
5BF	EPA42C	BFG Flare Stack C	0.047	0.0095	0.32	0.012	
PKSW		Gas Processing VRS Outlet (Nº5 WHS)	0.00094	0.00094	0.0098		0.038
PKSW	SP05	Springhill 5 (MCL1 Selas Stack)				0.16	
PKSW	SP06	Springhill 6 (MCL2 Selas Stack)'				0.25	
PKSW	SP07	Springhill 7 (MCL2 Selas Stack)				0.11	
PKSW	SP09	Springhill 9 (MCL2 Passivation Stack)	0.0017	0.0031			
PKSW	SP10	Springhill 10 (MCL1 Passivation Exhaust)	0.000021				
PKSW	SP12	Springhill 12 (CPL3 Prime Oven Incinerator)	0.03	0.03	0.31	0.19	
PKSW	SP13	Springhill 13 (CPL3 Finish Oven Incinerator)	0.05	0.05	0.058	0.29	
6BF	EPA43	6BF BFG excess gas bleeder stack A	0.14	0.029	0.96	0.036	
6BF		6BF BFG excess gas bleeder stack B	0.14	0.029	0.96	0.036	
6BF		6BF Slag Granulation Cooling Tower					0.48

Table 6.7 Source properties for fugitive sources

Scenario	ID	Description	Source properties								
			Source type	X coordinate (m)	Y coordinate (m)	Stack or volume height (m)	Diameter (m)	Exhaust velocity (m/s)	Exhaust temperature (K)	Sigma Y (m)	Sigma Z (m)
PKSW	SINTC01	Sinter Cooler Fugitive Emissions 01	POINT	306521.7	6184365.07	10.0	6.2	4.0	579		
PKSW	SINTC02	Sinter Cooler Fugitive Emissions 02	POINT	306517.7	6184368.07	10.0	6.2	4.0	579		
PKSW	SINTC03	Sinter Cooler Fugitive Emissions 03	POINT	306514.7	6184372.07	10.0	6.2	3.0	487		
PKSW	SINTC04	Sinter Cooler Fugitive Emissions 04	POINT	306512.7	6184377.07	10.0	6.2	3.0	487		
PKSW	SINTC05	Sinter Cooler Fugitive Emissions 05	POINT	306512.7	6184383.07	10.0	6.2	3.0	487		
PKSW	SINTC06	Sinter Cooler Fugitive Emissions 06	POINT	306514.7	6184388.07	10.0	6.2	3.0	487		
PKSW	SINTC07	Sinter Cooler Fugitive Emissions 07	POINT	306517.7	6184392.07	10.0	6.2	3.4	459		
PKSW	SINTC08	Sinter Cooler Fugitive Emissions 08	POINT	306522.7	6184396.07	10.0	6.2	3.4	459		
PKSW	SINTC09	Sinter Cooler Fugitive Emissions 09	POINT	306527.7	6184397.07	10.0	6.2	3.4	459		
PKSW	SINTC10	Sinter Cooler Fugitive Emissions 10	POINT	306532.7	6184397.07	10.0	6.2	3.4	459		
PKSW	SINTC11	Sinter Cooler Fugitive Emissions 11	POINT	306537.7	6184396.07	10.0	6.2	1.6	409		
PKSW	SINTC12	Sinter Cooler Fugitive Emissions 12	POINT	306542.7	6184392.07	10.0	6.2	1.6	409		
PKSW	SINTC13	Sinter Cooler Fugitive Emissions 13	POINT	306545.7	6184388.07	10.0	6.2	1.6	409		
PKSW	SINTC14	Sinter Cooler Fugitive Emissions 14	POINT	306527.7	6184363.07	10.0	6.2	4.0	579		
PKSW	SINTV01	Sinter Building Fugitive Emissions 01	VOLUME	306570.4	6184351.6	10.0				9.3	9.3
PKSW	SINTV02	Sinter Building Fugitive Emissions 02	VOLUME	306600	6184329.3	10.0				9.3	9.3
PKSW	SINTV03	Sinter Building Fugitive Emissions 03	VOLUME	306629.7	6184303.7	10.0				9.3	9.3
PKSW	BOS01	BOS01 Roof Vent Fugitive Emissions	VOLUME	305566	6184702	41.2				3.7	1.2
PKSW	BOS02	BOS02 Roof Vent Fugitive Emissions	VOLUME	305543	6184713	41.2				3.7	1.2
PKSW	BOS03	BOS03 Roof Vent Fugitive Emissions	VOLUME	305511	6184728	41.2				3.7	1.2
PKSW	CRSH	Crusher	VOLUME	306870	6184188	2.5				1.2	2.3
PKSW	HMP01	Hot Metal Pit 01	VOLUME	303856	6185603	2.5				12.0	2.3
PKSW	HMP02	Hot Metal Pit 02	VOLUME	303914	6185602	2.5				12.0	2.3
PKSW	HMP03	Hot Metal Pit 03	VOLUME	303980	6185603	2.5				12.0	2.3
PKSW	HMP04	Hot Metal Pit 04	VOLUME	304033	6185603	2.5				12.0	2.3
PKSW	HMP05	Hot Metal Pit 05	VOLUME	304099	6185603	2.5				12.0	2.3
PKSW	MHND	Materials Handling - VE	VOLUME	306856	6184063	5.0				2.3	4.7

Scenario	ID	Description	Source properties								
			Source type	X coordinate (m)	Y coordinate (m)	Stack or volume height (m)	Diameter (m)	Exhaust velocity (m/s)	Exhaust temperature (K)	Sigma Y (m)	Sigma Z (m)
PKSW	CSP1	Recycling Area - Crushing/Screening Plant 01 - VE	VOLUME	304217	6185047	2.5				27.7	2.3
PKSW	CSP2	Recycling Area - Crushing/Screening Plant 02 - VE	VOLUME	304164	6185136	2.5				27.7	2.3
PKSW	MRP	Recycling Area - Metal Recovery Plant - VE	VOLUME	303998	6185792	2.5				25.4	2.3
PKSW	SCP	Slag Cooling Pot	VOLUME	305661	6184730	2.5				7.7	2.3
PKSW	SSP01	Slag Stockpile 01	VOLUME	305596	6184814	2.5				4.7	2.3
PKSW	SSP02	Slag Stockpile 02	VOLUME	305616	6184804	2.5				4.7	2.3
PKSW	SSP03	Slag Stockpile 03	VOLUME	305637	6184792	2.5				4.7	2.3
PKSW	SSP04	Slag Stockpile 04	VOLUME	305658	6184781	2.5				4.7	2.3
PKSW	SPBLG	Springhill Building Fugitives	VOLUME	304773	6185005	8.9				26.5	46.2
PKSW	B4STD	Battery 4 (standpipe emissions)	POINT	306350	6183817	15.0	0.5	6.0	923		
PKSW	B5STD	Battery 5 (standpipe emissions)	POINT	306455	6183877	15.0	0.5	6.0	923		
PKSW	B6STD	Battery 6 (standpipe emissions)	POINT	306572	6183947	15.0	0.5	6.0	923		
PKSW	B7STD	Battery 7A (standpipe emissions)	POINT	306626	6184097	15.0	0.5	6.0	923		
5BF	BF5SPIT1	Blast Furnace 5 Slag Pit 1	VOLUME	305740	6184774	2.5				3.5	2.3
5BF	BF5SPIT2	Blast Furnace 5 Slag Pit 2	VOLUME	305791	6184801	2.5				3.5	2.3
6BF	BF6SPIT1	Blast Furnace 6 Slag Pit 1	VOLUME	305881	6184279	5.0				13.7	4.7
6BF	BF6SPIT2	Blast Furnace 6 Slag Pit 2	VOLUME	305807	6184344	5.0				13.7	4.7
6BF	BF6SPIT3	Blast Furnace 6 Slag Pit 3	VOLUME	305968	6184236	5.0				13.7	4.7
6BF	BF6SPIT4	Blast Furnace 6 Slag Pit 4	VOLUME	305925	6184255	5.0				13.7	4.7
6BF	BF6SPIT5	Blast Furnace 6 Slag Pit 5	VOLUME	305843	6184312	5.0				6.8	2.3
PKSW	DG01	Diffuse gas COG, BFG & NG EF's 01	VOLUME	306291.52	6183877.23	1.0				4.7	0.5
PKSW	DG02	Diffuse gas COG, BFG & NG EF's 02	VOLUME	306334.84	6183894	1.0				4.7	0.5
PKSW	GPF01	Gas Processing Fugitives01	VOLUME	305843.82	6183726.98	1.0				11.6	0.5
PKSW	GPF02	Gas Processing Fugitives02	VOLUME	306243.07	6183941.56	1.0				11.6	0.5
PKSW	GPF03	Gas Processing Fugitives03	VOLUME	306608.9	6184145.58	1.0				11.6	0.5
PKSW	GPF04	Gas Processing Fugitives04	VOLUME	306044.33	6184458.65	1.0				11.6	0.5
PKSW	GPF05	Gas Processing Fugitives05	VOLUME	305528.99	6184701.36	1.0				11.6	0.5
PKSW	GPF06	Gas Processing Fugitives06	VOLUME	305319.72	6185124.59	1.0				11.6	0.5
PKSW	GPF07	Gas Processing Fugitives07	VOLUME	305373.63	6185636.73	1.0				11.6	0.5
PKSW	GPF08	Gas Processing Fugitives08	VOLUME	305461.23	6186078.12	1.0				11.6	0.5
PKSW	COF01	Coke Ovens Fugitives01	VOLUME	306444.43	6183871.87	1.0				4.7	0.5
PKSW	COF02	Coke Ovens Fugitives02	VOLUME	306538.94	6183928.09	1.0				4.7	0.5
PKSW	COF03	Coke Ovens Fugitives03	VOLUME	306630.2	6183983.09	1.0				4.7	0.5
PKSW	COF04	Coke Ovens Fugitives04	VOLUME	306573.98	6184064.16	1.0				4.7	0.5
PKSW	COF05	Coke Ovens Fugitives05	VOLUME	306613.08	6184085.75	1.0				4.7	0.5

Table 6.8 Mass emission rates for fugitive sources

Scenario	ID	Description	Pollutant emission rates (g/s)				
			TSP	PM_{10}	SO_2	NOx	H_2S
PKSW	SINTC01	Sinter Cooler Fugitive Emissions 01	0.14	0.033			
PKSW	SINTC02	Sinter Cooler Fugitive Emissions 02	0.14	0.033			
PKSW	SINTC03	Sinter Cooler Fugitive Emissions 03	0.14	0.033			
PKSW	SINTC04	Sinter Cooler Fugitive Emissions 04	0.14	0.033			
PKSW	SINTC05	Sinter Cooler Fugitive Emissions 05	0.14	0.033			
PKSW	SINTC06	Sinter Cooler Fugitive Emissions 06	0.14	0.033			
PKSW	SINTC07	Sinter Cooler Fugitive Emissions 07	0.14	0.033			
PKSW	SINTC08	Sinter Cooler Fugitive Emissions 08	0.14	0.033			
PKSW	SINTC09	Sinter Cooler Fugitive Emissions 09	0.14	0.033			
PKSW	SINTC10	Sinter Cooler Fugitive Emissions 10	0.14	0.033			
PKSW	SINTC11	Sinter Cooler Fugitive Emissions 11	0.14	0.033			
PKSW	SINTC12	Sinter Cooler Fugitive Emissions 12	0.14	0.033			
PKSW	SINTC13	Sinter Cooler Fugitive Emissions 13	0.14	0.033			
PKSW	SINTC14	Sinter Cooler Fugitive Emissions 14	0.14	0.033			
PKSW	SINTV01	Sinter Building Fugitive Emissions 01	0.14	0.033			
PKSW	SINTV02	Sinter Building Fugitive Emissions 02	0.14	0.033			
PKSW	SINTV03	Sinter Building Fugitive Emissions 03	0.14	0.033			
PKSW	BOS01	BOS01 Roof Vent Fugitive Emissions	4.3	0.8			
PKSW	BOS02	BOS02 Roof Vent Fugitive Emissions	4.3	0.8			
PKSW	BOS03	BOS03 Roof Vent Fugitive Emissions	4.3	0.8			
PKSW	CRSH	Crusher	1	0.42			
PKSW	HMP01	Hot Metal Pit 01	0.002	0.0016			
PKSW	HMP02	Hot Metal Pit 02	0.002	0.0016			
PKSW	HMP03	Hot Metal Pit 03	0.002	0.0016			
PKSW	HMP04	Hot Metal Pit 04	0.002	0.0016			
PKSW	HMP05	Hot Metal Pit 05	0.002	0.0016			
PKSW	MHND	Materials Handling - VE	0.039	0.039			
PKSW	CSP1	Recycling Area - Crushing/Screening Plant 01 - VE	0.27	0.14			
PKSW	CSP2	Recycling Area - Crushing/Screening Plant 02 - VE	0.27	0.14			
PKSW	MRP	Recycling Area - Metal Recovery Plant - VE	0.68	0.35			
PKSW	SCP	Slag Cooling Pot	5.5	2.9			
PKSW	SSP01	Slag Stockpile 01	1.4	0.73			
PKSW	SSP02	Slag Stockpile 02	1.4	0.73			
PKSW	SSP03	Slag Stockpile 03	1.4	0.73			
PKSW	SSP04	Slag Stockpile 04	1.4	0.73			
PKSW	SPBLG	Springhill Building Fugitives	0.059	0.059			
PKSW	B4STD	Battery 4 (standpipe emissions)	0.082	0.082	0.83	0.15	0.0019
PKSW	B5STD	Battery 5 (standpipe emissions)	0.082	0.082	0.83	0.15	0.0019
PKSW	B6STD	Battery 6 (standpipe emissions)	0.082	0.082	0.83	0.15	0.0019
PKSW	B7STD	Battery 7A (standpipe emissions)	0.082	0.082	0.83	0.15	0.0019
5BF	BF5SPIT1	Blast Furnace 5 Slag Pit 1					0.003

Scenario	ID	Description	Pollutant emission rates (g/s)				
			TSP	PM_{10}	SO_2	NOx	H_2S
5BF	BF5SPIT2	Blast Furnace 5 Slag Pit 2					0.003
6BF	BF6SPIT1	Blast Furnace 6 Slag Pit 1					0.0046
6BF	BF6SPIT2	Blast Furnace 6 Slag Pit 2					0.0046
6BF	BF6SPIT3	Blast Furnace 6 Slag Pit 3					0.0046
6BF	BF6SPIT4	Blast Furnace 6 Slag Pit 4					0.0046
6BF	BF6SPIT5	Blast Furnace 6 Slag Pit 5					0.0046
PKSW	DG01	Diffuse gas COG, BFG & NG EF's 01	0.044	0.022	0.99	0.79	
PKSW	DG02	Diffuse gas COG, BFG & NG EF's 02	0.044	0.022	0.99	0.79	
PKSW	GPF01	Gas Processing Fugitives01					0.0011
PKSW	GPF02	Gas Processing Fugitives02					0.0011
PKSW	GPF03	Gas Processing Fugitives03					0.0011
PKSW	GPF04	Gas Processing Fugitives04					0.0011
PKSW	GPF05	Gas Processing Fugitives05					0.0011
PKSW	GPF06	Gas Processing Fugitives06					0.0011
PKSW	GPF07	Gas Processing Fugitives07					0.0011
PKSW	GPF08	Gas Processing Fugitives08					0.0011
PKSW	COF01	Coke Ovens Fugitives01	0.63	0.32	0.92	0.13	0.013
PKSW	COF02	Coke Ovens Fugitives02	0.63	0.32	0.92	0.13	0.013
PKSW	COF03	Coke Ovens Fugitives03	0.63	0.32	0.92	0.13	0.013
PKSW	COF04	Coke Ovens Fugitives04	0.63	0.32	0.92	0.13	0.013
PKSW	COF05	Coke Ovens Fugitives05	0.63	0.32	0.92	0.13	0.013

6.4 Comparison of existing to future emissions

A comparison of emissions to air for the existing and future scenarios is provided in Table 6.9.

To simplify data interpretation and for comparative purposes, emissions were summarised by the following classifications:

- Source type:
  - Stack sources
  - Fugitive sources
  - All sources
- Scenario:
  - **PKSW** – sources that are unaffected by the project that occur during the existing scenario and will continue to occur during the future scenario (i.e. background emissions from the remainder of plant)
  - **5BF** – source related to 5BF operation only (i.e. emissions from 5BF only)
  - **6BF** – sources related to the project (6BF) operation only (i.e. emissions from 6BF only)
  - **Existing** – includes PKSW sources and 5BF sources (i.e. the current PKSW plant operation including 5BF)
  - **Future** – includes PKSW sources and 6BF sources (i.e. the future PKSW plant operation including the relined 6BF)

The comparison between existing and future scenarios identified the following trends with regard to pollutant mass emission rates:

- Particulate – minor increase (~7% increase) in particulate emissions. This is attributed to increased particulate emissions from 6BF stack sources (6BF stove heating stack, 6BF cast house dedusting stack, 6BF stockhouse dedusting stack). It is noted that emission rates from 6BF stack sources were estimated based on historic sampling data during the previous 6BF campaign. It is considered likely that upgrades to 6BF as part of the project will result in an improvement (reduction) of emissions to air. The improvements cannot be quantified until the project is operational and sampling can be undertaken. Therefore, using historic sampling data to estimate emissions from 6BF is considered conservative.
- Common gaseous pollutants (SO_2 and NO_x) – slight decrease (~1% decrease) in common gaseous pollutant emissions.
- H_2S – minor increase (~3% increase) in H_2S emissions. This is attributed to use of historic sampling data for 6BF slag pits. It is understood that 6BF slag pits are also larger and more exposed (no buildings for barriers) compared to 5BF slag pits, contributing to the minor increase in expected H_2S emissions.

Table 6.9 Emissions summary

Scenario	Pollutant emission rates (g/s)				
	TSP	PM_{10}	SO_2	NOx	H_2S
Stack sources					
PKSW	21.1	9.1	165.1	194.8	0.78
5BF	3.9	1.7	24.2	9.9	0.48
6BF	8.1	3.1	21.9	6.1	0.50
Existing	25.0	10.7	189.2	204.7	1.27
Future	29.1	12.2	186.9	201.0	1.29
Change from existing to future (%)	16%	13%	-1%	-2%	2%
Fugitive sources					
PKSW	32.1	11.9	9.9	2.82	0.0814
5BF					0.006
6BF					0.0230
Existing	32.1	11.9	9.9	2.82	0.0874
Future	32.1	11.9	9.9	2.82	0.104
Change from existing to future (%)	0%	0%	0%	0%	20%
All sources (stack and fugitive sources)					
Existing	57.2	22.6	199.1	207.5	1.35
Future	61.3	24.1	196.8	203.8	1.39
Change from existing to future (%)	7%	6%	-1%	-2%	3%

6.5 Other than normal operating conditions

During other than normal operating conditions, for example, upset furnace conditions, there may be short periods of higher emissions.

Potential events that may result in higher short term emissions are presented in Table 6.10. These events are difficult to anticipate and the likelihood of any of these occurring is very low; events associated with the bleeders or casthouse floor have a very short duration. Given the short duration, significant ground level impacts at sensitive receptors are not anticipated.

Table 6.10 Potential events with elevated emissions

Plant section	Emission	Duration	Frequency
Bleeders opening	Bleeders opening as a safety mechanism when there is excessive pressure in the furnace, releasing blast furnace gas. Also include steam and particulates.	About 10 seconds	This event will occur during commissioning. On average, bleeders opening occurs twice per year.
Casthouse floor	Elevated particulate matter in significant fugitive emission. Highly visible to community.	From 30 seconds up to 5 minutes	These emissions can occur several times per year however, the secondary dedusting hood is expected to reduce this frequency.
	Local release of BFG through the taphole at the casthouse floor.	From 30 seconds up to 5 minutes	These emissions can occur several times per year however, the secondary dedusting hood is expected to reduce this severity.
Pollution control device	Baghouse trip or extraction hood failure presents a heightened risk of casthouse floor emissions.	Extended period	This is a rare event that may occur during the furnace campaign.
	Failure of filters in baghouse could result in exceedance of licence limits for particulate matter at cast house dedusting or stock house dedusting stacks.	Extended period	This is a rare event that may occur during the furnace campaign.

7. Emissions limit assessment

7.1 Methodology

The emissions limit assessment assessed air emission concentrations from the project against the relevant air emission standard of concentration limits stipulated in the POEO Clean Air Regulation.

Project air emission concentrations were calculated based on pollutant mass emission rates and stack volumetric flowrates provided in the emissions inventory. A review of the POEO Clean Air Regulation identified that standards of concentration listed for Iron and steel: primary production (Group 6) were most appropriate to assess the project. Standards of concentration are listed for TSP, NO_2 and H_2S.

7.2 Emissions limit assessment

The emissions limit assessment was undertaken for the following sources that are proposed as part of the project:

- EPA003 – No 6 Blast Furnace Stove Waste Gas Stack
- EPA004 – No 6 Blast Furnace Cast House Dedusting Stack
- EPA005 – No 6 Blast Furnace Stock House Dedusting Stack

The 6BF BFG excess gas bleeder stack A (EPA43) and 6BF BFG excess gas bleeder stack B are considered to be flare sources (emergency use). No POEO standard of concentration exists for this type of source. Consequently, 6BF BFG excess gas bleeder stack A and B were not considered in the emissions limit assessment. Similarly, no POEO standard of concentration exists for 6BF slag granulation cooling tower and there are significant logistical constraints associated with sampling air emissions from a cooling tower. Therefore, the 6BF slag granulation cooling tower was not considered in the emissions limit assessment.

A summary of normalised exhaust flowrates for project sources is provided in Table 7.1. The findings of the emissions limit assessment are summarised in Table 7.2, noting that concentrations were only shown for pollutants where an applicable standard of concentration exists. For type 1 and 2 substances, mercury and cadmium historical emission sampling of 6BF in 2009 was used as a conservative estimate of emission concentrations.

The project is compliant with the relevant POEO standards of concentration listed for Iron and steel: primary production.

Table 7.1 Normalised exhaust flowrate for project stack sources

ID	Description	Source properties		
		Actual exhaust flowrate (m^3/s)	Actual flowrate to normalised flowrate ratio	Normalised exhaust flowrate (Nm^3/s, 273 K, 101.3 kPa, dry)
EPA003[3]	No 6 Blast Furnace Stove Waste Gas Stack	95.5	1.63	58.4
EPA004	No 6 Blast Furnace Cast House Dedusting Stack	271.2	1.24[4]	218.2
EPA005	No 6 Blast Furnace Stock House Dedusting Stack	200.3	1.12[4]	178.9

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[3] A ratio of actual to normalised flowrate was not available for EPA003. BlueScope provided an estimated of exhaust moisture between 6 – 15%. Normalisation calculation were based on an exhaust temperature of 399.5 K, pressure of 101.3 kPa and moisture of 10.5% (average of advised range).

[4] The ratio of actual flowrate to normalised flowrate was determined from the average of historical sampling data

Table 7.2 Summary of emission limit assessment

ID	Description	Pollutant concentration (mg/Nm^3)					
		TSP	NOx	H_2S	Type 1 substances and Type 2 substances (in aggregate)[5]	Cadmium (Cd)[5]	Mercury (Hg)[5]
POEO standard of concentration for Iron and steel: primary production (Group 6)		**50**	**500**	**5**	**1**	**0.2**	**0.2**
EPA003	No 6 Blast Furnace Stove Waste Gas Stack	0.019	0.10	0.0003	-	-	-
EPA004	No 6 Blast Furnace Cast House Dedusting Stack	0.02	-	-	-	-	-
EPA005	No 6 Blast Furnace Stock House Dedusting Stack	0.02	-	-	0.040	0.00042	0.00023

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[5] Normalised flowrate calculated based on most recent available sampling data

8. Construction and commissioning air quality assessment

8.1 Construction assessment

A risk-based approach in accordance with IAQM guidance was adopted to assess potential particulate impacts during the construction of the project.

The IAQM guidance recommends a detailed risk assessment be undertaken where there is a human receptor within 350 m, or an ecological receptor within 50 m of the construction footprint, or where there is a human or ecological receptor within 50 m of any haulage routes up to 500 m from the site entrance.

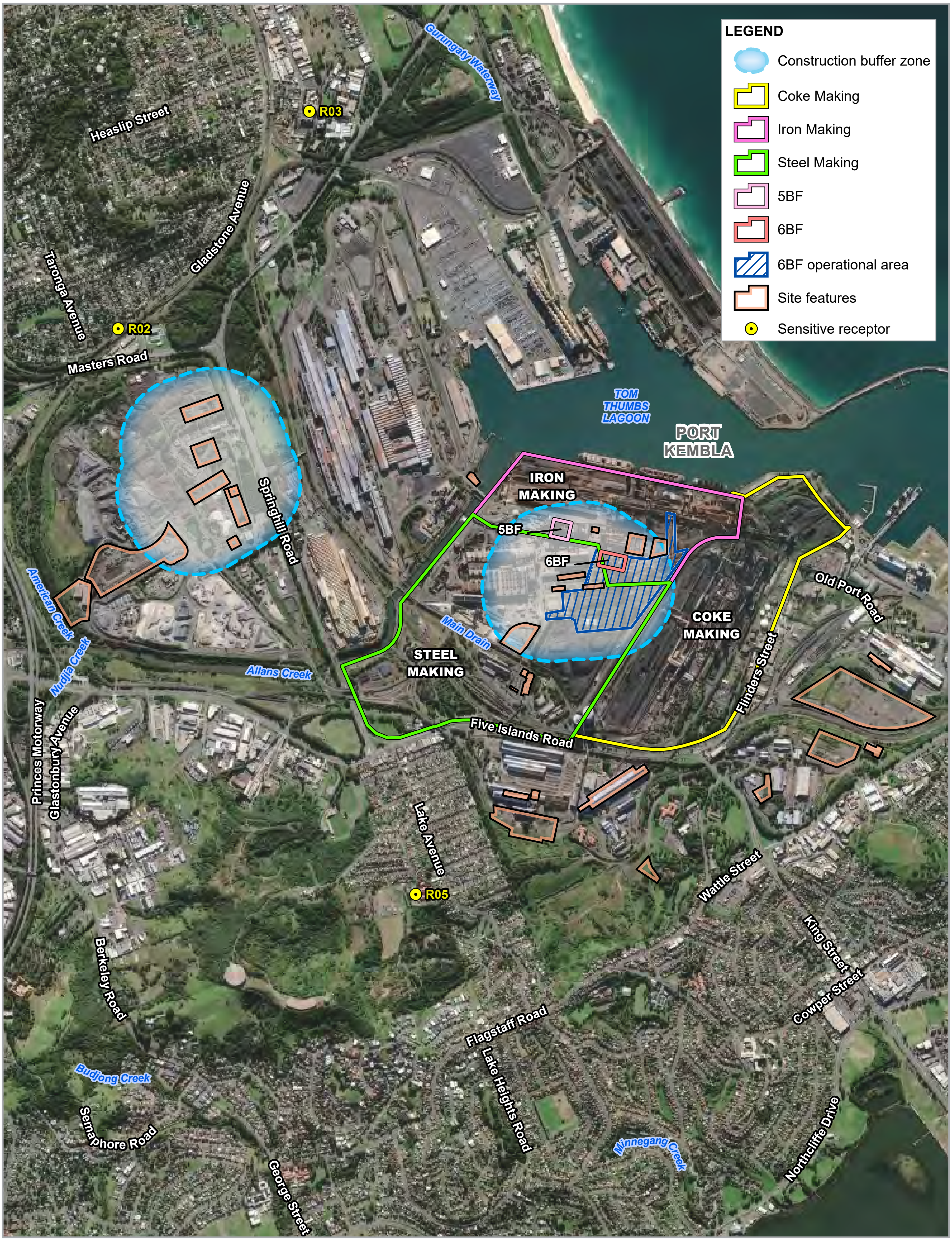
It is noted that construction activities will occur on the eastern portion of the PKSW site away from any identified sensitive receptors. The locations of identified sensitive receptors with respect to the site boundary and the construction activities area are provided in Table 8.1 and a 350 metre buffer distance from the construction areas (No.2 Works 1, No.2 Works 2 and No.2 Works 3) and processing areas (Recycling Area 4 and Recycling Area 5) is shown on Figure 8.1. All sensitive receptors were identified to be located outside the buffer distance (>350 m from construction activities) of the 6BF construction area and ancillary facilities construction areas.

Table 8.1 Location of identified sensitive receptors with respect to construction activities

Receptor ID	Receptor type	Approximate distance and direction from the PKSW boundary	Approximate distance and direction from 6BF construction area	Approximate distance and direction from nearest ancillary facilities construction areas
R01	Residential	~410 m northwest	~3400 m northwest	~640 m northwest
R02	Residential	~180 m north	~2700 m north	~520 m north
R03	Educational	~360 m northwest	~2700 m northwest	~1500 m northwest
R04	Residential	~1630 m west	~4300 m west	~1800 m west
R05	Educational	~460 m west	~1900 m west	~560 m west
R06	Residential	~400 m south	~2200 m south	~490 m south

As all sensitive receptors are located outside the construction area buffer distance (>350 m from construction activities) and particulate emissions during construction are expected to be relatively minor (refer Section 6.1.2), it is considered that there is low risk of particulate impacts and no further assessment is considered necessary in accordance with IAQM guidance.

Emissions to air during construction should be managed and reduced by implementation of the mitigation measures outlined in Section 11.1 to minimise the likelihood and severity of any potential air quality impacts.



Paper Size ISO A4

0 0.2 0.4 0.6 0.8 1

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Air Quality Impact Assessment

Location of proposed construction activities

Project No.	12541101
Revision No.	0
Date	21/10/2021

FIGURE 8.1

G:\22\12541101\GIS\Maps\12541101_AQI_Assessment_A.aprx\12541101_AQIA005_ConstructionActivities_A
Print date: 21 Oct 2021 - 17:42

Data source: LPI: DTDB/DCDB, 2017. World Imagery: Maxar.
Created by: tmorton

8.2 Commissioning assessment

A qualitative management-based approach was adopted to assess project commissioning, as commissioning is a once-off process that is necessary for operations to commence and no commissioning air emissions sampling data was available at the time of this assessment.

During blow-in, runner covers are not initially installed (because the flow characteristics of the initial liquids are variable and require manual intervention) and consequently, there is potential for elevated emissions to air to occur for a relatively short period of time due to the casthouse dedusting system initially operating with a reduced effective capacity. The proposed commissioning procedure aligns with the industry standard approach that is adopted at similar facilities around the world. In addition, best practice methods (refer Section 11) will be implemented to minimise emissions to air where possible.

Due to relatively short duration of commissioning and implementation of industry standard and best practice methods, although the potential impact for any elevated emissions to air cannot be quantified there is considered to be a low risk of potential air quality impacts.

Emissions to air during commissioning should be managed and reduced by implementation of the mitigation measures outlined in Section 11.2 to minimise the likelihood and severity of any potential air quality impacts.

9. Operational air quality assessment

9.1 Operational assessment overview

Air quality dispersion modelling was undertaken to predict potential worst-case scenario air quality impacts from the project in accordance with the methodology outlined in Section 3. The assessment results have been compared with the relevant state and national air quality criteria and standards which exist to protect human health and the environment from air pollution.

The model predictions for existing and future scenarios are presented as tabulated results providing ground level concentrations at each sensitive receptor (with criteria exceedances highlighted) and as contour plots to illustrate the predicted pattern of dispersion and allow interpretation of predicted model results at any location within the sampling grid. The averaging period, statistic/percentile, impact location and impact type presented for each pollutant was chosen to align with assessment criteria (refer Section 2.3.2) for that particular pollutant species.

Predicted pollutant concentrations were presented for the following cases:

- **6BF** – predicted concentrations from 6BF sources only.
- **Incremental** – predicted concentrations from the PKSW site (includes 5BF and PKSW sources for existing scenario and includes 6BF and PKSW sources for future scenario).
- **Cumulative with DPIE AQMS** – cumulative concentrations were calculated using background pollutant concentrations recorded by DPIE AQMS in accordance with Table 5.10. This scenario accounts for potential cumulative impacts with existing facilities (noting inclusion of DPIE AQMS data may conservatively overestimate cumulative impacts by ‘double counting’ the impact from current PKSW operations).
- **Cumulative with DPIE AQMS and SS projects** – cumulative concentrations were calculated using background pollutant concentrations recorded by DPIE AQMS in accordance with Table 5.10 (as above) and contributions from SS projects (refer Section 5.3.2). Contributions from the Port Kembla Gas Terminal project were accounted for by including additional sources in the dispersion model in accordance with scenario 1 presented in *East Coast Gas Project Modification Air Quality Assessment* (GHD, 2019). Scenario 1 was considered the worst-case scenario operational situation that will likely occur, consisting of two gas fuelled engines active on board the Floating Storage and Regasification Unit and two liquid engines active on board the fuelled LNG carrier. This case accounts for potential cumulative impacts with existing facilities and future projects.

The following methodologies specific to a particular pollutant were adopted:

- A contemporaneous approach to calculating cumulative particulate concentrations was adopted. Predicted incremental concentrations were added to recorded daily variable background concentration for the same 24-hour period to calculate predicted cumulative particulate concentration.
- 1 second H_2S concentrations were estimated by applying a peak to mean factor of 2.3. H_2S emissions from slag granulation (5BF slag granulator stacks and 6BF slag granulation cooling tower) were scaled to 60% and H_2S emissions from slag pits (5BF slag pits and 6BF slag pits) were scaled to 40% to align with the typical operating scenario, i.e. the H_2S emissions are spread between the two sources depending on operating conditions at the time. As discussed in Section 10, there are a number of additional processes in place which aim to further reduce H_2S emissions associated with 6BF.
- Chemical transformations were not modelled within CALPUFF, however the ozone limiting method (OLM) which is listed as Method 2 for estimating total NO_2 in the Approved Methods was adopted. Method 1 (Section 8.1.1) in the Approved Methods assumes 100 % of NO will be converted to NO_2. This is considered extremely conservative as in reality, only a fraction of NO will be converted to NO_2. Therefore, a more detailed assessment has been undertaken for all receptors using Method 2 (Section 8.2.2) of the Approved Methods. Method 2 is based on NO reacting with ozone in the atmosphere to form NO_2. Hourly variable background ozone and NO_2 data was sourced from nearby DPIE AQMS in accordance with Table 5.10.

Predicted pollutant concentrations for the existing and future scenarios are presented in Sections 9.2 and 9.3 respectively.

9.2 Existing

9.2.1 Particulates and common gaseous pollutants

Predicted incremental and cumulative particulate concentrations are presented in Table 9.1 and a contour dispersion plot of incremental 24 hour PM_{10} is shown on Figure 9.1. An exceedance of the 24 hour PM_{10} criteria was predicted at R05 for the 'Cumulative with DPIE AQMS and other SS projects' scenario. This predicted exceedance comprised an incremental concentration of 3.6 µg/m^3 and a background concentration of 46.6 µg/m^3 resulting in a cumulative concentration of 50.2 µg/m^3. Therefore, the exceedance was primarily attributed to elevated background concentrations.

Table 9.1 Predicted particulate concentrations (existing scenario)

Receptor	Predicted particulate concentrations (µg/m^3)								
	Incremental			Cumulative with DPIE AQMS			Cumulative with DPIE AQMS and other SS projects		
	TSP	PM_{10}		TSP	PM_{10}		TSP	PM_{10}	
	Annual	24 hour	Annual	Annual	24 hour	Annual	Annual	24 hour	Annual
Criteria	**90**	**50**	**25**	**90**	**50**	**25**	**90**	**50**	**25**
R01	0.6	5.8	0.4	36.9	47.2	18.1	36.9	47.2	18.2
R02	1.1	8.7	0.8	37.4	47.5	18.5	37.4	47.5	18.5
R03	1.5	6.9	0.9	37.7	50.0	18.6	37.7	50.0	18.7
R04	0.4	6.3	0.3	36.7	47.2	18.0	36.7	47.2	18.0
R05	3.1	19.6	1.8	39.4	50.1	19.5	39.4	50.2	19.5
R06	1.9	7.7	1.2	38.1	48.1	18.9	38.1	48.2	19.0

The top 10 ranked cumulative PM_{10} values for the worst impacted receptor (R05) are summarised in Table 9.2. An exceedance of the 24 hour PM_{10} criteria is predicted for one 24 hour period at R05 (equivalent to 0.3% of the time).

Table 9.2 Top 10 ranked cumulative PM_{10} values for R05

Rank	Date of predicted concentration	Breakdown of predicted concentration components (µg/m^3)		
		Incremental	Background	Cumulative
1	20/12/2017	3.6	46.6	50.2
2	10/02/2017	1.7	46.3	48.0
3	19/12/2017	3.8	44.2	48.0
4	24/09/2017	0.3	47.2	47.5
5	09/01/2017	1.6	45.6	47.2
6	13/01/2017	0.8	45.8	46.6
7	26/03/2017	19.6	23.9	43.5
8	17/01/2017	3.3	40.1	43.4
9	13/03/2017	7.4	35.7	43.1
10	02/12/2017	2.5	40.4	42.9

Predicted incremental and cumulative NO_2 concentrations are presented in Table 9.3 and a contour dispersion plot of incremental 1 hour NO_2 is shown on Figure 9.2. No exceedances of the EPA or NEPM assessment criteria were predicted at sensitive receptor locations.

An area of off-site incremental exceedance of the NEPM criteria was predicted to the southeast of PKSW (refer Figure 9.2), near Adaptalift Group warehouse (which is located approximately 30 m southeast of the PKSW boundary).

Table 9.3 Predicted NO_2 concentrations (existing scenario)

Receptor	**Predicted NO_2 concentrations (µg/m^3)**					
	Incremental		**Cumulative with DPIE AQMS**		**Cumulative with DPIE AQMS and other SS projects**	
	1 hour	**Annual**	**1 hour**	**Annual**	**1 hour**	**Annual**
EPA criteria	**246**	**62**	**246**	**62**	**246**	**62**
NEPM criteria	**164**	**31**	**164**	**31**	**164**	**31**
R01	75.5	1.5	107.2	13.1	107.2	13.5
R02	77.2	2.8	107.2	14.4	107.2	15.0
R03	71.4	4.4	107.2	16.0	107.2	17.1
R04	62.3	1.2	107.2	12.8	107.2	13.1
R05	92.6	4.7	108.9	16.3	108.9	17.0
R06	68.4	2.6	113.8	14.1	116.2	15.0

Predicted incremental and cumulative SO_2 concentrations are presented in Table 9.4 and a contour dispersion plot of incremental 1 hour SO_2 is shown on Figure 9.3.

Compliance was predicted against the EPA criteria for all sensitive receptors.

The following exceedances of the NEPM criteria were predicted:

- An incremental exceedance of the 1 hour criteria at R06
- Cumulative exceedances of the 1 hour criteria at R05 and R06

An area of off-site incremental exceedance of the EPA criteria was predicted to the southeast of PKSW (refer Figure 9.3), near the Ampol Port Kembla Diesel Stop (which is located approximately 30 m southeast of the PKSW boundary).

The exceedances of the NEPM criteria require interpretation in the context that the 1 hour and 24 hour SO_2 standards were strengthened in the recent revision (May 2021) of the Air NEPM. The 1 hour SO_2 criteria was strengthened from 570 µg/m^3 to 286 µg/m^3 (representing a 50% reduction) while the 24 hour criteria was strengthened from 228 µg/m^3 to 57 µg/m^3 (representing a 75% reduction). The NEPC notes that the strengthened SO_2 standards are now among the tightest in the world.

For assessment purposes, it is considered unrealistic to expect existing industry to be able to comply with the strengthened NEPM SO_2 criteria immediately. It is noted that compliance is predicted when comparing the 1 hour and 24 hour SO_2 predictions against the superseded NEPM criteria.

Therefore, a comparative approach (refer Section 9.4.1) was adopted to assess the relative impact of the project on predicted SO_2 concentrations.

Table 9.4 Predicted SO_2 concentrations (existing scenario)

Receptor	Predicted SO_2 concentrations (µg/m^3)					
	Incremental		Cumulative with DPIE AQMS		Cumulative with DPIE AQMS and other SS projects	
	1 hour	24 hour	1 hour	24 hour	1 hour	24 hour
EPA criteria	**570**	**228**	**570**	**228**	**570**	**228**
NEPM criteria	**286**	**57**	**286**	**57**	**286**	**57**
R01	171.1	25.1	171.1	29.6	173.0	30.0
R02	167.5	48.4	167.5	54.1	168.5	54.3
R03	180.4	29.3	233.0	42.9	233.1	43.3
R04	135.9	28.3	135.9	28.3	139.5	29.6
R05	283.1	31.1	285.9	45.4	304.4	46.6
R06	341.9	36.0	341.9	36.0	342.1	36.6

Paper Size ISO A4

0 0.5 1 1.5

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Air Quality Impact Assessment

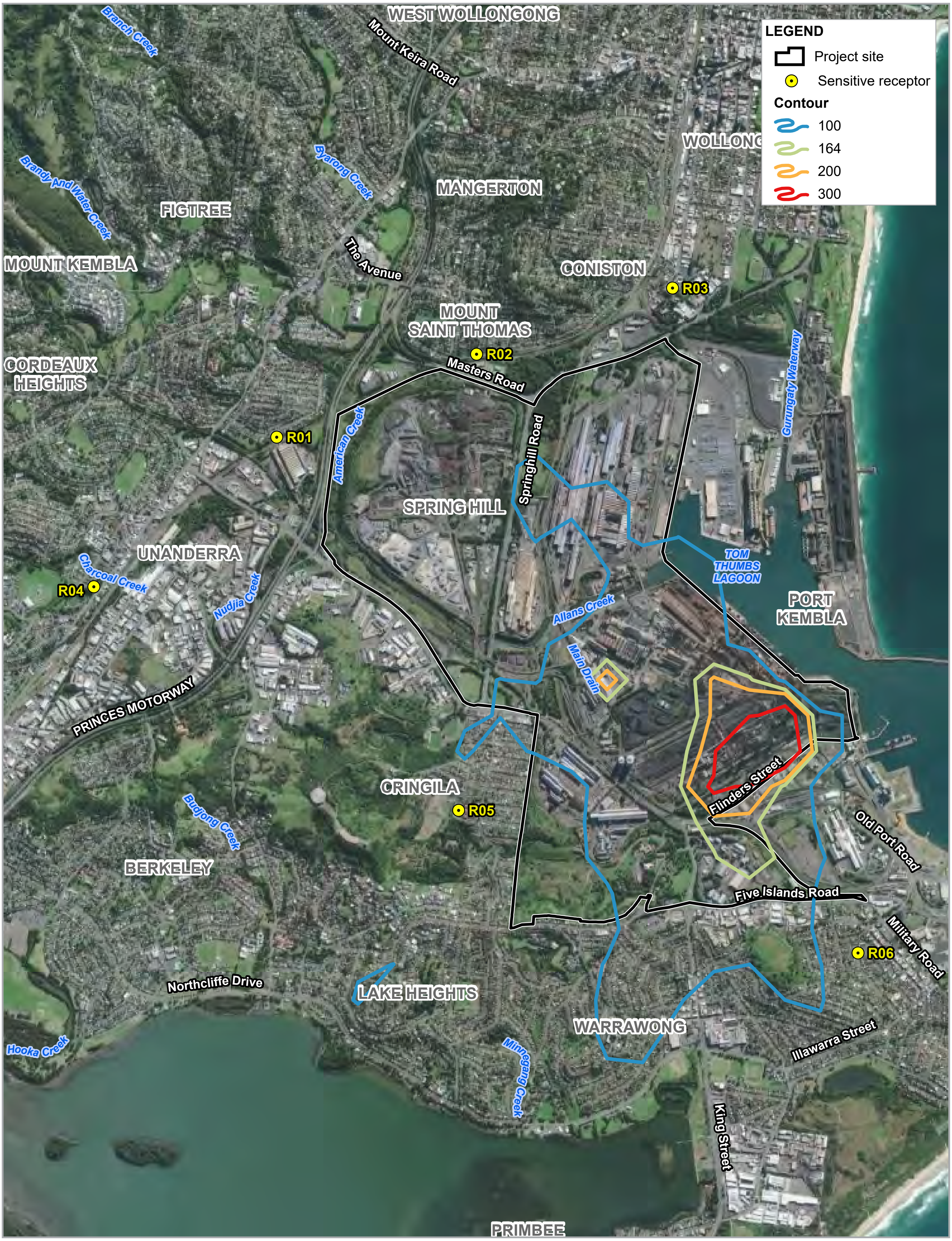
Predicted incremental 24 hour PM_{10} concentration for existing scenario ($\mu g/m^3$, 100th percentile)

Project No.	12541101
Revision No.	0
Date	14/10/2021

FIGURE 9.1

G:\22\12541101\GIS\Maps\12541101_AQI_Assessment_A.aprx\12541101_AQIA006_24hr_PM10_Exg_A
Print date: 10 Nov 2021 - 15:34

Data source: LPI: DCDB/DTDB, 2017. Commonwealth of Australia (Geoscience Australia) 250K Topographic Data Series 3, 2006. World Imagery: Maxar. Created by: tmorton



Paper Size ISO A4

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Air Quality Impact Assessment

Predicted incremental 1 hour NO_2 concentration for existing scenario ($\mu g/m^3$, 100th percentile)

Project No.	12541101
Revision No.	0
Date	14/10/2021

FIGURE 9.2

G:\22\12541101\GIS\Maps\12541101_AQI_Assessment_A.aprx\12541101_AQIA007_1hr_NO2_Exg_A
Print date: 10 Nov 2021 - 15:33

Data source: LPI: DCDB/DTDB, 2017. Commonwealth of Australia (Geoscience Australia) 250K Topographic Data Series 3, 2006. World Imagery: Maxar. Created by: tmorton

Paper Size ISO A4

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Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Air Quality Impact Assessment

Predicted incremental 1 hour SO_2 concentration for existing scenario ($\mu g/m^3$, 100th percentile)

Project No.	12541101
Revision No.	0
Date	21/10/2021

FIGURE 9.3

G:\22\12541101\GIS\Maps\12541101_AQI_Assessment_A.aprx\12541101_AQIA008_1hr_SO2_Exg_A
Print date: 10 Nov 2021 - 15:32

Data source: LPI: DCDB/DTDB, 2017. Commonwealth of Australia (Geoscience Australia) 250K Topographic Data Series 3, 2006. World Imagery: Maxar. Created by: tmorton

9.2.2 Odorous air pollutants (H_2S)

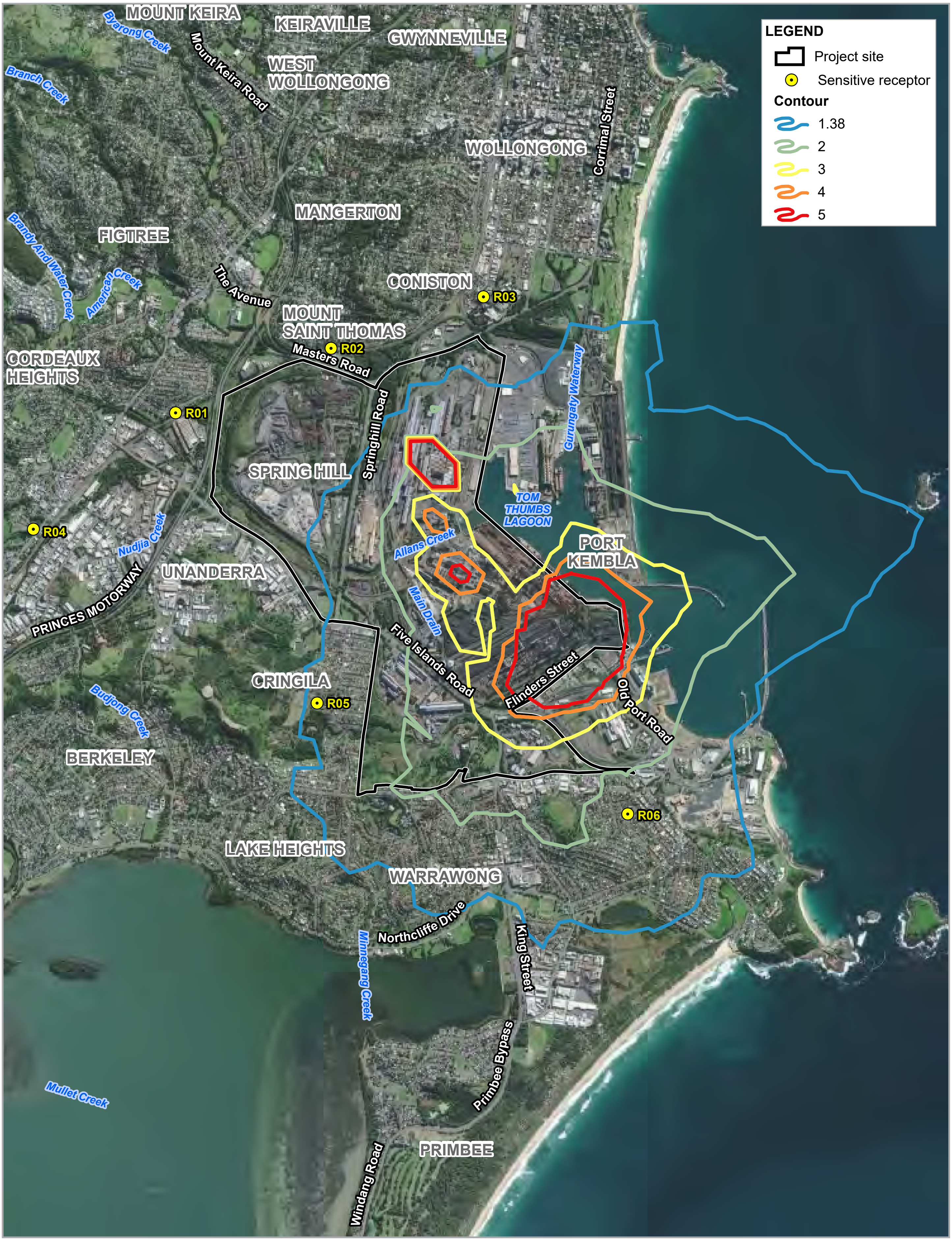
Predicted H_2S concentrations are presented in Table 9.5 and a contour dispersion plot of incremental 1 second H_2S is shown on Figure 9.4. Exceedance of the 1 second H_2S criteria were predicted at R05 and R06. Compliance with the 1 hour criteria was predicted at all sensitive receptors.

An area of off-site incremental exceedance of the 1 second H_2S criteria was predicted to the south and east of PKSW (refer Figure 9.4). The NSW EPA criteria for H_2S (1 second, 99th percentile) allows for 88 hours per year (1% of the time) where the concentration may exceed 1.38 µg/m^3. At receptor R06, the 99th percentile criteria is exceeded, with the model predicting 98 additional hours per year (1.1% of the time) where the concentration is above the criteria level.

As discussed in *BlueScope Steel, Port Kembla Sub-hourly Modelling of Hydrogen Sulphide* (Environ, 2011) and *BlueScope Steel, Port Kembla Site Air Emissions Modelling – PRP131* (Environ, 2012), the 1 second H_2S criteria is considered very stringent and therefore the Californian EPA 1 hour (public welfare) criterion of 42 ug/m^3 was included for comparative purposes. It is noted that this approach was previously submitted to and accepted by the NSW EPA. The predicted maximum 1 hour H_2S concentrations are significantly below the Californian criteria.

Table 9.5 Predicted H_2S concentrations (existing scenario)

Receptor	Predicted H_2S concentrations (µg/m^3)	
Averaging period	**1 second**	**1 hour**
Statistic	**99.9th percentile**	**Maximum**
Impact type	**Incremental**	**Cumulative**
Criteria	**1.38**	**42**
R01	0.68	3.3
R02	0.96	3.5
R03	1.08	3.5
R04	0.59	3.1
R05	1.44	5.4
R06	1.82	4.2



Paper Size ISO A4

0 0.5 1 1.5

Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Air Quality Impact Assessment

Predicted incremental 1 second H_2S concentration for existing scenario ($\mu g/m^3$, 100th percentile)

Project No.	12541101
Revision No.	0
Date	10/11/2021

FIGURE 9.4

G:\22\12541101\GIS\Maps\12541101_AQI_Assessment_A.aprx\12541101_AQIA010_1sH2S_Exg_A
Print date: 10 Nov 2021 - 15:31

Data source: LPI: DCDB/DTDB, 2017. Commonwealth of Australia (Geoscience Australia) 250K Topographic Data Series 3, 2006. World Imagery: Maxar. Created by: tmorton

9.3 Future

9.3.1 Particulates and common gaseous pollutants

Predicted incremental and cumulative particulate concentrations are presented in Table 9.6 and a contour dispersion plot of incremental 24 hour PM$_{10}$ is shown on Figure 9.5. Exceedance of the 24 hour PM$_{10}$ criteria was predicted at R03 and R05 from the site.

The exceedance at R03 comprised an incremental concentration of 4.5 µg/m^3 and a background concentration of 45.6 µg/m^3 resulting in a cumulative concentration of 50.1 µg/m^3.

The exceedance at R05 comprised an incremental concentration of 3.7 µg/m^3 and a background concentration of 46.6 µg/m^3 resulting in a cumulative concentration of 50.3 µg/m^3.

For both predicted exceedances, the incremental contribution was relatively minor (<10% of assessment criteria) whilst background concentrations were elevated (>90% of assessment criteria). Therefore, the exceedances were primarily attributed to elevated background (off-site) concentrations.

As previously discussed, the background concentration used in the assessment already includes some increment from PKSW therefore the results of this assessment are conservative. The proposed 6BF has a number of additional controls (refer Section 10) when compared to 5BF and additional particulate impacts from the project are considered to be unlikely.

Table 9.6 Predicted particulate concentrations (future scenario)

Receptor	Predicted particulate concentrations (µg/m^3)											
	Incremental						Cumulative					
	Only 6BF sources			All PKSW future sources			Cumulative with DPIE AQMS			Cumulative with DPIE AQMS and other SS projects		
	TSP	PM$_{10}$		TSP	PM$_{10}$		TSP	PM$_{10}$		TSP	PM$_{10}$	
	Annual	24 hour	Annual	Annual	24 hour	Annual	Annual	24 hour	Annual	Annual	24 hour	Annual
Criteria	**90**	**50**	**25**	**90**	**50**	**25**	**90**	**50**	**25**	**90**	**50**	**25**
R01	0.1	0.6	0.04	0.7	6.1	0.5	36.9	47.2	18.2	36.9	47.2	18.2
R02	0.2	0.8	0.1	1.3	8.8	0.8	37.5	47.5	18.5	37.5	47.5	18.5
R03	0.3	0.7	0.1	1.6	6.8	1.0	37.9	50.1	18.7	37.9	50.2	18.7
R04	0.1	0.6	0.03	0.5	6.4	0.3	36.7	47.2	18.0	36.7	47.2	18.0
R05	0.4	1.3	0.1	3.3	19.7	1.8	39.6	50.2	19.5	39.6	50.3	19.6
R06	0.5	1.1	0.1	2.2	8.1	1.3	38.4	48.3	19.0	38.4	48.4	19.0

The top 10 ranked cumulative PM$_{10}$ values for the worst impacted receptor (R05) are summarised in Table 9.7. An exceedance of the 24 hour PM$_{10}$ criteria is predicted for one 24 hour period at R03 and R05 (equivalent to 0.3% of the time).

Table 9.7 Top 10 ranked cumulative PM$_{10}$ values for R05

Rank	Date of predicted concentration	Breakdown of predicted concentration components (µg/m^3)			
		Incremental – only 6BF sources	Increment – All PKSW future sources	Background	Cumulative with DPIE AQMS and other SS projects
1	20/12/2017	0.2	3.7	46.6	50.3
2	10/02/2017	0.0	1.7	46.3	48.0
3	19/12/2017	0.2	3.8	44.2	47.9
4	24/09/2017	0.0	0.3	47.2	47.5
5	09/01/2017	0.2	1.7	45.6	47.3
6	13/01/2017	0.0	0.8	45.8	46.6
7	26/03/2017	0.6	19.7	23.9	43.6
8	17/01/2017	0.0	3.3	40.1	43.4
9	13/03/2017	0.7	7.5	35.7	43.2
10	02/12/2017	0.0	2.3	40.4	42.7

Predicted incremental and cumulative NO$_2$ concentrations are presented in Table 9.8 and a contour dispersion plot of incremental 1 hour NO$_2$ is shown on Figure 9.6. No exceedances of the EPA or NEPM assessment criteria were predicted at sensitive receptor locations.

An area of off-site incremental exceedance of the NEPM criteria was predicted in an industrial area to the southeast of PKSW (refer Figure 9.6), near Adaptalift Group warehouse (which is located approximately 30 m southeast of the PKSW boundary). It is noted that the exceedance area predicted for the future scenario is smaller than that for the existing scenario and therefore the project is anticipated to have a beneficial impact on ambient NO$_2$ concentrations (net reduction) compared to existing operations (refer to Section 9.4 for a detailed comparison between predicted existing and future concentrations).

Table 9.8 Predicted NO$_2$ concentrations (future scenario)

Receptor	Predicted NO$_2$ concentrations (µg/m^3)							
	Incremental				Cumulative			
	Only 6BF sources		All PKSW future sources		Cumulative with DPIE AQMS		Cumulative with DPIE AQMS and other SS projects	
	1 hour	Annual	1 hour	Annual	1 hour	Annual	1 hour	Annual
EPA criteria	**246**	**62**	**246**	**62**	**246**	**62**	**246**	**62**
NEPM criteria	**164**	**31**	**164**	**31**	**164**	**31**	**164**	**31**
R01	6.8	0.1	75.2	1.5	107.2	13.1	107.2	13.5
R02	7.9	0.1	74.8	2.7	107.2	14.3	107.2	14.9
R03	9.8	0.2	68.2	4.3	107.2	15.8	107.2	17.0
R04	6.3	0.05	60.6	1.2	107.2	12.8	107.2	13.1
R05	13.2	0.2	92.7	4.5	108.9	16.1	108.9	16.8
R06	19.6	0.2	68.3	2.5	113.8	14.1	116.2	15.0

Predicted incremental and cumulative SO$_2$ concentrations are presented in Table 9.9 and a contour dispersion plot of incremental 1 hour NO$_2$ is shown on Figure 9.7.

Compliance was predicted against the EPA criteria for all receptors.

The following exceedances of the NEPM criteria were predicted:

– An incremental exceedance of the 1 hour criteria at R06
– Cumulative exceedances of the 1 hour criteria at R06

An area of off-site incremental exceedance of the EPA criteria was predicted in an industrial area to the southeast of PKSW (refer Figure 9.7), near the Ampol Port Kembla Diesel Stop which is located approximately 30 m southeast of the PKSW boundary. It is noted that the exceedance areas predicted for the future scenario are smaller than those predicted for the existing scenario. Therefore the project is anticipated to have a beneficial impact on ambient SO_2 concentrations (net reduction) compared to existing operations (refer to Section 9.4 for a detailed comparison between predicted existing and future concentrations).

The exceedances of the NEPM criteria require interpretation in the context that the 1 hour and 24 hour SO_2 standards were strengthened in the recent revision (May 2021) of the Air NEPM. The 1 hour SO_2 criteria was strengthened from 570 µg/m^3 to 286 µg/m^3 (representing a 50% reduction) while the 24 hour criteria was strengthened from 228 µg/m^3 to 57 µg/m^3 (representing a 75% reduction). The NEPC notes that the strengthened SO_2 standards are now among the tightest in the world.

For assessment purposes, it is considered unrealistic to expect existing industry to be able to comply with the strengthened NEPM SO_2 criteria immediately. It is noted that compliance is predicted when comparing the 1 hour and 24 hour SO_2 predictions against the superseded NEPM criteria.

Therefore, a comparative approach was adopted to assess the relative impact of the project on predicted SO_2 concentrations.

Incremental SO_2 emissions from new sources related to this project only (i.e. 6BF on its own) are well below the EPA and NEPM criteria (refer Table 9.11).

Table 9.9 Predicted SO_2 concentrations (future scenario)

Receptor	Predicted SO_2 concentrations (µg/m^3)							
	Incremental				Cumulative			
	Only 6BF sources		All PKSW future sources		Cumulative with DPIE AQMS		Cumulative with DPIE AQMS and other SS projects	
	1 hour	24 hour	1 hour	24 hour	1 hour	24 hour	1 hour	24 hour
EPA criteria	**570**	**228**	**570**	**228**	**570**	**228**	**570**	**228**
NEPM criteria	**286**	**57**	**286**	**57**	**286**	**57**	**286**	**57**
R01	23.8	3.1	163.3	23.3	166.1	29.4	168.1	29.8
R02	27.7	5.5	150.6	47.1	160.5	52.8	161.0	53.0
R03	34.6	4.3	170.4	28.2	220.2	37.1	220.3	37.4
R04	22.3	3.8	125.5	26.2	134.9	26.2	134.9	27.5
R05	48.6	6.1	232.6	32.1	235.5	42.9	253.9	44.1
R06	66.7	6.1	312.0	35.5	312.0	35.5	312.1	37.1

The top 10 ranked cumulative SO_2 values for the worst impacted receptor (R06) are summarised in Table 9.11. Exceedances of the 1 hour SO_2 criteria are predicted for four 1 hour periods at R06 (equivalent to 0.05% of the time). Predicted 1 hour SO2 concentrations from the project (Incremental – only 6BF sources) are significantly below the EPA and NEPM assessment criterions.

Table 9.10 Top 10 ranked cumulative 1 hour SO_2 values for R06

Rank	Date and hour of predicted concentration	Breakdown of predicted 1 hour SO_2 concentration components (µg/m^3)			
		Incremental – only 6BF sources	Increment – All PKSW future sources	Background	Cumulative with DPIE AQMS and other SS projects
1	27/05/2017 7:00	66.7	312.0	0.1	**312.1**
2	5/06/2017 19:00	50.2	202.3	5.5	**207.9**
3	2/10/2017 0:00	27.6	184.5	0.1	**184.6**
4	31/01/2017 6:00	29.5	161.5	2.9	**164.4**
5	6/02/2017 3:00	26.0	126.5	34.9	161.4
6	25/07/2017 18:00	29.3	154.9	0.0	154.9
7	4/10/2017 2:00	6.4	129.8	8.9	138.8
8	3/07/2017 3:00	21.1	137.7	0.0	137.7
9	26/04/2017 4:00	23.1	135.4	0.0	135.4
10	16/12/2017 22:00	0.0	0.0	134.4	134.4

Paper Size ISO A4

0 0.5 1 1.5

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Air Quality Impact Assessment

Predicted incremental 24 hour PM_{10} concentration for future scenario ($\mu g/m^3$, 100th percentile)

Project No.	12541101
Revision No.	0
Date	10/11/2021

FIGURE 9.5

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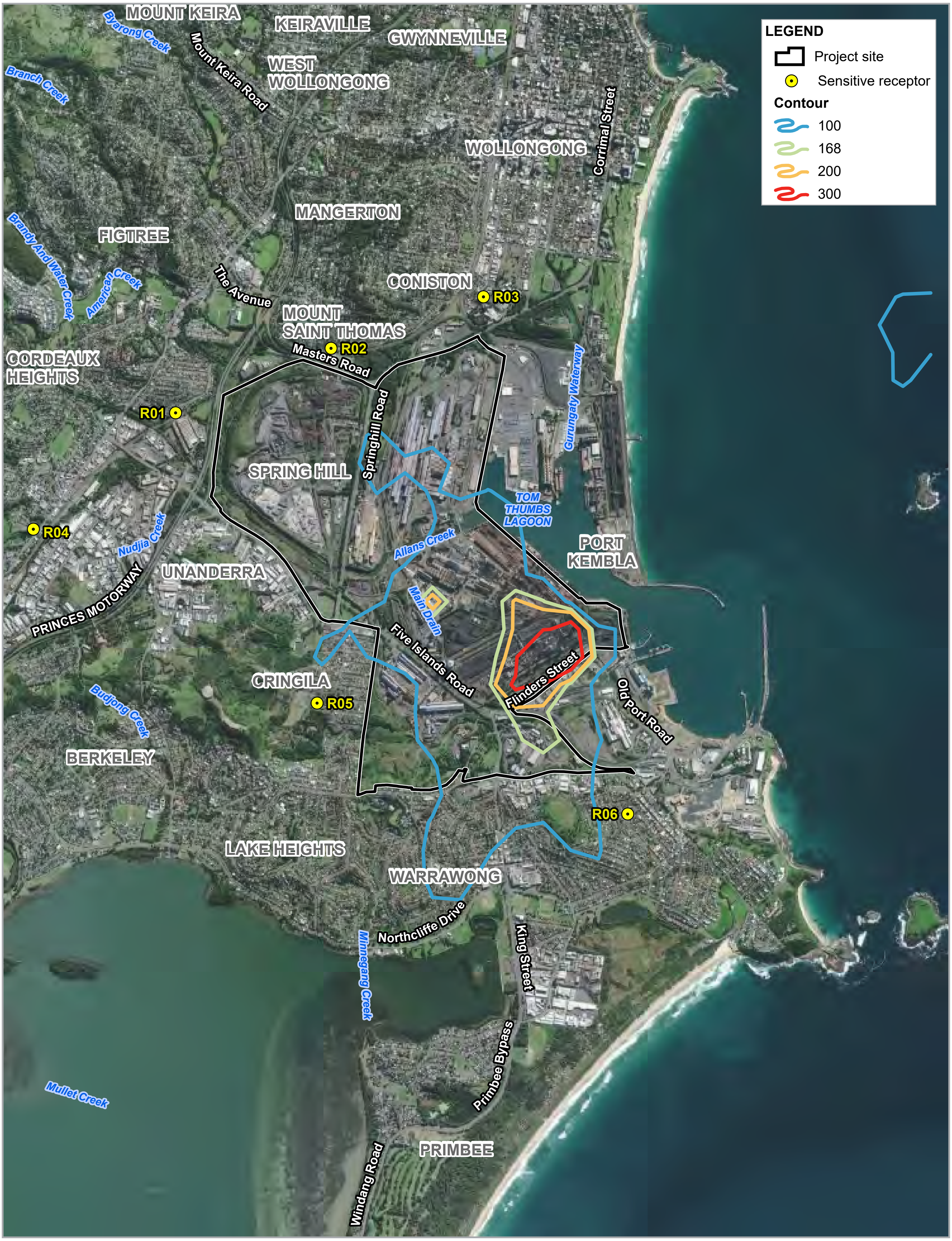

Paper Size ISO A4

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Kilometres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Air Quality Impact Assessment

Predicted incremental 1 hour NO_2 concentration for future scenario ($\mu g/m^3$, 100th percentile)

Project No. **12541101**
Revision No. **0**
Date **10/11/2021**

FIGURE 9.6

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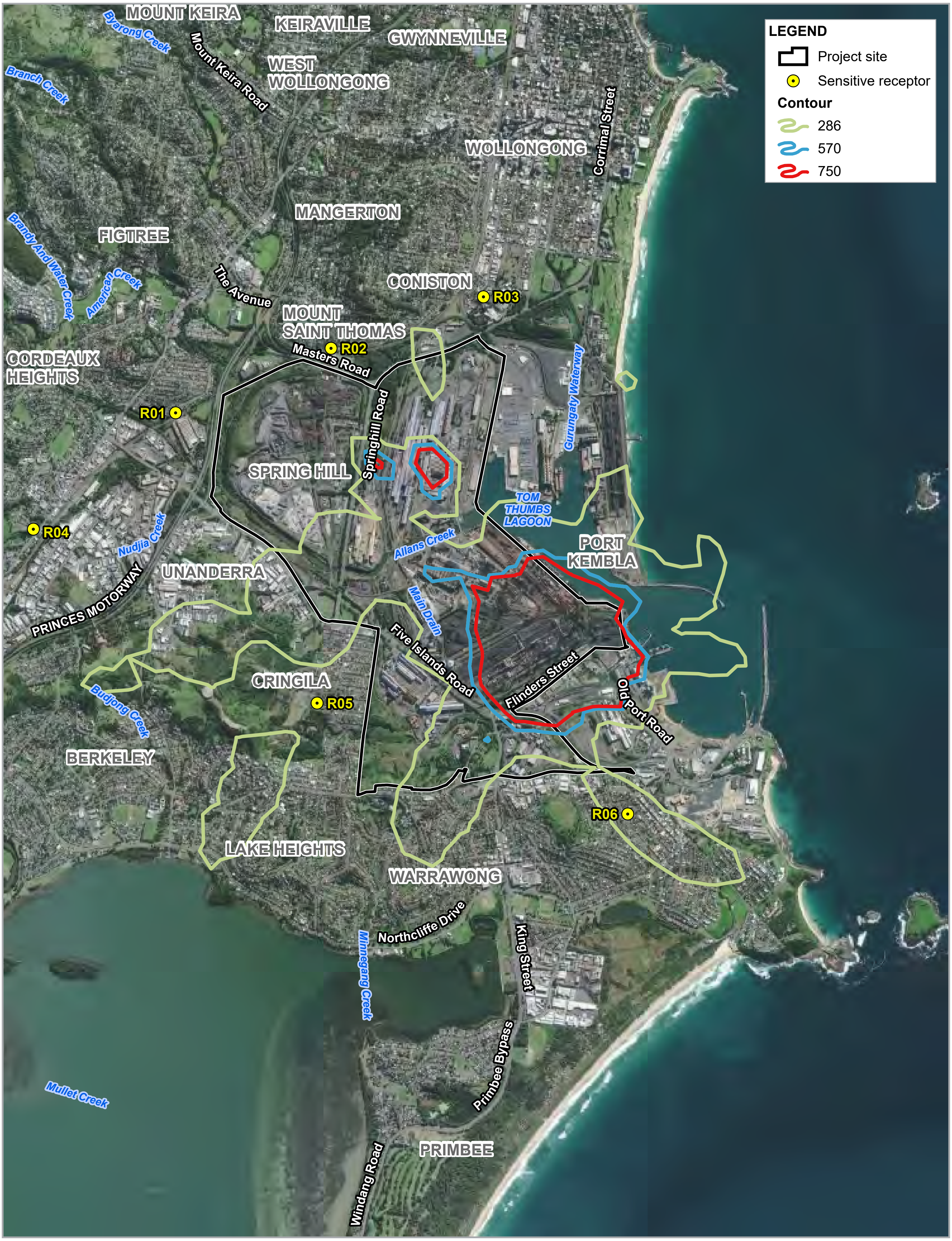

Paper Size ISO A4

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Air Quality Impact Assessment

Predicted incremental 1 hour SO_2 concentration for future scenario ($\mu g/m^3$, 100^{th} percentile)

Project No. **12541101**
Revision No. **0**
Date **10/11/2021**

FIGURE 9.7

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Print date: 10 Nov 2021 - 15:34

Data source: LPI: DCDB/DTDB, 2017. Commonwealth of Australia (Geoscience Australia) 250K Topographic Data Series 3, 2006. World Imagery: Maxar. Created by: tmorton

9.3.2

9.3.2 Odorous air pollutants (H_2S)

Predicted H_2S concentrations are presented in Table 9.11 and a contour dispersion plot of incremental 1 second H_2S is shown on Figure 9.8. A minor exceedance of the 1 second H_2S criteria was predicted at R06, however there has been a reduction in concentration due to this project. As discussed in Section 3.2.1, 6BF is not anticipated to be a source of any other odorous pollutants, consequently only H_2S was considered.

The predicted incremental H_2S concentration, from 6BF only, shows that it contributes about one third of total H_2S emissions at the receptor locations. Given that modelled emissions from 6BF are likely conservative (as discussed in Section 6.3.2), the project is unlikely to lead to offsite odour impacts, and is predicted to reduce odour impacts at the sensitive receptor locations.

Compliance with the 1 hour criteria was predicted at all sensitive receptors.

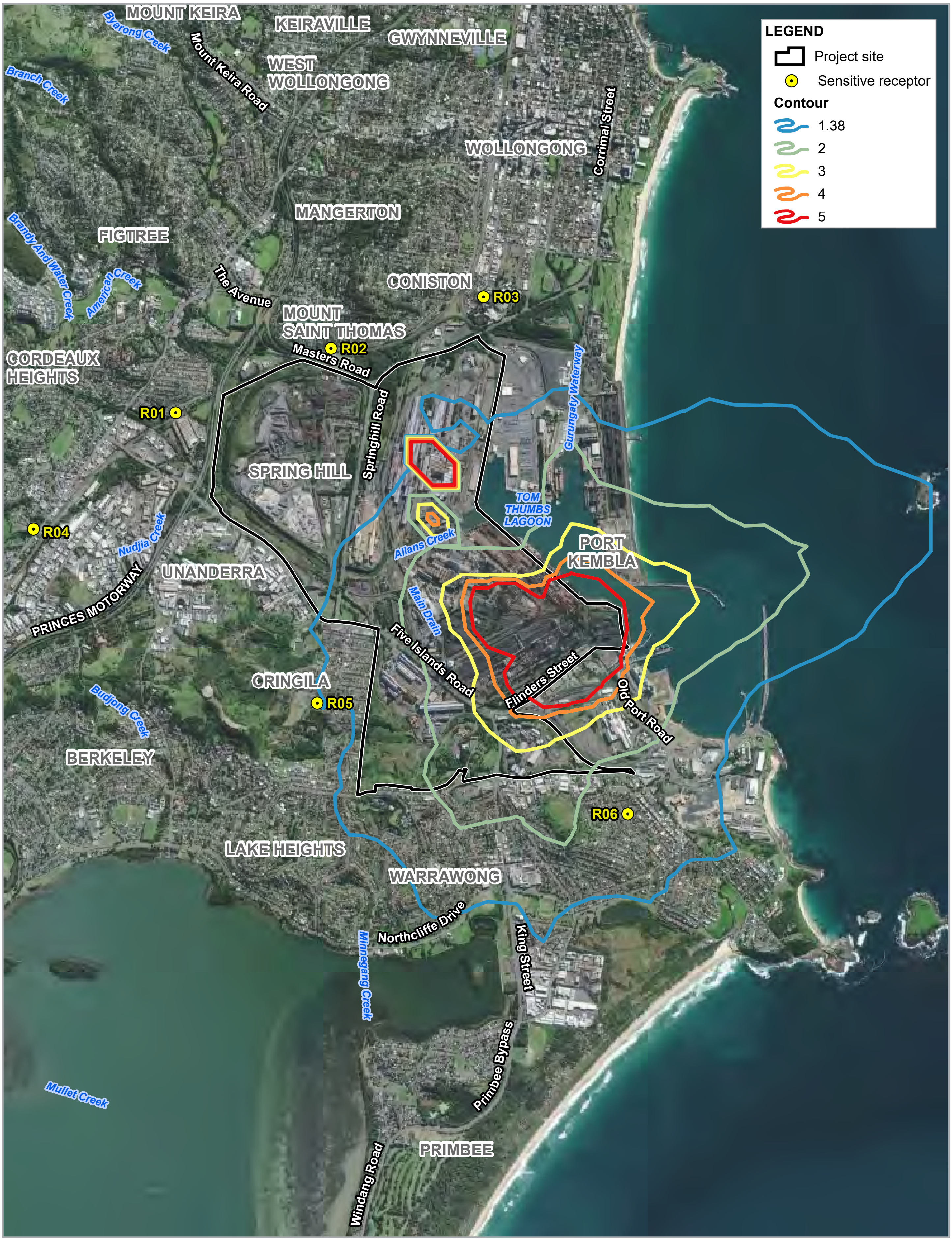
An area of off-site incremental exceedance of the 1 second H_2S criteria was predicted to the south and east of PKSW (refer Figure 9.8). This is a peak concentration that would only likely occur for a short time over any one year period. The EPA criteria for H_2S (1 second, 99th percentile) allows for 88 hours per year (1% of the time) where the concentration may exceed 1.38 µg/m^3. At receptor R06, the 99th percentile criteria is exceeded, with the model predicting only 53 additional hours per year (0.6% of the time) where the concentration is above the criteria level.

It is noted that the exceedance area predicted for the future scenario is smaller than that predicted for the existing scenario. Therefore, the project is anticipated to have a beneficial impact on ambient H_2S concentrations (net reduction) compared to existing operations (refer to Section 9.4 for a detailed comparison between predicted existing and future concentrations).

As discussed in *BlueScope Steel, Port Kembla Sub-hourly Modelling of Hydrogen Sulphide* (Environ, 2011) and *BlueScope Steel, Port Kembla Site Air Emissions Modelling – PRP131* (Environ, 2012), the 1 second H_2S criteria is considered very stringent and therefore the Californian EPA 1 hour (public welfare) criterion of 42 ug/m^3 was included for comparative purposes. The predicted maximum 1 hour H_2S concentrations are significantly below the Californian criteria.

Table 9.11 Predicted odorous air pollutant concentrations (future scenario)

Receptor	Predicted odorous air pollutant concentrations (µg/m^3)			
	Incremental – Only 6BF sources		All PKSW future sources	
Pollutant	H_2S		H_2S	
Averaging period	1 second	1 hour	1 second	1 hour
Statistic	99.9th percentile	Maximum	99.9th percentile	Maximum
Impact type	Incremental	Incremental	Incremental	Cumulative
Criteria	1.38	42	1.38	42
R01	0.19	0.3	0.64	3.0
R02	0.27	0.6	0.81	3.1
R03	0.31	0.8	0.94	3.4
R04	0.15	0.2	0.53	2.9
R05	0.38	1.5	1.35	7.0
R06	0.44	0.7	1.59	3.9



Paper Size ISO A4

0 0.5 1 1.5

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Air Quality Impact Assessment

Predicted incremental 1 second H_2S concentration for future scenario (µg/m³, 99th percentile)

Project No.	**12541101**
Revision No.	**0**
Date	**10/11/2021**

FIGURE 9.8

G:\22\12541101\GIS\Maps\12541101_AQI_Assessment_A.aprx\12541101_AQIA015_1sH2S_Future_A
Print date: 10 Nov 2021 - 15:29

Data source: LPI: DCDB/DTDB, 2017. Commonwealth of Australia (Geoscience Australia) 250K Topographic Data Series 3, 2006. World Imagery: Maxar. Created by: tmorton

9.4 Comparison of existing to future impacts

A comparative analysis of predicted incremental and cumulative air quality concentrations is provided in this section. The analysis examined the relative impact of the project by presenting the difference in model predictions between existing and future scenarios. The difference was expressed as the percentage change (rounded to one decimal place) from existing to future scenario (i.e. a positive percentage indicates increased impacts are predicted during the future scenario while a negative percentage indicates decreased impacts are predicted during the future scenario).

9.4.1 Particulates and common gaseous pollutants

The difference in predicted particulate concentrations is provided in Table 9.12.

A minor increase in incremental particulate concentrations was predicted as a result of the project. It is attributed to the minor increase in particulate emissions from the future scenario as discussed in Section 6.4.

A less than 1% change between scenarios is predicted for cumulative predictions. This is attributed to low site contributions relative to the background concentrations which account for the majority of the cumulative impact at receptors. As background concentrations remain constant for both scenarios, minor changes to predictions are observed.

Table 9.12 Predicted particulate concentrations (percentage change from existing to future scenario)

Receptor	Incremental			Cumulative with DPIE AQMS			Cumulative with DPIE AQMS and other SS projects		
	TSP	PM_{10}		TSP	PM_{10}		TSP	PM_{10}	
	Annual	24 hour	Annual	Annual	24 hour	Annual	Annual	24 hour	Annual
R01	10.3%	3.8%	3.2%	0.2%	0.0%	0.1%	0.2%	0.0%	0.1%
R02	9.2%	0.7%	2.9%	0.3%	0.0%	0.1%	0.3%	0.0%	0.1%
R03	12.3%	-0.7%	4.0%	0.5%	0.2%	0.2%	0.5%	0.2%	0.2%
R04	12.2%	1.6%	3.5%	0.1%	0.0%	0.1%	0.1%	0.0%	0.1%
R05	5.7%	0.3%	0.9%	0.5%	0.2%	0.1%	0.5%	0.2%	0.1%
R06	18.0%	5.2%	4.9%	0.9%	0.4%	0.3%	0.9%	0.4%	0.3%

The difference in predicted NO_2 concentrations is provided in Table 9.13. A decrease in incremental and cumulative NO_2 concentrations is predicted (i.e. the project is predicted to have a beneficial impact on ambient NO_2 concentrations (net reduction) compared to existing operations).

The following improvements were identified at sensitive receptor locations:

- Up to a 4.5% reduction of incremental 1 hour NO_2 concentrations
- Up to a 4.6% reduction of incremental 24 hour NO_2 concentrations
- No change in cumulative 1 hour NO_2 concentrations
- Up to a 1.2% reduction of cumulative (cumulative with DPIE AQMS and other SS projects) 24 hour NO_2 concentrations

Table 9.13 Predicted NO_2 concentrations (percentage change from existing to future scenario)

Receptor	Predicted NO_2 concentrations (µg/m^3)					
	Incremental		Cumulative with DPIE AQMS		Cumulative with DPIE AQMS and other SS projects	
	1 hour	Annual	1 hour	Annual	1 hour	Annual
R01	-0.3%	-2.2%	0.0%	-0.3%	0.0%	-0.2%
R02	-3.2%	-2.0%	0.0%	-0.4%	0.0%	-0.3%
R03	-4.5%	-2.9%	0.0%	-0.8%	0.0%	-0.7%
R04	-2.8%	-2.7%	0.0%	-0.3%	0.0%	-0.2%
R05	0.1%	-4.6%	0.0%	-1.3%	0.0%	-1.2%
R06	-0.2%	-1.3%	0.0%	-0.2%	0.0%	-0.2%

The difference in predicted SO_2 concentrations is provided in Table 9.14. Generally, a decrease in incremental and cumulative SO_2 concentrations is predicted (i.e. the project is predicted to have a beneficial impact on ambient SO_2 concentrations (net reduction) compared to existing operations).

The following improvements were identified at sensitive receptor locations:

- Up to a 17.8% reduction of incremental 1 hour SO_2 concentrations.
- Up to a 7.3% reduction of incremental 24 hour SO_2 concentrations.
- Up to a 16.6% reduction of cumulative (cumulative with DPIE AQMS and other SS projects) 1 hour SO_2 concentrations.
- Up to a 13.7% reduction of cumulative (cumulative with DPIE AQMS and other SS projects) 24 hour SO_2 concentrations.

Table 9.14 Predicted SO_2 concentrations (percentage change from existing to future scenario)

Receptor	Predicted SO_2 concentrations (µg/m^3)					
	Incremental		Cumulative with DPIE AQMS		Cumulative with DPIE AQMS and other SS projects	
	1 hour	24 hour	1 hour	24 hour	1 hour	24 hour
R01	-4.6%	-7.0%	-2.9%	-0.5%	-2.8%	-0.5%
R02	-10.1%	-2.8%	-4.2%	-2.5%	-4.4%	-2.5%
R03	-5.5%	-3.6%	-5.5%	-13.6%	-5.5%	-13.7%
R04	-7.6%	-7.3%	-0.8%	-7.3%	-3.3%	-7.0%
R05	-17.8%	3.4%	-17.6%	-5.4%	-16.6%	-5.2%
R06	-8.8%	-1.4%	-8.8%	-1.4%	-8.8%	1.5%

9.4.2 Odorous air pollutants

The difference in predicted H_2S concentrations is provided in Table 9.15.

A decrease in H_2S concentrations is predicted at all receptors with the exception of the indicative 1 hour maximum H_2S concentration at R05. This is due to future H_2S sources ‘aligning’ along a common wind direction so that worse case down wind impacts occur at R05 at the same time. Up to a 15.4% reduction in 1 second H_2SH2S concentrations was predicted.

It is noted that an exceedance of the 1 second H_2S criteria was predicted at R05 for the existing scenario. Based on improvements to site operations as part of the project, compliance with the 1 second H_2S criteria was predicted at R05 for the future scenario.

Table 9.15 Predicted odorous air pollutant concentrations (percentage change from existing to future scenario)

Pollutant	H_2S	
Averaging period	**1 second**	**1 hour**
Statistic	**99.9th percentile**	**Maximum**
R01	-6.1%	-9.9%
R02	-15.4%	-11.9%
R03	-13.2%	-3.4%
R04	-11.0%	-8.5%
R05	-6.3%	27.9%
R06	-12.5%	-6.9%

10. Best practice assessment and emissions controls

10.1 Best practice assessment

The purpose of this chapter is to present the Best Available Techniques (BAT) Assessment for the proposed design and operation of the new blast furnace and associated infrastructure. This is a requirement of the SEARS, specifically EPA's guidance to DPIE in the development of the SEARs.

The BAT assessment has been based on a review of available technology internationally. The generally accepted best practices for steel making are those adopted by the European Union under the BAT Reference Document (BREF) for Iron and Steel Production Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control).

Relevant conclusions from the BREF, and how these are being addressed by BlueScope, are summarised in Table 10.1 below. Responses below directly address BAT conclusions in Chapter 9.5 BAT Conclusions for Blast Furnaces from the BREF document with a focus on Air Emissions (Bat 59 to 65).

The review of emissions from the operation of 6BF compared to 5BF indicates that it will generally result in a reduction of pollutants. Reference is made to the existing emission profile outlined in Section 6 which has been improved by the best practice emission controls, as identified in the following sections, to be used on the project to improve emissions for the operation of 6BF.

When reviewing the BAT assessment in Table 10.1 it should be noted that BlueScope undertakes a constant review of emerging BAT for managing emissions and seeks to constantly improve controls where practical, reasonable and feasible to do so in regards to international best practice.

10.2 Additional emission controls

To meet the conclusions of the BREF, BlueScope intends to implement the following additional process and emission controls as part of the project:

- Cast house floor fugitives - Manipulator and trough covers, extraction from main trough, extraction at taphole with primary and secondary hood (noting that 5BF only has a primary hood), lowered tilting platforms during casting (also an improvement on 5BF).
- Iron Kish - Extraction at iron ladles and slag tilting spouts. Both the iron ladles and Slag Pots will have level sensors to ensure they are filled in a controlled manner.
- Slag Handling - Coldwater slag granulation with condensing unit. Slag pits – air cooling for up to 24 hours before applying water to minimise H_2S generation during watering.
- Dust catcher - A lock-hopper will be installed at the base of the dust catcher and will minimise BFG and dust emissions to the atmosphere.
- Dust suppression - Sealed roads, street sweepers and truck wheel washes from stockhouse and slag handling areas.

Table 10.1 Summary of best practice assessment

	EU BAT BREF	6BF Control	Conformance to BAT	Improvement status
Air emissions	59. BAT for displaced air during loading from the storage bunkers of the coal injection unit is to capture dust emissions and perform subsequent dry dedusting. The BAT-associated emission level for dust is <20 mg/Nm^3, determined as the average over the sampling period (discontinuous measurement, spot samples for at least half an hour).	Emissions from PCI plant are all below 20 mg/m^3. No changes to operation of this plant in relation to the project.	Conforms to BAT	Same as existing at 5BF
	60. BAT for burden preparation (mixing, blending) and conveying is to minimise dust emissions and, where relevant, extraction with subsequent dedusting by means of an electrostatic precipitator or bag filter.	Enclosed conveyors Dust suppression Dedusting at every material transfer in the Stockhouse via baghouse.	Conforms to BAT Current stockhouse stack testing at 5BF complies with Clean Air Act Group 6 limits	Same as existing at 5BF
	61. BAT for casting house (tap holes, runners, torpedo ladles charging points, skimmers) is to prevent or reduce diffuse dust emissions by using the following techniques: I. covering the runners II. optimising the capture efficiency for diffuse dust emissions and fumes with subsequent off-gas cleaning by means of an electrostatic precipitator or bag filter III. fume suppression using nitrogen while tapping, where applicable and where no collecting and dedusting system for tapping emissions is installed. When using BAT II, the BAT-associated emission level for dust is <1 – 15 mg/Nm^3, determined as a daily mean value.	Runners covered Primary dedusting damper and secondary dedusting hood to capture emissions at tapholes Dedusting at charging conveyor Dedusting with baghouse Tilting platforms to be lowered during casting	i. Conforms to BAT ii. Conforms to BAT iii. Not used and not applicable - Nitrogen fume suppression presents a safety hazard and is only applicable where no dedusting system is installed Current 5BF casthouse stack results comply with Clean Air Act Group 6 limits	Secondary dedusting hood is an improvement on 5BF and was in place for previous 6BF campaign. Lowered tilting platform during casting is an improvement on 5BF and was in place for previous 6BF campaign. The covered runners and dedusting are the same as existing at 5BF.
	62. BAT is to use tar-free runner linings.	Tar-free runner linings used	Conforms to BAT	Same as existing at 5BF and previous 6BF campaign
	63. BAT is to minimise the release of blast furnace gas during charging by using one or a combination of the following techniques: I. bell-less top with primary and secondary equalising II. gas or ventilation recovery system III. use of blast furnace gas to pressurise the top bunkers.	i. Bell-less top charging with equalising relief valves for material hopper. Primary equalisation with semi clean gas, secondary equalisation with nitrogen continuing to flow into the bin during material discharge. ii. Not applicable as a mixture of BFG and nitrogen is used to pressurise the furnace top bunkers.	Conforms to BAT	Same as existing at 5BF and previous 6BF campaign

	EU BAT BREF	6BF Control	Conformance to BAT	Improvement status
	Applicability of BAT II Applicable for new plants. Applicable for existing plants only where the furnace has a bell-less charging system. It is not applicable to plants where gases other than blast furnace gas (e.g. nitrogen) are used to pressurise the furnace top bunkers.	iii. Pressurisation using semi clean gas and nitrogen		
	64. BAT is to reduce dust emissions from the blast furnace gas by using one or a combination of the following techniques: I. using dry predusting devices such as: i. deflectors ii. dust catchers iii. cyclones iv. electrostatic precipitators. II. subsequent dust abatement such as: i. hurdle-type scrubbers ii. venturi scrubbers iii. annular gap scrubbers iv. wet electrostatic precipitators v. disintegrators. For cleaned blast furnace (BF) gas, the residual dust concentration associated with BAT is <10 mg/Nm^3, determined as the average over the sampling period (discontinuous measurement, spot samples for at least half an hour).	I. ii. Pre-dedusting with dust catcher II. iii. Subsequent abatement by annular gas scrubber	I. Conforms to BAT - ii. II. Conforms to BAT - iii. Gas cleaning complies with <10mg/m^3 BAT emission limit.	Same as 5BF with improvements compared to previous 6BF campaign
	65. BAT for hot blast stoves is to reduce emissions by using desulphurised and dedusted surplus coke oven gas, dedusted blast furnace gas, dedusted basic oxygen furnace gas and natural gas, individually or in combination. The BAT-associated emission levels, determined as daily mean values related to an oxygen content of 3 %, are: • sulphur oxides (SOx) expressed as sulphur dioxide (SO2) <200 mg/Nm3 • dust<10 mg/Nm3 • nitrogen oxides (NOx), expressed as nitrogen dioxide (NO2) <100 mg/Nm3	Stoves use dedusted BFG, dedusted COG (not desulphurised), and natural gas New design will improve combustion efficiency Installation of Waste Gas Heat Recovery	Conforms to BAT for gas re-use Stove emissions comply with Clean Air Act Group 6 limits Improved combustion efficiency will reduce CO emissions however, the extent of reduction is still being investigated. Current emissions do not comply to BAT-associated emission levels though it is anticipated that installation of WGHR will result in emission reductions.	Improvement on 5BF and previous 6BF campaign

	EU BAT BREF	6BF Control	Conformance to BAT	Improvement status
Production residues	68. BAT is to prevent waste generation from blast furnaces by using one or a combination of the following techniques: I. appropriate collection and storage to facilitate a specific treatment II on-site recycling of coarse dust from the blast furnace (BF) gas treatment and dust from the cast house dedusting, with due regard for the effect of emissions from the plant where it is recycled III. hydrocyclonage of sludge with subsequent on-site recycling of the coarse fraction (applicable whenever wet dedusting is applied and where the zinc content distribution in the different grain sizes allows a reasonable separation) IV. slag treatment, preferably by means of granulation (where market conditions allow for it), for the external use of slag (e.g. in the cement industry or for road construction).	i. Dust catcher, sludge dewatering ii. Flue dust is recycled at Sinter Plant iii. Potential for hydroclonage currently under investigation. Learnings will be applied to 6BF. iv. Slag granulation undertaken where possible, remainder formed as rock slag.	Conforms to BAT	Same as existing at 5BF
	69. BAT for minimising slag treatment emissions is to condense fume if odour reduction is required.	Cold slag granulation with condensing unit	Conforms to BAT	Improvement on 5BF and previous 6BF campaign
Energy	71. BAT is to maintain a smooth, continuous operation of the blast furnace at a steady state to minimise releases and to reduce the likelihood of burden slips.	Closed loop cooling water Use of stockrods for burden level detection and monitoring	Conforms to BAT	Same as existing at 5BF and previous 6BF campaign

	EU BAT BREF	6BF Control	Conformance to BAT	Improvement status
	74. BAT is to preheat the hot blast stove fuel gases or combustion air using the waste gas of the hot blast stove and to optimise the hot blast stove combustion process. Description For optimisation of the energy efficiency of the hot stove, one or a combination of the following techniques can be applied: • the use of a computer-aided hot stove operation • preheating of the fuel or combustion air in conjunction with insulation of the cold blast line and waste gas flue • use of more suitable burners to improve combustion • rapid oxygen measurement and subsequent adaptation of combustion conditions. Applicability The applicability of fuel preheating depends on the efficiency of the stoves as this determines the waste gas temperature (e.g. at waste gas temperatures below 250 °C, heat recovery may not be a technically or economically viable option). The implementation of computer-aided control could require the construction of a fourth stove in the case of blast furnaces with three stoves (if possible) in order to maximise benefits.	Hot stove operation is computer-aided Lagging used in cold blast main and waste gas flue is refractory lined. New burner design to improve combustion Waste gas oxygen measurement to be replaced	Conforms to BAT	Improvement on 5BF and previous 6BF campaign

11. Management and mitigation

Air quality management and mitigation measures to reduce emissions to air from the project and minimise any potential air quality impacts are provided in the Sections below. These controls will be in addition to the EPL fugitive dust emission controls detailed in Condition O3. The BlueScope “Fugitive Dust Management System” procedure (MA-ENV-02-02) will be applied throughout construction, commissioning and operation.

11.1 Construction

While general construction activities are not expected to exceed air quality goals at nearby receptors, the following mitigation measures are recommended:

- Prepare a dust management plan for use during construction activities.
- Regularly monitor existing ambient air quality stations during dust generating construction activities.
- During demolition of any contaminated areas, take extra precautions to prevent dust leaving the work area.
- Reduce or cease dust generating activities if clearly visible plumes of dust go off the site or monitoring shows excessive particulate levels.
- Blasting or heavy demolition which may lead to excessive dust will only be undertaken in conditions not likely to disperse dust towards sensitive receptors.
- Operations conducted in areas of low moisture content material will be suspended during high wind speed events and water sprays will be used.
- Aim to minimise the size of storage piles where possible. Development of any new stockpile areas must be in accordance with the BSL Risk Assessment Process.
- Limit cleared areas of land and stockpiles and clear only when necessary to reduce fugitive dust emissions. All material stockpiles will have appropriate stormwater and dust controls in place.
- Control on-site traffic by designating specific routes for haulage and access. Traffic on any unpaved construction areas should be limited to 25 kilometres per hour.
- All trucks carrying dry bulk material that is loaded on site must be loaded and operated so as to prevent spillage of any material from the load (which generates dust). Trucks must be covered prior to leaving the licenced site boundary.

These measures will assist in reducing impact on all areas off-site during construction activities.

11.2 Commissioning

The following mitigation measures are recommended during commissioning:

- Notify local residents about the proposed commissioning timetable of activities that could affect people off-site and provide advice on what they can expect regarding emissions including smoke.
- Where practicable, any commissioning activities that may lead to excessive emissions or visible smoke should be timed as much as possible to occur when winds are not blowing towards residential areas.

11.3 Operation

Operational air quality impacts are anticipated to be consistent with, or better than existing operations and no specific additional emission controls are recommended. It is recommended that BlueScope continue to reduce emissions of SO_2 with any future modifications as it continues to reduce its emission profile towards the updated 2021 NEPM standards. The following operational management and mitigation measures are recommended:

- Develop and implement an Air Quality Management Plan prior to commencement of operations including:
  - Identify all major sources of air emissions and associated proactive and reactive mitigation measures to ensure air pollution is prevented or minimised
  - Describe protocols for regular maintenance of plant and equipment
  - Outline procedures for monitoring and reporting air emissions
  - Describe measures to regularly review the effectiveness of air pollution control measures

Conduct post commissioning sampling of all new emissions sources in accordance with Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DEC, 2007). Point sources where sampling will be conducted includes:

  - EPA003 – No 6 Blast Furnace Stove Waste Gas Stack
  - EPA004 – No 6 Blast Furnace Cast House Dedusting Stack
  - EPA005 – No 6 Blast Furnace Stock House Dedusting Stack

Fugitive emission sampling to include where practicable:

  - Slag pits
  - 6BF Granulation Cooling tower

- Conduct ongoing emission sampling in accordance with conditions of Development Consent and the EPL.
- Investigate the use of online monitoring systems at the stoves stack, stock house dedusting stack, and cast house dedusting stack, such as opacity meters.

12. Conclusion

GHD has conducted an air quality impact assessment to assess the construction, commissioning and operation of the No. 6 Blast Furnace at the Port Kembla Steelworks. The assessment was undertaken in accordance with relevant legislation and government guidance.

A qualitative based approach was adopted to assess the construction and commissioning of the project. The construction assessment identified a low risk of potential air quality impacts as there will be a large separation distance between construction activities and sensitive receptors, and emissions to air during construction are expected to be relatively minor.

The commissioning assessment concluded that there was potential of elevated emissions to occur for a relatively short period of time during commissioning. As the commissioning procedure will align with the industry standard approach and adopt best practice methods where possible, emissions during commissioning are considered to be minimised as far as reasonably practicable. Due to relatively short duration of commissioning and implementation of industry standard and best practice methods, although the potential impact for any elevated emissions to air cannot be quantified, the commissioning process is considered to pose a low risk of potential adverse air quality impacts to surrounding receptors.

The quantitative operational air quality assessment consisted of three parts, an emission limit assessment, an air quality impact assessment and a best practice assessment.

The emission limit assessment identified that all No. 6 Blast Furnace air quality emission sources assessable to standard of concentration limits will comply with standard of concentration limits stipulated in the POEO Clean Air Regulation.

The air quality impact assessment used air quality dispersion modelling to predict incremental and cumulative pollutant concentrations from the existing and proposed future operating scenarios. The findings of the dispersion modelling are summarised below:

- Existing scenario (operation of 5BF and PKSW) findings:
  - A minor cumulative exceedance of the 24 hour PM_{10} criteria was predicted for one 24 hour period in the modelled year at R05. This exceedance was primarily attributed to elevated background concentrations which accounted for 93% of the criteria while existing scenario incremental concentrations accounted for 7% of the criteria.
  - Compliance was predicted for 1 hour and annual NO_2 concentrations against both EPA and NEPM assessment criterions at sensitive receptor locations.
  - Compliance was predicted for 1 hour and 24 hour SO_2 concentrations against the EPA assessment criteria at sensitive receptor locations.
  - An incremental exceedance of the 1 hour SO_2 NEPM criteria was predicted at R06 and cumulative exceedances were predicted at R05 and R06. These exceedances of the NEPM criteria require interpretation in the context that the 1 hour SO_2 standard was reduced in a recent revision (May 2021) of the Air NEPM.
  - Exceedance of the 1 second H_2S criteria was predicted at R05 and R06. Compliance was predicted for the 1 hour H_2S criteria at all sensitive receptors.
- Future scenario (operation of 6BF and PKSW) findings:
  - Minor cumulative exceedance of the 24 hour PM_{10} criteria were predicted at R03 and R05 for one day of the year only. These exceedances were primarily attributed to elevated background concentrations which accounted for 91% and 93% of the criteria while future scenario incremental concentrations accounted for 9% and 7% of the criteria for receptors R03 and R05 respectively. 6BF sources account for approximately 1% and 3% of the maximum cumulative 24 hour PM_{10} contribution at R03 and R05 respectively.
  - Compliance was predicted for 1 hour and annual NO_2 concentrations against both EPA and NEPM assessment criteria at sensitive receptor locations.

- Compliance was predicted for 1 hour and 24 hour SO_2 concentrations against the EPA assessment criteria at sensitive receptor locations.
- An incremental and cumulative exceedance of the 1 hour SO_2 NEPM criteria was predicted at R06. This exceedance of the NEPM criteria requires interpretation in the context that the 1 hour SO_2 standard was reduced in a recent revision (May 2021) of the Air NEPM. These exceedances are attributed mostly to existing sources on the PKSW site and predicted concentrations comply with the existing NSW EPA criteria. 6BF sources account for approximately 21% of the maximum cumulative 1 hour SO_2 contribution at R06.
- An exceedance of the 1 second H_2S criteria was predicted at R06 only. Compliance was predicted for the 1 hour H_2S criteria at all sensitive receptors. The predicted incremental H_2S concentration, from 6BF only, shows that it contributes about one third of total H_2S emissions at the receptor locations. Given that modelled emissions from 6BF are likely to be conservative, the project is unlikely to lead to off-site odour impacts and is predicted to reduce odour impacts at the sensitive receptor locations. 6BF sources account for approximately 28% of the maximum 1 second H_2S contribution at R06.

Comparatively, the future scenario was predicted to result in a general reduction of all pollutant concentrations (NO_2, SO_2 and H_2S), except for particulate matter, in relation to which a minor increase was predicted due to assumptions in the assessment. The project includes a number of measures anticipated to reduce particulates compared to the existing situation.

The best practice assessment benchmarked proposed No. 6 Blast Furnace emissions control measures against European Union Best Available Techniques (BAT). The best practice assessment concluded that the project conforms with the best available techniques and for each BAT requirement offers a beneficial or at least neutral impact compared with current No. 5 Blast Furnace operations.

From an air quality perspective, the project is considered an improvement (reduction in pollutant concentrations) compared with existing operations.

13. References

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Barclay J and Scire J (2011) *Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the Approved Methods for the Modelling and Assessments of Air Pollutants in NSW, Australia*. Atmospheric Studies Group TRC Environmental Corporation.

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Environ (2012) *BlueScope Steel, Port Kembla Site Air Emissions Modelling – PRP131*

Environ (2011) *BlueScope Steel, Port Kembla Sub-hourly Modelling of Hydrogen Sulphide*

GHD (2019) *East Coast Gas Project Modification Air Quality Assessment*

– Institute of Air Quality Management (2016) Guidance on the assessment of dust from demolition and construction

National Environmental Protection Council (2021) *National Environment Protection (Ambient Air Quality) Measure - Variation 2021.*

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Appendices

Appendix A

Meteorological modelling methodology

A-1 Overview

Local meteorology, including long term wind speed and direction as well as atmospheric stability, can influence how pollutants are dispersed into the local environment.

This appendix outlines the methodology used to synthesise site-representative meteorology for the project. The meteorology is used in CALPUFF to drive the dispersion model.

A-2 Methodology

The meteorology modelling methodology is summarised below:

- Selection of a model period
- Development of coarsely gridded prognostic meteorological data set using the Weather Research and Forecast model (WRF) model
- Development of refined gridded meteorological data set which takes into account local terrain features using the CAMET diagnostic meteorological model
- Verification of model performance using data measured at BoM and BlueScope meteorological monitoring stations
- Extraction of predicted meteorological parameters from the CALMET model

A-2-1 Nearby BoM station review

A review of nearby BoM station is provided in Table A.1.

Table A.1 Nearby BoM station review

BoM station	Approximate distance from Site	Availability of meteorological data	BoM station setting
Port Kembla AWS (BoM ID: 68253)	0.5 km east of the Site	Began operation in 1990. All desired meteorological parameters except cloud data available.	Located on eastern most wharf in Port Kembla
Bellambi AWS (BoM ID: 68228)	12 km North of the site	Began operation in 1988. All desired meteorological parameters available.	Located on exposed headland
Albion Park (Wollongong airport) (BoM ID: 68241)	14 km southwest of the site	Began operation in 1999. All desired meteorological parameters available.	Located in cleared airport setting

Due to close proximity to the project, the Port Kembla AWS was selected for inclusion in the representative year analysis.

A-2-2 Representative year selection

A representative year was chosen for modelling purposes based on review of Southern Oscillation Index (SOI) for the past 10 years and an analysis BoM data recorded at Port Kembla AWS for the last year calendar years (01/01/2016 – 31/12/2020).

The SOI indicates the intensity of El Nino or La Nina events in the Pacific Ocean. A value of less than -7 often indicates El Nino episodes (typically accompanied by sustained warming of the central and eastern tropical Pacific Ocean, a decrease in the strength of the Pacific Trade Winds, and a reduction in winter and spring rainfall over much of eastern Australia and the Top End) while a value of greater than 7 often indicates La Nina episodes (typically associated with stronger Pacific trade winds and warmer sea temperatures to the north of Australia, waters in the central and eastern tropical Pacific Ocean become cooler during this time). Together, these give an increased probability that eastern and northern Australia will be wetter than normal[6].

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[6] SOI data and description of El Nino and La Nina episodes sourced from Australian Government BoM, available online: http://www.bom.gov.au/climate/current/soi2.shtml

The SOI for the past 10 years is shown in Figure A.1.

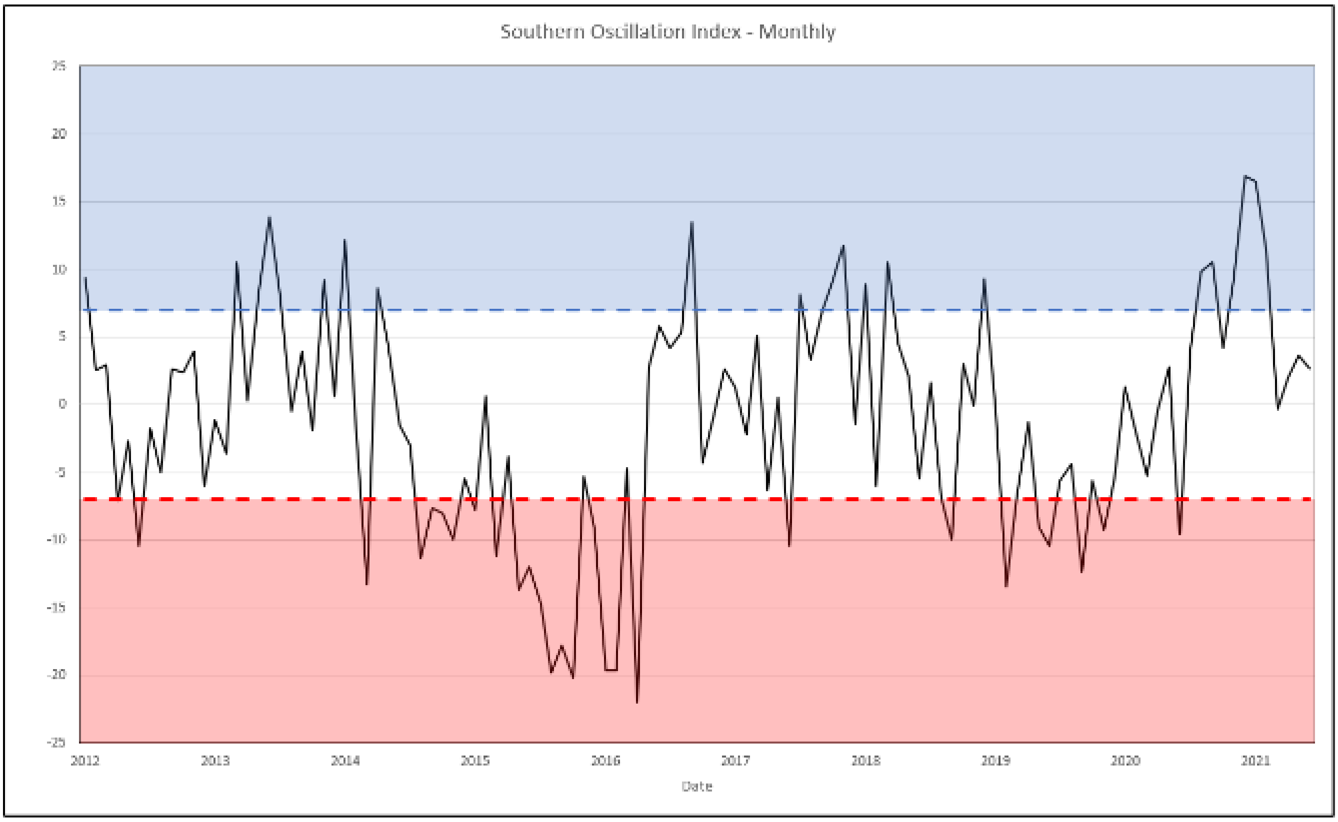


Figure A.1 ***Southern Oscillation Index for last 10 years (2012 – 2021)***

Probability density function plots of Port Kembla AWS data (2016-2020) for wind speed, wind direction and temperature are provided in Figure A.2, Figure A.3 and Figure A.4 respectively.

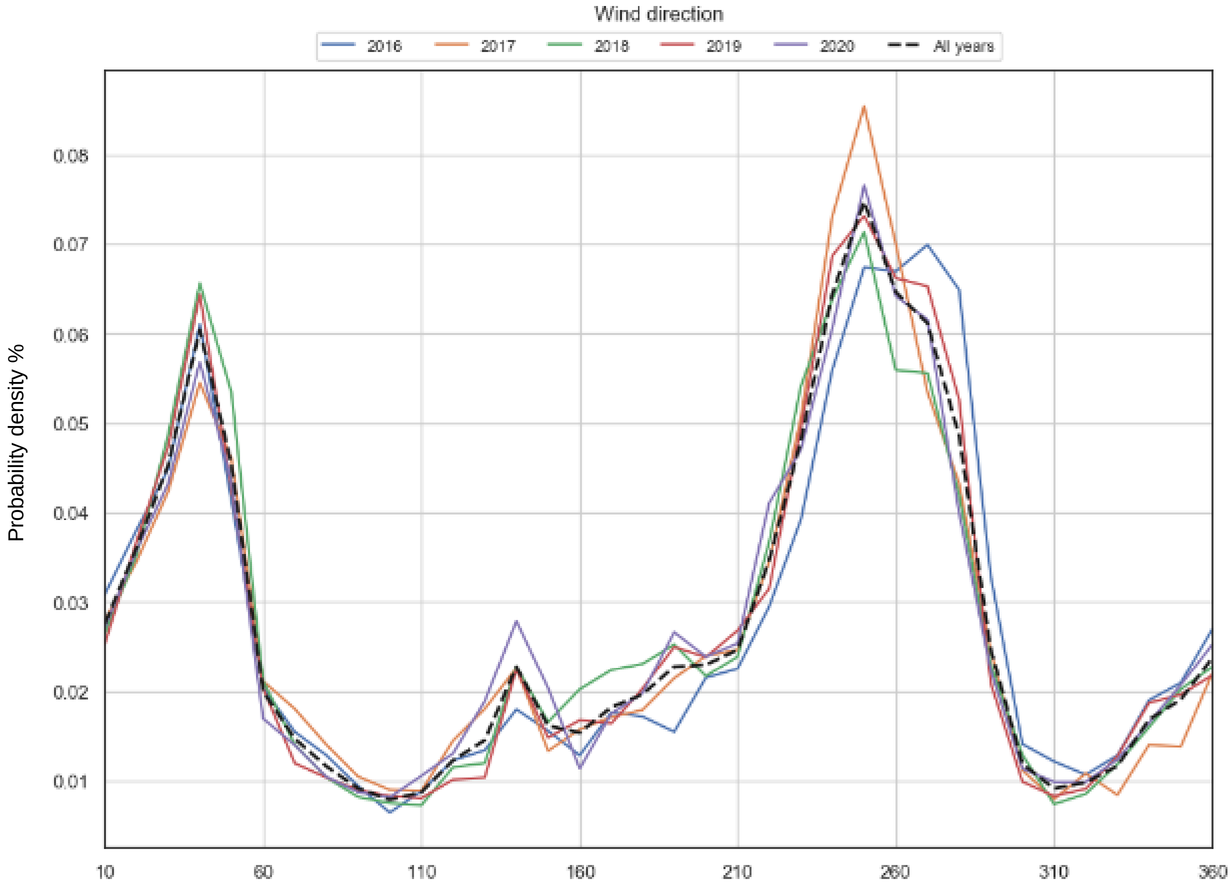


Figure A.2 Wind direction plot, degrees (Port Kembla AWS, 2016 – 2020)

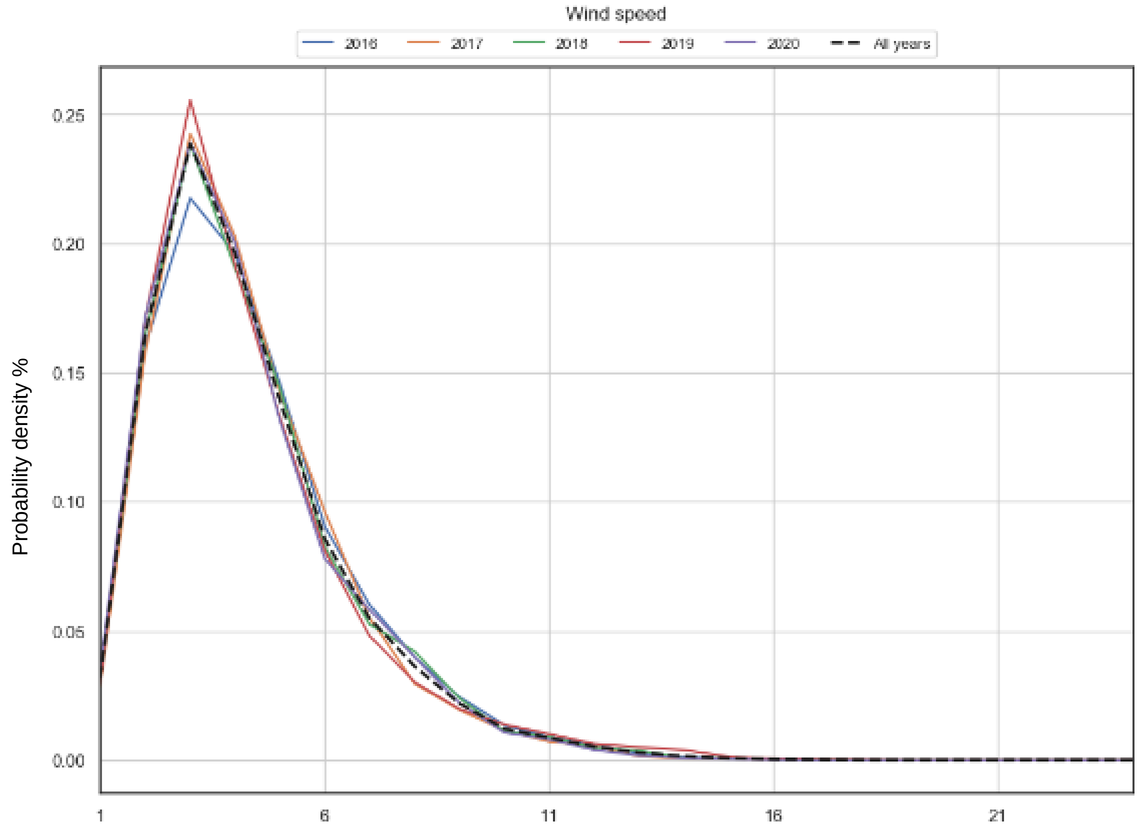


Figure A.3 Wind speed plot, m/s (Port Kembla AWS, 2016 – 2020)

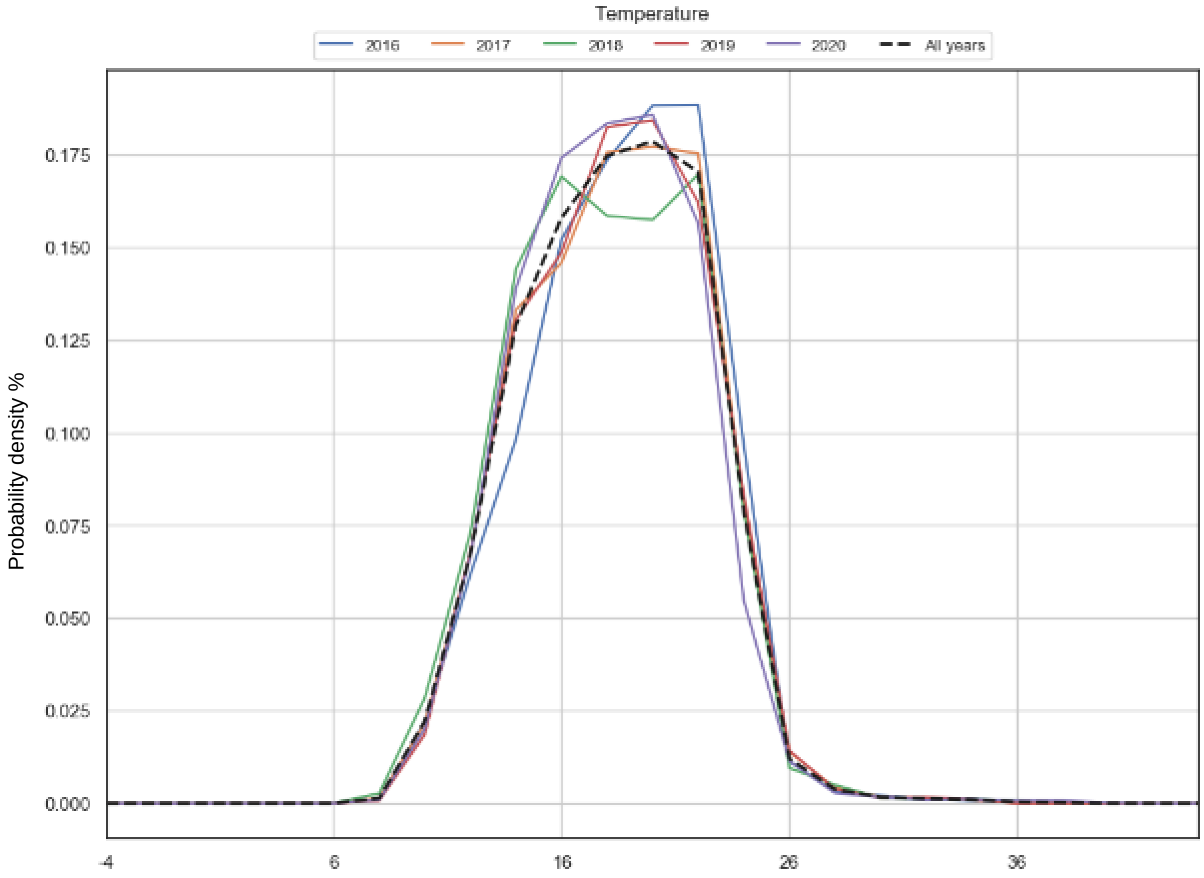


Figure A.4 Temperature plot, degrees celcius (Port Kembla AWS, 2016 – 2020)

Based on the review of SOI data and meteorological conditions recorded at Port Kembla AWS, the representative year selected for modelling purposes was 01 January 2017 through 01 January 2018.

A-2-3 Prognostic meteorology

The parameters for the prognostic WRF model are summarised in Table A.2.

Table A.2 WRF model parameters

Parameter	Value
Modelled period	1 January 2017 to 31 December 2017
Domain centre	Latitude: 34.602506 S Longitude: 150.6581 E
Domain grid spacing	1 km
Domain size	100 x 100 km
Number of vertical levels	25

A-3 CALMET modelling

CALMET (Version 7) was used to resolve the wind field around the subject site to 250 metres spatial resolution. The application of CALMET for this purpose is an approved modelling approach in NSW as per the Approved Methods with model guidance documentation provided.

Upon completion of the broad scale WRF modelling runs, a CALMET simulation was set up to run for the model period using the three-dimensional gridded data output from the WRF model as an initial guess field. This approach is consistent with guidance documentation.

CALMET was run using the ‘No-Obs’ mode (i.e. surface observational data was not included in the model). Given the site is located within a complex land-sea interface, it was deemed that introduction of observational data into the model would lead to inconsistencies/irregularities in the predicted wind field, where blending of the observations and initial guess field is carried out. This is especially true at wind field levels above the surface level on the coastline, which are critical in this instance when assessing dispersion of pollutants from the ship loading vent sources.

A comparison of the predicted and observed wind field was carried out which showed good agreement with respect to frequency and pattern of various wind speeds. The level of agreement is deemed sufficient for dispersion modelling purposes, especially where peak 1-hour averaging periods are of concern and further the error associated with the model prediction is deemed preferable in comparison to the errors associated with the introduction of surface data (as described above).

All model settings were selected based on the recommendations provided in the Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the Approved Methods for the Modelling and Assessments of Air Pollutants in NSW, Australia (J Barclay and J Scire, Atmospheric Studies Group TRC Environmental Corporation, 2011) except for MDISP (parameter for dispersion coefficients) for which the default value was used.

The southwest corner of the CALMET domain, or the origin, was located at UTM Zone 56 coordinates 285 kilometres east and 6164 kilometres north. The CALMET domain extended 40 kilometres to the east and north.

The CALMET domain consisted of 160 grids in both the east and north directions, with a grid resolution of 0.25 kilometre.

The CALMET model parameters are summarised in Table A3. The TERRAD value was selected based on inspection of the terrain elevations in the immediate vicinity of the subject site. It should be noted that multiple TERRAD values were tested and the value producing the best results was selected.

Terrain and land use data used for the CALMET modelling are presented in Figure A5 and Figure A6.

Table A.3 Summary of CALMET model parameters

Parameter	Value
Modelled period	1 January 2017 to 31 December 2017
Mode	No obs (NOOBS = 2)
UTM zone	56
Domain origin (south-west corner)	Easting: 285 km Northing: 6164 km
Domain size	160 x 160 at 0.25 km resolution (40.0 km x 40.0 km)
Number of vertical levels	11
Vertical levels (m)	0, 20, 40, 80, 160, 320, 640, 1200, 2000, 3000, 4000,
CALMET settings for hybrid mode Settings selected in accordance with (OEH, 2011)	TERRAD = 1.75 km
Initial guess field	WRF .m3d file used as an initial guess field for CALMET
Surface data	N/A
Upper air data	No site-specific upper air data is used. Upper air data is included within the WRF .m3d initial guess field.
Land use and terrain data	Land use data was manually developed through assessment of aerial imagery to accurately reflect the land use in the area. High-resolution terrain data was sourced from the STRM 1-second (~30 m) database.

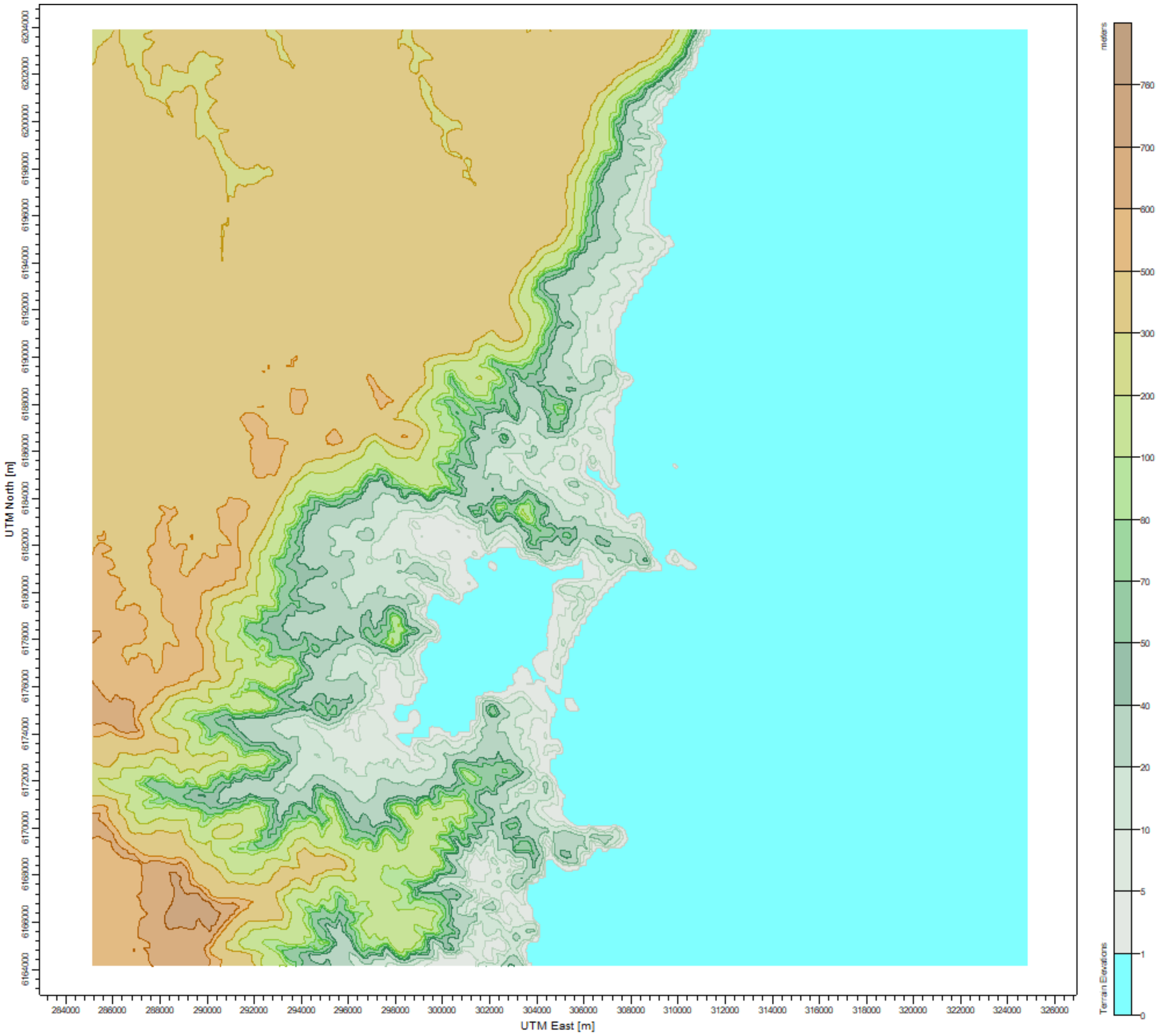


Figure A.5 Terrain data used for CALMET modelling

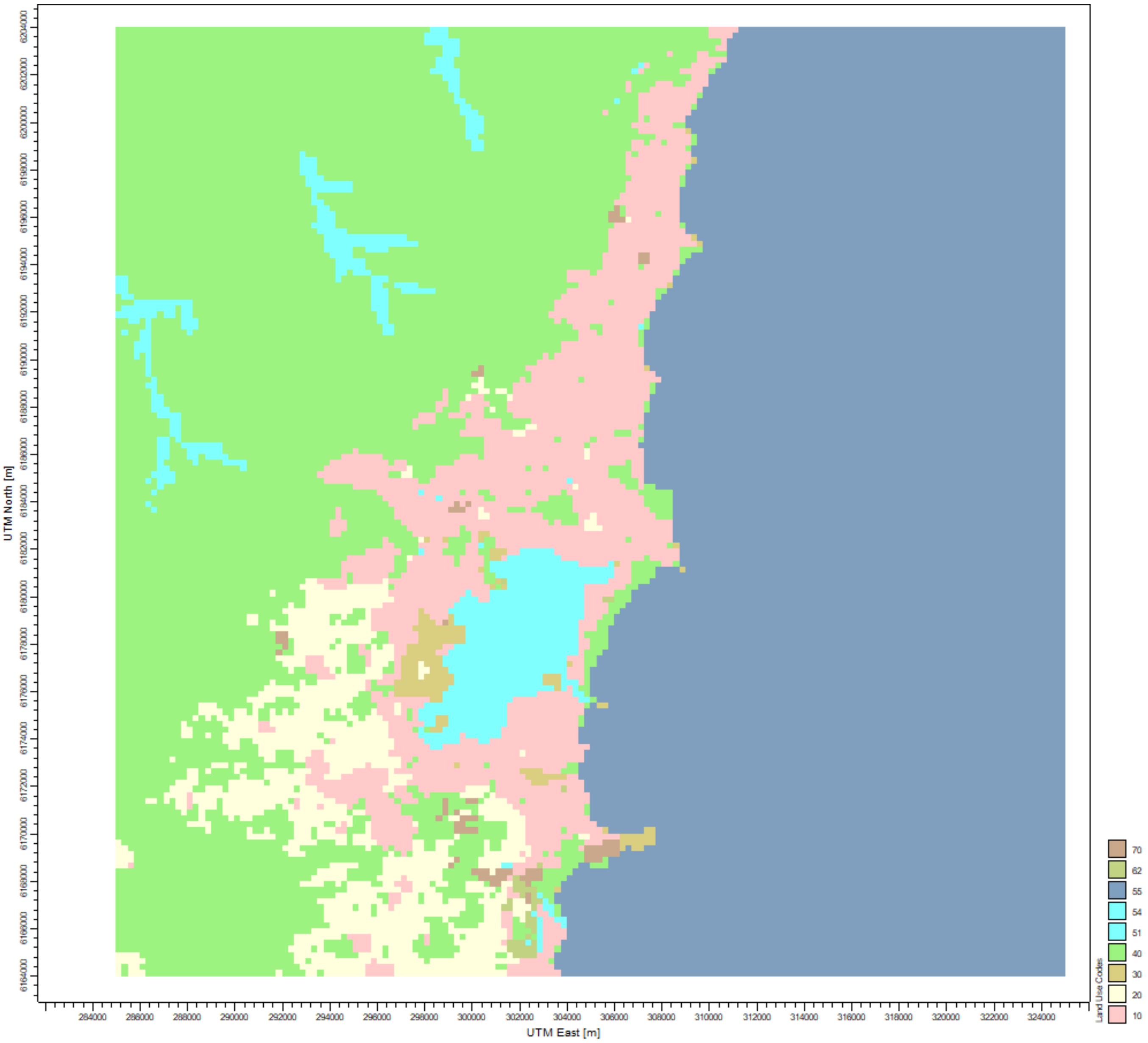


Figure A.6 *Land use data used for CALMET modelling*

The local meteorology largely determines the pattern of off-site air quality impact on receptors (houses, businesses and industry). The effect of wind on dispersion patterns can be examined using the wind and stability class distributions at the site from the dataset that is produced by CALMET. The winds at the site are most readily displayed by means of wind rose plots, giving the distribution of winds and the wind speeds from these directions.

The features of particular interest in this assessment are (i) the dominant wind directions and (ii) the relative incidence of stable light wind conditions that yield minimal mixing (defines peak impacts from ground-based sources).

A-3-1 Annual wind patterns

The wind rose for the entire data period taken at the project site is shown in Figure A7 and shows the following features:

- The predominant annual average wind directions are from the west.
- Lower wind speeds (0.5 – 1 m/s) are rare but can occur from any direction.
- The average wind speed predicted was 5.2 metres per second.
- Calm conditions (wind speeds less than 0.5 m/s) occurred 0.3 per cent of the time.

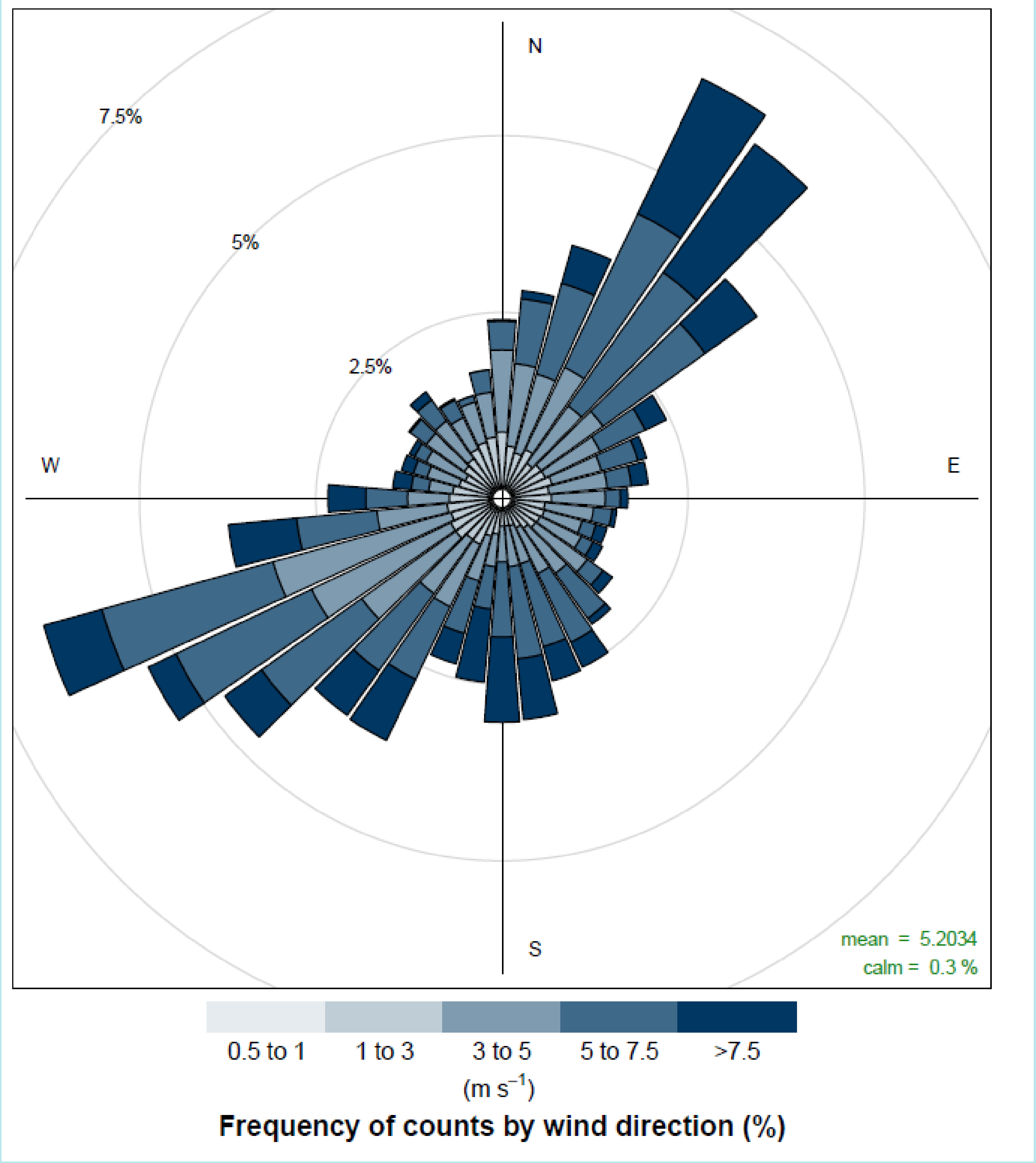


Figure A.7 Wind rose at site from CALMET (2017)

A-3-2 Pattern of atmospheric stability

Atmospheric stability substantially affects the capacity of a pollutant such as gas, particulate matter or odour to disperse into the surrounding atmosphere upon discharge and is a measure of the amount of turbulent energy in the atmosphere.

There are six Pasquill-Gifford classes (A-F) used to describe atmospheric stability and these classes are grouped into three stability categories; stable (classes E-F), neutral (class D), and unstable (classes A-C). The climate parameters of wind speed, cloud cover and insolation (solar radiation) are used to define the stability category as shown in Table A4. As these parameters vary from day to night, there is a corresponding variation in the occurrence of each stability category.

Stability is most readily displayed by means of stability rose plots, giving the frequency of winds from different directions for various stability classes A to F.

Table A.4 Stability category relationship to wind speed and stability characteristics

Stability category	Wind speed range (m/s)[a]	Stability characteristics
A	0 – 2.8	Extremely unstable atmospheric conditions, occurring near the middle of day, with very light winds, no significant cloud.
B	2.9 – 4.8	Moderately unstable atmospheric conditions occurring during mid-morning/mid-afternoon with light winds or very light winds with significant cloud.
C	4.9 – 5.9	Slightly unstable atmospheric conditions occurring during early morning/late afternoon with moderate winds or lighter winds with significant cloud.
D	≥6	Neutral atmospheric conditions. These occur during the day or night with stronger winds, during periods of total cloud cover or during the twilight period.
E	3.4 – 5.4 b	Slightly stable atmospheric conditions occurring during the night-time with significant cloud and/or moderate winds.
F	0 – 3.3 [b]	Moderately stable atmospheric conditions occurring during the night-time with no significant cloud and light winds.

Note: a Data sourced from the Turner's Key to the P-G Stability Categories, assuming a Net Radiation Index of +4 for daytime conditions (between 10:00 am and 6:00 pm) and –2 for night-time conditions (between 6:00 pm and 10:00 am)

b Assumed to only occur at night, during Net Radiation Index categories of –2.

Figure A.8 shows the frequency of stability class for all hours of the model generated dataset. The following observations were made:

- Unstable atmospheres (classes A, B and C) occur 21 per cent of the time
- Neutral atmosphere conditions (class D) are the dominant stability state of the atmosphere occurring 49 per cent of the time
- Stable conditions (classes E and F) occur 30 per cent of the time

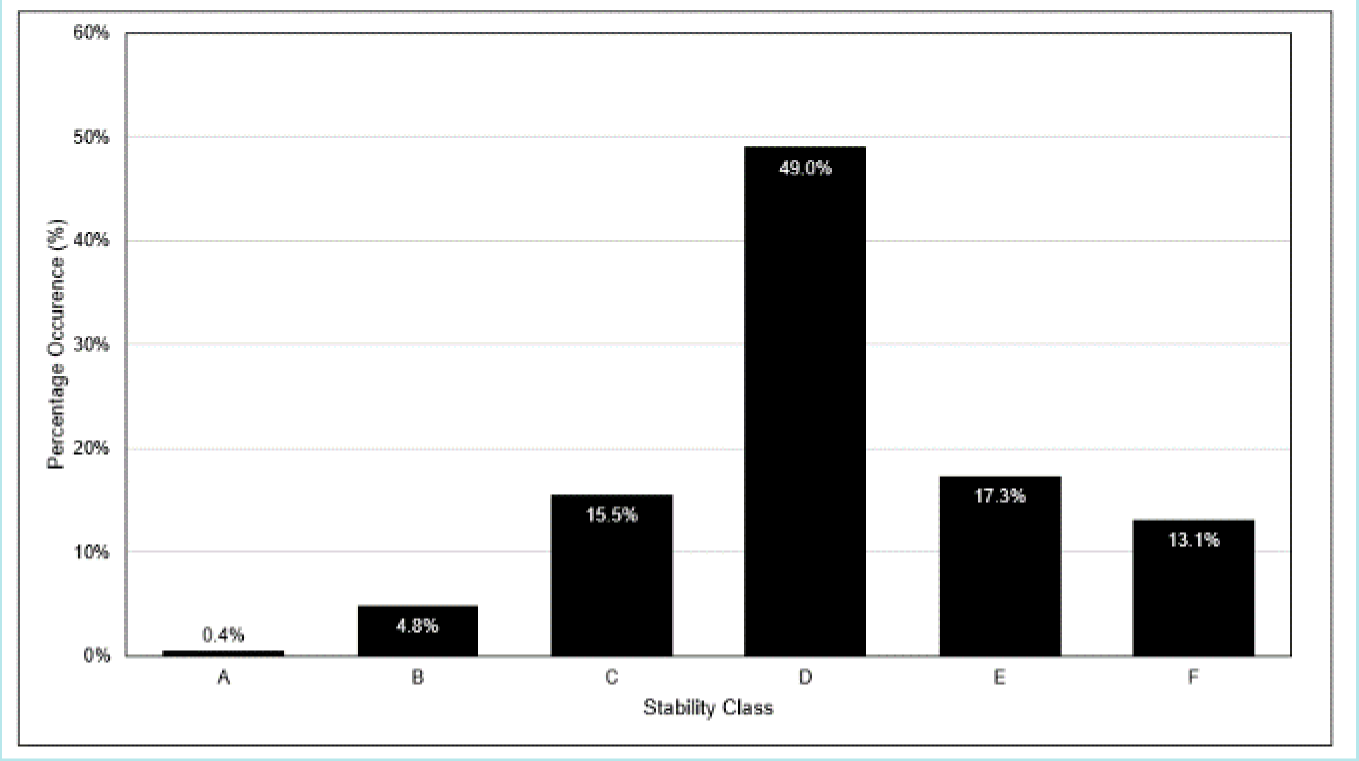


Figure A.8 Distribution of stability class for the model period

A-3-3 Mixing height

Mixing height signifies the height above the surface of the earth throughout which a pollutant can be dispersed. It is often associated with a sharp increase in temperature with height (inversion), and a sharp decrease in pollutant concentration.

A box plot of CALMET predicted mixing heights for the project is shown in Figure A.9. During the night and early morning hours, mixing heights are lower with an average of approximately 890 m (7:00 pm to 7:00 am), which then increase after sunrise to an average of approximately 1160 m during the day (7:00 am to 7:00 pm).

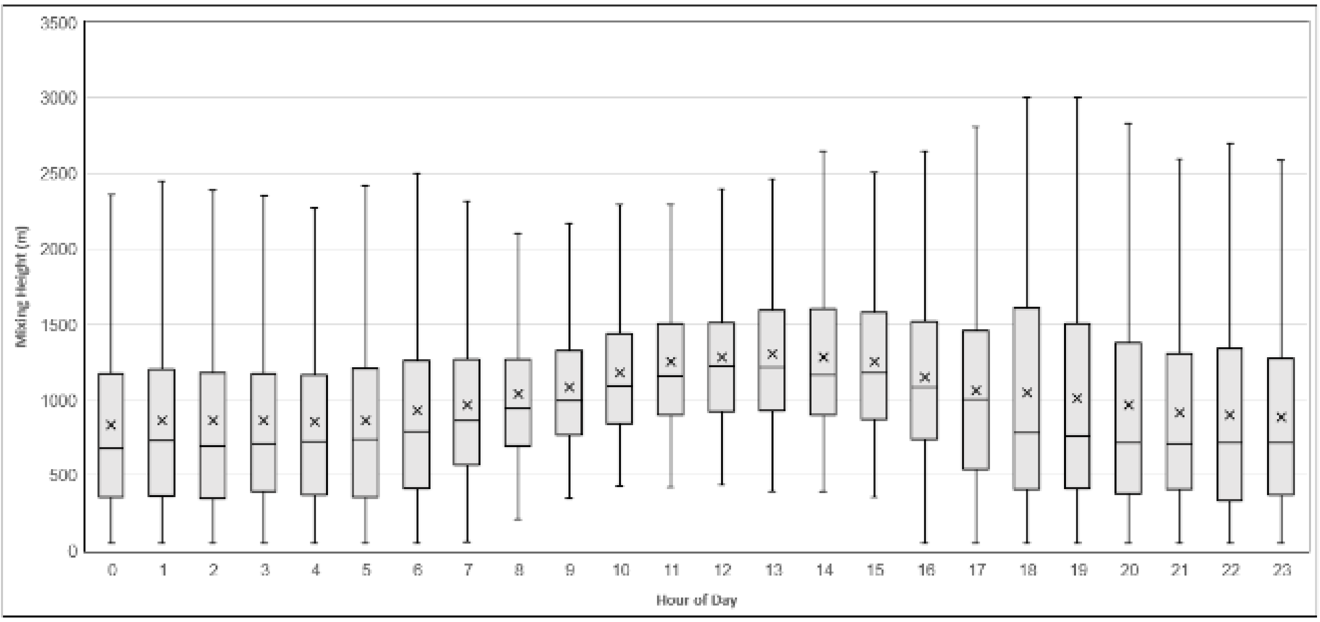


Figure A.9 Mixing heights predicted by CALMET at the project

A-4 Model verification

Verification of the meteorological model performance was carried out by comparison of model outputs to BOM observations at the Port Kembla AWS, Bellambi AWS and Albion Park (Wollongong airport) and BlueScope meteorological observations at Old Scout Hall and North Gate.

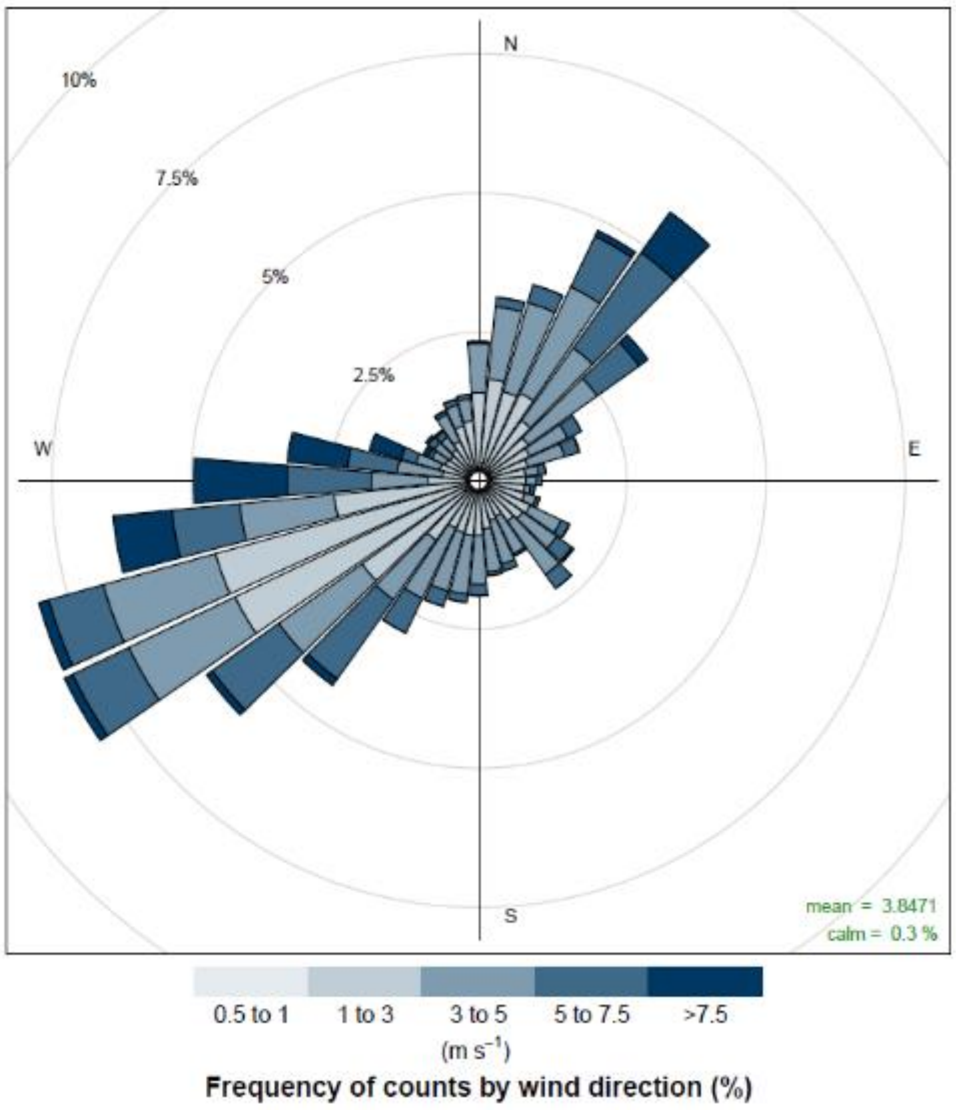
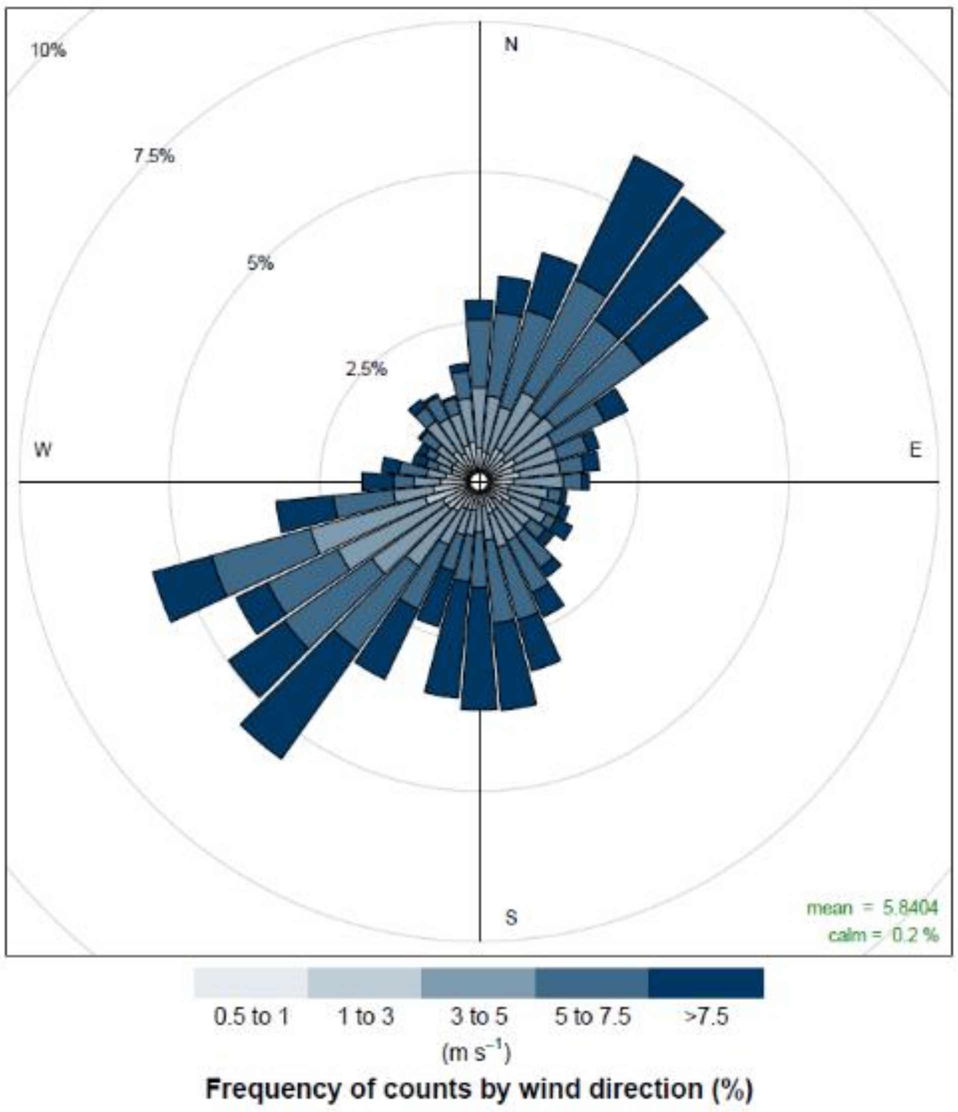
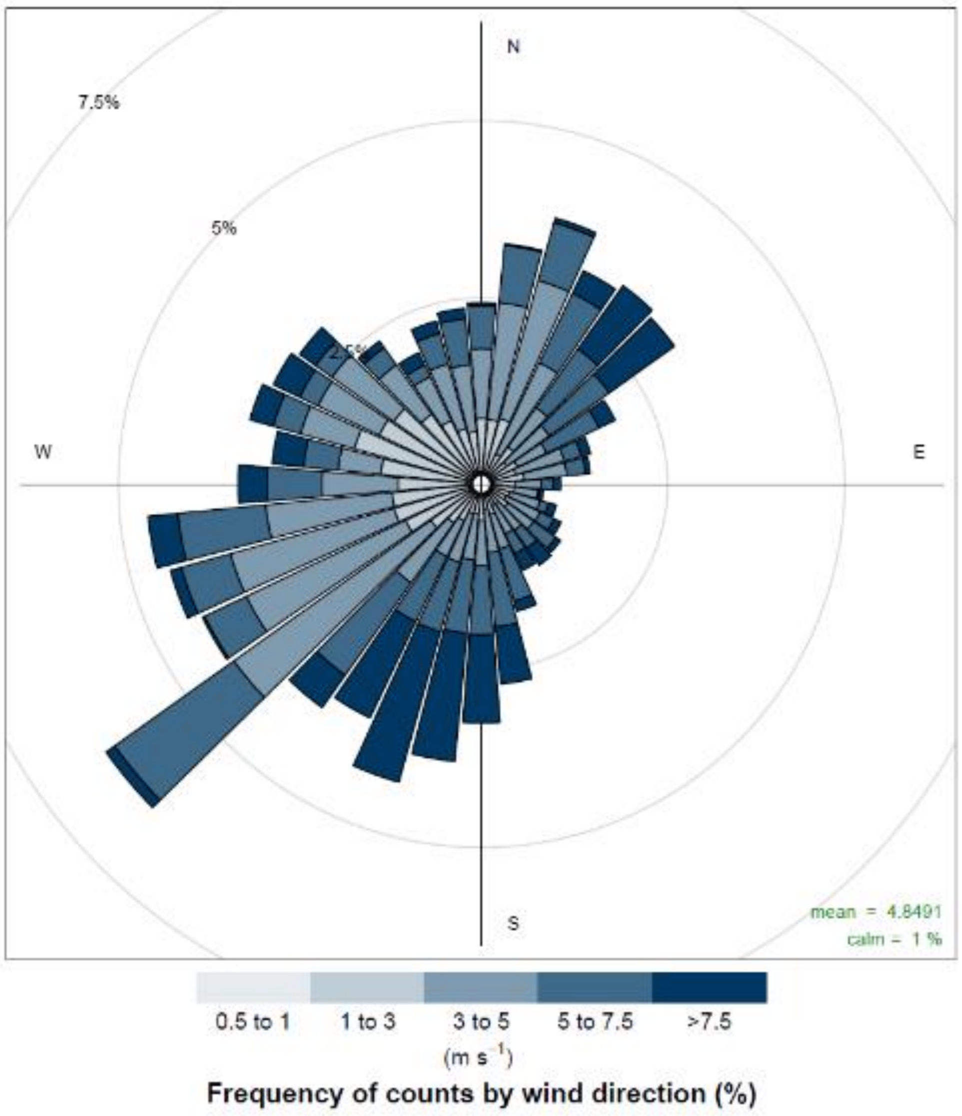
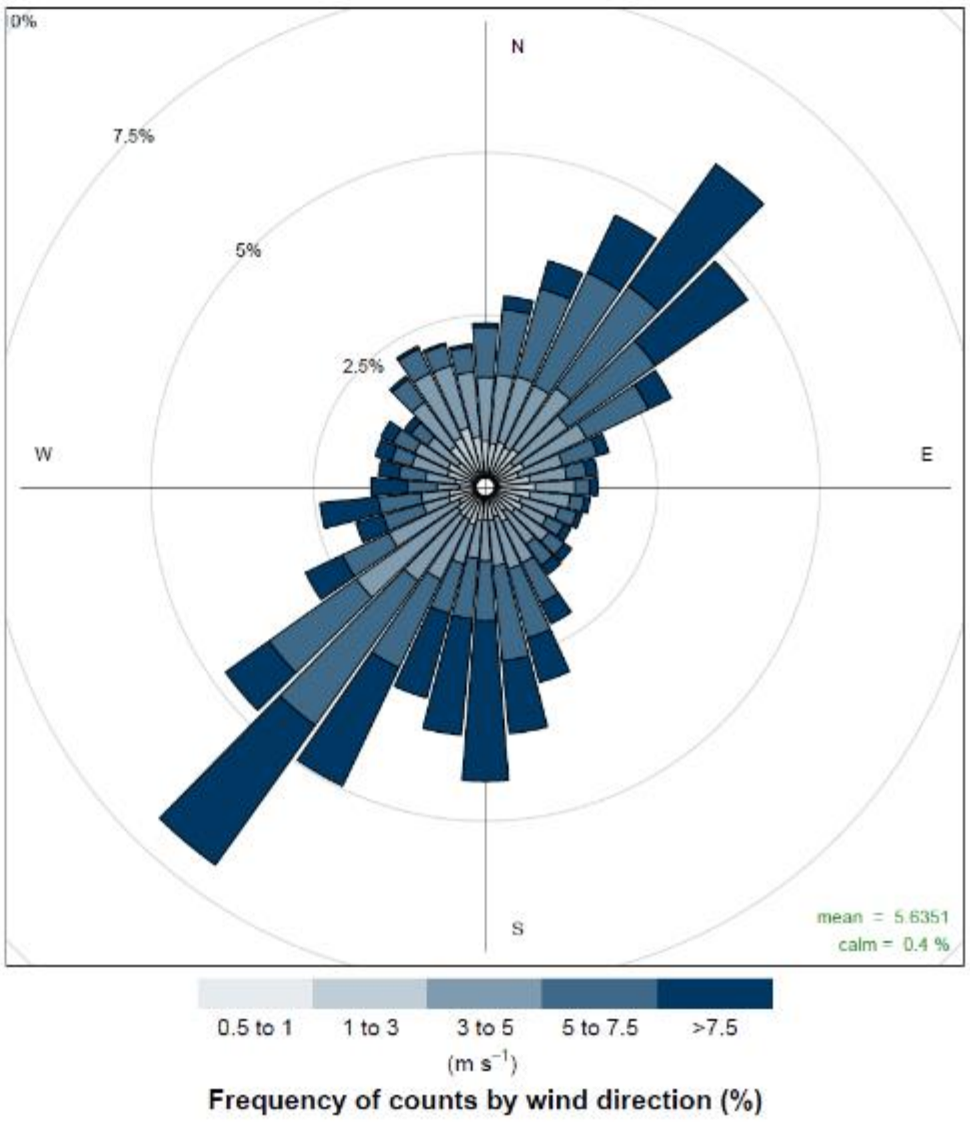
BoM and BlueScope observation data was sourced for the same time period as that of the CALMET model period (01/01/2017 through 01/01/2018) for verification.

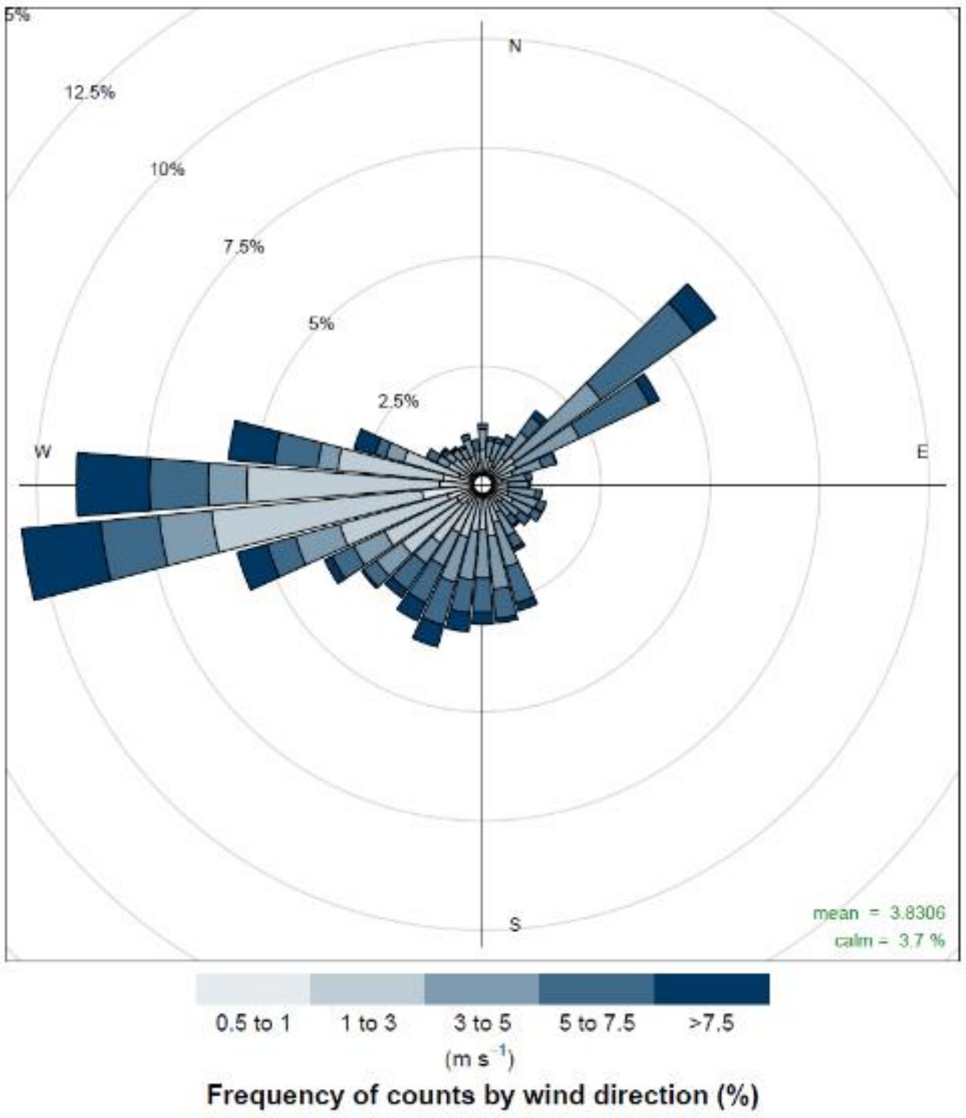
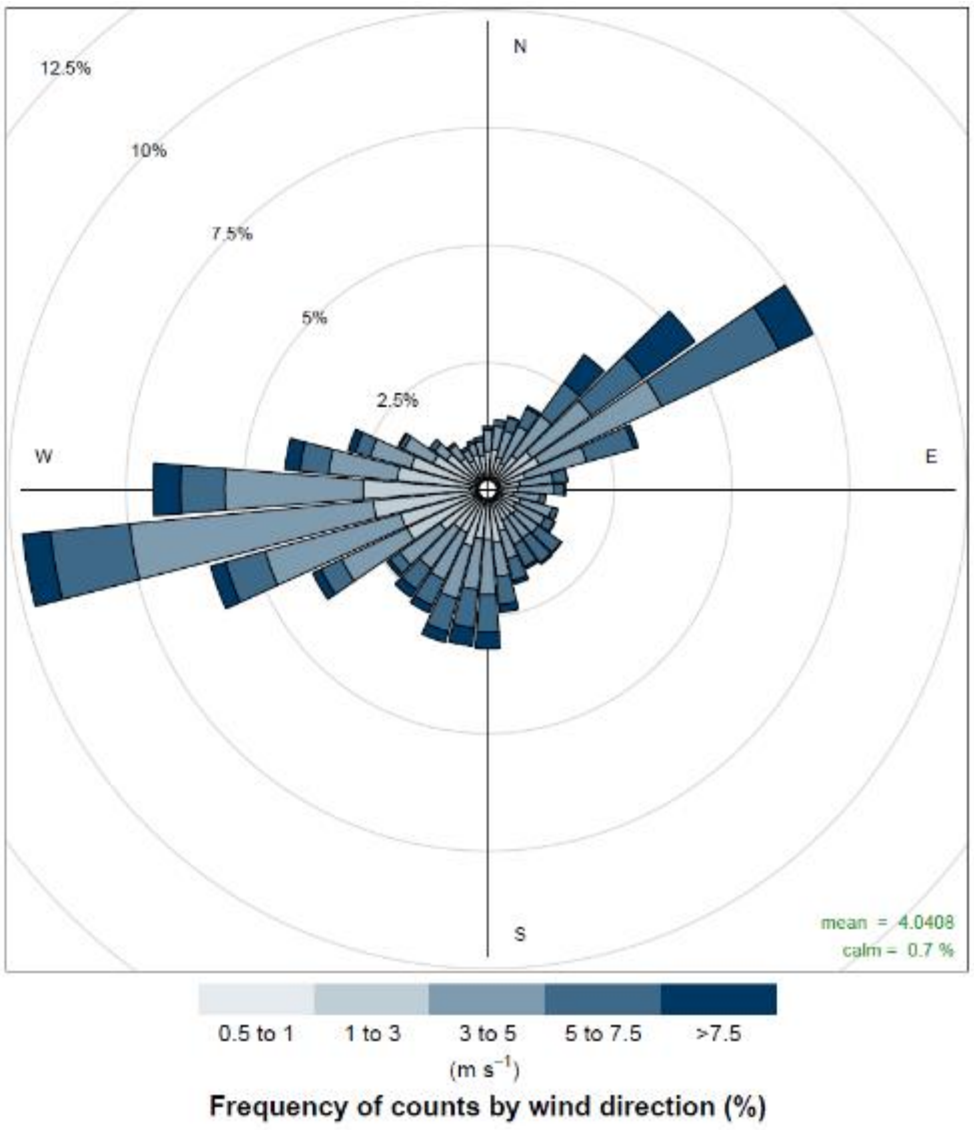
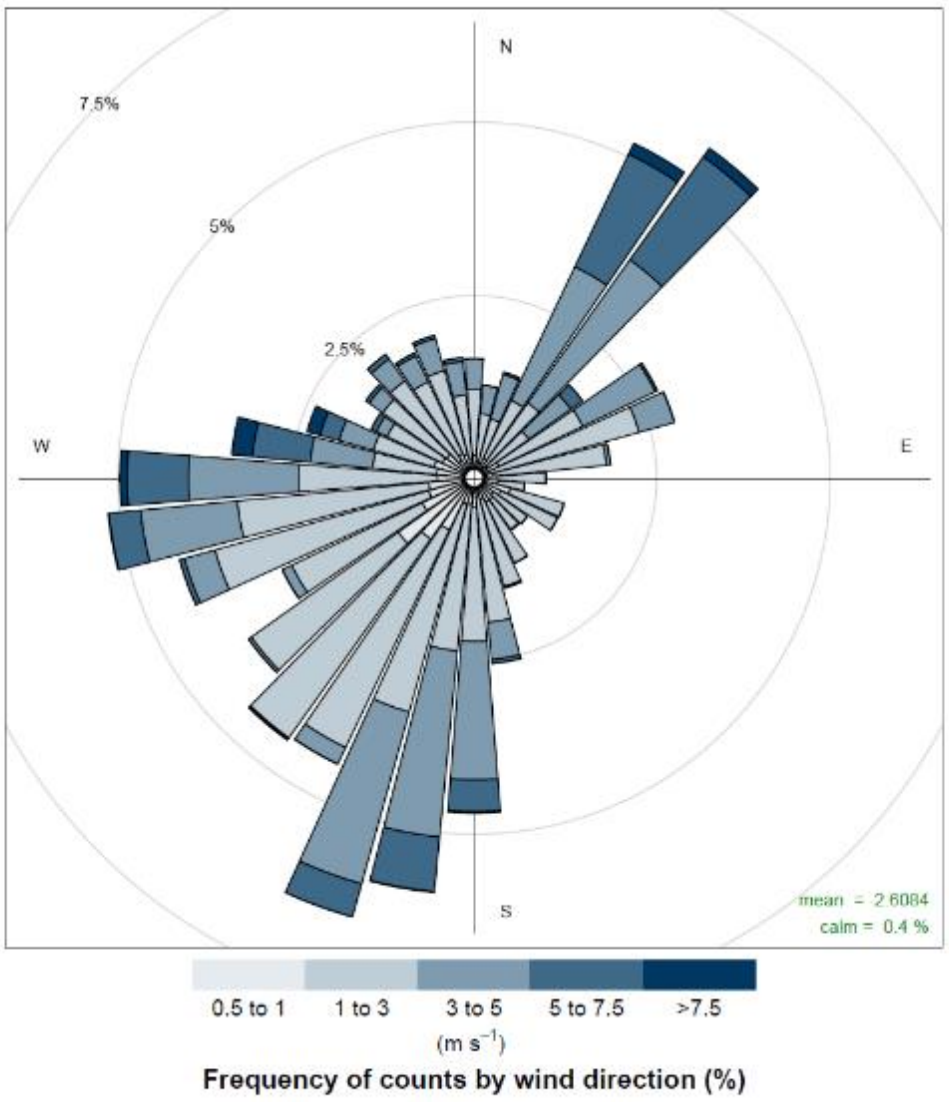
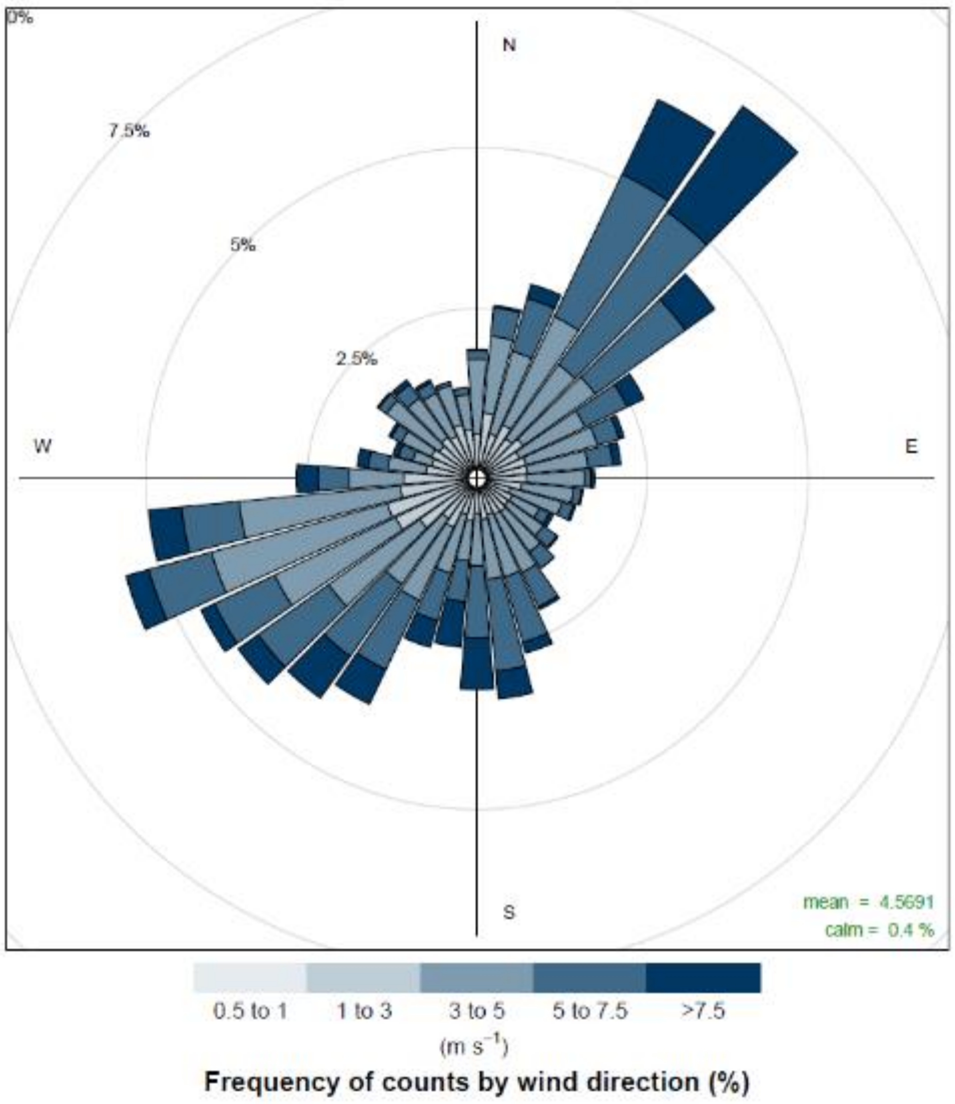
It is noted that comparisons against BlueScope meteorological observations were provided for high level indicative purposes only as they are not fully compliant with the Australian Standard for wind speed and direction due to insufficient height above ground and nearby obstructions that could influence recorded meteorology.

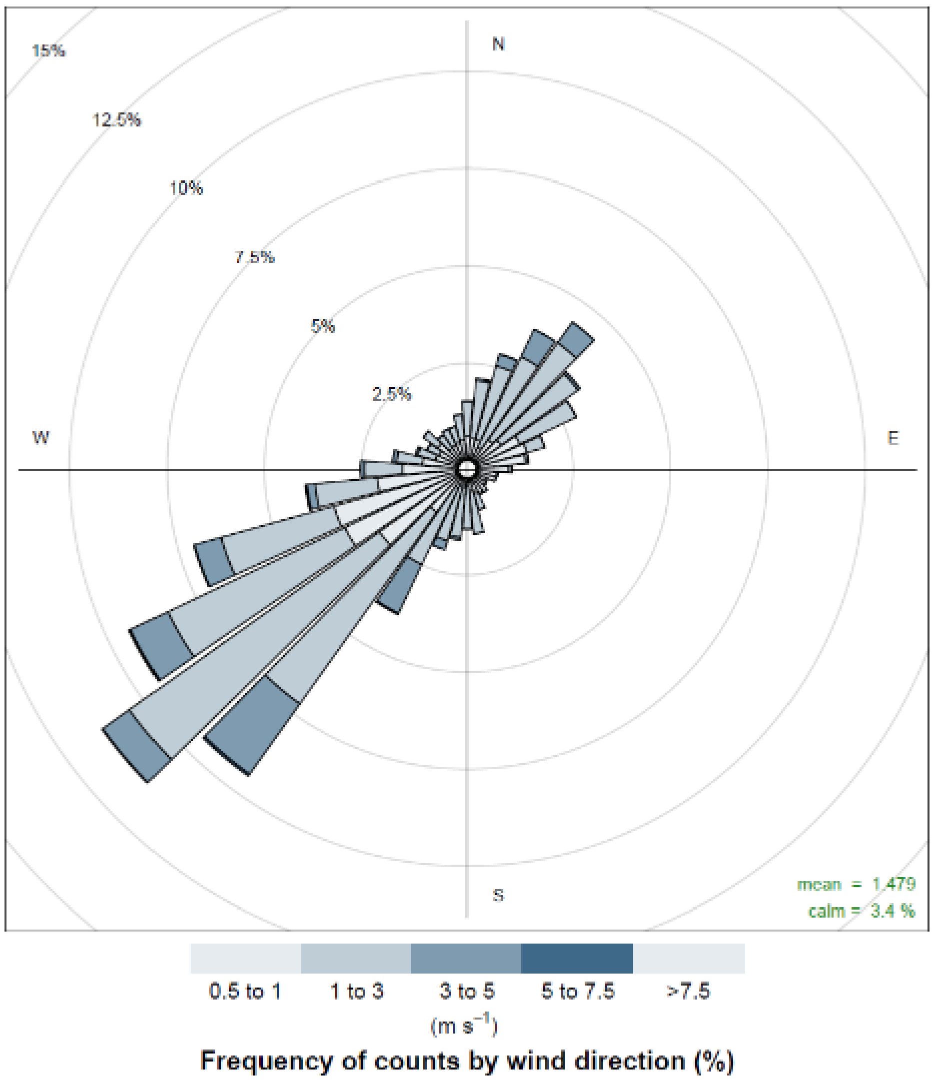
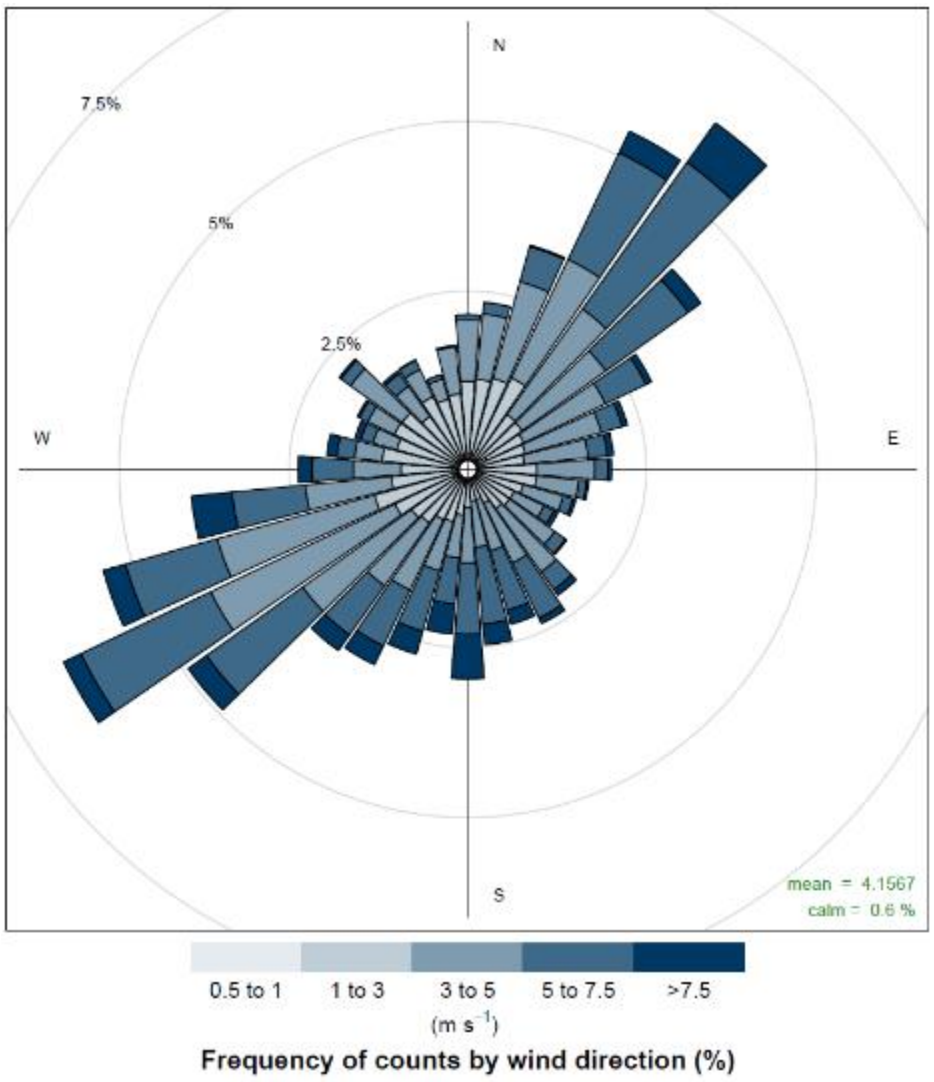
Figures comparing the BOM observations and the CALMET output are presented in Table A.5 and described below:

- Comparison to BoM stations shows relatively good agreement between the observed and modelled data set. The wind patterns including the primary wind directions (winds from the northeast and southwest at the Port Kembla AWS and Bellambi AWS and winds from the northeast and west at the Albion Park station) are replicated in the model outputs. The observed data contains a higher percentage of lower wind speeds than the CALMET output and consequently the CALMET output shows a higher mean wind speed. The frequency of calm winds (<0.5 m/s) predicted by the CALMET model aligns well with that observed at Port Kembla AWS and Bellambi AWS, while the model predicts slightly less occurrence of calms at Albion Park compared to BoM station observations.
- Comparison to BlueScope shows relatively good agreement of pattern direction patterns between the observed and modelled data set, however observed wind speeds are significantly lower than those predicted by the model. As noted above, BlueScope's meteorological observations are not fully compliant with the Australian Standard for wind speed and direction as the anemometer is lower than 10 metres as specified by the Australian Standard and the nearby wind field is obstructed by buildings etc., which increase turbulent resulting in less/slower winds. Consequently, it is expected that the BlueScope observations have a greater percentage of lower wind speed compared to the modelled data set.
- The analysis demonstrates that the performance of the CALMET model is acceptable.

Table A.5 Model verification of CALMET model output compared to observation data

Observation	CALMET output
BOM observations	
BOM observation – Port Kembla AWS – 01/01/2017-01/01/2018  	CALMET output – Port Kembla AWS – 01/01/2017-01/01/2018 
BOM observation – Bellambi AWS – 01/01/2017-01/01/2018  	CALMET output – Bellambi AWS – 01/01/2017-01/01/2018 

Observation	**CALMET output**
BOM observation – Albion Park (Wollongong airport) – 01/01/2017-01/01/2018	CALMET output – Albion Park (Wollongong airport) – 01/01/2017-01/01/2018
	
BlueScope observations	
BlueScope observation – BlueScope Old Scout Hall – 01/01/2017-01/01/2018	CALMET output – BlueScope Old Scout Hall – 01/01/2017-01/01/2018
	

Observation	**CALMET output**
BlueScope observation – BlueScope North Gate – 01/01/2017-01/01/2018	CALMET output – BlueScope North Gate – 01/01/2017-01/01/2018
	

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Appendix F

Noise and vibration impact assessment

Blast Furnace No. 6 Reline Project

Noise and Vibration Impact Assessment

BlueScope Steel (AIS) Pty Ltd

7 March 2022

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Author	Marco Velasco / Angus Bagby
Project manager	Simon Murphy
Client name	BlueScope Steel (AIS) Pty Ltd
Project name	BlueScope Blast Furnace No. 6 Reline
Document title	Blast Furnace No. 6 Reline Project | Noise and Vibration Impact Assessment
Revision version	Rev 0
Project number	12541101

Document status

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S4	0	A. Bagby	M. Velasco		K Rosen		28/10/2021
S4	1	A. Bagby	M. Velasco		K Rosen		07/03/2022

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Executive summary

This report

This noise and vibration impact assessment (NVIA) report has been prepared on behalf of BlueScope Steel (AIS) Pty Ltd (BlueScope) to support the Environmental Impact Statement (EIS) for the No. 6 Blast Furnace (6BF) project (the project) and responds to the Secretary’s Environmental Assessment Requirements (SEARs) for noise and vibration. This NVIA describes the existing noise environment, assesses the potential noise and vibration impacts associated with the construction and operational phases of the project, and assesses the potential increases in noise along the local transport network as a result of the proposal.

Existing environment

The study area identified for the purposes of this noise and vibration assessment is defined as a 3.5 kilometre radius from the central 6BF structure. Within this study area, 103 potential receivers have been selected, which are considered representative of the most-affected noise sensitive receivers to the project. Due to constraints surrounding the COVID-19 pandemic (as of June 2021), background noise monitoring was not undertaken for the specific purpose of this NVIA. Rating background noise levels (RBLs) have been established based on previous noise monitoring undertaken in the study area and have been used to establish the operational noise and construction noise criteria.

Noise impacts from the proposal during operation

An assessment of operational noise from the proposal (6BF and associated activities only, as opposed to a site-wide assessment) has been undertaken to predict noise levels at noise sensitive receivers. Operational noise criteria has been proposed for residential receivers based on a review of the existing Environment Protection License (EPL) 6092 for the Number 5 Blast Furnace (5BF), and guidance from the NSW EPA *Noise Policy for Industry* (NPfI) (NSW EPA, 2017). Operational noise criteria for non-residential receivers have been provided from NPfI.

A 3D noise model has been prepared to predict operational noise levels at noise sensitive receivers. Predictions show that compliance with the proposed operational noise criteria is achieved at all noise sensitive receivers based on the operation of equipment considered part of typical operations. A breakdown of the received noise levels at the most-affected residences indicate that noise emissions from operational noise sources at the Slag handling and Stockhouse areas comprise over half of the received acoustic energy from the modelled noise sources, with the blast furnace contributing to the rest.

The operational noise criteria used in this assessment is based on the NPfI discrete process criteria, which aims to ensure that noise emission from the proposal does not contribute to the existing total industrial noise level at the most affected receivers. As compliance is achieved, no cumulative noise impacts considering the existing industrial noise in the area are anticipated.

Sleep disturbance impacts have been assessed against the sleep disturbance screening criterion provided in the NPfI. Operational activities with the potential for short-duration $L_{A1(1min)}$ noise events have been identified, and predictions have been made to residential receivers. It is predicted that $L_{A1(1min)}$ noise levels will be below the screening criterion and as such, no sleep disturbance noise impacts are anticipated from the proposal.

Current noise emissions from Port Kembla Steelworks (PKSW) include the currently operating 5BF which will cease operations prior to ironmaking commencing at 6BF. A move of ironmaking operation from 5BF to 6BF will see little difference in the amount of noise generated from the PKSW.

Noise impacts from the proposal during construction

Construction noise levels have been predicted to the sensitive receivers within the study area with consideration to the acoustic requirements of the *Interim Construction Noise Guideline* (DECCW, 2011). Construction scenarios have been prepared to assess construction noise from laydown area operations, and the main construction activities within the 6BF site.

It is predicted that majority of the construction noise levels from laydown area operations and the main construction area activities will be below the Noise Management Levels (NMLs) for all sensitive receivers, for works both within and outside standard construction hours. Exceedances of the NMLs are predicted during high-intensity 6BF construction activities outside of standard construction hours. These exceedances are triggered by the use of high noise generating activities such as pile driving and rock-breaking, and will occur for a short duration at the commencement of construction activities. It is recommended that they only take place within the recommended standard construction hours.

An out of hours works procedure will be developed as part of the Construction Environmental Management Plan (CEMP) for the proposal, as authorisation for 24 hour construction is being sought as part of the request for planning approval. Subject to the final construction timetable, construction will be carried out between 7.00 am and 6.00 pm, Monday to Saturday. Where practical, noise generating activities with potential to impact any nearby receivers will be scheduled during standard hours.

For any high impact works required outside of standard hours, an application will be made to the EPA seeking approval in writing to undertake the works per EPL 6092. A description of the works, justification and management measures will be included as part of the application.

Vibration impacts from the proposal during construction

An assessment of construction vibration has been undertaken against criteria from *Assessing Vibration: A Technical Guideline* (DEC, 2006) for structural damage, and *BS6472: Guide to Evaluation of Human Exposure to Vibration in Buildings* (1 Hz to 80 Hz) (British Standards, 2008) for human comfort impacts. It is anticipated that short term human comfort impacts may be experienced for residences close to site preparation works in the No.1 Works laydown area during the use of an 18T vibratory roller however, this can be prevented through use of smaller equipment at this location. These impacts will be limited to the duration of work using this equipment, which is anticipated to only occur for a short duration at the commencement of construction activities. The potential impacts are considered to be a highly conservative approximation, since at this stage is not certain whether the roller is required, or for what duration. Due to the offset distances from the works and the nearest buildings, potential for any vibration related structural damage to occur as a result of the project is negligible.

Monitoring occurred for four blasts in January 2009 as part of previous blast furnace reline works. It concluded no discernible blast events (ground vibration or airblast overpressure) were identified at monitoring undertaken 1.1 kilometres to the southwest. Similarly, blasting required for the 6BF will take place approximately 1.1 kilometres away from the nearest residential receivers in Cringila and will use a similar methodology to the blasting at 5BF. Due to the similar distance from the source, no ground vibration or airblast overpressure impacts from blasting are anticipated at any of the nearby residential receivers.

Traffic noise impacts from the proposal during construction

Construction traffic noise levels on public roads are predicted to comply with the road traffic noise assessment criteria in accordance with the *NSW Road Noise Policy* (RNP) (DECCW, 2011) at the nearest residential receiver to the road. As such, no construction traffic noise impacts are anticipated. Construction traffic along internal private roads near sensitive receivers are also predicted to comply with construction NMLs for the site.

Mitigation and management measures have been recommended in response to the findings of the impact assessment.

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Abbreviations and acronyms

Term	Definition
AGL	Above ground level
AS	Australian Standards
AWS	Automatic weather station
BS	British Standards
BlueScope	BlueScope Steel (AIS) Pty Ltd
°C	Degrees Celsius
CEMP	Construction Environmental Management Plan
CNVG	Construction Noise and Vibration Guideline (TfNSW, 2016)
CSSI	Critical State Significant Infrastructure
dB	Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics.
dBA	Decibel expressed with the frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at low and high frequencies.
DCNG	Draft Construction Noise Guideline (EPA, 2021)
DEC	Department of Environment and Conservation NSW
DECC	Department of Environment and Climate Change NSW
DECCW	Department of Environment and Climate Change and Water NSW
DIN	German Institute for Standardisation (Deutsches Institut für Normung)
DP	Deposited Plan
DPIE	Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EPA	Environment Protection Authority NSW
GHD	Gutteridge Haskins & Davey
ICNG	Interim Construction Noise Guideline (DECC, 2009)
ISO	International Organization for Standardisation (Organisation internationale de normalisation)
km	Kilometre
$L_{A1(1min)}$	The noise level exceeded for 1 per cent of the time over a 1 minute period, used to denote maximum noise levels
m	Metre
m/s	Metres per second
NCA	Noise Catchment Area
NML	Noise Management Level
NPfI	Noise Policy for Industry (EPA, 2017)
NSW	New South Wales
RBL	Rating Background Noise Level
RNP	Road Noise Policy (DECCW, 2011)
SEARs	Secretary's Environmental Assessment Requirements

Term	Definition
SPL	Sound Pressure Level
SPLi	Internal Reverberant Sound Pressure Level
SSD	State Significant Development
SWL	Sound Power Level
TRT	Top gas recovery turbine
WGHR	Waste Gas Heat Recovery
5BF	Blast Furnace Number 5
6BF	Blast Furnace Number 6
µPa	Micropascals

Glossary of terms

Term	Definition
A weighting	The human ear responds more to frequencies between 500 Hz and 8 kHz and is less sensitive to very low-pitch or high-pitch noises. The frequency weightings used in sound level measurements are often related to the response of the human ear to ensure that the meter better responds to what you actually hear.
Noise-enhancing weather conditions	Weather effects that enhance noise (i.e. wind and temperature inversions) that occur at a site for a significant period of time (i.e. light winds, up to and including 3 m/s, occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far. This is described using the Leq descriptor.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the L90 descriptor.
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Construction footprint	Defined as the area that will be directly affected by construction of the proposal. It includes: – The location of project infrastructure, 6BF, slag handling area and immediate surrounds – The area that will be directly disturbed by the movement of construction plant and machinery, and the location of the temporary, construction compounds and laydown areas that will be used during construction
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build. Reasonableness relates to the application of judgement in arriving at a decision, considering the following factors: – Noise mitigation benefits (amount of noise reduction provided, number of people protected) – Cost of mitigation (cost of mitigation versus benefit provided) – Community views (aesthetic impacts and community wishes) – Noise levels for affected land uses (existing and future levels, and changes in noise levels)
Ground-borne vibration	Vibration transmitted from a source to a receptor via the ground.
Hertz	The measure of frequency of sound wave oscillations per second. 1 oscillation per second equals 1 hertz.
Maximum noise event	The loudest event or events within a given period of time. This is generally described using the L_{max} descriptor.
Meteorological conditions	Wind and temperature inversion conditions.
Most-affected location	Location(s) that experience (or will likely experience) the greatest noise impact from the construction works and operations under consideration. In determining these locations, existing background noise levels, noise source location(s), distance and any shielding between the construction works (or proposed works) and the residences and other sensitive land uses need to be considered.
Noise management level	The NML as defined by the ICNG. To be measured and assessed at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the residential property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most affected point within 30 m of the residence.
Noise sensitive land use	Land uses that are sensitive to noise, such as residential areas.

Term	Definition
Non-compliance	Development is in non-compliance with its noise consent/ licence conditions if the monitored noise levels exceed its statutory noise limit (exceptions may be given if the noise level exceeds by less than 2 dB).
Octave	A division of the frequency range into bands, the upper frequency limit.
One third-octave	Single octave bands divided into three parts.
Project noise trigger level	Target noise levels for a particular noise generating facility. They are based on the most stringent of the intrusive criteria or amenity criteria. Which of the two criteria is the most stringent is determined by measuring the level and nature of existing noise in the area surrounding the actual or propose noise generating facility.
Proponent	BlueScope Steel (AIS) Pty Ltd
Proposal site	The southern section of the No.2 Works, within the ironmaking facilities, which is located within Lot 1 DP 606434.
Rating Background Level	The RBL is defined by the Noise Policy for Industry (NPfI) as the overall, single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-hour period used for the assessment background level). This is the level used for assessment purposes.
Resonance	Resonance describes the phenomenon of increased amplitude that occurs when the frequency of a periodically applied force is equal or close to a natural frequency of the system on which it acts.
Study area	Land in the vicinity of, and including, the proposal site. The 'study area' is the wider area surrounding the proposal site.
Temperature inversion	An atmospheric condition in which temperature increases with height above the ground.
Z-Weighting (or Linear-weighted)	Zero-weighting or Linear-weighting indicates no weighting filter has been applied and refers to a flat frequency response for sound level meters.

1. Introduction

1.1 Background and overview

BlueScope Steel (AIS) Pty Ltd (BlueScope) is one of Australia's leading manufacturers and is a global leader in finished and semi-finished steel products. BlueScope's Port Kembla Steelworks (PKSW) operation in NSW includes two blast furnaces. No. 5 Blast Furnace (5BF) is currently operating, while No. 6 Blast Furnace (6BF) is currently in care and maintenance.

5BF is expected to continue to produce (molten) iron on a continuous basis until it reaches the end of its operational life at some stage between 2026 and 2030. BlueScope is proposing a move of iron production from 5BF to 6BF, after 5BF ceases operation.

6BF last produced iron in 2011, at which point it was taken out of service and placed into care and maintenance. To prepare 6BF to become operational again, major maintenance works are required (the project). The project aims to return 6BF to service through a reline process that will be carried out while 5BF continues to operate.

The project has been declared critical state significant infrastructure (CSSI) in accordance with section 5.13 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and Schedule 5 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). An environmental impact statement (EIS) has been prepared to support the application for approval.

This noise and vibration impact assessment report has been prepared by GHD Pty Ltd (GHD) as part of the EIS for the project. The EIS has been prepared to support the application for determination of the project and address the environmental assessment requirements of the Secretary's Environmental Assessment Requirements (SEARs) pertaining to noise and vibration.

1.2 Purpose of this report

The purpose of this report is to assess the potential noise and vibration impacts from constructing and operating the project. The report:

- Addresses the SEARs (DPIE, 2021) as listed in Table 2.1.
- Describes the existing environment with respect to noise and vibration.
- Assesses the potential impacts of constructing and operating the project on sensitive receivers.
- Recommends measures to mitigate and manage the impacts identified.

1.3 Structure of this report

The structure of the report is outlined below.

- **Section 1** – provides an introduction to the report
- **Section 2** – provides a description of the project during the operational and construction phases
- **Section 3** – describes the methodology used to assess potential impacts to sensitive receivers
- **Section 4** – describes the existing noise environment and the sensitive receivers in the study area
- **Section 5** – details the assessment criteria used to assess the potential noise and vibration impacts
- **Section 6** – summarises the outcomes of the assessment and a discussion of the potential impacts
- **Section 7** – provides the mitigation measures recommended to reduce the potential impacts
- **Section 8** – summarises the key outcomes of the noise and vibration impact assessment
- **Section 9** – lists the references used in this report

1.4 Limitations

This report has been prepared by GHD for BlueScope (AIS) Steel Pty Ltd and may only be used and relied on by BlueScope (AIS) Steel Pty Ltd for the purpose agreed between GHD and BlueScope (AIS) Steel Pty Ltd as set out in section 1.2 of this report. GHD otherwise disclaims responsibility to any person other than BlueScope (AIS) Steel Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

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The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

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2. Legislative and policy context

2.1 Secretary's Environmental Assessment Requirements

The SEARs relevant to noise and vibration, together with a reference to where they are addressed in this report are summarised in Table 2.1.

Table 2.1 Noise and vibration SEARs

Requirement	Where addressed in this report
Noise and vibration	
A quantitative assessment of potential construction, operational and transport noise and vibration impacts of the project prepared in accordance with the relevant Environment Protection Authority guidelines	Section 7.1 (Operation – EPL 6092 and NPfI) Section 7.2 and 7.3 (Construction – ICNG) Section 7.4 and 7.7 (Traffic noise – RNP)
Identification of sensitive receivers and consideration of cumulative noise from approved and/or proposed development on site and in the vicinity of the site	Section 5.2 (Sensitive receivers) Section 6.1.4 (Cumulative noise impacts)
Details and justification of proposed noise mitigation and monitoring measures	Section 8.2 (Construction mitigation) Section 8.3 (Operational) Section 8.4 (Draft Operational Noise Management Plan)

2.2 Guidelines and policies

The assessment was undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

- Interim Construction Noise Guideline (ICNG) (DECC, 2009)
  - Used for the assessment of construction noise and vibration impacts
- NSW Road Noise Policy (RNP) (DECCW, 2011)
  - Used for the assessment of traffic generation from the project; both in construction and operation phases
- Noise Policy for Industry (NPfI) (EPA, 2017)
  - Used for the assessment of operational noise impacts
- Assessing Vibration: A Technical Guideline (DEC, 2006)
  - Used for the assessment of construction vibration impacts
- *BS 7385-2:1993 Evaluation and measurement for vibration in buildings Part 2 – Guide to damage* (British Standards, 1993)
  - Used for the determination of suitable vibration intensity thresholds for structures
- *Technical Basis for Guidelines to Minimise Annoyance due to blasting overpressure and ground vibration* (ANZEC, 1990)
  - Used for the assessment of overpressure impacts resulting from blasting activities

3. Methodology

3.1 Key tasks

Project definition

- Review of operational noise sources from the project, and assignment of suitable source noise levels.
- Review of proposed construction staging and construction areas and indicative construction equipment lists.

Existing environment

- Identify the study area relevant to the noise and vibration assessment.
- Identify and classify sensitive receivers within the study area.
- Characterise the existing noise environment based on previous noise monitoring undertaken at representative locations in the study area.
- Determine the rating background levels (RBL) for residential receivers in the study area to establish the construction noise and operational noise criteria.

Operational noise assessment

- Identify the significant noise sources associated with the blast furnace during operation and indicative sound power levels based on measured or assumed noise data of similar equipment at 5BF supplemented with noise measurements undertaken by GHD.
- Determine worst-case operating scenarios during all periods of the day based on assumptions detailed in Appendix C.
- Predict noise levels at sensitive receivers using SoundPLAN Version 8.2 (SoundPLAN) noise modelling software with consideration to the local meteorological conditions.
- Where required, in-principle noise mitigation measures have been recommended to reduce noise to within acceptable and compliant levels. Operational noise criteria considers requirements both from the NSW EPA *Noise Policy for Industry* (NPfI) and the existing environment protection license EPL 6092 for 5BF. These noise mitigation measures are to be incorporated into the detailed design noise model.

Construction noise and vibration assessment

- The RBLs were used to establish the noise management levels (NMLs) in accordance with the ICNG.
- A list of likely construction activities and machinery was developed based on the constructability requirements for the project. The construction activities were used to develop construction scenarios for construction noise modelling. Representative sound power levels for the selected equipment were obtained from the *Construction Noise and Vibration Guideline (CNVG)* (TfNSW, 2016), AS2436:2010 *Guide to noise and vibration control on construction, demolition and maintenance sites* (Australian Standards, 2010).
- Noise modelling was undertaken for the identified construction scenarios and likely equipment that will be operating.
- Safe working distances for human comfort and cosmetic damage to buildings were sourced from the CNVG for various vibratory intensive equipment. Any sensitive receivers located within these safe working distances were identified.
- Where noise or vibration levels were predicted to exceed the construction noise management levels or vibration criteria, feasible and reasonable construction noise or vibration mitigation measures are recommended to reduce potential impacts.

Road traffic noise assessment during construction

A screening assessment has been undertaken for the construction traffic assessment. The screening assessment is based on the Road Noise Policy (DECCW, 2011) (RNP) which states "*any increase in the total noise level should be limited to 2 dB above that of the corresponding 'without construction' scenario*". Modelling has been undertaken using SoundPlan using the algorithm defined in the *Calculation of Road Traffic Noise* (Department of Transport, Welsh Office, 1988). Potential impacts have been identified using the following methodology:

- Identify the construction traffic routes and their road classifications.
- Determine the existing and future total traffic volumes along the route.
- Calculate the increase in road traffic noise traffic between the pre-construction and during-construction scenarios.
- Where the increase in traffic noise levels is above +2 dBA, assess the total noise levels against the RNP road traffic noise criteria to identify whether mitigation should be considered.

Road traffic noise assessment during operation

Traffic generation on public roads during operation is anticipated to be consistent with the existing conditions. As such, a quantitative assessment of potential road traffic noise increase on public roads as a result of the project is not considered necessary as the acoustic requirements of the NSW Road Noise Policy are anticipated to be met.

Blasting assessment

A high-level blasting assessment has been undertaken to identify potential airblast overpressure and ground vibration impacts from blasting at the blast furnace to nearby sensitive receivers and assessed against the ANZEC blasting guideline.

3.2 Study area

The study area has been defined as approximately 3.5 kilometres from the proposal site as noise impacts during construction or operation are not anticipated beyond this distance.

3.3 Noise monitoring

It was not possible to undertake noise monitoring to establish the background noise environment at the nearest residential receivers for the following reasons:

- There were concerns over the validity of long-term noise monitoring during a lockdown period due to NSW COVID-19 restrictions in an area where road traffic noise and commercial/industrial activity are the dominant noise sources in the study area (as of June 2021).
- Visits to residences necessary to request permission for noise monitoring to be carried out were not permitted under State Government restrictions put in place as a result of the COVID-19 Delta variant outbreak (as of June 2021).

In view of the above, background noise monitoring data has been utilised from a publicly available noise and vibration impact assessment in Port Kembla, the '*Port Kembla Gas Terminal – Noise and Vibration Impact Assessment*' (Australian Industrial Energy, 2018) to establish the RBL at residences within the study area.

Background noise monitoring conducted in 2018, using the NPfI long term method, was undertaken at two residential locations representative of the reasonably most affected locations to quantify the existing background and ambient noise levels in the surrounding environment. The measured background noise levels were used to establish the RBLs for each of the relevant periods of the day in accordance with Fact Sheet A and Fact Sheet B of the NPfI. The RBLs were used to establish the NMLs in accordance with the ICNG and the intrusiveness noise levels in accordance with the NPfI.

The relevant noise catchment areas (NCAs) where these RBLs have been used to establish the construction noise management levels are discussed in Section 5.2.

Table 3.1 Representative background and ambient noise levels in the study area

Monitoring I.D	Location	Rating Background Level (RBL), L90 - dBA			Ambient level, Leq - dBA		
		Day	Evening	Night	Day	Evening	Night
L1	117 Gladstone Avenue, Coniston	39	40 (39)	39	52	50	50
L2	16 Merrett Avenue, Cringilla	43	42	45 (42)	51	49	50

Notes:

1) Where the evening RBL is higher than the day RBL, the day RBL has been used to establish the criteria.
2) Where the night RBL is higher than the evening RBL, the evening RBL has been used to establish the criteria.

3.4 Operational noise assessment

3.4.1 Overview

Noise modelling of the 6BF has been based on near-field noise measurements of equipment undertaken as presented in *Environmental noise and vibration monitoring results for No. 5 Blast Furnace Reline Project* (BlueScope Steel / Hatch, 2009) to determine the sound power level of individual items of equipment or the internal sound pressure level of operations within buildings. Where noise levels were not provided for noise equipment/processes associated with the 5BF, sound power levels have been measured by GHD at the 5BF site or estimated based on a literature review of similar equipment. During the detailed design phase, source noise levels should be confirmed.

The location of noisy equipment/processes have been based on drawings and information provided by BlueScope and include the 3D dimensional co-ordinates of these items for inclusion in the noise model. Appendix B includes a general arrangement drawing showing the location of the noise sources in the model.

The duration and frequency/timing of each item (i.e. continuous, intermittent, emergency use only) has been taken into account in the noise model and time corrections have been applied where appropriate to represent a worst-case (15 minute) scenario of typical operations.

The following factors have been considered in the operational noise modelling:

- The sound power level (SWL) of external noise sources has been modelled as either a point source, area source (2D or 3D) or a line source. For line or area sources, the SWL can be represented either as a SWL (total area or line) or SWL” (per m^2) for an area of SWL” (per metre) for a line.
- Internal noise levels (SPLi) at the façade of buildings have been estimated based on measured data to predict break-out noise from noise generating buildings.

To predict the noise levels at sensitive receivers surrounding the site, the following factors have been taken into account in the operational noise modelling:

- External noise line sources (e.g. conveyors)
- External point sources (e.g. pumps, ventilation fans, valves, vibro-feeders, screens etc.)
- The envelope of each building (3-dimensional) to predict break-out noise levels from each building component including the noise reduction properties and surface area of each of the external building components
- Terrain topography
- Absorption from the ground coverage
- Atmospheric absorption
- Relevant shielding objects (e.g. buildings/noise barriers)
- The operating times/duration/frequency of the relevant noise sources
- The potential for noise enhancing meteorological conditions

3.4.2 Environmental noise modelling methodology

Acoustic modelling was undertaken using SoundPLAN noise modelling software to predict indicative environmental noise levels at the sensitive receivers surrounding the project site during the operation of the facility. SoundPLAN is a computer program for the calculation, assessment and prognosis of noise propagation. It calculates environmental noise propagation using industry standard models such as the ISO 9613-2 (ISO, 1996) prediction method.

General parameters used in the model are listed in Table 3.2.

Table 3.2 Noise modelling parameters

Variable	Parameter used
Calculation method	ISO 9613-2: 1996 *Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation*
Topography	Sourced from ELVIS GIS Australia - 5 m elevation intervals
Receiver heights	1.5 m above building ground level
Ground absorption	0.5 for all areas (0 is non-porous ground and 1 is porous ground such as that found in a rural setting comprising of mainly grass and vegetation)
Temperature	10°C (conservative)
Humidity	90% (conservative)
Number of reflections	A maximum number of 2 reflections from surrounding structures
Building footprints and heights (outside the project site)	PSMA Geoscape data
Building footprints and heights (within the project site)	Based on drawings provided by BlueScope and a Navisworks model to estimate the height of buildings/structures
Source noise levels	Detailed assumptions for the source noise level inputs are presented in Appendix C for equipment shown in Table 4.2

3.4.3 Local meteorological conditions

Wind has the potential to increase noise levels at a receiver when it is light and stable and blows from the direction of the source of the noise. As the strength of the wind increases, the noise produced by the wind will mask noise from most industrial and transport sources.

Temperature inversions (i.e. where atmospheric temperature increases with altitude) typically occur during stable atmospheric conditions such as the night-time period in the winter months. Temperature inversion can also increase site noise levels at surrounding assessment locations.

Wind effects and temperature inversions need to be considered when predicting the long-term noise levels during the operation of the project.

3.4.3.1 Noise Policy for Industry requirements

The NPfI requires assessment of noise under standard and noise enhancing weather conditions. The NPfI defines these as follows:

- Standard meteorological conditions: defined by stability categories A through to D with wind speeds up to 0.5 m/s at 10 m above ground level (AGL) for day, evening and night periods.
- Noise-enhancing meteorological condition: defined by stability categories A through to D with light winds (up to 3 m/s at 10 m AGL) for the day and evening periods; and stability categories A through to D with light winds (up to 3 m/s at 10 m AGL) and/or stability category F with winds up to 2 m/s at 10 m AGL.

The NPfI specifies the following two options to consider meteorological effects:

1. Adopt the noise-enhancing meteorological conditions for all assessment periods for noise impact assessment purposes without an assessment of how often these conditions occur – a conservative approach that considers source-to-receiver wind vectors for all receivers and F class temperature inversions with wind speeds up to 2 m/s at night.
2. Determine the significance of noise-enhancing conditions. This involves assessing the significance of temperature inversions (F and G class stability categories) for the night-time period and the significance of light winds up to and including 3 m/s for all assessment periods during stability categories other than E, F or G. Significance is based on a threshold of occurrence of 30% determined in accordance with the provisions in this policy. Where noise-enhancing meteorological conditions occur for less than 30% of the time, standard meteorological conditions may be adopted for the assessment.

3.4.3.2 Wind effects

The NPfI recommends consideration of wind effects if they are “significant”. The NPfI defines “significant” as the presence of source-to-receiver wind speed (measured at 10 m above ground level) of 3 m/s or less, occurring for 30% of the time in any assessment period and season.

This is further clarified by defining source-to-receiver wind direction as being the directional component of wind. The NPfI states that where wind is identified to be a significant feature of the area then assessment of noise impacts should consider the highest wind speed below 3 m/s, which is considered to prevail for at least 30% of the time.

A review of the vector components of hourly wind data from 2016 to 2020 was undertaken for data from the Bureau of Meteorology’s Port Kembla Harbour automatic weather station (AWS) (ID: 068253). The observations are approximately 2 km from the site and are considered representative for the site and surrounds.

Figure 3.1 shows the wind roses (2016 to 2020) for each NPfI assessment period and for each season. Table 3.3 provides a summary of the prevailing wind conditions that are relevant to the assessment. The analysis indicates that noise-enhancing wind conditions are identified to be a significant feature of the area in the following wind directions: South-Southwest, Southwest, West-southwest, West and West-northwest. These wind directions all blow from the site to the sea and not in the direction of any sensitive receiver locations. As such, noise-enhancing conditions due to wind effects have not been considered in this assessment.

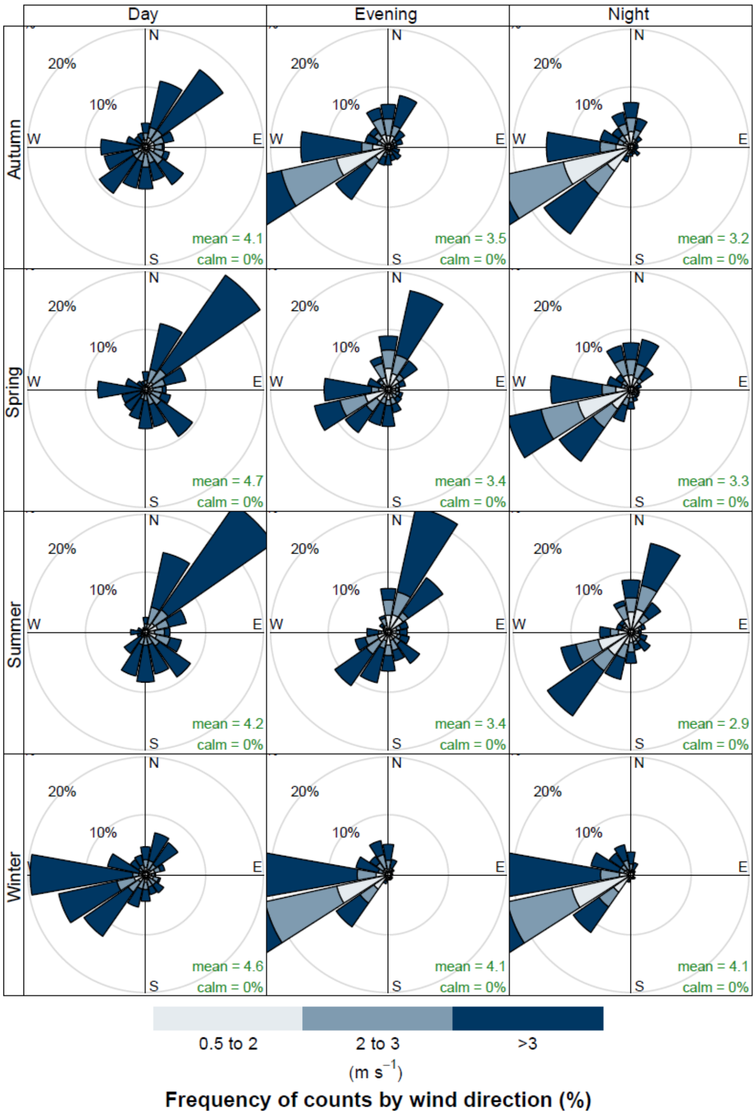


Figure 3.1 *5 year wind rose (seasonal and relevant assessment periods) – 068253 AWS*

Table 3.3 Significant wind effects analysis – Port Kembla Harbour AWS

Wind direction[1]	**Summer**			**Autumn**			**Winter**			**Spring**		
	Day	**Evening**	**Night**	**Day**	**Evening**	**Night**	**Day**	**Evening**	**Night**	**Day**	**Evening**	**Night**
N	10%	19%	23%	10%	17%	14%	9%	9%	6%	9%	21%	18%
NNE	13%	20%	23%	12%	15%	12%	10%	7%	4%	12%	21%	17%
NE	16%	19%	19%	14%	11%	9%	10%	4%	2%	14%	18%	12%
ENE	19%	16%	15%	14%	7%	4%	9%	2%	1%	15%	13%	8%
E	17%	11%	9%	15%	4%	2%	9%	1%	0%	15%	9%	5%
ESE	15%	10%	7%	14%	3%	1%	9%	1%	0%	13%	8%	4%
SE	13%	12%	9%	14%	3%	2%	9%	1%	0%	11%	9%	5%
SSE	12%	13%	12%	14%	4%	3%	10%	1%	1%	10%	10%	7%
S	9%	15%	19%	13%	8%	12%	11%	7%	7%	9%	13%	14%
SSW	7%	17%	26%	12%	26%	34%	14%	28%	29%	6%	19%	28%
SW	5%	15%	28%	10%	30%	39%	14%	33%	34%	4%	20%	32%
WSW	3%	12%	26%	7%	30%	40%	13%	34%	35%	3%	18%	32%
W	1%	10%	23%	6%	32%	41%	12%	36%	36%	2%	18%	31%
WNW	1%	8%	20%	5%	32%	35%	10%	33%	32%	1%	18%	28%
NW	2%	10%	16%	5%	18%	18%	7%	14%	12%	2%	16%	17%
NNW	5%	15%	21%	7%	17%	15%	8%	10%	8%	5%	19%	17%

Notes:

1) The percentages shown are the frequency of counts by wind direction for light winds up to 3 m/s and include the arithmetic sum of the direction being reported and the four closest directions. Where 30% occurrence is exceeded, the cell is shaded blue

3.4.3.3 Temperature inversions

Temperature inversions typically occur during the night-time period in the winter months and have the potential to increase noise levels from the operations at the blast furnace to the surrounding sensitive land uses. Per the NPfI, temperature inversions are to be assessed when they are found to occur for 30% of the time (about two nights per week) or greater during the winter months. As the project is proposed to operate 24 hours a day, the effect of temperature inversions on noise levels at night should be considered.

Noise enhancement due to temperature inversions occurs when the atmosphere is relatively stable which corresponds with Pasquill-Gifford stability category F and G. The Bureau of Meteorology (BoM) Port Kembla Harbour AWS data did not contain cloud cover measurements. As such, cloud data has been sourced from the nearest available BoM AWS, being Bellambi AWS (ID: 068228) approximately 11 kilometres to the north of the site, which is considered representative of the site for the purposes of determining the occurrence of temperature inversions.

An analysis of the Bellambi AWS meteorological data (three winter months from 2016 to 2020) has been undertaken using the Turner method which considers the following observations parameters:

- Hourly wind speed and direction at 10 metres
- Hourly cloud cover measurements
- Hourly cloud ceiling-height measurements
- Daily records of time of sunrise and sunset

The percentage occurrence of the stability categories are presented in Table 3.4.

Table 3.4 Percentage occurrence of Pasquill stability categories

Pasquill–Gifford stability category	Percentage occurrence (winter nights)	F and G combined (night period)	Are temperature inversions a feature of the area?
A	0	38%	Yes
B	0		
C	0		
D	33		
E	28		
F	28		
G	11		

The results indicate that ‘F’ and ‘G’ class temperature inversions are a feature of the area as they occur for more than 30% of the time during the winter and therefore are relevant to the assessment.

The ISO 9613-2 algorithm considers a moderate source-to-receiver wind or a temperature inversion in the algorithm. As such, the environmental noise propagation prediction method is considered appropriate and representative of the worst-case meteorological conditions for the site. Option 1 as described in Section 3.4.3.1 in accordance with the NPfI has hence been selected.

3.4.3.4 Atmospheric conditions

Temperature and humidity affects how sound is absorbed by the atmosphere. With a fixed temperature at 10ºC, a decrease in relative humidity from 90% to 30% can decrease the sound level for a listener standing 800 m from the noise source by 3 dB (at 1000 Hz). Fixing the relative humidity at 90%, and increasing the temperature from 10 ºC to 25 ºC can decrease the sound level 800 m from the noise source by 3 dB (at 1000 Hz).

Adopting an average temperature of 10°C and average humidity of 90% is generally representative of the worst-case atmospheric conditions for environmental noise propagation and is considered conservative for the purposes of this assessment.

3.4.4 Source noise levels

6BF is not currently in operation and as such, source noise levels have been estimated based on the noise monitoring report at 5BF for similar equipment titled *“Environmental noise and vibration monitoring results for No. 5 Blast Furnace Reline Project* (Hatch, 2009)”.

A site visit was also conducted by GHD in September 2021 to confirm source noise levels of certain items of equipment, and to conduct noise measurements of equipment where noise data was not available.

Source noise heights and building heights have been based on drawings provided by BlueScope. Detailed assumptions for each noise source are presented in Appendix C, along with noise data and screenshots of the 3D SoundPLAN noise model.

All source sound power levels are presented in Appendix C. Column *Noise level source* stipulates where each equipment sound power level is sourced from, corresponding as follows:

- “GHD measurements 2021” – noise measurements undertaken by GHD during a site visit to BlueScope facility, conducted in September 2021.
- “SWL_Hatch (Table 6.2)” – Table 6.2 from *Environmental noise and vibration monitoring results for No.5 Blast Furnace Reline Project* (Hatch, 4 December 2009). Sound levels calculated from measurements by Hatch.
- “SWL_BlueScope (Table 6.3)” – Table 6.3 from *Environmental noise and vibration monitoring results for No.5 Blast Furnace Reline Project* (Hatch, 4 December 2009). Sound power levels using measured data from BlueScope measurements.

3.5 Construction noise assessment

3.5.1 Construction noise prediction method

Acoustic modelling was undertaken using SoundPLAN noise modelling software to predict the effects of construction noise generated by the proposed works. General parameters used in the model are listed in Table 3.5.

Table 3.5 Noise modelling parameters

Variable	Parameter used
Calculation method	ISO 9613-2:1996 *Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation* (recommended in the DCNG for construction noise)
Meteorology	Well-developed moderate ground based temperature inversion, such as commonly occurs on clear, calm nights or ‘downwind’ conditions which are favourable to sound propagation
Topography	Sourced from ELVIS GIS Australia - 5 m elevation intervals
Receiver heights	1.5 metres above building ground level
Ground absorption	0.5 for all areas (0 is non-porous ground and 1 is porous ground such as that found in a rural setting comprising of mainly grass and vegetation)

The exact details of the construction methodology, plant or equipment for the project, such as the intensity of works, sound power levels or operating duration are not yet known therefore this assessment is based on a variety of conservative assumptions. This information will be refined during detailed design and construction planning. The magnitude of the noise levels associated with construction activities will be dependent upon a number of factors:

- The intensity and location of construction activities
- The type of equipment used
- Existing local noise sources
- Intervening terrain
- The prevailing weather conditions

3.5.2 Construction scenarios

The sound power noise levels for all construction equipment have been sourced from the following documents:

- AS2436 – Guide to Noise Control on Construction, Maintenance and Demolition Site (Australian Standards, 2010)
- Construction Noise and Vibration Guideline (RMS, 2016).

To represent the worst-case construction activities, the construction noise modelling scenarios set out in Table 3.6 for laydown areas and Table 3.7 for 6BF construction activities have been prepared for construction noise modelling. The modelling scenarios are intended to be a high-level representation of overall construction noise emission from the project, and are based on identified high noise-generating equipment as provided in Table 4.6.

For works in the *No 2 Works* areas (No2W), some rock breaking will be required during the site preparation phase of construction activities. A geotechnical survey of the proposed areas will be conducted at the commencement of construction activities. These scenarios are denoted in Table 3.6 as “Rock breaking”.

Table 3.6 Indicative construction scenarios – laydown areas

Construction scenario	Anticipated construction equipment			Activity sound power level (SWL), dBA
	20T Forklift	Excavator	Rock breaker	
Equipment SWL, dBA	105	105	120	-
No1W 1	✓	✓		105
No1W 4	✓	✓		105
No1W 5	✓	✓		105
No2B 1	✓	✓		105
No2W 1	✓	✓		105
No2W 1 – Rock breaking			✓	120
No2W 2	✓	✓		105
No2W 2 – Rock breaking			✓	120
No2W 3	✓	✓		105
No2W 3 – Rock breaking			✓	120
No2W 4	✓	✓		105
No2W 4 – Rock breaking			✓	120
No2W 5	✓	✓		105
No2W 5 – Rock breaking			✓	120
No2W 6	✓	✓		105
No2W 6 – Rock breaking			✓	120
RA 4	✓	✓		105
RA 5	✓	✓		105
SpringHill Electrical	✓	✓		105

Table 3.7 Indicative construction scenarios – 6BF construction activities

Construction scenario	**Anticipated construction equipment**						**Activity sound power level (SWL), dBA**
	Large excavator	**Franna crane**	**Front end loaders**	**Vibratory roller**	**Rock breaker**	**Pile driver**	
Equipment SWL, dBA	115	98	112	109	120	130	
General construction activities	✓	✓	✓	✓			116
High intensity construction activities					✓	✓	130

3.6 Road traffic noise assessment

3.6.1 Methodology overview

Noise modelling has been undertaken to predict road traffic noise levels at residences along the transport routes for the following scenarios:

- The existing road traffic conditions (pre-construction)
- Road traffic conditions during construction (existing traffic + traffic generation during construction and operation phases)

Road traffic noise levels during construction and operation are assessed against the RNP road traffic noise criteria (see Section 6.4) to identify any potential noise impacts at residences and whether any receivers qualify for consideration of noise mitigation.

3.6.2 Prediction method

Noise modelling was undertaken using RMS' construction noise estimator tool using the parameters presented in Table 3.8.

Table 3.8 Noise modelling parameters

Variable	**Parameter used**
Calculation method	RMS Construction noise estimator tool using the Department of Transport, Welsh Office Calculation of Road Traffic Noise (CoRTN) (UK) prediction method adjusted for NSW conditions
Shielding	No topography or shielding from buildings included (conservative)
Traffic speeds	Sign posted speeds
Façade correction	+2.5 dBA
Receiver heights	1.5 metres above building ground level
CoRTN conversion	-3 dBA for conversion between $L_{A10(1hr)}$ and $L_{Aeq(1hr)}$ noise levels
Ground absorption	0.5 for all areas within the site

4. Project description

This section provides a description of the project with a focus on elements that relate to the assessment of potential noise and vibration impacts.

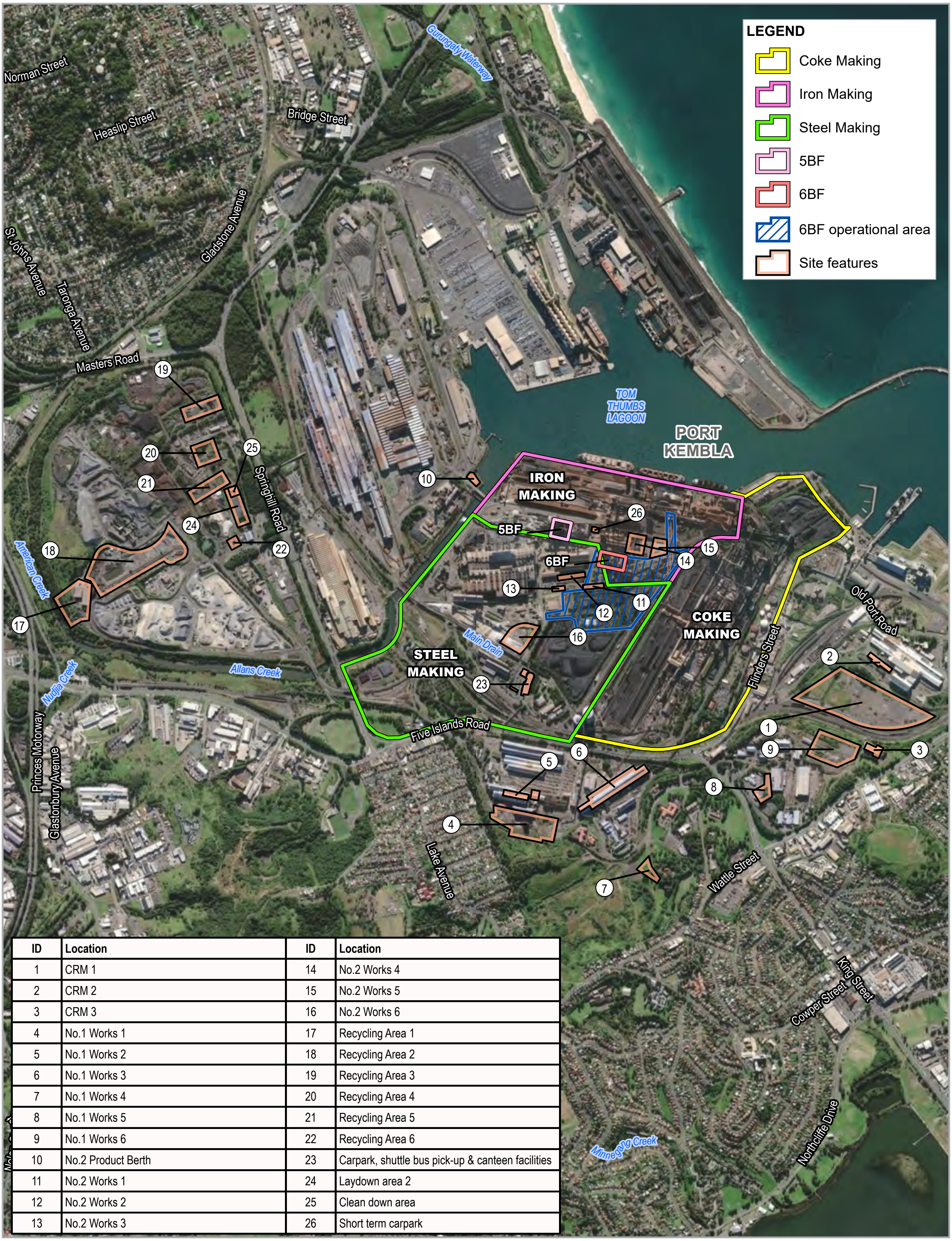
4.1 Project summary

Table 4.1 provides a summary of the key elements of the project. Key features of the project are shown on Figure 4.1.

Table 4.1 Project summary

Project element	Summary
6BF operational area and construction footprint location	Lot 1 DP 606434
Construction	Major construction work will be required within the blast furnace and surrounding facilities and will involve removing the remaining burden materials, refractory bricks and blocks, and staves within the interior of the blast furnace for replacement. Any required repairs or replacement of ancillary equipment or structures will also be carried out.
Access	The majority of the construction traffic will access the site via the major roads that service the Port Kembla industrial area, including the Princes Motorway and Princes Highway, Shellharbour Road, Springhill Road, Five Islands Road and Masters Road. No changes to existing access arrangements are proposed.
Ancillary construction facilities	Various locations within the PKSW site within Lot 1 DP 606434, Lot 1 DP 606432, Lot 1 DP 595307 and Lot 1 DP 606430.
Ironmaking components and systems	– Raw materials handling – Sinter plant – Blast furnace – Charging system – Blast furnace vessel – Cooling system – Casthouse – Hot blast system – Off gas system – Slag handling
Operations	Operation of 6BF will be generally the same as existing operations utilised at 5BF (24-hour operation), including: – Processing and transport of raw materials (iron ore, coal, coke, fluxes). – Production of sinter (agglomeration of iron ore, coke and limestone dust) for use within the blast furnace. – Production of approximately 2.7 Mtpa of iron from 6BF. – Processing of approximately 0.88 Mtpa of blast furnace slag for reuse as construction products.
Construction work hours	Where practical, and subject to the final construction program, construction will be carried out during the following construction hours: – Monday to Friday: 7.00 am to 6.00 pm – Saturday: 7.00 am to 6.00 pm – Sundays and public holidays: no work A number of construction activities will be scheduled to be undertaken as night works. Final construction phase will require 24 hour construction (estimated to be a period of 5 months). 24 hour construction may also be required for an extended period if 6BF is required online earlier than 2026.

Project element	Summary
Construction duration	Approximately 3 years
Operational duration	Approximately 20 years



ID	Location	ID	Location
1	CRM 1	14	No.2 Works 4
2	CRM 2	15	No.2 Works 5
3	CRM 3	16	No.2 Works 6
4	No.1 Works 1	17	Recycling Area 1
5	No.1 Works 2	18	Recycling Area 2
6	No.1 Works 3	19	Recycling Area 3
7	No.1 Works 4	20	Recycling Area 4
8	No.1 Works 5	21	Recycling Area 5
9	No.1 Works 6	22	Recycling Area 6
10	No.2 Product Berth	23	Carpark, shuttle bus pick-up & canteen facilities
11	No.2 Works 1	24	Laydown area 2
12	No.2 Works 2	25	Clean down area
13	No.2 Works 3	26	Short term carpark

Paper Size ISO A4

0 0.2 0.4 0.6 0.8 1

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Noise and Vibration Impact Assessment

Key project features

Project No.	**12541101**
Revision No.	**0**
Date	**28/10/2021**

FIGURE 4-1

\\ghdnet\ghd\AU\Newcastle\Projects\22\12541101\GIS\Maps\12541101_NVIA_0.aprx\12541101_NVIA001_KeyFeatures_0
Print date: 28 Oct 2021 - 10:49

Data source: LPI: DTDB/DCDB, 2017. World Imagery: Maxar.
Created by: tmorton

4.2 Operation of the project

The main noise generating systems associated with the operation of 6BF are:

- 6BF, including:
  - Hot blast system and hot blast stoves
  - Blast furnace proper and furnace top (including bleeder valves)
  - Casthouses
  - Gas cleaning system, including dust handling and effluent treatment
  - Cooling system
  - Top gas recovery turbine (TRT)
  - Casthouse and Stockhouse Bag houses
- Slag handling area, including:
  - Slag granulator
  - Slag handling yard and pits
- Charging system, including:
  - Stockhouse
  - Conveyors

4.3 Noise generating equipment/processes

4.3.1 Typical operations

The major external noise generating equipment associated within each operational component of the project are listed in Table 4.2 along with the operating assumptions used for noise modelling purposes. The operation of the blast furnace is 24 hours a day, 7 days a week, however not all equipment will operate at maximum capacity for an entire 15 minute period. As such, the assumed operating conditions is considered representative of a worst-case scenario for a 15-minute assessment period.

The locations of noise generating equipment are shown in a drawing provided by BlueScope which is included in Appendix B.

Table 4.2 Significant noise sources to be considered

System / Area	Noise sources	No. of items	Operating assumptions
Number 6 Blast Furnace			
Hot Blast	Combustion Air Fans	2	Operating continuously; noise data sourced from 5BF measurements
	Stove Purge Fans	3	Not contributing to overall noise emission from the site
	COG Booster Fans	2	Intermittent operations; noise data obtained from GHD 2021 measurements
	Stove pressurisation valve	3	Intermittent operations; noise data obtained from GHD 2021 measurements
	Stove depressurisation valve	3	Intermittent operations; noise data obtained from GHD 2021 measurements
	Snort Control Valve Silencer	1	Considered as emergency and shutdown operations only
Furnace Top	Material Bin Pressure Relief Silencers	1	Intermittent operations; noise data obtained from GHD 2021 measurements

System / Area	Noise sources	No. of items	Operating assumptions
	Material Bin Pressure Relief Valve Silencer[1]	1	Intermittent operations; noise data obtained from GHD 2021 measurements
	Gear Box Planetary Drive	1	Not contributing to overall noise emission from the site
	Gear Box Tilt Drive	1	Not contributing to overall noise emission from the site
	Stock Rod Drives	1	Operating continuously; noise data sourced from 5BF measurements
	Furnace Top Bleeders	1	Considered as emergency operations only
Gas Cleaning	Scrubber Feed Pumps	3	Operating continuously; noise data obtained from Hatch 5BF measurements
	Scrubber Recirculation Pumps	3	Operating continuously; noise data obtained from Hatch 5BF measurements
	Aeration Blowers	1	Not contributing to overall noise emission from the site
	Cooling Tower Fans	2	Not contributing to overall noise emission from the site
	RS Elements	1	Not contributing to overall noise emission from the site
	Dust Handling System	1	Not contributing to overall noise emission from the site
Cooling system	RWS Cooling Pump	5	Not contributing to overall noise emission from the site
	PW Gearbox Cooling Pump	2	Not contributing to overall noise emission from the site
	SBC Pumps	4	Operating continuously; noise data obtained from Hatch 5BF measurements
TRT	TRT	1	Not contributing to overall noise emission from the site
	TRT Alternator	1	Not contributing to overall noise emission from the site
Bag Houses	Stockhouse Baghouse Fan	1	Operating continuously; noise data obtained from Hatch 5BF measurements
	Casthouse Baghouse Fans	2	Operating continuously; noise data obtained from Hatch 5BF measurements
	Baghouse Blowers	3	Operating continuously; noise data obtained from GHD 2021 measurements
Slag Handling Area			
Slag Granulator	Slag Granulation Cooling Tower Fans	2	Operating continuously; noise data obtained from Hatch 5BF measurements
	Granulation Pump	2	Intermittent operations; noise data obtained from Hatch 5BF measurements
	Condensation Pump	2	Intermittent operations; noise data obtained from Hatch 5BF measurements
	Cooling Circuit Pump	2	Intermittent operations; noise data obtained from Hatch 5BF measurements
Slag handling yard and pits	Spray pumps	2	Operating continuously; noise data obtained from Hatch 5BF measurements
	Truck wash	1	Not contributing to overall noise emission from the site
	Knocking block / slag pot carrier	1	Operating continuously; noise data obtained from GHD noise database
Charging system			
Stockhouse	Conveyor Drives	27	Operating continuously; noise data obtained from Hatch 5BF measurements

System / Area	Noise sources	No. of items	Operating assumptions
	Small vibro-feeders and screens	31	Intermittent operations; noise data obtained from GHD 2021 measurements, adjusted for size
	Medium vibro-feeders and screens	11	Intermittent operations; noise data obtained from GHD 2021 measurements, adjusted for size
	Large vibro-feeders and screens	4	Intermittent operations; noise data obtained from GHD 2021 measurements
Conveyors	Conveyors	17	Operating continuously; noise data obtained from GHD noise database. These are generally enclosed and do no result in significant noise emissions.
Note 1: Noise emission takes into consideration noise reduction performance of silencer. Noise emission is modelled at silencer outlet location.			

4.3.2 Noise generating buildings

The noise generating buildings associated with the 6BF are shown in Table 4.3. Noise generating equipment and operations within these buildings generate average internal noise levels up to $L_{Aeq(15min)}$ 85 dBA at ground level. These buildings are enclosed and the façade will provide a sound transmission reduction of approximately 20 dBA. As such, it is assumed that these buildings do not contribute to the overall noise emission from the blast furnace site and have not been included in the noise model, with the exception of the cast house hydraulic room (included due to its large size).

Table 4.3 Noise generating buildings associated with 6BF

Building	Operating assumptions	Building construction / openings
Furnace Top Hydraulic Room	Not contributing to overall noise emission from the site.	Steel metal sheet / windows
Gas Cleaning Hydraulic Room		Steel metal sheet / windows
TRT Hydraulic Room		Steel metal sheet / windows
Conveyor Drive Houses		Steel metal sheet / windows
Cast House Hydraulic Room	Included in noise model based on measured noise levels.	Steel metal sheet / windows

4.3.3 Emergency and shutdown operations

During emergencies (i.e. not anticipated during typical operation), the noise sources listed in Table 4.4 may operate. As the pressure release safety valve has the potential to occur during any time of the day, a sleep disturbance screening assessment has been undertaken in Section 7.1.2.

Table 4.4 Noise sources during emergencies

Emergency equipment	Frequency of operation (events per year)	Typical duration of event (s)	Included in L_{Aeq} assessment?	Included in $L_{A1(1min)}$ assessment?^{1}
Furnace Top Bleeder Valve	Average 2 times per year	10 seconds	No	No
Snort Control Valve Silencer	2.8 times per year Approximately every 18 weeks	10 seconds	No	Yes

4.4 Construction of the project

4.4.1 Overview

The reline and transition to operation of 6BF will be completed in approximately three years which, assuming a construction start during 2023, will see completion of construction in 2026. The actual construction start and completion dates will depend on the operational performance of the 5BF facility, and the timing of when furnace condition requires that it be decommissioned.

Construction will commence once all necessary approvals are obtained. Detailed construction planning, including timing, staging and work sequencing, will be confirmed once construction contractors have been engaged.

The construction information described in this chapter is preliminary and is based on the current stage of the design. It provides an indicative construction method that retains flexibility for the successful contractors to refine and optimise aspects of the approach. The construction methodology will be refined as the design progresses, and once the construction contractors are engaged. A final construction methodology and program will be jointly developed by the project team and construction contractors based on the conditions of approval and the mitigation and management measures provided in this document.

4.4.2 Construction access

Deliveries of construction plant and materials will be via sub-arterial or arterial roads to access the BlueScope site where vehicles will utilise internal access roads to access the 6BF. PKSW has established rail connections and shipping berths however no construction deliveries are currently expected from rail or ships. Deliveries will be unloaded to designated areas within the construction laydown areas or taken direct to their set location. The majority of construction staff vehicle movements will take place at the beginning and end of each day. Heavy vehicle movements will occur throughout the day.

4.4.3 Construction storage/laydown areas

The project will require approximately 31,000 m^2 of indoor storage and 57,000 m^2 of outdoor storage. The delivery of materials and equipment to the work sites will be staged as required with minimal storage available in the area immediately adjacent to 6BF. Indicative laydown areas are shown on Figure 4.2.

Construction support facilities, car parks and laydown areas identified are on areas of the site which have been historically used for similar activities including during previous reline events. A summary of proposed laydown areas is provided in Table 4.5.

Table 4.5 Ancillary facilities

ID	Location	Activity	Size (m^2)	Indoor/Outdoor	Comments
No1W 1	No.1 Works 1	Storage	28,500	Outdoor	Currently used as coke storage (rarely used)
No1W 2	No.1 Works 2	Storage	5,000	Indoor	No change to the use of the space as it is used today – not considered as part of noise assessment
No1W 3	No.1 Works 3	Storage	36,500	20,000 indoor 16,500 outdoor	No change to the use of the space as it is used today – not considered as part of noise assessment
No1W 4	No.1 Works 4	Storage	6,400	Outdoor	-
No1W 5	No.1 Works 5	Storage	4,000	500m^2 indoor 3,500m^2 outdoor	-

ID	Location	Activity	Size (m^2)	Indoor/Outdoor	Comments
No1W 6	No.1 Works 6	Storage	17,000	Outdoor	No change to the use of the space as it is used today – not considered as part of noise assessment
1	CRM 1	Storage	80,000	Outdoor	-
2	CRM2	Storage	3,000	Indoor	Operations indoor – not considered as part of noise assessment as operations assumed to not contribute
3	CRM3	Storage	2,800	Indoor	Operations indoor – not considered as part of noise assessment as operations assumed to not contribute
No2W 1	No.2 Works 1	Construction	1,000	Outdoor	-
No2W 2	No.2 Works 2	Construction	3,000	Outdoor	-
No2W 3	No.2 Works 3	Construction	1,500	Outdoor	-
No2W 4	No.2 Works 4	Storage	3,000	Outdoor	-
No2W 5	No.2 Works 5	Storage	7,000	Outdoor	-
No2W 6	No.2 Works 6	Storage	7,000	Outdoor	-
No2B 1	No.2 Products Berth	Storage	2,500	Outdoor	-
Ra 1	Recycling Area 1	Storage / cleaning	14,000	3,000 indoor 11,000 outdoor	No change to the use of the space as it is used today – not considered as part of noise assessment
Ra 2	Recycling Area 2	Processing	88,000	Outdoor	No change to the use of the space as it is used today – not considered as part of noise assessment
Ra 3	Recycling Area 3	Processing	25,000	Outdoor	No change to the use of the space as it is used today – not considered as part of noise assessment
Ra 4	Recycling Area 4	Storage / Processing	11,000	Outdoor	-
Ra 5	Recycling Area 5	Storage / Processing	20,000	Outdoor	-
Ra 6	Recycling Area 6	Storage	4,500	Outdoor	No change to the use of the space as it is used today – not considered as part of noise assessment
SPE	Springhill Electrical	Storage	3,000	Indoor	Operations indoor – not considered as part of noise assessment as operations assumed to not contribute

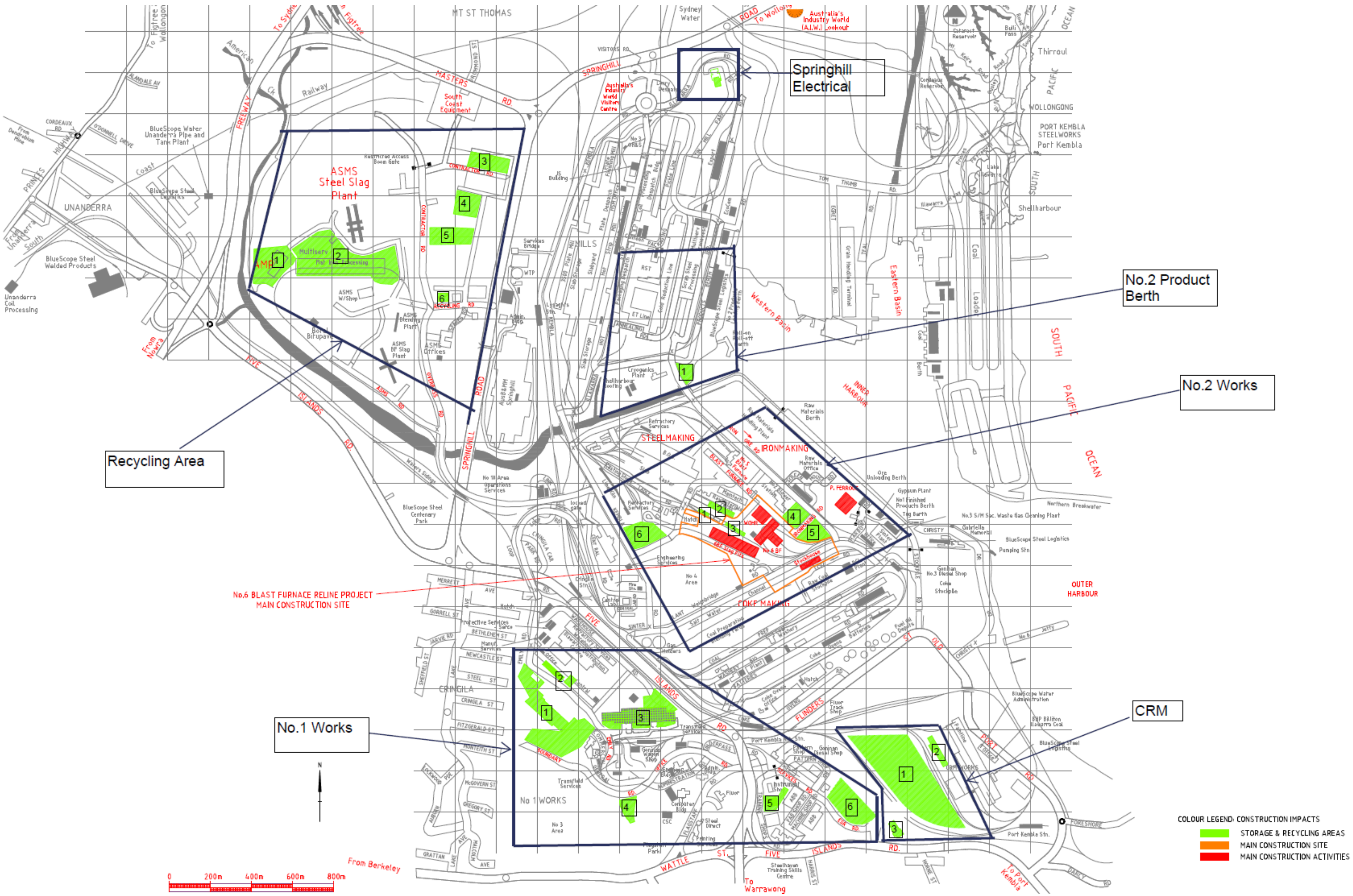


Figure 4.2 Indicative laydown areas locations

4.4.4 Reline construction activities

Major construction work will be required within the blast furnace and surrounding facilities and will involve removing the remaining burden materials, refractory bricks and blocks, and staves within the interior of the blast furnace for replacement. Any required repairs or replacement of ancillary equipment or structures will also be carried out. The location of the reline construction activities are provided in Figure 4.2 as red highlighted areas.

Construction activities will indicatively involve the following tasks:

- Removal of the remaining burden materials.
- Removal of the iron skull.
- Removal of worn carbon block refractories in the hearth.
- Removal of worn refractories in the remainder of the vessel.
- Demolition of other equipment including:
  - Cooling staves which protect the blast furnace shell.
  - Hot blast main refractory lining where required, including the expansion joints.
  - Clarifier tank and associated equipment where required.
- Repairs to the blast furnace shell where required.
- Installation of a new clarifier tank and associated equipment.
- Installation of the new hearth, sidewall refractories and staves.
- Repair/replacement of tuyeres, tapholes and instrumentation.
- Repair, maintenance and/or upgrade of ancillary equipment including:
  - Furnace cooling systems.
  - Hot blast system including the stoves, with the addition of a Stove Waste Gas Heat Recovery (WGHR) system.
  - Gas system, with addition of a Top Gas Recovery Turbine (TRT).
  - Furnace top, including the charging equipment, bleeder valves and outrigger crane.
  - Casthouse floors and associated equipment.
  - Stockhouse (raw materials feed system).
  - Automation and power systems.
  - Services.
- Construction of a new primary ferrous feed system in the Raw Materials Handling area.
- Civil works for the new slag handling area.
- Installation of a new slag granulation system.
- Commissioning and ramp up of 6BF operations.

4.4.5 Reline indicative equipment list

A list of indicative equipment required for the reline construction activities is presented in Table 4.6 and categorised into general construction equipment and high-impact construction equipment for modelling purposes.

Table 4.6 Indicative equipment list at Blast Furnace and surrounding facilities

Indicative construction equipment			
General construction equipment			
Excavators ranging from 5t to 40t	Bobcats (skid steer loaders)	Water blasters	Rail tamper
Cranes of various capacity ranging from 15t to 800t	Plate compactors	Grit blasters	Various brick saws and mixers

Indicative construction equipment			
Dump trucks	Explosives equipment (drilling rig)	Semi trailers	Material hoists and winches
Front end loaders	Air compressors	Abbey hoists	Refractory gunning machine
Telescopic boom excavator	Diesel welders	Forklifts	Temporary stove burners, fuel pipe and fans.
Liquids tankers	Welding Machines	Sykes pumps	Alimak passenger and goods lifts
Tear-Out machine	Temporary conveyors	Nitrogen welding and cutting gases	Scaffolding
Boom and scissor lifts	Vacuum loading (suck) trucks	Concrete mixers	Concrete pumps
Fuel trucks	Flat Bed Trucks	Vibratory roller	-
High-intensity construction equipment			
Piling Rigs	Rock-breaker	Concrete saw	-

4.4.6 Blasting

Explosive blasting may be required within the 6BF steel furnace shell structure to break up the iron skull. Should blasting be required, a summary of the proposed blasting works is as follows (subject to change):

- Approximately 500 tonnes of residual iron skull to be removed
- Approximately 200 holes to be drilled
- Approximately 150 kg of explosives to be deployed
- Approximately 10 blasts over 10 days in mid to late 2024

4.4.7 Construction hours

Authorisation for 24 hour construction is being sought as part of the request for planning approval.

Where practical, and subject to the final construction timetable, construction will be carried out during the following construction hours:

- Monday to Friday: 7.00 am to 6.00 pm
- Saturday: 7.00 am to 6.00 pm
- Sundays and public holidays: no work

However, there will be a number of construction activities that need to be undertaken outside of standard hours for safety purposes to minimise interaction between the project and the remainder of the PKSW operations. Where practical, noise generating activities with potential to impact any nearby receivers will be scheduled during standard hours.

4.4.8 Blasting hours

The recommended standard hours for blasting as prescribed in the ICNG are:

- Monday to Friday: 7:00 am to 6:00 pm
- Saturdays: 9:00 am to 1:00 pm
- No work on Sundays or public holidays

The proposed hours for blasting activities required for the skull excavation inside the 6BF are:

- Monday to Sunday: 6:00 am to 8:00 pm

The justification for blasting works outside of the recommended standard hours is as follows:

1. An overriding necessity to maintain the highest levels in personnel safety and risk mitigation. The blasts will be conducted when there is a minimum of personnel on site, that is, the most appropriate scheduling is at shift change times when the site is much less populated.
2. The level of explosive used will be optimised to minimise potential collateral damage to the critical existing equipment inside of the Blast Furnace which must be retained for future use, as well as reducing community impact.
3. The blasts will be contained within the 6BF steel furnace shell structure, which will contribute significantly to the attenuation of noise impacts at these more sensitive times of day.
4. Ground vibration levels and airblast overpressure levels are anticipated to be well below the criteria at the most-affected residences (see Section 7.3 and 7.5).

The proposed approach to blasting is consistent with industry standards and also with previous reline activities undertaken at the PKSW.

4.4.9 Timing

The overall construction program is anticipated to be around 3 years. An indicative construction timeline showing durations of key activities is provided below in Table 4.7.

Table 4.7 Indicative works schedule

Project stage	Activities	Approximate duration
1	– Progress with refurbishment activities that do not require long-lead items. – Early works commences for enabling activities. Includes cranes, lifts, casthouse roof replacement, drainage, construction facilities.	24 to 30 months
2	– Construction activities including demolition, civils, stockhouse, slag handling, hot blast system, gas system, cooling system, wreck out of furnace, furnace top. – Control system and automation upgrade.	24 months
3	– Initiated with twelve months advance notice of end of 5BF operations. – Construction activities including relining of furnace. – Pre-commissioning and commissioning of 6BF.	12 months
4	– Managed transition of operations from 5BF to 6BF with ramp-down of 5BF followed by ramp-up production of 6BF. – 5BF decommissioned and made safe on ceasing operation.	1 month

4.4.10 Construction traffic

The construction of the project is expected to generate:

- Approximately 300 light vehicles per day, comprising of contractors and construction personnel vehicles, which will result in 600 light vehicle movements per day (300 arrivals and 300 departures). These vehicles are expected to arrive between 5:00 am to 6:00 am and depart between 4:00 pm to 6:00 pm.
  - It is estimated that around ninety to ninety-five percent of the expected light vehicle movements will be directed to park in the central car park via Cringila Car Park Access Road. Some contractors and visitors may also use this access to the car park, where they will then be transported via mini bus through the gate at Loop Road.
  - The remaining five percent of light vehicle movements is assumed to enter and exit via the North Gate.
- Up to 50 buses per day resulting in 100 bus movements per day via Cringila Car Park Road. These buses will be used to transport workers within PKSW premises e.g. from central car park to construction site and vice versa.
- Between 50 and 100 trucks per day (depending upon the phase of construction works), resulting in between 100 and 200 truck movements per day.

- Based on conservative estimates, the expected peak traffic generation for the construction activities is summarised in Table 4.8.

Table 4.8 Traffic generation – two-way traffic

	Daily traffic generation (vehicles)	Peak Hour traffic generation (vehicles)
Light vehicles	600	300
Heavy vehicles	300	30
Total	900	330

Three typical construction traffic access routes have been considered for the purpose of this assessment. These include the following routes and are shown in Figure 4.3.

- **Route 1:** access to laydown area via Cringila Car Park Road. Vehicles to depart at Emily Road/Five Islands Road intersection.
- **Route 2:** access to laydown area via Flagstaff Road and Five Islands Road intersection.
- **Route 3:** access to laydown area and construction site via Flinders Street, Stockpile Road and Old Port Road.

A summary of these routes is provided in Figure 4.3.

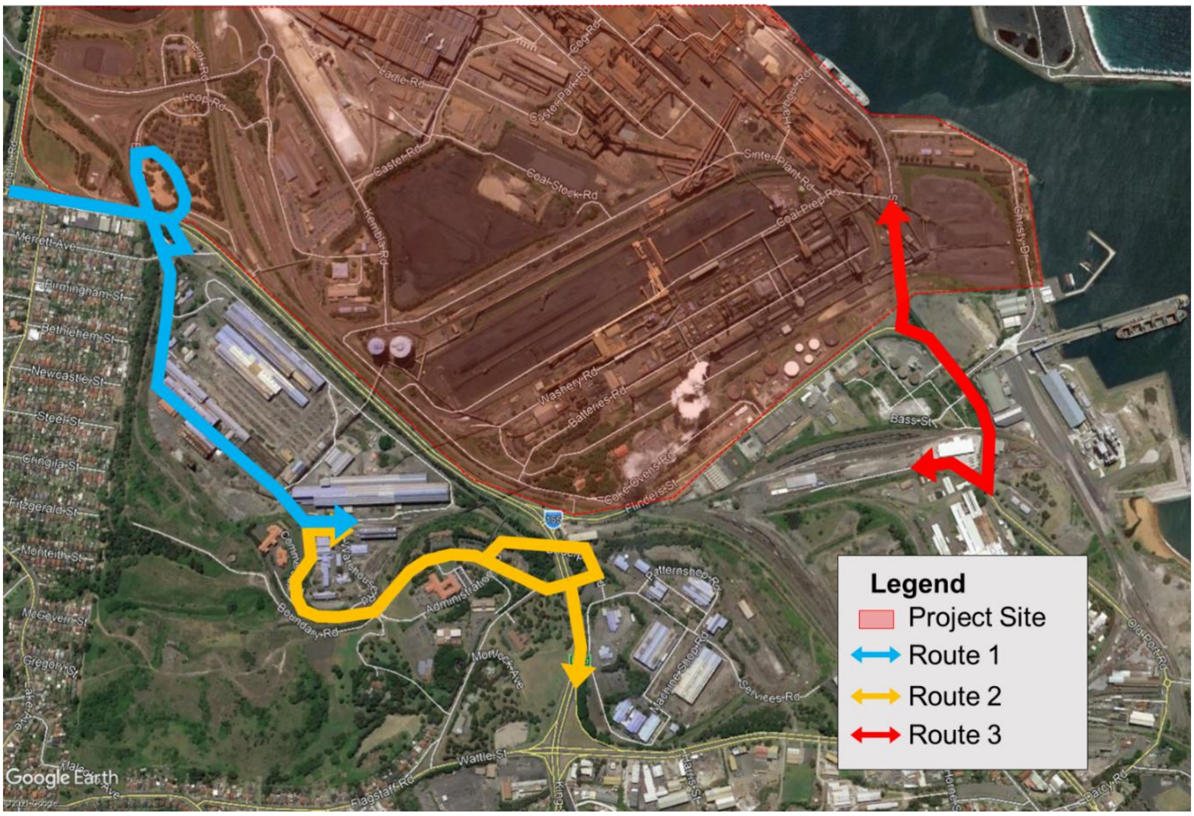


Figure 4.3 Construction Traffic Routes

Source: Google maps (2021), modified by GHD

Table 4.9 Construction access routes to each construction site

Route ID	From	To	Route	Assumptions
1A	Wollongong	PKSW project site	Princes Motorway (SB)	– Trips on Princes Motorway assumed to be split 50/50 – 70% of HV trips generated – 70% of 95% of LV trips generated
			Five Islands Road (EB)	
			Cringila Car Park Road (NB)	
			Loop Road (SB)	
			Emily Road (SB)	
1B	PKSW project site	Wollongong	Emily Road (NB)	– Trips on Princes Motorway assumed to be split 50/50 – 70% of HV trips generated – 70% of 95% of LV trips generated
			Emily Road (NB)	
			Five Islands Road (WB)	
			Princes Motorway (NB)	
2A	Port Kembla	PKSW project site	Five Islands Road (NB)	– 30% of HV trips generated – 30% of 95% of LV trips generated
			Flagstaff Road (WB)	
			General Office Road (WB)	
			Emily Road (NB)	
2B	PKSW project site	Port Kembla	Emily Road (SB)	– 30% of HV trips generated – 30% of 95% of LV trips generated
			General Office Road (EB)	
			Underpass Road (EB)	– Flagstaff Road (EB)
			Five Islands Road (SB)	– Five Islands Road (NB)
3	PKSW project site	Other PKSW locations	Old Port Road	– Along Old Port Road
4	PKSW project site	Other PKSW locations	Internal PKSW roads only	– Internal only

5. Existing environment

5.1 Project site location

The project is located in Port Kembla in the Wollongong LGA and Illawarra region of NSW. Sydney is approximately 80 km to the north of Port Kembla, while the Wollongong Central Business District (CBD) is approximately 2.5 km to the north and Lake Illawarra is approximately 3 km to the south. Port Kembla is the main industrial centre of the Illawarra region.

The PKSW site is zoned IN3 – Heavy Industrial under *State Environmental Planning Policy (Three Ports) 2013* (Three Ports SEPP). The PKSW site is a multiuse industrial area which includes storage, manufacturing, port berths, private internal roads and offices. Access to PKSW is provided by Springhill Road, Five Islands Road, Flinders Street, and Christy Drive and then private internal roads in PKSW.

The closest urban developments to PKSW are the suburbs of Cringila, Berkeley, Lake Heights, Warrawong and Port Kembla to the south, Unanderra, Cobblers Hill, Mount St Thomas, Coniston and Figtree to the north and west.

5.2 Noise sensitive land uses

Noise sensitive land uses are defined based on the type of occupancy and the activities performed in the land use. Noise sensitive land uses include:

- Residential dwellings.
- Classrooms at schools and other educational institutes.
- Hospital wards and operating theatres.
- Places of worship.
- Passive and active recreational areas such as parks, sporting fields, golf courses. Note that these recreational areas are only considered sensitive when they are in use or occupied.
- Community centres.
- Hotels, motels, caretaker’s quarters, holiday accommodation and permanent resident caravan parks.

Offices, retail outlets and other business such as theatres and childcare centres could be considered noise sensitive. However, typically industrial and commercial premises are not considered particularly noise sensitive and have a relatively high noise criteria.

The study area has been defined as approximately 3.5 kilometres from the 6BF structure as noise impacts are not anticipated beyond this distance under normal operating conditions. Within this distance, 103 potential receivers have been selected to represent all sensitive receivers within the study area. The sensitive receivers and planning zones are shown in Figure 5.1.

Residential areas have been categorised into four discrete noise catchment areas (NCAs), being:

- NCA01 – The most-affected residences in Wollongong
- NCA02 – The most-affected residences in Coniston/Mount Saint Thomas
- NCA03 – The most-affected residences in Cringila
- NCA04 – The most-affected residences in Warrawong and Port Kembla

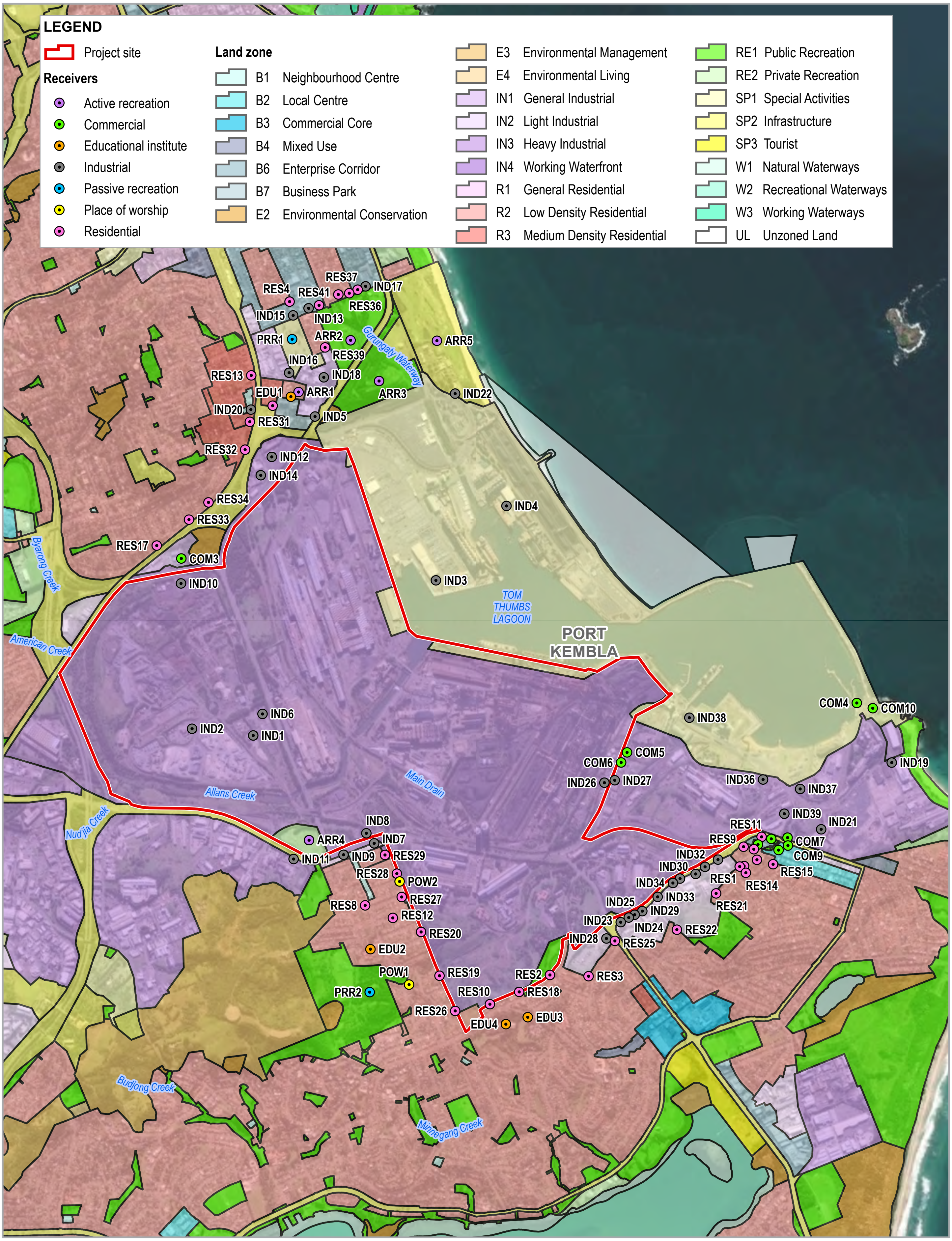
For the purposes of this noise assessment, key residential receivers have been selected for each NCA. If compliance is achieved at these residential receivers, then compliance will be ensured for all other residential receivers for each NCA. These key residential receivers are provided below in Table 5.1. Non-residential noise sensitive receivers considered in this noise assessment are provided in Table 5.2.

Table 5.1 Key residential sensitive receivers

ID	MGA20 Z56 coordinates		Type	NCA	Distance from 6BF structure (m²)	Direction	Description
	x	y					
RES39	306246	6187289	Residential	NCA01	2,950	N	Most-affected residences in Wollongong
RES33	304813	6186719	Residential	NCA02	2,650	NNW	Most-affected residences in Coniston
RES29	304828	6183990	Residential	NCA03	1,250	ESE	Most-affected residences in Cringila
RES01	306945	6182674	Residential	NCA04	1,900	SSE	Most-affected residences in Port Kembla
RES23	305641	6182840	Residential	NCA04	1,550	SSE	Most-affected residences in Warrawong

Table 5.2 Non-residential sensitive receivers

ID	MGA20 Z56 coordinates		MGA20 Z56 coordinates	Distance from 6BF structure (m²)	Direction	Description
	x	x				
ARR1	305928	6187111	Active recreation	2,750	N	Coniston Primary School playground
ARR2	306427	6187243	Active recreation	2,900	N	JJ Kelly Park
ARR3	306457	6186895	Active recreation	2,600	N	Australia’s Industry World Lookout
ARR4	304418	6184347	Active recreation	1,600	W	BlueScope Centenary Park
ARR5	306950	6186936	Active recreation	2,750	NNE	Wollongong Golf Club
EDU01	305865	6187109	Educational institute	2,750	N	Coniston Primary School
EDU02	304408	6183468	Educational institute	1,850	ESE	Cringila Public School
EDU03	305126	6182501	Educational institute	2,050	SSE	Warrawong High School
EDU04	304969	6182536	Educational institute	2,100	SSE	Warrawong Public School
POW01	304519	6183117	Place of worship	1,950	SE	Imam Rida As Mosque Cringila
POW02	304823	6183777	Place of worship	1,350	ESE	Bilal Mosque
PRR01	306075	6187455	Passive recreation	3,100	N	Wollongong Cemetery
PRR02	304253	6183209	Passive recreation	2,100	ESE	Park in Cringila



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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Noise and Vibration Impact Assessment

Project site locations, sensitive receivers, planning zones and noise monitoring locations

Project No.	**12541101**
Revision No.	**0**
Date	**28/10/2021**

FIGURE 5-1

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Print date: 28 Oct 2021 - 10:49

Data source: LPI: DTDB/DCDB, 2017. DPE: Land zones, 2019. World Imagery: Maxar.
Created by: tmorton

5.3 Rating Background Levels (RBL)

As discussed in Section 3.3, RBLs have been established based on previous noise monitoring undertaken in the study area and are considered representative of the noise environment for the most-affected residences within each NCA. These RBLs have been used to establish the construction noise management levels in this assessment. The most-affected residences (all NCAs) can be characterised as urban residential as the acoustic environment:

- Is dominated by 'urban hum' or industrial source noises
- Has through-traffic with characteristically heavy and continuous traffic lows during peak periods
- Is near commercial and industrial districts

Table 5.3 Representative background and ambient noise levels in the study area

Monitoring I.D	Noise Catchment Area (NCA)	Rating Background Level (RBL), L90 - dBA			Ambient level, Leq – dBA		
		Day	Evening	Night	Day	Evening	Night
L1	NCA01 and NCA02	39	39	39	52	50	50
L2	NCA03 and NCA04	43	42	42	51	49	50

6. Assessment criteria

6.1 Operational noise criteria

6.1.1 Existing operational noise limits – EPL 6092

The operations associated with the 6BF form one area within the larger PKSW site. EPL 6092 contains operational noise limits for individual activities within the Port Kembla Steelworks site, including the 5BF. The operational noise limits for the 5BF are presented below in Table 6.1 along with additional notes.

> *"L6.6 For the purpose of the noise measurements referred to in condition L6.5, 5dB(A) must be added to the measured level if the noise is substantially tonal and impulsive in character.*
>
> *Noise monitoring must use the "FAST" response on the sound level meter.*
>
> *Note: Noise impacts that may be enhanced by temperature inversions shall be addressed by:*
>
> *a) documenting noise complaints received to identify any higher level of impacts or patterns of temperature inversions; and*
>
> *b) where levels of noise complaints indicate a higher level of impact then actions to quantify and ameliorate any enhanced impacts under temperature inversions conditions should be developed and implemented"*

In lieu of site-wide noise monitoring and noise modelling of the entire PKSW site, it is proposed that noise emission from the 6BF is assessed against the existing operational noise limit for the 5BF, being $L_{Aeq(15min)}$ 35 dBA at the most-potentially affected residence. It should be noted that there are currently no operational noise limits for the slag handling area or the stockhouse associated with 5BF as previous environmental noise assessments for 5BF did not include noise emissions from these areas.

There is no $L_{A1(1min)}$ operational noise limit for the 5BF to assess maximum noise events during the night period such as noise from pressure release valves or the noise from activities within the stockhouse. A such, sleep disturbance impacts have been assessed against a $L_{A1(1min)}$ noise level of 55 dBA and is consistent with the $L_{A1(1min)}$ operational noise limits for scrap cutting and the steam assets upgrade project (assessed at the most potentially affected residences).

Table 6.1 Assessment criteria – 6BF

Activity	Noise Limit $L_{Aeq(15min)}$, dBA	Noise Limit $L_{A1(1min)}$, dBA	Compliance Location
Number 5 Blast Furnace	35	55	Most potentially affected residence

6.1.2 NSW EPA Noise Policy for Industry (NPfI)

The following guidance is provided in the NPfI pertaining to certain criteria which may apply to existing industrial operations with a proposed discrete modification to their operations:

> *“Where a development proposal involves a discrete process and premises-wide mitigation, has or is to be considered outside of the development proposal, a project noise trigger level for noise from new/modified components (not the whole site) of the operation may be set at 10 dB(A) or more below existing site noise levels or requirements. This approach means that the increase in noise from the whole site is minimised and provides scope for existing components to achieve noise reductions over time.”*

Previous industrial compliance noise monitoring for the BlueScope site was conducted by SLR as part of *BlueScope Steel – Port Kembla N&V Compliance Monitoring August 2018* (SLR, December 2018). Monitoring locations have been selected which are considered representative of the NCAs used in this noise assessment. This noise monitoring data is also generally supported by the ambient noise descriptors as provided in GHD’s background noise monitoring data in Table 3.1 (refer to night period measurements). As such, this compliance noise monitoring data is considered suitable to establish criteria for a NPfI discrete process assessment. This assessment criteria for a discrete process is provided below in Table 6.2.

Table 6.2 Existing industrial noise level, and NPfI discrete assessment noise criteria

Representative monitoring location (SLR)	NCA representation	Measured industrial noise level (night period), dBA	NPfI discrete process criteria (night period) $L_{Aeq(15min)}$, dBA
M2 (BlueScope Air Monitoring Station – Flagstaff Road, Lake Heights)	NCA04 – Warrawong	48 (General site noise)	38
M5 (Site-office – Merret Avenue, Cringila)	NCA03 – Cringila	51 (General site noise)	41
M6 (Cnr Hill Street and Ocean Street, Mt St Thomas)	NCA02 – Mt St Thomas	41 (General low frequency rumble)	31
	NCA01 – Wollongong		

Due to the complexity and scale of the PKSW site, premises-wide mitigation is not proposed. The following matters must be considered in the context of future noise emissions relevant to the project:

- 5BF will not be operational during the operation of 6BF and as such, noise emissions from the existing 5BF will be cease.
- The stockhouse and slag handling areas associated with 5BF were not originally included in the previous environmental noise assessments for 5BF. As such, the existing EPL does not contain operational noise limits for the operations associated with the 5BF slag handling and stockhouse areas. This noise assessment considers noise emission from the 6BF including the slag handling areas and the stockhouse areas and recommends opportunities to reduce noise levels from these activities. If required, mitigation strategies are recommended in Section 8.3 to reduce operational noise levels to compliant levels.
- Compliance for noise emission from 5BF could not be determined at the most-affected residences as the contribution could not be determined at a far-field location (Cringila and Warrawong). This is due to the fact that the EPL operational noise limit for 5BF is 35 dBA and the existing industrial noise levels from the overall PKSW site is approximately 51 dBA at the most-affected Cringila receivers and 48 dBA at the most-affected Lake Heights/Warrawong Receivers. As such, it is proposed that an intermediate compliance location (between the source and the most-affected residences) be used to verify noise levels once 6BF is operational to identify any potential noise issues. Details of this is provided in Section 8.3.

6.1.3 Operational noise criteria

With consideration to the operational noise criteria provided above in Sections 6.1.1 and 1.1.1, the following approach is proposed for the assessment of operational noise from 6BF:

- The operational noise emission from industrial processes directly associated with the 6BF will be assessed towards the NPfI discrete process criteria to ensure existing industrial noise levels do not increase as a result of the project when assessed at the most-affected residences.
- The operational noise emission from the 6BF components (not including the slag handling or stockhouse), will be assessed towards the existing EPL 6092 noise limit, as the limit was intended for the specific 5BF process.

The operational noise criteria for this assessment is provided below in Table 6.3. Assessment against the NPfI discrete process criteria should ensure that noise contribution from the 6BF (including slag handling and stockhouse) does not contribute to the overall noise emission levels from the overall PKSW site at the most-affected residences.

Table 6.3 Operational noise criteria

Assessment	Receiver type	Operational noise criteria, $L_{Aeq(15min)}$ dBA	Operational components considered in assessment	
			Operational component	**Modelled source groups**
NPfI discrete assessment	Residential – NCA01	31	6BF Slag Handling Area Stockhouse	Hot Blast Slag Granulator Conveyor belts Bag Houses Furnace Top Gas Cleaning Cooling Stockhouse Slag handling yard and pits
	Residential – NCA02			
	Residential – NCA03	41		
	Residential – NCA04	38		
EPL 6092 noise limit	Residential (All)	35	6BF	Hot Blast Slag Granulator Bag Houses Furnace Top Gas Cleaning Cooling

6.1.4 Cumulative noise criteria for residential receivers

Cumulative noise impacts affecting receivers from all industrial noise sources are assessed according to the amenity criteria of the NPfI. The combined impact of all industrial noise sources at a receiver point should be considered, where industrial facilities are either operating or have been approved for development. The cumulative noise criteria that apply for the residential receivers within the project area shown in Table 6.4.

Table 6.4 Amenity noise level for urban residential receivers

Receiver type	Time of day	Recommended amenity noise level L_{Aeq}, dBA
Urban residential receivers	Day	60
	Evening	50
	Night	45

Based on the previous noise monitoring data and compliance noise monitoring, the recommended amenity noise level for urban residential receivers is currently being exceeded during the night period at the most-affected residential receivers in Cringila and Warrawong; refer to Table 6.2. Adoption of the assessment criteria in Section 6.1.3 should ensure noise emissions from the PKSW site do not increase as a result of the project and would negate any potential any cumulative noise impacts from existing and planning industrial noise sources.

6.1.5 Operational noise criteria for non-residential receivers

Operational noise criteria for non-residential receivers have been established based on the project amenity noise levels provided in Section 2.4 of the NPfI. These noise limits are based on the recommended amenity noise level minus 5 dB. The operational noise criteria for non-residential receivers are provided below in Table 6.5.

Table 6.5 Non-residential receiver project amenity noise criteria

Receiver type	Time of day	Recommended amenity noise level L_{Aeq}, dBA	Project amenity noise criteria $L_{Aeq(15min)}$[2], dBA
Educational institute	When in use	45[1]	43
Place of worship	When in use	50	48
Active recreation	When in use	55	53
Passive recreation	When in use	50	48

Note 1: The recommended amenity noise level is provided as an internal noise level. A + 10 dB correction has been applied to convert to an external noise level, based on a 10 dB reduction for a partially open window

Note 2: A + 3 dB correction has been applied to convert the L_{Aeq} noise descriptor to a $L_{Aeq(15min)}$ noise descriptor, as per guidance from the NPfI

6.2 Construction noise

The EPA has released the Draft Construction Noise Guideline (DCNG) in 2020 for public consultation purposes only and once public consultation is complete, the feedback will be used to provide a final guideline to replace the ICNG. The ICNG will remain applicable for projects as it is referred to in the SEARs.

However, the DCNG still provides useful guidance and includes the following changes:

- Emphasis on the need to engage with the community, to ensure that the community’s views are considered when planning how to manage construction noise impacts.
- Improved guidance for managing noise from construction activities taking place outside the recommended standard hours of work.
- Alignment of the level of assessment required with risk of noise impact.
- A simplified assessment path for routine activities undertaken by public authorities on public infrastructure through industry management procedures.
- Increased emphasis on the need for proponents to justify the selection of noise mitigation measures to improve transparency.

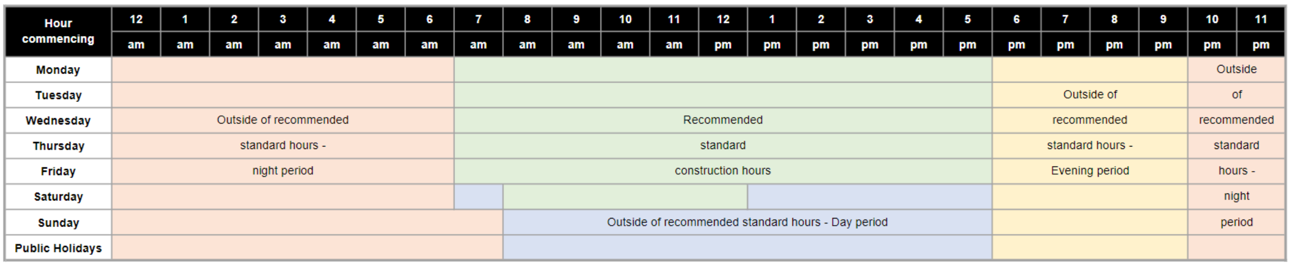
The intent of these changes has been considered in this assessment however construction noise associated with the project has been assessed against the requirements of the ICNG.

6.2.1 ICNG/EPL construction hours

The ICNG provides guidance for assessment and management of construction noise. The guideline recommends standard hours for construction activities as follows:

- Monday to Friday: 7:00 am to 6:00 pm
- Saturday: 8:00am to 1:00 pm
- No work on Sundays or Public Holidays

Figure 6.1 shows the ICNG recommended standard construction hours (consistent with the EPL construction hours) and the out-of-hours work periods for the day, evening and night.



Hour commencing	12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm
Monday																							Outside	
Tuesday																			Outside of				of	
Wednesday	Outside of recommended							Recommended											recommended				recommended	
Thursday	standard hours -							standard											standard hours -				standard	
Friday	night period							construction hours											Evening period				hours -	
Saturday																							night	
Sunday									Outside of recommended standard hours - Day period														period	
Public Holidays																								

Figure 6.1 Recommended standard and outside of recommended standard construction hours

Per condition L6.3 of EPL 6092, the hours of construction may be varied by written consent of the EPA.

Authorisation for 24 hour construction is being sought as part of the request for planning approval.

Where practical, and subject to the final construction timetable, construction will be carried out during the following construction hours:

- Monday to Friday: 7.00 am to 6.00 pm
- Saturday: 7.00 am to 6.00 pm
- Sundays and public holidays: no work

6.2.2 Outside of recommended standard hours work

There will be a number of construction activities scheduled to be undertaken as night works to manage interaction with the remainder of the PKSW operations and the higher day shift workforce.

Where practical noise generating activities with potential to impact any nearby receivers will be scheduled during standard hours.

Final installation of components inside the blast furnace and other residual construction activities will require 24 hour construction (estimated to be a period of 5 months). Further, 24 hour construction may be required for an extended period to speed up the completion of construction if 6BF is required online earlier than 2026.

For any high impact activities required outside of the construction hours (7.00 am to 6.00 pm, Monday – Saturday), an application will be made to the EPA seeking approval in writing to undertake the works per EPL 6092. A description of the works, justification and management measures will be included as part of the application.

Operation of 6BF will be 24 hours per day seven day a week in line with 5BF current operations. There will be no concurrent ironmaking operation of both 5BF and 6BF.

6.2.3 Noise management levels

The construction noise management levels represent a noise level that, if exceeded, will require management measures including:

- Reasonable and feasible work practices
- Contact with the residences to inform them of the nature or works to be carried out, the expected noise levels, and durations and contact details

The management measures are aimed at reducing noise impacts at the residential receivers. However, it may not be reasonable and feasible to reduce noise levels to below the noise affected management level at all times. The noise affected construction noise management levels are not intended as a noise limit but rather a level at which noise management is required and as such should not be considered as a noise limit in the environmental protection licence or approval conditions.

Table 2 in the ICNG provides recommended NML for residences, which are detailed in Table 6.6.

Table 6.6 Residential construction noise management levels, dBA (ICNG, 2009)

Time of day	Noise management level, $L_{Aeq(15\ min)}$	Application notes
Recommended standard hours	Noise affected: RBL + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq(15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected: 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: – Times identified by the community when they are less sensitive to noise (such as before and after school, or mid-morning or mid-afternoon for works near residences). – If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected: RBL + 5 dBA	A strong justification will typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable measures have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.

6.2.4 Sleep disturbance

Whilst some out of hours works may be required, generally these will be afternoon, evening or weekend works and not during times where sleep disturbance may be caused. No significant construction works are proposed during the night period (10:00 pm to 7:00 am Monday to Saturday and 10:00 pm on Saturday to 8:00 am on Sunday). If activities are required to be undertaken during these times it will be limited to activities which are not audible at the nearest sensitive receiver, or discreet events which need to be undertaken outside standard hours for safety reasons. It should also be noted that operational activities at PKSW occur 24 hours a day so this is typical of the local noise environment.

As such, no sleep disturbance impacts are anticipated during the construction phase of the project.

6.2.5 Project specific construction noise management levels

The noise management levels at sensitive receivers in the study area are summarised in Table 6.7 and have been based on Table 6.6. As the measured RBLs are lower than the minimum background levels specified in the NPfI, the minimum background noise levels have been used.

Table 6.7 Project specific construction noise management levels

Sensitive receiver type	Construction Noise Management Levels, $L_{Aeq(15min)}$					Sleep disturbance (Night)
	Standard construction hours		Outside standard construction hours			
	Noise affected	Highly noise affected	Day	Evening	Night	
Residential NCA01 (Wollongong) and NCA02 (Coniston/Mt. St. Thomas)	49	75	44	44	44	54 $L_{A1(1min)}$

Sensitive receiver type	Construction Noise Management Levels, $L_{Aeq(15min)}$					Sleep disturbance (Night)
	Standard construction hours		Outside standard construction hours			
	Noise affected	Highly noise affected	Day	Evening	Night	
Residential NCA03 (Cringila) and NCA04 (Warrawong / Port Kembla)	53	75	48	47	47	57 $L_{A1(1min)}$
Educational institutions	55 (external)					-
Places of worship	55 (external)					-
Active recreation areas	65					-
Passive recreation areas	60					-

6.3 Construction vibration

6.3.1 Human comfort

Vibration is assessed based on the criteria in *Assessing Vibration: A Technical Guideline* (DEC, 2006). *BS6472: Guide to Evaluation of Human Exposure to Vibration in Buildings* (1 Hz to 80 Hz) (British Standards, 2008) is recognised as the preferred standard for assessing the 'human comfort criteria'. Intermittent vibration, such as construction work, is assessed using the vibration dose value.

Whilst the assessment of response to vibration in BS 6472-1:2008 is based on vibration dose value and weighted acceleration, for construction related vibration it is considered more appropriate to provide guidance in terms of a peak particle velocity (PPV), since this parameter is likely to be more routinely measured based on the more usual concern over potential building damage. Table 6.9 provides guidance on the effect of vibration levels for human comfort in peak particle velocity as reference against the vibration guide values shown in Table 6.8.

Table 6.8 Acceptable PPV Values for Human Comfort (BS 6472-2008)

Receiver	Period	Continuous and impulsive vibration guide goals	
		Preferred value	Maximum value
Residential	Day	0.28 (8.6)	0.56 (17.0)
Offices, schools, educational institutes and places of worship	When in use	0.56 (18.0)	1.1 (36.0)
Workshops	When in use	1.1 (18.0)	2.2 (36.0)

Notes:

1) Impulsive goals are shown in brackets – These are most relevant to activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.

Humans are capable of detecting vibration at levels which are well below those causing risk of damage to a building. The degrees of perception for humans are suggested by the vibration level categories given in *BS5228.2 – 2009, Code of Practice Part 2 Vibration for noise and vibration on construction and open sites – Part 2: Vibration* (British Standards, 2009), as shown below in Table 6.9.

Table 6.9 Guidance on effect of vibration levels for human comfort (BS 5228.2 – 2009)

Vibration level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration at this level in residential environments will cause complaints, but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure.

6.3.2 Structural damage to standard structures

The minimum working distances for structural (cosmetic) damage used for this assessment have been based on *BS 7385-2:1993 Evaluation and measurement for vibration in buildings Part 2 – Guide to damage* (British Standards, 1993) levels from ground borne vibration which enables the likelihood of building damage from ground vibration to be assessed. The use of BS7385 is the preferred standard in NSW to assess potential vibration impacts to standard structures and is consistent with the Transport for NSW noise and vibration guidelines.

The vibration levels in this standard are adopted as building damage criteria and are presented in Table 6.10.

Table 6.10 Transient vibration guide values - minimal risk of cosmetic damage

Type of building	Peak component particle velocity in frequency range of predominant pulse[1]	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures industrial and heavy commercial building	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures residential or light commercial type buildings [2]	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Notes:

1) Values referred to are at the base of the building.

2) At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

6.3.3 Structural damage to heritage structures

The German Standard DIN 4150-3: 1999 Structural Vibration – Part 3: Effects of vibration on structures provides guideline values for the maximum absolute value of the velocity 'at the foundation of various types of building. Experience has shown that if these values are complied with, damage that reduces the serviceability of the building will not occur. If damage nevertheless occurs, it is to be assumed that other causes are responsible.' These values are provided in Table 6.11.

Measured values exceeding those listed in Table 6.11 do not necessarily lead to damage; should they be significantly exceeded however, further investigations are necessary. No heritage structures have been identified within 250 metres of the construction footprint and as such, no vibration impacts to heritage impacts are anticipated.

Table 6.11 Guideline values for short term vibration on structures

Line	Type of building	Guideline values for velocity, (mm/s)		
		1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (e.g. listed buildings under preservation order)	3	3 to 8	8 to 10

Notes:

1) Values referred to are at the base of the building.

2) At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

6.4 Traffic noise (construction and operation)

The RNP provides traffic noise target levels for residential receivers in the vicinity of existing roads and are applied to road upgrades. For this assessment these levels are also applied to construction works to identify potential construction traffic impacts and the potential for reasonable and feasible mitigation measures. The RNP road types are based on the functional roles shown in Table 6.12.

The additional traffic during construction and operation is anticipated to have a negligible effect on the existing traffic volumes (and traffic noise) on the local road network. As such, no further assessment of potential road traffic noise increases on the local road network is deemed necessary.

Table 6.12 Road Categories from RNP

Road category	Functional role	Public roads used by project
Freeways or motorways/arterial roads	Support major regional and inter-regional traffic movement. Freeways and motorways usual feature strict access controls via grade separated interchanges.	– Princes Motorway
Sub-arterial road or collector road	Provide connection between arterial roads and local roads. May support arterial roads during peak period. May have been designed as local streets but can serve major traffic generating developments or support non-local traffic.	– Springhill Road – Masters Road – Five Islands Road
Local roads	Provide vehicular access to abutting property and surrounding streets. Provide a network of the movement of pedestrians and cyclists, and enable social interaction in a neighbourhood. Should connect, where practicable, only to sub-arterial roads.	– Flagstaff Road

The application notes for the RNP state that "*for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level as a result of the development should be limited to 2 dB above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night noise assessment criterion*."

If the road traffic noise increase from the construction work is within 2 dBA of current levels then the objectives of the RNP are met and no specific mitigation measures are required. Mitigation should be applied when road traffic noise levels increase by 2 dB *and* the controlling noise criterion in Table 6.13 are exceeded at the façade of the residence.

Table 6.13 Road traffic noise criteria, dBA

Development type	Applicability to assessment	Day 7:00 am to 10:00 pm	Night 10:00 pm to 7:00 am
Existing residence affected by additional traffic on arterial / sub-arterial / collector roads generated by land use developments	– Springhill Road – Five Islands Road	60 $L_{eq(15hr)}$	55 $L_{eq(9hr)}$
Existing residence affected by additional traffic on local roads generated by land use developments	– Flagstaff Road	55 $L_{eq(1hr)}$	50 $L_{eq(1hr)}$

6.5 Blasting noise and vibration

The following documents were used to establish the blasting criteria for this assessment:

- Technical Basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZECC, 1990)
- Australian Standard AS2187.2 (2006) Explosives – Storage and use Part 2: Use of explosives

6.5.1 Airblast overpressure

The recommended human comfort level for airblast overpressure is 115 dB(L) peak. This level may be exceeded on up to five per cent of the total number of blasts over a period of 12 months, however should not exceed 120 dB(L) peak.

6.5.2 Ground vibration

The recommended human comfort level for vibration should not exceed a peak particle velocity of 5 mm/s. This level may be exceeded on up to five per cent of the total number of blasts over a period of 12 months, however should not exceed 10 mm/s.

6.5.3 Structural damage

AS2187.2 (2006) recommends the following in relation to structural damage:

- A limit of 133 dBL airblast overpressure on structures as research showed no damage (even cosmetic) occurs at airblast levels below this level.
- BS7385.2 values can be adopted for the prevention of minor or cosmetic damage occurring in structures from ground vibration which are 15 mm/s at 4 Hz PPV for standard residential buildings.

The human comfort level is significantly below the structural damage criteria which will be used to manage impacts, therefore structural damage is considered highly unlikely at surrounding sensitive receivers.

Table 6.14 Summary of blasting criteria

Type	Impact	Screening criteria	Source
Ground vibration	Human comfort	5 mm/s	ANZECC (1990)
	Structural damage to residences	15 mm/s	AS2187.2 (2006)
Airblast overpressure	Human comfort	115 dBL_{peak}	ANZECC (1990)
	Structural damage to residences	133 dBL_{peak}	AS2187.2 (2006)

7. Impact assessment

7.1 Operational noise

7.1.1 Predicted noise levels

The predicted $L_{Aeq(15min)}$ noise levels at each key sensitive receiver are presented in Table 7.1 and only include the noise sources identified in Table 4.2 (i.e. 6BF, Slag Handling and Charging System) against the NPfI discrete process criteria for residential receivers, and amenity criteria for non-residential receivers.

The noise modelling indicates compliance is predicted at all sensitive receiver locations with RES29 in Cringila predicted to receive the highest noise levels. Table 7.2 shows the contribution of the modelled noise sources at RES29 in Cringila, considered to be the most affected residence. L_{Aeq} noise contours at 1.5 metres above ground are presented in Figure 7.2. Full operational noise results to noise sensitive receivers are provided in Appendix D.

Figure 7.1 is a pie chart displaying the noise level contributions from each of the noise source groups associated with the operation of 6BF when assessed at RES29. The noise levels from each component are converted from a decibel (dBA, reference pressure of 20 µPa) to a pressure intensity (µPa) to show the percentage contribution in a non-logarithmic manner. It is illustrated noise levels from the main 6BF components at RES29 contribute to approximately half of the noise emissions, whilst the slag handling area and the stockhouse area contribute to a quarter of the noise emissions each.

Table 7.1 Predicted $L_{Aeq(15min)}$ noise levels at sensitive receivers, dBA

RID	Receiver Type	$L_{Aeq(15min)}$ noise level, dBA		Complies?
		Criteria	Predicted noise level	
ARR1	Active recreation	53	22	Yes
ARR2	Active recreation	53	20	Yes
ARR3	Active recreation	53	25	Yes
ARR4	Active recreation	53	32	Yes
ARR5	Active recreation	53	23	Yes
EDU1	Educational institute	43	18	Yes
EDU2	Educational institute	43	36	Yes
EDU3	Educational institute	43	28	Yes
EDU4	Educational institute	43	27	Yes
POW1	Place of worship	48	27	Yes
POW2	Place of worship	48	33	Yes
PRR1	Passive recreation	48	20	Yes
PRR2	Passive recreation	48	28	Yes
RES1	Residential - NCA04	38[1]	33	Yes
RES23	Residential - NCA04	38[1]	35	Yes
RES29	Residential - NCA03	41[1]	39	Yes
RES33	Residential - NCA02	31[1]	28	Yes
RES39	Residential - NCA01	31[1]	23	Yes
Note 1: In accordance with the NPfI discrete process assessment criteria provided in Table 6.3				

Table 7.2 Predicted $L_{Aeq(15min)}$ contribution of noise sources at most-affected residences (RES29 in Cringila) dBA

Source group	Operational component	EPL 6092 criteria	Contributed noise level $L_{Aeq(15min)}$, dBA	
Hot Blast	6BF	35 (based on 5BF)	27	31 (Total from 6BF)
Conveyor belts			24	
Bag Houses			23	
Furnace Top			22	
Gas Cleaning			21	
Cooling			18	
Stockhouse	Charging system	N/A	36	
Slag Handling	Slag handling	N/A	35	
Slag Granulator			25	
Total			39	

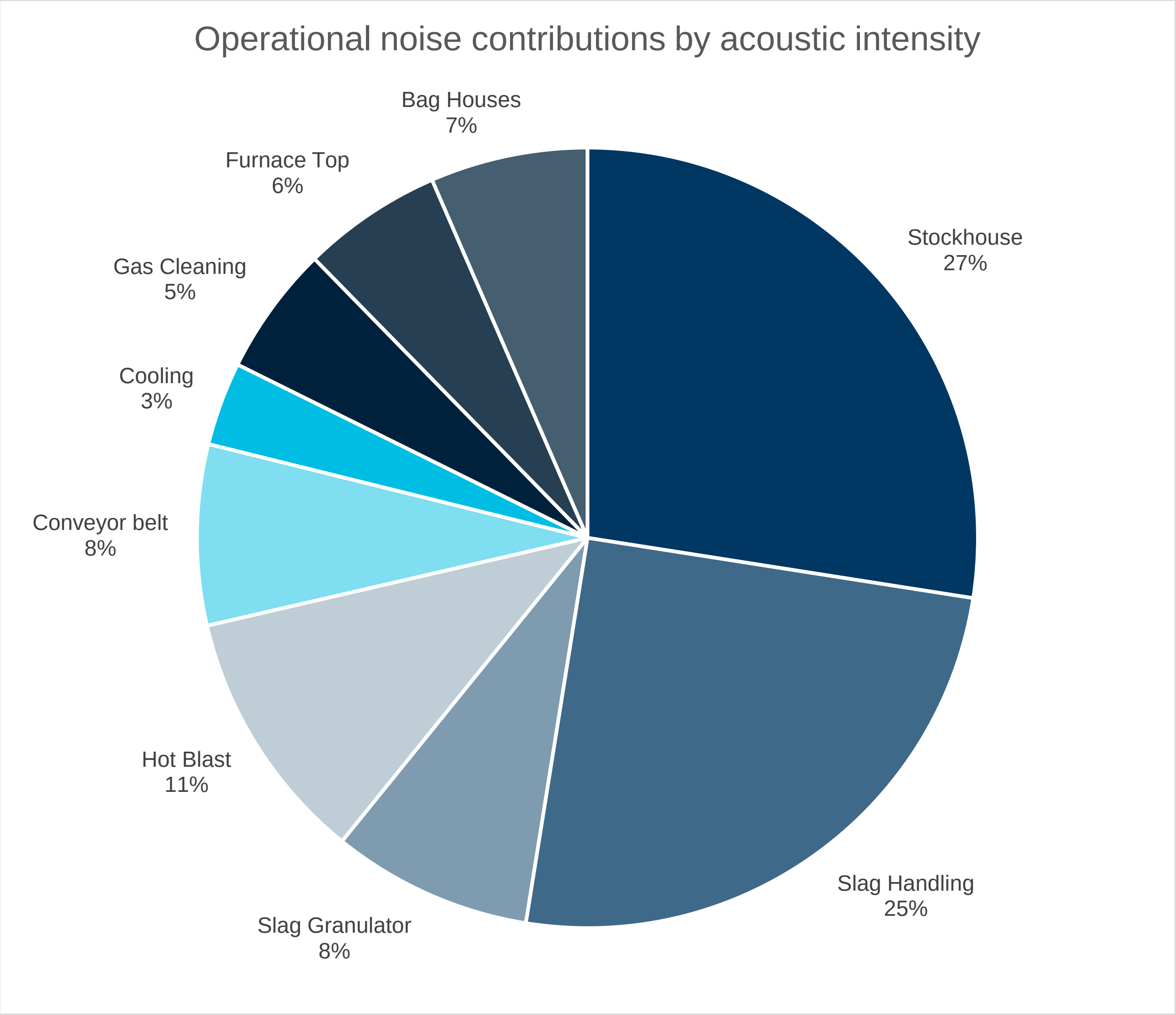


Figure 7.1 Operational noise contributions by acoustic intensity (RES29 in Cringila), percentage of overall noise emission based on µPa

Paper Size ISO A4

0 0.2 0.4 0.6 0.8

Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Noise and Vibration Impact Assessment

Operational noise emission L_{Aeq} noise contours

Project No.	**12541101**
Revision No.	**0**
Date	**28/10/2021**

FIGURE 7-2

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7.1.2 Sleep disturbance impacts

The potential for sleep disturbance is considered from short-duration, high level noise events. In this case, significant maximum noise levels events have been modelled from the following set of operational equipment. The modelled $L_{A1(1min)}$ noise levels considered in the assessment are as provided in Appendix C:

- Furnace top:
  - Bin pressure relief silencer
  - Bin pressure relief valve
- Hot blast:
  - Furnace top bleeder– not considered as part of normal operations, as noise emissions only occur during emergency operation
  - Snort control valve silencer
  - Stove pressurisation/depressurisation valves
- Stockhouse:
  - Vibrofeeders
  - Screens
- Slag handling:
  - Knocking block

Regarding the furnace top bleeder and snort control valve silencer, sound levels of these events were measured during cold commissioning of 5BF during its reline in 2009. Both were audible at residential receiver locations with the following observations:

- Noise from the Snort control valve silencer was barely audible
- Noise from the Furnace top bleeder valves were easily audible and measured

These sources however occur infrequently, with the furnace top bleeder only operating in a noise-producing state in emergency situations and on initial commissioning; it is not part of normal operations and therefore it is not considered as part of the sleep disturbance assessment. The Snort valve operates at shutdown and start-up (approximately every 18 weeks) and in emergency situations. Whilst it is not considered part of typical operations, it has been included in the sleep disturbance assessment, as discussed above in Table 4.4. The predicted $L_{A1(1min)}$ noise levels are presented in Table 7.3.

Table 7.3 Predicted $L_{A1(1min)}$ noise levels at sensitive receivers during the night, dBA

RID	Receiver Type	$L_{A1(1min)}$ EPL sleep disturbance criterion	Highest $L_{A1(1min)}$ noise level, dBA						
			Furnace top		Hot blast		Stockhouse		Slag handling
			Bin Pressure Relief Silencer	Bin Pressure Relief Valve	Snort Control Valve Silencer	Stove Depressurisation Valve	Screen	Vibrofeeder	Knocking Block
RES01	Residential - NCA04	55	30	27	42	10	31	30	36
RES23	Residential - NCA04	55	35	35	30	14	32	34	40
RES29	Residential - NCA03	55	38	38	40	18	36	35	45
RES33	Residential - NCA02	55	27	27	39	8	25	23	31
RES36	Residential - NCA01	55	22	23	37	3	23	22	14

$L_{A1(1min)}$ noise predictions indicate that the sleep disturbance screening criterion is not exceeded at the key residential receivers from worst case maximum noise events. It is noted that the furnace top bleeder is not considered in this $L_{A1(1min)}$ sleep disturbance assessment, as it will only occur as an emergency operation, or during commission testing. In the rare event of its occurrence, $L_{A1(1min)}$ noise levels at residential receivers are expected to be significantly above the $L_{A1(1min)}$ noise criterion, however it is not considered representative of typical maximum noise events as part of normal operation.

As part of the commissioning stage of this project, testing of the furnace top bleeder will need to be undertaken. $L_{A1(1min)}$ noise levels from its testing are predicted to reach up to 85 dBA at the nearest residential receivers. This noise event is expected to last up to approximately 10 seconds, and will be highly intrusive to residential receivers. Appropriate mitigation measures to manage this noise event are provided in Section 8.3.1.

7.1.3 Cumulative noise impacts

As stated in Section 2.1 of the NPfI, "*The project amenity noise level seeks to protect against cumulative noise impacts from industry and maintain amenity for particular land uses*." The operational noise criteria used in this assessment is more stringent than the NPfI project amenity noise level. It is based on the NPfI discrete process criteria, which aims to ensure the noise emission from the proposal does not contribute to the existing total industrial noise level at the most affected receivers. Compliance with the assessment criteria should ensure there are no cumulative noise impacts as a result of the proposal.

A list of the major projects in the vicinity of the proposal is presenting in Section 9.10.1 of the EIS for reference.

7.2 Construction noise

7.2.1 Predicted noise levels

Construction noise levels have been predicted at the sensitive receivers within the study area with consideration to the acoustic requirements of the ICNG. The predicted maximum noise level along with the NML from laydown area operations for each receiver is provided in Table 7.4 for residential receivers, and Table 7.5 for non-residential receivers. The predicted maximum noise level along with the NML from 6BF construction activities is provided in Table 7.6. The noise modelling assumes that the loudest equipment in the scenario is operating at maximum capacity simultaneously at the closest distance between the construction work area and the receiver. Construction noise contours are provided in Figure 7.3 for laydown area operations, and Figure 7.4 and Figure 7.5 for 6BF construction activities.

Exceedances of the NML during standard construction hours are printed in red. Exceedances of the NML during outside standard construction hours are printed in blue.

Table 7.4 Construction noise levels for laydown areas – Residential receivers

Laydown area and construction activity	**Noise Management Levels** **Standard hours: 53** **OOHW Day: 48** **OOHW Evening: 47** **OOHW Night: 47**			**Noise Management Levels** **Standard hours: 49** **OOHW Day: 44** **OOHW Evening: 44** **OOHW Night: 44**	
	RES01 (NCA04)	**RES23 (NCA04)**	**RES29 (NCA03)**	**RES33 (NCA02)**	**RES39 (NCA01)**
No1W 1 – excavator / forklift	5	38	20	16	8
No1W 4 – excavator / forklift	3	40	9	10	4
No1W 5 – excavator / forklift	11	34	17	10	6
No2B 1– excavator / forklift	13	17	25	22	16
No2W 1 – excavator / forklift	15	23	25	14	0
No2W 1 – Rock breaking	30	38	40	29	15
No2W 2 – excavator / forklift	18	24	29	6	0
No2W 2 – Rock breaking	33	39	44	21	10
No2W 3 – excavator / forklift	19	23	27	17	10
No2W 3 – Rock breaking	33	39	42	32	25
No2W 4 – excavator / forklift	19	22	22	14	11
No2W 4 – Rock breaking	34	37	37	29	26
No2W 5 – excavator / forklift	19	20	21	15	12
No2W 5 – Rock breaking	34	35	36	30	27
No2W 6 – excavator / forklift	18	26	34	16	7
No2W 6 – Rock breaking	33	41	49	31	22
RA 4 – excavator / forklift	7	11	21	31	15
RA 5 – excavator / forklift	8	13	22	30	14
SpringHill Electrical – excavator / forklift	0	1	6	15	19

Table 7.5 Construction noise levels for laydown areas – Non-residential receivers

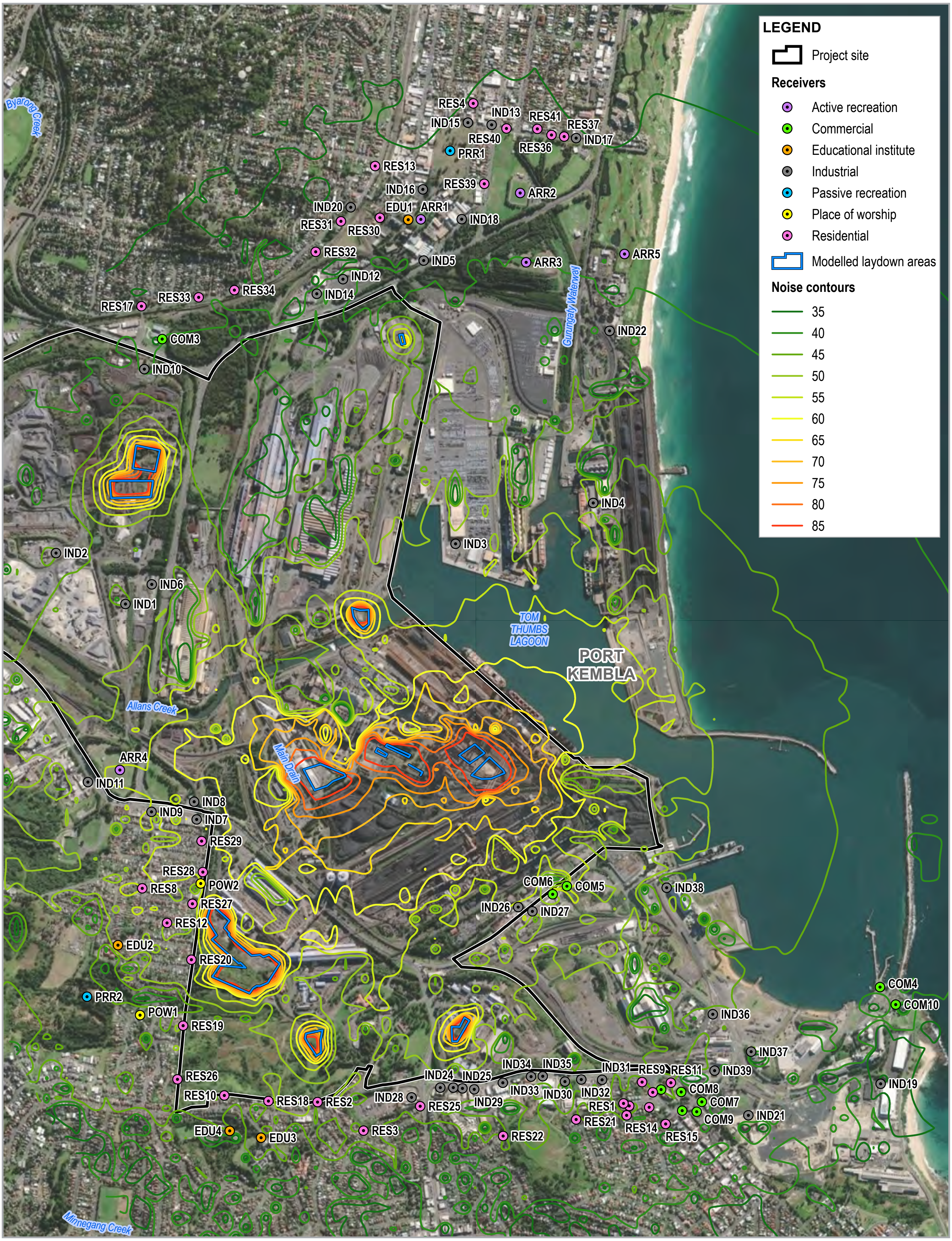
Laydown area and construction activity	NML (Active Recreation) 65 dBA					NML (Educational) 55 dBA				NML (Place of worship) 55 dBA		NML (Passive Recreation) 60 dBA	
	ARR1	ARR2	ARR3	ARR4	ARR5	EDU1	EDU2	EDU3	EDU4	POW1	POW2	PRR1	PRR2
No1W 1 – excavator / forklift	9	8	10	28	9	9	41	30	28	38	47	7	32
No1W 4 – excavator / forklift	6	5	7	20	6	7	31	23	21	29	27	5	29
No1W 5 – excavator / forklift	7	6	8	17	8	2	23	24	21	20	22	6	19
No2B 1– excavator / forklift	18	16	18	23	16	9	21	10	9	12	12	15	13
No2W 1 – excavator / forklift	1	2	12	20	7	0	22	11	17	17	19	2	13
No2W 1 – Rock breaking	16	17	27	35	22	11	37	26	32	32	34	17	28
No2W 2 – excavator / forklift	0	0	5	23	2	0	25	18	18	20	23	0	18
No2W 2 – Rock breaking	11	10	20	38	17	10	40	33	33	35	38	11	33
No2W 3 – excavator / forklift	10	10	14	22	12	0	25	7	4	9	22	10	12
No2W 3 – Rock breaking	25	25	28	38	26	13	40	21	19	22	37	25	25
No2W 4 – excavator / forklift	8	11	14	17	12	0	20	17	16	15	6	4	7
No2W 4 – Rock breaking	23	26	29	32	27	13	35	32	31	30	21	20	22
No2W 5 – excavator / forklift	14	13	15	17	14	13	21	16	15	8	20	11	14
No2W 5 – Rock breaking	29	28	30	32	29	28	36	31	30	23	35	26	29
No2W 6 – excavator / forklift	9	9	11	31	10	0	29	21	21	22	30	9	22
No2W 6 – Rock breaking	24	24	26	46	25	13	44	36	36	37	45	24	37
RA 4 – excavator / forklift	11	15	17	21	13	20	16	11	10	13	16	16	13
RA 5 – excavator / forklift	10	15	16	26	13	21	18	12	10	14	18	15	14
SpringHill Electrical – excavator / forklift	25	18	21	4	15	7	2	0	0	0	1	17	0

Table 7.6 ***Construction noise levels from 6BF construction activities (main construction site)***

Receiver ID	Noise Management Level, $L_{Aeq(15min)}$ dBA	Prediction construction noise level, $L_{Aeq(15min)}$ dBA	
		General construction activities[1]	High impact construction works[2]
ARR1	65 (Active recreation)	26	35
ARR2		25	34
ARR3		28	37
ARR4		35	44
ARR5		26	35
EDU1	55 (Educational institute)	24	33
EDU2		38	47
EDU3		32	41
EDU4		30	39
POW1	55 (Place of worship)	32	41
POW2		38	47
PRR1	60 (Passive recreation)	24	33
PRR2		30	39
RES1 (NCA04)	NMLs for Residences in Cringila, Warrawong and Port Kembla: Standard hours: 53 OOHW Day: 48 OOHW Evening: 47 OOHW Night: 47	34	43
RES23 (NCA04)		37	46
RES29 (NCA03)		42	51
RES33 (NCA02)	NMLs for Residences in Wollongong, Coniston and Mt. St Thomas: Standard hours: 49 OOHW Day: 44 OOHW Evening: 44 OOHW Night: 44	29	38
RES39 (NCA01)		26	35

Note 1: Based on a selection of the highest noise generating equipment from this scenario’s equipment list, being large excavator, franna crane, front end loaders and vibratory roller

Note 2: Based on a selection of the highest noise generating equipment from this scenario’s equipment list, being a rock breaker and pile driver



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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Noise and Vibration Impact Assessment

Construction noise contours laydown area operations

Project No. **12541101**
Revision No. **0**
Date **28/10/2021**

FIGURE 7-3

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Noise and Vibration Impact Assessment

Construction noise contours 6BF construction activities, general construction activities

Project No.	**12541101**
Revision No.	**0**
Date	**28/10/2021**

FIGURE 7-4

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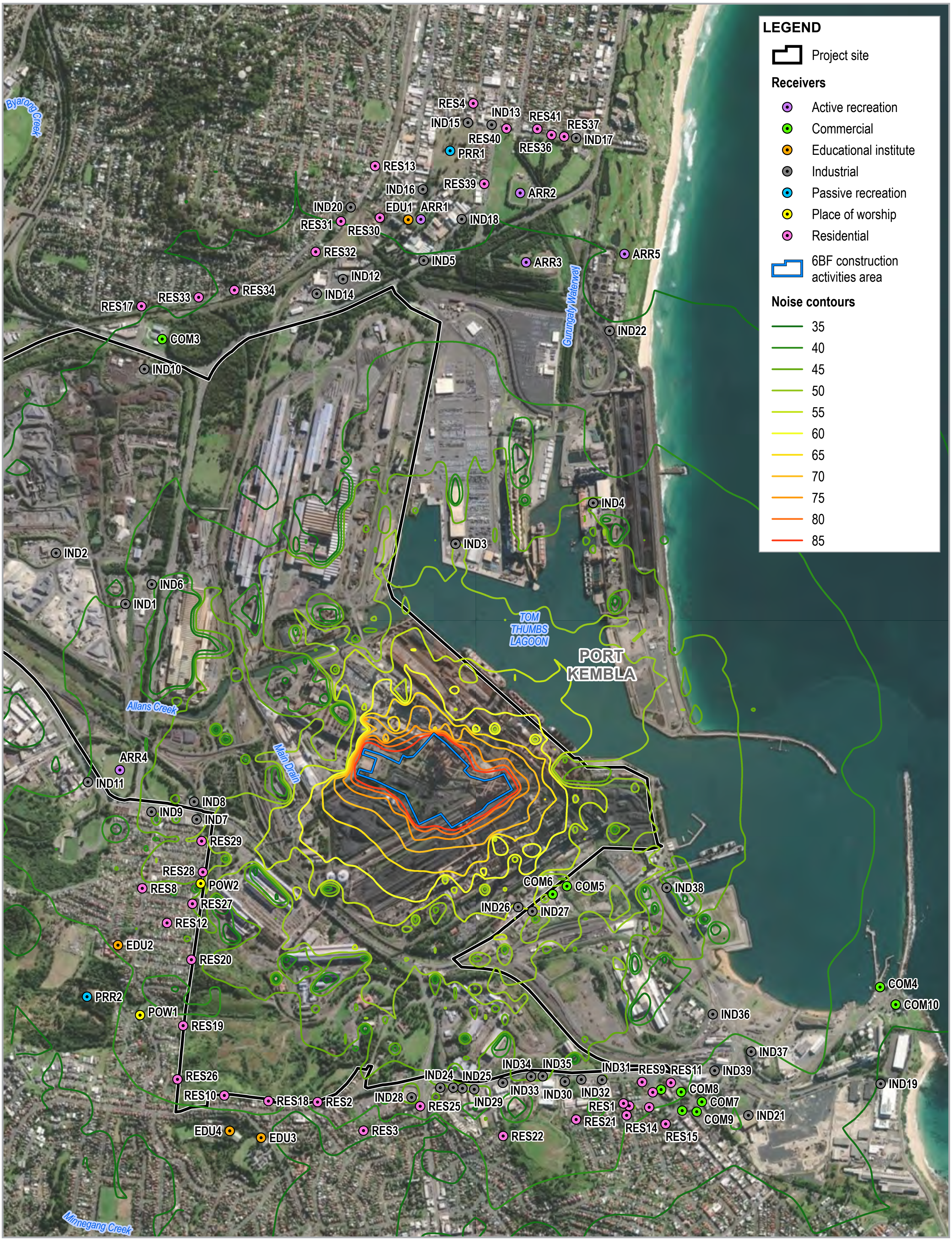
Data source: LPI: DTDB/DCDB, 2017. DPE: Land zones, 2019. World Imagery: Maxar.
Created by: tmorton



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Grid: GDA 1994 MGA Zone 56

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BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Noise and Vibration Impact Assessment

Construction noise contours 6BF construction activities, high intensity construction activities

Project No.	**12541101**
Revision No.	**0**
Date	**28/10/2021**

FIGURE 7-5

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Data source: LPI: DTDB/DCDB, 2017. DPE: Land zones, 2019. World Imagery: Maxar.
Created by: tmorton

7.2.2 Construction noise impacts during standard construction hours

Laydown area operations

It is predicted that construction noise levels from all laydown area operations are below the NML during standard construction hours. As such, long term construction noise impacts from these activities are not anticipated.

6BF construction activities – general construction activities

It is predicted that construction noise levels from 6BF construction activities involving general construction are below the NML for all residential receivers. It is anticipated that these construction activities will make up the majority of construction noise for the life of the construction project.

6BF construction activities – high intensity construction activities

It is predicted that construction noise levels from 6BF construction activities involving high intensity activities are below the NML for almost all residential receivers during standard construction hours.

7.2.3 Construction noise impacts outside standard construction hours

Laydown area operations

It is predicted that rock breaking activities may lead to exceedances of the NML at one residential receiver outside of standard construction hours. For all other receivers, it is predicted that noise generation is below the NML for out of hours works.

It is anticipated that these activities may be required at the project commencement phase for site and laydown area establishment. It is not confirmed these activities will be required however they have been assessed to confirm worst case impacts. It is therefore recommended that these activities be scheduled to only occur during standard construction hours to ensure that construction noise levels do not exceed the NML at the nearest residential receivers during out of hours construction works.

6BF construction activities – general construction activities

It is predicted that construction noise levels from 6BF construction activities involving general construction are below the NML for all residential receivers outside standard construction hours.

6BF construction activities – high intensity construction activities

It is predicted that construction noise levels from 6BF construction activities involving high intensity activities are above the NML at residential receiver RES29 outside standard construction hours. These exceedances will occur during the following activities:

- Rock breaking
- Impact piling

It is recommended that these activities be scheduled to only occur during standard construction hours to ensure that construction noise levels do not exceed the NML at the nearest residential receivers during out of hours construction works.

7.2.4 Construction noise impacts for non-residential receivers

It is predicted that all noise generation from laydown areas and construction activities is below the NML at the nearest noise sensitive non-residential receivers.

7.2.5 Cumulative noise impacts

Section 9.10.1 of the EIS provides a list of proposed major projects in the vicinity of the proposal site. There is the potential for construction of these projects to occur concurrently which may lead to cumulative construction noise impacts. Based on predicted construction noise levels, potential cumulative construction noise impacts would only be anticipated during high intensity 6BF construction activities, however this is only considered minor. Noise emission from all other construction activities is predicted to be significantly below the NMLs at the nearest residential receivers, which makes up the majority of construction activities for the proposal.

When the Construction Noise and Vibration Management Plan for the proposal is prepared, it can be determined whether construction activities are to occur concurrently alongside noise emission from proposed major projects in the vicinity.

7.3 Construction vibration

7.3.1 Vibration safe working distances

The method for the construction vibration assessment included:

- Identifying safe working distances to comply with the human comfort and the cosmetic damage criteria. These buffer distances have been adopted from *Construction Noise and Vibration Strategy*.
- Safe working distances for vibration intensive equipment are shown in Table 7.7. The vibratory equipment associated with the project include vibratory rollers and excavators.
- Buildings within the safe working distances have been identified for consideration of management measures.
- The safe working distance for heritage structures has been estimated as twice the distance as the safe working distance for standard structures.

Safe working distances for vibratory intensive equipment are shown in Table 7.7.

Table 7.7 Vibration safe working distances

Equipment	Human comfort (OH&E Vibration guideline)	Cosmetic damage to standard structures	Cosmetic damage to heritage structures
Piling rig – Bored <800 mm	N/A	2 m (nominal)	4 m
Piling rig–Hammer (12 t down force)	50 m	15 m	30 m
Piling rig – Vibratory (sheet piles)	20 m	2 m to 20 m	40 m
Vibratory roller (>18 tonnes)	100 m	25 m	50 m
Vibratory roller (13-18 tonnes)	100 m	20 m	40 m
Vibratory roller (7-13 tonnes)	100 m	15 m	30 m
Vibratory roller (4-6 tonnes)	40 m	12 m	24 m
Vibratory roller (2-4 tonnes)	20 m	6 m	12 m
Vibratory roller (1-2 tonnes)	15 m	5 m	10 m
Small hydraulic hammer 300 kg (5-12t excavator)	7 m	2 m	4 m
Medium hydraulic hammer 900 kg (12-18t excavator)	23 m	7 m	14 m
Large hydraulic hammer 1600 kg (18-34t excavator)	73 m	22 m	44 m
Jackhammer (handheld)	Avoid contact with structure	1 m (nominal)	2 m

7.3.2 Human comfort

It is anticipated that as part of the site preparation phase for works associated with laydown area No.1 Works area 1, a vibratory roller may be used for earthworks. For a conservative assessment, an 18T vibratory roller is considered. The closest distance between the proposed laydown area and the nearest residence is approximately 85 metres, and falls within the buffer distance of 100 metres for an 18T vibratory roller. Whilst this may indicate construction vibration impacts for human comfort, it will only be limited to the duration of this phase of work. Further, this is based on a highly conservative approximation of the potential works; at this stage is not certain whether use of the roller is required, or for what duration. As such, long term residual human comfort vibration impacts are not anticipated.

7.3.3 Structural damage

Rolling activities have the potential to exceed the structural damage vibration criteria should these works occur within 20 metres of residences or 40 metres of heritage structures. No residences or heritage structures have been identified within 40 metres of any construction works and as such, no adverse structural damage vibration impacts are anticipated as a result of the project.

7.4 Construction traffic noise along public roads

7.4.1 Construction traffic generation on public and local private roads

During construction, the project is expected to generate up to 600 light vehicle (300 arrivals and 300 departures) and 300 heavy vehicle (150 arrivals and 150 departures) movements per day and will likely utilise the roads listed in Table 7.8. Public roads adjacent to residences have been assessed against the Road Noise Policy and local private roads adjacent to residences have been assessed against the ICNG NMLs. Roads away from residences have not been included in the assessment as noise impacts are not anticipated.

Table 7.8 Public and local private roads to be used during construction

Public roads adjacent to residences	Public roads not near any residences	Local private roads within PKSW site not near any residences	Local private roads within PKSW site adjacent to residences
– Springhill Road – Five Islands Road	– Flagstaff Road (small section between intersections of Five Islands Road and General Office Road)	– Cringila Car Park Road – Loop Road – BlueScope Access Road	– Emily Road (assessed in Section 7.5)

7.4.2 Noise impacts along public roads

Based on the anticipated construction traffic numbers and timing as outlined in the projects Traffic Impact Assessment (GHD, 2021), the traffic generation for the assessed roads are provided below in Table 7.9.

Table 7.9 Construction traffic generation

Road name	Assessment type	Time frame	Light vehicles	Heavy vehicles
Springhill Road	Arterial / sub-arterial – collector roads	Daily	4	44
Five Islands Road		Daily	200	110

Traffic volumes on Springhill Road and Five Islands Road will have to increase by more than 58% to result in an increase of 2 dBA. Mid-block traffic counts for Springhill Road, Five Islands Road and Flinders Street were provided by Transport for NSW (Australian Industrial Energy, 2018) in 2015 as presented in Table 7.10. The traffic generation as a result of the construction works on public roads is considered to be negligible when compared to the existing traffic volumes and as such, the acoustic requirements of the Road Noise Policy (RNP) are anticipated to be met.

Table 7.10 Existing traffic volumes on haulage routes

Road	Section	24 hour volume (bi-directional), 2015
Five Islands Rd	Between Springhill Rd and Flinders St	40,564
Five Islands Rd-	Between Princes Hwy and Glastonbury Ave	21,686
Five Islands Rd	Between Glastonbury Ave and Springhill Rd	23,890
Five Islands Rd	Between King St and Darcy Rd	8,572
Spring Hill Road-	North of Keira St	17,384
Spring Hill Road-	Between Masters Road and Keira St	42,389
Spring Hill Road-	Between Five Islands Road and Masters Rd	50,185

7.5 Construction traffic noise within project site

One of the anticipated construction traffic routes involves use of Emily Road, which at certain points is situated approximately 70 metres from residential receivers. These residential receivers are represented by key receiver RES29. Based on the anticipated construction traffic generation (GHD, 2021), approximately 200 light vehicles and 11 heavy vehicles may use this access road between 5:00 am and 6:00 am, and have the potential to lead to construction related noise impacts. Noise modelling has been conducted along Emily Road to assess noise impacts from construction traffic towards residential receivers; because it falls within the project site boundary and not along a public road, it is assessed against the ICNG NMLs rather than the RNP criteria.

The assumptions and results of the assessment are provided below in Table 7.11. It is predicted that noise from construction traffic along Emily Road is below the NML for residential receivers within NCA02. As such, construction noise impacts from traffic along Emily Road is not anticipated.

Table 7.11 Emily Road construction traffic assessment

Assessed Road	Road speed	Road surface	Construction traffic		Receiver ID	Predicted noise level $L_{Aeq(15min)}$, dBA	NML – night, $L_{Aeq(15min)}$, dBA
			Light vehicles	Heavy vehicles			
Emily Road	40 km/hr	DGA	200	11	RES29 – NCA02	48	48

7.6 Blasting impacts

Monitoring the slag pit skull blasting for airblast overpressure noise and ground vibration occurred at two locations in January 2009 at the base of the 5BF and at the Merrett Avenue office car-park, the nearest BlueScope residential boundary approximately 1.1 kilometres to the southwest. Monitoring occurred for four blasts in January 2009 and no discernible blast events (ground vibration or airblast overpressure) were identified at the Merrett Avenue office car park (representative of the most-affected residences in Cringila). Blasting required for the 6BF will take place approximately 1.1 kilometres away from the nearest residential receivers in Cringila and will use a similar methodology to the blasting at 5BF. Due to the similar distance from the source, no ground vibration or airblast overpressure impacts from blasting are anticipated at any of the nearby residential receivers.

Blast levels measured in the blast furnace basement area during the slag pit skull blasting (near the source) were up to about 3.5 mm/s ground vibration and airblast overpressures of about 130 to 134 dBL. It is difficult to estimate the airblast overpressure levels at the most-affected residences due to the acoustic shielding provided shell of the blast furnace, however it is anticipated airblast overpressure levels will be well below the criteria of 115 dBL given no blast events could be measured at the Merrett Avenue office carpark during the 5BF blasting activities. Similarly, given ground vibration levels were measured to be 3.5 mm/s near the source of the blasting, ground vibration levels are predicted to be well below 5 mm/s when assessed at the nearest residences over 1 km away.

7.7 Operational traffic impacts

The existing traffic along the haulage route would need to increase by approximately 58 % in order for noise levels to increase by 2 dBA. No operational road traffic noise impacts are expected as existing traffic volumes are not anticipated to increase by over 58 % on any public roads as traffic generation is anticipated to be consistent with the existing conditions during operation.

8. Mitigation measures

8.1 Justification for proposed mitigation measures

Mitigation measures for both construction and operational phases of the proposal are primarily focused around mitigation at the source. This is considered the most feasible and reasonable to implement, as any noise reduction at the source would benefit the greatest number of sensitive receivers. Due to the size of the proposal site, mitigation in transmission between the source and the receiver is not considered as feasible (Note should be made that local shielding/barriers close to noise sources is considered reasonable and feasible). Mitigation at the receiver is not required as noise mitigation at the source is considered appropriate to minimise any potential noise impacts during construction or operation.

8.2 Construction mitigation measures

8.2.1 Reasonable and feasible mitigation measures

The ICNG identifies that, due to the nature of construction, it is inevitable that impacts arise where construction occurs near sensitive receivers. During construction there will be noise impacts on some receivers during certain times and during certain construction activities.

Where noise is above the construction noise management levels, all feasible and reasonable work practices to minimise noise will be implemented, and all potentially affected receivers will be informed.

Table 8.1 Reasonable and feasible mitigation measures during the construction phase

Control type	Mitigation measure
At source mitigation measures	
Construction hours and scheduling	Where feasible and reasonable, construction will be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels will be scheduled during less sensitive time periods.
Equipment selection	Quieter and less vibration emitting construction methods will be used where feasible and reasonable.
Plant noise levels	The noise levels of plant and equipment will have an operating sound power lower or similar to the levels presented in Table 3.6 and Table 3.7.
Selection of low-noise attachments for rock breaking equipment	Where rock breaking and impact piling works are required within No2. Works areas 1,2,3 and 6, mitigations measures should be considered, such as: – Low noise attachments for rock breakers – Resilient pad (dolly) between pile and hammerhead for impact piling
Location of plant	As much distance as possible will be placed between the plant or equipment and residences and other sensitive land uses, where possible.
Direction of equipment	Equipment with directional noise characteristics will be oriented away from noise sensitive receivers.
Plan worksites and activities to minimise noise and vibration.	Where additional activities or plant may only result in a marginal noise increase and speed up works, the duration of impact will be limited by concentrating noisy activities at one location and moving to another as quickly as possible.
Reduced equipment power	Only the necessary size and power of equipment will be used.
Minimise disturbance arising from delivery of goods to construction sites.	– Loading and unloading of materials/deliveries will occur as far as practically possible from sensitive receivers.
Engine compression brakes	The use of engine compression brakes will be limited in proximity to residences.
Maintain equipment	Equipment will not be operated until it is maintained or repaired, where maintenance or repair would address the annoying character of noise identified.

Control type	Mitigation measure
Reduce size of vibratory roller or compactor	Limit the size of the vibratory compactor to 18 tonnes to maintain the safe work buffer distances.
Construction traffic within project site	Construction traffic travelling along Emily Road to remain below the speed limit of 40 km/hr.
Scheduling of high-intensity construction activities	The following works should only be undertaken within recommended standard construction hours – Impact piling – Rock breaking
In transmission path mitigation measures	
Utilise acoustic shielding between the source and receiver from buildings / barriers	– Temporary site buildings and materials stockpiles will be used as noise barriers. – Natural landform as noise barrier – fixed equipment will be place in cuttings, or behind earth berms.

8.2.2 Construction noise and vibration management plan (CNVMP)

A construction noise and vibration management plan (CNVMP) will be developed once a detailed construction methodology has been prepared. The construction noise and vibration management plan will include a review of the construction noise predictions during the environmental impact assessment phase based. The plan will be based on the construction method and include a detailed examination of feasible and reasonable work practices and noise mitigation measures to manage sensitive receivers that are predicted to be 'noise affected'. The construction noise and vibration management plan will also include:

- Details of the construction methodology
- Feasible and reasonable mitigation measures to be implemented
- Updated noise predictions at sensitive receivers
- A noise monitoring procedure and program for the duration of works
- A community consultation plan to liaise with the noise affected receivers, including:
  - Notification to residences a minimum of seven calendar days prior to the start of works and should include information such as total building time, what works are expected to be noisy, their duration, what is being done to minimise noise and when respite periods will occur.
  - A procedure for complaints, including maintaining a compliant register on site.

8.2.3 Construction noise monitoring

A noise monitoring procedure and program will be carried out for the duration of construction works in accordance with the construction noise and vibration management plan and any approval or licence conditions. Monitoring reports will be prepared in accordance with the requirements of the noise monitoring procedures.

Details around specific noise monitoring requirements, locations and procedures would be determined once detailed information around construction activities and scheduling is available. Monitoring would look to assess noise from both 'typical' and 'high intensity' construction activities.

8.2.4 Construction management measures

Management measures to reduce potential noise impacts at sensitive receivers will be incorporated into the CNVMP and will include the following as a minimum:

- All employees, contractors and subcontractors are to receive an environmental induction. The site induction must at least include:
  - All project specific and relevant standard noise and vibration mitigation measures.
  - Relevant licence and approval conditions.
  - Permissible hours of work.

    - Any limitations on high noise generating activities.
    - Location of nearest sensitive receivers.
    - Construction employee parking areas.
    - Designated loading/unloading areas and procedures.
    - Site opening/closing times (including deliveries).
    - Environmental incident procedures.
- All rock-breaking and pile driving activities should be confined between the hours: daytime hours of 7:00 am to 6:00 pm from Monday to Friday and 8:00 am to 1:00 pm on Saturday, with the exception of the following activities:
    - The delivery of oversized plant or structures.
    - Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm.
- Works required to be undertaken outside of standard construction hours (ICNG) should be justified in the project CEMP and assessed against the noise requirements of the ICNG.

8.3 Mitigation measures for operation

All conclusions from the operational noise assessment are based on a combination of similar noise sources from 5BF, alongside additional noise measurements where required conducted by GHD in 2021. To check that noise model predictions are representative of 6BF operational noise emission at sensitive receivers, noise validation measurements should be undertaken at an intermediate location in the path between source equipment and Cringila receivers. The location should be selected so that a signal to noise ratio of minimum 10 dB is achieved, with:

- Signal being noise levels from the 6BF operations (6BF, Stockhouse, Slag handling)
- Noise being extraneous noise source not associated with 6BF operations

A proposed noise validation location is provided below in Table 8.2, along with the predicted noise level. This is also graphically provided in Figure 8.1.

Table 8.2 Noise validation location and predicted noise level

Noise validation location coordinates (MGA Z56)		Validation location predicted noise level $L_{Aeq(15min)}$, dBA
x	y	
305837	6184054	56

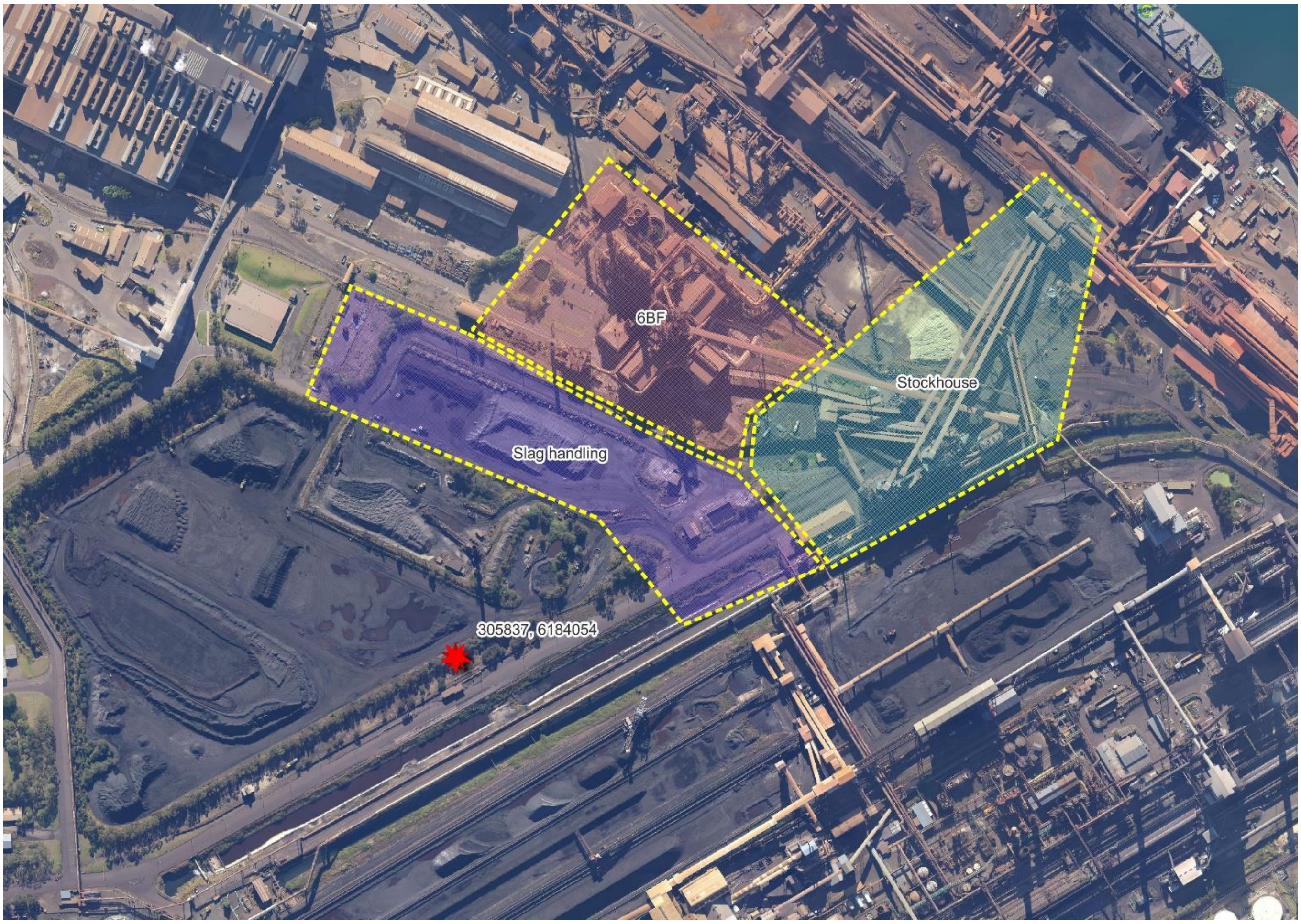

Figure 8.1 *Proposed noise validation measurement location – coordinates MGA94 Z56*

If the results of the noise validation measurements indicated that operational noise levels are above the noise predictions, then mitigation measures for the Stockhouse and Slag handling areas can be considered for noise reduction. These may include:

- Nearfield shielding adjacent to operating noise sources to block line of site to receivers, such as barriers or enclosures.
- Incorporation of measures to reduce knocking or impact noise for vibrofeeders and screens.
- Selection of low noise vehicles alternatives for industrial pot carriers within the Slag handling area.
- Additional noise measurements of operating equipment, and comparison against assumed noise sources provided in Appendix C. The operational noise model may be refined where appropriate.

8.3.1 Furnace top bleeder testing

It is anticipated that $L_{A1(1min)}$ noise levels from the furnace top bleeder testing will reach up to 85 dBA at the nearest residential receivers. As such, notification will be provided to surrounding residences of this testing prior to its commencement. The notification will include details around its anticipated start time and date, duration of noise event, description of the noise, and anticipated noise levels.

8.4 Operational Noise Management Plan (NMP)

An operational noise management plan should be developed to minimise the risk of adverse noise impacts during the operation. It should be refined throughout the design process and have consideration to:

- The relevant licence conditions
- Conditions of approval

- The *Noise Policy for Industry*
- *Australian Standards 1055 Acoustics – Description and measurement of environmental noise*
- *Approved methods for the measurement and analysis of environmental noise in NSW* – currently in draft form
- Conclusions of validation noise monitoring prior to operations commencing

The operational noise management plan should include:

- Operational noise management measures to be implemented
- Updated operational noise predictions at sensitive receivers
- A noise monitoring program
- A complaints handling protocol

Table 8.3 provides draft inclusions for incorporation into the operational noise management plan to minimise the risk of adverse noise impacts at sensitive receivers during the operation.

Table 8.3 Draft operational noise management plan inclusions

Control type	Measure
Operational noise management measures for operators/workers	
Operational noise management measures for operators/workers	– All equipment will be properly maintained in accordance with the manufacturer's specifications. – All equipment will be operated in the appropriate manner. – The use of engine/compression brakes on-site will be minimised. – Dropping and scraping of materials on the ground will be minimised, where practical. – Building openings such as doors or shutters will remain closed when not in use. – All buildings and enclosures will be maintained to preserve their acoustic performance. – All significant items of noisy plant will be designed and tested to meet the required internal or external noise levels to satisfy environmental noise goals. – Where noisy maintenance is required, it will be scheduled to occur during periods when receivers are less sensitive, such as during the daytime.
Noise monitoring program	
Noise complaint records	In the event of a noise complaint received from the community, the complaint will be promptly investigated and resolved.
Noise monitoring qualifications	All attended noise monitoring will be carried out by a suitably qualified noise specialist. Records of routine equipment calibration and testing will be maintained by the qualified noise specialist undertaking the monitoring.
Frequency of noise monitoring	Noise monitoring will be carried out during the first year of operation, to confirm compliance and verify noise emissions. On completion of this year, the frequency of noise monitoring will be reviewed.

9. Evaluation and conclusion

This noise and vibration impact assessment report has been prepared on behalf of BlueScope for the project to support the EIS and responds to the SEARs for noise and vibration. It describes the existing ambient and background noise and vibration and assesses the potential noise impacts associated with the construction and operational phases of the proposal and the increases in noise along the local transport network (during construction and operation) with respect to the following guidelines:

- Operational phase - Noise Policy for Industry (NPfI) (EPA, 2017)).
- Construction phase - Interim Construction Noise Guideline (ICNG) (DECC, 2009). The Draft Construction Noise Guideline (DCNG) (EPA, 2021) has also been considered for general guidance only.
- Road transport network - Road Noise Policy (DECCW, 2011).
- Vibration – Assessing Vibration: A Technical Guideline (DEC, 2006) and BS 7385-2:1993 Evaluation and measurement for vibration in buildings Part 2 – Guide to damage (British Standards, 1993).
- Blasting - Technical Basis for Guidelines to Minimise Annoyance due to blasting overpressure and ground vibration (ANZEC, 1990).

Recommended mitigation and management measures were identified in response to the impact assessment findings.

9.1 Impacts from the proposal during operation

An assessment of operational noise from the proposal has been undertaken to predict noise levels at noise sensitive receivers. Operational noise criteria has been proposed for residential receivers based on a review of the existing Environment Protection License (EPL) 6092 for the 5BF, and guidance from the NSW EPA *Noise Policy for Industry* (NPfI) (NSW EPA, 2017). Operational noise criteria for non-residential receivers has been provided from NPfI.

An operational noise model has been prepared to predict operational noise levels at noise sensitive receivers. Predictions show that compliance with the proposed operational noise criteria is achieved at all noise sensitive receivers, based on the operation of equipment considered part of typical operations. An acoustic intensity breakdown of received noise levels indicate that noise emission from the Slag handling and Stockhouse operational source group areas comprise over half of the received acoustic energy from the site.

The operational noise criteria used in the assessment is based on the NPfI discrete process criteria, which aims to ensure that noise emission from the proposal does not contribute to the existing total industrial noise level at the most affected receivers. As compliance is achieved, no cumulative noise impacts are anticipated considering the existing industrial noise in the area are anticipated.

To ensure that noise predictions are representative of operational noise levels from the proposals, noise validation measurements should be undertaken prior to operations commencing. Based on the results of this, the noise model and assumptions may be refined, and operational mitigation measures can be incorporated where appropriate. This may include:

- Nearfield source shielding, such as barriers and enclosures.
- Impact noise mitigation devices.

Sleep disturbance impacts have been assessed against the sleep disturbance screening criterion provided in the NPfI. Operational activities with the potential for short-duration $L_{A1(1min)}$ noise events have been identified, and predictions have been made to residential receivers. It is predicted that $L_{A1(1min)}$ noise levels are below the screening criterion, and as such no sleep disturbance noise impacts are anticipated from the proposal.

9.2 Impacts from the proposal during construction

Construction noise levels have been predicted to the sensitive receivers within the study area with consideration to the acoustic requirements of the *Interim Construction Noise Guideline* (DECCW, 2011). Construction scenarios have been prepared to assess construction noise from laydown area operations, and 6BF construction activities.

It is predicted that construction noise levels from almost all laydown area operations and construction area activities are below the NMLs for all sensitive receivers, for works both within and outside standard construction hours. Exceedances of the NMLs are predicted during high intensity 6BF construction activities outside of standard construction hours. These exceedances are triggered from the use of high noise generating equipment such as impact piles and rock breakers, and will occur for a short duration at the commencement of construction activities. It is planned that they only take place within standard construction hours. At source mitigation treatments may also be considered such as:

– Low noise attachments for rock breakers.
– Resilient pad (dolly) between pile and hammerhead for impact piling.

There is the potential for construction of these projects to occur concurrently which may lead to cumulative construction noise impacts. Based on predicted construction noise levels, potential cumulative construction noise impacts would only be anticipated during high intensity 6BF construction activities, however this is only considered minor. Noise emission from all other construction activities is predicted to be significantly below the NMLs at the nearest residential receivers, which makes up the majority of construction activities for the proposal.

An assessment of construction vibration has been undertaken against criteria from *Assessing Vibration: A Technical Guideline* (DEC, 2006) for structural damage, and *BS6472: Guide to Evaluation of Human Exposure to Vibration in Buildings* (1 Hz to 80 Hz) (British Standards, 2008) for human comfort impacts. It is anticipated that short term human comfort impacts may be experienced for residences close to site preparation works in the No.1 Works laydown area during the use of an 18T vibratory roller. These impacts will be limited to the duration of the these works, which are anticipated to only occur for a short duration at the commencement of construction activities. It is based on a highly conservative approximation of the potential works, since at this stage it is not certain whether the roller is required, or for what duration.

Monitoring occurred for four blasts in January 2009 as part of previous reline works. It concluded no discernible blast events (ground vibration or airblast overpressure) were identified at monitoring undertaken 1.1 kilometres to the southwest. Similarly blasting required for the 6BF will take place approximately 1.1 kilometres away from the nearest residential receivers in Cringila and will use a similar methodology to the blasting at 5BF. Due to the similar distance from the source, no ground vibration or airblast overpressure impacts from blasting are anticipated at any of the nearby residential receivers.

Construction traffic noise levels on public roads are predicted to comply with the road traffic noise assessment criteria at the nearest residential receiver to the road and no construction traffic impacts are expected. Construction traffic along internal private roads near sensitive receivers is also predicted to comply with construction NMLs for the site.

10. References

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Appendices

Appendix A

Acoustic concepts and terminology

Acoustic concepts and terminology

Definition of ‘noise’

Sound may be defined as any pressure variation that the human ear can detect. The terms “sound” and “noise” are more or less interchangeable however, “noise” is generally often referred to as unwanted sound.

Factors that contribute the environmental noise

Noise from an activity such as construction noise or noise during the operation of a facility at a given receiver location can be affected by a number of different factors, including:

- How loud the source activity is and the type of source:
  - Point (for e.g. a pump or motor)
  - Line (for e.g. a road or railway line)
  - Area (for e.g. the external façades of an industrial building)
- The distance from the source to receiver
- The type of ground between the sound and receiver locations (e.g. hard surfaces or porous ground)
- The ground topography between the source and the receiver. For e.g. is it flat or hilly? Blocking the line of sight will generally reduce the noise level for the receiver
- Obstacles that may block the line of sight between the source and the receiver. For e.g. buildings or noise walls
- Atmospheric absorption (dependent on humidity and temperature)
- Meteorological conditions that may increase or reduce environmental sound propagation (for e.g. wind direction or temperature inversions)

Noise measurements

Noise is generally measured using a specially designed ‘sound level meter’ (SLM) and must meet internationally recognized performance standards. To avoid expressing sound or noise in terms of Pa, which could involve some unmanageable numbers, the logarithmic decibel or dB scale is used. The scale uses the hearing threshold of 20 μPa or 20×10^{-6} Pa as the reference level and is defined as 0 dB.

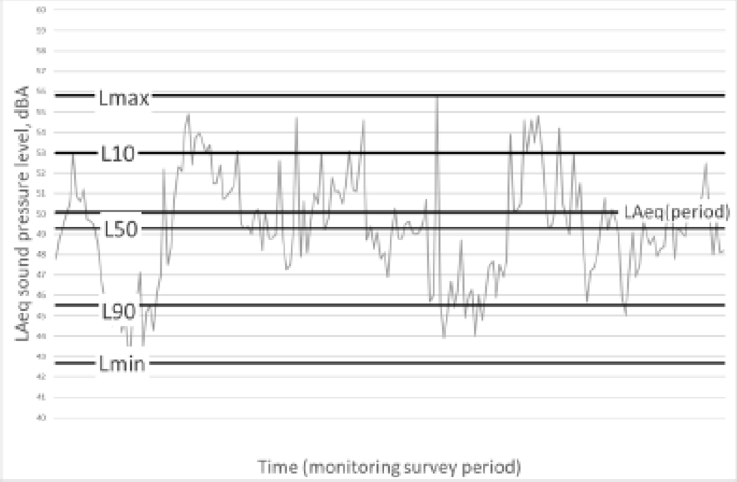
Typical noise levels

The table below presents typical noise sources for each various sound pressure levels and a corresponding subjective noise level description.

Subjective level	Sound pressure level (dBA)	Typical sources
Silent	0	Threshold of hearing
Almost silent	20	Recording studio
Quiet	30	Bedroom
	40	Private office
Moderate	50	General office
	60	Department store
Loud	70	Loud television
	80	Kerb side of busy street
Very loud	90	Construction site
	100	Loud car horn (3 m away)
Extremely loud	110	Grinding on steel
	120	Heavy rock concert
Intolerable	130	Threshold for pain

Typical noise descriptors

Noise is represented by the descriptor L_{AN}, representing a statistical sound measurement recorded on the 'A' weighted scale. A typical noise monitoring chart is shown in the graph below along with the noise descriptors.



Where:

- L_{Amax}: The maximum sound level recorded during the measurement period.
- L_{Amin}: The minimum sound level recorded during the measurement period.
- $L_{A10(period)}$: The A-weighted sound pressure level that is exceeded for 10% of the measurement period.
- $L_{Aeq(period)}$: Equivalent sound pressure leve, the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
- $L_{A90(period)}$: The A-weighted sound pressure level that is exceeded for 90% of the time over which a given sound is measured. This is considered to represent the background noise e.g. $L_{A90(15min)}$.

Changes in noise levels

The table below presents a qualitative description of average human responses to changes in noise levels.

Difference	Human response
Difference of 2 dBA	Generally imperceptible by the human ear
Difference of 5 dBA	Considered significant
Difference of 10 dBA	Perceived as a doubling (or halving) of the noise source
Addition of two identical noise levels	Increase levels by 3 dBA
Addition of second noise level of similar character	If the secondary noise level is a minimum 8 dBA below the primary noise level, the noise level will not significantly increase
Doubling of distance between source and receiver	Results in a 3 dBA decrease for a line source and 6 dBA for a point source
A doubling of traffic volume	Results in a 3 dBA increase in noise

Audibility of noise

The table below presents quantitative guidance and qualitative descriptions regarding the audibility of noise.

Audibility	Description
Inaudible	Noise source cannot be heard. The noise level is generally less than the background noise level, potentially by more than 10 dBA or greater
Barely audible	Characteristics of the noise is difficult to define or masked by extraneous noise. The noise level is generally 5-7 dBA below the background noise or ambient noise level, depending on the nature of the noise e.g. constant or intermittent
Just audible	Characteristics of the noise can be defined but extraneous noise sources are also contributing to the received noise. The noise level is typically below the background and ambient noise level.
Audible	Characteristics of the noise can be easily defined. The noise level may be at the level of the background noise and above.
Dominant	The noise source is significantly 'louder' than all other noise sources. The noise level will likely be significantly greater than the background noise level.

Types of noise sources

The table below offers a qualitative description of various noise types and provides the noise descriptor that is typically used to measure the type of noise.

Duration of the noise	**Description**
Continuous noise	Continuous noise is produced by equipment or activities that operates without interruption in the same mode, for e.g. blowers, pumps and processing equipment. Measuring for just a few minutes with hand-held equipment is sufficient to determine the noise level. If tones or low frequencies are heard, the frequency spectrum can be measured for documentation and further analysis. Continuous noise sources are generally captured by the L_{90} noise descriptor.
Intermittent noise	Intermittent noise is a noise level that increases and decreases rapidly. This might be caused by a train passing by, factory equipment that operates in cycles, or aircraft flying above. Intermittent noise is measured in a similar way to continuous noise, with a sound level meter. The duration of each occurrence and the time between each event is important to note. To gain a more reliable estimate of the noise level, multiple occurrences of the noise source is measured to gain a reliable estimate. Intermittent noise sources are generally captured by the L_{eq} noise descriptor.
Impulsive noise	The noise from impacts or explosions, for e.g. from a pile driver, punch press or gunshot, is called impulsive noise. It is brief and abrupt, and its startling effect causes greater annoyance than would be expected from a simple measurement of sound pressure level. To quantify the impulsiveness of noise, the difference between a quickly responding and a slowly responding parameter can be used. Impulsive noise sources are generally captured by the L_{max} or L_{peak} noise descriptor.
Frequency content	Description
Low frequency	Noise containing major components in the low-frequency range (10 hertz [Hz] to 160 Hz) of the frequency spectrum
Tonal noise	Tonal noise contains one or more prominent tones (i.e. distinct frequency components), and is normally regarded as more offensive than 'broad band' noise
Defining characteristic	Description
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Subject noise	The noise in question removed from any extraneous noise in the area
Offensive noise	The definition of offensive noise in the POEO Act is noise: (a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances: (i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or (ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or (b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations.

Frequency analysis

Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers. The units for frequency are Hertz (Hz), which represent the number of cycles per second. Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

Vibration

Definition of 'vibration'

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity.

Vibration descriptors

These may be expressed in terms of 'peak' velocity or 'rms' velocity. The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period. Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) and transverse. The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/Vo), where Vo is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used by some organisations.

Types of vibration

Vibration in buildings can be caused by many different external sources, including industrial, construction and transportation activities. The vibration may be continuous (with magnitudes varying or remaining constant with time), impulsive (such as in shocks) or intermittent (with the magnitude of each event being either constant or varying with time). A description of each vibration type including examples are presented in the table below.

Vibration type	Description	Examples
Continuous vibration	Vibration continues uninterrupted for a defined period (usually throughout daytime and/or night-time). This type of vibration is assessed on the basis of weighted rms acceleration values	Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery)
Impulsive vibration	A vibration source (continuous or intermittent) which has a rapid build up to a peak followed by a damped decay that may or may not involve several cycles of vibration (depending on frequency and damping). This type of vibration is assessed on the basis of weighted rms acceleration values	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.
Intermittent vibration	Interrupted periods of continuous (for e.g. a drill) or repeated periods of impulsive vibration (for e.g. a pile driver), or continuous vibration that varies significantly in magnitude. This type of vibration is assessed on the basis of vibration dose values	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer this would be assessed against impulsive vibration criteria

How humans perceive vibration

People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

Typical vibration levels

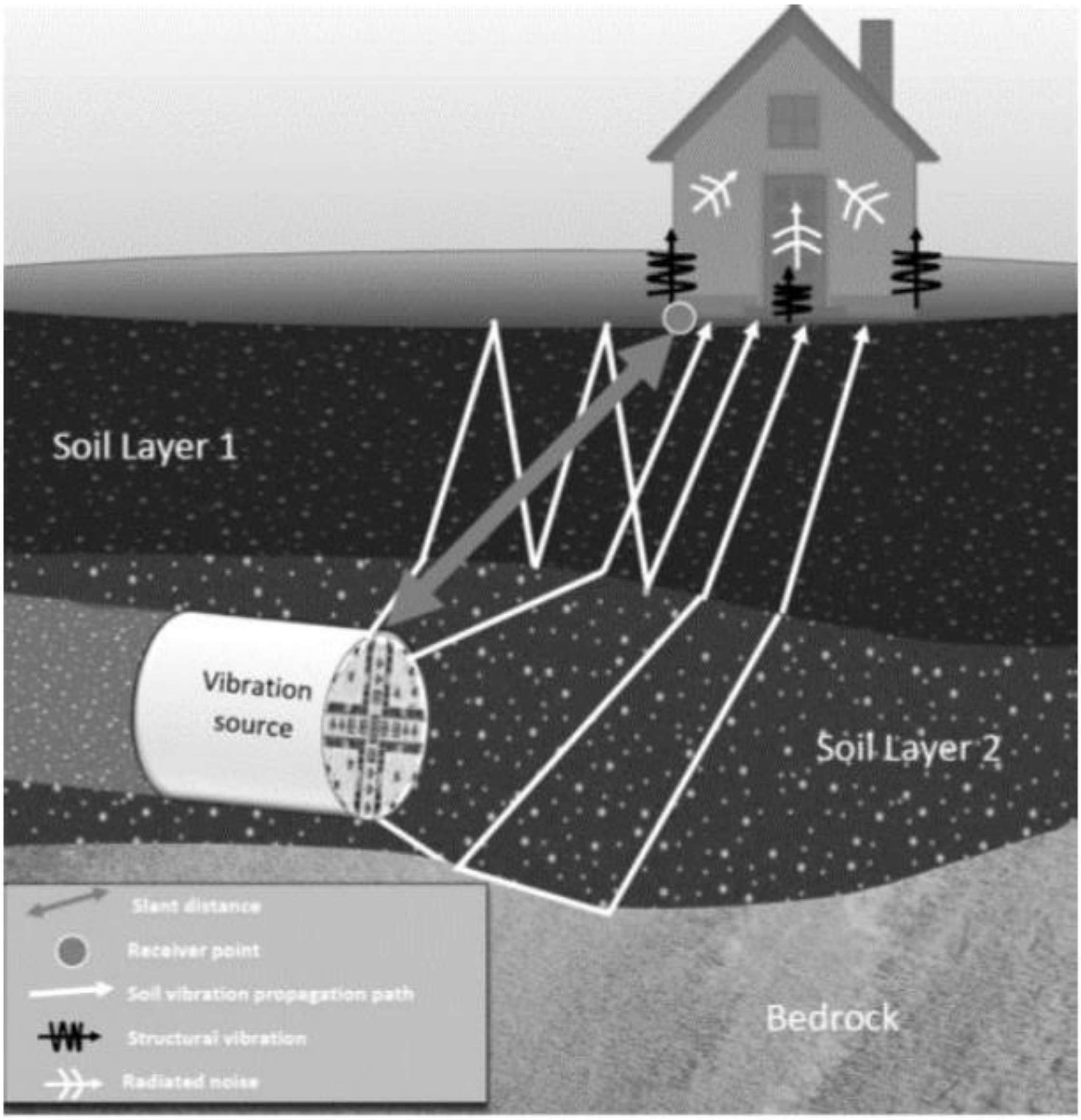
Typical ground vibration from civil construction activities occurs in the frequency range of approximately 8 Hz to 100 Hz. Within this frequency range, building contents such as blinds and pictures would commence visible movement at 0.5 mm/s. At vibration levels higher than 0.9 mm/s, rattling of windows, crockery or loose objects would be audible and annoying.

Velocity level (mm/s)	Typical source	Response
0.01	Typical background vibration level	Scanning electron microscopes to 50000 x amplification
0.03		500x amplification bench microscopes
0.1	Average passenger train vibration	Approximate threshold for human perception of vibration
0.3	Average freight train vibration Max passenger train vibration	Approx. residential annoyance for train passbys
1	Large rock breaker	Vibration level that will generally result in complaints
3	Blasting/ Impact pile driving	Threshold for minor cosmetic damage

Ground-borne noise and vibration

Noise that propagates through a structure as vibration and is radiated by vibrating wall, ceiling and floor surfaces is termed “ground-borne noise”, “regenerated noise”, or sometimes “structure borne noise”. Ground-borne noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air. Typical sources of ground-borne noise include tunnelling construction works or underground railway operations.

The figure below presents the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities that occur below the ground level (for e.g. a tunnel boring machine).



Acronyms and abbreviations

Term	Definition
AWS	Automatic Weather Station
BOM	Bureau of Meteorology
dB	Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics.
dBA	Decibel expressed with the frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at low and high frequencies.
dBZ or dBL	The unit used to measure 'Z-weighted' sound pressure levels with no weighting applied, linear.
CEMP	Construction Environmental Management Plan
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
EPA	Environmental Protection Authority
ICNG	*Interim Construction Noise Guideline* (DECC, 2009).
NPfI	*Noise Policy for Industry* (EPA, 2017).
$L_{Aeq(period)}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
$L_{A10(period)}$	The noise level exceeded for 10 per cent of the time and is approximately the average of the maximum noise levels.
$L_{A90(period)}$	The sound pressure level that is exceeded for 90% of the measurement period.
L_{Amax}	The absolute maximum noise level in a noise sample
NSW	New South Wales
OOHW	Out-of-hours Works
PPV	Peak particle velocity is the maximum vector sum of three orthogonal time-synchronized velocity components regardless of whether these component maxima occurred simultaneously.
RBL	Rating Background Level . The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period.
rms	Root Mean Square Amplitude (rms) is the square root of the average of the squared values of the waveform. In the case of the sine wave, the RMS value is 0.707 times the peak value, but this is only true in the case of the sine wave.
RNP	*Road Noise Policy* (DECCW, 2011).
SEARs	Secretary's Environmental Assessment Requirements
SPL	Sound Pressure Level
SWL	Sound Power Level
SWRO	Seawater Reverse Osmosis
Rw	Weighted Sound Reduction Index which provides a single-number quantity which characterises the airborne sound insulation of a material or building element over a range of frequencies
TBM	Tunnel Boring Machine
VDV	Vibration dose value - As defined in BS6472 – 2008, VDV is given by the fourth root of the integral of the fourth power of the frequency weighted acceleration.
WFP	Water Filtration Plant

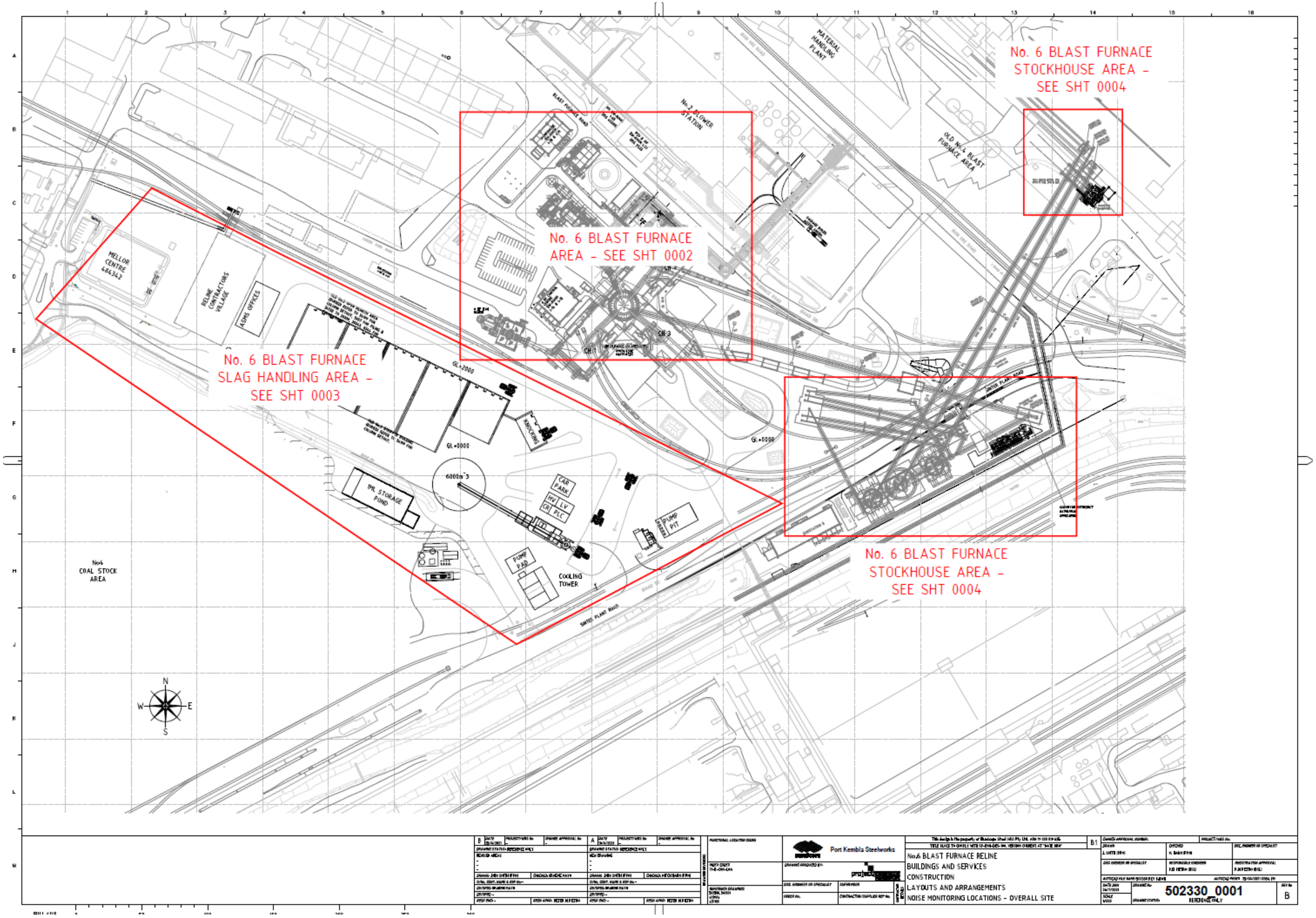
Common Terms

Term	Definition
A weighting	The human ear responds more to frequencies between 500 Hz and 8 kHz and is less sensitive to very low-pitch or high-pitch noises. The frequency weightings used in sound level measurements are often related to the response of the human ear to ensure that the meter better responds to what you actually hear
Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far. This is described using the Leq descriptor
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the L90 descriptor
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Determining authority	Defined by Section 110 of the *Environmental Planning and Assessment Act 1979* as 'a Minister or public authority and, in relation to any activity, means the Minister or public authority by or on whose behalf the activity is or is to be carried out or any Minister or public authority whose approval is required in order to enable the activity to be carried out.'
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous
EIS	Environmental Impact Assessment
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build. reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors: - Noise mitigation benefits (amount of noise reduction provided, number of people protected); Cost of mitigation (cost of mitigation versus benefit provided); Community views (aesthetic impacts and community wishes); Noise levels for affected land uses (existing and future levels, and changes in noise levels)
Ground-borne noise	Noise heard within a building that is generated by vibration transmitted through the ground into the structure from construction works, sometimes referred to as 'regenerated noise' or 'structure-borne noise'. Ground-borne noise can be more noticeable than airborne noise for underground works such as tunnelling. The ground-borne noise levels are only applicable when ground-borne noise levels are higher than airborne noise levels.
Ground-borne vibration	Vibration transmitted from a source to a receptor via the ground
Hertz	The measure of frequency of sound wave oscillations per second. 1 oscillation per second equals 1 hertz.
Masking	The phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street.
Maximum noise event	The loudest event or events within a given period of time. This is generally described using the L_{max} descriptor
Meteorological conditions	Wind and temperature inversion conditions
Most-affected location	Location(s) that experience (or will likely experience) the greatest noise impact from the construction works under consideration. In determining these locations, existing background noise levels, noise source location(s), distance and any shielding between the construction works (or proposed works) and the residences and other sensitive land uses need to be considered.

Term	Definition
Noise management level	The Noise Management Level (NML) as defined as the EPA's ICNG. To be measured and assessed at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the residential property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most affected point within 30 m of the residence.
Noise sensitive receiver	An area or place potentially affected by noise which includes: a residential dwelling an educational institution, library, childcare centre or kindergarten a hospital, surgery or other medical institution an active (e.g. sports field, golf course) or passive (e.g. national park) recreational area commercial or industrial premises a place of worship.
Non-compliance	Development is deemed to be in non-compliance with its noise consent/ licence conditions if the monitored noise levels exceed its statutory noise limit (exceptions may be given if the noise level exceeds by less than 2 dB)
Octave	A division of the frequency range into bands, the upper frequency limit
Project noise trigger level	Target noise levels for a particular noise generating facility. They are based on the most stringent of the intrusive criteria or amenity criteria. Which of the two criteria is the most stringent is determined by measuring the level and nature of existing noise in the area surrounding the actual or propose noise generating facility.
Proposal	The construction and operation of the SWRO site, the modifications to the Illawarra WFP site and associated infrastructure including the power route, the delivery pipeline, the se and the intake and outlet tunnels.
proposal site	The immediate location of the proposal, which is the area that has the potential to be directly disturbed by construction and operation.
Resonance	Resonance describes the phenomenon of increased amplitude that occurs when the frequency of a periodically applied force is equal or close to a natural frequency of the system on which it acts.
Study area	Land in the vicinity of, and including, the proposal site. The 'study area' is the wider area surrounding the proposal site.
Temperature inversion	An atmospheric condition in which temperature increases with height above the ground.
Third-octave	Single octave bands divided into three parts.

Appendix B

Operational noise sources general arrangement


No. 6 BLAST FURNACE STOCKHOUSE AREA – SEE SHT 0004
No. 6 BLAST FURNACE AREA – SEE SHT 0002
No. 6 BLAST FURNACE SLAG HANDLING AREA – SEE SHT 0003
No. 6 BLAST FURNACE STOCKHOUSE AREA – SEE SHT 0004
MATERIAL HANDLING PLANT
No.2 BLOWER STATION
OLD No.6 BLAST FURNACE AREA
MELLOR CENTRE
RELINE CONTRACTORS VILLAGE
ASMS OFFICES
GL+2000
GL+0000
6000m^3
SML STORAGE POND
CAR PARK
HV LV
CR PLC
PUMP PIT
PUMP PAD
COOLING TOWER
SINTER PLANT ROAD
CH 1
CH 3
No4 COAL STOCK AREA
N
S
E
W
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No.6 BLAST FURNACE RELINE
BUILDINGS AND SERVICES
CONSTRUCTION
LAYOUTS AND ARRANGEMENTS
NOISE MONITORING LOCATIONS – OVERALL SITE
B1
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REFERENCE ONLY
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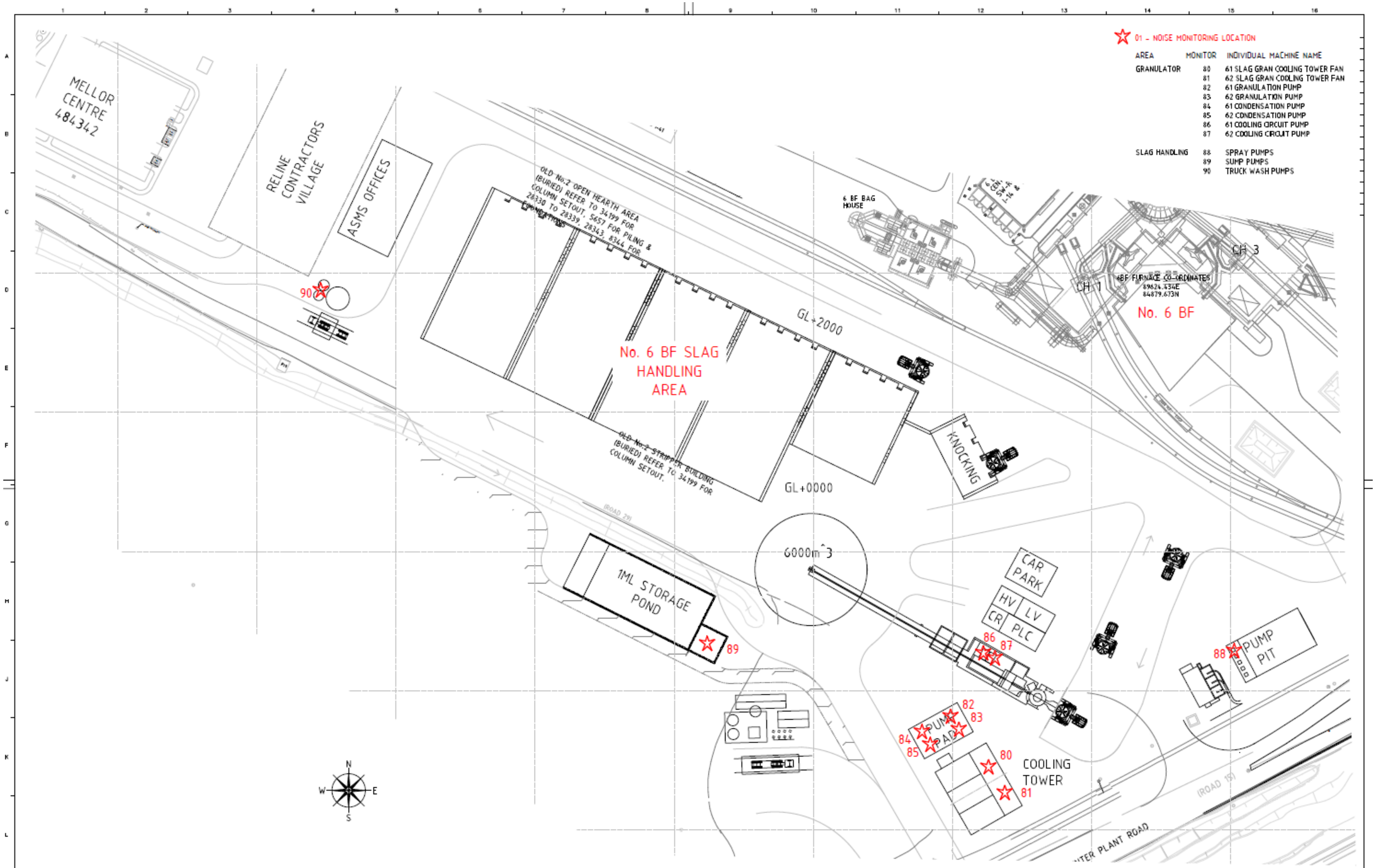

☆ 01 – NOISE MONITORING LOCATION

AREA	MONITOR	INDIVIDUAL MACHINE NAME
GRANULATOR	80	61 SLAG GRAN COOLING TOWER FAN
	81	62 SLAG GRAN COOLING TOWER FAN
	82	61 GRANULATION PUMP
	83	62 GRANULATION PUMP
	84	61 CONDENSATION PUMP
	85	62 CONDENSATION PUMP
	86	61 COOLING CIRCUIT PUMP
	87	62 COOLING CIRCUIT PUMP
SLAG HANDLING	88	SPRAY PUMPS
	89	SUMP PUMPS
	90	TRUCK WASH PUMPS

A

DRAWING STATUS: PROPOSAL ONLY

NEW DRAWING

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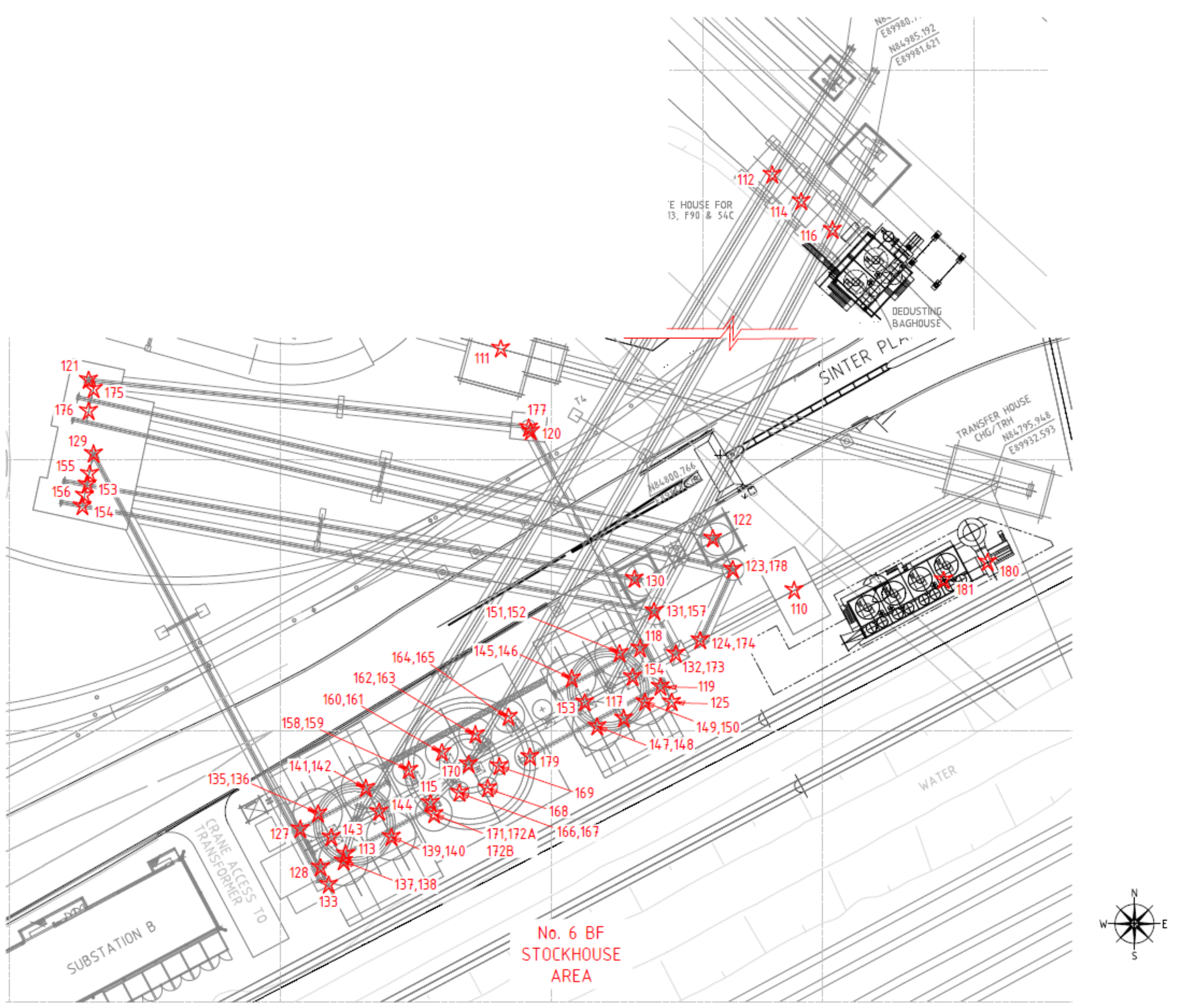
CONSTRUCTION
LAYOUTS AND ARRANGEMENTS
NOISE MONITORING LOCATIONS – SLAG HANDLING AREA

B1

DRAWING No. 502330_0003
REFERENCE ONLY

REV No. A



☆ 01 - NOISE MONITORING LOCATION

AREA	MONITOR	INDIVIDUAL MACHINE NAME
STOCKHOUSE	110	CS1 CONVEYOR DRIVES × 2
	111	CS2 CONVEYOR DRIVES × 4
	112	S13 CONVEYOR DRIVE
	113	S14 CONVEYOR DRIVE
	114	F90 CONVEYOR DRIVE
	115	F91 CONVEYOR DRIVE
	116	54C CONVEYOR DRIVE
	117	55C CONVEYOR DRIVE
	118	SC1 CONVEYOR DRIVE
	119	SC2 CONVEYOR DRIVE
	120	SC3 CONVEYOR DRIVE
	121	SC4 CONVEYOR DRIVE
	122	SC5 CONVEYOR DRIVE
	123	SC6 CONVEYOR DRIVE
	124	SC7 CONVEYOR DRIVE
	125	SC8 CONVEYOR DRIVE
	126	-
	127	SS1 CONVEYOR DRIVE
	128	SS2 CONVEYOR DRIVE
	129	SS3 CONVEYOR DRIVE
	130	SS4 CONVEYOR DRIVE
	131	SS5 CONVEYOR DRIVE
	132	SS6 CONVEYOR DRIVE
	133	SS7 CONVEYOR DRIVE
	134	-
	135	SNT-B01-VBFDR
	136	SNT-S01-SCREEN
	137	SNT-B02-VBFDR
	138	SNT-S02-SCREEN
	139	SNT-B03-VBFDR
	140	SNT-S03-SCREEN
	141	SNT-B04-VBFDR
	142	SNT-S04-SCREEN
	143	SNT-W01-VBFDR
	144	SNT-W02-VBFDR
	145	COK-B01-VBFDR
	146	COK-S01-Screen
	147	COK-B02-VBFDR
	148	COK-S02-Screen
	149	COK-B03-VBFDR
	150	COK-S03-Screen
	151	COK-B04-VBFDR
	152	COK-S04-Screen
	153	-
	154	-
	155	SST-S01-Screen
	156	SST-S02-Screen
	157	SST-BSL-VBFDR
	158	FER-B01-VBFDR
	159	FER-W01-VBFDR
	160	FER-B02-VBFDR
	161	FER-W02-VBFDR
	162	FER-B03-VBFDR
	163	FER-W03-VBFDR
	164	FER-B04-VBFDR
	165	FER-W04-VBFDR
	166	FLX-B01-VBFDR
	167	FLX-W01-VBFDR
	168	FLX-B02-VBFDR
	169	FLX-B03-VBFDR
	170	FLX-W02-VBFDR
	171	SST-BSB-VBFDR
	172A	Recycles Surge Bin Vibro Feeder
	172B	Recycles Surge Bin Weigh Feeder
	173	SST-WHP-VBFDR
	174	SCK-WHP-VBFDR
	175	SCK-S01-Screen
	176	SCK-S02-Screen
	177	SCK-HSG-VBFDR
	178	SCK-BSL-VBFDR
	179	SCK-BNT-VBFDR
	180	61 STOCKHOUSE FAN
	181	BAGHOUSE BLOWERS

B DRAWING STATUS: REFERENCE ONLY
ADDED LOCATIONS

A DRAWING STATUS: PROPOSAL ONLY
NEW DRAWING

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No.6 BLAST FURNACE RELINE
BUILDINGS AND SERVICES
CONSTRUCTION
LAYOUTS AND ARRANGEMENTS
NOISE MONITORING LOCATIONS - STOCKHOUSE AREA

B1

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REFERENCE ONLY
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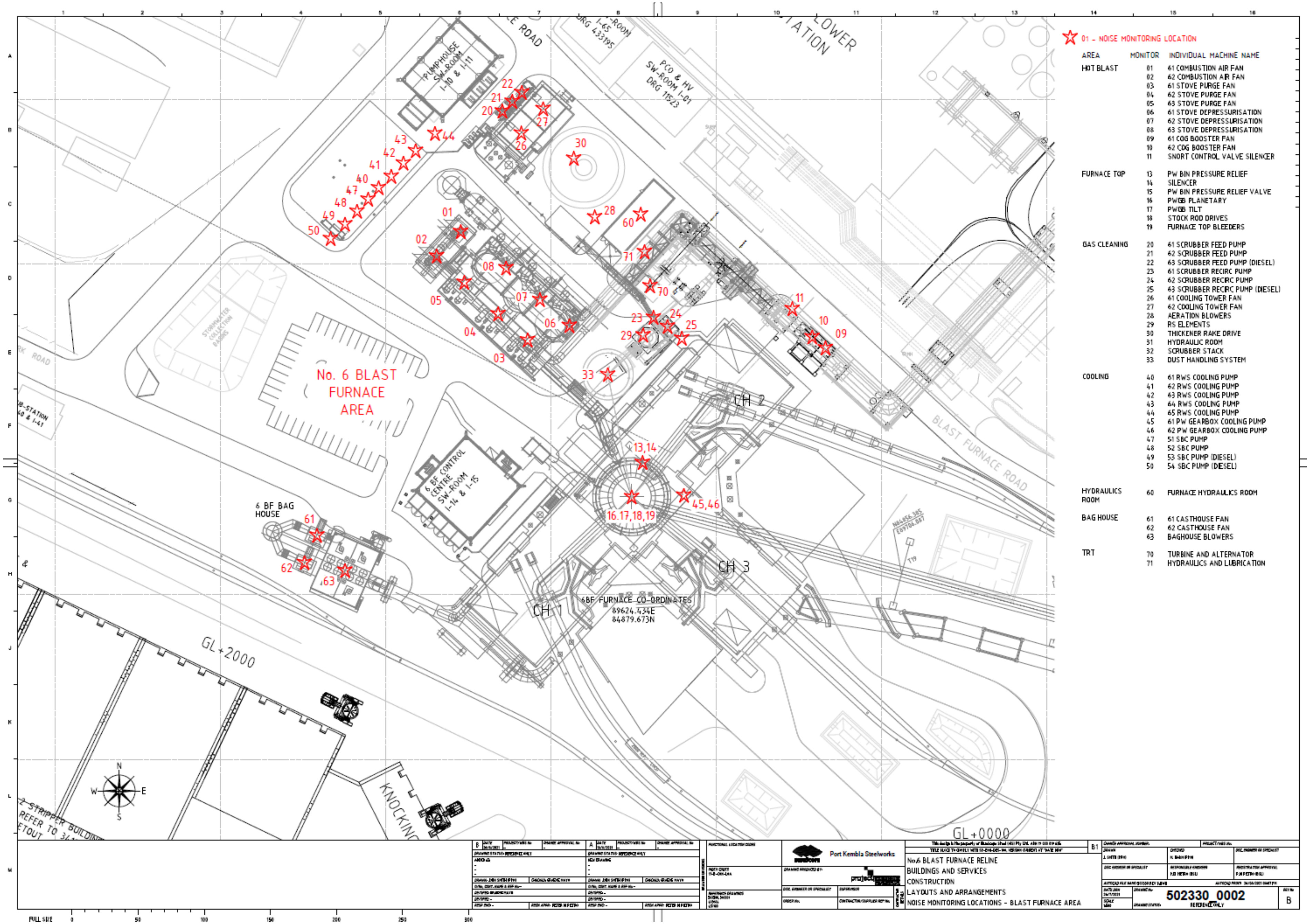

01 – NOISE MONITORING LOCATION

AREA	MONITOR	INDIVIDUAL MACHINE NAME
HOT BLAST	01	61 COMBUSTION AIR FAN
	02	62 COMBUSTION AIR FAN
	03	61 STOVE PURGE FAN
	04	62 STOVE PURGE FAN
	05	63 STOVE PURGE FAN
	06	61 STOVE DEPRESSURISATION
	07	62 STOVE DEPRESSURISATION
	08	63 STOVE DEPRESSURISATION
	09	61 COG BOOSTER FAN
	10	62 COG BOOSTER FAN
	11	SNORT CONTROL VALVE SILENCER
FURNACE TOP	13	PW BIN PRESSURE RELIEF
	14	SILENCER
	15	PW BIN PRESSURE RELIEF VALVE
	16	PWGB PLANETARY
	17	PWGB TILT
	18	STOCK ROD DRIVES
	19	FURNACE TOP BLEEDERS
GAS CLEANING	20	61 SCRUBBER FEED PUMP
	21	62 SCRUBBER FEED PUMP
	22	63 SCRUBBER FEED PUMP (DIESEL)
	23	61 SCRUBBER RECIRC PUMP
	24	62 SCRUBBER RECIRC PUMP
	25	63 SCRUBBER RECIRC PUMP (DIESEL)
	26	61 COOLING TOWER FAN
	27	62 COOLING TOWER FAN
	28	AERATION BLOWERS
	29	RS ELEMENTS
	30	THICKENER RAKE DRIVE
	31	HYDRAULIC ROOM
	32	SCRUBBER STACK
	33	DUST HANDLING SYSTEM
COOLING	40	61 RWS COOLING PUMP
	41	62 RWS COOLING PUMP
	42	63 RWS COOLING PUMP
	43	64 RWS COOLING PUMP
	44	65 RWS COOLING PUMP
	45	61 PW GEARBOX COOLING PUMP
	46	62 PW GEARBOX COOLING PUMP
	47	51 SBC PUMP
	48	52 SBC PUMP
	49	53 SBC PUMP (DIESEL)
	50	54 SBC PUMP (DIESEL)
HYDRAULICS ROOM	60	FURNACE HYDRAULICS ROOM
BAG HOUSE	61	61 CASTHOUSE FAN
	62	62 CASTHOUSE FAN
	63	BAGHOUSE BLOWERS
TRT	70	TURBINE AND ALTERNATOR
	71	HYDRAULICS AND LUBRICATION

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No.6 BLAST FURNACE RELINE
BUILDINGS AND SERVICES
CONSTRUCTION
LAYOUTS AND ARRANGEMENTS
NOISE MONITORING LOCATIONS – BLAST FURNACE AREA

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REFERENCE ONLY
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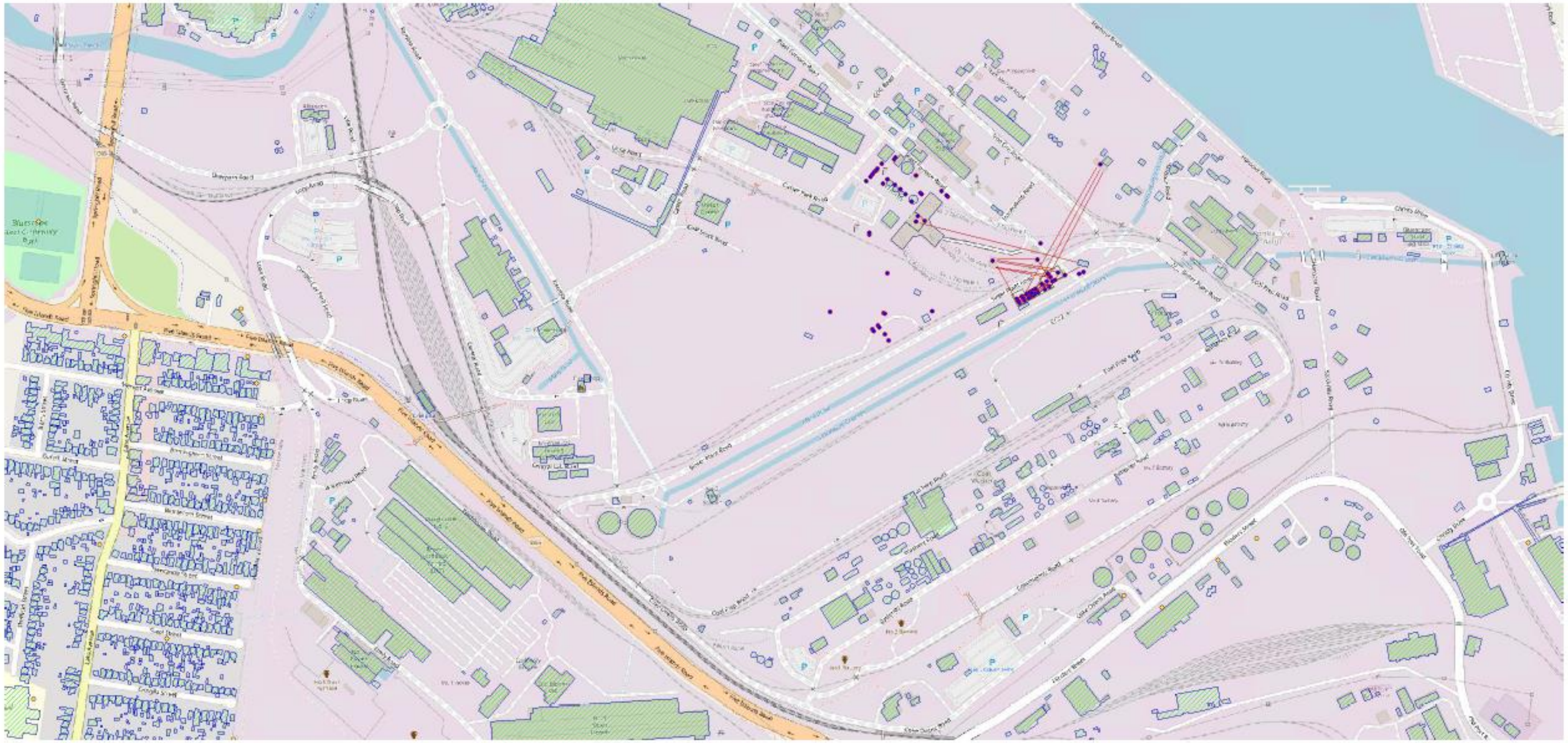
Appendix C

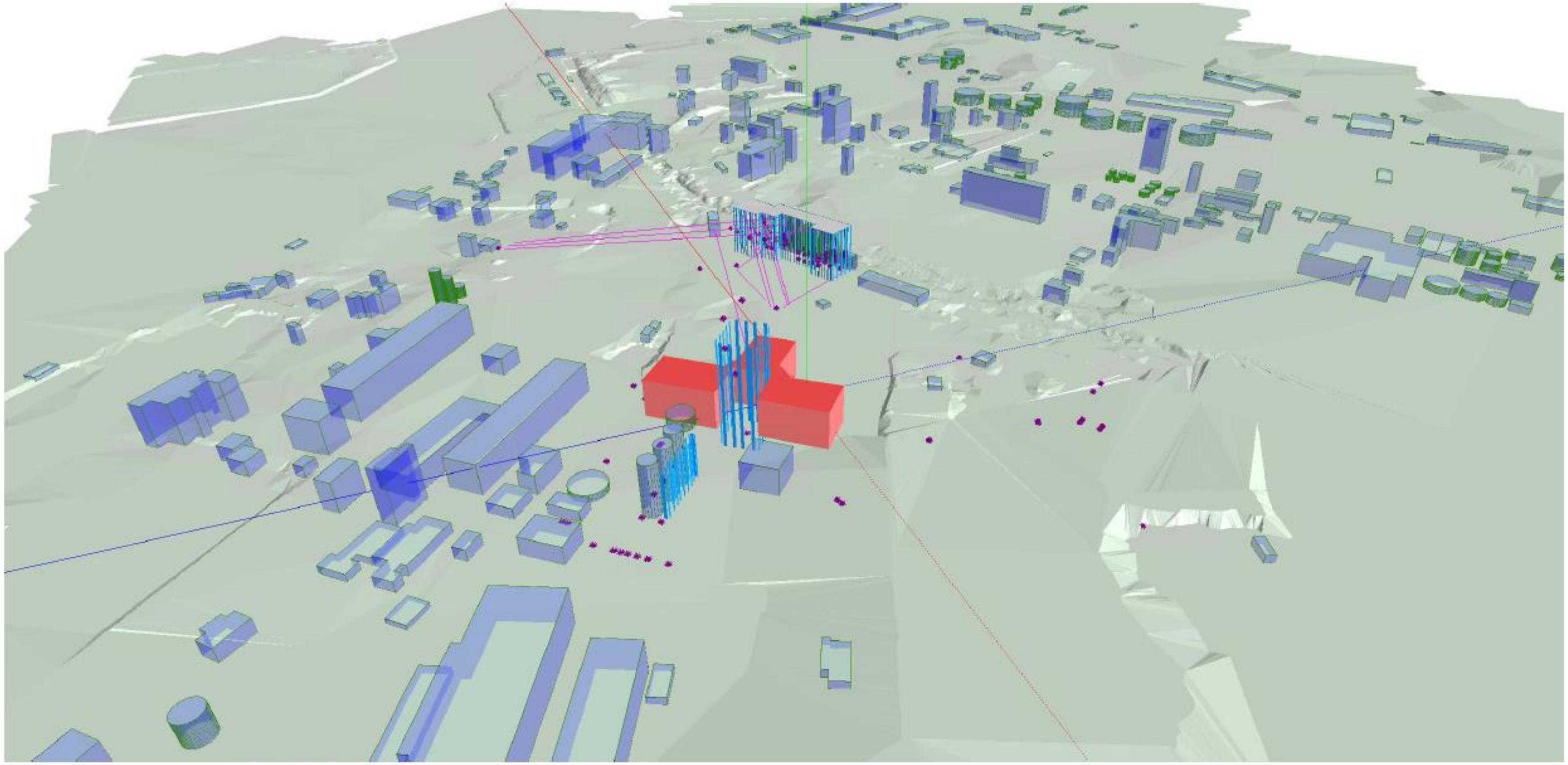
Noise source levels and modelling assumptions

Area	Equipment name	6BF location ID	MGA Location - Easting	MGA Location - Northing	Heigh above ground, metres	LAeq1min noise level, dBA	Operating time per 15 minute period, minutes	Time correction, dB	LAeq15min noise level, dBA	LAmax noise level considered in assessment, dBA	Noise level source
Hot Blast	61 Combustion Air Fan	1	305980.6011	6184425.678	2.5	102	15	-	102	-	GHD measurements 2021
Hot Blast	62 Combustion Air Fan	2	305973.1456	6184417.253	2.5	102	15	-	102	-	GHD measurements 2021
Hot Blast	61 Stove Purge Fan	3	306000.2159	6184392.687	1	-	-	-	-	-	Not contributing to noise emission
Hot Blast	62 Stove Purge Fan	4	305990.4802	6184401.304	1	-	-	-	-	-	Not contributing to noise emission
Hot Blast	63 Stove Purge Fan	5	305980.7445	6184409.92	1	-	-	-	-	-	Not contributing to noise emission
Hot Blast	61 Stove Depressurisation Valve	6	306014.7968	6184398.148	3.6	106	5	-4.8	101	106	GHD measurements 2021
Hot Blast	62 Stove Depressurisation Valve	7	306005.0611	6184406.763	3.6	106	5	-4.8	101	106	GHD measurements 2021
Hot Blast	63 Stove Depressurisation Valve	8	305995.3243	6184415.379	3.6	106	5	-4.8	101	106	GHD measurements 2021
Hot Blast	61 COG Booster Fan	9	306092.3597	6184393.941	5	101	8	-3.0	98	-	SWL_Bluescope (Table 6.3)
Hot Blast	62 COG Booster Fan	10	306089.9245	6184396.096	5	101	8	-3.0	98	-	SWL_Bluescope (Table 6.3)
Hot Blast	Snort Control Valve Silencer	11	306080.8658	6184404.113	22	140	0	-16.5	123	140	Calculated from Hatch monitoring report farfield measurements
Furnace Top	PW Bin Pressure Relief Silencer	14	306037.3023	6184357.872	79.5	114	0	-22.6	91	124	GHD measurements 2021
Furnace Top	PW Bin Pressure Relief Valve	13	306037.3023	6184357.872	60.4	114	0	-22.6	91	124	GHD measurements 2021
Furnace Top	PWGB Planetary	16	306034.2682	6184347.261	47.1	-	-	-	-	-	Not contributing to noise emission
Furnace Top	PWGB Tilt	17	306034.2682	6184347.261	46.6	-	-	-	-	-	Not contributing to noise emission
Furnace Top	Stock Rod Drives	18	306034.2682	6184347.261	0	104	15	-	104	-	SWL_Bluescope (Table 6.3)
Furnace Top	Furnace top bleeders	19	306034.2682	6184347.261	90	171	0	-16.5	154	171	Calculated from Hatch monitoring report farfield measurements
Gas Cleaning	61 Scrubber Feed Pump	20	305993.2958	6184462.804	0.8	94	15	-	94	-	SWL_Hatch (Table 6.2)
Gas Cleaning	62 Scrubber Feed Pump	21	305995.6156	6184465.426	0.8	94	15	-	94	-	SWL_Hatch (Table 6.2)
Gas Cleaning	63 Scrubber Feed Pump (Diesel)	22	305998.3133	6184468.46	0.8	99	0	-	99	-	SWL_Hatch (Table 6.2)
Gas Cleaning	61 Scrubber Recirc Pump	23	306042.4544	6184400.146	0.75	90	15	-	90	-	SWL_Bluescope (Table 6.3)
Gas Cleaning	62 Scrubber Recirc Pump	24	306044.1747	6184398.332	0.75	91	15	-	91	-	SWL_Bluescope (Table 6.3)
Gas Cleaning	63 Scrubber Recirc Pump (Diesel)	25	306045.8265	6184396.591	0.75	98	0	-	98	-	SWL_Hatch (Table 6.2)
Gas Cleaning	61 Cooling Tower Fan	26	305998.7729	6184456.895	11.5	-	-	-	-	-	Not contributing to noise emission
Gas Cleaning	62 Cooling Tower Fan	27	306005.2373	6184464.201	11.5	-	-	-	-	-	Not contributing to noise emission
Gas Cleaning	Aeration blowers	28	306020.9013	6184431.707	1	92	15	-	92	-	GHD measurements 2021
Gas Cleaning	RS Elements	29	306035.8439	6184396.289	8	-	-	-	-	-	Not contributing to noise emission
Gas Cleaning	Thickener Rake Drive	30	306014.8567	6184449.169	9	104	15	-	104	-	SWL_Bluescope (Table 6.3)
Gas Cleaning	Dust Handling System	33	306026.28	6184384.112	7.6	89	15	-	89	-	SWL_Hatch (Table 6.2)
Cooling	61 RWS Cooling Pump	40	305957.4963	6184439.136	1	-	-	-	-	-	Not contributing to noise emission
Cooling	62 RWS Cooling Pump	41	305960.0158	6184442.13	1	-	-	-	-	-	Not contributing to noise emission
Cooling	63 RWS Cooling Pump	42	305962.7983	6184445.127	1	-	-	-	-	-	Not contributing to noise emission
Cooling	64 RWS Cooling Pump	43	305965.4498	6184448.122	1	-	-	-	-	-	Not contributing to noise emission
Cooling	65 RWS Cooling Pump	44	305970.7517	6184454.115	1	-	-	-	-	-	Not contributing to noise emission
Cooling	61 PW Gearbox Cooling Pump	45	306049.7954	6184348.21	34.1	-	-	-	-	-	Not contributing to noise emission
Cooling	62 PW Gearbox Cooling Pump	46	306049.7954	6184348.21	34.1	-	-	-	-	-	Not contributing to noise emission
Cooling	51 SBC Pump	47	305953.8507	6184435.017	1	89	15	-	89	-	SWL_Hatch (Table 6.2)
Cooling	52 SBC Pump	48	305949.8745	6184430.523	1	89	15	-	89	-	SWL_Hatch (Table 6.2)
Cooling	53 SBC Pump (Diesel)	49	305946.8923	6184427.153	1	89	0	-	89	-	SWL_Hatch (Table 6.2)
Cooling	54 SBC Pump (Diesel)	50	305942.2527	6184421.911	1	95	15	-	95	-	SWL_Hatch (Table 6.2)
Stockhouse	CS1 Conveyor Drives * 2	110	306306.576	6184248.759	1.5	104	15	-	104	-	SWL_Bluescope (Table 6.3)
Stockhouse	CS2 Conveyor Drives * 4	111	306251.8519	6184292.295	1	104	15	-	104	-	SWL_Bluescope (Table 6.3)
Stockhouse	S13 Conveyor Drive	112	306371.0849	6184454.887	4.1	104	11	-1.5	102	-	SWL_Bluescope (Table 6.3)
Stockhouse	S14 Conveyor Drive	113	306224.7538	6184198.265	37.5	104	11	-1.5	102	-	SWL_Bluescope (Table 6.3)
Stockhouse	F90 Conveyor Drive	114	306376.0762	6184450.483	4.1	104	15	-	104	-	SWL_Bluescope (Table 6.3)
Stockhouse	F91 Conveyor Drive	115	306240.317	6184208.377	30.5	104	15	-	104	-	SWL_Bluescope (Table 6.3)
Stockhouse	54C Conveyor Drive	116	306381.9531	6184445.297	10	100	9	-2.2	98	-	SWL_Bluescope (Table 6.3)
Stockhouse	55C Conveyor Drive	117	306275.6935	6184224.597	40	100	9	-2.2	98	-	SWL_Bluescope (Table 6.3)
Stockhouse	SC1 Conveyor Drive	118	306278.6747	6184237.788	9	95	8	-3.0	92	-	SWL_Bluescope (Table 6.3)
Stockhouse	SC2 Conveyor Drive	119	306282.5668	6184230.799	9	95	8	-3.0	92	-	SWL_Bluescope (Table 6.3)
Stockhouse	SC3 Conveyor Drive	120	306257.5883	6184277.214	10.5	98	8	-3.0	95	-	SWL_Bluescope (Table 6.3)
Stockhouse	SC4 Conveyor Drive	121	306175.7246	6184285.046	10.5	94	15	-	94	-	SWL_Bluescope (Table 6.3)
Stockhouse	SC5 Conveyor Drive	122	306291.606	6184257.68	19.5	88	15	-	88	-	SWL_Bluescope (Table 6.3)
Stockhouse	SC6 Conveyor Drive	123	306294.6623	6184252.674	23.5	100	15	-	100	-	SWL_Bluescope (Table 6.3)
Stockhouse	SC7 Conveyor Drive	124	306290.0674	6184240.248	9	100	15	-	100	-	SWL_Bluescope (Table 6.3)
Stockhouse	SC8 Conveyor Drive	125	306221.8956	6184192.978	5.2	95	0	-	95	-	SWL_Bluescope (Table 6.3)
Stockhouse	SS1 Conveyor Drive	127	306216.6202	6184203.204	9	98	11	-1.5	96	-	SWL_Bluescope (Table 6.3)
Stockhouse	SS2 Conveyor Drive	128	306220.5148	6184196.216	9	94	11	-1.5	92	-	SWL_Bluescope (Table 6.3)
Stockhouse	SS3 Conveyor Drive	129	306176.8934	6184271.407	19.5	88	11	-1.5	86	-	SWL_Bluescope (Table 6.3)
Stockhouse	SS4 Conveyor Drive	130	306277.2878	6184250.407	19.5	104	15	-	104	-	SWL_Bluescope (Table 6.3)
Stockhouse	SS5 Conveyor Drive	131	306280.0459	6184244.674	28	104	15	-	104	-	SWL_Bluescope (Table 6.3)
Stockhouse	SS6 Conveyor Drive	132	306284.7935	6184237.764	11.5	104	15	-	104	-	SWL_Bluescope (Table 6.3)
Stockhouse	SS7 Conveyor Drive	133	306284.5852	6184227.917	4.3	104	0	-	104	-	SWL_Bluescope (Table 6.3)
Stockhouse	SNT-B01-VBFDR	135	306219.6378	6184206.031	15.86	99	12	-1.0	98	109	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SNT-S01-Screen	136	306219.6378	6184206.031	12.4	102	12	-1.0	101	112	GHD measurements 2021
Stockhouse	SNT-B02-VBFDR	137	306224.5064	6184197.295	15.86	99	12	-1.0	98	109	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SNT-S02-Screen	138	306224.5064	6184197.295	12.4	102	12	-1.0	101	112	GHD measurements 2021
Stockhouse	SNT-B03-VBFDR	139	306233.2419	6184202.164	15.86	99	12	-1.0	98	109	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SNT-S03-Screen	140	306233.2419	6184202.164	12.4	102	12	-1.0	101	112	GHD measurements 2021
Stockhouse	SNT-B04-VBFDR	141	306228.3734	6184210.899	15.86	99	12	-1.0	98	109	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SNT-S04-Screen	142	306228.3734	6184210.899	12.4	102	12	-1.0	101	112	GHD measurements 2021
Stockhouse	SNT-W01-VBFDR	143	306222.0738	6184201.669	3.3	99	10	-1.8	97	109	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SNT-W02-VBFDR	144	306230.8094	6184206.538	3.3	99	10	-1.8	97	109	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	COK-B01-VBFDR	145	306265.9361	6184231.834	15.49	96	8	-3.0	93	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	COK-S01-Screen	146	306265.9361	6184231.834	12.6	99	8	-3.0	96	109	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	COK-B02-VBFDR	147	306270.8046	6184223.099	15.49	96	8	-3.0	93	106	GHD measurements 2021, corrected to appropriate machine size

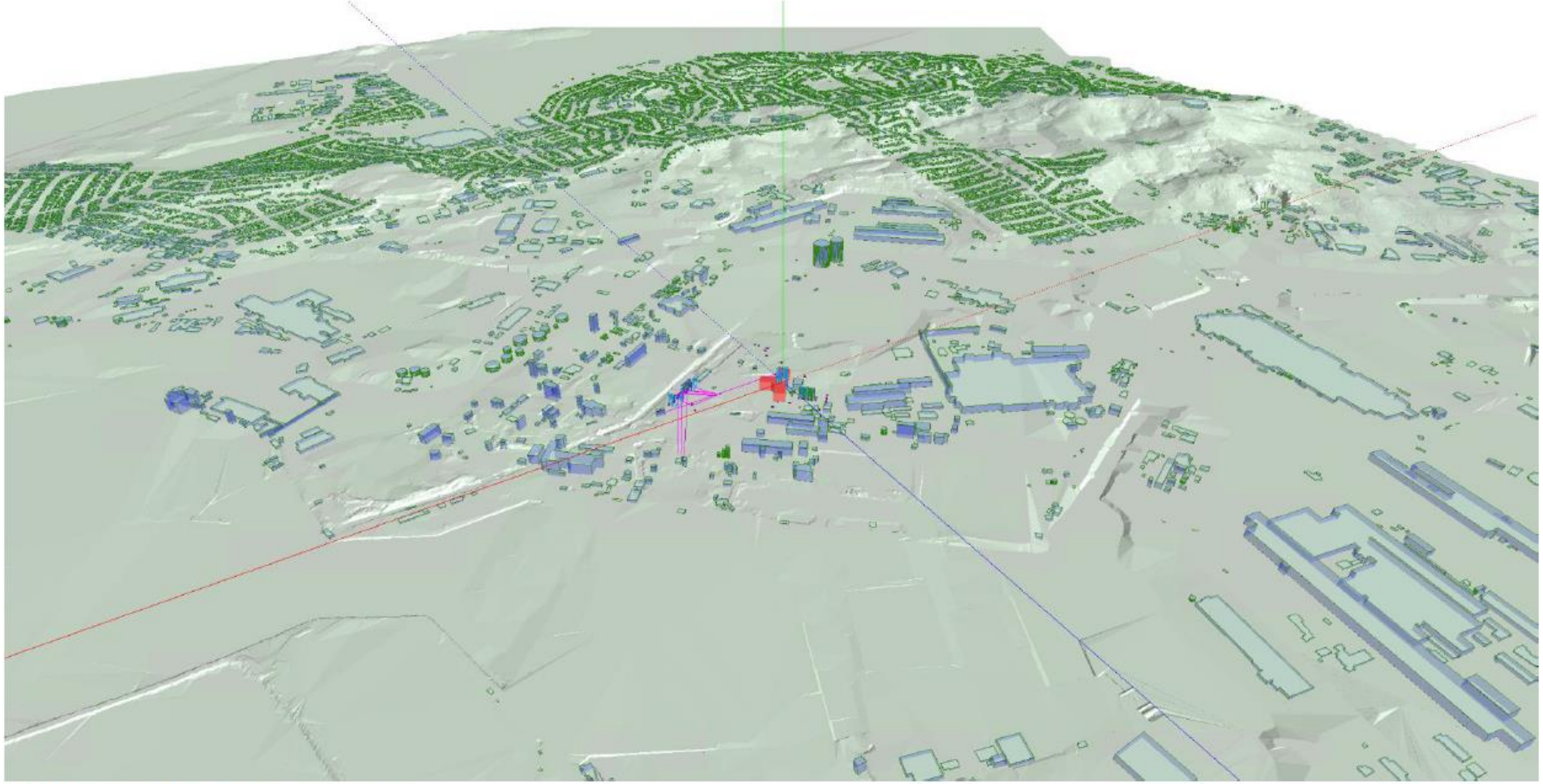
Area	Equipment name	6BF location ID	MGA Location - Easting	MGA Location - Northing	Heigh above ground, metres	LAeq1min noise level, dBA	Operating time per 15 minute period, minutes	Time correction, dB	LAeq15min noise level, dBA	LAmax noise level considered in assessment, dBA	Noise level source
Stockhouse	COK-S02-Screen	148	306270.8046	6184223.099	12.6	99	8	-3.0	96	109	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	COK-B03-VBFDR	149	306279.5401	6184227.967	15.49	96	8	-3.0	93	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	COK-S03-Screen	150	306279.5401	6184227.967	12.6	99	8	-3.0	96	109	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	COK-B04-VBFDR	151	306274.6716	6184236.703	15.49	96	8	-3.0	93	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	COK-S04-Screen	152	306274.6716	6184236.703	12.6	99	8	-3.0	96	109	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SST-H01-VBFDR	153	306175.7936	6184265.712	6	96	15	-	96	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SST-H02-VBFDR	154	306175.0451	6184261.833	6	96	15	-	96	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SST-S01-Screen	155	306176.1741	6184267.681	5	96	15	-	96	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SST-S02-Screen	156	306175.4253	6184263.802	5	96	15	-	96	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SST-BSL-VBFDR	157	306281.0359	6184244.514	13	96	15	-	96	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	FER-B01-VBFDR	158	306236.2377	6184214.415	8.5	96	3	-7.0	89	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	FER-W01-VBFDR	159	306236.2377	6184214.415	2.5	96	3	-7.0	89	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	FER-B02-VBFDR	160	306242.2821	6184217.784	8.5	96	3	-7.0	89	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	FER-W02-VBFDR	161	306242.2821	6184217.784	2.5	96	3	-7.0	89	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	FER-B03-VBFDR	162	306248.397	6184221.192	8.5	96	3	-7.0	89	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	FER-W03-VBFDR	163	306248.397	6184221.192	2.5	96	3	-7.0	89	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	FER-B04-VBFDR	164	306254.4414	6184224.561	8.5	96	3	-7.0	89	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	FER-W04-VBFDR	165	306254.4414	6184224.561	2.5	96	3	-7.0	89	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	FLX-B01-VBFDR	166	306245.6371	6184210.574	8	96	2	-10.0	86	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	FLX-W01-VBFDR	167	306245.6371	6184210.574	2.5	96	2	-10.0	86	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	FLX-B02-VBFDR	168	306250.8485	6184211.493	8	96	2	-10.0	86	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	FLX-B03-VBFDR	169	306252.9035	6184215.634	8	96	2	-10.0	86	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	FLX-W02-VBFDR	170	306247.4025	6184215.781	2.5	96	2	-10.0	86	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SST-BSB-VBFDR	171	306241.0412	6184206.504	10	96	3	-7.0	89	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	Recycles Surge Bin Vibro Feeder	172A	306241.0412	6184206.504	4	96	3	-7.0	89	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	Recycles Surge Bin Weigh Feeder	172B	306241.0412	6184206.504	3	96	3	-7.0	89	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SST-WHP-VBFDR	173	306285.2802	6184236.891	2.5	99	8	-3.0	96	109	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SCK-WHP-VBFDR	174	306289.7419	6184239.51	2.5	96	8	-3.0	93	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SCK-S01-Screen	175	306176.6695	6184283.436	5	96	15	-	96	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SCK-S02-Screen	176	306175.8824	6184279.36	5	96	15	-	96	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SCK-HSG-VBFDR	177	306257.2295	6184277.857	5.7	96	8	-3.0	93	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SCK-BSL-VBFDR	178	306295.4017	6184252.521	10	96	10	-1.8	94	106	GHD measurements 2021, corrected to appropriate machine size
Stockhouse	SCK-BNT-VBFDR	179	306258.5379	6184217.407	10	96	8	-3.0	93	106	GHD measurements 2021, corrected to appropriate machine size
Hydraulic Rooms	Furnace Hydraulics Room	60	306034.2151	6184431.332	0	81	15	-	81	-	SWL_Hatch (Table 6.2)
TRT	Turbine and Alternator	70	306040.1894	6184412.92	8	-	-	-	-	-	Not contributing to noise emission
TRT	Hydraulics and Lubrication	71	306036.2896	6184421.566	1.2	-	-	-	-	-	Not contributing to noise emission
Bag Houses	61 Stockhouse Fan	180	306342.3264	6184254.723	2	104	15	-	104	-	SWL_Hatch (Table 6.2)
Bag Houses	Baghouse blowers	181	306334.2816	6184251.287	1	101	8	-3.0	98	-	GHD measurements 2021
Bag Houses	61 Casthouse Fan	61	305939.2652	6184333.935	2	98	15	-	98	-	SWL_Bluescope (Table 6.3)
Bag Houses	62 Casthouse Fan	62	305935.6928	6184325.456	2	100	15	-	100	-	SWL_Bluescope (Table 6.3)
Bag Houses	Baghouse Blowers * 2	63	305948.028	6184323.33	1	101	8	-3.0	98	-	GHD measurements 2021
Granulator	61 Slag Gran Cooling Tower Fan	80	305976.372	6184139.92	14	88	15	-	88	-	SWL_Hatch (Table 6.2)
Granulator	62 Slag Gran Cooling Tower Fan	81	305983.0758	6184128.781	14	98	15	-	98	-	SWL_Hatch (Table 6.2)
Granulator	61 Granulation Pump	82	305964.4485	6184156.29	1.7	91	8	-3.0	88	-	SWL_Hatch (Table 6.2)
Granulator	62 Granulation Pump	83	305966.5592	6184152.639	1.7	93	8	-3.0	90	-	SWL_Hatch (Table 6.2)
Granulator	61 Condensation Pump	84	305953.5106	6184149.97	1.7	91	8	-3.0	88	-	SWL_Hatch (Table 6.2)
Granulator	62 Condensation Pump	85	305955.6203	6184146.318	1.7	91	8	-3.0	88	-	SWL_Hatch (Table 6.2)
Granulator	61 Cooling Circuit Pump	86	305974.4825	6184179.348	0.5	91	8	-3.0	88	-	SWL_Hatch (Table 6.2)
Granulator	62 Cooling Circuit Pump	87	305976.9181	6184178.034	0.5	91	8	-3.0	88	-	SWL_Hatch (Table 6.2)
Slag Handling	Spray Pumps	88	306063.9964	6184182.741	0.5	91	15	-	91	-	SWL_Hatch (Table 6.2)
Slag Handling	Sump Pumps	89	305875.1914	6184181.41	0.5	91	15	-	91	-	SWL_Hatch (Table 6.2)
Slag Handling	Truck Wash	90	305732.812	6184303.688	0	-	-	-	-	-	Not contributing to noise emission
Slag Handling	Knocking Block	91	305981.62	6184251.77	2	110	15	-	110	120	GHD database



Noise model – plan view



Noise model – 3D view close



Noise model – 3D view far

Appendix D

Full operational noise results

Receiver ID	Operational noise level LAeq(15min), dBA	Receiver Type	Operational noise criteria (NPfI discrete process assessment) Laeq(15min), dBA	Compliance?
ARR1	22	Active recreation	65	Yes
ARR2	20	Active recreation	65	Yes
ARR3	25	Active recreation	65	Yes
ARR4	32	Active recreation	65	Yes
ARR5	23	Active recreation	65	Yes
EDU1	18	Educational institute	55	Yes
EDU2	36	Educational institute	55	Yes
EDU3	28	Educational institute	55	Yes
EDU4	27	Educational institute	55	Yes
POW1	27	Place of worship	55	Yes
POW2	33	Place of worship	55	Yes
PRR1	20	Passive recreation	60	Yes
PRR2	28	Passive recreation	60	Yes
RES1	33	Residential - NCA04	38	Yes
RES2	34	Residential - NCA03	41	Yes
RES3	33	Residential - NCA03	41	Yes
RES4	22	Residential - NCA01	31	Yes
RES5	33	Residential - NCA04	38	Yes
RES6	35	Residential - NCA04	38	Yes
RES7	33	Residential - NCA04	38	Yes
RES8	38	Residential - NCA03	41	Yes
RES9	32	Residential - NCA04	38	Yes
RES10	33	Residential - NCA03	41	Yes
RES11	35	Residential - NCA04	38	Yes
RES12	34	Residential - NCA03	41	Yes
RES13	24	Residential - NCA02	31	Yes
RES14	33	Residential - NCA04	38	Yes
RES15	30	Residential - NCA04	38	Yes
RES16	35	Residential - NCA04	38	Yes
RES17	27	Residential - NCA02	31	Yes
RES18	35	Residential - NCA03	41	Yes
RES19	29	Residential - NCA03	41	Yes
RES20	31	Residential - NCA03	41	Yes
RES21	34	Residential - NCA04	38	Yes
RES22	31	Residential - NCA04	38	Yes
RES23	35	Residential - NCA03	41	Yes
RES24	39	Residential - NCA03	41	Yes
RES25	34	Residential - NCA03	41	Yes
RES26	34	Residential - NCA03	41	Yes
RES27	34	Residential - NCA03	41	Yes
RES28	38	Residential - NCA03	41	Yes
RES29	39	Residential - NCA03	41	Yes
RES30	27	Residential - NCA02	31	Yes
RES31	25	Residential - NCA02	31	Yes
RES32	24	Residential - NCA02	31	Yes
RES33	28	Residential - NCA02	31	Yes
RES34	27	Residential - NCA02	31	Yes
RES35	28	Residential - NCA02	31	Yes
RES36	20	Residential - NCA01	31	Yes
RES37	19	Residential - NCA01	31	Yes
RES38	26	Residential - NCA01	31	Yes
RES39	23	Residential - NCA01	31	Yes
RES40	23	Residential - NCA01	31	Yes
RES41	21	Residential - NCA01	31	Yes

Appendix G

Hazard and risk assessment

Blast Furnace No. 6 Reline Project

Hazard and Risk Report

BlueScope Steel (AIS) Pty Ltd

7 March 2022

→ **The Power of Commitment**

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			Name	**Signature**	**Name**	**Signature**	**Date**
S4	0	Fiona Duncan	M. Erskine		K. Rosen		26/10/21
S4	1	Fiona Duncan	M. Erskine		K. Rosen		07/03/22

Executive summary

BlueScope Steel (AIS) Pty Ltd's (BlueScope) Port Kembla Steelworks operation in NSW includes two blast furnaces. No. 5 Blast Furnace (5BF) is currently operating, while No. 6 Blast Furnace (6BF) is currently in care and maintenance. 5BF is expected to continue to produce (molten) iron on a continuous basis until it reaches the end of its operational life at some stage between 2026 and 2030. BlueScope is proposing a move of iron manufacture from 5BF to 6BF, after 5BF ceases operation. 6BF last produced iron in 2011, at which point it was taken out of service and placed into care and maintenance. To prepare 6BF to become operational again, major maintenance works are required (the project). The project aims to return 6BF to service through a reline process that will be carried out while 5BF continues to operate. GHD Pty Ltd (GHD) was commissioned by BlueScope to prepare a preliminary risk screening in accordance with *State Environment Planning Policy No. 33 - Hazardous and Offensive Development* (SEPP 33).

The results of the dangerous goods and transport screening indicate that the project does not exceed any of the SEPP 33 thresholds for operation but storage of explosives during construction exceeds the SEPP 33 threshold. Given the use of explosives during construction of the project it has been considered 'potentially hazardous' and a Preliminary Hazard Analysis (PHA) has been prepared. It is considered that there is potential for moderately serious harm, and a Level 2 PHA is appropriate. A Level 2 PHA uses a semi-quantitative approach based on comprehensive hazard identification to demonstrate that the activity does not pose a significant risk.

Assessments of the air quality, and noise and vibration impact of the project have been completed as part of the EIS, as the development is 'potentially offensive'. The results from the air quality and noise and vibration assessments indicate that if appropriate control measures are in place during construction and operation, the project will minimise the impact of the relevant amenity criteria. Over the lifecycle of the project, and with safeguards, the project is not expected to release a significant quantity of pollutant emissions and is not considered to be an 'offensive industry'.

A qualitative hazard identification study was completed as a systematic way to identify any potential offsite impacts, during construction and operation. The hazard identification study identified the following hazards with the potential for offsite impact, all of which can be suitably controlled:

- Fire/explosion from the natural gas supply
- Fire/explosion from self-generated gas (coke ovens gas)
- Explosion from molten metal and water
- Discharge of toxic dust and/or fumes (blast furnace gas and coke ovens gas)
- Use/handling of explosives

Of these impacts, three were considered serious enough that further semi-quantitative analysis was warranted, specifically internal furnace molten metal explosions, coke ovens gas leaks and ignition, and fuel gas leaks and ignition. The assessment showed that there was no off-site impact and that the risk complies to HIPAP 4 risk criteria.

The hazard identification study demonstrates that the project could be designed, constructed and operated in a manner that will meet relevant regulations, standards and policies.

It is recommended that the following controls be implemented that incorporate practices that will prevent risk scenarios occurring through:

- Inspection and maintenance regime for the gas reducing station, the coke ovens gas and the blast furnace gas pipework and associated fittings
- Separation, or tightly controlled usage, of water around the furnace areas, including procedures/training regarding the expectations for management of water leaks
- Furnace design to avoid inadvertent water leakage into the furnace
- Inspection and maintenance regime for furnace closed water systems
- Bollards or equivalent to protect ground level fuel gas infrastructure such as the natural gas reducing station
- Explosives stored at least 90 metres from the site boundary

It is important to note that any new equipment should have procedures developed for safe operation. This is particularly important for the operation of any new fixed or mobile machinery to prevent injury to people.

Any changes to the assumptions used in this report should result in a review of the PHA and update as required.

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.3 and the assumptions and qualifications contained throughout the report.

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Appendices

Terms and abbreviations

Abbreviation	Description
ADG	Australian Dangerous Goods Code
AS	Australian Standard
AS/NZS	Australian and New Zealand Standard
bar	Measurement of atmospheric pressure
BF	Blast Furnace
BFG	Blast Furnace Gas
°C	Degrees Celsius
CBD	Central Business District
COG	Coke Ovens Gas
CSSI	Critical State Significant Infrastructure
DG	Dangerous Good
DPIE	Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EP&A	Environmental Planning and Assessment
GHD	GHD Pty Ltd
HIPAP	Hazardous Industry Planning Advisory Paper
K	Kelvin
kg	Kilograms
km	Kilometres
kPag	Kilopascals gauge
kW/m^2	Kilowatts per meters squared
LGA	Local Government Area
LPG	Liquid Propane Gas
m	Metres
mm	Millimetres
MPag	Mega Pascals gauge
MSDS	Material Safety Data Sheet
NSW	New South Wales
PHA	Preliminary Hazard Analysis
PHAST	Process Hazard Analysis Software Tool
PKSW	Port Kembla Steelworks
PPE	Personal Protective Equipment
SEPP 33	State Environment Planning Policy Number 33
SWMS	Safe Work Method Statement
UN	United Nations

1. Introduction

1.1 Background and project overview

BlueScope Steel (AIS) Pty Ltd's (BlueScope) Port Kembla Steelworks (PKSW) operation in NSW includes two blast furnaces. No. 5 Blast Furnace (5BF) is currently operating, while No. 6 Blast Furnace (6BF) is currently in care and maintenance.

5BF is expected to continue to produce (molten) iron on a continuous basis until it reaches the end of its operational life at some stage between 2026 and 2030. BlueScope is proposing a move of iron manufacture from 5BF to 6BF, after 5BF ceases operation.

6BF last produced iron in 2011, at which point it was taken out of service and placed into care and maintenance. To prepare 6BF to become operational again, major maintenance works are required (the project). The project aims to return 6BF to service through a reline process that will be carried out while 5BF continues to operate.

The project has been declared critical state significant infrastructure (CSSI) in accordance with section 5.13 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and Schedule 5 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP).

1.2 Purpose of this report

GHD Pty Ltd (GHD) was commissioned by BlueScope to prepare a preliminary risk screening in accordance with *State Environment Planning Policy No. 33 - Hazardous and Offensive Development* (SEPP 33). This report will support the preparation of an Environmental Impact Statement (EIS) under the EP&A Act for the project.

This report addresses the relevant criteria in the NSW Secretary's Environmental Assessment Requirements (SEARs) for the project issued in July 2021 (as outlined in section 2.5) and assesses the potential hazards and risks of the project under SEPP 33.

As such, this report focuses on the impact of potential hazards associated with the use of dangerous goods and hazardous substances that may arise during the construction and operation of the project. Specifically, this report:

- Describes the existing environment with respect to the project
- Screens the quantities of dangerous goods expected to be used during construction and operation of the project
- Assesses the impacts of construction and operation of the project specific to dangerous goods and other hazardous substances
- Recommends measures to mitigate the impacts identified

1.3 Limitations

This report has been prepared by GHD for BlueScope Steel (AIS) Pty Ltd and may only be used and relied on by BlueScope Steel (AIS) Pty Ltd for the purpose agreed between GHD and BlueScope Steel (AIS) Pty Ltd as set out in section 1.2.

GHD otherwise disclaims responsibility to any person other than BlueScope Steel (AIS) Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by BlueScope Steel (AIS) Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2. Legislative and policy context

The project has been declared CSSI in accordance with Section 5.13 of the EP&A Act.

2.1 Applying SEPP 33: Hazardous and Offensive Development Application Guidelines

The Department of Planning's, NSW, 2011 guideline, "*Applying SEPP 33: Hazardous and Offensive Development Application Guidelines"* provides the process for assessing if developments are potentially hazardous or offensive, including threshold levels that trigger the potentially hazardous or offensive status. SEPP 33 is the main guidance document that has been followed for this assessment.

The project has been declared CSSI and requires approval from the NSW Minister for Planning and Public Spaces. *State Environment Planning Policy No. 33 - Hazardous and Offensive Development* (SEPP 33) is required to be considered as part of the EIS. SEPP 33 provides a process for identifying a potentially hazardous development should storage and transport screening thresholds be exceeded.

2.2 Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Safety Planning

The Department of Planning's, NSW, 2011, *Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Safety Planning* (HIPAP No 4) sets out risk criteria for industries that are considered hazardous. This document is only used if SEPP 33 indicates a development is potentially hazardous.

2.3 Hazardous Industry Planning Advisory Paper No 6 – Guidelines for Hazard Analysis

The Department of Planning's, NSW, 2011, *Hazardous Industry Planning Advisory Paper No 6 – Guidelines for Hazard Analysis* (HIPAP No 6) lists the process required for preliminary hazard analysis (PHA). This document is only used if SEPP 33 indicates a development is potentially hazardous.

2.4 Multi-Level Risk Assessment

The Department of Planning's, NSW, 2011, *Multi-level Risk Assessment* lists the process required for completing a risk assessment at a qualitative, semi-quantitative or fully quantitative level of detail. This document is only used if SEPP 33 indicates a development is potentially hazardous and a PHA is required.

2.5 Secretary's environmental assessment requirements

The SEARs relevant to hazards and risk, together with a reference to where they are addressed in this report, are outlined in Table 2.1.

Table 2.1 Hazard and risk SEARs

Requirements	Where addressed in this report
A preliminary risk screening completed in accordance with State Environmental Planning Policy No. 33 - Hazardous and Offensive Development (SEPP 33) and *Applying SEPP 33* (2011), with a clear indication of class, quantity and location of all dangerous goods and hazardous materials associated with the development	Section 5
Should preliminary screening indicate that the project is "potentially hazardous", a PHA must be prepared in accordance with *Hazardous Industry Planning Advisory Paper No. 6 - Guidelines for Hazard Analysis* (2011) and *Multi-Level Risk Assessment* (2011)	Section 6
Systems and procedures to prevent and manage all types of emergencies	Section 6.1 and Section 7

3. Methodology

This section describes the methodology used to undertake the hazard and risk study.

3.1 Approach to assessment

3.1.1 SEPP 33 screening

SEPP 33 applies to any project which falls under the policy's definition of 'potentially hazardous industry' or 'potentially offensive industry'. If not controlled appropriately, some activities within these industries may create an offsite risk or offence to people, property or the environment thereby making them potentially hazardous or potentially offensive. The purpose of this report is to determine if the project is potentially hazardous using the SEPP 33 risk screening process or potentially offensive considering expected discharge requirements. If the screening indicates that the project is potentially hazardous, then a PHA is required. The overall risk screening process, as outlined in SEPP 33 is summarised in Figure 3.1. If the project is potentially offensive, after considering the quantity and nature of any discharges and the significance of the offence likely to be caused, having regard to surrounding land use and the proposed controls, then additional controls are required.

The risk screening process typically concentrates on the storage of specific dangerous good (DG) classes that have the potential for significant offsite effects. Specifically, the assessment involves the identification of classes and quantities of all DGs to be used, stored or produced on site with an indication of storage locations. The quantities of DGs are then assessed against the SEPP 33 threshold quantities. If any of the SEPP 33 threshold quantities are exceeded, then a PHA is required.

3.1.2 Hazard identification

Following screening and during the final assessment of the project, a determination of whether the project poses significant risk or offence is required. Hazard identification highlights any risks associated with the interaction of the project (as a whole) with the surrounding environment. This is a systematic process to identify any potential offsite impacts. The aim of the hazard identification process is to show the project does not pose any significant risk or offence.

The hazard identification is a desktop qualitative assessment and involves documenting possible events that could lead to a possible off-site incident. The assessment then lists potential causes of the incident, as well as identification of operational and organisational safeguards to prevent the incidents from occurring or to mitigate their impact. The hazard identification is conducted for both construction and operation of the project.

3.1.3 Preliminary Hazard Analysis

For development projects classified as 'potentially hazardous industry', a PHA is completed to determine the risk to people, property and the environment at the proposed location and in the presence of controls. Criteria of acceptability are used to determine if the development project is classified as a 'hazardous industry'. If this is the case, the development project may not be permissible within most industrial zonings in NSW.

The PHA will identify potential hazards, analyse these hazards in terms of their impact to people and the environment and their likelihood of occurrence, quantify the resultant risk to surrounding land uses and assess the risk to demonstrate that the project will not impose an unacceptable level of risk.

Applying SEPP 33 (2011) identifies three levels of PHA. If a PHA is required, a judgement of the level of risk associated with the project is determined using the results of the screening and hazard identification stages. The three levels of PHA are:

- Level 1 – if significant but not serious potential for harm is identified, a qualitative PHA is completed
- Level 2 – if medium potential for harm is identified, a semi-quantitative PHA is completed
- Level 3 – if high potential for harm is identified, a quantitative PHA is completed

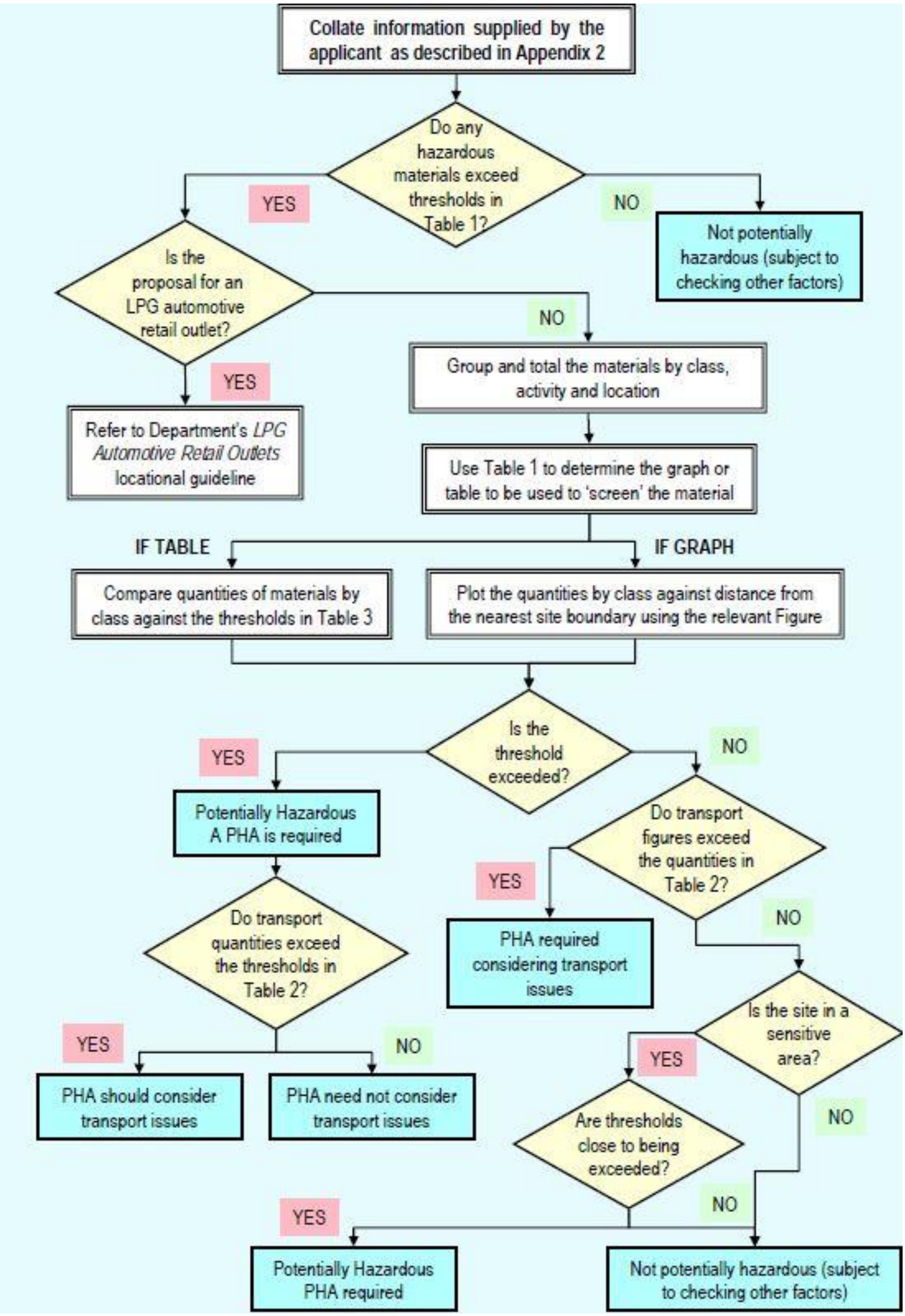


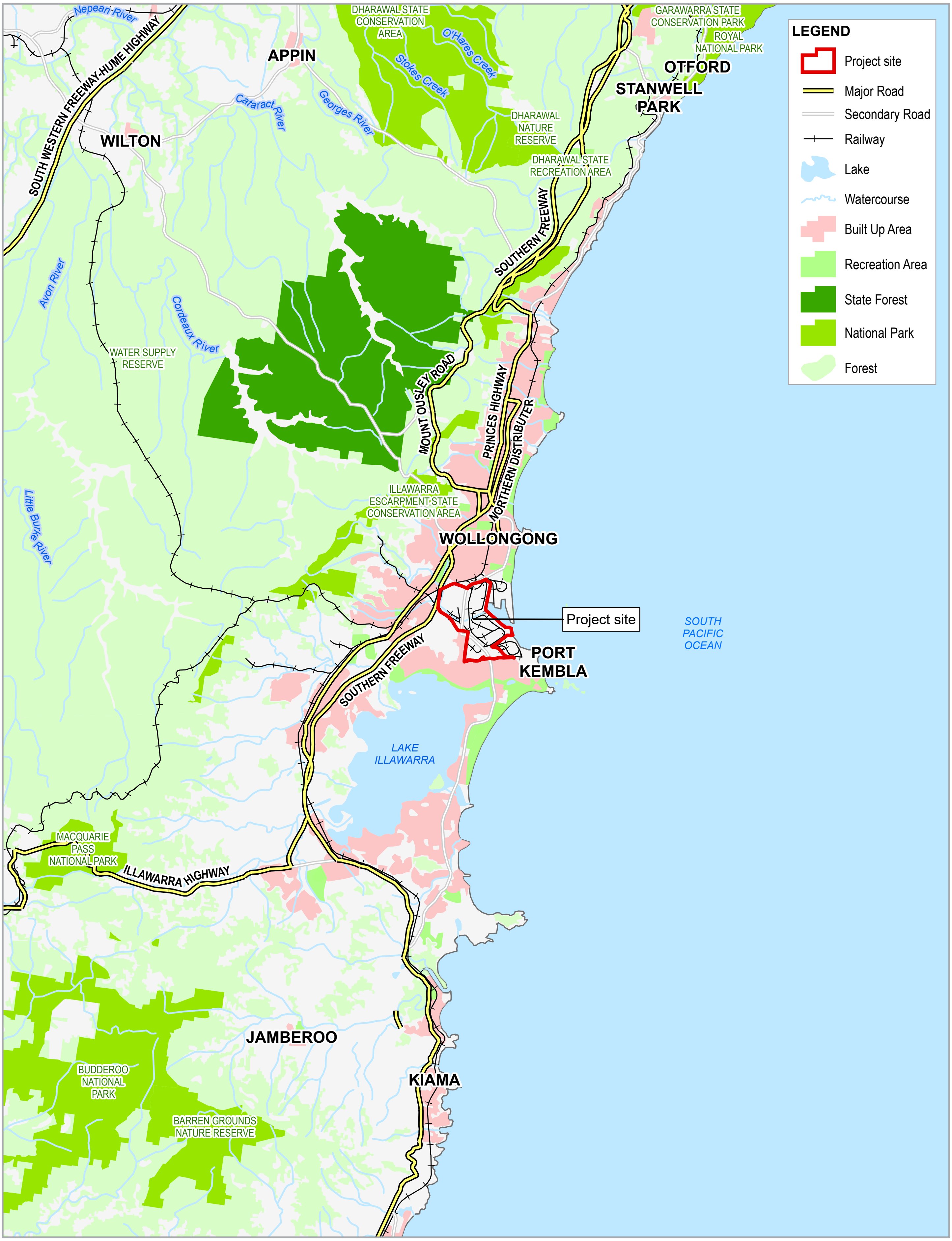
Figure 3.1 SEPP 33 screening process

4. Existing environment

The project is located within an industrial site of approximately 750 hectares (ha) at Port Kembla in the Wollongong LGA and Illawarra region of NSW. Sydney is approximately 80 kilometres (km) to the north of Port Kembla, while the Wollongong Central Business District (CBD) is approximately 2.5 km to the north and Lake Illawarra is approximately 3 km to the south. Port Kembla is the main industrial centre of the Illawarra region.

Key features of Port Kembla are the heavy industrial area and the port including industrial developments such as PKSW, fertiliser production facilities and petroleum hydrocarbon storage and wholesaling. The port of Port Kembla is zoned SP1 – Special Activities. The Inner Harbour, specifically developed as an all-weather shipping port, covers approximately 60 ha with around 2.9 km of commercial shipping berths. BlueScope operates berths in the Inner Harbour that supply materials for the PKSW.

The area surrounding Port Kembla industrial area is primarily occupied by residential development. These urban areas provide small and large-scale retail outlets, community services (e.g. medical facilities, hospital, schools and sporting facilities) and commercial facilities (e.g. banking and post office). The closest urban developments to PKSW are the suburbs of Cringila, Berkeley, Lake Heights, Warrawong and Port Kembla to the south, and Unanderra, Cobblers Hill, Mount St Thomas, Coniston and Figtree to the north and west. The urban areas of Cringila are located adjacent to the No. 1 Works and No. 2 Works areas and are the nearest to the project area, being approximately 1.2 km to the southwest as shown on Figure 4.1 to Figure 4.3.



Paper Size ISO A4

0 1.5 3 4.5 6

Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Hazard and Risk Report

Regional Location

Project No.	**12541101**
Revision No.	**0**
Date	**23/11/2021**

FIGURE 4-1

\\ghdnet\ghd\AU\Newcastle\Projects\22\12541101\GIS\Maps\HazardRiskAssessment_0.aprx\12541101_HR001_RegionalLocality_0
Print date: 23 Nov 2021 - 13:19

Data source: Commonwealth of Australia (Geoscience Australia): 250K Topographic Data Series 3, 2006. .
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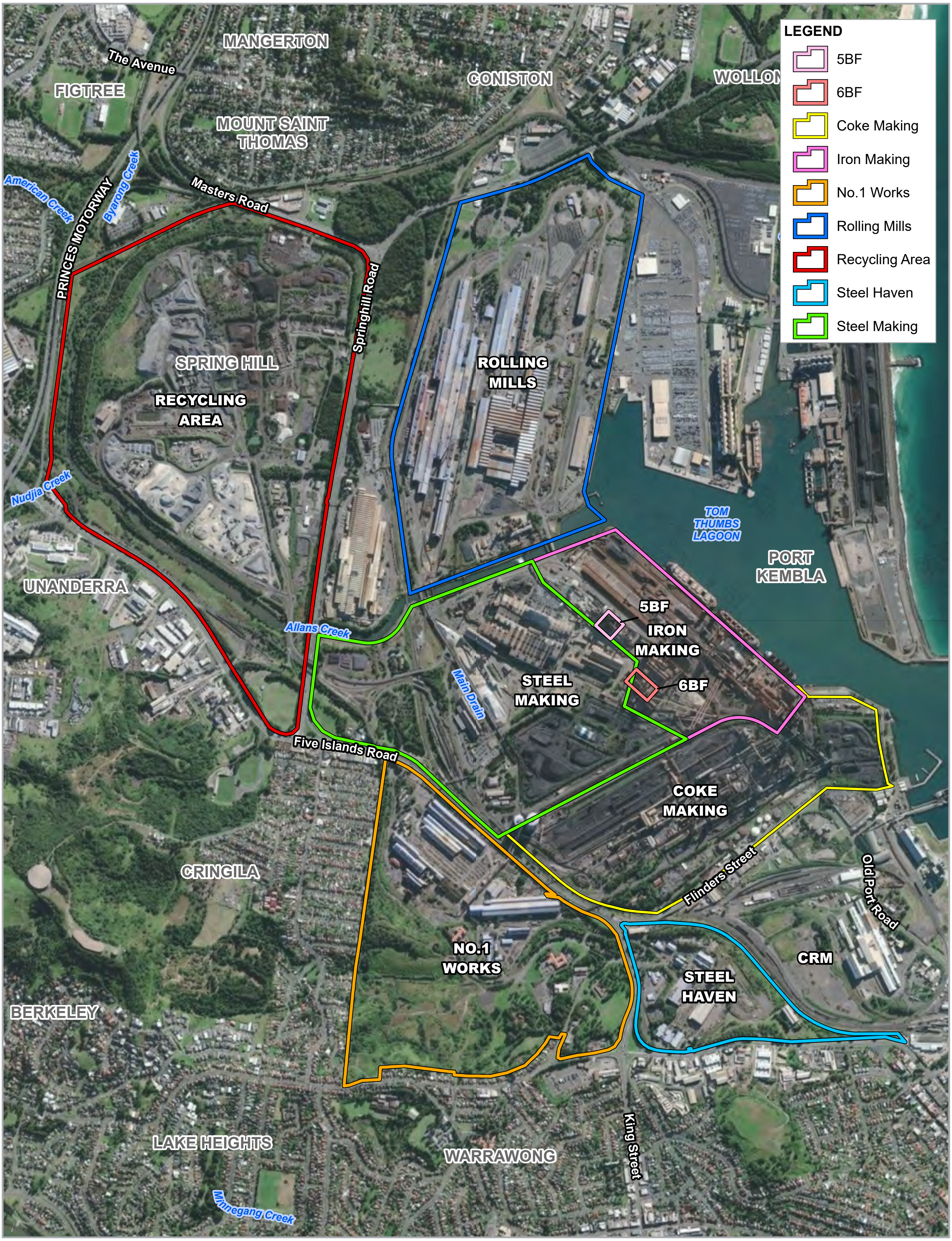

Paper Size ISO A4

0 0.15 0.3 0.45 0.6

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Hazard and Risk Report

Port Kembla Steelworks site layout and locality

Project No.	12541101
Revision No.	0
Date	23/11/2021

FIGURE 4-2

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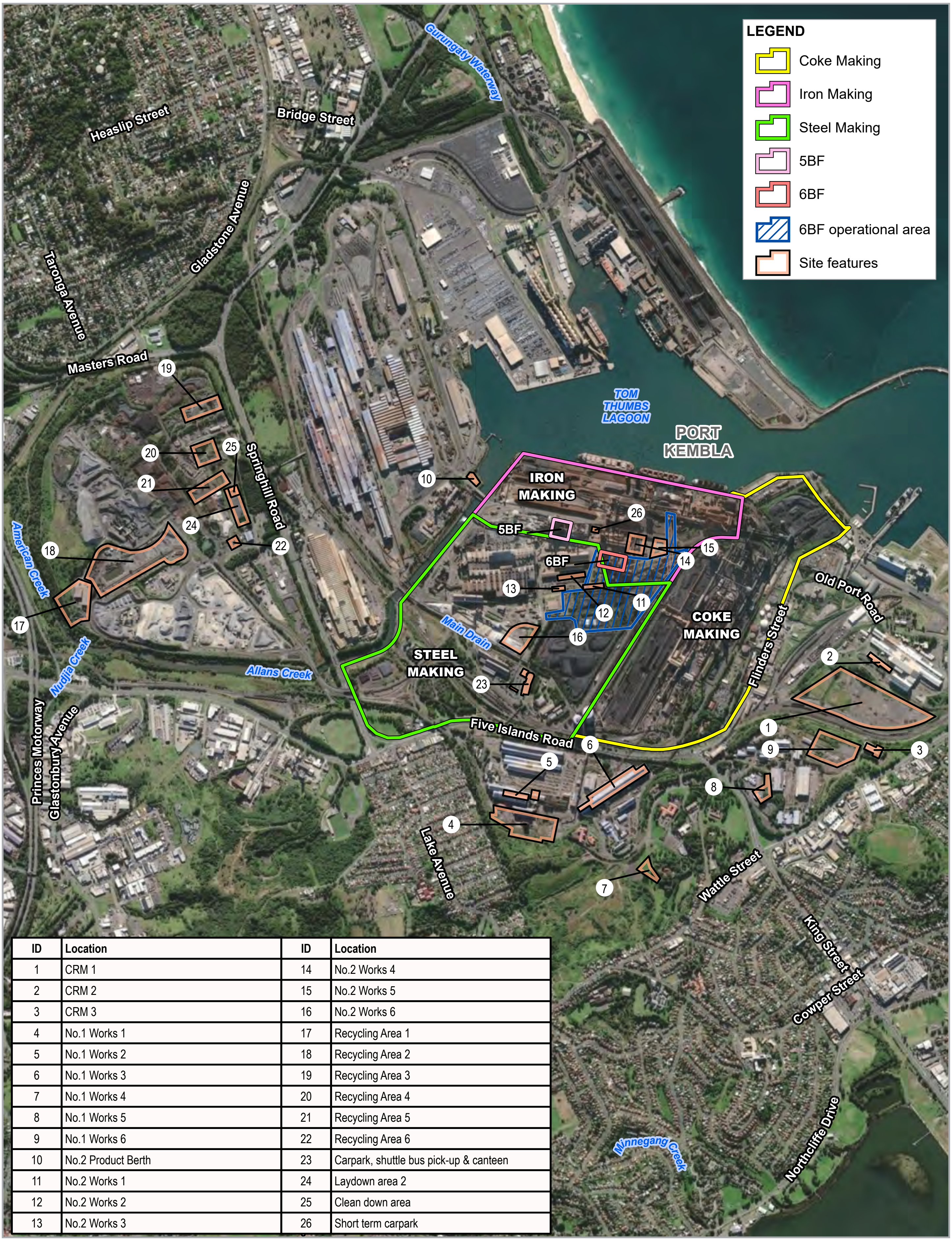
Print date: 23 Nov 2021 - 13:20

Data source: LPI: DCDB/DTDB, 2017. World Imagery: Maxar.
Created by: tmorton



ID	Location	ID	Location
1	CRM 1	14	No.2 Works 4
2	CRM 2	15	No.2 Works 5
3	CRM 3	16	No.2 Works 6
4	No.1 Works 1	17	Recycling Area 1
5	No.1 Works 2	18	Recycling Area 2
6	No.1 Works 3	19	Recycling Area 3
7	No.1 Works 4	20	Recycling Area 4
8	No.1 Works 5	21	Recycling Area 5
9	No.1 Works 6	22	Recycling Area 6
10	No.2 Product Berth	23	Carpark, shuttle bus pick-up & canteen
11	No.2 Works 1	24	Laydown area 2
12	No.2 Works 2	25	Clean down area
13	No.2 Works 3	26	Short term carpark

Paper Size ISO A4

0 0.15 0.3 0.45 0.6

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Hazard and Risk Report

Key project features

Project No. 12541101
Revision No. 0
Date 23/11/2021

FIGURE 4-3

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Print date: 23 Nov 2021 - 13:20

Data source: LPI: DTDB/DCDB, 2017. World Imagery: Maxar.
Created by: tmorton

4.1 Project area

For the purpose of the EIS, the project area includes 6BF and the associated construction area. The project area is shown in Figure 4.4. The project involves the relining of 6BF over a period of approximately 3 years to return it to service and commence ironmaking after 5BF ceases operation.

The reline of the furnace involves:

- Removal of remaining burden material and iron skull
- Stripping of the staves, refractories and hearth from inside the shell
- Repairs to the furnace shell where required
- Installation of the new hearth, sidewall refractories and staves
- Repairs/replacement of the tuyeres, tapholes, furnace cooling systems and instrumentation
- Upgrade work to the 6BF ancillary systems for continuous operation

☆ 01 – HAZARDOUS MATERIAL LOCATION

PHASE	LOCATION	HAZARDOUS SUBSTANCE
MANUFACTURING	01	CORROSION INHIBITOR
	02	ETP – SODIUM HYPOCHLORITE, POLYMER, BIODISPERSANT & SODIUM HYDROXIDE.
	03	ETP – ANTISCALANT
	04	CORROSION INHIBITOR
	05	CORROSION INHIBITOR
	06	OXYGEN, ACETYLENE, HELIUM.
	07	HANDIGAS (LPG)
CONSTRUCTION	08	OXYGEN, ARGON, ARGOSHIELD
	09	LPG, ACETYLENE
	10	VARIOUS CHEMICALS (REFER TO HAZARDOUS SUBSTANCE SPREADSHEET FOR DETAILS)
	11	VARIOUS CHEMICALS (REFER TO HAZARDOUS SUBSTANCE SPREADSHEET FOR DETAILS)
SLAG HANDLING AREA (LOCATION NOT SHOWN ON MAP)		EXPLOSIVES

Figure 4.4 *Project Area*

5. Preliminary risk screening and emissions

5.1 Dangerous goods storage

5.1.1 Construction

A summary of the chemicals used and/or stored on-site during construction of the project is shown in Table 5.1. During construction it is assumed that minimal storage of chemicals will occur, and no stockpiling will occur (just-in-time use). The maximum expected quantity and DG classification are provided in Table 5.1.

Table 5.1 Construction chemicals

Product Name	UN number	DG Class	Packing group (PG)	SUB RISK/S	Maximum Quantity (kg)
Bottled Gases					
Oxygen	1072	2.2		5.1	729
LPG	1075	2.1			180
Acetylene	1001	2.1			249
Argon	1006	2.2			922
Argoshield	1956	2.2			944
Nitrogen	1066	2.2			906
Medical air		2.2			559
Miscellaneous					
Paint (spray cans)	various	2.1			50
Paint (liquid)	various	3	II		500
Solvents - thinners, MEK	various	3	II		1,000
Diesel	3082	9	III		5,000
Kerosene	1223	3	III		200
Epoxies	various	3	III		500
Welding fluxes	N/A	N/A			50
Adhesives	various	3	III		100
Cleaning agents	various	8	II		1,000
Carbon and ceramic refractory blocks (monolithic and brick)	N/A	N/A			1,300,000
COG residue	N/A	N/A			1,000
BFG residue	N/A	9	III		1,000
Gearbox oil	various	3	III		500
Grease	various	3	III		500
Aircon refrigerant	various	2.2			200
Explosives		1.1			150

The screening thresholds for on-site storage are shown in Table 5.2. Based on the DG class, the SEPP 33 storage thresholds for the construction of the project are exceeded for explosives if storage is unconstrained. It is possible for the storage of explosives to not exceed the thresholds if the location is set back from the boundary (see section 6.2.3 for more details).

Table 5.2 Construction chemical threshold comparison

DG class	Combined storage threshold (tonnes)	Combined quantity (tonne)	Exceedance of SEPP 33 threshold
1.1	0.1	0.15	Fail (exceeds the threshold)
2.1	0.5	0.25	Pass (does not exceed)
2.1 (LPG)	10	0.18	Pass (does not exceed)
2.2	None	3.33	Pass (excluded) *
3 - II	5	1.50	Pass (does not exceed)
3 - III	5	2.20	Pass (does not exceed)
5.1	5	0.73	Pass (does not exceed)
8 - II	25	1.0	Pass (does not exceed)
9 - III	None	6.0	Pass (excluded) *

* This refers to dangerous goods that SEPP 33 has excluded from requiring a threshold quantity.

5.1.2 Operation

A summary of the chemicals used and/or stored on-site during operation of the project is shown in Table 5.3. Assumptions have been made about the usage of these chemicals on-site. The DG classification and the quantities have also been provided in Table 5.3.

Table 5.3 Operational chemicals

Product Name	UN number	DG Class	PG	SUB RISK/S	Quantity (kg)
Water Treatment Chemicals					
NALCO® 1392	3265	8	III		1500
ACTI-BROM 7342	N/A	N/A			1500
HI-TEX 82220	N/A	N/A			4500
CAT-FLOC 8103 PLUS	N/A	N/A			1500
Sodium Hypochlorite 12.5% Solution	1791	8	II		3450
Caustic soda - Liquid (46% - 50%)	1824	8	II		18000
Furnace Cooling Chemicals					
Nalco 8338	3266	8	III		354
Nalco 8338	3266	8	III		2596
Nalco 8338	3266	8	III		354
Manufacturing Bottled Gases					
Air Compressed		2.2			121
Oxygen Compressed	1072	2.2		5.1	541.6
HANDIGAS (LPG)	1075	2.1			90
Acetylene	1001	2.1			444
HELIUM COMPRESSED	1046	2.2			25.35
Piped Gases					
COG	1023	2.3		2.1	No storage vessels onsite
BFG	1953	2.3		2.1	No storage vessels onsite

Product Name	UN number	DG Class	PG	SUB RISK/S	Quantity (kg)
Natural gas	1971	2.1			No storage vessels onsite
Oxygen	1072	2.2		5.1	No storage vessels onsite
Nitrogen	1066	2.2			No storage vessels onsite
Miscellaneous					
CIGWELD COMWELD BRONZE FLUX	1458	5.1	III		20
CONCRESIVE 2530 (B)	2735	8	III		20
Gearbox oil	various	3	III		1,000
Grease	various	3	III		1,000
KEROSENE	1223	3	III		160
WHITE KNIGHT SQUIRTS GLOSS BLACK AEROSOL	1950	2.1			6
WORMALD HFC-227EA (WORMALD HFC-227EA)	3296	2.2			No storage vessels onsite
BELZONA® 2921 (ELASTOMER GP CONDITIONER)	1193	3	II		20
BELZONA® 2211 (MP HI-BUILD ELASTOMER) SOLIDIFIER	3082	9	III		20

The screening thresholds for on-site storage are shown in Table 5.4. Based on the DG class, the SEPP 33 storage thresholds for operation of the project are not exceeded for any chemical.

Table 5.4 Operation chemical threshold comparison

DG class	Combined storage threshold (tonnes)	Combined quantity (tonne)	Exceedance of SEPP 33 threshold
2.1	0.5	0.45	Pass (does not exceed)
2.1 (LPG)	10	0.09	Pass (does not exceed)
2.2	None	0.69	Pass (excluded) *
3 - II	5	0.02	Pass (does not exceed)
3 - III	5	2.16	Pass (does not exceed)
5.1	5	0.56	Pass (does not exceed)
8 - II	25	21.5	Pass (does not exceed)
8 - III	50	4.8	Pass (does not exceed)
9 - III	None	0.02	Pass (excluded) *

* This refers to dangerous goods that SEPP 33 has excluded from requiring a threshold quantity.

5.2 Transport screening

5.2.1 Construction of the project

It is assumed that during construction of the project, there would be low volumes of DGs stored in the construction compounds, using a just-in-time usage regime. Therefore, the transportation volumes of chemicals during construction are considered minimal. The transport screening minimum threshold for any DG vehicle movements is 100 per year. Based on this, the SEPP 33 transport thresholds for construction of the project are not exceeded. In accordance with the requirements of SEPP 33, BlueScope will undertake further consultation with DPIE regarding the proposed transport and handling arrangement associated with the project.

5.2.2 Operation of project

Transport of DGs during operation of the project is expected to follow similar patterns to current blast furnace operations. As such, the transportation screening thresholds for operation are not exceeded. At this stage of the project's development, it is assumed that DGs would primarily access the site via Springhill Road from Port Kembla.

5.3 Summary of risk screening results

The results of the dangerous goods and transport screening indicate that the project does not exceed any of the thresholds for operation but does exceed the thresholds for storage of explosives during construction. Given the use of explosives during construction, the project has been considered 'potentially hazardous' and a PHA has been prepared.

5.4 Amenity overview

Assessments of the air quality, and noise and vibration impact of the project have been completed as part of the EIS, as the development is 'potentially offensive'.

5.4.1 Air quality assessment

The air quality assessment results predict minor criteria exceedances at receptors located across the study area. Exceedances as a result of the project are incremental and for some pollutants, such as particulate matter, have been modelled to occur as a result of elevated background levels. Overall the air quality assessment found that the operation of 6BF would result in a net reduction of emissions to air as a result of environmental control improvements proposed as part of the project. Emissions can be managed through appropriate selection of construction equipment, compliance monitoring in accordance with the site Environmental Protection Licence (EPL) and community engagement. The results of the air quality assessment are detailed in Appendix C of the EIS.

5.4.2 Noise and vibration impact assessment

The noise and vibration impact assessment results indicate that the predicted noise levels during construction of the project would meet noise management levels (NML) for most construction scenarios during standard hours and outside of standard hours. Some high noise intensity but short duration works such as pile driving and blasting may result in exceedances of the NMLs at some receivers. The assessment is dependent on the location and intensity of construction activities and has recommended locations for activities to minimise noise impacts at sensitive receptors. Reasonable and feasible management measures including consulting with potentially impacted residents have been recommended to manage these impacts.

For operations, the predicted noise levels at residences against project noise trigger levels indicate compliance with the requirements subsequent to the incorporation of mitigation measures to reduce noise levels at the source. Generally speaking, operational noise from 6BF will be similar to noise currently generated by 5BF. The results of the noise and vibration impact assessment are detailed in Appendix D of the EIS.

5.5 Summary of emissions results

The results from the air quality, and noise and vibration assessments indicate that if appropriate control measures are in place during construction and operation, the project will minimise the impact of the relevant amenity criteria. Over the lifecycle of the project, and with safeguards, the project is not expected to release a significant quantity of pollutant emissions and is not considered to be an ‘offensive industry’.

6. Preliminary hazard analysis

The results of the SEPP 33 screening indicate that due to the quantity of explosives stored on site during construction, a PHA is required. It is considered that there is potential for moderately serious harm, and a Level 2 PHA is appropriate.

A Level 2 PHA uses a semi-quantitative approach based on comprehensive hazard identification to demonstrate that the activity does not pose a significant risk. The PHA follows the process shown in Figure 6.1, which complies with the Department of Planning's *Multi-level Risk Assessment Guideline*.

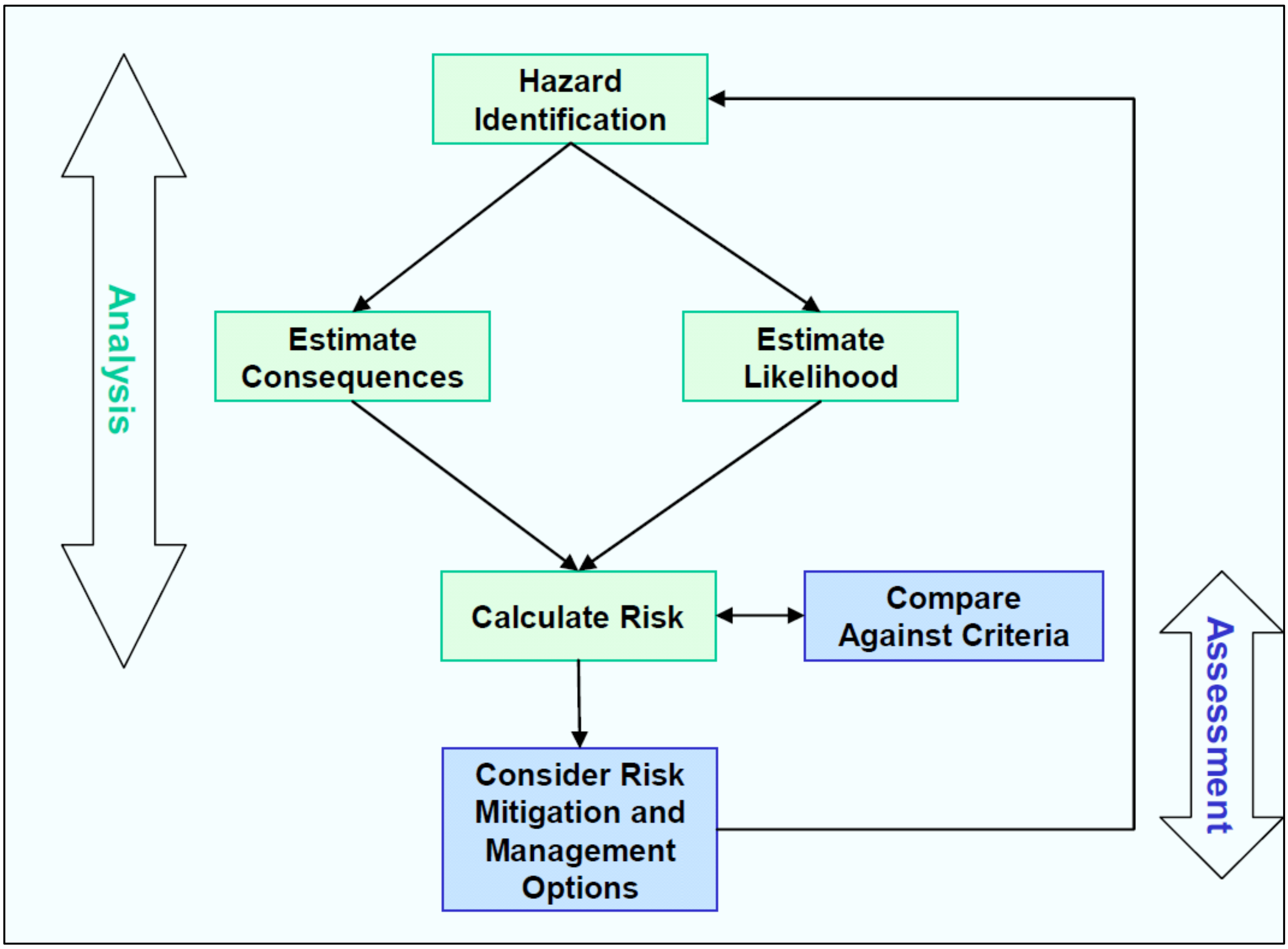

Figure 6.1 PHA process

6.1 Hazard identification

The results of the hazard identification are provided in Table 6.1. The hazard identification was conducted as a desktop study and focussed specifically on both the construction and operation activities of the project. Safeguards are also outlined in Table 6.1 and are required to ensure the risk scenarios that were identified are contained or at least controlled to an acceptable level.

Table 6.1 Hazard identification list

Hazard scenario	Causes	Consequence	Further assessment to assess potential off-site impacts	Identified/ recommended safeguards
Vehicle interactions	Vehicle movements in vicinity of personnel	Personal injury	No	Traffic management plan including standard traffic rules, signage Site speed limits One way traffic movement through the site for delivery vehicles Designated pedestrian areas Driver competency Construction management plan
Natural hazards	Flooding, earthquake, lightning	Personal injury Plant shut down Possible fire	No	Structures and tanks designed to appropriate codes and standards Housekeeping standards Site drainage
External fire (adjacent to site)	Fire or explosion from adjacent land users	Asset damage Plant shut down Personal injury	No	Site fuel management Buildings designed to appropriate codes Fire protection systems Housekeeping standards
Furnace explosion	Incorrect fuel / air mix Internal water leak	Asset damage Personal injury	No	Standard operating procedures Closed loop cooling system with leak detection system Process monitoring systems Gas Safety Regulations, training and accreditations based on AS3814 (Industrial and Commercial Gas Fired Appliances) and AS1375 (Industrial Fuel Fired Appliances)
Molten metal spill	Splash Loss of containment	Asset damage Personal injury	No	Standard operating procedures Maintenance and inspection strategies Furnace operation training and accreditations for personnel Plant and process design
Molten metal explosion	Contact with water	Asset damage Personal injury	Yes	Closed loop cooling system with leak detection system Standard operating procedures Maintenance and inspection strategies Furnace operation training and accreditations for personnel Plant and process design
Flammable gas leak and ignition	Fire or explosion following a fuel gas leak due: – Failure/ damage of pipework – Failure/ damage of cylinders – Impact damage – Corrosion	Asset damage Personal injury	Yes	Barriers erected around gas pipe in key areas Pressure piping and pressure vessel design Standard operating procedures Maintenance and inspection strategies

Hazard scenario	Causes	Consequence	Further assessment to assess potential off-site impacts	Identified/ recommended safeguards
Use/ handling of explosives	Removal of furnace skull	Asset damage Personal injury	Yes	Licenced explosives contractor Handling procedures Safe Working Method Statement Use as minimal amounts as possible Containment (within blast furnace)
Loss of containment of chemicals, including dangerous goods	Damage to storage containers e.g. due to external impact Corrosion Wear & tear	Environmental damage Personal injury	No	Purpose designed chemical store, including bunds Inspection and maintenance strategies Handling procedures Standard operating procedures Spill kits
Contact with chemicals, including dangerous goods	Transfer and handling	Personal injury	No	Transfer and handling procedures Standard operating procedures PPE
Toxic release	Failure/ damage of pipework	Personal injury	Yes	Safe piping design Inspection and maintenance strategies

6.2 Hazardous materials

Based on the results of the hazard identification, the following scenarios may have the potential for off-site impacts:

- Fire/explosion from the natural gas supply
- Fire/explosion from self-generated gas (coke ovens gas)
- Explosion from molten metal and water
- Discharge of toxic dust and/or fumes (blast furnace gas and coke ovens gas)
- Use/handling of explosives

6.2.1 Natural gas

Fire/explosion incident resulting from leaks in the gas supply branch pipeline extending from the gas mains to the on-site gas reducing station could result in high heat radiation levels with potential for off-site impacts. However, the likelihood of this occurring is low as the pipeline is on an elevated pipe corridor, fully welded and situated in a controlled industrial environment. Additionally, whilst the location of the fuel gas will move from 5BF to 6BF, there is no fundamental change in the quantity of fuel gas on site. The potential hazards associated with the quantity of fuel gas on site have been considered previously in applications for consent. As such it is not considered in the consequence analysis.

At the gas reducing station (ground level), the pressure is reduced from the feed pressure of 1,140 kPag to a value of 400 kPag downstream in the reticulation system for gas appliance usage and 15 kPag for the stoves.

The worst-case scenario considered is that of an ignited gas release occurring at the gas reducing station. The reducing station is considered to have the highest potential risk because of the pressure and exposure to surrounding activities. Likely leak sources include piping connections and flanges. With the elevated pipe corridor, the potential for damage by impact from a vehicle on internal roads is limited to the reducing station, so is not considered beyond this location.

6.2.2 Molten metal

The scenario of a molten metal-water explosion resulting from water contacting molten metal in a furnace could conceivably occur if moisture was accidentally introduced (from a leak in a cooling element). Outside of the furnace, a molten metal-water explosion could occur if moisture or pooled water contacts molten metal or slag during transfer processes. There are documented molten metal-water explosions, with associated fatalities, in the metal processing industry e.g. Aluminium Association data compiled in the past 19 years shows 25 severe molten aluminium-water explosions with 19 associated fatalities (Jacoby 2000), although it is noted that steel molten metal explosions may not be as severe as aluminium molten metal explosions (Tabatabei and Turner 2009).

Both iron and steel molten metal explosions have occurred previously on site, which have resulted in projectiles impacting and/or penetrating building walls but have not impacted locations at or beyond the site boundary. As such, missile effects off-site are not considered further. Impurities if present could also increase the risk of explosion. It is considered that most of the effects of the above scenarios would be limited to the site, however, given the possibility of overpressure impacts off-site, limited quantitative analysis was conducted. Whilst molten metal explosions can occur both inside and outside of the furnace, the analysis has focused only on the interior furnace explosion as the confined nature of the furnace as opposed to the semi-confined, more open nature outside, will result in a higher explosion efficiency with correspondingly larger consequences, however will still not have offsite impacts.

6.2.3 Explosives

Blasting is expected to be undertaken to remove the salamander material retained inside the 6BF hearth should the ability to remove this material by mechanical means such as jack hammer mounted excavator prove insufficient. It is estimated that 500 tonnes of residual iron skull/salamander material must be removed. Based on this, it is assumed that the maximum quantity of explosives stored on site at any point in time during construction is 150 kg. To comply with DG storage thresholds, it is recommended that the explosives are stored at least 90 metres from the site boundary. If explosives storage is near 6BF, it is recommended that storage is an appropriate distance away from any blasting activities and in accordance with AS 2187.1 - *Explosive storage, transport and use - storage*. As the storage location can be 90 metres from any boundary given size of PKSW and the location of 6BF, the offsite risk is negligible, and it is not considered in the consequence analysis.

6.2.4 Blast furnace gas

Blast Furnace Gas is a toxic gas. It comprises of carbon monoxide, carbon dioxide, nitrogen, water vapour and hydrogen. A failure in the pipework or associated fittings could result in a potential release to the atmosphere. There are a number of engineering controls designed to reduce this likelihood to rare. Additionally, whilst the location of the blast furnace gas will move from 5BF to 6BF, there is no fundamental change in the quantity of blast furnace gas on site. The potential hazards associated with the quantity of blast furnace gas on site have been considered previously in applications for consent. Blast Furnace Gas will have a localised toxic effect and the offsite risk is negligible, so is not considered in the consequence analysis.

6.2.5 Coke ovens gas

Coke Ovens Gas is a flammable and toxic gas. It is a composition of hydrogen, methane, carbon monoxide, carbon dioxide, nitrogen, ethylene, ethane, benzene, toluene, hydrogen sulphide and trace amounts of acetylene. A failure in the pipework or associated fittings could result in a potential release to the atmosphere. There are a number of engineering controls designed to reduce this likelihood to rare. Additionally, whilst the location of the coke ovens gas will move from 5BF to 6BF, there is no fundamental change in the quantity of coke ovens gas on site. The potential hazards associated with the quantity of coke ovens gas on site have been considered previously in applications for consent. Coke Ovens Gas will also have a localised toxic effect, but the offsite risk is negligible, so is not considered in the consequence analysis. However, given the possibility of overpressure impacts off-site, limited quantitative analysis was conducted.

6.3 Hazard scenarios

The following scenarios were identified as being worthy of further analysis:

- Flange leak (5 mm) in the above-ground section of the 50 mm gas branch pipeline (11.4 barg) at the gas reducing station
- Split (50 mm) to the 100 mm fuel gas piping connection on the gas reducing station outlet (4 barg)
- Rupture (50 mm) to the above-ground section of the 500 mm gas branch pipeline (11.4 barg) at the gas reducing station by vehicle impact
- Explosion resulting from the contacting of molten metal and 100 litres of water (cooling system leak) in a furnace
- Coke ovens gas connection leak (10 mm) to the 400 mm pipeline (0.14 barg)
- Coke ovens gas pipe split (200 mm) to the 400 mm pipeline (0.14 barg)

Smaller leaks from the natural gas fuel supply and the piped coke ovens gas are also possible but will have consequences less than the hazard scenarios analysed. As such they have not been considered in this PHA.

6.4 Consequence determination

The release, dispersion and flammable effect for natural gas pipeline/fitting leaks, vehicle impact to the natural gas reducing station and molten metal – water explosions are calculated using the appropriate textbook calculations (see Appendix A). A description of the consequence conditions employed is provided in Table 6.2.

For coke ovens gas releases, the release, dispersion and flammable effects are performed using PHAST (Process Hazard Analysis Software Tool) 8.4, a commercial software package. PHAST 8.4 package models have been extensively utilised, and a description of the consequence models employed is provided in Appendix B.

It should be noted that consequence modelling is not the same as risk modelling. Consequence modelling only represents the impact zone that would be affected if a release should occur. It does not consider the following important risk considerations:

- Likelihood of a release, i.e. a leak frequency
- Probability of a wind direction towards a particular location

6.4.1 Assumptions

The conditions outlined in Table 6.2 and Table 6.3 were used in the consequence determination.

Table 6.2 Conditions for textbook calculations

Condition	Natural Gas (methane)		Molten Metal
Temperature	20 °C	20 °C	1,500 °C
Storage pressure	inlet – 11.4 bar gauge	outlet – 4 bar gauge	Not applicable
Quantity	continuous	continuous	100 kg water

Table 6.3 Conditions for PHAST modelling

Condition	Coke Ovens Gas		
Composition (vol/vol) for modelling	Hydrogen Methane Carbon monoxide Carbon dioxide Nitrogen Ethylene Ethane Benzene Hydrogen Sulphide	62.0% 26.5% 5.6% 1.9% 1.2% 1.0% 1.0% 0.6% 0.2%	0.1742 kg 0.5532 kg 0.2039 kg 0.1094 kg 0.0394 kg 0.0437 kg 0.0395 kg 0.0065 kg 0.0009 kg
Temperature	20 °C		
Pipeline pressure	0.14 bar gauge		
Pipeline internal diameter	400 mm		
Quantity	continuous, 1.9 kg/s (21,000 m^3/hr)		
Surface roughness	1 m (regular large obstacle coverage)		
Weather conditions	1.5 / F (stable night time conditions with light wind and moderate clouds) 20 °C		

6.4.2 Results

A summary of the determined consequences is provided in Table 6.4 and Table 6.5. The consequences are worst case scenarios as they assume no intervention to limit the release. For the leak scenarios some level of intervention would be expected. As such, the contours can be considered conservative.

Table 6.4 Summary of heat radiation consequences

Release Scenario	Maximum Distance Downwind of Release to Heat Radiation (m)		
	4.7 kW/m^2 (injury)	12.6 kW/m^2 (fatality)	23 kW/m^2 (property damage)
Natural gas pipeline (inlet pipeline of gas reducing station) – flange leak	5.1	4.0	3.5
Natural gas pipeline (outlet pipeline of gas reducing station) – pipe split	31.1	24.6	21.9
Natural gas pipeline (inlet pipeline of gas reducing station) – vehicle strike pipe rupture	48.6	38.5	34.3
Coke ovens gas pipeline – connection leak	Does not reach level	Does not reach level	Does not reach level
Coke ovens gas pipeline – connection split	26.9	21.7	18.2

Details of the calculations are in Appendix A.

Table 6.5 Summary of overpressure consequences

Release Scenario	Maximum Distance Downwind of Release to Overpressure (m)		
	0.07 bar (injury)	0.14 bar (property damage)	0.21 bar (fatality)
Molten metal – water contact	100.0	68.0	48.0
Coke ovens gas pipeline – connection split (delayed explosion)	38.8	30.8	28.1

Details of the calculations are in Appendix A.

None of the consequence distances extend beyond the boundary and there is no off-site impact. All scenarios have the potential to affect the on-site worker population.

6.5 Likelihood estimation

The likelihood of the worst-case scenarios resulting in a fatality or injury was calculated using an event tree. The assignment of the frequency and probability values has been made based on industry failure frequencies, specialist risk management judgement and the quantified consequences.

It is important to note that the determination of 'absolute values' for assigned probabilities is less important than consistently using 'comparative' or 'relative' values. The overall aim is to provide a ranking to compare with risk criteria.

A summary of the results is shown in Table 6.6 and Table 6.7. As no consequences reach off-site, these frequencies are not included.

Table 6.6 On-site jet fire frequencies

Scenario	Natural Gas Flange Leak	Natural Gas Pipe Split	Natural Gas Vehicle Impact	Coke Ovens Gas Connection Leak	Coke Ovens Gas Pipe Split
Frequency of gas release (per annum)	5.00×10^{-06}	6.70×10^{-07}	1.10×10^{-08}	1.60×10^{-06}	6.5×10^{-08}
Frequency of jet fire (per annum)	5.00×10^{-09}	1.27×10^{-09}	3.24×10^{-09}	1.60×10^{-09}	1.24×10^{-10}
Frequency of fatality (per annum)	5.00×10^{-10}	1.02×10^{-09}	2.91×10^{-09}	0.00	9.88×10^{-11}

Details of the calculations are provided in Appendix C.

Table 6.7 On-site explosion frequencies

Scenario	Molten Metal – Water Interaction	Coke Ovens Gas Pipe Split
Frequency of explosion (per annum)	1.00×10^{-06}	6.50×10^{-08}
Frequency of fatality (per annum)	8.00×10^{-07}	4.16×10^{-08}

Details of the calculations are provided in Appendix C.

6.6 Risk assessment

A summary of the compliance of all the events with the relevant risk criteria from HIPAP 4 is provided in Table 6.8. This assessment shows that the project will comply with the risk criteria.

Table 6.8 Risk criteria compliance

Event	Individual Fatality Risk	One Injury / Fatality every X Years	HIPAP Risk Criteria	Compliance
Fire and explosion scenarios with property damage offsite	0.00	–	5.00×10^{-05}	Complies
Fire and explosion scenarios with serious injury to offsite people	0.00	–	5.00×10^{-05}	Complies
Fire and explosion scenarios with fatality of offsite people	0.00	–	1.00×10^{-06}	Complies
Fire and explosion scenarios with fatality of onsite personnel	8.46×10^{-07}	1,200,000	5.00×10^{-05}	Complies

7. Recommendations

It is recommended that management procedures be implemented that incorporate practices that will prevent risk scenarios occurring through:

- Inspection and maintenance regime for the gas reducing station, the coke ovens gas and the blast furnace gas pipework and associated fittings
- Separation, or tightly controlled usage, of water around the furnace areas, including procedures/training regarding the expectations for management of water leaks
- Furnace design to avoid inadvertent water leakage into the furnace areas
- Inspection and maintenance regime for furnace closed water systems
- Bollards or equivalent to protect ground level fuel gas infrastructure such as the natural gas reducing station

Explosives being stored at least 90 metres from the site boundary. It is important to note that any new equipment should have procedures developed for safe operation. This is particularly important for the operation of any new fixed or mobile machinery to prevent injury to people.

Any changes to the assumptions used in this report should result in a review of the PHA and updates as required.

7.1 Explosives management

Explosives will be used on site during construction as part of skull breaking activities in the blast furnace.

Explosives should be stored in a non-ferrous receptacle clearly marked ‘Explosives’ that is kept closed and locked (except during use by authorised personnel) and stored in the original containers which are securely sealed. The storage area should be a well-ventilated magazine licenced for Class 1.1 explosives, which protects the explosives from the weather, contamination, sources of ignition and access from unauthorised individuals. Storage should be isolated from other dangerous good stores and the area free of debris, waste and combustibles. The explosives containers should be protected against physical damage and regularly checked for spills and leaks.

Magazines are required to comply with the requirements of AS 2187.1 *Explosives – Storage, transport and use – Storage* which addresses issues with design and location of the magazine, security, inventory and management of the explosives, and safety concerns.

Where more than 2.5 kg of Class 1.1 explosives are stored on a site, every perimeter entrance to the designated construction site must be labelled with a ‘Hazchem’ placard in accordance with the Explosives Regulations. Adequate security needs to be provided for the explosives storage area, and only those who are authorised for unsupervised access to the area may have means to unlock the explosive storage magazine.

Limited quantities of explosives are expected to be stored on site at any one time, however, at the storage area and during use, there shall be no smoking, naked light, heat or ignition source present. The explosives stock should be rotated to prevent ageing (use on first in-first out basis).

7.2 Emergency management

In order to manage emergency situations that may arise as part of the project, an Emergency Response Plan will be developed. The response plan will include as a minimum:

- Details of each of the hazard scenarios as identified in Section 6.3 of this report
- Details of the risks associated with each of these scenarios
- Emergency response plans detailing measures to be undertaken should an emergency scenario eventuate

BlueScope has significant experience in managing risks associated with blast furnace operation and currently operates 5BF in accordance with an existing Emergency Response Plan. An Emergency Response Plan was in place at 6BF during its previous campaign, and therefore has well established protocols in place to manage the identified risks.

8. Conclusions

This report includes a preliminary risk screening of the project in accordance with the requirements of SEPP 33. The results of the dangerous goods screening indicate that the project does exceed the thresholds within the SEPP 33 requirements for dangerous good storage, specifically class 1 (explosive) chemicals, however the results of the transport screening do not exceed the dangerous good movement thresholds. As a result, the project is deemed a ‘potentially hazardous industry’.

The intent during construction is that there would be low volumes of dangerous goods stored in construction compounds, using a just-in-time usage regime.

A qualitative hazard identification study was completed as a systematic way to identify any potential offsite impacts, during construction and operation. The hazard identification study identified the following hazards with the potential for offsite impact, all of which can be suitably controlled:

- Furnace molten metal explosion
- Natural gas leak and ignition
- Coke ovens gas leak and ignition
- Use/ handling of explosives
- Toxic release

Of these impacts, three were considered serious enough that further analysis was warranted; specifically furnace molten metal explosions, coke ovens gas leaks and ignition and natural gas leaks and ignition. The assessment showed that there was no off-site impact and that the risk complies to HIPAP 4 risk criteria.

All risks identified can be managed to tolerable levels provided the safeguards identified (see Table 6.1) are enacted.

The hazard identification study demonstrates that the project could be designed, constructed and operated in a manner that will meet relevant regulations, standards and policies.

Assessments of the air quality, and noise and vibration impact of the project have been completed as part of the EIS, as the development is ‘potentially offensive’. The results from the air quality and noise and vibration assessments indicate that if appropriate control measures are in place during construction and operation, the project will minimise the impact of the relevant amenity criteria. Over the lifecycle of the project, and with safeguards, the project is not expected to release a significant quantity of pollutant emissions and is not considered to be an ‘offensive industry’.

9. References

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Appendix A

Consequence Calculation Summary

A-1 Introduction

The consequences of selected hazard scenarios identified in section 6.3 of the report are calculated in the following sections. Namely:

- Jet fire resulting from a natural gas release (flange leak and pipe split)
- Molten metal – water explosion (moisture from water bottle into a furnace)

A-2 Jet fire

The models used to calculate the magnitude and radiation levels of the resulting jet fire scenarios are presented in Lees (1996).

The scenarios considered are:

- Flange leak (5 mm) in the above-ground section of the 50 mm gas branch pipeline (11.4 barg) at the gas reducing station
- Split (50 mm) to the 100 mm fuel gas piping connection on the gas reducing station outlet (4 barg)

Failure of the pipe or connection will result in a sustained release of gas under pressure, potentially resulting in a jet fire. For the purposes of the calculations, it is assumed that the fire is based on the formation of an unobstructed, turbulent free jet.

A-3 Jet fire gas flow

Gas flow from both the high pressure sections of the facility (approximately 11 barg on the inlet to the metering station and 4 barg on the outlet respectively) is critical, i.e. sonic or choked.

The discharge rate (*G*) is calculated using the following formula from Coulson *et al* (1999).

$$\boldsymbol{G = C_d A_r P_1 \left[\left(\frac{M\,\gamma}{R\,T_1} \right) \left(\frac{2}{\gamma + 1} \right)^{\left(\frac{\gamma+1}{\gamma-1} \right)} \right]^{1/2}}$$

Where:

C_d = discharge coefficient (assumed 0.61)

A_r = effective open area (m^2)

P_1 = initial release pressure (Pa)

M = molecular weight (assumed methane, 0.016 kg/mol)

R = universal gas constant (8.314 J/mol.K)

T_1 = initial release temperature

γ = Specific heat ratio, assumed 1.4

A-4 Jet fire magnitude

It is generally assumed that the flame will have approximately the same length as an unignited jet. The shape of the gas jet release and the resultant jet fire can be approximately predicted using models from TNO (1979). The jet is modelled as a long cylinder at ambient conditions.

The jet diameter (d_f) is given by:

$$d_f = \frac{D_o}{2\, K_1 \sqrt{b_2}}$$

$$K_1 = \left(\frac{0.32\, \rho_a}{\sqrt{\rho_o}}\right) \left(\frac{b_1}{b_1 + b_2}\right) j$$

$$b_1 = 50.5 + 48.2\, \rho_a - 9.95\, \rho_a^2$$

$$b_2 = 23 + 41\, \rho_a$$

Where

D_o = diameter of the rupture in gas flow calculations (m)

ρ_o = density of gas at outflow conditions (kg/m^3)

ρ_a = density of gas at ambient conditions (kg/m^3)

j = composition at the end of the flare, assumed 0.05 vol fraction (LEL)

The flow is assumed to reach ambient conditions instantaneously so the jet diameter can be considered as being coincident with the discharge point.

The jet length (L_f) is given by:

$$L_f = \frac{D_o}{K_1}$$

A-5 Jet fire radiation

The model used for calculation of the radiation from the jet fire is from Lees (1999) and is an extension of the model from API RP521 'Flare Radiation'.

The radiated heat from the midpoint on the flare centerline (Q_p) is given by:

$$Q_p = n\, G\, H_c$$

Where

n = efficiency factor, assumed 0.35

G = total gas release rate (kg/s)

H_c = heat of combustion (kJ/kg)

The heat radiation (I) from the midpoint on the flare centreline to a receptor at distance (x) is given by:

$$I = \frac{\tau_g\, Q_p}{4\, \pi\, x^2}$$

$$\tau_g = 1 - 0.0565 \ln x$$

A-6 Jet fire results

The results of the consequence analysis are summarised below.

Table A.1 Jet fire results

Scenarios	Flange Leak	Pipe Split	Vehicle Impact
Release Duration (min)	Continuous	Continuous	Continuous
Release hole size (m)	0.005	0.05	0.05
Release area A_r (m^2)	0.0000196	0.00196	0.00196
Pressure P_1 (Pa)	1,241,325	501,325	1,241,325
Temperature T_1 (K)	293.15	293.15	293.15
Methane molecular weight M (kg/mol)	0.016	0.016	0.016
Universal gas constant R	8.314	8.314	8.314
Gas Flow Rate G (kg/s)	0.026	1.053	2.608
ρ_o (kg/m^3)	8.290	3.308	8.190
ρ_a (kg/m^3)	0.666	0.666	0.666
K_1	0.00225	0.00357	0.00227
Jet Fire Diameter d_f (m)	0.156	0.988	0.988
Jet Fire Length L_f (m)	2.2	14.0	22.1
Radiation Q_p (kW)	509	20,537	50,851
Distance (m) to heat radiation I of 23 kW/m^2	3.5	21.9	34.3
Distance (m) to heat radiation I of 12.6 kW/m^2	4.0	24.6	38.5
Distance (m) to heat radiation I of 4.7 kW/m^2	5.1	31.1	48.6

A-7 Explosion

The scenario considered is:

– Explosion resulting from the contacting of molten metal and water in a furnace.

The scenario considered is that of 100 kg of water (0.1 m^3) contacting molten metal in a furnace. The process is considered in two steps; firstly, the water is heated at constant volume to 1772 K, resulting in a large pressure build up; secondly, the resultant vapor undergoes a reversible isothermal expansion to atmospheric pressure.

The initial pressure (P_s) of the vapor after the first step is calculated using the ideal gas equation.

$$P_s = \frac{n\,R\,T}{V}$$

Where

P_s = pressure (Pa)

n = number of moles of gas

R = universal gas constant (8.314 J/mol.K)

T = temperature of the gas (K)

V = initial volume of gas (m^3)

The ideal work resulting from the second step is calculated using the following formula from Sandler (1999).

$$\boldsymbol{W = n\,R\,T\ln\frac{P_S}{P_E}}$$

Where

W = Work (KJ)

P_S = Initial pressure (Pa)

P_E = Final pressure (Pa)

n = Number of moles of gas

R = Universal gas constant (8.314 J/mol.K)

T = Temperature of the gas (K)

Schubach (1996) suggest an explosive efficiency (energy transferred to shock wave) for a pressure burst explosion of 30% to 40% of the maximum theoretical reversible work output. For the purposes of determining the consequence of a molten metal / water reaction, the worst-case efficiency (40%) is used.

In order to determine the blast overpressure at a distance from the explosion, the graphical correlation between scaled distance (Z) and peak overpressure (P_r) is used as stated in Shin (2015).

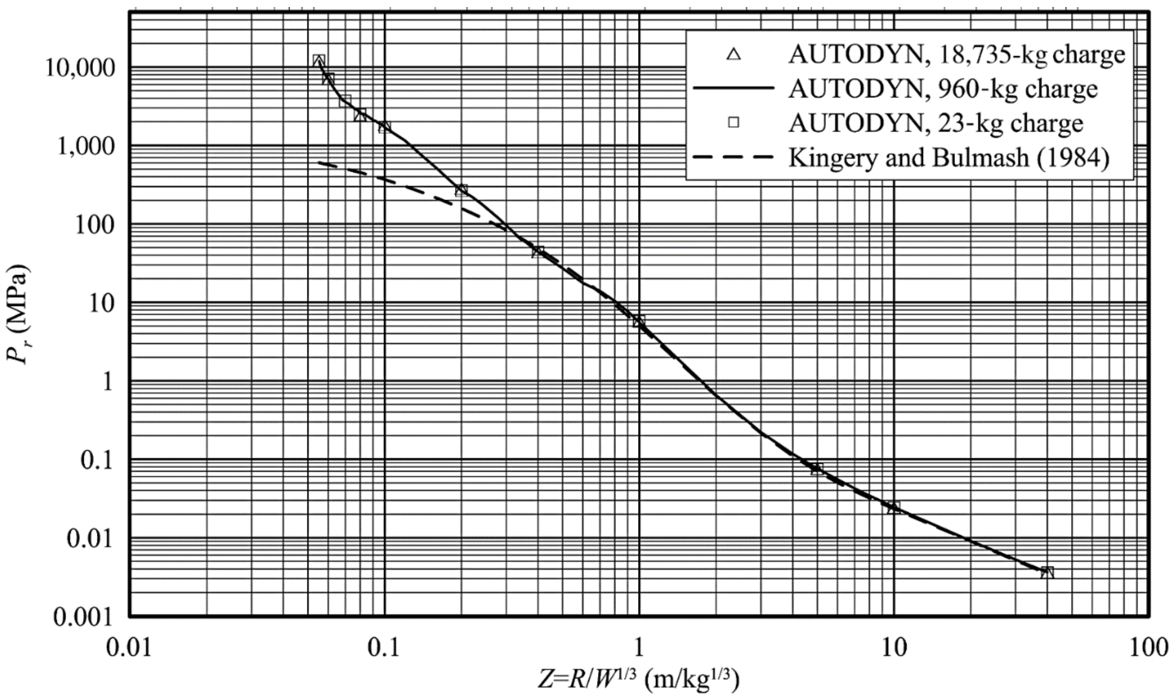

Figure A.1 Reflected peak overpressure versus scaled distance (Shin, 2015)

Once the scaled distance is known, the relationship between the scaled distance (*Z*) and the actual distance (*R*) is used.

$$Z = \frac{R}{W^{1/3}}$$

A-8 Explosion results

The results of the explosive consequence analysis are presented in the tables below.

Table A.2 Work results

Parameter	Value
Mass H_2O (kg)	100.0
H_2O Moles n (mole)	55.6
Temperature T (K)	1772
Universal gas constant R	8.314
Initial Pressure P_B (kPa)	819,122
Final Pressure P_E (kPa)	101.3
Total Theoretical Work W_t (kJ)	737,017
Explosion efficiency	40%
Actual Work W (kJ)	294.8

Table A.3 Explosion results

Peak Overpressure (kPa)	Scaled Distance (m/kg$^{1/3}$)	Actual Distance (m)
3.5	40	159.9
7 (injury)	25	100.0
14 (property damage)	17	68.0
21 (fatality)	12	48.0
35	8	32.0
70	5	20.0

A-9 References

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Appendix B

PHAST Consequence Modelling Summary

B-1 Discharge modelling

If there is a hole in a pipeline, vessel, flange or other piece of process equipment, the fluid inside will be released through the opening, provided the process pressure or static head is higher than ambient pressure. The properties of the fluid upon exiting the hole play a large role in determining consequences, e.g., vapour or liquid, velocity of release etc. Figure B1 illustrates an example scenario.

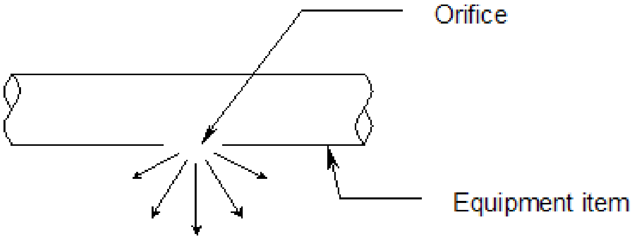

Figure B.1 Typical Discharge

The discharge can be considered to have two stages; the first is expansion from initial storage conditions to orifice conditions, the second from orifice conditions to ambient conditions.

The conditions at the orifice are calculated by assuming isentropic expansion, i.e., entropy before release = entropy at orifice. This allows enthalpy and specific volume at the orifice to be calculated.

The equations for mass flow rate ($\dot{m}$) and discharge velocity (u_0) are then given by:

$$\boldsymbol{\dot{m} = C_d A_0 \rho_0 \sqrt{-2(H_0 - H_i)}}$$

$$\boldsymbol{u_0 = C_d \sqrt{(-2(H_0 - H_i)}}$$

Where:

C_d = Discharge Coefficients

A_0 = Area of the Orifice

ρ_0 = Density of the Material in the Orifice

H_0 = Enthalpy at the Orifice

H_i = Enthalpy at Initial Storage Conditions

The discharge parameters passed forward to the dispersion model are as follows:

- Release height (m) and orientation.
- Thermodynamic data: release temperature (single phase) (°C) or liquid mass fraction (two-phase), initial drop size (m).
- Other data:
  - For instantaneous release: mass of released material (kg), expansion energy (J).
  - For continuous release: release angle (degrees), rate of release (kg/s), release velocity (m/s), release duration (s).

B-2 Dispersion

When a vapour leak occurs, some material will be released into the atmosphere. Upon being released it will start to disperse and dilute into the surrounding atmosphere. The limiting (lowest) concentration of interest is related to flammable and toxic limits for flammable and toxic substances respectively. The model used to determine extent of release is described below, along with some of the key input parameters.

The consequence modelling package SAFETI utilises the Unified Dispersion Model. This models the dispersion following a ground level or elevated two-phase unpressurised or pressurised release. It allows for continuous, instantaneous, constant finite duration and general time varying releases. It includes a unified model for jet, heavy and passive two phase dispersion including possible droplet rain out, pool spreading and re-evaporation.

B-3 Jet dispersion

For a continuous, pressurised release, a vapour is released as a jet, i.e., high momentum release. The jet eventually loses momentum and disperses as a passive cloud. Figure B2 below shows a typical release and the various phases involved.

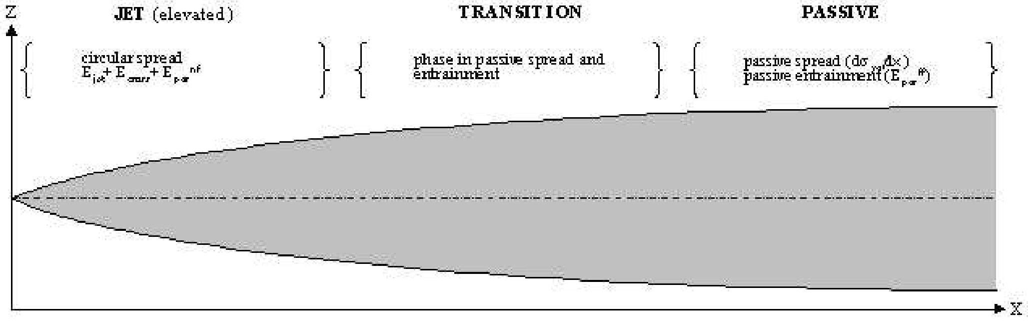

Figure B.2 Jet Dispersion

The cloud is diluted by air entrainment until it eventually reaches the lower limit of concern. During the jet phase, the mixing is turbulent and much air is entrained. In the passive phase, less air is potentially entrained, and it occurs via a different mechanism to the turbulent jet phase. The calculation of the plume therefore depends on many factors, the key parameters being:

- Vapour released, specifically molecular weight
- Discharge conditions including phase(s) of release, velocity etc.
- Atmospheric conditions (a cloud will generally travel further in more stable conditions with lower wind speeds)

B-4 Dispersion from pool evaporation

If a rupture occurs from a drum or vessel containing a liquefied gas, the liquefied gas pools on the ground whilst rapid vaporisation occurs forming a vapour cloud, which ultimately disperses, as a low momentum cloud. Due to the low momentum, the cloud is not turbulent, which is a significant factor in air entrainment and dilution of the cloud. Figure B3 below shows a typical release and some of the inputs into the calculation.

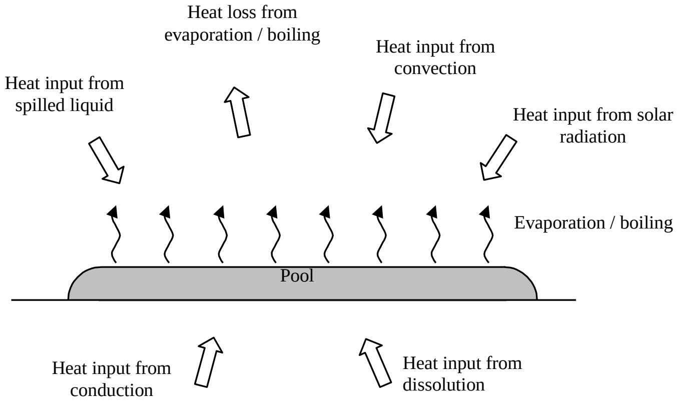

Figure B.3 Pool Evaporation Heat Balance

The rate of the evaporation depends on numerous factors, the most important ones being:

- Surface it is released onto (e.g. its thermal properties and temperature)
- Atmospheric conditions (a cloud will generally travel further in more stable conditions with lower wind speeds)
- Boiling point of the liquid
- Pool size

The concentration of interest is normally related to the toxic limits or specified Emergency Response Planning Guideline (ERPG) limits set for the contained hazardous material.

B-5 Toxic load and probability of death

The toxic load L_{toxic}, for a given component i, is calculated from the concentration of the material at a given position. In the case of a continuous cloud, the concentration does not vary with time and the toxic load is given by:

$$L_{Toxic}\ i\ = t_{exp} \times (f_i C)^{T_N(i)}$$

The probability of death P_{death}, for a given component i, at a given position is calculated from a "probit number", P_i, which is calculated from the "toxic load" and calculated given by the following equations:

$$P(i) = T_A(i) + T_B(i) \ln L_{Toxic}(i)$$

$$P_{Death}(i) = \frac{1}{2}\left\{1 + erf\left[\frac{P(i) - 5}{\sqrt{2}}\right]\right\}$$

Where:

t_{exp} = Exposure Time

f_i = Fraction of the Toxic Component in the Cloud

C = Concentration of the Component at a Given Position

$T_{N(i)}$ = Probit Number N of the Component i

$T_{A(i)}$ = Probit Number N of the Component i

$T_{B(i)}$ = Probit Number N of the Component i

B-6 Flammable effects

If the release is of a flammable material, it is possible for the release to be ignited. The resulting type of fire (e.g. jet, pool, explosion etc.) depends on the physical properties of the release and whether the ignition is immediate or delayed.

B-6-1 Jet fire

Jet fires are a result of high momentum releases. If a flammable release is ignited instantaneously, a jet fire will result. The flame will have a degree of 'lift off' as the flammable mixture has to dilute to be within the flammable limits. This section briefly discusses the model used for jet fires as well as key parameters in the calculation.

The jet fire calculation utilises the Chamberlain model. In this model, jet fires are modelled as a conical flame, with the ignited portion lift off, inclination and shape being determined by the material being released, the pressure at which it is being released and the hole size that it is being released through. These release parameters are the main inputs to the jet fire radiation calculations. Figure B4 below shows a graphical representation of the jet fire model.

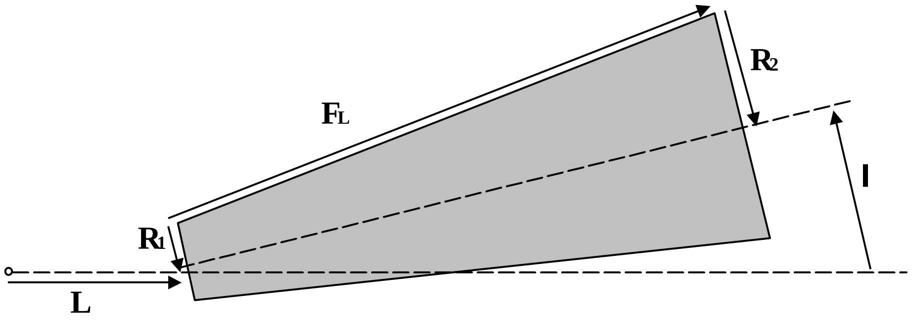

Figure B.4 Truncated Cone Jet Fire Model

Where:

L = Lift off

I = Flame Inclination

R_1 = Flame Base Radius

R_2 = Flame End Radius

F_L = Flame Length

The jet fire calculations model radiation from the entire surface of the ignited portion of the jet. This includes radiation from the cone forming the body of the flame, as well as from the ends of the cone. The amount of radiation that a nearby receiver is exposed to is determined by its distance from the flame surface, as well as by the orientation of the flame relative to the receiver. The key parameters in the calculation of the radiation exposure of a receiver are therefore the flame lift off, the flame inclination, and the dimensions of the ignited portion of the jet (i.e. flame length and end radii).

B-6-2 Fireball model

Fireballs are short-lived flames which generally result from the ignition and combustion of turbulent vapour/two phase (i.e. aerosol) fuels in air. Releases that fuel fireballs are usually near instantaneous and commonly involve the catastrophic failure of pressured vessels/pipelines. Fireballs can dissipate large amounts of thermal radiation which away from their visible boundaries may transmit heat energy that could be hazardous to life and property.

SAFETI uses static models to evaluate fireballs. Static models assume a fireball exists at its maximum size over its lifespan and ignore transient flame characteristics. It provides a conservative flame shape and incident radiation estimates.

The fireball model (Figure B5) determines the flammable mass, fireball duration, radius and lift-off height (height from the centre of the fireball to the ground under the fireball) as well as the surface emissive power to generate the heat radiation effect.

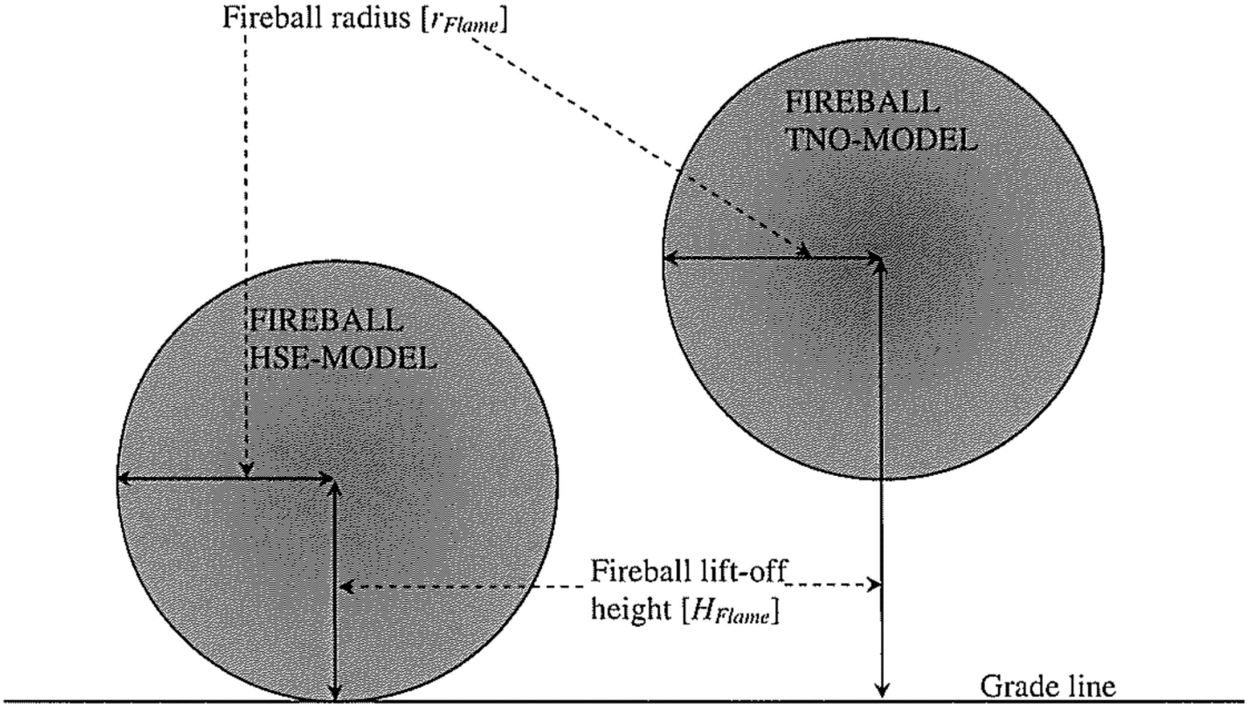

Figure B.5 Fireball Model

B-6-3 Multi energy explosion model

The Multi Energy Model gives overpressure of an explosion as a function of distance from the explosion. The explosion is modelled as a sphere and overpressure is calculated based on scaled distance from the centre. This section explains the key parameters involved in the multi energy model.

The energy released by the explosion, E, is calculated as the product of the mass of fuel in the cloud and the heat of combustion. This assumes a stoichiometric mixture of fuel and air.

The distance scaling factor, S, is related to the energy released by the explosion and the atmospheric pressure by:

$$S = \left[\frac{E}{P_a}\right]^{1/3}$$

The scaled distance r is then given by:

$$r = \frac{d}{S}$$

where d is the actual distance of the receiver from the cloud centre.

To calculate overpressure a set of 10 curves is used. The actual curve used depends on the degree of confinement, with a confinement of 1 being least confined and 10 most confined. Process plants generally have a confinement factor of 7, though it needs to be assessed for each individual process. The graph showing the 10 curves is included in Figure B6.

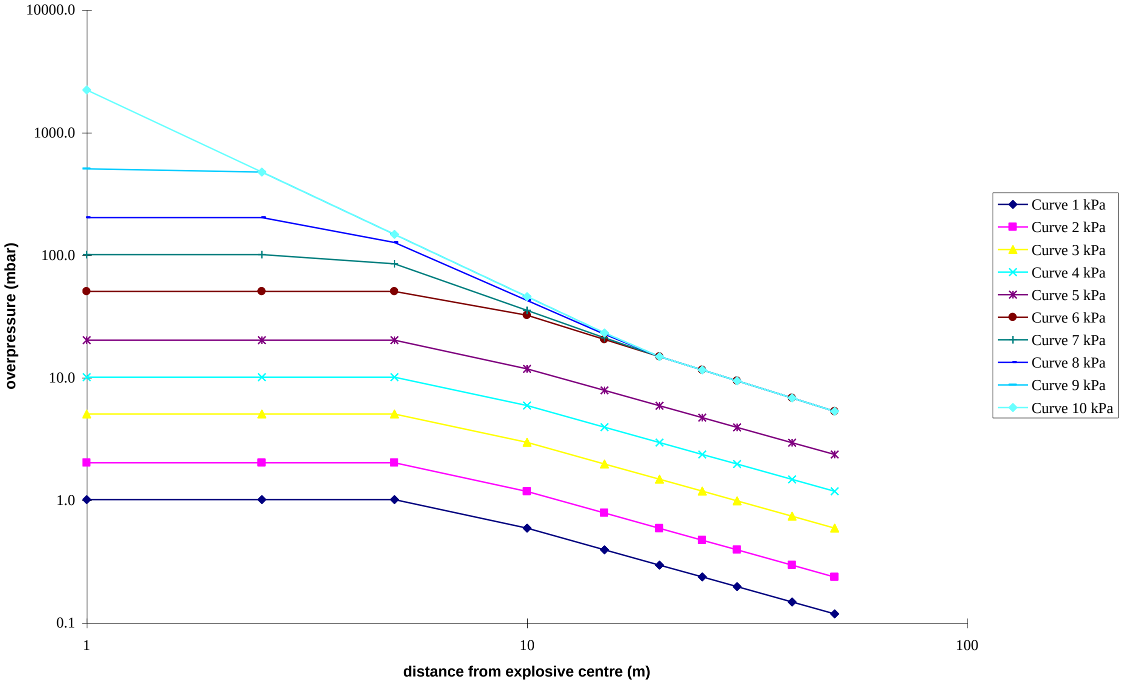

Figure B.6 Multi Energy Curves

B-7 References

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Appendix C

Frequency Calculation Summary

C-1 Introduction

The frequencies of all hazard scenarios are calculated in the following section. The expected frequency is needed to enable a calculation of the risk. The scenarios are:

- Natural gas flange leak
- Natural gas pipe split
- Natural gas pipe vehicle impact
- Coke ovens gas connection leak
- Coke ovens gas pipe split
- Coke ovens gas pipe split delayed explosion
- Molten metal – water explosion

C-2 Release frequencies

An estimate of appropriate release frequencies is from HSE UK failure rates (2017).

Table C.1 Release frequency

Parameter	Basis	Value
50 mm natural gas flange failure – 5 mm (per flange per year)	1 flange	5.00×10^{-06}
100 mm natural gas pipe split – 50 mm (per meter per year)	10 meters pipe	6.70×10^{-07}
400 mm coke ovens gas pipe pin hole – 10 mm (per meter per year)	10 meters pipe	1.00×10^{-06}
400 mm coke ovens gas pipe split – 200 mm (per meter per year)	10 meters pipe	6.50×10^{-08}
Fixed cooling water pipework failure (per meter per year)	1 meter pipe	1.00×10^{-06}
Serious vehicle accident on site	Estimated repair cost at least $10k	2.20×10^{-07}

C-3 Ignition probability

Once a gas leak has occurred, in order for a jet fire to eventuate, the escaping gas must be ignited by an ignition source. Ignition probability is dependent on the extent of the gas leak as well as the position of the ignition source in the surrounding area.

An estimate of appropriate small plant ignition probabilities is from OPG (2010). The ignition probability for a vehicle strike is from HSE CRR (1997).

Table C.2 Ignition probabilities

Parameter	Value
Gas release within a small plant at 0.1 kg/s	0.001
Gas release within a small plant at 0.5 kg/s	0.0019
Gas release within a small plant at 1,000 kg/s	1.0
Gas release from a vehicle strike	0.29

C-4 Jet fire frequency results

The results of the frequency analysis and risk assessment are summarised below.

Table C.3 On-site jet fire results

	Natural Gas Flange Leak	Natural Gas Pipe Split	Natural Gas Pipe Vehicle Impact	Coke Ovens Gas Connection Leak	Coke Ovens Gas Pipe Split
Frequency of serious accident (per annum) – Table C.1	Not applicable	Not applicable	2.20×10^{-07}	Not applicable	Not applicable
probability accident ruptures natural gas inlet pipeline (conservative assumption)	Not applicable	Not applicable	0.05 (On-site speed is low)	Not applicable	Not applicable
Frequency of gas release (per annum) – Table C.1	5.00×10^{-06}	6.70×10^{-07}	1.10×10^{-08}	1.00×10^{-06}	6.50×10^{-08}
Probability of ignition – Table C.2	0.001	0.0019	0.29	0.001	0.0019
Frequency of jet fire (per annum)	5.00×10^{-09}	1.27×10^{-09}	3.24×10^{-09}	1.00×10^{-09}	1.24×10^{-10}
Probability of person impacted (based on consequence)	1	1	1	1	1
Probability impact results in fatality (conservative assumption)	0.1 (On-site operators in immediate area impacted – but not in main thoroughfare)	0.8 (On-site operators in area impacted – near control room)	0.9 (Driver may be incapacitated by accident)	0.0 (Heat contours expected to result in injury only)	0.8 (On-site operators in area impacted)
Frequency of fatality (per annum)	5.00×10^{-10}	1.02×10^{-09}	2.91×10^{-09}	0.00	9.88×10^{-11}

C-5 Explosion frequency results

An estimate of the frequency of fixed pipe leak uses HSE UK failure rates (2017).

Table C.4 Molten metal explosion frequency

Parameter	Value
Frequency of failure of the water-cooling pipework (per annum) – Table C.1	1.00×10^{-06}
Probability water leak is exposed to molten metal (conservative assumption)	1
Explosion frequency (per annum)	1.00×10^{-06}
Probability of person impacted (based on consequence)	1
Probability impact results in fatality (conservative assumption)	0.8 (On-site operators in area impacted – within furnace room)
Frequency of fatality (per annum)	8.00×10^{-07}

Table C.5 Coke ovens gas pipe split delayed explosion frequency

Parameter	Value
Frequency of split of the coke ovens gas pipe (per annum) – Table C.1	6.50 x 10^{-08}
Probability of delayed ignition (conservative assumption)	0.8 (Working industrial facility with potential ignition sources beyond hazardous area)
Explosion frequency (per annum)	5.20 x 10^{-08}
Probability of person impacted (based on consequence)	1
Probability impact results in fatality (conservative assumption)	0.8 (On-site operators in area impacted)
Frequency of fatality (per annum)	4.16 x 10^{-08}

C-6 References

HSE, Failure Rate and Event Data for use within Risk Assessments, 2017, pgs. 45, 48, 58 and 65.

OGP Risk Assessment Data Directory, ignition probabilities, International Association of Oil and Gas Producers, 2010.

Det Norske Veritas (DNV), Failure Frequency Guidance, Process Equipment Leak Frequency Data for use in QRA, 2013.

HSE Contract Research Report (CRR), Ignition probability of flammable gases, 1997.

Reason, J., Managing the risks of organisational accidents, 1998.

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→ The Power of Commitment

Appendix H

Water quality impact assessment

Blast Furnace No. 6 Reline Project

Water Quality Impact Assessment

BlueScope Steel (AIS) Pty Ltd

7 March 2022

→ **The Power of Commitment**

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S4	1	C Dengate	S. Murphy		K Rosen		07/03/2022

The Power of Commitment

Executive Summary

GHD has completed a water quality impact assessment of the construction, commissioning, operation and decommissioning of the No. 6 Blast Furnace (6BF) at the Port Kembla Steelworks. The assessment supports the EIS for the project and responds to the SEARs relating to surface and groundwater quality.

The assessment describes the existing ambient and background water quality and assesses the potential impacts to water quality associated with the construction, operational and decommissioning phases of the project with respect to the following guidelines:

- NSW Marine Water Quality Objectives (WQO's) in NSW (DEC, 2006)
- Storing and Handling Liquids: Environmental Protection (DECC, 2007)
- Managing Urban Stormwater: Soils and construction - Volume 2 (DECC, 2008)
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2018)

Potential risks to water quality during the construction, commissioning and decommissioning phases are well understood by BlueScope given the experience gained during the successful delivery of the three previous reline projects at the Port Kembla Steel Works (PKSW). Risks to water quality during these phases of the project are proposed to be managed via the existing drainage network and site capture and containment measures, including adequate storage basins, comprehensive monitoring and controlled discharge.

The operation of 6BF following completion of reline activities, commissioning and ramp up will be generally the same as existing operations at No. 5 Blast Furnace (5BF). Specific locations of certain activities within the PKSW site will change due to the transfer of operations to 6BF. However, changes to the quantity or characteristics of water outputs from the blast furnace will be minimal.

Similarly, water uses and discharges from the blast furnace will be consistent with the quantity and quality of those at 5BF. Minor changes to cooling water discharges are expected due to the alternative cooling system associated with 6BF. The stormwater drainage system proposed for the project will enable the capture and reuse of stormwater and containment of any spills, providing an improvement over the current stormwater management capabilities.

An assessment of the future 6BF operations against the above water quality guidelines was undertaken based on the historical 5BF operational monitoring data, previous numerical modelling studies and ecological studies of Allans Creek and the Inner Harbour. Key findings of the assessment are summarised below:

- Relatively few exceedances of the 95% LOSP DGV's occur at the licence discharge point during operations, with the exception of cyanide which nevertheless is compliant with EPL 6092 concentration limits.

  As part of BlueScope's ongoing commitment to improvement and efforts to comply with the NSW WQO's and ANZG guidelines, Pollution Reduction Program (PRP) 182 is currently underway to address the identified gaps in data when comparing the analytes measured at No. 2 Blower Station (2BS) drain, which receives flows from the 6BF drain and discharges to Allans Creek, against the list specified in the water quality guidelines. PRP 182 involves extensive sampling to identify and quantify all sources of pollutants entering, and ultimately discharging from, the 2BS drain to Allans Creek, including from the blast furnace effluent treatment system.

  Investigations are currently underway at 5BF to determine additional, online treatment solutions to reduce the concentration of cyanide in the effluent treatment system blowdown water before it is discharged to the 2BS drain. Learnings and solutions for cyanide treatment will be applied to future operation of 6BF.
- Products added to the effluent treatment system such as scale inhibiter, flocculant, coagulant and biocides will be dosed at rates in accordance with the manufacturer's guidance and BlueScope's current operational procedures such that no significant impacts to water quality when compared to 5BF? are expected at the proposed discharge concentration.
- Whilst the cooling system proposed for 6BF offers the benefits of both reduced energy and water use in comparison to the existing cooling system at 5BF, an increase of approximately 3,000m^3/h of salt water will be required, which represents an increase of around 10% over current operations. At the point of discharge to Allans Creek, these changes are expected to result in a temperature increase of approximately 0.5 – 1°C.

- Numerical modelling previously undertaken on behalf of BlueScope indicates that increased temperatures drop rapidly upon discharge into Allans Creek, with an initial mixing zone of 30m to 40m from the discharge point.
- Allans Creek and the Inner Harbour have been subject to the effects of warmer than ambient industrial discharges for decades and are considered part of a highly disturbed ecosystem. Existing temperatures within 2BS Drain and Allans Creek are not compliant with the default guideline values for temperature and future temperatures are expected to remain non-compliant. However, the predicted increase in temperature at the point of discharge into Allans Creek will comply with the site-specific temperature criteria (an increase of less than 3°C) developed during previous studies and will remain well within the temperature limits that are specified under EPL 6092.
- The risk of negative impacts to groundwater posed by the project is considered low on account of BlueScope's recent and proposed improvements to capture and containment measures and its ongoing groundwater monitoring program.
- Water proposed to be used during the project does not trigger water licencing requirements and will be sourced from an appropriately authorised and reliable supply comprised of both recycled water from the Wollongong Water Recycling Plant (over 85% of the current industrial water mixture) and unfiltered Avon Dam water.

As part of an ongoing commitment to sustainability, BlueScope has successfully completed approximately 77 water-related PRPs and continues to work closely with the EPA to identify opportunities for further improvement. As part of the 6BF reline project, BlueScope has committed to delivering an extensive list of mitigation measures relating to water discharge and water use that will minimise the risk of surface water or groundwater contamination during operation of the project. These include improvements relating to:

- Process and discharge controls
- Stormwater
- Discharge locations
- Water use
- Wastewater management
- Spill management

In addition, the stormwater drainage system proposed for the project will enable the capture and reuse of stormwater, providing improved water cycle management over the current stormwater management capabilities.

Further to the mitigation measures described above, recommendations have been made regarding a number of management plans to be developed following completion of detailed design and implemented during the project.

Based on the investigations and assessment undertaken by GHD and the conclusions drawn in this WQIA, it is considered that, subject to the recommended mitigation measures being applied, the proposed project will not result in any material adverse impacts to water quality, when compared to the current operations of 5BF. Amongst other positive effects, the project will result in reduced water use, improved energy efficiency and improved water capture capability thereby minimising the risk of adverse water quality impacts.

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Abbreviations and acronyms

Term	Definition
AAT	Australian Amalgamated Terminals
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines
AS	Australian Standards
ASS	Acid sulphate soils
BC Act	Biodiversity Conservation Act 2016
BFG	Blast Furnace Gas
BF-BOF operating model	Blast Furnace ironmaking and Basic Oxygen Furnace steelmaking
Biosecurity Act	Biosecurity Act 2015
BS	British Standards
BlueScope	BlueScope Steel (AIS) Pty Ltd
BoM	Bureau of Meteorology
BOS	Basic Oxygen Steelmaking
°C	Degrees Celsius
CEMP	Construction Environmental Management Plan
CLM Act	Contaminated Land Management Act 1997
CO	Carbon monoxide
CO2	Carbon dioxide
Coastal Management SEPP	State Environmental Planning Policy (Coastal Management) 2018
COG	Coke Oven Gas
COPC	Contaminants of Potential Concern
CSSI	Critical State Significant Infrastructure
DEC	Department of Environment and Conservation NSW
DECC	Department of Environment and Climate Change NSW
DECCW	Department of Environment and Climate Change and Water NSW
DGV	Default Guideline Values
DNAPL	Dense Non-Aqueous Phase Liquid
DO	Dissolved oxygen
DP	Deposited Plan
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EPA	Environment Protection Authority NSW
EPL	Environmental Protection Licence

Term	Definition
GHD	Gutteridge Haskins & Davey
IMED	Ironmaking East Drain
ISO	International Organization for Standardisation (Organisation internationale de normalisation)
km	Kilometre
LBL	Load Based Licensing
LNAPL	Light Non-Aqueous Phase Liquid
LOSP	Level of Species Protection
LOR	Limit of reporting
m	Metre
mg/L	Milligrams per litre
mm	Millimetres
m3/hr	Cubic metres per hour
NTU	Nephelometric Turbidity Units
NSW	New South Wales
pH	Acidity
PKSW	Port Kembla Steel Works
PRP	Pollution Reduction Program
SEARs	Secretary’s Environmental Assessment Requirements
SSD	State Significant Development
SWMP	Soil and Water Management Plan
TRT	Top gas recovery turbine
TSS	Total Suspended Solids
µg/L	Micrograms per litre
WGHR	Waste Gas Heat Recovery
WQIA	Water quality impact assessment
5BF	Blast Furnace Number 5
6BF	Blast Furnace Number 6

1. Introduction

1.1 Background and project overview

BlueScope Steel (AIS) Pty Ltd (BlueScope) is one of Australia's leading manufacturers and with its parent company, BlueScope Steel Limited, is a global leader in finished and semi-finished steel products. BlueScope's Port Kembla Steelworks (PKSW) operation in NSW includes two blast furnaces. No. 5 Blast Furnace (5BF) is currently operating, while No. 6 Blast Furnace (6BF) is currently in care and maintenance.

5BF is expected to continue to produce (molten) iron on a continuous basis until it reaches the end of its operational life at some stage between 2026 and 2030. BlueScope is proposing a move of iron production from 5BF to 6BF, after 5BF ceases operation.

6BF last produced iron in 2011, at which point it was taken out of service and placed into care and maintenance. To prepare 6BF to become operational again, major maintenance works are required (the project). The project aims to return 6BF to service through a reline process that will be carried out while 5BF continues to operate.

The project enables critical steelmaking operations to continue whilst BlueScope evaluates innovative "green steel" technologies that are starting to be piloted globally but will not be commercialised at scale in time to maintain production once the current campaign of the 5BF concludes. The project has been declared Critical State Significant Infrastructure (CSSI) in accordance with section 5.13 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and Schedule 5 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP).

This water quality impact assessment report has been prepared by GHD Pty Ltd (GHD) as part of the EIS for the project. The EIS has been prepared to support the application for project approval and addresses the environmental assessment requirements of the Secretary's Environmental Assessment Requirements (SEARs) pertaining to water quality.

1.2 Purpose of this report

The purpose of this report is to assess the potential water quality impacts from constructing and operating the project. The report:

- Addresses the SEARs (DPIE, 2021) as listed in Section 2.2
- Describes the existing environment with respect to water quality
- Assesses the potential impacts on sensitive receivers of constructing and operating the project
- Recommends measures to mitigate and manage the impacts identified

1.3 Structure of this report

The structure of the report is outlined below.

- **Section 1** – provides an introduction to the report.
- **Section 2** – describes the methodology used to undertake the assessment of water quality impacts.
- **Section 3** – describes the existing water quality environment and the sensitive receivers in the study area.
- **Section 4** – provides a description of the project during the construction, commissioning and operational phases.
- **Section 5** – summarises the outcomes of the assessment and a discusses the potential impacts.
- **Section 6** – provides the mitigation measures recommended to reduce the potential impacts.
- **Section 7** – summarises the key outcomes of the water quality impact assessment.
- **Section 8** – lists the references used in this report.

1.4 Project definitions

For the purposes of this report, the following definitions are employed:

- The project is the development that is the subject of the EIS, being the proposed reline and operation of 6BF and associated supporting infrastructure.
- The project area is the area within which the project is located and which will be directly impacted by the project.
- The study area is the site that was investigated during preparation of the EIS. The study area encompasses the project area and a buffer as relevant to searches and investigations inclusive of the catchment within which the project is situated: Inlet Channel, Allans Creek, Tom Thumb Lagoon and Port Kembla Harbour.

1.5 Limitations

This report has been prepared by GHD for BlueScope Steel (AIS) Pty Ltd and may only be used and relied on by BlueScope Steel (AIS) Pty Ltd for the purpose agreed between GHD and BlueScope Steel (AIS) Pty Ltd as set out in Section 1.2 of this report. GHD otherwise disclaims responsibility to any person other than BlueScope Steel (AIS) Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by BlueScope Steel (AIS) Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions may change after the date of this report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

2. Methodology

2.1 Overview

This section outlines the methodology used in the water quality impact assessment of the project. The approach included the following key tasks:

Assessment scope:

- Review of potential surface and groundwater impacts of the project.
- Characterisation of water quality discharges, including quality and quantity of all pollutants from the project.
- Documenting details of the stormwater and wastewater management systems.
- Undertaking a site water balance.

Existing environment:

- Identifying the study area relevant to the water quality assessment, including sensitive receiving environments.
- Characterising the existing water quality of Allans Creek and the Inner Harbour based on previous numerical modelling and monitoring programs undertaken in the vicinity of the study area.
- Identifying and classifying existing intake and discharge points within the study area.
- Reviewing the completed and ongoing Pollution Reduction Programs of relevance to the study area.
- Identifying where relevant criteria for receiving waters are being met.
- Identifying where relevant criteria for receiving waters are not being met and what activities are being undertaken to work toward their achievement over time.
- Characterising the nature and extent of any contamination on the site and surrounding area.

Water quality impact assessment:

- Documenting relevant criteria for assessment of potential water quality impacts.
- Comparing expected discharge characteristics and resulting water quality parameters at the edge of the mixing zone and within Allans Creek and the Inner Harbour of Port Kembla to the relevant criteria.
- Where the relevant criteria are not met, describing potential mitigation measures that will limit impacts to water quality and may enable the criteria to be met in time, thereby avoiding or minimising impacts to sensitive receiving environments.
- Describing the proposed erosion and sediment controls during construction.
- Providing recommendations for any required water quality controls for implementation during construction and future operations.

2.2 Legislative and policy context

2.2.1 Secretary’s Environmental Assessment Requirements

The SEARs relevant to water quality impacts, together with a reference to where they are addressed in this report, are outlined in Table 2.1. Consideration has also been given to the EPA’s advice regarding key water quality issues, which have been addressed throughout the Water Quality Impact Assessment (WQIA).

Table 2.1 SEARs relating to water quality

Requirement	Where addressed in this report
Water Quality	
An assessment of potential surface and groundwater impacts of the project	Section 4, Section 5 and Section 9.1 of the EIS
Characterisation of water quality discharges, including quality and quantity of all pollutants from the project for comparison against relevant water quality criteria and details of proposed water quality controls	Section 4 and Section 5
A detailed site water balance and any water licensing requirements	Section 3.9 and Section 4.4
Details of the stormwater and wastewater management systems and measures to treat, reuse or dispose of water	Section 4 and Section 6
Description of the proposed erosion and sediment controls during construction	Section 6
Characterisation of the nature and extent of any contamination on the site and surrounding area	Section 3.4

2.2.2 Guidelines and policies

The assessment was undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

- NSW Marine Water Quality Objectives in NSW (DEC, 2006)
- Storing and Handling Liquids: Environmental Protection (DECC, 2007)
- Managing Urban Stormwater: Soils and construction – Volume 1 (Landcom, 2004)
- Australian and New Zealand Guidelines for fresh and marine water quality (ANZG, 2018)
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000)
- NSW Environment Protection Authority (EPA) guidance regarding mixing zones (EPA, 2018)

Further details regarding the relevant environmental values, indicators and associated guideline values or criteria for Port Kembla are provided in Section 2.3.

2.3 Guideline assessment criteria

The National Water Quality Management Strategy (NWQMS) provides a national framework for improving water quality in Australia's waterways. The main policy objective of the NWQMS is to achieve sustainable use of the nation's water resources, protecting and enhancing their quality, while maintaining economic and social development.

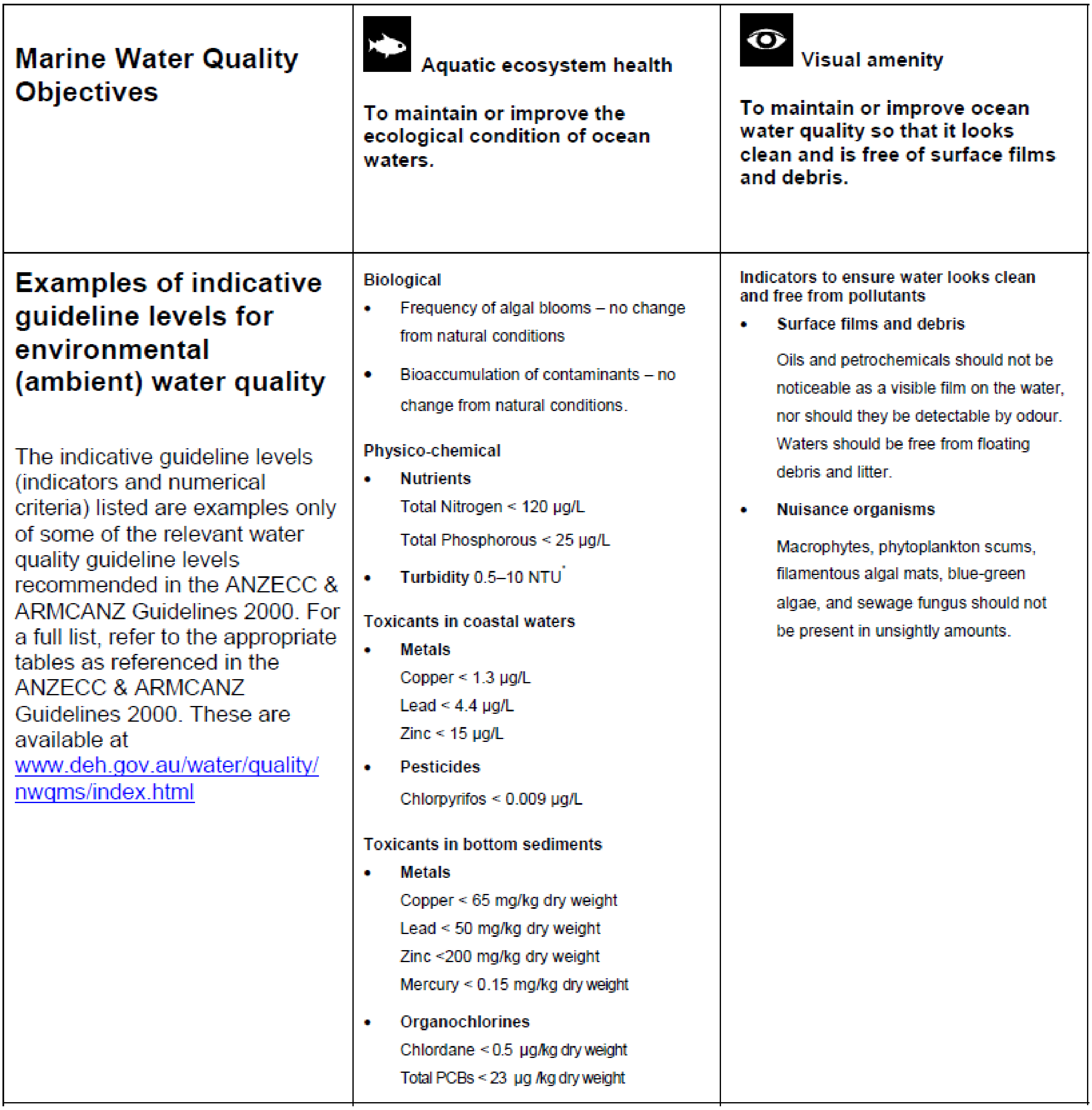
There are a number of national guideline documents under the NWQMS that aim to provide a consistent approach to the management of significant water quality issues. Those of relevance to the project and this water quality impact assessment are summarised below:

- Management of water quality for natural and semi-natural water resources is guided by the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018 or Water Quality Guidelines).
- Management of groundwater quality is guided by the National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (AG, 2013).

At a state level, the Marine Water Quality Objectives (WQOs) were adopted by the NSW Government in 2005 and are intended as a guideline tool for strategic planning and development assessment (DEC 2005)[1]. The WQO's define the following marine water quality values:

- Aquatic ecosystems i.e. aquatic ecosystem health
- Primary contact recreation i.e. swimming, surfing
- Secondary contact recreation i.e. boating, wading
- Visual amenity i.e. aesthetic qualities of waters
- Aquatic foods i.e. water suitable for growing seafood

In the case of Port Kembla Harbour, the relevant values relate only to Aquatic Ecosystems and Visual Amenity (DECCW, 2006), for which the relevant guideline levels for ambient water quality are presented in Figure 2.1.



Marine Water Quality Objectives	**Aquatic ecosystem health** **To maintain or improve the ecological condition of ocean waters.**	**Visual amenity** **To maintain or improve ocean water quality so that it looks clean and is free of surface films and debris.**
Examples of indicative guideline levels for environmental (ambient) water quality The indicative guideline levels (indicators and numerical criteria) listed are examples only of some of the relevant water quality guideline levels recommended in the ANZECC & ARMCANZ Guidelines 2000. For a full list, refer to the appropriate tables as referenced in the ANZECC & ARMCANZ Guidelines 2000. These are available at www.deh.gov.au/water/quality/nwqms/index.html	**Biological** • Frequency of algal blooms – no change from natural conditions • Bioaccumulation of contaminants – no change from natural conditions. **Physico-chemical** • **Nutrients** Total Nitrogen < 120 µg/L Total Phosphorous < 25 µg/L • **Turbidity** 0.5–10 NTU[*] **Toxicants in coastal waters** • **Metals** Copper < 1.3 µg/L Lead < 4.4 µg/L Zinc < 15 µg/L • **Pesticides** Chlorpyrifos < 0.009 µg/L **Toxicants in bottom sediments** • **Metals** Copper < 65 mg/kg dry weight Lead < 50 mg/kg dry weight Zinc <200 mg/kg dry weight Mercury < 0.15 mg/kg dry weight • **Organochlorines** Chlordane < 0.5 µg/kg dry weight Total PCBs < 23 µg /kg dry weight	**Indicators to ensure water looks clean and free from pollutants** • **Surface films and debris** Oils and petrochemicals should not be noticeable as a visible film on the water, nor should they be detectable by odour. Waters should be free from floating debris and litter. • **Nuisance organisms** Macrophytes, phytoplankton scums, filamentous algal mats, blue-green algae, and sewage fungus should not be present in unsightly amounts.

Figure 2.1 Relevant guideline levels for ambient water quality (DEC 2006)

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[1] It is noted that the NSW Government is reviewing the NSW Water Quality Objectives across coastal catchments, as a key action under Initiative 1 of the NSW Marine Estate Management Strategy 2018–2028. At the time of assessment no updated information was available.

At the time of publication, the WQO's were intended to be used in conjunction with the supporting information provided by the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000), which were superseded by the revised ANZG 2018 Water Quality Guidelines.

It should also be noted that the environmental values and respective numerical indicator values represent objectives for ambient background water quality and are not intended to be applied to point source discharges or mixing zones. Further details are provided in Sections 3.6 and 3.7 regarding the existing water quality conditions and receiving environments of Port Kembla. In summary, Allans Creek and the western portion of the Inner Harbour are considered part of a highly disturbed ecosystem where exceedances of the 95% trigger values for protection of marine waters have been recorded in relation to aluminium, cadmium, copper, lead, zinc, tin and arsenic (refer Section 3.7).

Despite these legacy water quality issues, it is recognised that significant efforts have been made on the part of industry to reduce the level of pollution and improve water quality within Port Kembla. Hence for the purposes of this assessment, with the exception of temperature (which is discussed further after Table 2.2), it is proposed to rely on the WQOs for definition of the relevant values for Port Kembla Harbour (as defined in Figure 2.1) and to rely on the ANZG 2018 Water Quality Guidelines for Default Guideline Values (DGV's) for the Levels of Species Protection (LOSP) summarised in Table 2.1.

Table 2.2 Relevant water quality criteria

Water quality parameter		**DGV's (ANZG 2018)[2], [3]**		**NSW water quality objective**
Aquatic ecosystems				
Biological				
Frequency of algal blooms		Not listed		No change from natural conditions
Bioaccumulation of contaminants		Not listed		No change from natural conditions
Physico-chemical and Nutrients				
Dissolved oxygen		90-110 % saturation		Not listed
pH		8.0-8.4		Not listed
Temperature		80th %ile of reference system*		Not listed
Turbidity		0.5-10 NTU		0.5-10 NTU
Total Nitrogen		120 µgN/L		<120 µg/L
Total Phosphorous		25 µgP/L		<25 µg/L
Chlorophyll-a		1 µg/L		Not listed
Toxicants				
	80% LOSP	90% LOSP	95% LOSP	
Ammonia (NH3)	1700 µg/L	1200 µg/L	910 µg/L	Not listed
Cyanide (CN)	14 µg/L	7 µg/L	4 µg/L	Not listed
Cadmium (Cd)	36 µg/L	14 µg/L	5.5 µg/L	Not listed
Chromium(VI) ($Cr6^+$)	85 µg/L	20 µg/L	4.4 µg/L	Not listed
Copper (Cu)	8 µg/L	3 µg/L	1.3 µg/L	<1.3 µg/L
Lead (Pb)	12 µg/L	6.6 µg/L	4.4 µg/L	<4.4 µg/L
Zinc (Zn)	43 µg/L	23 µg/L	8 µg/L	<15 µg/L
Mercury (Hg) (inorganic)	1.4 µg/L	0.7 µg/L	0.4 µg/L	Not listed
* Refer discussion of site specific temperature criteria below				

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[2] Values, targets and actions in these guidelines are not mandatory, but support a nationally-agreed framework for water quality planning and management.

[3] DGVs for groundwater ecosystems have not been developed as part of the 2018 ANZG. It is noted that generally, the Water Quality Guidelines should apply to the quality of both surface water and of groundwater, since the community values which they protect relate to above-ground uses (e.g. irrigation, drinking water, farm animal or fish production and maintenance of aquatic ecosystems). The 2013 AG groundwater guidelines do not provide guideline values for toxicants in groundwaters, but rather provide guidance on how existing DGV's for other community values might be applied, or where new guideline values might need to be derived, in order to inform the setting of appropriate water quality objectives (ANZG, 2018).

Temperature

Whilst the ANZG 2018 have superseded the ANZECC guidelines, the fact sheets and guideline packages from Volume 2 of the ANZECC guidelines have been referenced for guidance in thermal trigger values (yet to be updated for currency in the ANZG, 2018). The ANZECC guidelines state that two approaches may be taken to derive the most appropriate trigger values for unnatural changes in temperature:

1. *For slightly to moderately disturbed ecosystems or important ecosystems, where appropriate reference system(s) is available, and there are sufficient resources to collect the necessary information for the reference system(s), the trigger values should be determined as follows:*
   hot water discharges should not be permitted to increase the temperature of the aquatic ecosystem above the 80th percentile temperature value obtained from the seasonal distribution of temperature data from the reference system.
2. *For important waterbodies, and those in very poor condition, appropriate site-specific scientific studies should be undertaken, and the information from these studies should be used together with professional judgement and other relevant information, to derive the trigger values. Where local but higher-quality reference data are used, a less stringent cut off than the 20th or 80th percentile value may be used. The 20th or 80th percentile values, however, should be used as a target for site improvement.*

The guidelines recommend a two-step approach to assessment:

1. *Test the performance indicator (temperature) for the ecosystem against the low risk trigger value for that ecosystem type. The median maximum daily temperature should be used for comparison within slightly to moderately disturbed ecosystems.*
2. *If test values are within the 20–80th percentile range, there is a low risk of adverse biological effects and the only further action required is regular monitoring of the key performance indicators and condition indicators. If after regular monitoring a 'low risk' outcome is consistently obtained, there is scope to refine the guideline trigger value. If the test values are outside the 20–80th percentile range, there is a high risk of adverse biological effects, and management action should occur. This might involve further ecosystem-specific investigation.*

Based on long term seawater temperature measurements outside of the port, the ambient 20th percentile, 50th percentile (median) and 80th percentile seawater temperatures are provided in Table 2.3.

Table 2.3 Ambient seawater temperature offshore of Port Kembla (Cardno, 2019)

Season	Seawater Temperature (ºC)		
	20th Percentile	Median	80th Percentile
Summer	20.0	21.2	22.4
Autumn	19.2	20.5	21.8
Winter	15.6	16.6	17.4
Spring	16.4	17.5	18.7

Adopting the two-step approach to the assessment, as recommended by the ANZECC guidelines, first requires testing of the predicted and measured temperatures at the point of discharge to Allans Creek against the 80th percentile temperatures to assess compliance with the low risk trigger values for slightly to moderately disturbed ecosystems.

Table 2.3 indicates that compliance would require the temperature increase at the edge of the nearfield mixing zone to be less than 0.8 (ºC) to 1.3 (ºC) depending on the season.

As part of investigations into an alternative salt water cooling system undertaken between 2006 and 2008, UNSW completed a study to assess ecological issues in relation to the proposed system and to identify a more suitable guideline trigger value for temperature impacts to Allans Creek and Port Kembla Harbour (CH2MHILL 2008, NSG 2006). The study concluded that ecologically important changes may occur if temperatures are elevated by more than 3˚C. A water temperature trigger value of 3˚C was adopted for the earlier assessment and is considered to be of more relevance to Allans Creek and the Inner Harbour than the default guideline value specified in the 2018 Water Quality Guidelines (ANZG, 2018).

Nevertheless, assessment of the proposed discharge stream associated with the project has also been compared to the 80th percentile values as a target for site improvement.

2.4 Existing discharge concentration limits – EPL 6092

The operations associated with the 6BF will take place within one area within the larger PKSW site. EPL 6092 contains individual discharge concentration limits for 14 surface water locations within the PKSW site. Monitoring conditions specified in the EPL include monitoring parameters, locations, frequencies as well as discharge limits relating to the 50th, 90th and 100th percentile concentrations for each discharge point.

The licence discharge points which will receive flows from the 6BF drain are the No. 2 Blower Station Drain (Point 79) and the Ironmaking East Drain (IMED) (Point 89). During normal operation, water received at the IMED is pumped to the No. 2 Blower Station Drain and therefore, there is no discharge at the licenced discharge point, Point 89. During periods of heavy rainfall, the IMED may overflow into the harbour at the licensed discharge point. The EPL also requires sampling at Point 89 if there is a discharge to the harbour during dry weather conditions. The No. 2 Blower Station Drain is sampled every 8 days as required by the EPL.

Pollutant concentration limits of these drains are specified in Table 2.4 and Table 2.5.

Table 2.4 EPL licence limits – Point 79 No. 2 Blower Station Drain

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	100 percentile concentration limit
Ammonia (Dry)	mg/L	n/a	1.5	5
Ammonia (Wet)	mg/L	n/a	n/a	5
BOD (Dry)	mg/L	5	10	20
BOD (Wet)	mg/L	n/a	n/a	20
Cadmium (Dry)	mg/L	0.01	0.02	0.06
Cadmium (Wet)	mg/L	n/a	n/a	0.06
Cyanide (Dry)	mg/L	n/a	0.05	0.3
Cyanide(Wet)	mg/L	n/a	n/a	0.3
Filtrable iron (Dry)	mg/L	n/a	0.1	0.3
Filtrable iron (Wet)	mg/L	n/a	n/a	0.3
Lead (Dry)	mg/L	n/a	0.05	0.1
Lead (Wet)	mg/L	n/a	n/a	0.1
Oil and grease (Dry)	mg/L	n/a	10	20
Oil and grease (Wet)	mg/L	n/a	n/a	50
pH (Dry)	pH	n/a	n/a	6.5-9.0
pH (Wet)	pH	n/a	n/a	6.5-9.0
Temperature (Dry)	degrees Celsius	n/a	35	40
Temperature (Wet)	degrees Celsius	n/a	n/a	40
Total iron (Dry)	mg/L	n/a	1	3
Total iron (Wet)	mg/L	n/a	n/a	50
Total zinc (Dry)	mg/L	n/a	1	3
Total zinc (Wet)	mg/L	n/a	n/a	3
TSS (Dry)	mg/L	n/a	30	50
TSS (Wet)	mg/L	n/a	n/a	500

Table 2.5 EPL licence limits – Point 89 Ironmaking East Drain

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	100 percentile concentration limit
Ammonia (Dry)	mg/L	3	5	7
Ammonia (Wet)	mg/L	n/a	n/a	7
Arsenic	µg/L			50
Cadmium (Dry)	mg/L	0.01	0.02	0.05
Cadmium (Wet)	mg/L	n/a	n/a	0.05
Chromium (total)	µg/L			350
Copper	mg/L			1
Cyanide (Dry)	mg/L	0.08	0.15	0.2
Cyanide (Wet)	mg/L	n/a	n/a	0.2
Filtrable iron (Dry)	mg/L	n/a	0.1	0.5
Filtrable iron (Wet)	mg/L	n/a	n/a	0.5
Flouride (Dry)	mg/L			50
Flouride (Wet)	mg/L			50
Lead (Dry)	mg/L	0.05	0.1	0.2
Lead (Wet)	mg/L	n/a	n/a	0.2
Mercury (Dry)	µg/L			3
Mercury (Wet)	µg/L			3
Oil and grease (Dry)	mg/L	n/a	10	20
Oil and grease (Wet)	mg/L	n/a	n/a	20
pH (Dry)	pH	n/a	n/a	6.5-9.0
pH (Wet)	pH	n/a	n/a	6.5-9.0
Selenium	µg/L			20
Temperature (Dry)	degrees Celsius	n/a	40	45
Temperature (Wet)	degrees Celsius	n/a	n/a	45
Total iron (Dry)	mg/L	n/a	3	7
Total iron (Wet)	mg/L	n/a	n/a	20
Total zinc (Dry)	mg/L	n/a	1	3
Total zinc (Wet)	mg/L	n/a	n/a	3
TSS (Dry)	mg/L	n/a	30	100
TSS (Wet)	mg/L	n/a	n/a	200

2.5 EPA advice regarding mixing zones

When considering the assessment criteria outlined in Section 2.3, it is important to note the point at which the limits are intended to be applied. Advice on this issue was provided by the EPA in relation to the 2018 EIS for the Port Kembla Gas Terminal, which stated that:

> *"the EPA's policy is that the WQOs should be met at the edge of the area where initial mixing occurs or "near-field" mixing. 'Near Field' relates to initial mixing where the initial characteristics of momentum flux, buoyancy flux and outfall geometry influence the plume trajectory and mixing. Mixing that occurs through buoyant spreading motion and passive diffusion due to ambient turbulence is referred to as 'Far Field' mixing. Mixing zones should not receive concentrations of pollutants that cause acute toxic impacts meaning that acute impacts should be assessed at end-of -pipe." (EPA, 2018)*

When considering mixing zones and the potential impacts within a mixing area, the EPA recommended several principles be adopted, including:

1. *The area or volume of an individual zone or group of zones should be limited to an area or volume as small as practicable that will not interfere with the designated uses or with the established community of aquatic life of the receiving waters.*
2. *The shape of the mixing zone should be a simple configuration that is easy to locate in the body of water and avoids impingement on biologically important areas.*
3. *Shore hugging plumes should be avoided.*
4. *The mixing zone should avoid impinging on sensitive biological features.*
5. *Impacts within mixing zones should be reversible.*
6. *Mixing zones should not be used for chemicals which bioaccumulate.*
7. *Mixing zones should not be used to manage the biostimulant impacts of nutrients, since the stimulation of algae (e.g. phytoplankton) may occur at considerable distances away from the nutrient source and is mediated by the biological characteristics of the waterbody as a whole.*
8. *Mixing zones should not receive concentrations of pollutants that cause acute toxic impacts. (EPA, 2018).*

This advice has been considered in the water quality impact assessment outlined in Section 5.

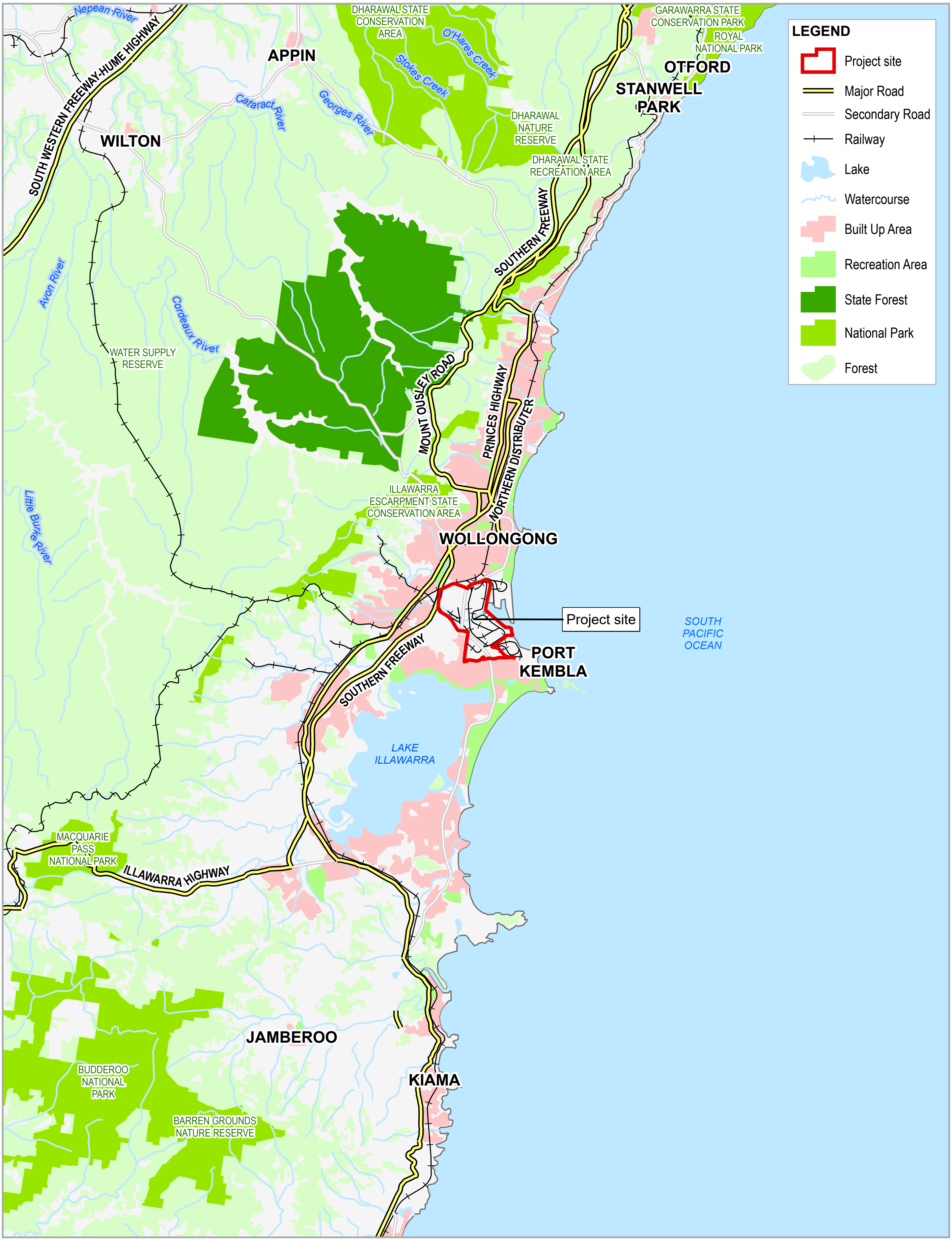
3. Existing environment

3.1 Project location

PKSW is located within an industrial site of approximately 750 hectares in the Wollongong Local Government Area (LGA), approximately 80 kms from Sydney and 2.5 kms from the City of Wollongong. Refer to Figure 3.1.

The PKSW site comprises the No.1 Works, No.2 Works, Steelhaven and the Recycling area as shown in Figure 3.2. The No.2 Works is divided into two sections by Allans Creek. The southern half of the No.2 Works comprises the Cokemaking, Ironmaking and Steelmaking facilities, while the northern half contains the Recycling Area and the Rolling Mills section. All sectors of PKSW are internally linked by road and rail and are currently supplied with electricity, water and gas services.

The land to which this project applies, including all connecting infrastructure and materials handling elements that require upgrades as part of the project, is within the southern section of the No.2 Works, and part of the Ironmaking facilities, which is located within Lot 1 DP 606434. Ancillary construction facilities will also be required and will be located within the wider PKSW site as shown in Figure 3.3. Key project features relating to water quality are presented in Figure 3.4.



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Kilometres

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 56

N

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Water Quality Impact Assessment

Project No.	**12541101**
Revision No.	**0**
Date	**25/11/2021**

Regional Location

FIGURE 3-1

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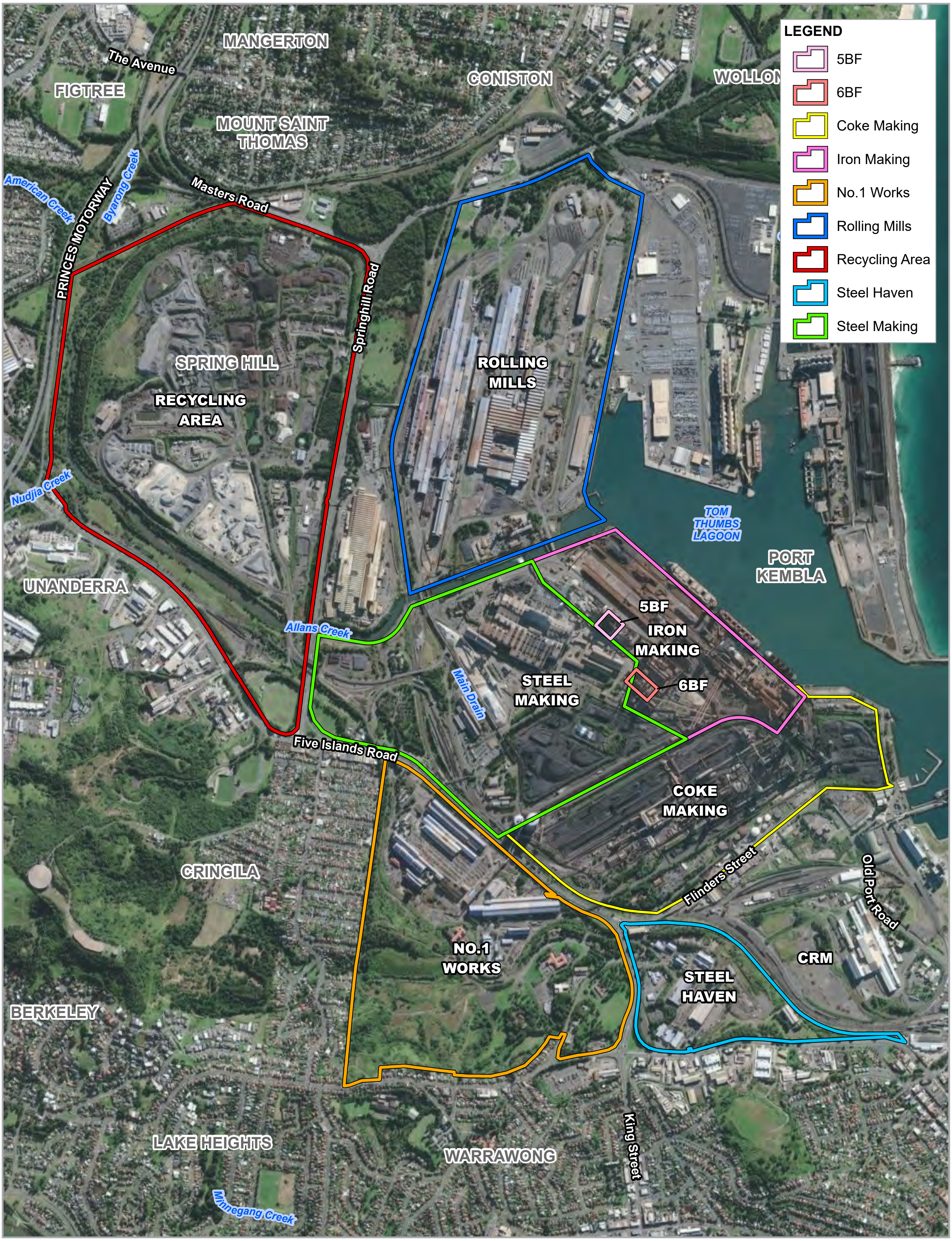
Created by: tmorton



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Kilometres

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 56

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GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Water Quality Impact Assessment

Port Kembla Steelworks
site layout and locality

Project No. 12541101
Revision No. 0
Date 25/11/2021

FIGURE 3-2

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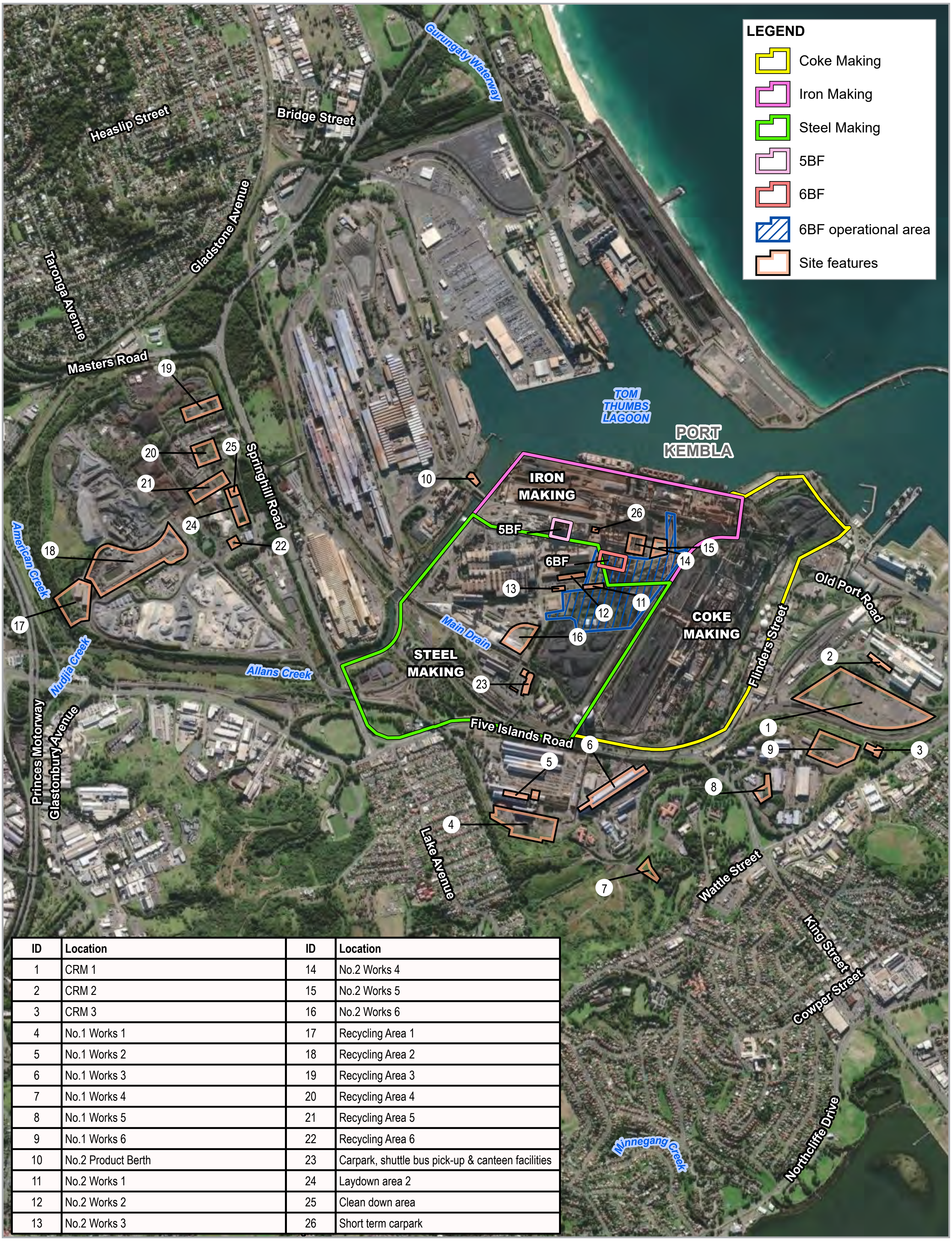

ID	Location	ID	Location
1	CRM 1	14	No.2 Works 4
2	CRM 2	15	No.2 Works 5
3	CRM 3	16	No.2 Works 6
4	No.1 Works 1	17	Recycling Area 1
5	No.1 Works 2	18	Recycling Area 2
6	No.1 Works 3	19	Recycling Area 3
7	No.1 Works 4	20	Recycling Area 4
8	No.1 Works 5	21	Recycling Area 5
9	No.1 Works 6	22	Recycling Area 6
10	No.2 Product Berth	23	Carpark, shuttle bus pick-up & canteen facilities
11	No.2 Works 1	24	Laydown area 2
12	No.2 Works 2	25	Clean down area
13	No.2 Works 3	26	Short term carpark

Paper Size ISO A4

0 0.2 0.4 0.6 0.8 1

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Water Quality Impact Assessment

Project No. 12541101
Revision No. 0
Date 25/11/2021

Key project features

FIGURE 3-3

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Data source: LPI: DTDB/DCDB, 2017. World Imagery: Maxar.
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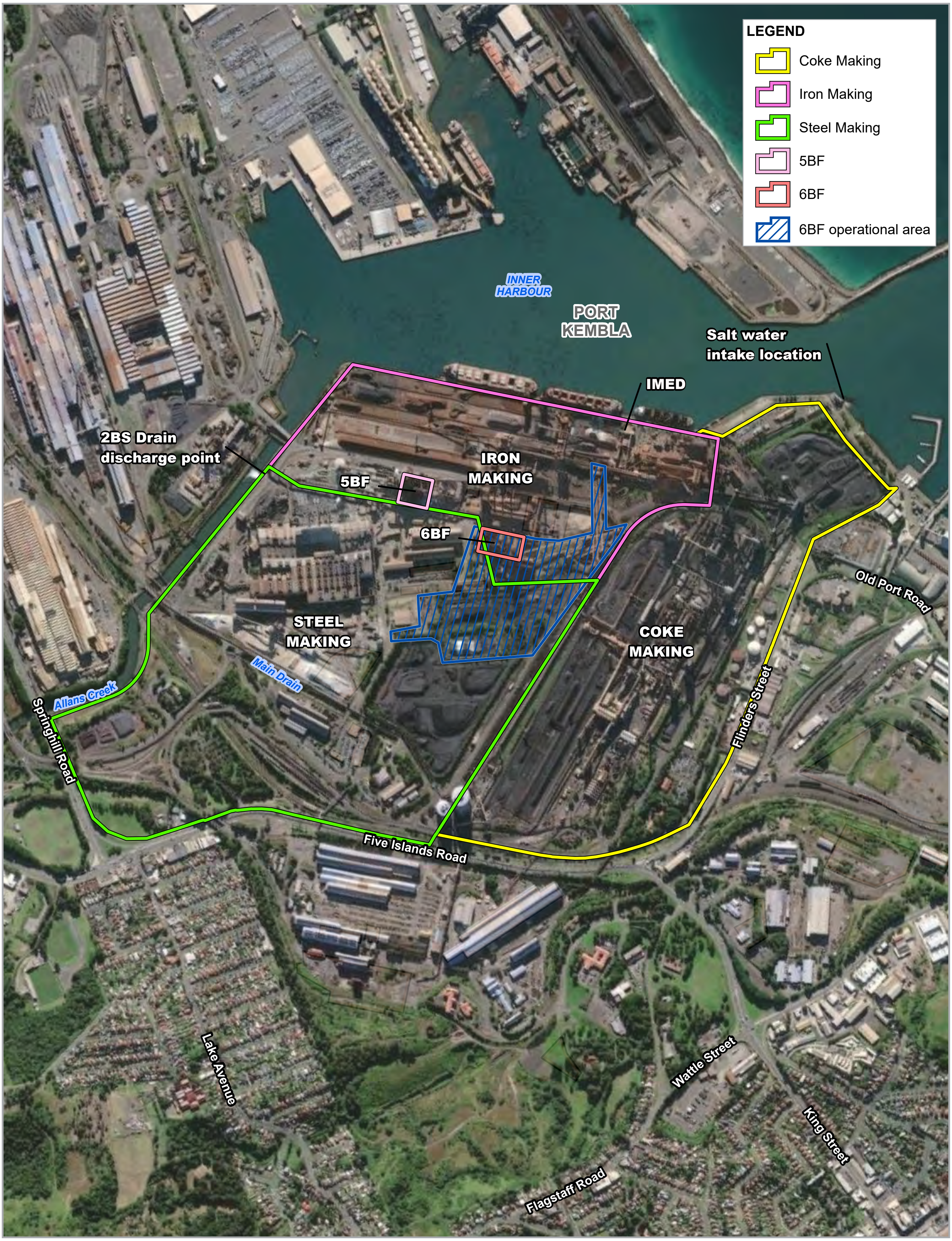

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0 100 200 300 400 500 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Water Quality Impact Assessment

Key project features relating to water quality

Project No.	**12541101**
Revision No.	**0**
Date	**25/11/2021**

FIGURE 3-4

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Data source: LPI: DTDB/DCDB, 2017. World Imagery: Maxar.
Created by: tmorton

3.2 Land use

The PKSW site is zoned IN3 – Heavy Industrial under *State Environmental Planning Policy (Three Ports) 2013* (Three Ports SEPP). PKSW and the adjacent Springhill Works together comprise the largest site in the Port Kembla industrial area, occupying approximately 750 ha and are mostly built around the western and northern side of Port Kembla's Inner Harbour. The PKSW site is a multi-use industrial area which includes storage, manufacturing, port berths, private internal roads and offices. Access to PKSW is provided by Springhill Road, Five Islands Road, Flinders Street, and Christy Drive, and private internal roads within PKSW.

The port of Port Kembla is located between the Pacific Ocean and the Port Kembla heavy industrial area and is zoned SP1 – Special Activities. The Inner Harbour, specifically developed as an all-weather shipping port, covers approximately 60 ha with around 2,900 m of commercial shipping berths. BlueScope operates five berths in the Inner Harbour that supply materials for PKSW.

More broadly, NSW Ports and the Port Authority of NSW manage the development and operation of the Port. Adjacent berths and trade types are shown in Figure 3.5 and summarised below (NSW Ports, 2021):

- Australian Amalgamated Terminals (AAT) manage Berths 103, 105, 106 and 107 located within the north portion of the Inner Harbour. The terminal is designed as a multi-purpose facility, handling motor vehicles and general cargo.
- Graincorp and Quattro Ports operate grain handling facilities through Berth 104 and Berth 103 respectively, which are located within the northern portion of the Inner Harbour. Berth 104 is a common user berth operated by NSW Ports and includes a bulk liquid facility, which handles a range of liquid products including chemicals and oils.
- Port Kembla Coal Terminal (PKCT) operates a coal exporting facility from Berth 102 located on the eastern shoreline of the Inner Harbour.
- Australian Industrial Energy has signed a long-term lease for Berth 101 and is proposing to develop a gas import terminal on the eastern shoreline of the Inner Harbour.

Figure 3.5 Map of surrounding port users (modified from NSWPorts, 2020)

3.3 Existing No. 5 Blast Furnace operations and drainage network

Ironmaking at PKSW is conducted via a thermochemical process of reduction of iron ore within the blast furnace. In general, iron ore, coke and other raw materials are charged into the blast furnace for smelting and a mixture of elemental iron (Fe), slag (mineral by-products), and Blast Furnace Gas (BFG) is generated from the blast furnace. Number 5 Blast Furnace (5BF) is the furnace currently in operation at PKSW.

Fine iron ore particles and other materials are first processed in the Sinter Plant to provide a permeable blend of raw materials for the smelting process. Following the smelting process, molten iron is cast via tapholes located near the base of the blast furnace into waiting rail-mounted torpedo ladles. The ladles transport the molten iron to other plants within PKSW for processing into steel.

The major by-products from the blast furnace operation are BFG and slag. Both of these by-products require the use and management of water. The hot gases leaving the top of the blast furnace are cooled and cleaned then piped through the interworks blast furnace gas main to other plants within PKSW for use as an energy source to the maximum practical extent. The molten slag stream is exposed to a continuous stream of high pressure water to generate slag sand, whilst the water is collected, cooled and reused in a closed loop system.

Further details regarding key elements of the existing 5BF operations relating to water quality are provided in Sections 3.3.1 to 3.3.4.

3.3.1 Existing 5BF gas cleaning

Condensate that is generated in the gas main is collected in seal pots. All the BFG condensate is collected and returned to the effluent treatment system via a series of collection tanks and pumps.

A wet scrubber is used to cool and clean the BFG exiting the top of the furnace. The resulting scrubber water reports to an effluent treatment system, where it is treated and cooled so it may be reused for further gas cleaning. A portion of the treated water is ‘blowndown’ (discharged) at a rate of 30 – 45 m^3/hr into the Outlet Channel (as shown in Figure 3.7) where it combines with approximately 26,000 m^3/hr of salt water used for cooling in other plant areas and discharges into Allans Creek and the Inner Harbour via the No. 2 Blower Station Drain. Flocculant and coagulant are added to the effluent treatment system to assist with the settling of solids in the clarifier (part of the effluent treatment system) and prevent excessive scaling. The slurry formed in the clarifier is sent via pipework for dewatering at the sinter plant, with recovered water returned to the effluent treatment system and the remaining solids transported to the PKSW Recycling Area.

During abnormal furnace operation, the chemical composition of the water may vary; in this circumstance, the blowdown water from the effluent treatment system is diverted to contingency storage to prevent release to the environment; it is then stored until such time as the quality of the water is confirmed to be acceptable for discharge in accordance with EPL 6092.

3.3.2 Existing 5BF cooling systems

The furnace cooling systems are all a fully closed loop design with heat exchangers. The closed loop design is a safety feature of the blast furnace allowing high accuracy leak detection and has the added benefit of minimising water loss. An evaporative cooling tower provides the heat sink for the closed loop cooling systems at 5BF. The cooling tower requires fresh water to replenish water lost through evaporation, and chemical treatment to comply with statutory requirements. A blowdown stream is recycled through the effluent treatment system.

Salt water sourced from the Outer Harbour is used for once-through cooling of the heat exchangers at the 5BF effluent treatment system and is subsequently discharged to Allans Creek and the Inner Harbour via No. 2 Blower Station Drain. Stormwater drains at 5BF discharge directly to the No. 2 Blower Station Drain or to the No.5 Blast Furnace Drain, both of which report to the Inner Harbour via Allans Creek.

A catchment map is presented in Figure 3.7 and schematic drawing showing inputs to the No. 2 Blower Station Drain, including from 5BF, is shown in Figure 3.8.

3.3.3 Existing 5BF slag granulation

Slag produced by the blast furnace is either formed into rock or granulated slag for sale as construction materials. Granulated slag is formed by subjecting the molten slag stream to a continuous stream of high pressure water. The water used for granulation is collected, cooled and reused in a closed loop system.

3.3.4 Existing 5BF stormwater drainage

Stormwater drains at 5BF discharge directly to the No.2 Blower Station Drain or to the No.5 Blast Furnace Drain, both of which report to the Inner Harbour via Allans Creek. EPL 6092 contains individual discharge concentration limits for 14 surface water locations within the PKSW site, 12 of which relate to water quality within the drainage network. The location of the water quality monitoring points identified in the licence are shown in Figure 3.6. Monitoring conditions specified in EPL 6092 include monitoring parameters, locations, frequencies as well as discharge limits relating to the 50th, 90th and 100th percentile concentrations for each discharge point as described in Section 5.

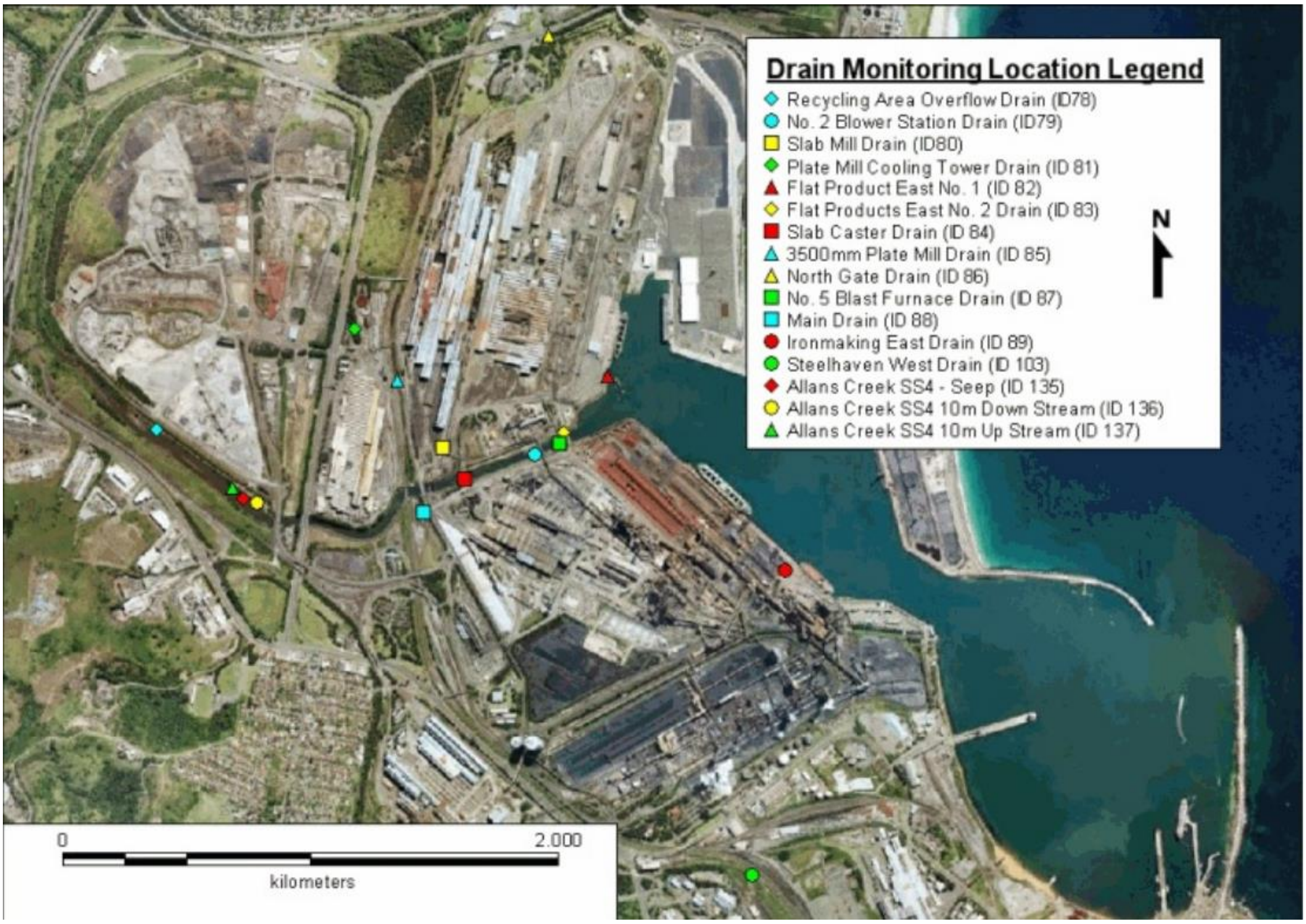

Figure 3.6 Water quality monitoring locations (including EPL identification numbers)

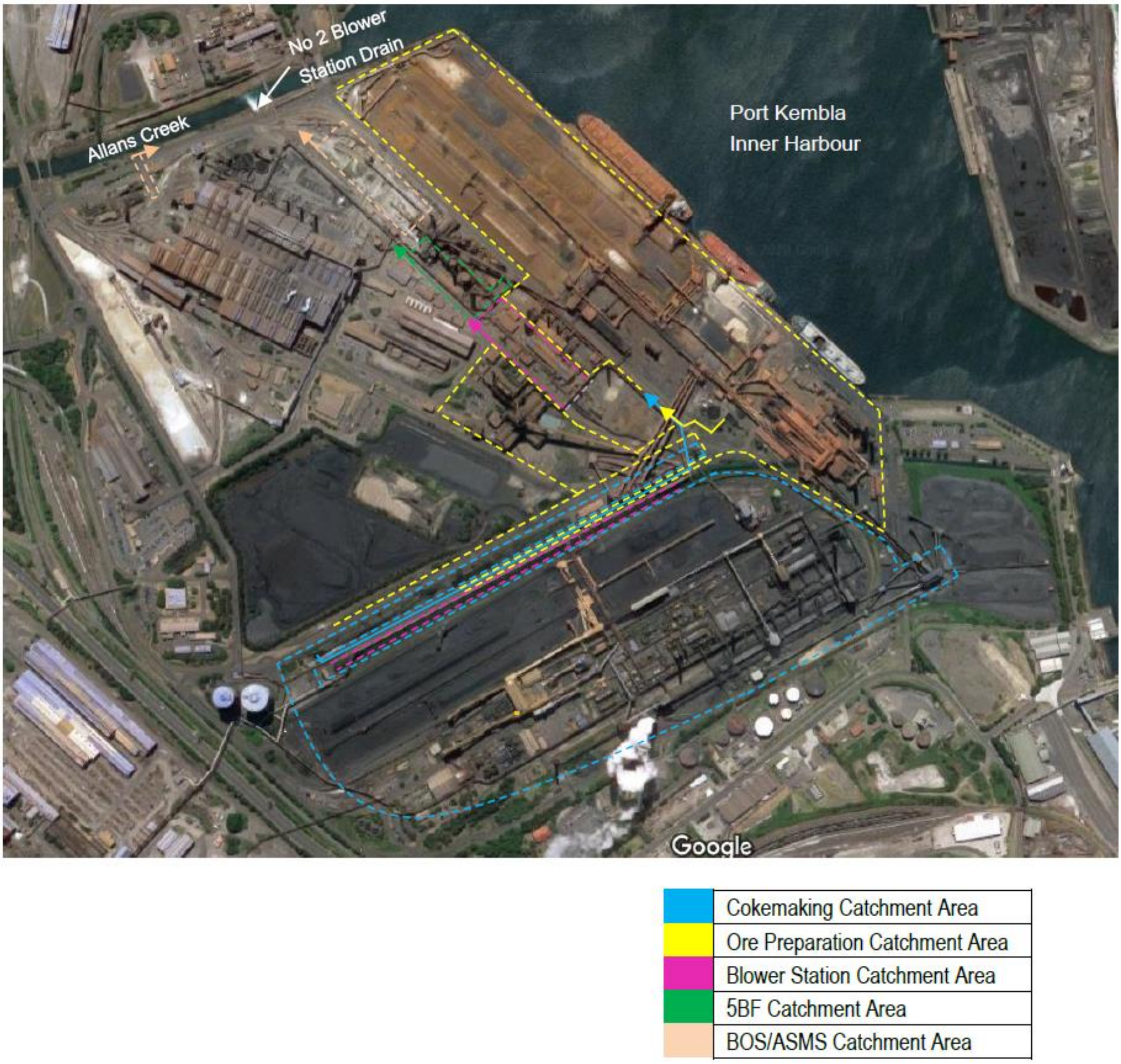

Figure 3.7 *Drain catchment map*

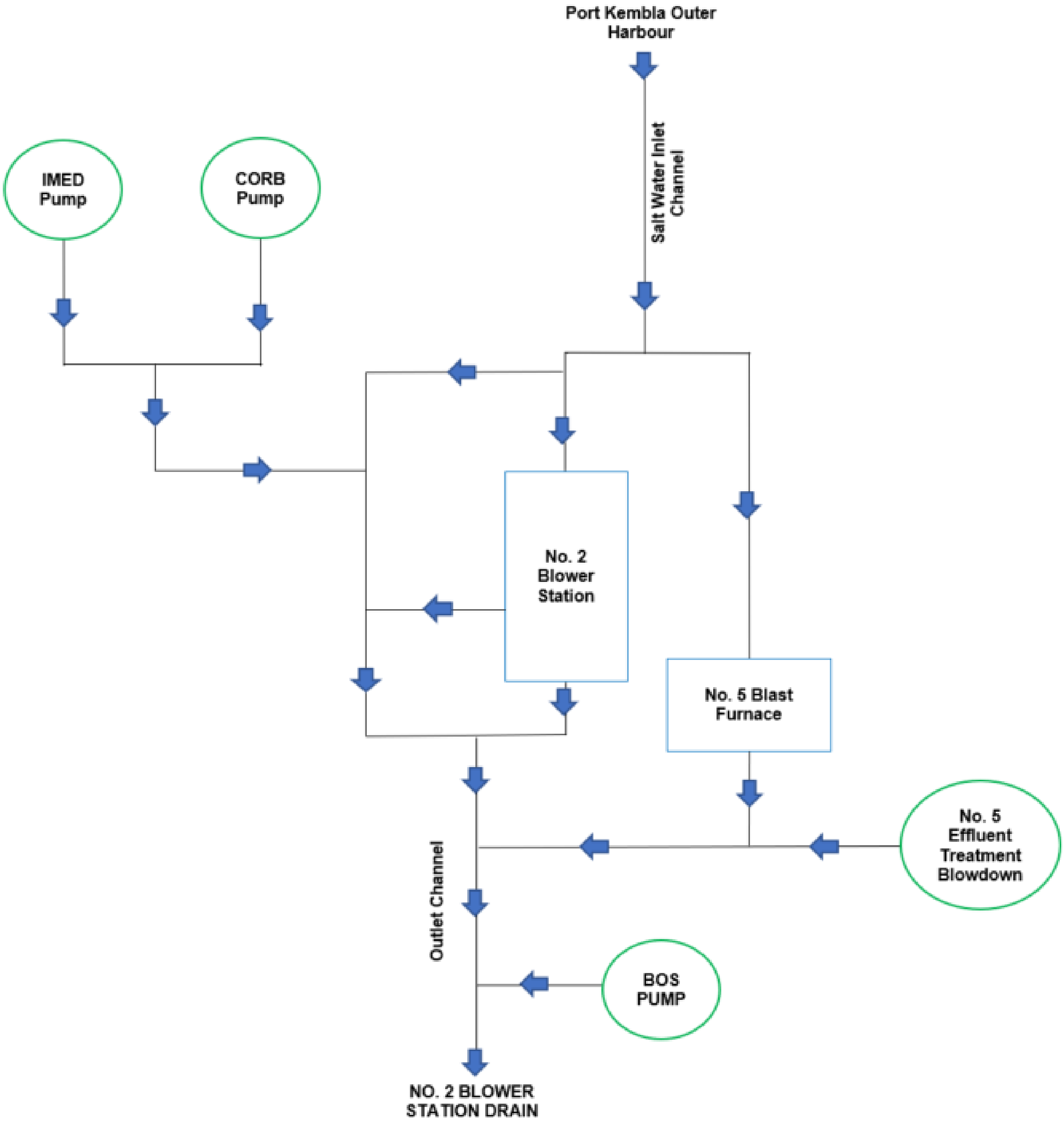

Figure 3.8 Schematic drawing of current 2BS Drain inputs

3.4 Contamination overview

A search of contaminated land records of notices and records of sites notified to the Environment Protection Authority (EPA) was conducted on 24 March 2021. The PKSW site is listed as a contaminated site by the EPA. The site has had four notices issued to it, the last being in March 2018, which was a notification to cease the Voluntary Management Plan for the site on the basis that regulation of the site under the *Contaminated Land Management Act 1997* (CLM Act) is no longer warranted. Ongoing management of site contamination occurs under EPL 6092.

Previous investigations undertaken at the project site (Egis, 2001; GHD, 2004; GHD, 2009; JBS&G, 2016) have identified potentially contaminated areas and Contaminants of Potential Concern (COPC) within the project site. The 6BF area was identified as a moderate contamination risk for heavy metals, total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene and xylenes (BTEX), polyaromatic hydrocarbons (PAHs), and volatile organic compounds (VOCs).

JBS&G (2016) found areas of hydrocarbon contamination in soils around the Sinter Plant and Cokemaking area, approximately 250 metres to the east and south of the project site, respectively. Elevated levels of heavy metals, benzene, ammonia and fluoride were also found in soils in these areas.

Elevated concentrations of heavy metals, TPH, PAHs, VOCs, cyanide, ammonia, nitrate, nitrogen and fluoride have been found within groundwater across the PKSW site (JBS&G, 2016; Senversa, 2019). Additionally, the hydrocarbon contamination at the Sinter Plant, Cokemaking and Gas Processing area has resulted in associated groundwater impacts, with a light non-aqueous phase liquid (LNAPL) plume identified in each of these areas (JBS&G, 2016; Senversa, 2019). BlueScope undertakes regular monitoring and remediation of this known contamination and provides annual reporting to the EPA.

Further discussion regarding levels of contaminants within groundwater and surface waters is provided in Section 3.4 and Section 3.5 and Section 3.6.

3.5 Groundwater

A Conceptual Site Model of groundwater at PKSW was developed in 2004 and refined in 2009 (GHD, 2009). This Conceptual Site Model was used as the basis for development of later targeted groundwater investigations (JBS&G 2016). The site's aquifer system can be summarised as comprising two primary aquifers overlying bedrock:

- A combined fill / shallow estuarine aquifer (the estuarine component of which comprises mostly sands and silts), underlain by;
- A deeper estuarine aquifer (predominantly comprising estuarine clays and muds) (JBS&G 2016).

Groundwater recharge predominantly occurs from rainfall infiltration and infiltration of water used for operational purposes, including dust suppression water (used primarily on raw materials stockpiles) and drainage waters. Groundwater recharge may also occur via the deeper (bedrock) aquifers (GHD, 2009).

Groundwater flow at the site generally trends in an easterly direction toward the inner harbour. However, topography, subsurface geology, and unlined surface water drainage channels result in localised variations to this trend, particularly along the perimeter of the site and adjacent to Allans Creek. The central portions of the site, characterized by extensive deposits of graded fill and deeper clay deposits, exhibit much flatter and more uniform hydraulic gradients (GHD, 2004).

BlueScope undertakes a groundwater monitoring program in line with condition E3.1 of EPL 6092 *Contamination Monitoring and Assessment Program*. This condition requires BlueScope to assess groundwater monitoring results against relevant criteria, assess for changes against historical results and evaluate the effectiveness of the monitoring well network. Wells which contain COPC are monitored annually while other wells are monitored less frequently. Monitoring is undertaken to inform assessment of the following:

- The nature and extent of groundwater contamination across PKSW.
- The direction of groundwater movement.
- The potential risks posed by the contamination to sensitive receiving environments.
- Changes in groundwater contaminant concentration over time.
- Surface water contaminant concentrations within Allans Creek to assess the potential for groundwater contamination to impact adjacent waterways.

Targeted groundwater investigations were undertaken in the vicinity of 6BF during 2016. These investigations defined COPC within PKSW groundwater as heavy metals, TPH/BTEX, PAHs, VOCs, OCPs, phenols, PCB's, ammonia, benzene, cyanide, fluoride. Within the BF6 area, COPC were limited to heavy metals, TPH/BTEX, PAHs, VOCs (JBS&G 2016).

Two wells, G24 and NT-MW09, are located within the 6BF project area to the east and west of the slag handling area. Testing in 2016 revealed exceedances of groundwater assessment criteria for manganese, cyanide, ammonia and nitrogen (JBS&G 2016).

Locations of groundwater monitoring wells are presented in Figure 3.9.

Figure 3.9 Groundwater sampling locations (modified from JBS&G, 2016)

3.6 Receiving environment

The PKSW site is generally flat and resides upon a base of artificial fill, including dredged sand and mud, rocks and local soil materials. The site is generally sealed, with small areas of exposed soil. Soils on site are classified as disturbed terrain, have a low probability of acid sulphate soils, and are generally susceptible to erosion, subsidence and lack permeability. The PKSW site is listed as a contaminated site on the EPA’s register of contaminated sites, with contamination managed and regulated under licence conditions attached to BlueScope’s EPL 6092. The site drains into two creeks, Main Drain and Allans Creek, which run into Tom Thumb Lagoon and Port Kembla Inner Harbour.

Allans Creek is a heavily modified waterway measuring approximately 30 m to 35 m in width with less than two metres of water depth at lowest astronomical tide in the vicinity of PKSW (Australian Hydrographic Service Chart AUS194). Allans Creek is the predominant source of freshwater inflow into Port Kembla Harbour and is subject to elevated temperature industrial discharges. Previous numerical modelling undertaken on behalf of BlueScope indicated that cooling water processes and recirculation are primarily controlled by harbour flushing, with notable differences at each level in the water column. The modelling revealed that wind and tidal influences play a significant role in the rate at which cooling waters discharged to Allans Creek are conveyed to the Inner Harbour (Cardno, 2006).

As a result, water temperatures within the Inner Harbour are generally one to two degrees warmer than sea temperatures beyond the entrance to the harbour.

Detailed studies into the ecology of Allans Creek and the Inner Harbour were undertaken as part of BlueScope's investigations into a once-through seawater cooling system (NSG, 2006). Key findings were summarised as follows (CH2M HILL, 2008):

- The Inner Harbour of Port Kembla is indicative of a stressful environment.
- Many species present in the Outer Harbour are not found within the Inner Harbour.
- Sessile invertebrate assemblages of Port Kembla demonstrated smaller numbers and varieties of sponges and ascidians than in slightly to moderately disturbed systems.
- Species more often associated with tropical waters are found in the Inner Harbour, possibly due to the warm cooling water.
- Fish assemblages resemble other estuaries within NSW.

A follow up study was completed in June 2012 as part of PRP 146: Assessment of the ecological condition of Port Kembla (UNSW, 2012). The objective of the study was to describe ecological communities and contaminant concentrations at multiple study locations in Port Kembla for comparison with study locations from reference estuaries and creeks. Key findings of the ecological health report cards for Port Kembla and Allans Creek are summarised in Table 3.1 and Table 3.2 respectively.

Table 3.1 Summary of Port Kembla ecological health report card findings (modified from UNSW, 2012)

Ecological community	Summary of historical results
Benthic larval fish	Communities are different, but no evidence of reduced ecological condition
Benthic and pelagic adult fish	Communities do not differ in composition or diversity measures
Planktonic larval fish	Communities may differ and evidence of reduced ecological condition
Epibiota	Communities are different, but no evidence of reduced ecological condition
Infauna	Communities may differ and evidence of improved ecological condition
Phytoplankton and microphytobenthos	Communities may differ and evidence of reduced ecological condition

Table 3.2 Summary of Allans Creek ecological health report card findings (modified from UNSW, 2012)

Ecological community	Summary of historical results
Epibiota	Communities are different, but no evidence of reduced ecological condition
Infauna	Communities do not differ in composition or diversity measures
Phytoplankton and microphytobenthos	Communities may differ and evidence of reduced ecological condition

The project site drains into the IMED which is pumped to the No. 2 Blower Station Drain and discharged to Allans Creek, before draining into the Inner Harbour. Allans Creek is classed as Good Freshwater Fish Community Status and Allans Creek and the Inner Harbour (former areas of Tom Thumb Lagoon) are key fish habitats (DPI, 2016). As a result, both are considered sensitive receiving environments and consideration has been given to strategies to avoid or minimise impacts to these waterways.

3.7 Water quality within Port Kembla

Water quality within Allans Creek and the Inner and Outer Harbours of Port Kembla has been historically impacted by urban and industrial discharges as well as ongoing port activities. These past activities led to contamination of marine sediments, groundwater and harbour waters.

Water quality monitoring studies have been previously undertaken to define ambient water quality within the port and to monitor water quality parameters during previous dredging campaigns. Key water quality monitoring programs undertaken within the Inner Harbour and Outer Harbour of Port Kembla since 2002 are summarised below:

- Monitoring and Assessing the Water and Sediment Quality of Port Kembla Harbour According to the ANZECC & ARMCANZ (2000) Guidelines undertaken by M. Phillips (2002).
- Port Kembla Harbour Water Quality Monitoring Program undertaken by the Port Kembla Harbour Environment Group[4] between 2002 and 2005.
- Berth 107 Dredging Water Quality Monitoring Program undertaken by Cleary Bros on behalf of Port Kembla Port Corporation between 2006 and 2008.
- Outer Harbour Tug Berth Dredging Water Quality Monitoring Program undertaken on behalf of Port Kembla Port Corporation in 2011.
- Outer Harbour Stage 1A Reclamation Water Quality Monitoring Program (including baseline and impact monitoring) undertaken on behalf of Port Kembla Port Corporation between 2011 and 2012.
- Maintenance Dredging Water Quality Monitoring Program undertaken by ENRS on behalf of NSW Ports in late 2014.
- Port Kembla Berth 103 Stage 2 Dredging and Spoil Disposal turbidity monitoring undertaken by Boskalis Australia 2015.
- AIE Port Kembla Gas Terminal Construction Water Quality Monitoring Program under EPL21529 June 2021 – September 2021 (ongoing at the time of issue of this report)

In many instances the historical laboratory Limits of Reporting (LOR) adopted during the previous studies listed above were greater than the assessment criteria, meaning that it was not possible to assess whether contaminant concentrations were above or below the current relevant criteria (GHD, 2018a). Consequently, the results of detailed analysis of the full data set may be misleading and would be considered of relatively little value. Nevertheless, it is possible to summarise the key issues relating to existing water quality within the port through review of these previous investigations which are summarised in Table 3.3.

The 2002-2005 monitoring program undertaken by the Port Kembla Harbour Environment Group is considered the most comprehensive study of ambient water quality conditions within the broader harbour. The program aimed to establish benchmarks to determine trends and future improvements in water quality and assess whether contaminant concentrations exceed the ANZECC / ARMCANZ Guidelines (2000). The program identified monitoring locations within the Inner and Outer Harbours of Port Kembla which have been subsequently adopted by a number of programs and are presented below in Figure 3.10.

Results of the 2002 – 2005 sampling were compared to relevant trigger values for the following analytes:

- Metals (Al, Cr, Mn, Fe, Ni, Cu, Zn, Sn, Pb, Cd, As, Se)
- Total Suspended Solids (TSS)
- Cyanide
- Ammonia
- Phenols

The most recent water quality monitoring data collected by AIE under EPL21529 between June and September 2021, shows that whilst background concentrations of aluminium, copper, lead and zinc have been recorded in excess of relevant DGV's in some instances, no exceedances have been recorded in relation to a number of traditional problematic contaminants such as cadmium, tin and arsenic.

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[4] The Port Kembla Harbour Environment Group (PKHEG) was formed in 1998 from the previous Port Kembla Harbour Catchment Management Committee as a forum for port stakeholders and community to work collaboratively towards a sustainable and healthy waterway and harbourside environment (NSW Ports, 2020).

Figure 3.10 *Monitoring locations within the broader port*

Table 3.3 Historical water quality (GHD, 2018a)

Parameter	Summary of historical results
Contaminants	Water samples collected under ambient conditions during the 2002-2005 monitoring program undertaken by the Port Kembla Harbour Environment Group identified concentrations of aluminium, cadmium, copper, lead, zinc, tin and arsenic in excess of the 95% trigger values for protection of marine waters. Concentrations of all other analytes were below the adopted trigger values. Elevated levels of adverse water quality parameters were generally found in the vicinity of creeks and waterways that drain industrial and stockpile areas such as the entrance to Allans Creek (Site 1), Gurangaty Waterway (Site 5), near No. 1 Products Berth (Site 3), the Cut (Site 7) and Darcy Road Drain (Site 15).
Suspended Solids / Turbidity	Total Suspended Solids concentrations are known to be influenced by shipping movements and freshwater flood events. Long term data collected during the 2002-2005 monitoring program undertaken by the Port Kembla Harbour Environment Group measured average TSS concentrations of 5.9mg/L and 3.2mg/L within the Inner and Outer Harbours respectively. TSS concentrations within the Inner Harbour were shown to vary between 1.0mg/L and 17.9mg/L. TSS concentrations within the Outer Harbour were shown to vary between 0.5mg/L and 11.8mg/L. Previous dredging campaigns (Berth 103) established a relationship between Nephelometric Turbidity Units (NTU) and TSS of 1 NTU = 2mg/L TSS. It is critical to note that the relationship between NTU and TSS is highly dependent on the material properties of the sediments in suspension.
pH	Previous monitoring campaigns have recorded pH levels within the Inner and Outer Harbour ranging between 7.6 and 8.1, and in some instances below the recommended ANZECC criteria for harbour waters (8.0-8.5). Previous investigations concluded that pH levels are lower in the Inner Harbour than the Outer Harbour, indicating pH levels within the Inner Harbour are likely influenced by freshwater discharges from existing waterways.
Temperature	Water temperatures within Port Kembla are generally higher than those measured offshore due to tidal flushing patterns and existing industrial discharges to the Inner Harbour. As a result, water temperatures within the Inner Harbour are generally one to two degrees warmer than sea temperatures beyond the entrance to the harbour. The Outer Harbour benefits from greater tidal flushing and is generally less than 0.25 degrees warmer than sea temperatures beyond the entrance to the harbour.
Salinity	Total Dissolved Solids (TDS) concentrations assessed during the 2014 maintenance dredging campaign ranged from 31.15g/L to 35.38g/L. Concentrations have been shown to vary with depth indicating density stratification within the water column. Concentrations are also known to be influenced by freshwater flood events.

3.8 PKSW water quality Pollution Reduction Programs

BlueScope has completed 77 water related Pollution Reduction Programs (PRPs) since its initial engagement with the EPA in 1976. Key water programs completed by BlueScope relevant to the project include the following:

- PRP 54 – Blast Furnace Gas Cleaning Effluent
- PRP 96 – Toxicity Testing of No. 2 Blower Station Drain Water
- PRP 146 – Port Kembla Inner Harbour Flora and Fauna Study
- PRP 147 – Investigate Stormwater First Flush Impact
- PRP 175 – (Pollution Study) – Diversion of Iron Ore Road Drain
- PRP 176 – Ironmaking East Drain Drainage Diversion Project (Environmental Improvement Program)

Ongoing monitoring programs and PRPs relating to water quality risks associated with current and future blast furnace operation are summarised below:

- **PRP 181 – Seal Pot System Risk Assessment**
  - The aim of this PRP is to assess the environmental risk and the feasibility of mitigation works for seal pots across PKSW, and to implement a works program to install mitigation works at the premises.
- **PRP 182 – Wastewater Assessment Program for Number 2 Blower Station (2BS) Drain**
  - The aim of this PRP is to investigate and assess the pollutant discharges to the 2BS drain by identifying sources, quantifying pollutants, assessing against relevant, contemporary environmental criteria.
- **PRP 183 – Blast Furnace Gas Condensate Toxicity Assessment**
  - The aim of this PRP is to develop and implement a methodology to characterise the blast furnace gas condensate produced under a range of operating scenarios and assess the toxicity of the gas condensate.

In addition, an investigation into online treatment of blast furnace process water is currently underway at 5BF. Learnings from this investigation will be applied to 6BF operation.

PKSW operates under a Water Stewardship Plan (Plan) which sets out the catchment and site challenges at the PKSW site. The purpose of this Plan is to define key targets in relation to water management which will be reviewed regularly both internally and externally with key stakeholders. The Plan has been developed using the International Water Stewardship Standard as a basis and in collaboration with various stakeholder groups. As a Water Steward, BlueScope is committed to sustainable water management for the PKSW site, in addition to contributing to efforts within the catchment and region. The Plan identifies the site and catchment risks, key stakeholders and water-related environmental and social adverse impacts.

3.9 Existing site water balance

PKSW sources industrial and domestic water from Sydney Water, which is Australia’s largest water utility provider and owned by the NSW Government. All water supplied by Sydney Water is from appropriately authorised sources. Approximately 600 m^3/d of potable water is used at PKSW.

PKSW uses industrial water in the steel manufacturing process, which is comprised of both recycled water and unfiltered Avon Dam water. Recycled water comprises over 85% of the current industrial water mixture and is sourced from the Wollongong Water Recycling Plant. The dual recycled / dam water supply provides the reliability required for the steel manufacturing process, and Sydney Water is able to adjust supply volumes to reflect PKSW’s site needs. Domestic water is a less significant water input to PKSW, comprising less than 3% of the total industrial and domestic water consumption and is a minor component of the overall domestic water reticulation network across the Illawarra region.

Approximately 26,000 m^3/h of seawater from the Outer Harbour is used at PKSW for salt water cooling. This water is returned to the Inner Harbour after use.

A diagram of the existing site water balance is shown in Figure 3.11.

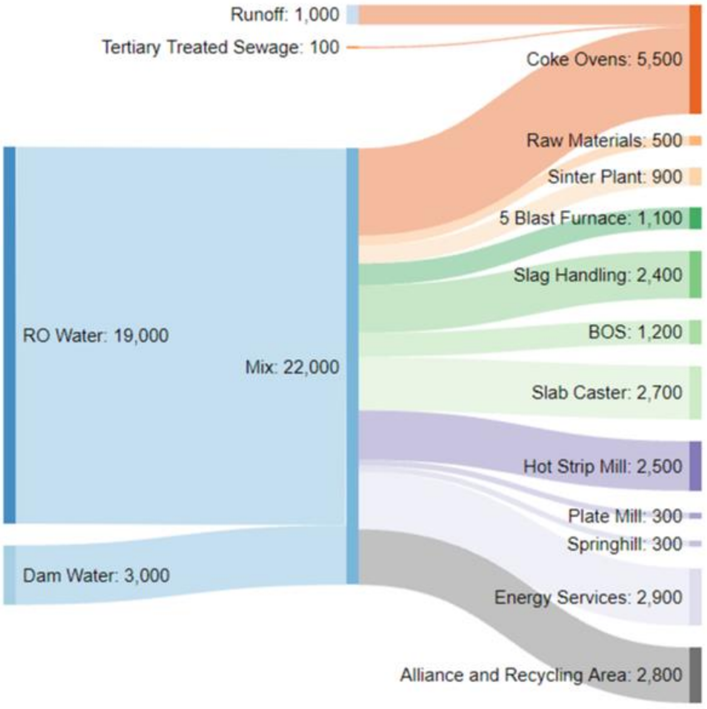

Figure 3.11 Existing site water balance at PKSW

4. Project description

4.1 Project Summary

To prepare 6BF to become operational again, major maintenance works are required as part of a reline process (the project).

The operation of 6BF following completion of reline activities, commissioning and ramp up will be generally the same as existing operations at 5BF. Specific locations of certain activities within the PKSW site will change due to the transfer of operations to 6BF. However, changes to the quantity or characteristics of water outputs from the blast furnace will be minimal.

Water uses and discharges from the blast furnace will be consistent with the quantity and quality of those at 5BF. Minor changes to cooling water discharges are expected due to the alternative cooling system associated with 6BF (refer Section 5.3). The stormwater drainage system proposed for the project will enable the capture and reuse of stormwater and containment of any spills, providing an improvement over the current stormwater management capabilities.

Table 4.1 provides a summary of the key elements of the project. Key features of the project are shown in Figure 3.3. Further details regarding the construction, commissioning, operations and decommissioning phases of the project are described in Sections 4.2 to 4.5.

Table 4.1 Project summary

Project element	Summary
6BF operational area and construction footprint location	Lot 1 DP 606434
Construction	Major construction work will be required within the blast furnace and surrounding facilities, and will involve removing the remaining burden materials, refractory bricks and blocks and staves within the interior of the blast furnace for replacement. Any required repairs or replacement of ancillary equipment or structures will also be carried out.
Access	The majority of the construction traffic will access the site via the major roads that service the Port Kembla industrial area, including the Princes Motorway and Princes Highway, Shellharbour Road, Springhill Road, Five Islands Road and Masters Road. No changes to existing access arrangements are proposed.
Ancillary construction facilities	Various locations within the PKSW site within Lot 1 DP 606434, Lot 1 DP 606432, Lot 1 DP 595307 and Lot 1 DP 606430.
Ironmaking components and systems	– Raw materials handling – Sinter Plant – PCI Plant – Blast furnace – Stockhouse and charging system – Blast furnace vessel – Cooling system – Casthouses – Hot blast system – Off gas system – Slag handling
Commissioning	Commissioning involves the following: – All services brought back into live condition – Various parts of plant re-heated – Pressure and leak tests conducted – Cooling systems filled and flushed – Furnace dried out and charged with kindling and burden material – Gas system purged and furnace ‘blown in’ – Furnace progressively heated until regular casting of iron and slag commences – Full production reached within one to two months

Project element	Summary
Operations	Operation of 6BF will be generally the same as existing operations utilised at 5BF (24-hour operation), including: – Processing and transport of raw materials (iron ore, coal, coke, fluxes). – Production of sinter (agglomeration of iron ore, coke and limestone dust) for use within the blast furnace. – Production of approximately 2.7 Mtpa of iron from 6BF. – Processing of approximately 0.88 Mtpa of blast furnace slag for use as construction product.
Construction work hours	Where practical, and subject to the final construction program, construction will be carried out during the following construction hours: – Monday to Friday: 7.00 am to 6.00 pm – Saturday: 7.00 am to 6.00 pm – Sundays and public holidays: no work A number of construction activities will be scheduled to be undertaken as night works. Final construction phase will require 24 hour construction (estimated to be a period of 5 months). Further, 24 hour construction may be required for an extended period if 6BF is required online earlier than 2026.
Construction duration	Approximately 3 years
Operational duration	Approximately 20 years

4.2 Construction overview

The reline and transition to operation of 6BF will be completed over a period of approximately three years which, assuming a construction start in 2023, would see construction completed in 2026. The actual construction start and completion dates will depend on the operational performance of the 5BF facility and its ability to complete its planned campaign life.

Construction will commence once all necessary approvals are obtained. Detailed construction planning, including timing, staging and work sequencing, will be confirmed once construction contractors have been engaged.

The construction information described in this chapter is preliminary and is based on the current stage of the design. It provides an indicative construction method that retains flexibility for the successful contractor to refine and optimise aspects of the approach. The construction methodology will be refined as the design progresses, and once the construction contractor is engaged. A final construction methodology and program will be developed by the construction contractor based on the conditions of approval and the mitigation and management measures provided in this document.

Major construction work will be required within the blast furnace and surrounding facilities and will involve:

- Removal of the remaining burden materials
- Removal of the iron skull
- Removal of worn carbon block refractories in the hearth
- Removal of worn refractories in the remainder of the vessel
- Demolition of other equipment including:
  - Cooling staves which protect the blast furnace shell
  - Hot blast main refractory lining, including the expansion joints
  - Clarifier tank and associated equipment where required
- Repairs to the blast furnace shell where required
- Installation of a new clarifier tank and associated equipment
- Installation of the new hearth, sidewall refractories and staves
- Repair/replacement of tuyeres, tapholes and instrumentation

- Repair, maintenance and/or upgrade of ancillary equipment including:
  - Furnace cooling systems
  - Hot blast system including the stoves
  - Gas system, with addition of a Top Gas Recovery Turbine (TRT)
  - Furnace top, including the charging equipment, bleeder valves and outrigger crane
  - Casthouse floors and associated equipment
  - Stockhouse (raw materials feed system)
  - Automation and power systems
  - Services
- Construction of a new primary ferrous feed system in the Raw Materials Handling area
- Civil works for the new slag handling area
- Installation of a new slag granulation system
- Commissioning and ramp up of 6BF operations

The overall construction program is anticipated to be around 3 years. An indicative construction timeline showing the duration of key activities is provided below in Table 4.2.

Table 4.2 Indicative works schedule

Project stage	Activities	Approximate duration
1	– Progress with refurbishment activities that do not require long-lead items. – Early works commence for enabling activities including cranes, lifts, casthouse roof replacement, drainage, construction facilities.	24 to 30 months
2	– Construction activities including demolition, civils, stockhouse, slag handling, hot blast system, gas system, cooling system, wreck out of furnace, furnace top. – Control system and automation upgrade.	24 months
3	– Construction activities including relining of furnace initiated with twelve months advance notice of end of 5BF operations. – Pre-commissioning and commissioning of 6BF.	12 months
4	– Managed transition of operations from 5BF to 6BF with ramp-down of 5BF followed by ramp-up production of 6BF. – 5BF decommissioned and made safe on ceasing operation.	6 – 8 weeks

4.2.1 Construction areas

Construction areas generally fall within two categories:

- Construction activities in the immediate vicinity of 6BF.
- Additional construction of ancillary facilities across the wider PKSW site comprising a mix of indoor and outdoor areas.

The delivery of materials and equipment to the work sites will be staged as required with minimal storage available in the area immediately adjacent to 6BF. Indicative laydown areas are shown on Figure 3.2.

The identified construction support facilities, car parks and laydown areas are on areas of the PKSW site that have been historically used for similar activities including during previous reline events and have existing stormwater controls. A summary of proposed laydown areas is provided in Table 4.3.

Table 4.3 Ancillary facilities

Location	Activity	Size (m^2)	Indoor/Outdoor
No.1 Works 1	Storage	28,500	Outdoor
No.1 Works 2	Storage	5,000	Indoor
No.1 Works 3	Storage	36,500	20,000 indoor 16,500 outdoor
No.1 Works 4	Storage	6,400	Outdoor
No.1 Works 5	Storage	4,000	500 indoor 3,500 outdoor
No.1 Works 6	Storage	17,000	Outdoor
CRM 1	Storage	80,000	Outdoor
CRM2	Storage	3,000	Indoor
CRM3	Storage	2,800	Indoor
No.2 Works 1	Construction	1,000	Outdoor
No.2 Works 2	Construction	3,000	Outdoor
No.2 Works 3	Construction	1,500	Outdoor
No.2 Works 4	Storage	3,000	Outdoor
No.2 Works 5	Storage	7,000	Outdoor
No.2 Works 6	Storage	7,000	Outdoor
No.2 Products Berth	Storage	2,500	Outdoor
Recycling Area 1	Storage / cleaning	14,000	3,000 indoor 11,000 outdoor
Recycling Area 2	Processing	88,000	Outdoor
Recycling Area 3	Processing	25,000	Outdoor
Recycling Area 4	Storage / Processing	11,000	Outdoor
Recycling Area 5	Storage / Processing	20,000	Outdoor
Recycling Area 6	Storage	4,500	Outdoor
Springhill Electrical	Storage	3,000	Indoor

4.3 Commissioning overview

Prior to operation, the project will undergo a period of commissioning which is a once off process that is necessary to allow operation of the blast furnace. It is anticipated the commissioning process will take several months to complete, after which the furnace will be gradually uprated over a period of approximately 6 weeks until full production is achieved.

The commissioning process is outlined as follows:

- All services brought back into live condition
- Various parts of plant reheated
- Pressure and leak tests conducted
- Cooling systems filled and flushed.

The furnace proper will be dried out using hot blast at limited temperatures, then charged with kindling (comprising firewood/railway sleepers and coke) and filled with a mix of burden material (coke and iron ore).

The gas systems will be purged ready for use and the furnace will be ‘blown in’. This involves the introduction of hot blast air through the tuyeres, with gas initially discharged until its composition is satisfactory for internal use, at which time the gas is then diverted into the gas cleaning system.

The furnace will be progressively heated until regular casting of iron and slag commences, although the iron quality is not usable initially, and it will take several days to produce useable iron which can be converted to steel.

The furnace will then be uprated to target production over the following weeks, reaching full production within one or two months.

4.4 Operational overview

Following the completion of reline activities, commissioning and ramp up, operation of 6BF will be the same as existing operations utilised at 5BF. Specific locations of certain activities within the PKSW site will be relocated due to the transfer of operations to 6BF. Changes to the quantity or characteristics of water outputs from the blast furnace will be minimal. Minor changes to cooling water discharges are expected due to the alternative cooling system associated with 6BF, and an improvement in stormwater management compared to existing operations will be realised.

The hot gases leaving the top of the blast furnace will be cooled and cleaned then piped through the gas main to other plants within PKSW for use as an energy source to the maximum practical extent. Condensate that is generated in the gas main will be collected in seal pots. All the condensate will be collected from the seal pots and returned to the effluent treatment system via a series of collection tanks and pumps. The design of the BFG seal pots proposed for the 6BF area are ‘no-blow’ seal pots which will reduce the risk of gas condensate overflows when compared to traditional seal pots.

4.4.1 Future site water balance

PKSW will continue to source industrial and domestic water from Sydney Water, which is Australia’s largest water utility provider and owned by the NSW Government. All water supplied by Sydney Water is from appropriately authorised sources. A diagram of the future site water balance is shown in Figure 4.1.

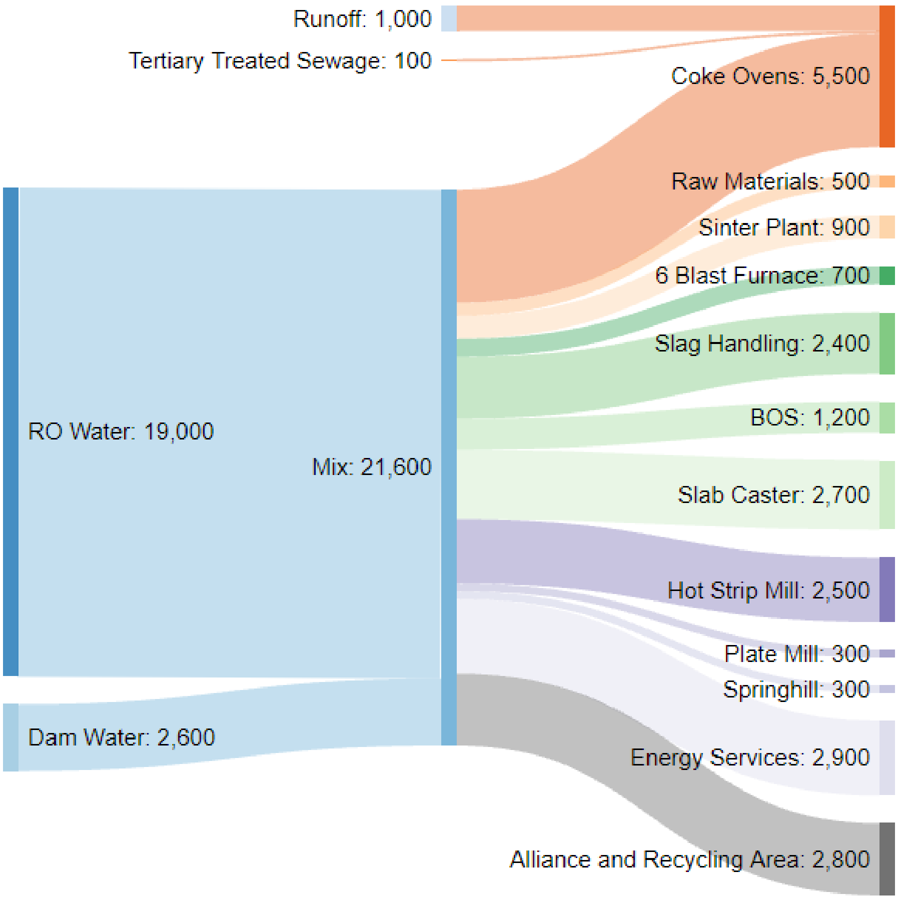

Figure 4.1 *Future site water balance at PKSW*

4.4.2 Gas cleaning

Consistent with current 5BF operation, the BFG exiting the top of the 6BF will be cooled and cleaned utilising a wet scrubber. The clean gas will then be piped through the gas main to other plants within PKSW for continued use as an energy source to the maximum practical extent. The effluent from the scrubber will be cooled and cleaned for reuse in the gas cleaning process. Blowdown water from the effluent treatment system will be discharged at a rate of approximately 30 – 45 m^3/h into the Outlet Channel where it will combine with approximately 26,000 m^3/h of salt water before discharging to Allans Creek and the Inner Harbour via the No. 2 Blower Station Drain. Flocculant and coagulant that will be added to the effluent treatment system to assist with settling of solids comply with statutory requirements (contained in AS/NZS 3666.1:2011) and assist in preventing excessive scale build up. Specific products used in the effluent treatment system are described in Section 5.3.1. The slurry formed in the effluent treatment system will be sent via pipework to dewatering at the Sinter Plant, with recovered water returned to the effluent treatment system and the remaining slurry taken to the PKSW Recycling Area.

During abnormal furnace operation, the chemical composition of the water may vary in which case, the blowdown water from the effluent treatment system will be diverted to contingency storage to prevent release to the environment and stored until such time as the quality of the water is confirmed to be acceptable for discharge in accordance with EPL 6092.

4.4.3 Cooling systems

The 6BF furnace cooling systems are all a fully closed loop design with heat exchangers. Once through salt water is used as the heat sink for the 6BF closed loop cooling systems on the secondary cooling or cold side of the heat exchangers. This differs from the evaporative cooling tower currently utilised at 5BF.

The closed loop design is a safety feature of the blast furnace allowing high accuracy leak detection and has the added benefit of minimising water loss. The additional salt water required will result in an increased volume of salt cooling water discharge (approximately 10%) compared to current operations, with a minor temperature increase predicted at the No. 2 Blower Station Drain discharge point.

Due to the potential for temperature increases in discharges to Allans Creek, evaporative and air-cooling towers were considered as part of the project. It was determined that an air cooling tower was unfeasible due to the unreliability of maintaining the temperature required for cooling supply in hot weather, and high water usage required for operation of an air to water cooling tower. An evaporative cooling tower is currently utilised at 5BF. Evaporative cooling towers require fresh water to replenish water lost through evaporation and are more energy intensive than the cooling system proposed for 6BF. It is therefore proposed that a once through salt water cooling system is used for 6BF, as it does not require regular freshwater make-up for its operation and is less energy intensive than an evaporative tower.

4.4.4 Slag granulation

Slag produced by the blast furnace is either formed into rock or granulated slag for sale as construction material. Granulated slag is formed by subjecting the molten slag stream to a continuous stream of high pressure water. The water used for granulation is collected, cooled and reused in a closed loop system.

4.4.5 Stormwater drainage

The project site has established stormwater drainage consisting of a series of sumps and collection tanks which capture the ‘first flush’ of rainfall events and any potential spills. These sumps are capable of pumping back to the effluent treatment system should further treatment be required. In a rain event, a “first flush” of stormwater (10mm in a day) is collected in sumps and tanks in the stormwater drainage system. Following the first flush and when sumps reach capacity, stormwater drains to IMED and is subsequently pumped to the No. 2 Blower Station Drain for release to Allans Creek. During major rainfall events, the IMED weir can overtop leading to discharge to the Inner Harbour at licence discharge Point 89.

As part of the project, the slag handling area will be prepared with hardstand graded to new internal drains and will include a truck wheel wash and a large collection tank for water recycling. All drains in the area will flow into either a new slag pit settling pond or the granulator settling pond. The new slag pit settling pond will capture all slag handling surface drainage (slag pit, adjacent slag pit roads and slag haulage truck wash areas) and will provide additional capacity to capture first flush during rain events. During normal operations, collected water will be recycled as make-up water to the granulator or as slag pit sprays. In a rain event, the first flush will be collected in the new slag pit settling pond; this settling pond will then overflow into a drain which flows into the plant stormwater drain before draining to IMED and will be subsequently pumped to the No. 2 Blower Station Drain for release to Allans Creek. A simplified block flow diagram showing the 6BF drainage is shown in Figure 5.1.

The No. 2 Blower Station Drain and Allans Creek have been selected as the proposed discharge locations following consideration of the following:

- Utilising existing infrastructure minimises impacts during the construction phase. In particular, this approach reduces the need to excavate, treat and dispose of materials on site, thereby minimising the risk of mobilising any existing contamination within soils and groundwater.
- Allans Creek and the western portion of the Inner Harbour have been subject to the effects of warmer than ambient industrial discharges for decades and are considered part of a highly disturbed ecosystem (NSG, 2006). The ecology of Allans Creek and the Inner Harbour are well understood following previous detailed studies which indicated that the receiving environment exhibits key differences to other reference environments partly as a result of these historical discharges (NSG, 2006), (CH2M HILL, 2008), (UNSW, 2012).
- Selecting the No. 2 Blower Station Drain and Allans Creek as the ongoing discharge location provides the greatest separation distance from higher value ecosystems within the Outer Harbour and areas beyond port limits, allowing for greater mixing within the Harbour.
- The water discharges from existing blast furnace operations are currently released at the No. 2 Blower Station Drain. As the quality of the water of the proposed project will be similar to that of existing conditions, there will be no changes to the waterways as a result of the project.

A simplified diagram of the inputs to the No.2 Blower Station Drain proposed by the project is presented in Figure 4.2.

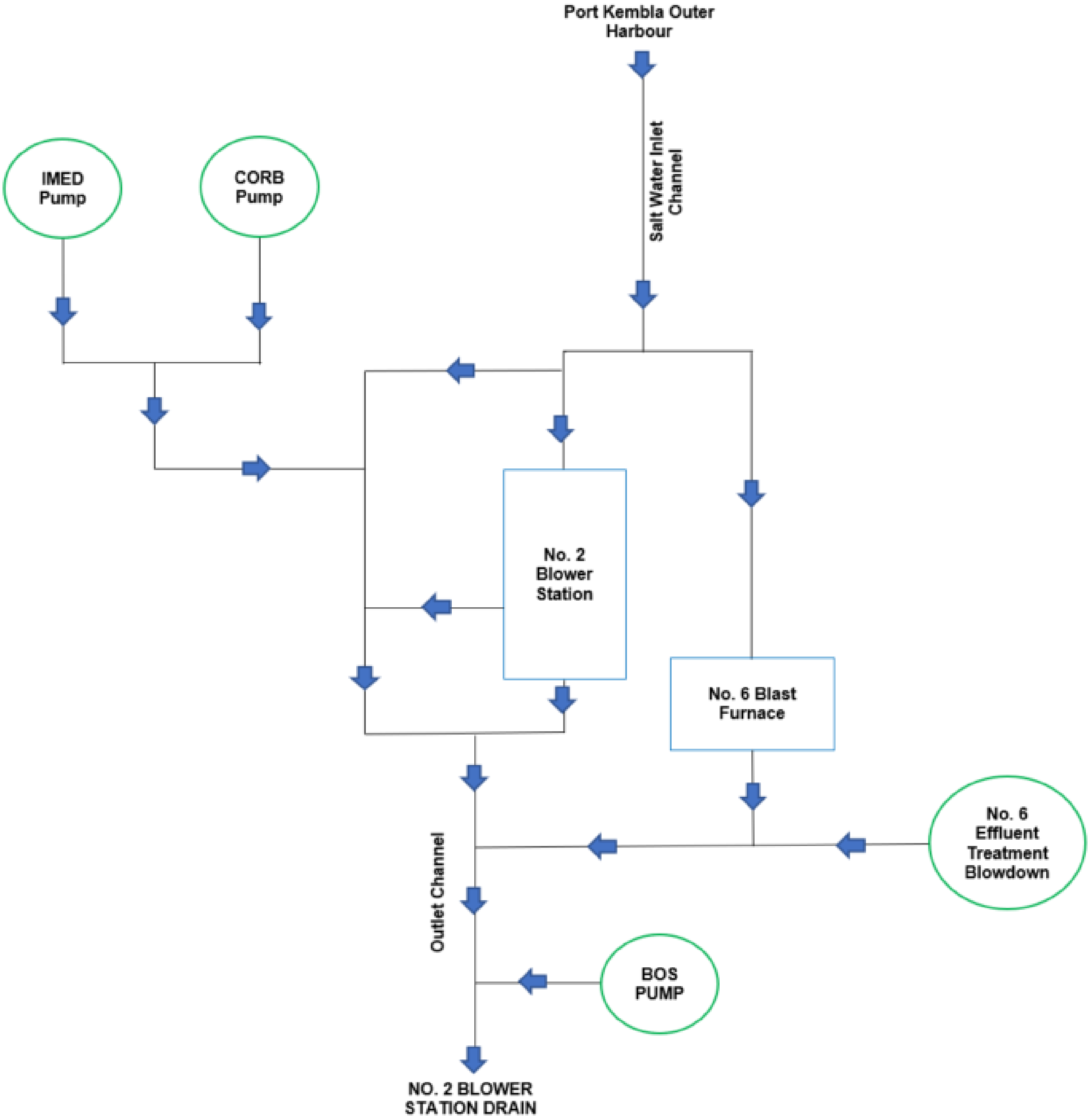

Figure 4.2 Schematic drawing of current 2BS Drain inputs

4.5 Decommissioning overview

A campaign is the period of time (measured in years) during which the furnace operates before needing to be relined. The target campaign duration for 6BF will be 20 years after which time furnace conditions would dictate relining or decommissioning requirements.

5. Water quality impact assessment

5.1 Project Construction WQIA

5.1.1 Construction impacts to surface water quality

Potential risks to water quality during the construction phase are well understood given the experience gained during the successful delivery of the three previous reline projects at PKSW. Specific risks include:

- Release of poor quality stormwater into drains and waterways where it is impacted by excavation works and other construction activities. This may include elevated TSS, reduced DO, pH impacts and the presence of organic matter and other debris.
- Mobilisation of existing contamination within soils.

All construction activities are proposed to take place in established areas. As mentioned in Section 4.2, the proposed laydown areas and carparks are existing infrastructure on the site with existing water management controls in place.

Similarly, the 6BF, its Stockhouse, and roadways within PKSW have existing stormwater drainage systems. The 6BF yard area is sealed and the drainage system includes a series of sumps designed to contain the ‘first flush’ of rainfall events and spills (refer to Section 4.4).

A site-specific Soil and Water Management Plan (SWMP) will be developed and implemented prior to construction in accordance with the *Managing Urban Stormwater: Soils & Construction, vol. 1* (Landcom 2004). This plan will outline the established controls that will be in place for the duration of construction works, as well as any targeted controls specific to the project. For example, bunding and storage requirements for chemical management will be in accordance with the relevant EPA requirements, Australian Standards and manufacturers’ requirements.

5.1.2 Construction impacts to groundwater

The project will require some~~,~~ excavation and ground disturbance, including for the slag handling civils and roads, slag granulator foundations, new Highline Switchroom foundations, foundations for the Waste Gas Heat Recovery system, clarifier foundations, TRT foundations, replacement of rail line ballast and rail, Main Control Building foundations, and Primary Ferrous Feed Conveyor foundations (in RMH). These areas will be within the footprint of the 6BF area shown on Figure 3.3 and will be confirmed during detailed design.

Vehicle movements may also disturb the ground, however, as the majority of the site is currently sealed, disturbance is expected to be minimal. Soil disturbance associated with the project has limited potential to cause localised soil erosion. The erosion risk is relatively low as the site is flat, and predominantly sealed with concrete or bitumen and the level of disturbance is expected to be minor.

Excavation or disturbance to natural material below the level of fill (approximately 5-8 metres below existing ground level) may be required, however the location and extent of excavation will be determined during detailed design once additional geotechnical site investigations have been completed.

The potential groundwater contaminants that may be encountered or mobilised by excavation works are well understood through BlueScope’s detailed and ongoing groundwater monitoring program. Following confirmation of the excavation requirements, an excavation and groundwater management plan (or similar) will be prepared outlining specific measures to be adopted during any excavation and dewatering activities required. It is therefore expected that any impacts to groundwater quality will be able to be readily managed during the construction phase. The implementation of a site specific SWMP will include measures to prevent spills which have the potential to result in groundwater impacts.

5.2 Project commissioning WQIA

5.2.1 Commissioning impacts to surface water quality

During commissioning, cooling water systems will be filled and flushed with industrial water in a controlled manner to drain. There is potential for foaming to occur within the gas system during start up due to the use of kindling and initial fill, which may require discharge into storage basins. Site containment measures will be developed during the detailed design phase to ensure that any overflows due to foaming are able to be contained on site.

During charging, purging and heating of the furnace, as much exhaust gas as possible will be directed through the gas cleaning systems. Similar to 5BF, the dust will be removed from the waste gas by way of a wet scrubber and the resulting scrubber water treated and recycled in the effluent system as described in Section 4.4.2. It is possible that the volume and chemical composition of the blowdown water generated during the commissioning phase will vary from that associated with full scale operations. A commissioning Water Quality Management Plan (WQMP) (or similar) will be developed during detailed design to assess the likely composition of effluent treatment plant water, including the potential for foaming. Where required, monitoring programs and corrective measures, such as the use of antifoam, will be developed to ensure that discharges to No.2 Blower Station drain and Allans Creek are in accordance with EPL 6092.

Commissioning of the granulator will be undertaken using industrial water within sealed hardstand areas in the vicinity of 6BF where drainage systems will be in place. Any potential impacts to surface water will be monitored and managed through either the commissioning WQMP or SWMP, which will be prepared following completion of detailed design.

5.2.2 Commissioning impacts to groundwater

Commissioning of the granulator will be undertaken using industrial water within sealed and hardstand areas in the vicinity of 6BF where drainage systems will be in place. Any potential impacts to groundwater recharge will be monitored and managed through either the commissioning WQMP or SWMP, which will be prepared following completion of detailed design.

5.3 Project operation WQIA

5.3.1 Operational impacts to surface water quality

Water uses and discharges from 6BF will be consistent with the quantity and quality of that which is currently discharged from 5BF, with minor changes to cooling water discharges expected due to the alternative cooling system associated with the project. A simplified block flow diagram for 6BF is presented in Figure 5.1. Discharges with potential impacts have been assessed in Sections 5.3.1.1 to 5.3.1.3 and an assessment of the resulting discharges against the relevant assessment criteria is presented in Section 5.3.3.

5.3.1.1 Blowdown

The effluent treatment system proposed for 6BF is consistent with the effluent treatment system used for existing operations and the discharge location will remain as the 2BS drain which discharges to Allans Creek.

The rate of future 6BF blowdown discharge is expected to be approximately 30 – 45 m^3/h, which is in accordance with existing discharge rates associated with 5BF operations. This rate represents a very small component (< 0.2%) of the broader flow rate within No. 2 Blower Station drain of approximately 26,000 m^3/h.

Flocculant and coagulant will be added to the effluent treatment system to assist with settling of solids, in compliance with statutory requirements (contained in AS/NZS 3666.1:2011) and prevent excessive scale build up. Specific products are assessed in Table 5.1.

Table 5.1 Assessment of products used within the effluent treatment system

Product name and manufacturer	Use, dosing and expected discharge concentration	Potential impacts to water quality
CAT-FLOC 8103 PLUS NALCO Water	– Water clarification aid (coagulant) – Dosing rate: 1.5 mg/L – Discharge concentration: 0.0026mg/L	Summary of ecological information (Nalco, 2020): – No known ecotoxicological effects. – Lowest reported NOEC Ceriodaphnia dubia: 1.25 mg/L. – Poorly biodegradable. – Not expected to bioaccumulate. – Manufacturer's assessment of potential environmental hazard is: Low. WQIA conclusion: No significant impacts to water quality expected at proposed discharge concentration.
HI-TEX 82220 NALCO Water	– Anionic flocculant – Dosing rate: 1.5 mg/L – Discharge concentration: 0.0026mg/L	Summary of ecological information (Nalco, 2017): – Considered harmful to aquatic life if released to waterways in sufficient concentrations – Lowest reported LC50 / EC50: > 1,000 mg/L – Poorly biodegradable but rapidly eliminated from the aquatic environment by adsorption onto organic particulate matter and sediment. – Not expected to bioaccumulate. – Manufacturer's assessment of potential environmental hazard is: Low. WQIA conclusion: No significant impacts to water quality expected at proposed discharge concentration.
ACTI-BROM™ 7342 NALCO Water	– Biocide precursor, biodispersant – 0.25 - 0.3 mg/L bromine based on a dosing rate of 0.6 - 0.8 mg/l and ~40% actives. – Discharge concentration: 0.0014mg/L	Summary of ecological information (Nalco, 2021a): – Considered harmful to aquatic life with long lasting effects if released to waterways in sufficient concentrations. – Lowest reported NOEC Lepomis macrochirus: 1,000 mg/L. – Lowest reported LC50 Daphnia magna: 0.038 mg/L – Inorganic substances for which a biodegradation value is not applicable. – Not expected to persist in the environment. – Not expected to bioaccumulate. – Manufacturer's assessment of potential environmental hazard is: Low. WQIA conclusion: No significant impacts to water quality expected at proposed discharge concentration.
NALCO® 1392 NALCO Water	– Scale inhibitor – Dosing rate 0.8 – 1.3 mg/L – Discharge concentration: 0.0023mg/L	Summary of ecological information (Nalco, 2021b): – No known ecotoxicological effects. – Lowest reported LC50 Green Algae: 20 mg/L. – Inherently biodegradable. – Not expected to bioaccumulate. – Manufacturer's assessment of potential environmental hazard is: Low. WQIA conclusion: No significant impacts to water quality expected at proposed discharge concentration.

Product name and manufacturer	Use, dosing and expected discharge concentration	Potential impacts to water quality
Sodium hypochlorite Solution (10-15% available chlorine) Ixom Operations Pty Ltd	– Sanitising agent, biocide – 0.5 mg/L chlorine based on a dosing rate of 4mg/L with ~12.5% available chlorine – Discharge concentration 0.0069mg/L	Summary of ecological information (IXOM,2019): – Considered very toxic to aquatic life with long lasting effects if released to waterways in sufficient concentrations – Lowest reported 96hr LC50 (fish): 0.065 mg/L (sodium hypochlorite) – Biodegradable – Does not bioaccumulate. – Acute Aquatic Toxicity – Category 1 – Chronic Aquatic Toxicity – Category 1 – WQIA conclusion: No significant impacts to water quality expected at proposed discharge concentration.

Notes: Expected discharge concentrations based on conservative assumptions of maximum discharge of 45 m^3/hr from blowdown and no loss of product during processing into 2BS drain flow of 26,000 m^3/hr. In reality, the majority of sodium hypochlorite, ACTI-BROM™ and NALCO® 1392 will be consumed in the process and the majority of CAT-FLOC 8103 PLUS and HI-TEX 82220 will bind to slurry solids and settle out in the filter cake.

The concentrations of pollutants in future water discharges are therefore expected to be comparable with existing discharges, and no adverse impacts are anticipated in Allans Creek or the Inner Harbour as a result of the project when compared to existing operations.

A detailed assessment of the key discharge characteristics against relevant water quality criteria is provided in Section 5.3.3.

5.3.1.2 Cooling water

The quality of the water discharging from 6BF will be consistent with the existing discharge from 5BF, except for temperature, which will be slightly elevated due to the salt water heat exchanger cooling system proposed for 6BF (refer Section 4.4 regarding operational overview). It is predicted that this will result in an increase of approximately 0.5 – 1°C at the licence discharge point, No. 2 Blower Station drain (Point 79).

Cooling water discharges will increase by approximately 3,000m^3/h, which represents an increase of around 10% over current operations associated with 5BF.

An assessment of the expected thermal discharge characteristics against relevant water quality criteria is provided in Section 5.3.3.

5.3.1.3 Gas condensate

BFG condensate from 6BF is expected to be of a similar composition to that associated with 5BF operations. There will be no change to Coke Ovens Gas (COG)[5] condensate as a result of the project. The 'no-blow' design of the BFG seal pots proposed for the 6BF area will reduce the risk of gas condensate overflows when compared to traditional seal pot design.

All gas condensate collection tanks will be fitted with remote level monitoring and alarming to reduce the risk of overflows. As occurs with existing operations, the BFG condensate will be collected in tanks and pumped to the effluent treatment system and COG condensate will be collected and trucked for processing at the Cokemaking facility.

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[5] COG is gas generated from cokemaking processes and is used as a fuel at the blast furnace. As such, there is a COG main with seal pots in the blast furnace yard from which COG condensate is collected.

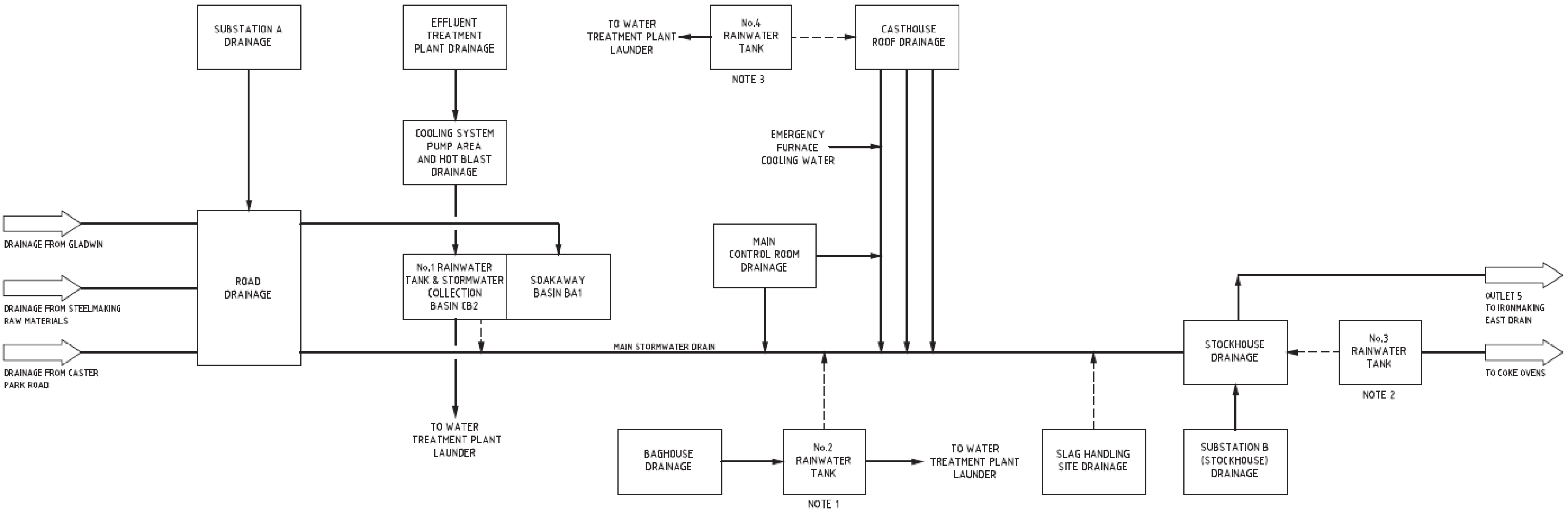

Figure 5.1 Simplified No. 6 Blast Furnace Block Flow Diagram RevB

5.3.2 Operational impacts to groundwater

Potential impacts to groundwater during the operational phase relate to the quantity and quality of groundwater recharge from infiltration of rainfall and water used for the operational purposes described in Section 4.4.

The 6BF site will include a significant amount of drainage infrastructure to ensure that water from rainfall and potential spills can be effectively captured and/or appropriately drained from the site. This drainage is an improvement in stormwater management compared to existing operations.

Given the extensive drainage controls, potential impacts to groundwater quality are expected to be adequately monitored and managed through ongoing groundwater monitoring under condition E3.1 of EPL 6092, the PKSW Water Stewardship Plan and the continued implementation of BlueScope's ongoing ISO 14001 certified Environmental Management System and associated processes.[6]

5.3.3 Assessment against relevant water quality criteria

An assessment of the key operational impacts described in Section 5.3.1 has been undertaken against the relevant assessment criteria relating to temperature (refer Section 5.3.3.1) and contaminants (refer Section 5.3.3.3) expected to be released to Allans Creek and the Inner Harbour.

5.3.3.1 Temperature – Assessment against water quality criteria

As discussed in Section 5.3.1, the quality of the water discharging from 6BF will be consistent with the existing discharge from 5BF with the exception of temperature which will be slightly elevated due to the salt water heat exchanger cooling system proposed for 6BF. With an increase in cooling water discharge of approximately 10% from 6BF compared to the existing discharge, it is predicted that this will result in an increase of approximately 0.5 – 1°C at the licence discharge point, No. 2 Blower Station drain (EPL 6092 Point 79).

Whilst the cooling system proposed for 6BF offers the benefits of reduced energy use and water use in comparison to the existing cooling system at 5BF, it is necessary to assess the increased discharge temperature against the relevant water quality criteria.

As noted in Section 2.5, the EPA's policy is that the WQOs should be met at the edge of the area where initial mixing or "near-field" mixing occurs, (in this context, 'near field' relates to initial mixing where the initial characteristics of momentum flux, buoyancy flux and outfall geometry influence the plume trajectory and mixing). Mixing that occurs through buoyant spreading motion and passive diffusion due to ambient turbulence is referred to as 'far field' mixing. Mixing zones should not receive concentrations of pollutants that cause acute toxic impacts meaning that acute impacts should be assessed at the point of release (EPA, 2018).

Adopting the two-step approach to the assessment recommended by the Water Quality Guidelines first requires comparison of the future temperatures at the point of discharge to Allans Creek to the 80th percentile temperatures of the reference system as a target for improvement. Table 2.3 indicates that compliance would require the temperature increase at the edge of the nearfield mixing zone to be less than 0.8 (^{o}C) to 1.3 (^{o}C) above ambient temperatures of the reference system depending on the season.

Given the multiple discharges to Allans Creek with temperature differentials of approximately six to seven degrees Celsius, it is considered highly unlikely that the existing or proposed discharge streams comply with the low risk 80th percentile trigger values for slightly to moderately disturbed ecosystems at the edge of the nearfield mixing zone. Previous modelling results (refer Section 5.3.3.2) predict that average heat loads associated with PKSW operations during summer would result in exceedances of the 80th percentile trigger values at a surface output point in the Inner Harbour located approximately 250 m from the entrance to Allans Creek.

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[6] ISO 14001 is the international standard that specifies requirements for an effective environmental management system (EMS).

Based on these results, both the existing and proposed discharge streams exceed the default assessment criteria relating to slightly, to moderately, disturbed ecosystems. Allans Creek and the Inner Harbour have, however, been subject to the effects of warmer than ambient industrial discharges for decades and are considered part of a highly disturbed ecosystem (NSG, 2006). Given the history of the PKSW site, it is considered appropriate to rely on site-specific scientific studies, together with professional judgement and other relevant information, to derive site-specific trigger values in accordance with the approach adopted by previous assessments completed on behalf of BlueScope (CH2MHILL, 2008).

The Water Quality Guidelines note that where local but higher-quality reference data are used, a less stringent cut off than the 20th or 80th percentile value may be used. The 20th or 80th percentile values, however, should be used as a target for site improvement.

In this regard, the predicted increase in temperature at the point of discharge from No. 2 Blower Station (2BS) drain into Allans Creek will comply with the temperature limits specified under Clause L3.5 of EPL 6092 as described in Section 2.4. Similarly, the predicted increase in temperature at the point of discharge into Allans Creek will comply with the site-specific temperature criteria (an increase of less than 3°C) developed during the 2006 studies discussed in Section 3.6.

Nevertheless, in the interests of site improvement as recommended for assessment under the Water Quality Guidelines, consideration has been given to the potential mitigation options for secondary cooling systems at the 6BF as summarised in Section 6.3.

5.3.3.2 Numerical modelling of cooling water discharge

Historical investigations

BlueScope has previously undertaken detailed numerical modelling of cooling water discharges to the Inner Harbour as part of proposed upgrade projects. Between 2006 and 2008, Cardno Lawson Treloar issued a series of reports documenting the findings of numerical cooling water studies into the proposed salt water cooling of the then-proposed Steelworks Co-Generation Plant (SCP) (Cardno, 2006a, 2006b, 2008).

The modelling in 2006 – 2008 was undertaken using a combination of near and far-field models (CORMIX and Delft 3D respectively) and was calibrated against earlier records of measured temperature data (operational data and field data collected using ADCP’s within Allans Creek and the Inner Harbour). The model has since been used by other proponents to assess the potential water quality impacts associated with the discharge of thermal plumes and their chemical constituents to Port Kembla Harbour (Cardno, 2019). On account of the recent use of the model by other major projects, the modelling approach and software used in the 2006 and 2008 BlueScope studies can be considered an acceptable approach for the current assessment. Since the earlier modelling was completed, no projects have been constructed or approved that would significantly alter ambient temperatures within Port Kembla.[7]

The modelling completed between 2006 and 2008 considered a variety of operating scenarios relating to typical and maximum heat loads during summer and winter conditions to account for seasonal variability. Importantly, all scenarios involved the operation of two blast furnaces (5BF and 6BF), which represents a worst-case scenario when compared to the proposed operations following completion of the 6BF reline project. It is also important to note that the Cogeneration Plant Project (for which the modelling was completed) was approved (Application Number: MP08_0132-Mod-1) but was not progressed; meaning that the previously proposed additional heat load was not applied to Allans Creek and the Inner Harbour. The flow and temperature data used for the modelling assessment is provided in Table 5.2 and Table 5.3.

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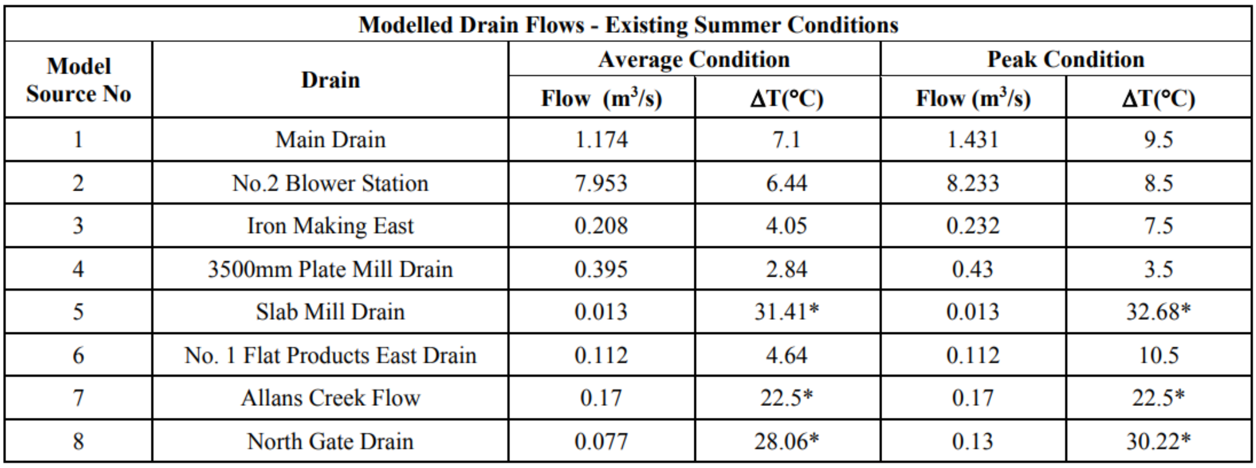
[7] The proposed warming water discharge associated with the AIE Gas Import Terminal will partially offset BlueScope’s cooling water discharge, however it would not be appropriate to include these benefits in the current assessment. It is also noted that the proposed AIP power station will discharge cooling water to the open coast beyond the Coal Loader Seawall, thus minimising the potential for any cumulative impacts to the Inner and Outer Harbours of Port Kembla.

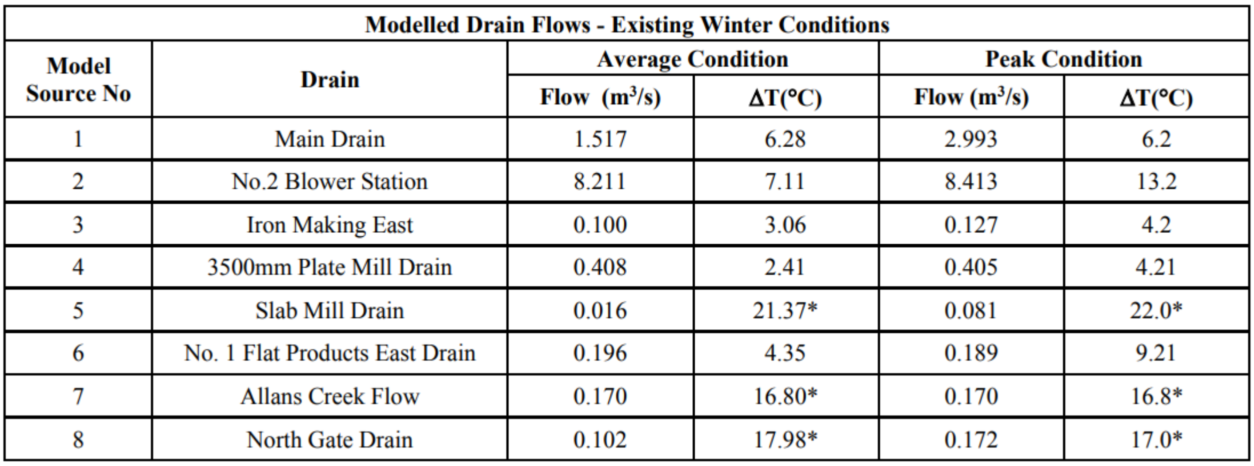
Table 5.2 Modelled drain flows – Existing summer conditions (Cardno, 2006)



Modelled Drain Flows - Existing Summer Conditions					
Model Source No	**Drain**	**Average Condition**		**Peak Condition**	
		Flow (m³/s)	**ΔT(°C)**	**Flow (m³/s)**	**ΔT(°C)**
1	Main Drain	1.174	7.1	1.431	9.5
2	No.2 Blower Station	7.953	6.44	8.233	8.5
3	Iron Making East	0.208	4.05	0.232	7.5
4	3500mm Plate Mill Drain	0.395	2.84	0.43	3.5
5	Slab Mill Drain	0.013	31.41*	0.013	32.68*
6	No. 1 Flat Products East Drain	0.112	4.64	0.112	10.5
7	Allans Creek Flow	0.17	22.5*	0.17	22.5*
8	North Gate Drain	0.077	28.06*	0.13	30.22*

* presented as absolute temperature rather than excess

Table 5.3 Modelled drain flows – Existing winter conditions (Cardno, 2006)



Modelled Drain Flows - Existing Winter Conditions					
Model Source No	**Drain**	**Average Condition**		**Peak Condition**	
		Flow (m³/s)	**ΔT(°C)**	**Flow (m³/s)**	**ΔT(°C)**
1	Main Drain	1.517	6.28	2.993	6.2
2	No.2 Blower Station	8.211	7.11	8.413	13.2
3	Iron Making East	0.100	3.06	0.127	4.2
4	3500mm Plate Mill Drain	0.408	2.41	0.405	4.21
5	Slab Mill Drain	0.016	21.37*	0.081	22.0*
6	No. 1 Flat Products East Drain	0.196	4.35	0.189	9.21
7	Allans Creek Flow	0.170	16.80*	0.170	16.8*
8	North Gate Drain	0.102	17.98*	0.172	17.0*

* presented as absolute temperature rather than excess

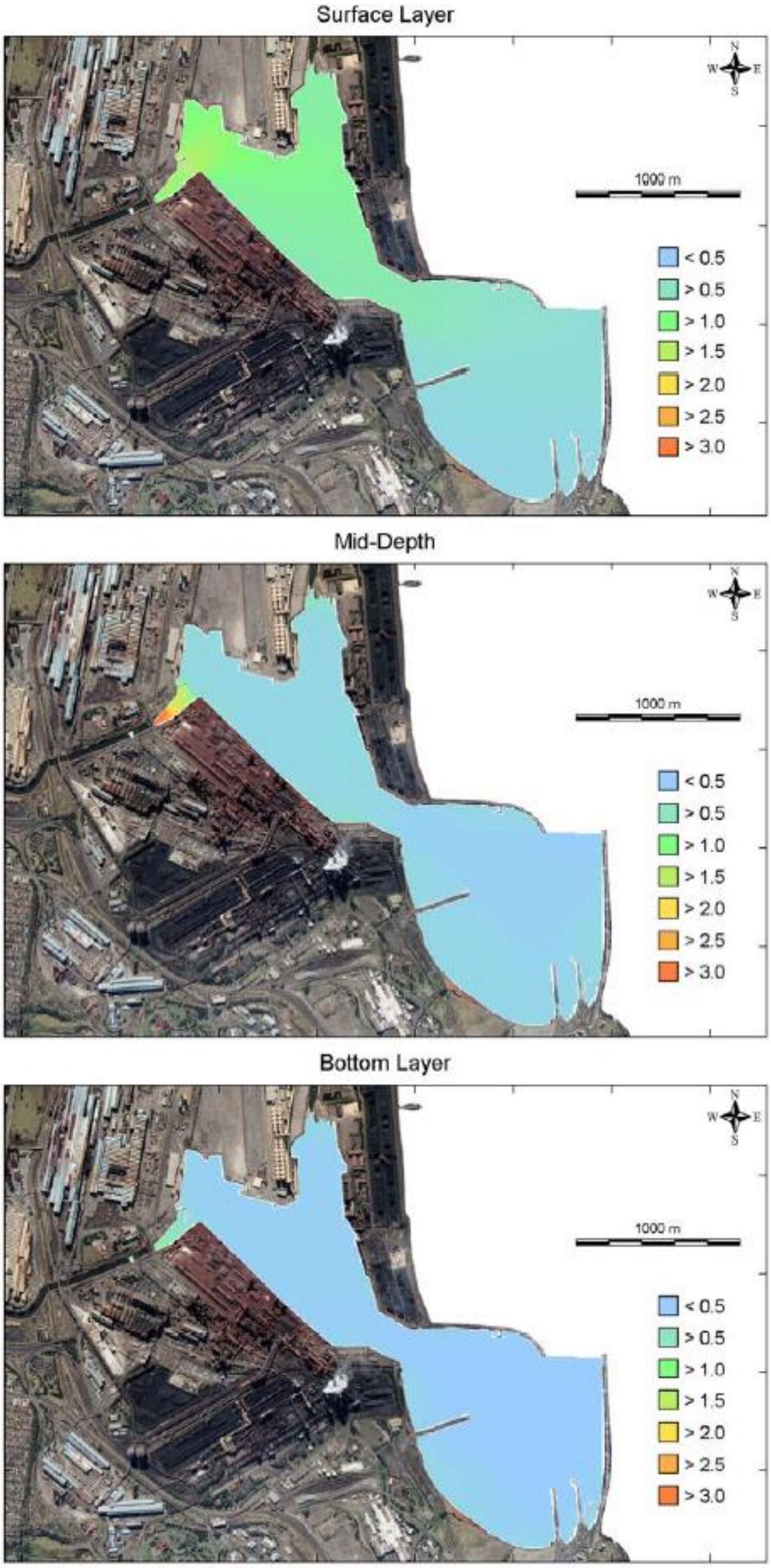
The 2008 modelling exercise assessed a new discharge point to Allans Creek with a temperature differential (ΔT) of 10.29°C and a discharge rate of 8.682 m^3/s. The previously assessed increased heat load is significantly higher than the predicted increase associated with the current project of approximately 0.5 – 1°C. Nevertheless, the following general observations regarding the previously predicted mixing zone behaviours are of relevance to the current project (Cardno, 2008):

– The previously proposed discharge point to Allans Creek resulted in an average mid-depth temperature increase near the discharge point in Allans Creek of approximately 3°C, indicating a rapid drop in temperature increases upon discharge.

– The initial mixing zone may extend between 30 m to 40 m from the discharge point in Allans Creek, indicating a limited area where the initial characteristics of momentum flux, buoyancy flux and outfall geometry influence the plume trajectory and mixing.

– Within the Inner Harbour, resulting average temperatures were generally less than 1.5°C for the surface layers and less than 0.5°C in the mid to bottom layers. Within the Outer Harbour, resulting average temperatures were generally less than 0.5°C for the surface layers and less than 0.2°C in the mid to bottom layers. Inner and Outer Harbour temperature increases indicate that far field mixing behaviours continue throughout the broader Port through buoyant spreading motion and passive diffusion due to ambient turbulence.

Whilst the previously assessed increased heat load was significantly higher than the predicted increase associated with the current project, Figure 5.2 provides an indication of the mixing behaviours and extent of the previously predicted thermal plume within the surface, mid-depth and bottom layers of the water column for the previously assessed peak summer load scenario.


Surface Layer

Mid-Depth

Bottom Layer

Figure 5.2 Average change in water temperature from the previously proposed peak summer load conditions associated with the Cogeneration Project (Cardno, 2008)

Resulting 50th percentile temperatures from the surface, mid-depth and bottom layers of the model were compared to summer and winter 80th percentile trigger values in accordance with the WQO's (DEC, 2006). Key findings of the 2008 salt water cooling assessment (CH2MHILL, 2008) are summarised below:

- Discharges generally exceed trigger values under summer and winter conditions at all locations within Allans Creek and at some locations within the Inner Harbour.
- The extent of the mixing zone was predicted to be within 40 m of the discharge point.
- No major losses of biota from the Inner Harbour or Allans Creek were anticipated as a result of the thermal discharges.
- It was considered unlikely that the predicted temperature increases would cause a significant increase in the effects (toxic or bioaccumulation) of the heavy metals or PAHs at the entrance to Allans Creek or the Inner Harbour.
- The expected temperature changes were considered unlikely to influence potential for invasion of marine pest species.
- Plankton blooms were considered unlikely to occur as a result of the predicted temperature increases.
- Temperature impacts are noticeably different at each level within the water column.
- The highest absolute temperatures occur in the surface layers but the largest impacts to temperature may occur at the surface, mid-water column or near the seabed.
- Behaviour of the discharge plume is dominated by the stage of tide and wind conditions.
- Tidal influences result in previously discharged cooling water being transported backwards and forwards through the discharge points.

Current monitoring data and predications

Temperature data from 2BS drain discharge point is collected every 8 days by BlueScope as required by monitoring conditions contained in EPL 6092. Continuous flow data at the 2BS drain discharge point is also measured in accordance with condition M8 of EPL 6092. Table 5.4 displays the average and maximum summer and winter results collected at this discharge point using data collected between 2016 and 2021, and includes the predicted temperature conditions as a result of the project. A comparison of the existing and predicted temperatures at the discharge point with values used for previous modelling demonstrate that the anticipated minor increase in temperature is similar to the modelled data. As no significant impacts to marine life were found in the previous modelling study, no significant impacts are anticipated due to the proposed discharges from operation of 6BF.

Table 5.4 Measured and predicted temperature conditions at the 2BS drain discharge point

Condition	Existing Flow (m^3/s)	Existing ΔT°C	Predicted Flow (m^3/s)	Predicted ΔT°C
Summer Average	7.291	6.5	7.314	7.0
Summer Maximum	9.090	7.2	9.170	8.2
Winter Average	7.242	6.1	7.322	6.6
Winter Maximum	9.385	6.7	9.465	7.7

5.3.3.3 Contaminants - Assessment against water quality criteria

An assessment of the future discharge to Allans Creek and the Inner Harbour has been undertaken on the basis that the 6BF discharge contribution to the 2BS drain will be the same as that associated with 5BF.

Data acquired from licence monitoring and load based licencing requirements at the 2BS drain at the point of discharge to Allans Creek (EPL 6092 Point 79) has been used to inform this assessment. Licence testing is undertaken every 8 days, while samples for load based licencing requirements are collected per 'The Protocol' (Load Based Licencing, June 2009) using NATA accredited laboratories.

Results of the assessment are presented in Table 5.5 and Table 5.6. The data has been compared against the ANZG (2018) Default Value Guidelines (DGVs) for marine waters at the 80%, 90% and 95% LOSP.

Only data from the period 2016 – 2021 has been used due to the following operational changes made prior to 2016:

- 2009 – Recirculating clarified water system installed at 5BF
- 2009 – Seal pot condensate containment system installed at 5BF
- 2011 – 6BF ceases operation
- 2016 – Ironmaking East Drain diverted to the 2BS drain
- 2016 – Coke Ovens Recovery Basin overflows diverted from the Main Drain (Point 78) to the 2BS drain

Table 5.5 No. 2 Blower Station Drain data assessment summary (2016 – 2021)

Parameter	80% LOSP	90% LOSP	95% LOSP
Ammonia	✓	✓	✓
Anthracene	✓	✓	✓
Arsenic (AsIII)*	✓	✓	✓
Arsenic (AsV)*	✓	✓	✓
Benzo(a)pyrene	✓	✓	✓
Cadmium	✓	✓	✓
Chromium (CrIII)	✓	✓	✓
Chromium (CrVI)	✓	✓	✓
Copper	☉	☉	☉
Cyanide	✓	×	☉
Fluoranthene	✓	✓	✓
Lead	☉	☉	☉
Mercury (inorganic)	✓	✓	✓
Naphthalene	✓	✓	✓
Phenanthrene	✓	✓	✓
Selenium (total)*	✓	✓	✓
Zinc	☉	☉	☉

Notes:

✓Complies with assessment criteria
× - *Does not comply with the assessment criteria*

☉ - *Limit of Reporting is not sufficiently low to assess compliance*

**Freshwater value has been used in absence of a marine water value*

Table 5.6 No. 2 Blower Station Drain data assessment against DGV (2016 – 2021)

Parameter / units	No. samples	Min value	Av. value	Max. value	100% EPL	80% LOSP	90% LOSP	95% LOSP
Ammonia (Nitrogen) (µg/l)	253	<60	<60	310	5000	1700	1200	910
Anthracene (µg/l)	4	<0.05	<0.05	<0.05	--	7	1.5	0.4
Arsenic* (µg/l)	23	<10	<10	<10	--	140	42	13
Benzo(a)pyrene (µg/l)	4	<0.05	<0.05	<0.05	--	0.7	0.4	0.2
BOD (mg/l)	1	<2	<2	<2	20	--	--	--
Cadmium (µg/l)	24	<5	<5	<5	60	36	14	5.5
Chromium (Total) (µg/l)	24	<10	<10	<10	--	85	20	4.4
Copper (µg/l)	24	<10	<10	<10	--	8	3	1.3
Cyanide (Total) (µg/l)	253	<5	<5	11.3	300	14	7	4
Flouranthene (µg/l)	4	<0.05	<0.05	0.06	--	2	1.7	1.4

Parameter / units	No. samples	Min value	Av. value	Max. value	100% EPL	80% LOSP	90% LOSP	95% LOSP
Filtrable Iron (mg/l)	253	<0.01	<0.01	0.16	0.3	--	--	--
Fluoride (mg/l)	5	<0.1	0.68	1.40	--	--	--	--
Hexavalent Chromium (mg/l)	21	<0.001	<0.001	<0.001	--	--	--	--
Lead (µg/l)	24	<20	<20	<20	100	12	6.6	4.4
Mercury (µg/l)	26	<0.20	<0.20	0.27	--	1.4	0.7	0.4
Naphthalene (µg/l)	4	<0.05	<0.05	0.15	--	120	90	70
Oil and Grease (mg/l)	253	<5	<5	<5	50	--	--	--
Phenanthrene (µg/l)	4	<0.05	<0.05	0.1	--	8	4	2
Selenium* (µg/l)	23	<10	<10	<10	--	34	18	11
Total Iron (mg/l)	253	0.06	0.19	1.4	--	--	--	--
TSS (mg/l)	253	<2	10.28	29	500	--	--	--
Zinc (Total) (µg/l)	253	<50	<50	520	3000	21	12	8

*Notes:

- Freshwater DGV's for As(V), Se
- Where individual readings were below LOR, a value of zero has been adopted in calculating average values
- Where all readings were below LOR, average value has been reported as <LOR

From examination of the above data, it is apparent that relatively few exceedances of the 95% LOSP DGV's occur during operations, with the exception of cyanide. The cyanide concentrations detected were all compliant with EPL 6092 concentration limits. The laboratory Limit of Reporting (LOR) for copper, lead and zinc is not sufficiently low to assess compliance against the DGVs.

Cyanide is present in the blowdown water discharged from the blast furnace effluent treatment system. Investigations are currently underway at 5BF to determine additional, online treatment solutions to reduce the concentration of cyanide in the blowdown water before it is discharged to the 2BS drain. Solutions identified through the investigations will be implemented at 5BF. Learnings and solutions for cyanide treatment at the 5BF will be applied to future operation of the 6BF.

The existing data set does not include several of the DGVs and, as already highlighted, in some cases the LOR is not sufficiently low to compare against DGVs. A project, PRP 182, is currently underway to address the identified gaps in data when comparing the analytes measured at the 2BS drain against the list specified in the ANZG (2018) DGVs. For this program, BlueScope is undertaking extensive sampling to identify and quantify all sources of pollutants entering, and ultimately discharging from the 2BS drain to Allans Creek, including from the blast furnace effluent treatment system. PRP 182 includes assessment of the potential impact of discharges on the environmental values of the receiving waters with reference to the relevant criteria relating to levels of aquatic ecosystem protection defined in ANZG (2018).

The findings of this ongoing program will provide critical inputs to the assessment and ongoing management of the potential water quality impacts of discharges to Allans Creek.

5.4 Project rundown and decommissioning WQIA

The target campaign duration for 6BF will be 20 years after which time furnace conditions will dictate relining or decommissioning requirements.

The risks to water quality associated with the rundown and decommissioning are well understood by BlueScope given the experience gained during the successful delivery of the three previous reline projects. During decommissioning, rundown water is captured, treated and tested prior to discharge to ensure compliance with EPL 6092.

As a result, risks to water quality associated with the rundown and decommissioning phase are able to be effectively managed through a rundown and decommissioning strategy (or similar) which will be developed at a future date, in consultation with the EPA as described in Section 6.4.

6. Mitigation measures

6.1 Mitigation measures during construction

BlueScope has committed to developing and implementing a Construction Environmental Management Plan (CEMP) to manage potential impacts during the construction phase. To manage impacts to water quality during the construction phase, it is recommended that the CEMP include a site specific SWMP outlining site management requirements, specific controls, environmental inspection requirements, roles and responsibilities, health and safety, incident management and emergency response including arrangements for managing wet weather events. The SWMP will include an Erosion and Sediment Control Plan (ESCP) which will be prepared in accordance with the *Blue Book -Managing Urban Stormwater: Soils and Construction* (4th edition, Landcom, 2004).

6.2 Mitigation measures during commissioning

A commissioning Water Quality Management Plan (WQMP) (or similar) will be developed following investigations during detailed design to assess the likely composition of initial flushing water, the potential for foaming, the characteristics of the start-up blowdown water and commissioning of the granulator. Where required monitoring programs and corrective measures will be developed to ensure that discharges to groundwater, No.2 Blower Station Drain and Allans Creek are in accordance with EPL 6092. The commissioning WQMP may be a standalone document or may form part of the SWMP.

6.3 Mitigation measures during operation

BlueScope has completed approximately 77 water-related PRPs and continues to work closely with the EPA to address issues associated with historical discharges and identify opportunities for ongoing improvement, including monitoring changes, retention or revision of concentration limits, load limits for specific pollutants, or changes to discharge locations. The following sections detail the water discharge and water use mitigation measures that will minimise the risk of surface water or groundwater contamination during operation of the project.

6.3.1 Process and discharge controls

The type of water discharges from 6BF will be consistent with the quantity and quality currently discharged from 5BF. The only direct discharge to the 2BS drain will be from the effluent treatment system as described in Section 5.3.1.1. All other discharges will be directed to IMED a secondary containment basin, which will then be pumped to the 2BS drain. In the event of a spill to drain, the IMED pumps can be turned off, ensuring the spill is captured and does not leave the site.

The slag handling area will include hardstand surfaces graded to internal drains in the area so surface water will flow into either the new slag pit settling pond or the granulator settling pond. Collected water from the water sprays in the area will be recycled as make-up water to the granulator or as slag pit sprays. In a rain event, the first flush will be collected in the new slag pit settling pond, which will flow into the plant stormwater drain before draining to IMED and subsequently be pumped to 2BS for release to Allans Creek.

The effluent treatment system will be above ground and bunded underneath to capture any flows. Any spillage will be captured and directed back into the effluent treatment system. Additional paving between the effluent treatment system and the road on the east side of the plant will cover the unsealed area.

COG and BFG condensate will be managed with the controls that have previously been identified as part of PRP181-Seal Pot Risk Assessment. ‘No-blow’ seal pots will be installed for BFG seal pots which will reduce the risk of gas condensate overflows, and collection tanks will be bunded and level detection with alarming installed to avoid over fill events.

The effluent treatment system will discharge cleaned and treated water to 2BS, however if the water quality is variable, this will be directed to contingency storage for further treatment and reassessment.

6.3.2 Stormwater

Drainage from 6BF area is directed to IMED which is a basin with a capacity of 7,556 kL that under dry weather conditions, does not flow directly to the harbour and is instead pumped to 2BS drain. In major rainfall events when the capacity of the basin is exceeded, the water overflows directly to the harbour over a weir at licensed discharge point, Point 89.

In a rain event a “first flush” of stormwater from process areas is collected in sumps and tanks in the drainage system. The proposed slag pit settling pond is designed to provide additional capacity to capture the first flush from rainfall events. The 6BF site has established stormwater drainage consisting of a series of sumps and collection tanks which capture first flush events and potential spills. Following the first flush and when sumps reach capacity, stormwater drains to IMED and is subsequently pumped to the No. 2 Blower Station Drain for release to Allans Creek. These rainwater sumps local to the blast furnace have the capability to pump back to the effluent treatment system.

There will be roof protection over the main chemical bunding to prevent excessive rainwater entering bunded areas.

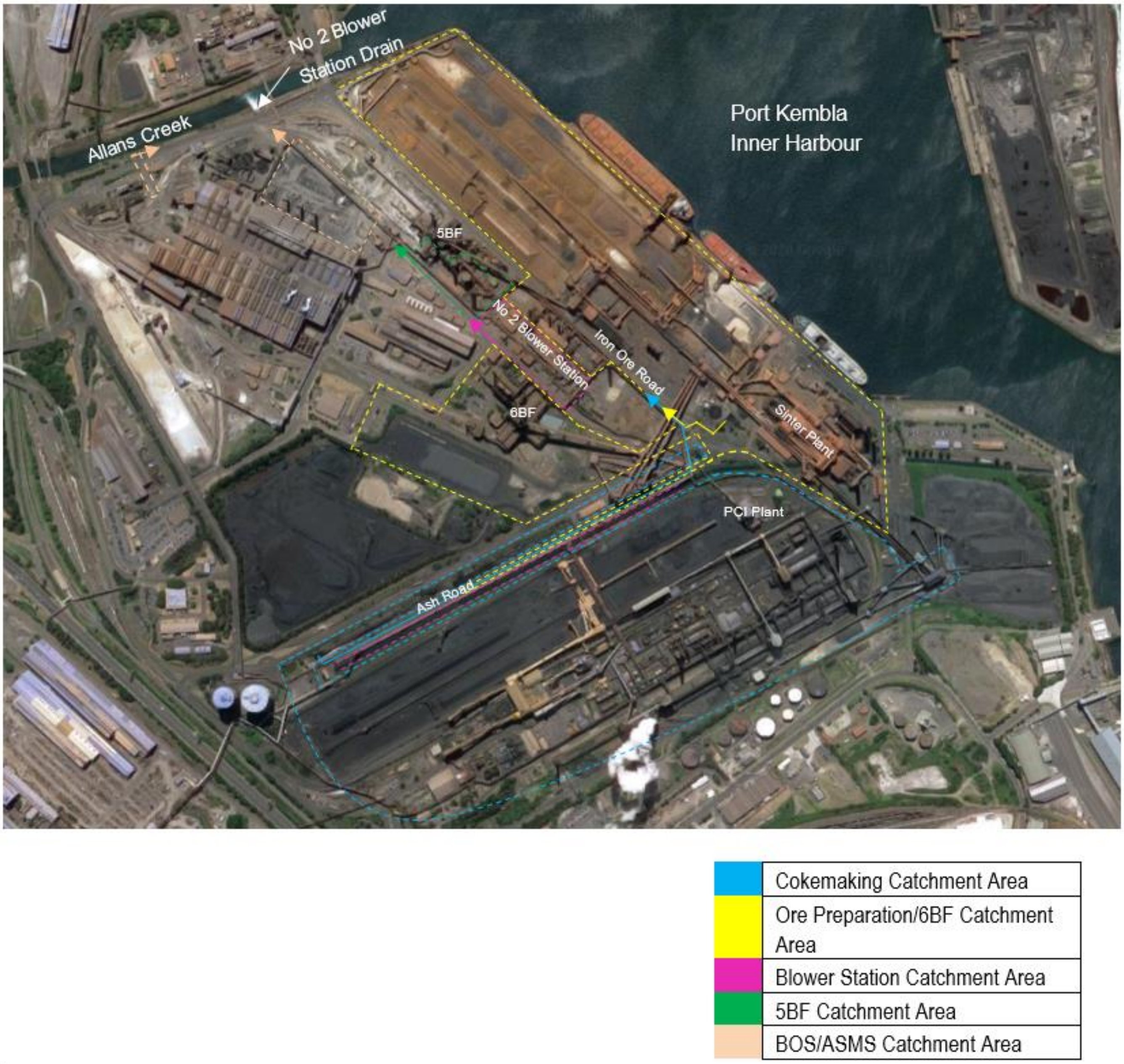


Figure 6.1 ***Drain catchment map following changes made by the project***

6.3.3 Discharge locations

The two licenced discharge locations that service the 6BF catchment area (refer Figure 3.6) are Point 79: 2BS drain and Point 88: IMED.

Blowdown from the effluent treatment system will be directly discharged to 2BS drain, which flows to Allans Creek. All other discharges, including stormwater will flow to IMED when rainwater collection sumps have filled.

2BS and IMED drains are currently monitored in compliance with EPL 6092. Water quality indicators (cyanide, ammonia, metals) are included in existing tests.

Further discussion regarding the reasons for selecting the proposed discharge locations is provided in Section 4.4.5.

6.3.4 Water use

Water uses associated with 6BF will be slightly different to those associated with the existing 5BF operations. Less fresh water will be required due to the use of a once through salt water cooling system instead of an evaporative cooling tower. This will result in approximately 10% additional salt water requirements at 6BF compared to 5BF as discussed in Section 5.3.1.2. The industrial and drinking (domestic) water supplier will continue to be Sydney Water. The water use and re-use processes will be as follows:

- The water used for granulation will be collected, cooled and reused in a closed loop system. Some water loss will occur due to moisture retained in the granulated slag.
- Slag handling water used to cool the slag pits will be reused. Some water loss will occur due to evaporation.
- Water from gas cleaning will be reused for further gas cleaning.
- The furnace cooling system will be a closed loop cooling system.
- Rainwater tanks will collect drainage from the site and can pump collected water back to the effluent treatment system.
- Heat exchanger cooling from salt water sourced from and returned to Port Kembla Outer Harbour.

Overall, the proposed cooling system will offer reduced water use and does not require a water licence from Water NSW.

6.3.5 Wastewater management

All process wastewater within the 6BF area will be either captured or treated and then discharged as summarised below:

- Blowdown water from the effluent treatment system is discharged to the 2BS drain following the treatment process.
- Contingency storage for all discharges will be used when water quality is variable.
- Collection of blast furnace gas seal pot water and return to the effluent treatment system.
- Collection of COG seal pot water with pick up by truck.[8]
- Seal pot tanks will have bunds installed and level detection with alarming on collection tanks to avoid over fill events.
- Online treatment for cyanide is currently under investigation at 5BF. Learnings will be applied to 6BF.

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[8] COG is gas generated from cokemaking processes and is used as a fuel at the blast furnace. As such, there is a COG main with seal pots in the blast furnace yard from which COG condensate is collected.

6.3.6 Spill management

There are a number of spill mitigation measures that will be implemented during the project for ongoing operational benefit. These include:

- EPA compliant bunding of all hazardous chemicals.
- Spill kits readily available.
- High risk process areas sealed.
- All runoff, including spills, from the gas cleaning and effluent treatment plants will be collected and returned to the water treatment plant during normal operation.
- Spill containment and additional paving between effluent treatment system and road on the east side of the plant.
- No-blow seal pots installed on blast furnace gas mains reducing the chance of make-up water being left on for extended periods of time.
- Level detection and alarming on gas condensate collection tanks.
- Seal pot tanks will have bunds installed and level detection with alarming on collection tanks to avoid over-fill events.
- Above ground effluent treatment system clarifier with bunding underneath to capture any overflows.

6.3.7 Ongoing monitoring programs

Monitoring programs have been developed and refined based on previous modelling and measured data collected to date. These are described in Section 3.7 and summarised in Table 6.1.

Table 6.1 Summary of ongoing monitoring programs

Area	Monitoring Programs
Surface waters	EPL 6092 contains individual discharge concentration limits for 14 surface water locations within the Port Kembla Steelworks site, 12 of which relate to water quality within the drainage network. Monitoring conditions specified in the EPL include monitoring parameters, locations, frequencies as well as discharge limits relating to the 50, 90 and 100 percentile concentrations for each discharge point. The No. 2 Blower Station drain (Point 79) is sampled every 8 days for an agreed suite of contaminants. As the quality of the discharges from 6BF won't be any different to 5BF, it is anticipated the suite of contaminants will remain the same. The Ironmaking East Drain is sampled for a similar suite of contaminants on a daily basis during dry weather discharge events.
Groundwater	BlueScope undertakes a groundwater monitoring program in line with condition E3.1 of EPL 6092, Contamination Monitoring and Assessment Program. This condition requires BlueScope to assess groundwater monitoring results against relevant criteria, assess for changes against historical results and evaluate the effectiveness of the monitoring well network. Wells which contain COPC are monitored annually while other wells are monitored less often. Monitoring is undertaken to inform assessment of the following: – The nature and extent of groundwater contamination utilising existing monitoring wells nominated by BlueScope. – The direction of groundwater movement. – The potential risks posed by the contamination, where present, to off-site ecological receptors. – Key changes (trends) in groundwater contaminant concentration. – The presence of surface water contamination in Allans Creek at prescribed sample locations.

BlueScope is undertaking extensive sampling under PRP182 to identify and quantify all sources of pollutants entering, and ultimately discharging from the 2BS drain to Allans Creek, including from the blast furnace effluent treatment system. The program includes assessment of the potential impact of discharges on the environmental values of the receiving waters with reference to the relevant criteria relating to levels of aquatic ecosystem protection defined in ANZG (2018). The findings of these ongoing programs, particularly PRP 182, will provide critical inputs to the assessment of the potential water quality impacts of discharges to Allans Creek.

6.4 Mitigation measures during decommissioning

Based on the experience gained during previous rundown and relining projects, drains used during typical operations would be delinked from the 6BF area during the rundown and decommissioning phase. This approach allows BlueScope to capture, test and treat all rundown effluent waters to ensure compliance with EPL 6092.

A rundown and decommissioning strategy (or similar) will be developed at a future date, in consultation with the EPA. The strategy will describe the water dosage and treatment processes during the rundown phase and management measures that will be implemented during decommissioning to ensure that water quality in the 2BS drain meets EPL conditions throughout the rundown process.

7. Evaluation and conclusion

This water quality impact assessment (WQIA) report has been prepared on behalf of BlueScope to support the EIS for the project and responds to the SEARs relating to surface and groundwater quality. It describes the existing ambient and background water quality and assesses the potential impacts to water quality associated with the construction, operational and decommissioning phases of the project with respect to the following guidelines:

- NSW Marine WQO's in NSW (DEC, 2006)
- Storing and Handling Liquids: Environmental Protection (DECC, 2007)
- Managing Urban Stormwater: Soils and construction - Volume 2 (DECC, 2008)
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2018)

Recommended mitigation and management measures were identified in response to the impact assessment findings.

7.1 Impacts from the project during construction

Potential risks to water quality during the construction phase relate to the potential release of poor quality stormwater into drains and waterways and the risk of mobilising existing contamination within soils and groundwater. These risks will be managed through the existing stormwater drainage network that will enable capture of stormwater prior to release to the environment.

All construction activities are proposed to take place in established areas with existing water management controls in place.

As a result, potential impacts to surface and groundwater quality during the construction phase are expected to be readily manageable through development and implementation of a site specific SWMP in accordance with the *Managing Urban Stormwater: Soils & Construction, vol. 1* (Landcom 2004).

7.2 Impacts from the project during commissioning

Potential risks to water quality during the commissioning phase relate to management of water used in initial flushing of cooling systems, management of potential foaming during start-up of the gas system, commissioning of the granulator and the potential for variable volume and chemical composition of blowdown waters during initial charging, purging and heating of the furnace.

These risks are well understood by BlueScope given the experience gained during the successful delivery of the three previous reline projects at PKSW and are proposed to be managed via the existing drainage network and site capture and containment measures, adequate storage basins, comprehensive monitoring and controlled discharge.

Subject to the development and implementation of a detailed commissioning WQMP or SWMP, these risks are expected to be able to be managed such that there are no adverse impacts to surface and groundwater quality during the commissioning phase except in accordance with EPL 6092 issued by the EPA.

Noting BlueScope's commitment to sustainable water management for the site, industrial water is proposed to be used for initial flushing of cooling systems and commissioning of the granulator. As a result, water proposed to be used during the commissioning phase will be sourced from an appropriately authorised and reliable supply.

7.3 Impacts of the project during operation

Returning 6BF to service and ceasing 5BF operations is expected to result in minor differences to BlueScope's future water uses and discharges. In particular, minor changes to cooling water discharges are expected due to the alternative cooling system associated with 6BF and locations of certain activities within the PKSW site will change due to the transfer of operations to 6BF.

Consideration has been given to potential impacts to water quality resulting from the project, including potential impacts to sensitive receiving environments as well as proposed improvements over existing operations.

Potential impacts to Allans Creek and the Inner Harbour relate to the temperature and chemical composition of discharges to 2BS drain. Recent monitoring data collected between 2016 and 2021 indicates that relatively few exceedances of the 95% LOSP DGV's occur during operations, with the exception of cyanide which nevertheless remains compliant with EPL 6092 concentration limits).

As part of BlueScope's ongoing commitment to improvement and efforts to comply with the NSW WQO's and ANZG guidelines, PRP 182 is currently underway to address the identified gaps in data when comparing the analytes measured at 2BS drain against the list specified in the ANZG (2018) DGVs. PRP 182 involves extensive sampling to identify and quantify all sources of pollutants entering, and ultimately discharging from the 2BS drain to Allans Creek, including from the blast furnace effluent treatment system.

Similarly, investigations are currently underway at 5BF to determine online, additional treatment solutions to reduce the concentration of cyanide in the blowdown water before it is discharged to the 2BS drain. Solutions identified through the investigations will be implemented at 5BF. Learnings and solutions for additional, online treatment at 5BF will be applied to future operation of 6BF.

The findings of these ongoing investigations will provide critical inputs to the assessment and ongoing management of the potential water quality impacts of discharges to Allans Creek and the Inner Harbour.

In relation to the temperature of future discharges to Allans Creek, the salt water heat exchanger cooling system proposed for 6BF requires an increased rate of salt water intake of approximately 3,000m^3/h, which represents an increase of around 10% over current operations associated with 5BF. Whilst the cooling system proposed for 6BF offers the benefits of reduced energy use, reduced water use, and reduced chemical treatment requirements in comparison to the existing cooling system at 5BF, it is predicted to result in an increase of approximately 0.5 - 1°C at the licence discharge point, No. 2 Blower Station drain (ID79).

Based on previous numerical modelling and water quality monitoring results, neither the existing or proposed discharge streams are expected to comply with the assessment criteria for slightly to moderately disturbed ecosystems. Allans Creek and the Inner Harbour have, however, been subject to the effects of warmer than ambient industrial discharges for decades and are considered part of a highly disturbed ecosystem (NSG, 2006). Given the history of the site, it is considered appropriate to rely on site-specific scientific studies, together with professional judgement and other relevant information, to derive site-specific trigger values.

In this regard, the predicted increase in temperature at the point of discharge from the 2BS drain into Allans Creek will comply with the temperature limits specified under Clause L3.5 of EPL 6092. Similarly, the predicted increase in temperature at the point of discharge into Allans Creek will comply with the site-specific temperature criteria (an increase of less than 3°C) developed during detailed studies into the ecology of Allans Creek and the Inner Harbour.

The risk of negative impacts to groundwater during operations is considered low on account of BlueScope's ongoing groundwater monitoring program and the recent and proposed improvements to capture and containment measures.

As part of an ongoing commitment to sustainability, BlueScope has completed approximately 77 water-related PRPs and continues to work closely with the EPA to identify opportunities for further improvement. As part of the current project, BlueScope has committed to delivering an extensive list of mitigation measures relating to water discharge and water use that will minimise the risk of surface water or groundwater contamination during operation of the project. These include improvements relating to:

- Process and discharge controls
- Stormwater
- Discharge locations
- Water use
- Wastewater management
- Spill management

Noting BlueScope's commitment to sustainable water management for the site, 6BF operations will continue to use industrial water in the steel manufacturing process; comprised of both recycled water from the Wollongong Water Recycling Plant (over 85% of the current industrial water mixture) and unfiltered Avon Dam water.

In addition, the stormwater drainage system proposed for the project will enable the capture and reuse of stormwater, providing improved water cycle management over the current stormwater management capabilities. As a result, water use during the operation of the project will be sourced from an appropriately authorised and reliable supply.

Subject to BlueScope's implementation of the proposed mitigation measures and ongoing efforts to characterise and reduce pollutants introduced to the water cycle, 6BF operations are expected to maintain compliance with EPL 6092 issued by the EPA such that there are no adverse impacts to surface and groundwater quality.

7.4 Impacts from the project during decommissioning

6BF is expected to operate for 20 years after which time furnace conditions would dictate relining or decommissioning requirements. Potential impacts to surface and groundwater quality during the decommissioning phase are expected to be readily manageable through development and implementation of a rundown and decommissioning strategy (or similar).

7.5 Final conclusion

Based on the investigations and assessment undertaken by GHD and the conclusions drawn in this WQIA report, it is considered that, subject to the recommended mitigation measures being applied, the proposed project will not result in any material adverse impacts to water quality, when compared to the current operations of 5BF. Amongst other positive effects, the project will result in reduced water use, improved energy efficiency and improved water capture capability thereby minimising the risk of adverse water quality impacts.

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→ The Power of Commitment

Appendix I

Traffic impact assessment

Blast Furnace No. 6 Reline Project

Traffic Impact Assessment

BlueScope Steel (AIS) Pty Ltd

7 March 2022

→ **The Power of Commitment**

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Terms and abbreviations

Abbreviation	Description
AADT	Average annual daily traffic
AS	Australian Standard
AS/NZS	Australian and New Zealand Standard
BF	Blast Furnace
BF-BOF	Blast Furnace – Basic Oxygen Furnace
BlueScope	BlueScope Steel (AIS) Pty Ltd
CSSI	Critical State Significant Infrastructure
CTMP	Construction transport management plan
DPIE	Department of Planning, Industry and Environment
EB	East bound
EIS	Environmental Impact Statement
EP&A	*Environmental Planning and Assessment Act 1979*
FTE	Full time equivalent
GHD	GHD Pty Ltd
HV	Heavy vehicle
km	Kilometres
LGA	Local Government Area
LoS	Level of service
LV	Light vehicle
m	Metres
mm	Millimetres
NB	North bound
NSW	New South Wales
OSOM	Oversize Overmass
PCU	Passenger Car Units
pc/h	Passenger cars per hour
PKSW	Port Kembla Steelworks
SB	South bound
SRD SEPP	*State Environmental Planning Policy (State and Regional Development) 2011*
VCR	Volume Capacity Ratio
TAG	Transport Access Guide
TfNSW	Transport for New South Wales
TIA	Traffic Impact Assessment
WB	West bound

1. Introduction

1.1 Background and project overview

BlueScope Steel (AIS) Pty Ltd (BlueScope) is one of Australia's leading manufacturers and is a global leader in finished and semi-finished steel products. BlueScope's Port Kembla Steelworks (PKSW) operation in NSW includes two blast furnaces. No. 5 Blast Furnace (5BF) is currently operating, while No. 6 Blast Furnace (6BF) is currently in care and maintenance.

5BF is expected to continue to produce (molten) iron on a continuous basis until it reaches the end of its operational life at some stage between 2026 and 2030. BlueScope is proposing a move of iron manufacture from 5BF to 6BF, after 5BF ceases operation.

6BF last produced iron in 2011, at which point it was taken out of service and placed into care and maintenance. In order to prepare 6BF to become operational again, major maintenance works are required (the project). The project aims to return 6BF to service through a reline process that will be carried out while 5BF continues to operate.

The project has been declared critical state significant infrastructure (CSSI) in accordance with section 5.13 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and Schedule 5 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). This Traffic Impact Assessment has been prepared to support the preparation of an Environmental Impact Statement (EIS) under the EP&A Act for the project. The EIS has in turn been prepared to support the application for project approval, to be determined by the NSW Minister for Planning and Public Spaces.

1.2 Purpose of this report

GHD Pty Ltd (GHD) has been commissioned by BlueScope to prepare a traffic impact assessment (TIA). This report will support the preparation of an Environmental Impact Statement (EIS) under the EP&A Act for the project.

This report addresses the relevant criteria in the NSW Secretary's Environmental Assessment Requirements (SEARs) for the project issued in July 2021 (as outlined in Section 3.1) and assesses the potential traffic and transport related impacts associated with the construction and operation of the project.

The purpose of this report is to document the results of the TIA which include:

- Describing the existing traffic and transport environment around the PKSW.
- Reviewing of the existing road and transport conditions, traffic volumes and crash data.
- Reviewing of the construction works of the project and its access arrangements.
- Assessing the potential impacts of the project construction works and the performance of key intersections during construction.
- Determining suitable mitigation measures to minimise the impacts.

1.3 Limitations

The preparation of this TIA relied on the following data sources or was limited by the following:

- Site inspections undertaken at the surrounding road network in September 2021.
- Intersection traffic counts commissioned by GHD were undertaken in September 2021 during a weekday AM and PM peak period at the following intersections.
  - Cringila Car Park Road / Five Islands Road intersection (left in, left out only).
  - Loop Road / Cringila Car Park Road intersection.
  - Five Islands Road / Emily Road (Entry) intersection.
  - Five Islands Road / Emily Road (Exit) intersection.
  - Springhill Road / BlueScope Access Road signalised intersection.
  - Five Islands Road / Flagstaff Road intersection (left in, left out only).

- PKSW gate entries from 2019 provided by BlueScope.
- Traffic data from Port Kembla Gas Terminal Traffic Impact Assessment Report prepared by GHD in 2018.

The following assumptions have been made in the preparation of this TIA:

- Assumptions in regard to construction traffic generation and distribution for the project as provided by BlueScope as detailed in Section 5.
- Construction of the project is expected to occur in 2023, with construction expected to occur over a three-year period.
- Analysis of historical traffic growth trends at roads within the study area identified that traffic has generally declined over the last five years, pre-COVID-19 pandemic.
- The traffic volumes surveyed in September 2021 were factored using 2019 gate entries data to reflect regular operations and traffic conditions pre-pandemic in order to assess the assessment of operational traffic impacts.

This report has been prepared by GHD for BlueScope Steel (AIS) Pty Ltd and may only be used and relied on by BlueScope Steel (AIS) Pty Ltd for the purpose agreed between GHD and BlueScope Steel (AIS) Pty Ltd as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than BlueScope Steel (AIS) Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Legislative and policy context

2.1 State Environmental Planning Policy (Infrastructure) 2007

Pursuant to Schedule 3 of *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) the project is considered to be traffic generating development to be referred to Transport for NSW (TfNSW). Clause 104 of ISEPP specifies that a consent authority must give written notice to TfNSW of an application for traffic generating development before granting development consent and consider any response provided by TfNSW. The project has been declared CSSI so development consent is not required. Regardless, TfNSW have been consulted with in the preparation of the SEARs (refer Section 2.3) and their comments addressed in the preparation of this TIA. A separate briefing note was also sent to TfNSW but no response was received prior to the finalisation of this report.

2.2 Guide to traffic generating developments

This TIA has been undertaken with reference to the *Guide to Traffic Generating Developments* (Roads and Maritime Services, 2002) (the Guide). The Guide provides a process and methodology to undertake the TIA. The traffic operation assessment process outlined in the Guide identifies the operating characteristics which need to be compared with agreed performance criteria.

The Guide states that existing daily traffic volumes on roads adjacent to a proposed development should be compared with estimated daily traffic volumes. This enables the functions of roads in the overall hierarchy of roads to be reviewed in the context of the proposed development. This TIA has been prepared based on this approach

The assessment criteria adopted for this report are outlined in Section 3.

2.3 Secretary’s Environmental Assessment Requirements

The SEARs relevant to traffic impacts, together with a reference to where they are addressed in this report, are outlined in Table 2.1.

Table 2.1 Traffic and transport SEARs

Requirement	Where addressed in this report
Include a traffic impact assessment addressing construction and operational traffic impacts of the project, details of traffic types and volumes, access roads and haul routes	Sections 5 and 6
An assessment of the predicted impacts of project traffic on road safety and capacity, including consideration of cumulative traffic and the need for any road upgrades or infrastructure works to support the project	Sections 6.1 and 6.2. No infrastructure upgrades are proposed as part of this project.
Details of internal road layouts and vehicle movement plans to demonstrate that all vehicle sizes can be safely accommodated on site	Section 6.1. Note that the existing internal road network has been previously approved, designed and constructed in accordance with relevant standards.

3. Methodology

3.1 Approach to assessment

This section outlines the method and evaluation criteria used in the traffic assessment of the project. This report focuses on the ultimate peak construction traffic generation scenario for each road impacted by the project and the overall effect on the higher order road network. To assess these impacts reference is made to:

- The assessment of intersection performance impacts as outlined in Section 3.1.1.
- The assessment mid-block performance impacts as outlined in Section 3.1.2.

Traffic generation associated with the operation of the project will be significantly lower than during the peak construction period. Traffic impacts will therefore be reduced during the operational period compared to the construction period.

Other factors considered include potential impacts to car parking, public transport, active transport and safety. The project will not impact on any rail networks external to the PKSW site.

3.1.1 Intersection assessment criteria

The performance of the existing road network is largely dependent on the operating performance of key intersections, which are critical capacity control points on the road network. The SIDRA 8 intersection modelling software was used to assess the proposed peak hour operating performance of intersections on the surrounding road network.

The criteria for evaluating the operational performance of intersections is provided by the *Guide to Traffic Generating Developments* (Roads and Maritime Services, 2002) and reproduced in Table 3.1. The criteria for evaluating the operational performance of intersections is based on a qualitative measure (i.e. Level of Service), which is applied to each band of average vehicle delay.

Table 3.1 Level of Service Criteria for intersections

Level of Service (LoS)	Average Delay per Vehicle (seconds/veh)	Traffic Signals, Roundabouts	Give Way & Stop Signs
A	< 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control modes	At capacity, requires other control mode
F	> 70	Over Capacity Unstable operation	Over Capacity Unstable operation

Source: Guide to Traffic Generating Developments (Roads and Maritime Services 2002)

3.1.2 Midblock assessment criteria

According to *Austroads Guide to Traffic Management, Part 3: Traffic Studies and Analysis*, Section 5.2.1, the one-way mid-block capacity of an urban arterial road with interrupted flow varies depending on the type of lane. The typical mid-block capacity for urban roads with interrupted flow is outlined in Table 3.2.

An interrupted flow facility road is one in which traffic flow conditions are subject to the influence of fixed elements such as traffic signals, stop signs, give-way signs, roundabouts or other controls which cause traffic to stop periodically, irrespective of the total amount of traffic; examples include urban streets, unsignalised and signalised intersections.

Table 3.2 Typical mid-block capacity for urban roads with interrupted flow

Type of lane	One-way mid-block capacity (pc/h)
Median or inner lane	
Divided Road	1000
Undivided Road	
Middle lane (of a 3 lane carriageway)	900
Divided road	900
Undivided road	1000
Kerb lane	
Adjacent to parking lane	900
Occasional parked vehicles	600
Clearway conditions	900

Source: Table 5.1 in Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis *Note: pc/h = passenger cars per hour*

However, *Austroads Guide to Traffic Management Part 3 – Traffic Studies and Analysis* (Section 5.2.1) outlines that:

> *Peak period mid-block traffic volumes may increase to 1200 to 1400 pc/h/lane on any approach road when the following conditions exist or can be implemented:*
>
> – *Adequate flaring at major upstream intersections.*
> – *Uninterrupted flow from a wider carriageway upstream of an intersection approach and flowing at capacity.*
> – *Control or absence of crossing or entering traffic at minor intersections by major road priority controls.*
> – *Control or absence of parking.*
> – *Control or absence of right turns by banning turning at difficult intersections*
> – *High volume flows of traffic from upstream intersections during more than one phase of a signal cycle.*
> – *Good co-ordination of traffic signals along the route.*

For the purposes of this assessment:

- A one-way mid-block capacity of 1,200 pc/h/lane has been adopted for arterial roads in the study area, including for Springhill Road and Five Islands Road.
- A one-way mid-block capacity of 900 pc/h/lane has been adopted for other roads in the study area, including Cringila Car Park Road, Loop Road, Emily Road, BlueScope Access Road, Flagstaff Road, and Old Port Road.

This is in keeping with the Austroads special conditions, which are reflective on the existing conditions for roads in the road network surrounding PKSW. This capacity is used to assess the Volume Capacity Ratio (VCR) of a particular road.

The VCR is a measure of the level of congestion on a road given the traffic volume and road capacity. When the VCR reaches 1, this indicates that the road is operating at 100 percent capacity.

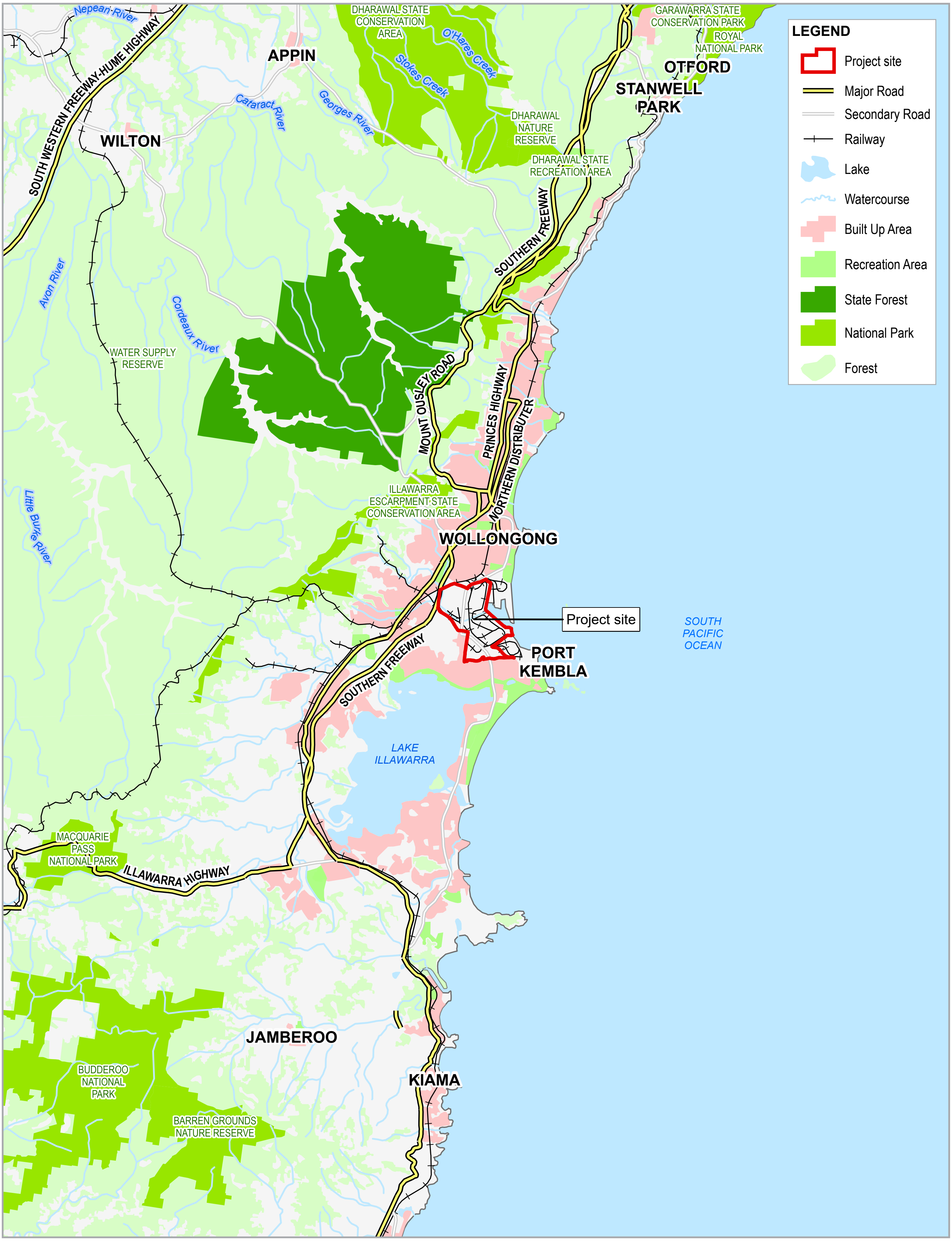
4. Existing environment

4.1 Project area

PKSW is located within an industrial site of approximately 750 hectares in the Wollongong Local Government Area (LGA), approximately 80 kilometres from Sydney and 2.5 kilometres from the City of Wollongong. Refer to Figure 4.1.

The PKSW site comprises the No.1 Works, No.2 Works, Steelhaven and the Recycling area. The No.2 Works is divided into two sections by Allans Creek. The southern half of the No.2 Works comprises the cokemaking, ironmaking and steelmaking facilities, while the northern half contains the Recycling Area and the packaging products section. All sectors of PKSW are internally linked by road and rail and are currently supplied with electricity, water and gas services.

The land to which this project applies, including all connecting infrastructure and materials handling elements that require upgrades as part of the project, is within the southern section of the No.2 Works, and part of the ironmaking facilities, which is located within Lot 1 DP 606434. Ancillary construction facilities will also be required and will be located within the wider PKSW site as shown in Figure 4.2.



Paper Size ISO A4

0 1.5 3 4.5 6

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Traffic Impact Assessment

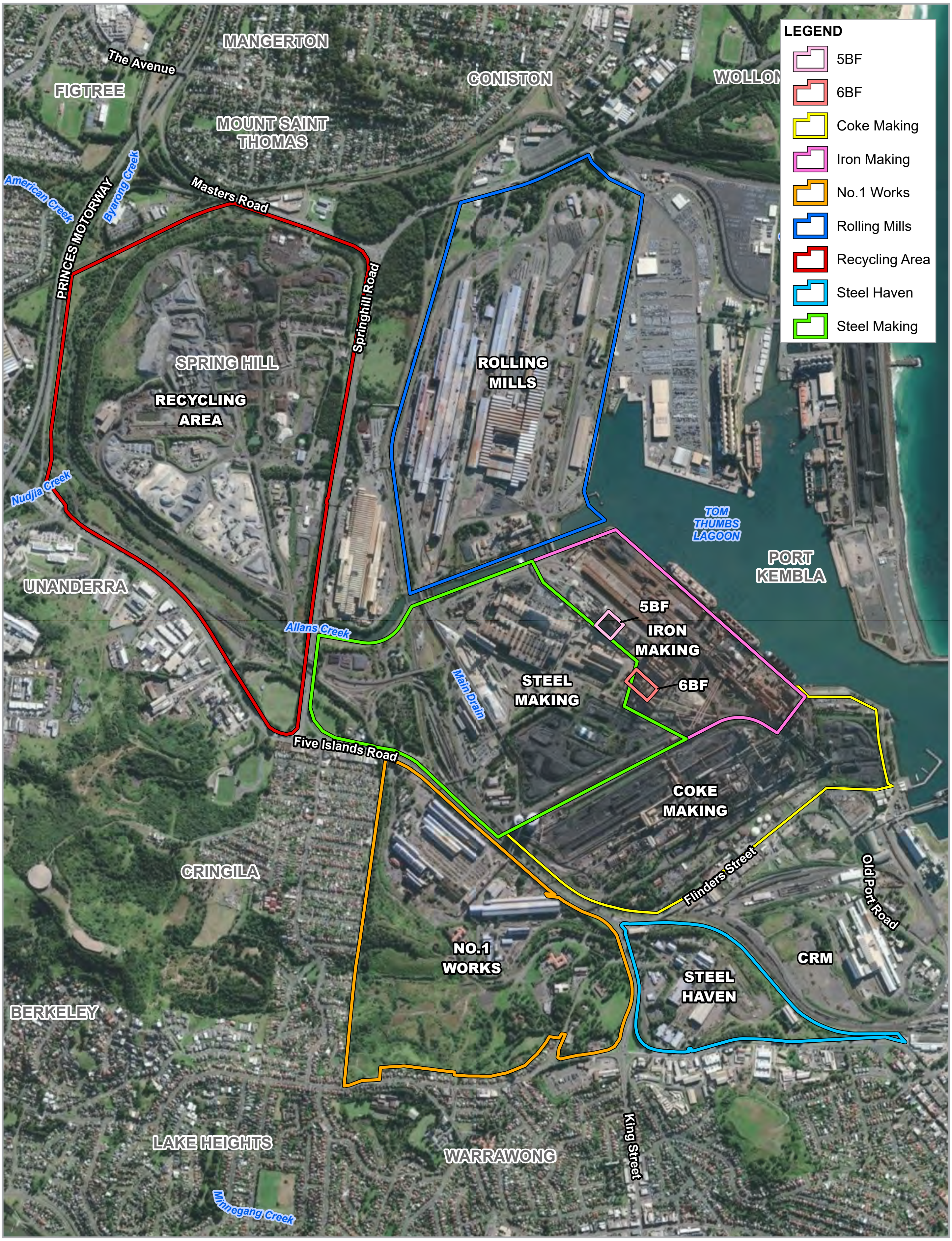
Regional Location

Project No.	**12541101**
Revision No.	**0**
Date	**21/10/2021**

FIGURE 4-1

G:\22\12541101\GIS\Maps\12541101_TrafficImpactAssessment_0.aprx\12541101_TIA001_RegionalLocality_0
Print date: 22 Oct 2021 - 09:08

Data source: Commonwealth of Australia (Geoscience Australia): 250K Topographic Data Series 3, 2006. .
Created by: tmorton



Paper Size ISO A4

0 0.15 0.3 0.45 0.6

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Traffic Impact Assessment

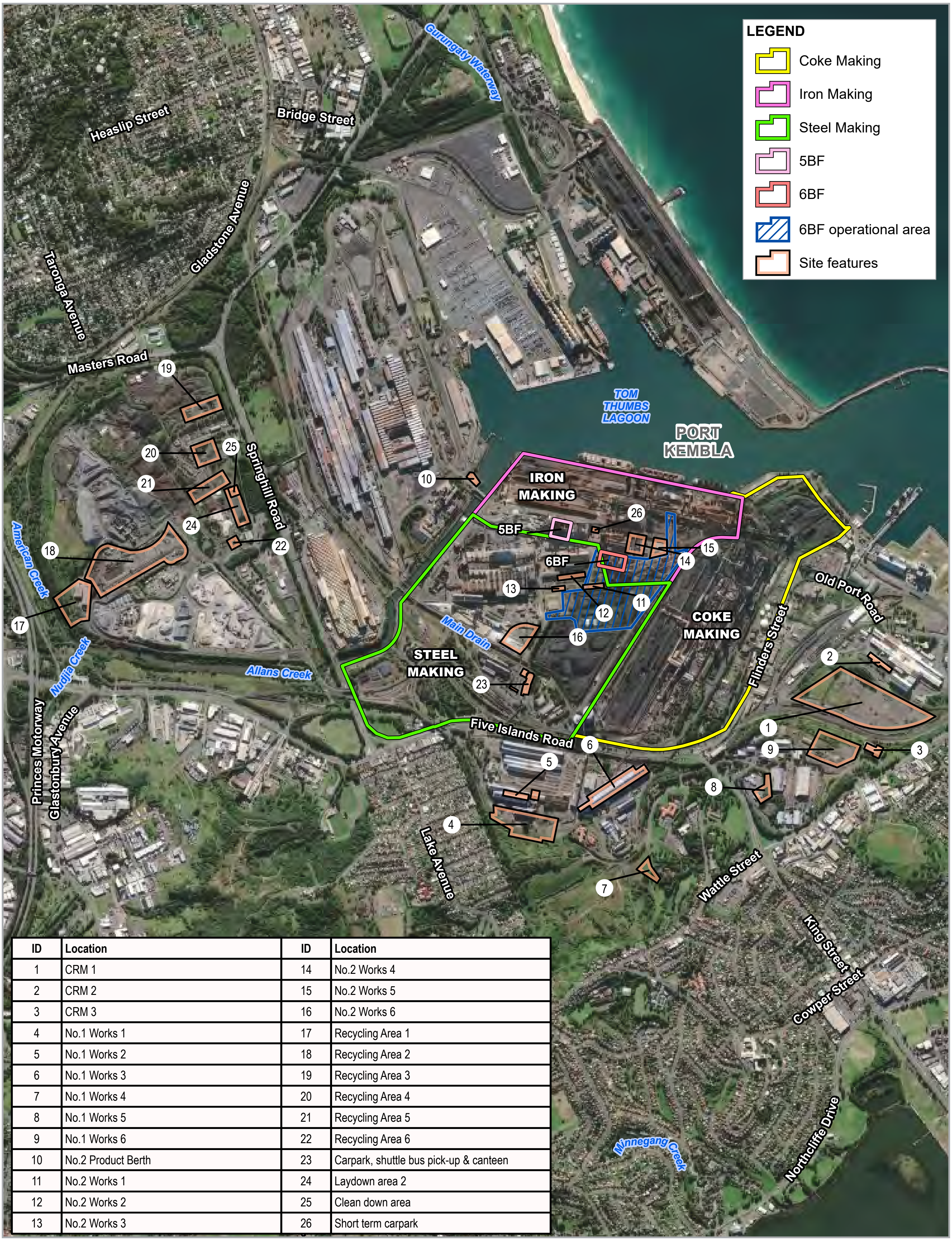
Port Kembla Steelworks site layout and locality

Project No.	12541101
Revision No.	0
Date	23/11/2021

FIGURE 4-2

\\ghdnet\ghd\AU\Newcastle\Projects\22\12541101\GIS\Maps\TrafficImpactAssessment_0.aprx\12541101_TIA002_SiteLayout_0
Print date: 23 Nov 2021 - 13:12

Data source: LPI: DCDB/DTDB, 2017. World Imagery: Maxar.
Created by: tmorton



ID	Location	ID	Location
1	CRM 1	14	No.2 Works 4
2	CRM 2	15	No.2 Works 5
3	CRM 3	16	No.2 Works 6
4	No.1 Works 1	17	Recycling Area 1
5	No.1 Works 2	18	Recycling Area 2
6	No.1 Works 3	19	Recycling Area 3
7	No.1 Works 4	20	Recycling Area 4
8	No.1 Works 5	21	Recycling Area 5
9	No.1 Works 6	22	Recycling Area 6
10	No.2 Product Berth	23	Carpark, shuttle bus pick-up & canteen
11	No.2 Works 1	24	Laydown area 2
12	No.2 Works 2	25	Clean down area
13	No.2 Works 3	26	Short term carpark

Paper Size ISO A4

0 0.15 0.3 0.45 0.6

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Traffic Impact Assessment

Key project features

Project No. 12541101
Revision No. 0
Date 21/10/2021

FIGURE 4-3

G:\22\12541101\GIS\Maps\12541101_TrafficImpactAssessment_0.aprx\12541101_TIA003_KeyFeatures_0
Print date: 22 Oct 2021 - 09:08

Data source: LPI: DTDB/DCDB, 2017. World Imagery: Maxar.
Created by: tmorton

4.2 Existing road network characteristics

This section provides an understanding of the existing road network surrounding the site.

4.2.1 Road hierarchy

Roads within NSW are categorised in the following two ways:

- By classification (ownership).
- By the function that they perform.

Classification and function definitions are described in the following sections.

Road classification

Roads are classified (as defined by the *Roads Act 1993*) based on their importance to the movement of people and goods within NSW (as a primary means of communication). The classification of a road allows TfNSW to exercise authority of all or part of the road. Classified roads include Main Roads, State Highways, Tourist Roads, Secondary Roads, Tollways, Freeways and Transitways.

For management purposes, TfNSW has three administrative classes of roads. These are:

- **State Roads** – Major arterial links throughout NSW and within major urban areas. They are the principal traffic carrying roads and are fully controlled by TfNSW with maintenance fully funded by TfNSW. State Roads include all Tollways, Freeways and Transitways; and all or part of a Main Road, Tourist Road or State Highway.
- **Regional Roads** – Roads of secondary importance between State Roads and Local Roads which, together with State Roads provide the main connections to and between smaller towns and perform a sub arterial function in major urban areas. Regional roads are the responsibility of councils for maintenance funding, though TfNSW funds some maintenance based on traffic and infrastructure. Traffic management on Regional Roads is controlled under delegation by local government. Regional Roads may be all or part of a Main Road, Secondary Road, Tourist Road or State Highway; or other roads as determined by TfNSW.
- **Local Roads** – The remainder of roads are council-controlled roads. Local Roads are the responsibility of local councils for maintenance funding. TfNSW may fund some maintenance and improvements based on specific programs (e.g. urban bus routes, road safety programs). Traffic management on Local Roads is controlled under the delegation by local government.

Functional hierarchy

Functional road classification involves the relative balance of the mobility and access functions. TfNSW define four levels in a typical functional road hierarchy, ranking from high mobility and low accessibility, to high accessibility and low mobility. These road classes are:

- **Arterial Roads** – generally controlled by TfNSW, typically no limit in flow and designed to carry vehicles long distances between regional centres.
- **Sub-Arterial Roads** – can be managed by either TfNSW or local council. Typically, their operating capacity ranges between 5,000 and 20,000 vehicles per day, and their aim is to carry traffic between specific areas in a sub region, or provide connectivity from arterial road routes (regional links).
- **Collector Roads** – provide connectivity between local roads and the arterial road network, and typically carry between 2,000 and 10,000 vehicles per day.
- **Local Roads** – provide direct access to properties and the collector road system, and typically carry less than 2,000 vehicles per day.

A map of the key roads within the study area and their respective classifications is presented in Figure 4.5. The key roads are discussed further in the following sections.

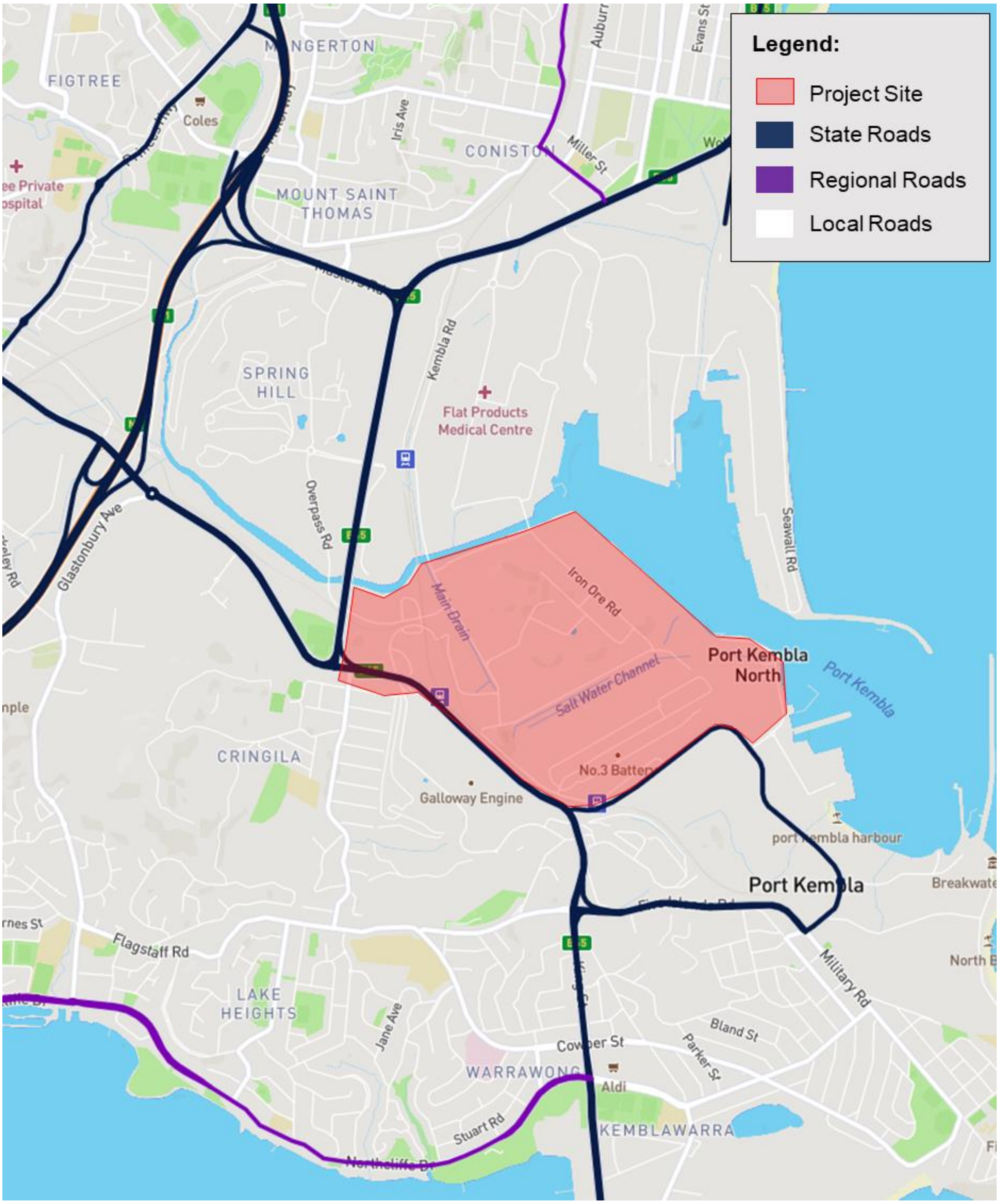


Figure 4.4 ***Road classification within study area***

Source: NSW Road Network Classifications, TfNSW, modified by GHD

4.2.2 Road characteristics

Springhill Road

Springhill Road (typical carriageway shown in Figure 4.5) is a state arterial road and forms part of the B65, which connects Wollongong Central Business District and Port Kembla. It runs in an approximately northeast to southwest alignment between Corrimal Street and the signal-controlled intersection with Masters Road. To the south of Masters Road, Springhill Road runs in an approximate north to south alignment and forms the northern approach to a signal-controlled intersection with Five Islands Road.

Springhill Road provides access to mainly industrial and port related land uses, including access roads to PKSW, which are accessed via signal-controlled intersections.

Springhill Road has the following key features outlined in Table 4.1.

Figure 4.5 ***Springhill Road, viewed westwards from BlueScope North Gate***

Image Source: Google Street View

Table 4.1 Springhill Road key features

<table>
<tr><th>Feature</th><th colspan="2">Description</th></tr>
<tr><td>Carriageway</td><td>Sealed dual carriageway with a raised centre median, with three traffic lanes in each direction.</td><td rowspan="4">

Source: Google maps, modified by GHD</td></tr>
<tr><td>Parking</td><td>Parking and stopping is restricted.</td></tr>
<tr><td>Speed Limit</td><td>80 km/h, which changes to 60 km/h to the north of Port Kembla Road.</td></tr>
<tr><td>Pedestrian Facilities</td><td>Footpaths are available:
– Shared path along the southern side of the road to the east of Masters Road and along the eastern side of the road to the south of Masters Road.
– Along the northern side of the road between Bridge Street and Tom Thumb Road.
– Signal controlled pedestrian crossings are provided at all signal controlled intersections.</td></tr>
<tr><td>Bicycle Facilities</td><td colspan="2">Shared paths are available:
– Along the southern side of the road to the east of Masters Road and along the eastern side of the road to the south of Masers Road.
– Along the western side of the road between Boral Asphalt access and Five Islands Road.</td></tr>
<tr><td>Public Transport</td><td colspan="2">Bus stops are located on both sides, with bus routes: 37, 51, 53, 57, 65 operating from these stops.</td></tr>
</table>

Five Islands Road (B65)

Five Islands Road (typical carriageway shown in Figure 4.6) is a state road, which forms part of the B65 between Wollongong and Port Kembla. It forms a signal-controlled intersection with Springhill Road and Flinders Street and provides a connection between the Princes Motorway and Port Kembla. It provides access to the PKSW via Cringila Car Park Road, Emily Road and Flagstaff Road.

Five Islands Road has the following key features outlined in Table 4.2.

Figure 4.6 Five Islands Road, viewed eastwards towards Springhill Road

Image Source: Google Street View

Table 4.2 Five Islands Road key features

Feature	Description	
Carriageway	Sealed dual carriageway with a raised centre median, with three traffic lanes in each direction.	 *Source: Google maps, modified by GHD*
Parking	Parking and stopping are restricted throughout the alignment.	
Speed Limit	80 km/h.	
Pedestrian Facilities	Footpaths are provided on both sides of the road at the following locations: – Between Springhill Road and Wattle Street. – Between Spring Road and the railway line overpass.	
Bicycle Facilities	A shared path is provided along the northern side of the road between Springhill Road and Flinders Street.	
Public Transport	Cringila Station is located on the northern side of Five Islands Road. Two bus stops are located approximately 45 metres to the south of Cringila Railway Station, with bus routes 27SC, 51 and 53 operating from these bus stops.	

Cringila Car Park Road

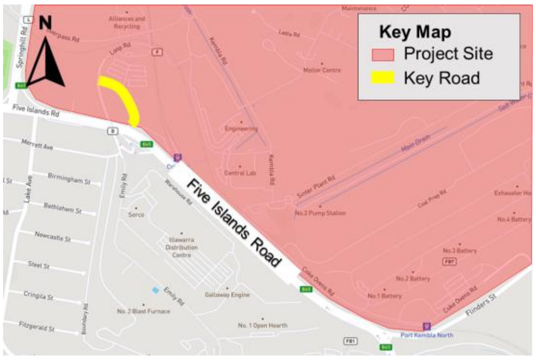
Cringila Car Park Road (typical carriageway shown in Figure 4.7) is a 250-metre local road, providing access to PKSW from Five Islands Road. It connects Five Islands Road in the south to Loop Road in the northwest and provides access to the project site car park.

Cringila Car Park Road has the following key features outlined in Table 4.3.

Figure 4.7 Cringila Car Park Road, viewed northwards towards Loop Road

Image Source: Google Street View

Table 4.3 Cringila Car Park Road key features

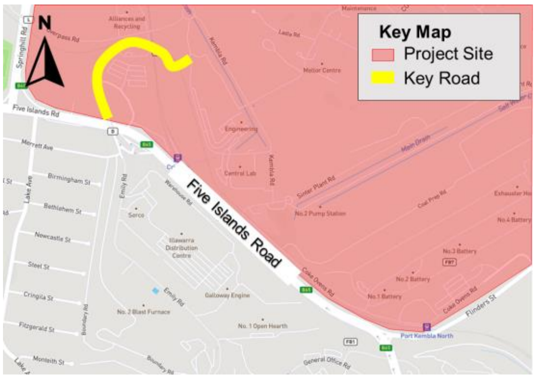
Feature	Description	
Carriageway	Sealed single carriageway with one lane in each direction. Divided by a 30-metre long median at the north-western end before the intersection with Loop Road.	 *Source: Google maps, modified by GHD*
Parking	There are no restrictions for parking and stopping throughout the alignment.	
Speed Limit	40 km/h	
Pedestrian Facilities	A shared path is provided along the eastern side of the road between Five Islands Road and Cringila Car Park.	
Bicycle Facilities		
Public Transport	There are no public transport facilities or services along this road.	

Loop Road

Loop Road is a local private road, providing a connection between Emily Road to the south and Central Road to the northeast.

Loop Road has the following key features outlined in Table 4.4.

Table 4.4 Loop Road key features

Feature	Description	
Carriageway	Sealed single carriageway with one lane in each direction.	 *Source: Google maps, modified by GHD*
Parking	There are no restrictions for parking and stopping throughout the alignment.	
Speed Limit	40 km/h	
Pedestrian Facilities	A shared path is provided along the southern side of the road between Cringila Car Park and Central Road.	
Bicycle Facilities		
Public Transport	There are no public transport facilities or services along this road.	

Emily Road

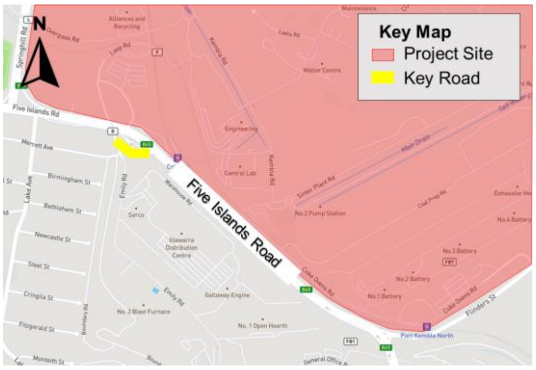
Emily Road (typical carriageway shown in Figure 4.8) is a short (approximately 120 metres) split, local private road, providing access to PKSW from Five Islands Road. It has two separate one-way roads from Five Islands Road that converge into a single carriageway at around 40 metres from Emily Road.

Emily Road has the key features outlined in Table 4.5.

Figure 4.8 *Emily Road, viewed westwards towards Loop Road*

Image Source: Google Street View

Table 4.5 *Emily Road key features*

Feature	Description	
Carriageway	Sealed carriageway with one lane in each direction.	 *Source: Google maps, modified by GHD*
Parking	No posted restrictions for parking and stopping throughout the alignment, however the available lane width prevents vehicles from parking at least 3 m away from the double barrier road centre line and would thereby encroach the through traffic movement.	
Speed Limit	40 km/h speed limit.	
Pedestrian Facilities	There are no pedestrian facilities available on this road.	
Bicycle Facilities	There are no bicycle facilities available on this road.	
Public Transport	There are no public transport facilities or services along this road.	

BlueScope Access Road

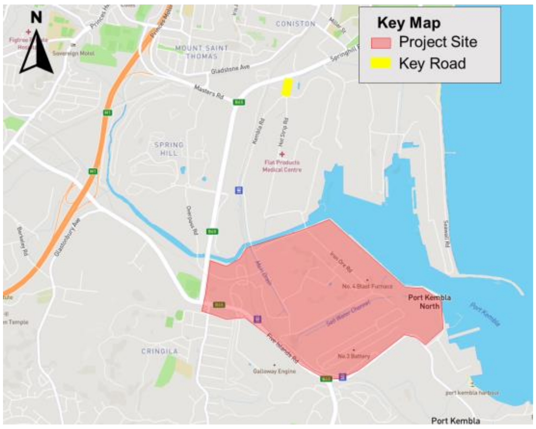
BlueScope Access Road or PKS North Gate entrance (shown in Figure 4.9) is an approximately 180-metre local private road, which serves as one of the primary accesses to PKSW from Springhill Road. The BlueScope Access Road is the primary access for visitors accessing the PKSW via the BlueScope Steel Visitors Centre. It forms a signalised intersection with Springhill Road and is accessed from the northeast via a slip lane. It forms a roundabout intersection with Kembla Road, Hot Strip Road and Illawarra Road at its southern end.

BlueScope Access Road has the following key features as outlined in Table 4.6.

Figure 4.9 BlueScope Access Road, viewed southwards

Image Source: Google Street View

Table 4.6 BlueScope Access Road key features

Feature	Description	
Carriageway	Sealed carriageway, generally divided by a single barrier line. Varying traffic lanes (two to three) are provided in each direction.	 *Source: Google maps, modified by GHD*
Parking	Parking and stopping are restricted throughout the alignment. Provides access to the North Gate car park and visitor parking. Security boom gate restricts access to the wider PKSW site.	
Speed Limit	50 km/h default urban speed limit.	
Pedestrian Facilities	Shared paths are provided on both sides of the road.	
Bicycle Facilities	There are no bicycle facilities available on this road.	
Public Transport	There are no public transport facilities available on this road.	

Flagstaff Road

Flagstaff Road is a local road (typical carriageway shown in Figure 4.10) that runs in an approximately east-west alignment from Five Islands Road to Berkeley Road. It provides access from Five Islands Road to PKSW in the south.

Flagstaff Road has the following key features as outlined in Table 4.7.

Figure 4.10 Flagstaff Road, viewed eastwards from Five Islands Road

Image Source: Google Street View

Table 4.7 Flagstaff Road key features

Feature	Description	
Carriageway	Single sealed carriageway with one lane in each direction.	 *Source: Google maps, modified by GHD*
Parking	Parking is not restricted however stopping is prohibited throughout the alignment within the PKSW premises.	
Speed Limit	40 km/h speed limit.	
Pedestrian Facilities	There are no pedestrian facilities available on this road within the PKSW premises.	
Bicycle Facilities	There are no bicycle facilities available on this road within the PKSW premises.	
Public Transport	There are no public transport facilities available on this road within the PKSW premises.	

Old Port Road

Old Port Road (shown in Figure 4.11) is classified as a state road and provides access to industrial and port related land uses within the southern part of Port Kembla. At its southern end it forms a roundabout intersection with Foreshore Road and further to the south becomes Darcy Road. At its southern end, Darcy Road forms the minor approach to a priority “Stop” controlled intersection with Five Islands Road and Military Road.

Old Port Road has the following key features as outlined in Figure 4.8.

Figure 4.11 Old Port Road, viewed southwards from Flinders Street

Image Source: Google Street View

Table 4.8 Old Port Road key features

<table>
<tr><th>Feature</th><th colspan="2">Description</th></tr>
<tr><td>Carriageway</td><td>Single sealed carriageway with one lane in each direction.</td><td rowspan="6">

Source: Google maps, modified by GHD</td></tr>
<tr><td>Parking</td><td>Unrestricted parking.</td></tr>
<tr><td>Speed Limit</td><td>60 km/h speed limit.</td></tr>
<tr><td>Pedestrian Facilities</td><td>A shared path is provided along the eastern side of the road to the north of Foreshore Road.</td></tr>
<tr><td>Bicycle Facilities</td><td>A shared path is provided along the eastern side of the road to the north of Foreshore Road.</td></tr>
<tr><td>Public Transport</td><td>Port Kembla Station is located to the west of Old Port Road, south of the intersection with Foreshore Road.
One bus stop is located adjacent to the Port Kembla Station. Bus routes 34, 43 and 65 operate from this bus stop.</td></tr>
</table>

4.3 Traffic volumes

4.3.1 Intersection traffic counts

GHD engaged Matrix Traffic and Transport Data Pty Ltd to undertake intersection traffic turning counts on Tuesday, 7 September 2021. The surveys were undertaken during the following time periods:

- Weekday AM peak (four hours): 5:00 am to 9:00 am.
- Weekday PM peak (two hours): 4:00 pm to 6:00 pm.

The intersection turning count surveys were undertaken at the following intersections:

- Cringila Car Park Road / Five Islands Road intersection (left in, left out only).
- Loop Road / Cringila Car Park Road intersection.

- Five Islands Road / Emily Road (Entry) intersection.
- Five Islands Road / Emily Road (Exit) intersection.
- Springhill Road / BlueScope Access Road signalised intersection.
- Five Islands Road / Flagstaff Road intersection (left in, left out only).

Analysis of the traffic survey data identified the following observed weekday AM and PM network peak hours:

- Weekday AM peak hour, between 7:45 am and 8:45 am.
- Weekday PM peak hour, between 4:00 pm and 5:00 pm.

A summary of the surveyed AM and PM peak hour traffic volumes for the above network peak hours is presented in Figure 4.12, Figure 4.13, Figure 4.14, and Figure 4.15 below. The full set of traffic count data is attached at Appendix A.

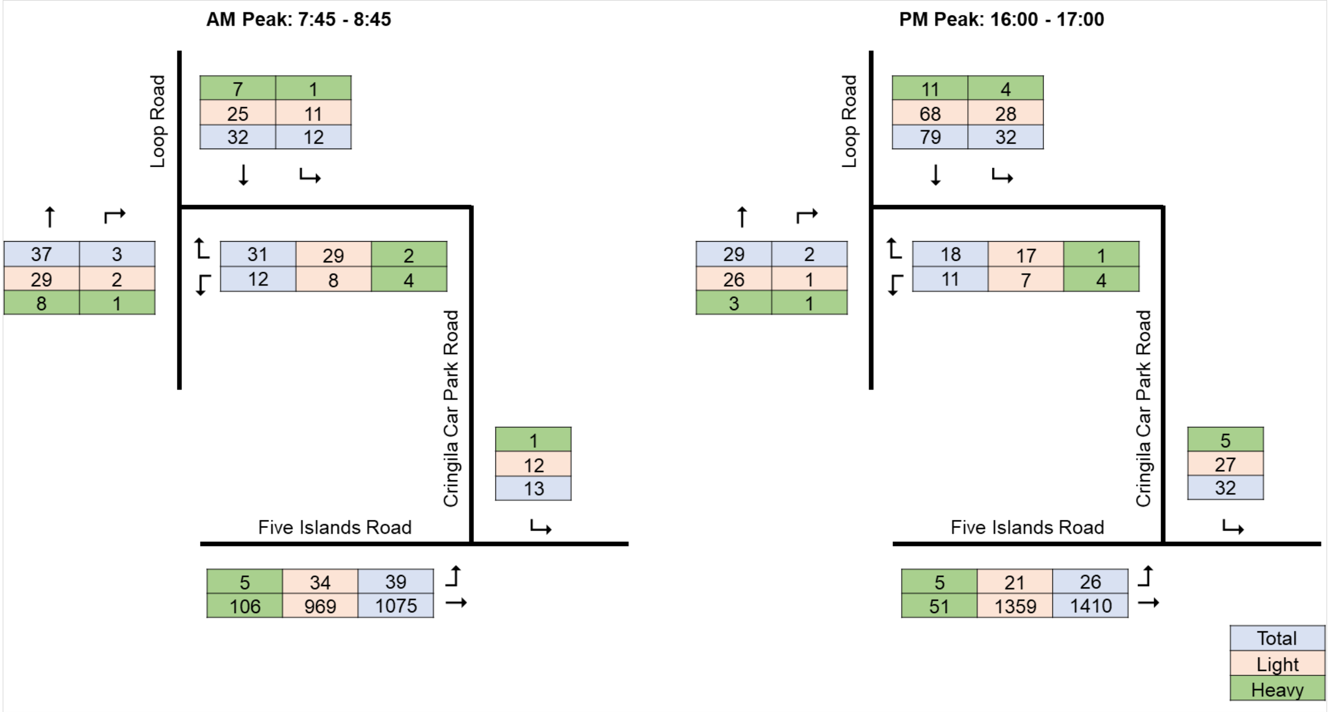


Figure 4.12 *Loop Road and Cringila Car Park intersection and Five Islands Road and Cringila Car Park Road intersection traffic volume*

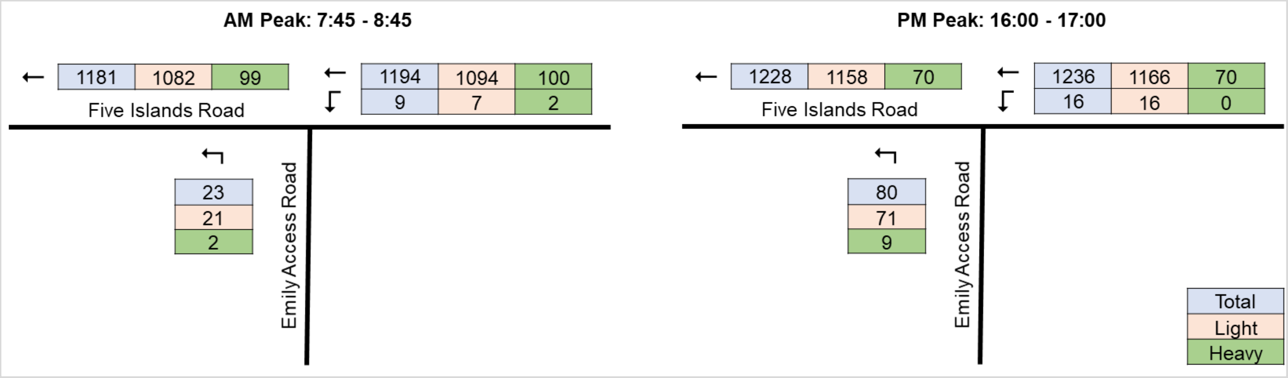


Figure 4.13 *Five Islands Road and Emily Road intersections traffic volume*

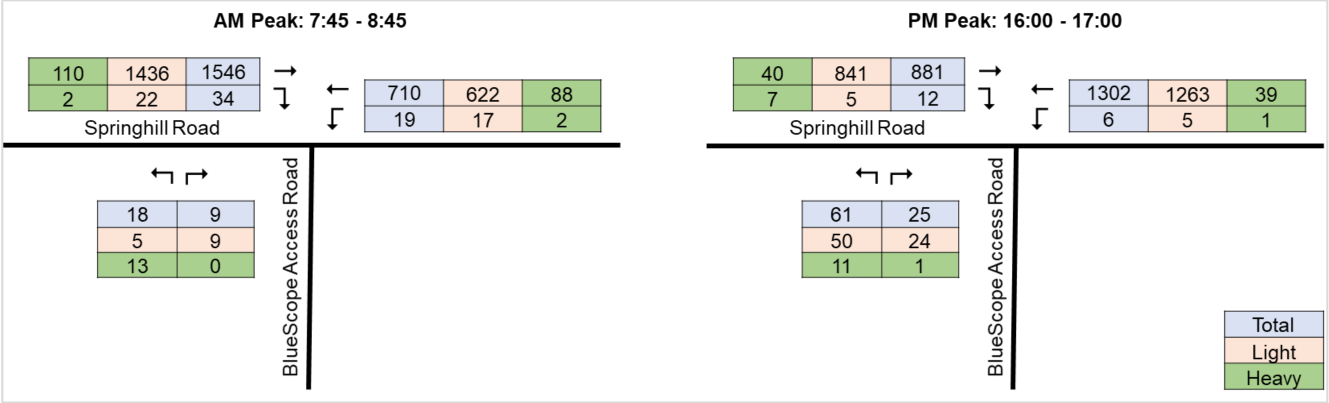


Figure 4.14 Springhill Road and BlueScope Access Road intersection traffic volume

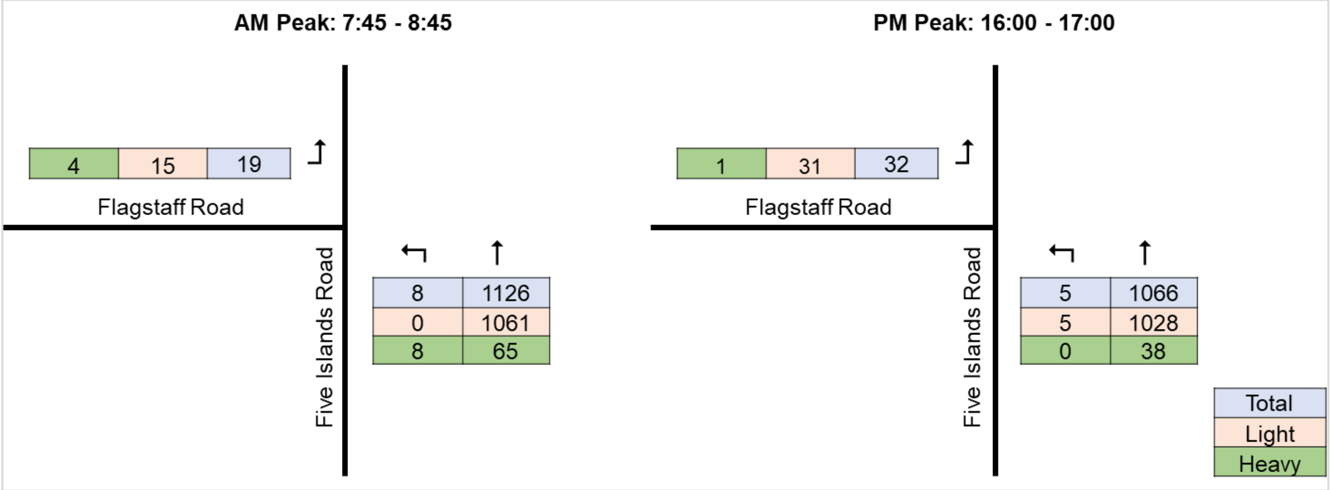


Figure 4.15 Flagstaff Road and Five Islands Road intersection traffic volume

It should be noted, however, that these traffic data do not reflect normal traffic conditions since the survey was undertaken during the lockdown period due to the COVID-19 pandemic, where only essential workers were able to travel to work. Access to the site was also restricted to one person per car. To quantify the effects of the pandemic in the road network and PKSW operations, the September 2021 traffic survey data has been compared with average gate entries / exits from the site recorded between 9 to 13 of September 2019 (using gate data provided by BlueScope) and with the traffic data from GHD's Port Kembla Gas Terminal TIA Report prepared in November 2018. Table 4.9 presents the difference between the data sets.

Table 4.9 Traffic Data Comparison

Location	Direction	Average 2019 Gate Entries / 2018 Traffic Survey		2021 Traffic Survey		% Difference	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Loop Road Gate	Entry	90	39	67	71	-26%	82%
	Exit	54	145	50	106	-7%	-27%
North Gate	Entry	68	21	47	68	-31%	224%
	Exit	34	97	25	55	-26%	-43%
Five Islands Road (northwest of Flinders Street)	NB/EB	2,186	1,838	1,114	1,436	-49%	-22%
	SB/WB	1,598	2,222	1,203	1,252	-25%	-44%
Springhill Road (southwest of Port Kembla Road)	NB/WB	1,366	649	1,555	906	14%	40%
	SB/EB	547	756	729	1,308	33%	73%

Analysis of the 2021 surveyed traffic volumes, compared to the historical pre COVID-19 pandemic data indicates:

- The number of vehicles entering the site via Loop Road has decreased by almost 30 per cent in the AM peak and increased by around 80 per cent in the PM peak.
- The number of vehicles departing via Loop Road has decreased by almost 10 per cent in the AM peak and by around 30 per cent in the PM peak.
- The number of vehicles entering via the North Gate has decreased by almost 30 per cent in the AM Peak but increased by more than 200 per cent in the PM peak.
- The number of vehicles departing via the North Gate has decreased by almost 30 per cent in the AM Peak and around 40 per cent in the PM peak.
- The number of eastbound vehicles passing through Springhill Road (southwest of Port Kembla Road) has increased by around 15 per cent in the AM peak and around 40 per cent in the PM peak.
- The number of westbound vehicles passing through Springhill Road (southwest of Port Kembla Road) has increased by around 30 per cent in the AM peak and around 70 per cent in the PM peak.
- The number of westbound vehicles passing through Five Islands Road (northwest of Flinders Street) has also decreased by almost 50 per cent in the AM peak and around 20 per cent in the PM peak.
- The number of eastbound vehicles passing through Five Islands Road (northwest of Flinders Street) has also decreased by around 20 per cent in the AM peak and 40 per cent in the PM peak.

To reflect the pre-pandemic traffic conditions for the subsequent analysis, 2021 surveyed traffic data were factored up utilising the 2018 surveyed traffic data and 2019 gate data provided by BlueScope except for the North Gate entries during the PM peak. The 2021 traffic survey data was utilised for this location to avoid reducing the traffic demands, to provide the most conservative assessment.

4.3.2 Functional classification

The classification of roads within the existing road network can be used as an indication of the functional role each road plays with respect to the volume of traffic they should appropriately carry. TfNSW has developed a set of road hierarchy classifications detailed in Table 4.10, which indicate typical nominal average annual daily traffic (AADT) volumes for various classes of roads.

Table 4.10 Functional classification of roads

Location	Traffic Volume (veh/d*)	Peak Hour Volume (veh/h*)
Motorway/Freeway	>15,000	>5,600
Arterial Road	>15,000	1,500 – 5,600
Sub-Arterial Road	5,000 – 20,000	500 – 2,000
Collector Road	2,000 – 10,000	200 – 1,000
Local Road	<2,000	0 – 200

Source: TfNSW, Road Design Guide and AMCORD
**Note veh/d = vehicles per day, veh/h = vehicles per hour*

Based upon the survey results presented above, the peak hour traffic volumes generally fall within the criteria provided in Table 4.10 for the relevant classification.

4.3.3 Mid-block capacity analysis

For the purposes of this assessment, a one-way mid-block capacity of 1,200 pc/h/lane has been adopted for the arterial roads, including Springhill Road and Five Islands Road, which is in keeping with the Austroads special conditions, which are reflective of the existing conditions. For Cringila Car Park Road, Loop Road, Emily Road, BlueScope Access Road, Flagstaff Road and Old Port Road, a one-way mid-block capacity of 900 pc/h/lane has been adopted.

Table 4.11 and Table 4.12 provide the VCR results for the existing AM and PM peak hours respectively. The following Passenger Car Units (PCU) factors have been applied to the survey, based on the PCU values provided in Table 10.1 in Roads and Maritime's *Traffic Modelling Guidelines* report (Roads and Maritime, 2013):

– Passenger car = 1.0.

– Light commercial vehicle = 1.0.

– Rigid heavy = 2.0.

– Heavy vehicles (if number of heavy articulated vehicles is unknown) = 2.5.

– Bus = 2.0.

– Articulated heavy = 4.0.

The data indicates that the key roads in the vicinity of the project are operating within the acceptable capacity for weekday morning and afternoon peak periods.

Table 4.11 Midblock volume / capacity analysis – AM peak hour

Road	Location	Direction	Capacity (veh/hr/lane)	Number of lanes	Total vehicles (PCU)	V/C ratio
Springhill Road	Northeast of BlueScope Access Road	Eastbound	1,200	3	1,466	0.41
		Westbound	1,200	3	522	0.14
	Northwest of BlueScope Access Road	Eastbound	1,200	3	1,358	0.38
		Westbound	1,200	3	520	0.14
BlueScope Access Road	South of Springhill Road	Northbound	900	2	35	0.02
		Southbound	900	2	69	0.04
Five Islands Road	Southeast of Cringila Car Park Road	Eastbound	1,200	3	1,358	0.38
	Southwest of Cringila Car Park Road	Eastbound	1,200	3	1,394	0.39
	Southeast of Emily Road (Entry)	Westbound	1,200	3	1,800	0.50
	Northwest of Emily Road (Entry)	Westbound	1,200	3	1,791	0.50
	Northeast of Emily Road (Exit)	Westbound	1,200	3	1,772	0.49
	Northwest of Emily Road (Exit)	Westbound	1,200	3	1,795	0.50
	Northeast of Flagstaff Road	Northbound	1,200	3	1,708	0.47
	Southeast of Flagstaff Road	Northbound	1,200	3	1,697	0.47
Cringila Car Park Road	Southeast of Cringila Car Park	Northbound	900	1	51	0.06
		Southbound	900	1	14	0.02
	Southwest of Cringila Car Park	Eastbound	900	1	17	0.02
		Westbound	900	1	56	0.06

Road	Location	Direction	Capacity (veh/hr/lane)	Number of lanes	Total vehicles (PCU)	V/C ratio
Loop Road	Northeast of Cringila Car Park Road	Northbound	900	1	88	0.10
		Southbound	900	1	45	0.05
	Southeast of Cringila Car Park Road	Northbound	900	1	51	0.06
		Southbound	900	1	48	0.05
Emily Road	South of Five Islands Road	Northbound	900	1	23	0.03
		Westbound	900	1	9	0.01
Flagstaff Road	East of Five Islands Road	Eastbound	900	2	19	0.01
		Westbound	900	2	8	0.00
Old Port Road[1]	North of Darcy Road	Northbound	900	1	91	0.10
		Southbound	900	1	87	0.10

Table 4.12 Midblock volume / capacity analysis – PM peak hour

Road	Location	Direction	Capacity (veh/hr/lane)	Number of lanes	Total vehicles (PCU)	V/C ratio
Springhill Road	Northeast of BlueScope Access Road	Eastbound	1,200	3	599	0.17
		Westbound	1,200	3	397	0.11
	Northwest of BlueScope Access Road	Eastbound	1,200	3	541	0.15
		Westbound	1,200	3	442	0.12
BlueScope Access Road	South of Springhill Road	Northbound	900	2	84	0.05
		Southbound	900	2	18	0.01
Five Islands Road	Southeast of Cringila Car Park Road	Eastbound	1,200	3	2,016	0.56
	Southwest of Cringila Car Park Road	Eastbound	1,200	3	1,979	0.55
	Southeast of Emily Road (Entry)	Westbound	1,200	3	1,499	0.42
	Northwest of Emily Road (Entry)	Westbound	1,200	3	1,483	0.41
	Northeast of Emily Road (Exit)	Westbound	1,200	3	1,474	0.41
	Northwest of Emily Road (Exit)	Westbound	1,200	3	1,554	0.43
	Northeast of Flagstaff Road	Northbound	1,200	3	1,311	0.36
	Southeast of Flagstaff Road	Northbound	1,200	3	1,284	0.36

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[1] Based on the traffic data from Port Kembla Gas Terminal Traffic Impact Assessment Report prepared by GHD in 2018

Road	**Location**	**Direction**	**Capacity (veh/hr/lane)**	**Number of lanes**	**Total vehicles (PCU)**	**V/C ratio**
Cringila Car Park Road	Southeast of Cringila Car Park	Northbound	900	1	5	0.01
		Southbound	900	1	42	0.05
	Southwest of Cringila Car Park	Eastbound	900	1	44	0.05
		Westbound	900	1	6	0.01
Loop Road	Northeast of Cringila Car Park Road	Northbound	900	1	9	0.01
		Southbound	900	1	121	0.13
	Southeast of Cringila Car Park Road	Northbound	900	1	8	0.01
		Southbound	900	1	81	0.09
Emily Road	South of Five Islands Road	Northbound	900	1	80	0.09
		Westbound	900	1	16	0.02
Flagstaff Road	East of Five Islands Road	Eastbound	900	2	32	0.02
		Westbound	900	2	5	0.00
Old Port Road[2]	North of Darcy Road	Northbound	900	1	96	0.11
		Southbound	900	1	127	0.14

4.3.4 Historical traffic growth trends

Traffic count data from the TfNSW Traffic Volumes Viewer website was used to determine historical traffic growth trends for roads within the study area.

A summary of the historical average weekday traffic volumes at Five Islands Road, east of Springhill Road (TfNSW Count Station ID: 07097) is shown in Table 4.13. The historical traffic count data indicates that there has been a decline in traffic volume in the order of some ten per cent in this location between 2014 to 2018.

Table 4.13 Average weekday traffic volumes (24 hours) – Five Islands Road, east of Springhill Road

Direction	**2014**	**2015**	**2016**	**2017**	**2018**
Northbound	22,366	22,190	22,620	23,185	22,998
Southbound	22,815	23,009	22,852	17,776	17,625
Total	45,181	45,199	45,472	40,961	40,623

Source: TfNSW Traffic Volume Viewer website

4.4 Safety - crash data review

Road crash information from 2015 to 2019 in the following locations was collected from road crash statistics published by NSW Centre for Road Safety:

- Five Islands Road within approximately 100 metres from Emily Roads (both directions), as shown in Figure 4.16.
- Five Islands Road within approximately 100 metres from Flagstaff Road (both directions), as shown in Figure 4.17.
- Springhill Road within approximately 100 metres from BlueScope Access Road (both directions), as shown in Figure 4.18.

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[2] Based on the traffic data from Port Kembla Gas Terminal Traffic Impact Assessment Report prepared by GHD in 2018

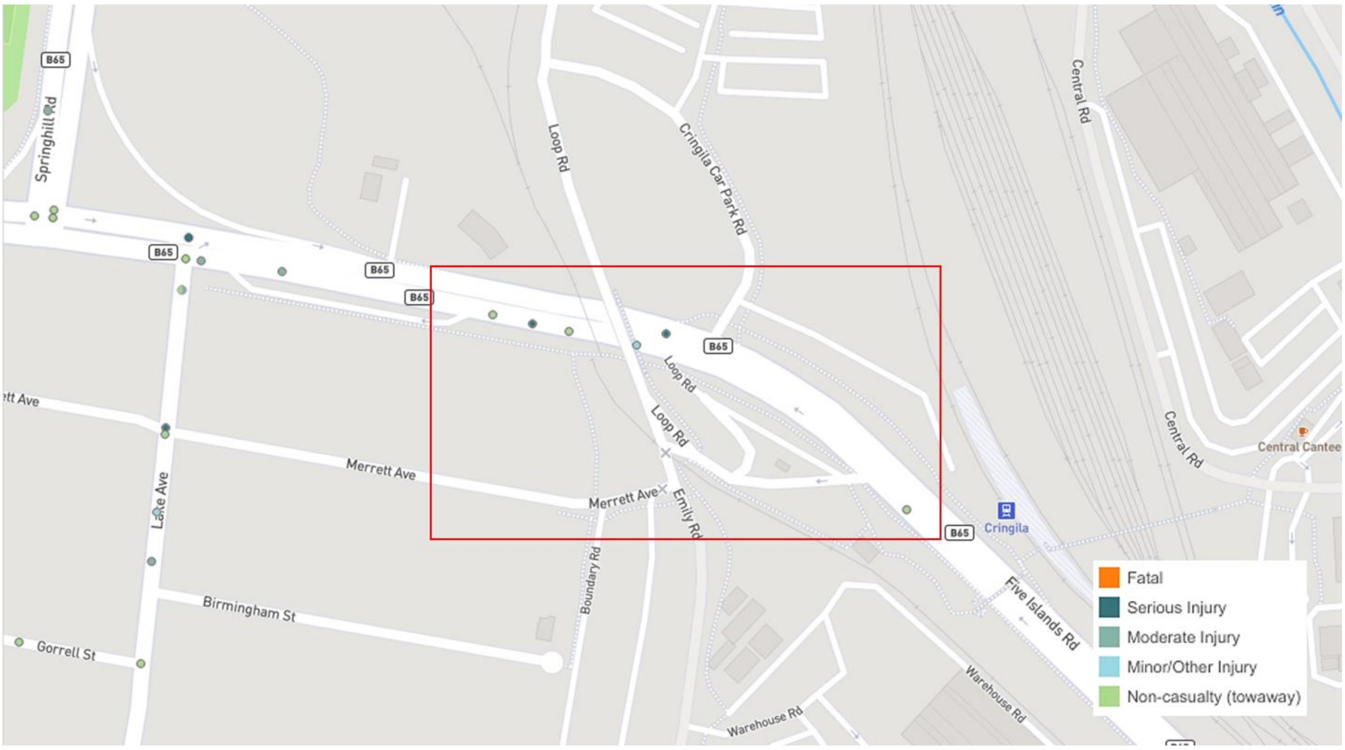

Figure 4.16 Crash locations (2015-2019) – Five Islands Road within approximately 100 metres from Emily Road

Source: Transport for NSW Centre for Road Safety modified by GHD

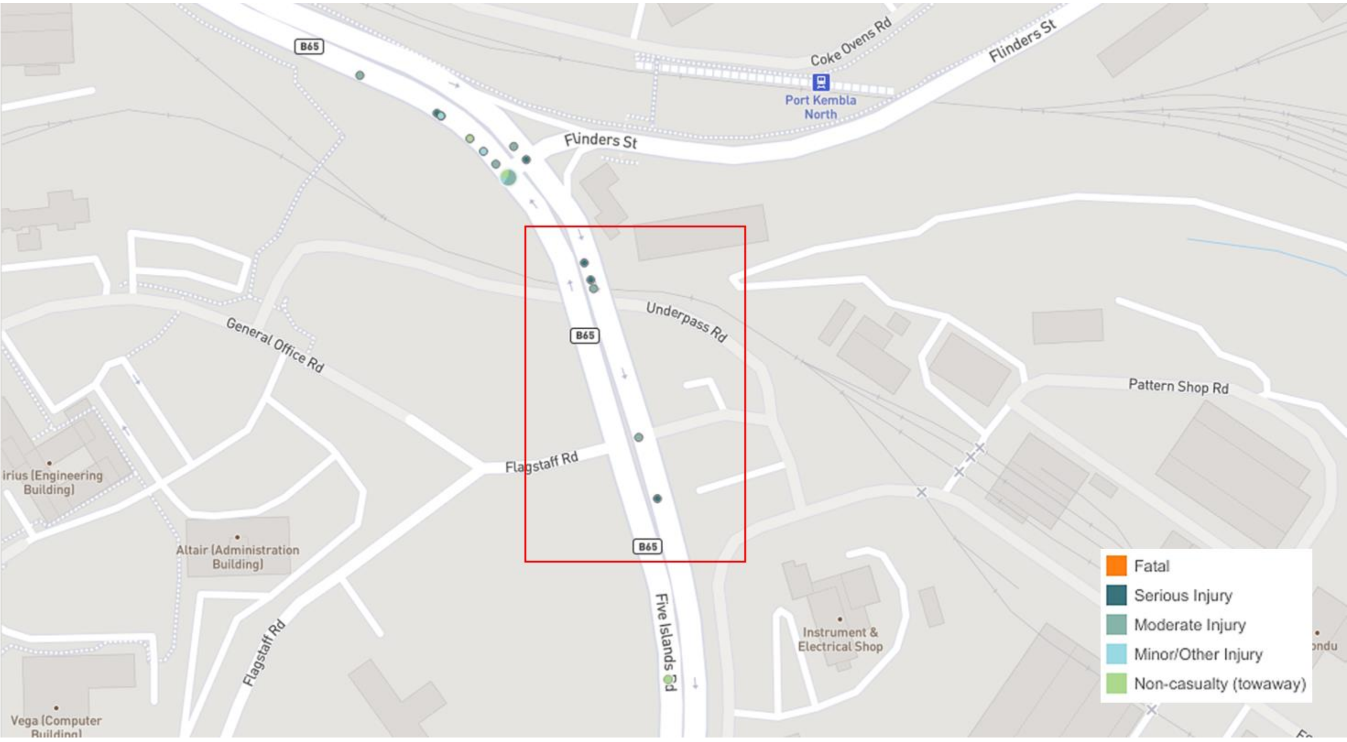

Figure 4.17 Crash locations (2015-2019) – Five Islands Road within approximately 100 metres from Flagstaff Road

Source: Transport for NSW Centre for Road Safety modified by GHD

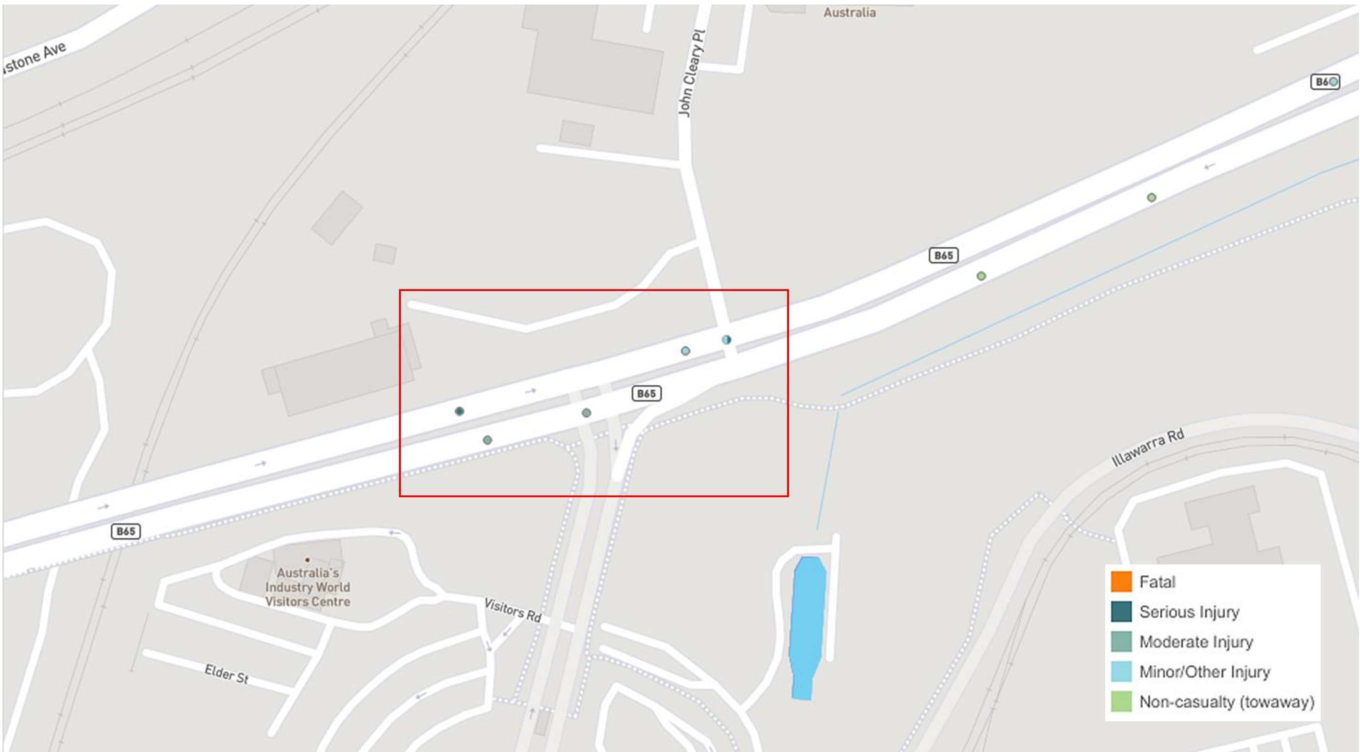

Figure 4.18 Crash locations (2015-2019) – Springhill Road within approximately 100 metres from BlueScope Access Road

Source: Transport for NSW Centre for Road Safety modified by GHD

From 2015 to 2019, 6 crashes were recorded near Five Islands Road and Emily Roads intersections, five crashes were recorded near Five Islands Road and Flagstaff intersection, and seven crashes were recorded near Springhill Road and BlueScope Access Road intersection. A summary of these crashes is presented in Table 4.14.

Table 4.14 Number of recorded crashes by road section (2015-2019)

Location	Number of Crashes	Number of Injuries			
		Fatal	Serious	Moderate	Minor
Five Islands Road within approximately 100 metres from Emily Road	6	0	2	0	1
Five Islands Road within approximately 100 metres from Flagstaff Road	5	0	3	2	0
Springhill Road within approximately 100 metres from BlueScope Access Road	7	0	2	3	2
Total	**18**	**0**	**7**	**5**	**3**

The predominant crash types are:

- Rear-end collisions and collisions with parked vehicles during daytime hours.
- Collisions with objects and parked vehicles on left and right hand bends at night.

These could be attributed to the reduced sight distance around the bends (when compared to straight alignment) or poor driver behaviour such as speeding and tailgating, among others.

4.5 Public and active transport

Active transport collectively refers to pedestrian traffic and commuter or recreational bicycle traffic. In reviewing the site and its accessibility to public transport opportunities, reference was made to the *NSW Planning Guidelines for Walking and Cycling (2004)*. This document outlines a recommended walkable distance of 400 metres to 800 metres to public transport and other local amenities or a 1.5 km bicycle riding distance.

Details of the accessibility to public transport, walking and bicycle riding access is provided in the following sections.

4.5.1 Train services and bus services

The closest stations to the project site are Cringila Station and Port Kembla North Station. These stations are served by the South Coast Line.

The nearest train stations and bus stops from the project site are shown in Figure 4.19. The bus routes and frequencies are presented in Table 4.15.

Figure 4.19 Train stations and bus stops locations

Source: Google Maps (2021), modified by GHD

Table 4.15 Bus services

Bus Number	Route	Day	Frequency
37	Wollongong to Shellharbour via Dapto (Loop Service)	Weekday	1 service per hour
		Saturday	1 service per hour
		Sunday and public holidays	1 service every 2 hours
51	Oak Flats to Wollongong via Stockland Shellharbour	Weekday	1 service per hour
		Saturday	1 service per hour
		Sunday and public holidays	1 service every 2 hours
53	Shellharbour to Wollongong	Weekday	1 service per hour
		Saturday:	1 service per hour
		Sunday and public holidays	1 service per hour
57	Wollongong to Shellharbour via Warrawong (Loop Service)	Weekday	1 service per hour
		Saturday	1 service per hour
		Sunday and public holidays	1 service every 2 hours
65	North Wollongong to Port Kembla (Loop Service)	Weekday	1 service per hour
		Saturday	1 service per hour
		Sunday and public holidays	1 service every 2 hours

4.5.2 Walking and cycling

Active transport facilities in proximity to the project site are limited to footpaths / shared paths along Springhill Road, Five Islands Road, Cringila Car Park Road, Old Port Road, and BlueScope Access Road. The off-road bicycle (shared path) routes in the vicinity of the site, including along Springhill Road, Five Islands Road and Old Port Road, are presented in Figure 4.20. There are neither pedestrian nor bicycle facilities along Emily Road and Flagstaff Road within the PKSW premises.

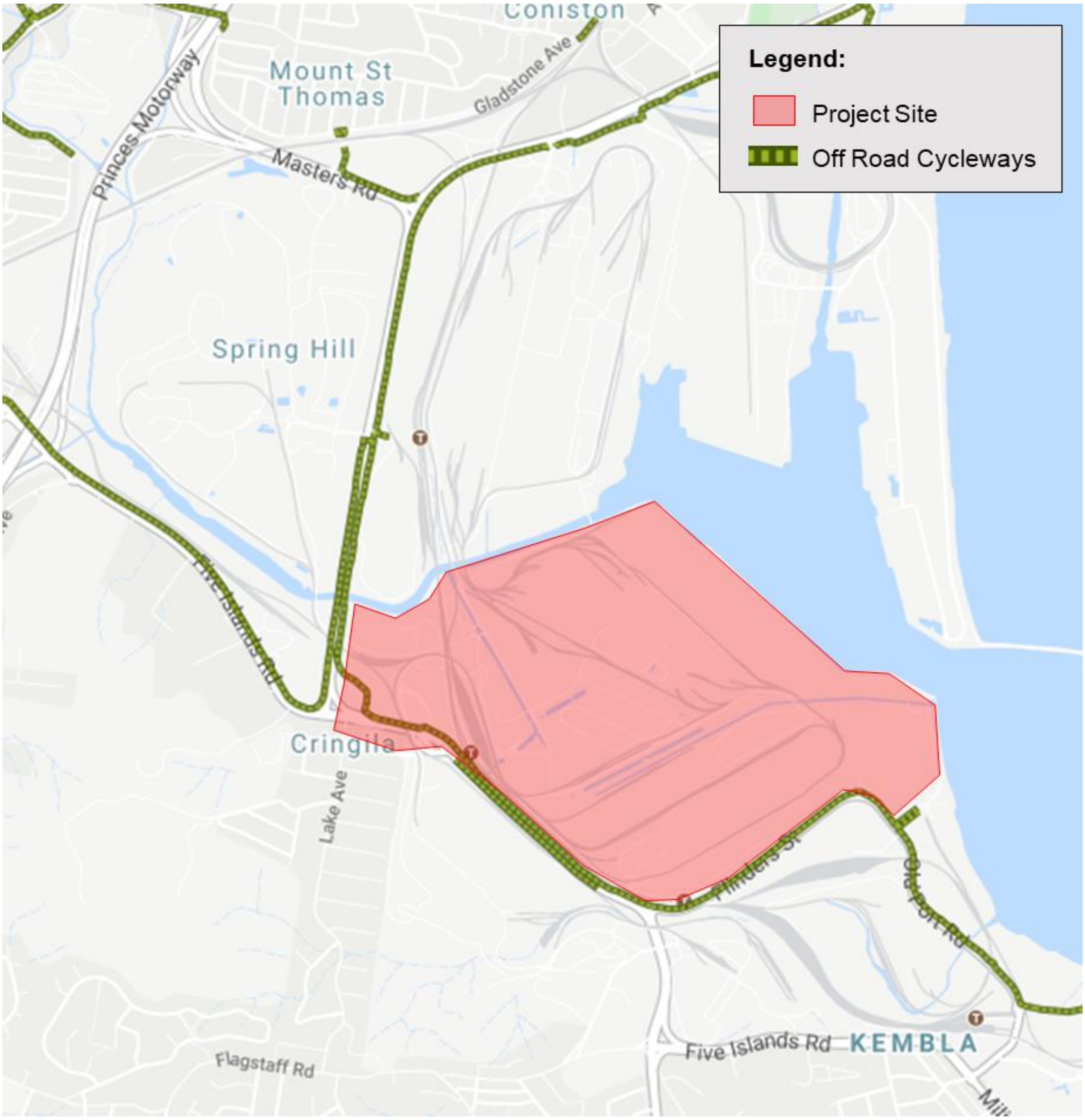

Figure 4.20 Existing bicycle network

TfNSW Cycleway Finder (2021), modified by GHD

5. Construction activities

Major construction work will be required within the blast furnace and surrounding facilities and will involve removing the remaining burden materials, refractory bricks and blocks and staves within the interior of the blast furnace for replacement. Any required repairs or replacement of ancillary equipment or structures will also be carried out.

Construction activities will indicatively involve the following tasks:

- Removal of the remaining burden materials.
- Removal of the iron skull.
- Removal of worn carbon block refractories in the hearth.
- Removal of worn refractories in the remainder of the vessel.
- Demolition of other equipment including:
  - Cooling staves which protect the blast furnace shell.
  - Hot blast main refractory lining where required, including the expansion joints.
  - Clarifier tank and associated equipment where required.
- Repairs to the blast furnace shell where required.
- Installation of a new clarifier tank and associated equipment.
- Installation of the new hearth, sidewall refractories and staves.
- Repair / replacement of tuyeres, tapholes and instrumentation.
- Repair, maintenance and/or upgrade of ancillary equipment including:
  - Furnace cooling systems.
  - Hot blast system including the stoves, with the addition of stove waste gas heat recovery (WGHR) system.
  - Gas system, with addition of a top gas recovery turbine (TRT).
  - Furnace top, including the charging equipment, bleeder valves and outrigger crane.
  - Casthouse floors and associated equipment.
  - Stockhouse (raw materials feed system).
  - Rail works (product delivery system).
  - Automation and power systems.
  - Services.
- Installation of a new slag granulation system.
- Shutdown and make-safe of 5BF.
- Commissioning and ramp up of 6BF operations.

5.1 Construction program

A summary of the construction staging and duration for each of the construction activities is provided in Table 5.1.

Table 5.1 Construction staging

Stage	Activities	Approximate Duration
1	– Procurement of long-lead time items (hearth, refractories, staves) initiated. – Progress with refurbishment activities that do not require long-lead items. – Early works commences for enabling activities. Includes cranes, lifts, casthouse roof replacement, drainage, construction facilities.	24 to 30 months
2	– Construction phase 1 activities including demolition, civils, stockhouse, slag handling, hot blast system, gas system, cooling system, wreck out of furnace, furnace top. – Control system and automation upgrade.	24 months
3	– Initiated with twelve months advance notice of end of 5BF operations. – Construction phase 2 activities including relining of furnace. – Complete in parallel with latter stages of phase 1 depending on timing of 5BF shutdown. – Pre-commissioning and commissioning of 6BF	12 months
4	– Managed transition of operations from 5BF to 6BF with ramp-down of 5BF followed by ramp-up production of 6BF. – 5BF decommissioned and made safe on ceasing operation.	1 month

5.2 Workforce

5.2.1 Workforce

The 6BF reline methodology allows reline activities to be completed in a measured way requiring a smaller construction workforce when compared to a 5BF multi-month reline outage.

Labour requirements for the 6BF reline model will be modest and will be mostly satisfied by local contractors. Across the duration of the project, a workforce of approximately 250 full time equivalent (FTE) workers will be required. As outlined in Section 5.4 a conservative number of 300 light vehicles accessing the site has been assumed in this assessment. If 6BF is required online earlier than 2026 for strategic, operational or safety reasons, this workforce size may be increased to complete the work in a reduced timeframe. The required increase in the workforce would be dependent on the timeframe required to complete the remaining works, however, this may result in a maximum of up to 1,000 workers being required, equivalent to what might be needed during a traditional reline.

During operation, it is anticipated that workforce requirements will not change significantly from existing operations with the 5BF workforce of approximately 105 to 110 FTE workers transferring to 6BF once operational.

5.2.2 Working hours

Authorisation for 24-hour construction is being sought as part of the request for planning approval.

Where practical, and subject to the final construction timetable, construction will be carried out during the following construction hours:

- Monday to Friday: 7.00 am to 6.00 pm.
- Saturday: 7.00 am to 6.00 pm.
- Sundays and public holidays: no work.

However, there will be a number of construction activities scheduled to be undertaken as night works to manage interaction with the remainder of the PKSW operations and the higher day-shift workforce.

Where practical, noise generating activities with the potential to impact any nearby receivers will be scheduled during standard hours.

Final installation of components inside the blast furnace and other residual construction activities will require 24-hour construction (estimated to be a period of five months). Further, 24-hour construction may be required for an extended period to speed up the completion of construction if 6BF is required online earlier than 2026.

During the 6BF commissioning period, each of the separate sub-systems of the furnace will be trial run and tested for safe operation. There will be no concurrent ironmaking operation of both 5BF and 6BF.

5.3 Construction equipment

Much of the equipment and materials required for the project has a long lead time for procurement. Specific types and quantities of equipment will be determined during project planning. An indicative list of the plant and equipment expected to be used during construction is provided in Table 5.2. Equipment will be sourced from onsite and also brought to site by contractors as required. Larger equipment will require heavy vehicle transportation.

Table 5.2 Indicative construction equipment

Construction equipment			
Excavators ranging from 5t to 40t	Bobcats (skid steer loaders)	Water blasters	Rail tamper
Cranes of various capacity ranging from 15t to 800t	Rock breaker	Grit blasters	Various brick saws and mixers
Dump trucks	Explosives equipment	Semi-trailers	Material hoists and winches
Front end loaders	Air compressors	Abbey hoists	Refractory gunning machine
Telescopic boom excavator	Diesel welders	Forklifts	Temporary stove burners, fuel pipe and fans.
Liquids tankers	Welding Machines	Sykes pumps	Alimak passenger and goods lifts
Tear-Out machine	Temporary conveyors	Temporary Oxygen, Acetylene, LPG, Argon, Nitrogen welding and cutting gases	Scaffolding
Boom and scissor lifts	Vacuum loading (suck) trucks	Concrete mixers	Concrete pumps
Fuel trucks	Flat Bed Trucks	Road Rollers	Piling Rigs
Concrete Saw	Plate compactors	-	-

5.4 Traffic generation

The construction of the project is expected to generate:

– Approximately 300 light vehicles per day, comprising of contractors and construction personnel vehicles, which will result in 600 light vehicle movements per day (300 arrivals and 300 departures). These vehicles are expected to arrive between 5:00 am to 6:00 am and depart between 4:00 pm to 6:00 pm.
  - It is estimated that around ninety to ninety-five percent of the expected light vehicle movements would be directed to park in the central car park via Cringila Car Park Access Road. Some contractors and visitors may also use this access to the car park, where they will then be transported via minibus through the gate at Loop Road.
  - The remaining five percent of light vehicle movements are assumed to enter and exit via the North Gate.

- Up to 50 buses per day resulting in 100 bus movements per day via Cringila Car Park Road. These buses will be used to transport workers within PKSW premises e.g. from central car park to construction site and vice versa. Potential bus pick-up and drop-off points are presented in Figure 5.1. It should be noted, however, that only the pick-up and drop-off point at central car park has an existing lay-by. It is therefore recommended to provide temporary bus stop facilities and implement appropriate traffic controls at these locations.
- Between 50 and 100 trucks per day (depending upon the phase of construction works), resulting in between 100 and 200 truck movements per day.

This traffic generation is considered to be low and within the daily fluctuation in traffic at roads in the surrounding road network. The construction activities are therefore expected to have negligible traffic impacts.

As noted in Section 5.2.1, should the operation life of 5BF end sooner than currently planned then an increase from 300 to a maximum of 1000 staff per day may be required. Should this occur, these staff would change from a single day shift to 24 hour construction. This would spread the increased number of worker movements across a 24 hour period. Therefore, the assessment of 300 light vehicle movements assessed in Section 6.1 are considered representative of worst case peak hour movements.

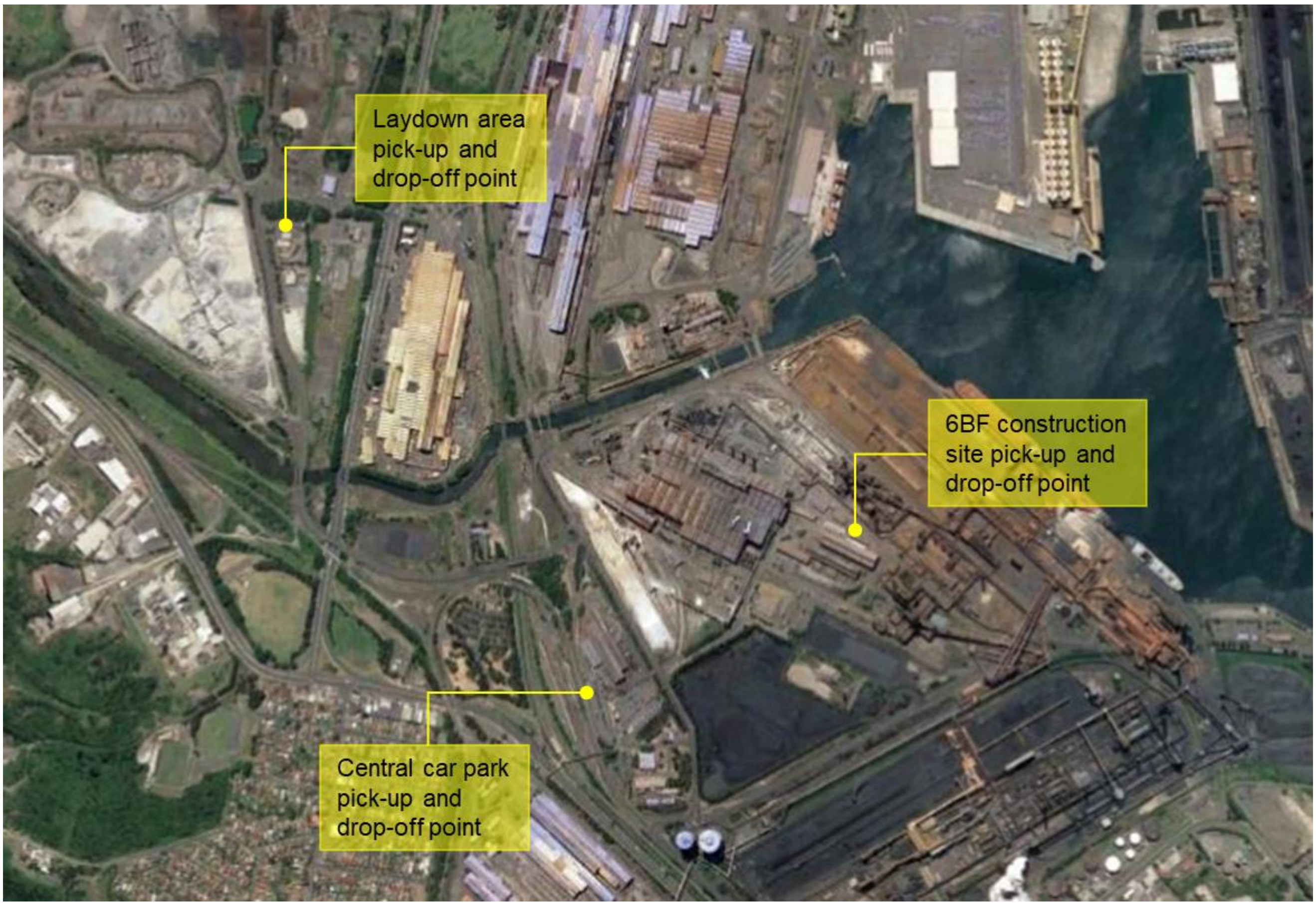

Figure 5.1 Indicative pick-up and drop-off points

Based on conservative estimates, the expected peak traffic generation for the construction activities is summarised in Table 5.3.

Table 5.3 Traffic generation – two-way traffic

	Daily traffic generation (vehicles)	Peak Hour traffic generation (vehicles)
Light vehicles	600	300
Heavy vehicles	300	30
Total	900	330

5.5 Construction vehicle access routes

Three typical construction traffic access routes have been considered for the purpose of this assessment. These include the following routes and are shown in Figure 5.2:

- **Route 1:** access to laydown area via Cringila Car Park Road. Vehicles to depart at Emily Road / Five Islands Road intersection.
- **Route 2:** access to laydown area via Flagstaff Road and Five Islands Road intersection.
- **Route 3:** access to laydown area and construction site via Flinders Street, Stockpile Road and Old Port Road.

A summary of these routes is provided in Table 5.4.

Internal roads that will be used for access to laydown areas and construction site are shown in Figure 5.3

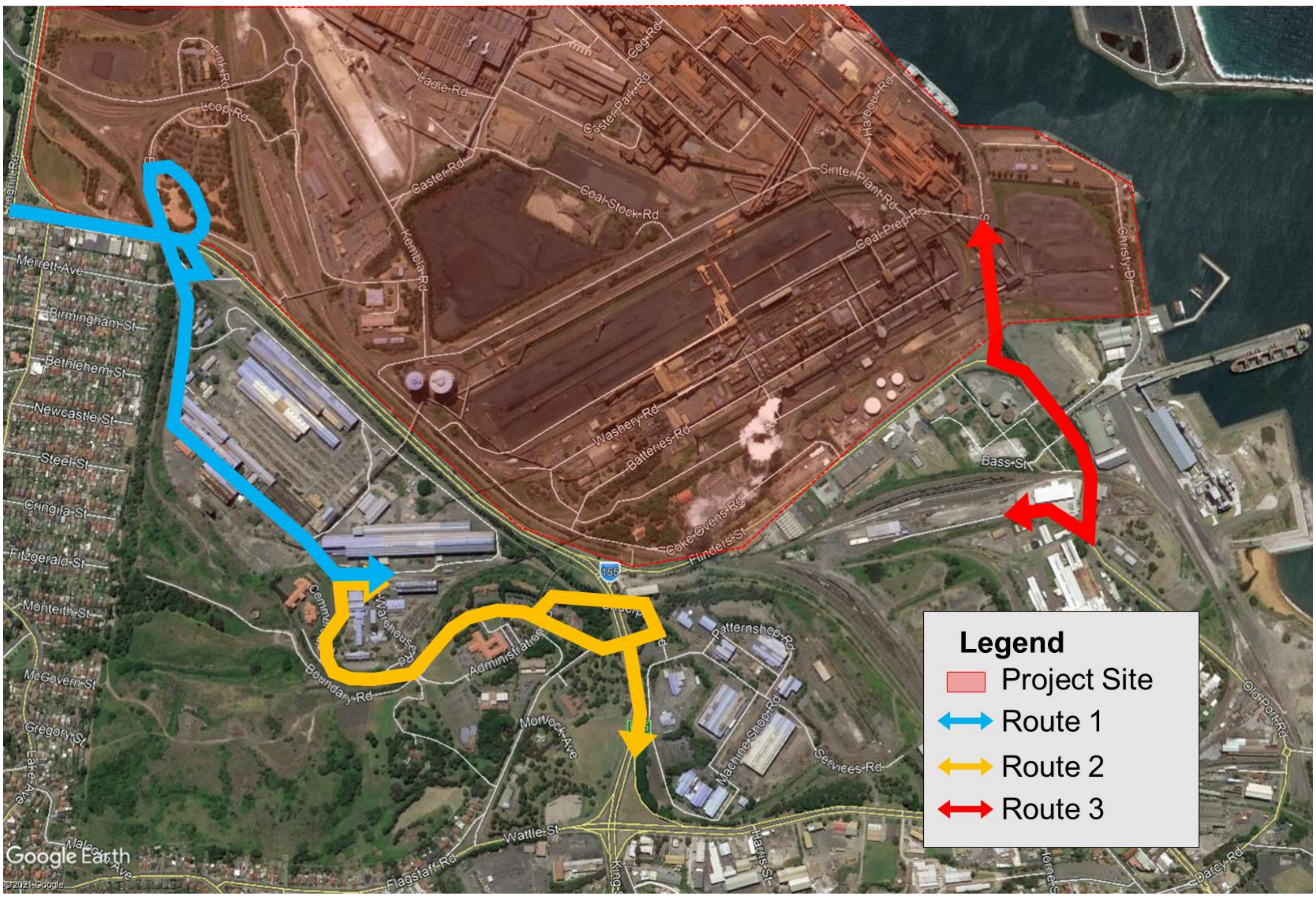

Figure 5.2 Construction Traffic Routes

Source: Google maps (2021), modified by GHD

Table 5.4 Construction access routes to each construction site

<table>
<tr><th>Route ID</th><th>From</th><th>To</th><th colspan="2">Route</th><th>Assumptions</th></tr>
<tr><td rowspan="5">1A</td><td rowspan="5">Wollongong</td><td rowspan="5">PKSW project site</td><td colspan="2">Princes Motorway (SB)</td><td rowspan="5">– Trips on Princes Motorway assumed to be split 50/50
– 70% of HV trips generated
– 70% of 95% of LV trips generated</td></tr>
<tr><td colspan="2">Five Islands Road (EB)</td></tr>
<tr><td colspan="2">Cringila Car Park Road (NB)</td></tr>
<tr><td colspan="2">Loop Road (SB)</td></tr>
<tr><td colspan="2">Emily Road (SB)</td></tr>
<tr><td rowspan="4">1B</td><td rowspan="4">PKSW project site</td><td rowspan="4">Wollongong</td><td colspan="2">Emily Road (NB)</td><td rowspan="4">– Trips on Princes Motorway assumed to be split 50/50
– 70% of HV trips generated
– 70% of 95% of LV trips generated</td></tr>
<tr><td colspan="2">Emily Road (NB)</td></tr>
<tr><td colspan="2">Five Islands Road (WB)</td></tr>
<tr><td colspan="2">Princes Motorway (NB)</td></tr>
<tr><td rowspan="4">2A</td><td rowspan="4">Port Kembla</td><td rowspan="4">PKSW project site</td><td colspan="2">Five Islands Road (NB)</td><td rowspan="4">– 30% of HV trips generated
– 30% of 95% of LV trips generated</td></tr>
<tr><td colspan="2">Flagstaff Road (WB)</td></tr>
<tr><td colspan="2">General Office Road (WB)</td></tr>
<tr><td colspan="2">Emily Road (NB)</td></tr>
<tr><td rowspan="4">2B</td><td rowspan="4">PKSW project site</td><td rowspan="4">Port Kembla</td><td colspan="2">Emily Road (SB)</td><td rowspan="4">– 30% of HV trips generated
– 30% of 95% of LV trips generated</td></tr>
<tr><td colspan="2">General Office Road (EB)</td></tr>
<tr><td>Underpass Road (EB)</td><td>Flagstaff Road (EB)</td></tr>
<tr><td>Five Islands Road (SB)</td><td>Five Islands Road (NB)</td></tr>
<tr><td>3</td><td>PKSW project site</td><td>Other PKSW locations</td><td colspan="2">Old Port Road</td><td>– Along Old Port Road</td></tr>
<tr><td>4</td><td>PKSW project site</td><td>Other PKSW locations</td><td colspan="2">Internal PKSW roads only</td><td>– Internal only</td></tr>
</table>

Paper Size ISO A4

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Traffic Impact Assessment

Internal roads used during reline activities

Project No.	**12541101**
Revision No.	**0**
Date	**21/10/2021**

FIGURE 5-3

G:\22\12541101\GIS\Maps\12541101_TrafficImpactAssessment_0.aprx\12541101_TIA004_InternalRoad_0
Print date: 22 Oct 2021 - 17:56

Data source: BlueScope: Internal roads layout, 2021. LPI: DCDB/DTDB, 2017. World Imagery: Maxar.
Created by: tmorton

6. Traffic impact assessment

This section outlines the traffic implications during the construction and operation of the project.

6.1 Construction impacts

6.1.1 Traffic impacts

Based on the traffic generation and traffic distributions outlined in Sections 5.4 and 5.5, the following sections summarise the expected increase in daily and peak hour traffic during peak construction activities. This peak construction period is expected to occur at the same time for a period of up to three years.

Daily traffic construction traffic

The expected increase in daily traffic associated with the peak construction activity for the project is summarised in Table 6.1 and the expected increase in peak hour traffic is summarised in Table 6.2.

It should be noted that peak hour traffic generation is associated with light vehicle movements during shift changeover periods. Light vehicle movements during other times of the day are expected to be minimal. Outside of shift change over hours, the construction of the project would result in an increase of around 30 two-way heavy vehicle movements per hour.

Table 6.1 Increase in construction traffic generation – daily traffic

Road	Location	Direction	Light vehicles	Heavy vehicles	Total vehicles
Springhill Road	Northeast of BlueScope Access Road	Eastbound	0	40	40
		Westbound	4	0	4
	Northwest of BlueScope Access Road	Eastbound	11	0	11
		Westbound	11	0	11
BlueScope Access Road	South of Springhill Road	Northbound	15	0	15
		Southbound	15	0	15
Five Islands Road	Southeast of Cringila Car Park Road	Eastbound	0	0	0
	Southwest of Cringila Car Park Road	Eastbound	200	110	310
	Southeast of Emily Road (Entry)	Westbound	0	0	0
	Northwest of Emily Road (Entry)	Westbound	0	0	0
	Northeast of Emily Road (Exit)	Westbound	0	0	0
	Northwest of Emily Road (Exit)	Westbound	200	110	310
	Northeast of Flagstaff Road	Northbound	0	0	0
	Southeast of Flagstaff Road	Northbound	170	80	250

Road	Location	Direction	Light vehicles	Heavy vehicles	Total vehicles
Cringila Car Park Road	Southeast of Cringila Car Park	Northbound	200	110	310
		Southbound	0	0	0
	Southwest of Cringila Car Park	Eastbound	200	110	310
		Westbound	0	0	0
Loop Road	Northeast of Cringila Car Park Road	Northbound	285	0	285
		Southbound	285	0	285
	Southeast of Cringila Car Park Road	Northbound	85	0	85
		Southbound	285	110	395
Emily Road	South of Five Islands Road	Northbound	200	110	310
		Westbound	0	0	0
Flagstaff Road	East of Five Islands Road	Eastbound	170	80	250
		Westbound	0	0	0
Old Port Road	North of Darcy Road	Northbound	0	150	150
		Southbound	0	150	150

Table 6.2 Peak hour (AM and PM) construction traffic generation on the surrounding road network

Road	Location	Direction	Light vehicles	Heavy vehicles	Total vehicles
Springhill Road	Northeast of BlueScope Access Road	Eastbound	0	4	4
		Westbound	4	0	4
	Northwest of BlueScope Access Road	Eastbound	11	0	11
		Westbound	11	0	11
BlueScope Access Road	South of Springhill Road	Northbound	15	0	15
		Southbound	15	0	15
Five Islands Road	Southeast of Cringila Car Park Road	Eastbound	0	0	0
	Southwest of Cringila Car Park Road	Eastbound	200	11	211
	Southeast of Emily Road (Entry)	Westbound	0	0	0
	Northwest of Emily Road (Entry)	Westbound	0	0	0
	Northeast of Emily Road (Exit)	Westbound	0	0	0
	Northwest of Emily Road (Exit)	Westbound	200	11	211
	Northeast of Flagstaff Road	Northbound	0	0	0
	Southeast of Flagstaff Road	Northbound	170	8	178

Road	Location	Direction	Light vehicles	Heavy vehicles	Total vehicles
Cringila Car Park Road	Southeast of Cringila Car Park	Northbound	200	11	211
		Southbound	0	0	0
	Southwest of Cringila Car Park	Eastbound	200	11	211
		Westbound	0	0	0
Loop Road	Northeast of Cringila Car Park Road	Northbound	285	0	285
		Southbound	285	0	285
	Southeast of Cringila Car Park Road	Northbound	85	0	85
		Southbound	285	11	296
Emily Road	South of Five Islands Road	Northbound	200	11	211
		Westbound	0	0	0
Flagstaff Road	East of Five Islands Road	Eastbound	170	8	178
		Westbound	0	0	0
Old Port Road	North of Darcy Road	Northbound	0	15	15
		Southbound	0	15	15

Midblock assessment

For a highly conservative midblock assessment of the proposal, the peak hour construction traffic movements have been added to the observed road network AM and PM peak hour traffic volumes. However, it should be noted that during the AM peak, the network peak hour was observed to be between 7:45 am and 8:45 am although the construction traffic peak hour is expected to be between 5:00 am and 6:00 am.

Additionally, the PM peak for staff light vehicle movements is expected to occur over a two hour period, with light vehicles departing the site between 4:00 pm to 6:00 pm. However, for a conservative assessment, it has been assumed that all staff would depart during the network peak hour.

Table 6.3 and Table 6.4 provide the VCR results for the AM and PM peak hours respectively for the peak construction period. As stated above, this is a highly conservative assessment, given that the peak hours for the construction traffic generation would not occur during the surrounding road network peak hours.

The data indicates that the majority of key roads in the vicinity of the project are expected to operate well within the acceptable capacity for weekday morning and afternoon peak periods.

Impacts to the M1 Princes Motorway are expected to be minimal given that this is a state Highway that caters for high traffic volumes.

Table 6.3 Peak construction midblock volume / capacity – AM peak hour

Road	Location	Direction	Capacity (veh/hr/lane)	Number of lanes	Total vehicles (PCUs)	V/C ratio
Springhill Road	Northeast of BlueScope Access Road	Eastbound	1,200	3	1,466	0.41
		Westbound	1,200	3	626	0.17
	Northwest of BlueScope Access Road	Eastbound	1,200	3	1,544	0.43
		Westbound	1,200	3	638	0.18
BlueScope Access Road	South of Springhill Road	Northbound	900	2	60	0.03
		Southbound	900	2	126	0.07

Road	Location	Direction	Capacity (veh/hr/lane)	Number of lanes	Total vehicles (PCUs)	V/C ratio
Five Islands Road	Southeast of Cringila Car Park Road	Eastbound	1,200	3	1,558	0.43
	Southwest of Cringila Car Park Road	Eastbound	1,200	3	2,058	0.57
	Southeast of Emily Road (Entry)	Westbound	1,200	3	2,028	0.56
	Northwest of Emily Road (Entry)	Westbound	1,200	3	2,016	0.56
	Northeast of Emily Road (Exit)	Westbound	1,200	3	1,994	0.55
	Northwest of Emily Road (Exit)	Westbound	1,200	3	2,020	0.56
	Northeast of Flagstaff Road	Northbound	1,200	3	1,860	0.52
	Southeast of Flagstaff Road	Northbound	1,200	3	2,045	0.57
Cringila Car Park Road	Southeast of Cringila Car Park	Northbound	900	1	515	0.57
		Southbound	900	1	16	0.02
	Southwest of Cringila Car Park	Eastbound	900	1	247	0.27
		Westbound	900	1	295	0.33
Loop Road	Northeast of Cringila Car Park Road	Northbound	900	1	678	0.75
		Southbound	900	1	57	0.06
	Southeast of Cringila Car Park Road	Northbound	900	1	239	0.27
		Southbound	900	1	121	0.13
Emily Road	South of Five Islands Road	Northbound	900	1	26	0.03
		Westbound	900	1	12	0.01
Flagstaff Road	East of Five Islands Road	Eastbound	900	2	120	0.07
		Westbound	900	2	115	0.06
Old Port Road	North of Darcy Road	Northbound	900	1	129	0.14
		Southbound	900	1	125	0.14

**veh = vehicles, hr = hour, PCU = passenger car units, V/C = volume to capacity ratio*
Note, PCU factors = 1 for light vehicles, 2 for heavy vehicles (or 2.5 if the number of B-Doubles is unknown) and 4 for B-Doubles

Table 6.4 Peak construction midblock volume / capacity analysis – PM peak hour

Road	Location	Direction	Capacity (veh/hr/lane)	Number of lanes	Total vehicles (PCUs)	V/C ratio
Springhill Road	Northeast of BlueScope Access Road	Eastbound	1,200	3	613	0.17
		Westbound	1,200	3	416	0.12
	Northwest of BlueScope Access Road	Eastbound	1,200	3	587	0.16
		Westbound	1,200	3	496	0.14
BlueScope Access Road	South of Springhill Road	Northbound	900	2	130	0.07
		Southbound	900	2	30	0.02
Five Islands Road	Southeast of Cringila Car Park Road	Eastbound	1,200	3	2,132	0.59
	Southwest of Cringila Car Park Road	Eastbound	1,200	3	2,088	0.58
	Southeast of Emily Road (Entry)	Westbound	1,200	3	1,625	0.45

Road	Location	Direction	Capacity (veh/hr/lane)	Number of lanes	Total vehicles (PCUs)	V/C ratio
	Northwest of Emily Road (Entry)	Westbound	1,200	3	1,609	0.45
	Northeast of Emily Road (Exit)	Westbound	1,200	3	1,600	0.44
	Northwest of Emily Road (Exit)	Westbound	1,200	3	2,148	0.60
	Northeast of Flagstaff Road	Northbound	1,200	3	1,381	0.38
	Southeast of Flagstaff Road	Northbound	1,200	3	1,448	0.40
Cringila Car Park Road	Southeast of Cringila Car Park	Northbound	900	1	7	0.01
		Southbound	900	1	51	0.06
	Southwest of Cringila Car Park	Eastbound	900	1	54	0.06
		Westbound	900	1	7	0.01
Loop Road	Northeast of Cringila Car Park Road	Northbound	900	1	11	0.01
		Southbound	900	1	715	0.79
	Southeast of Cringila Car Park Road	Northbound	900	1	11	0.01
		Southbound	900	1	669	0.74
Emily Road	South of Five Islands Road	Northbound	900	1	549	0.61
		Westbound	900	1	16	0.02
Flagstaff Road	East of Five Islands Road	Eastbound	900	2	214	0.12
		Westbound	900	2	5	0.00
Old Port Road	North of Darcy Road	Northbound	900	1	134	0.15
		Southbound	900	1	165	0.18

**veh = vehicles, hr = hour, PCU = passenger car units, V/C = volume to capacity ratio*
Note, PCU factors = 1 for light vehicles, 2 for heavy vehicles (or 2.5 if the number of B-Doubles is unknown) and 4 for B-Doubles

6.1.2 Intersection performance

The following key intersections within the study area have been assessed using the SIDRA 8 intersection modelling software, as these intersections provide access to the project site:

- Cringila Car Park Road / Five Islands Road intersection (left in, left out only).
- Loop Road / Cringila Car Park Road intersection.
- Five Islands Road / Emily Road (Entry) intersection.
- Five Islands Road / Emily Road (Exit) intersection.
- Springhill Road / BlueScope Road signalised intersection.
- Five Islands Road / Flagstaff Road intersection (left in, left out only).

The intersection traffic modelling has been undertaken for the following weekday peak hour periods, to coincide with the construction traffic generation peak hours for the project, which is associated with the shift changeover periods:

- AM peak – between 7:45 am and 8:45 am.
- PM peak – between 4:00 pm and 5:00 pm.

Construction traffic generated by the project outside of these periods would be minor, with an increase of around 30 two-way heavy vehicle movements per hour on the surrounding road network.

A summary of the SIDRA intersection modelling results for the “without construction traffic” scenario and the “with construction traffic” scenario is provided in Table 6.5 and Table 6.6. The intersection modelling indicates that the construction traffic would have minor impacts to the operation of these intersections, which would continue to operate with a satisfactory Level of Service (LoS) under the peak construction traffic scenario for the project. Outputs from the SIDRA intersection modelling are provided in full in Appendix B.

Table 6.5 SIDRA modelling results – 2021 surveyed traffic volumes (without construction traffic)

Intersection	**AM Peak (7:45 am – 8:45 am)**				**PM Peak (4:00 pm – 5:00 pm)**			
	Average Delay (s)	**LoS**	**Control Type**	**Degree of Saturation**	**Average Delay (s)**	**LoS**	**Control Type**	**Degree of Saturation**
Cringila Car Park Road / Five Islands Road	9.8	A	Stop	0.016	13.0	A	Stop	0.075
Loop Road / Cringila Car Park Road	5.2	A	Give way/Yield	0.029	5.6	A	Give way/Yield	0.005
Five Islands Road / Emily Road (Entry)	5.9	A	Give way/Yield	0.330	5.6	A	Give way/Yield	0.270
Five Islands Road / Emily Road (Exit)	6.7	A	Give way/Yield	0.028	6.1	A	Give way/Yield	0.087
Springhill Road / BlueScope Access Road	23.8	B	Signal	0.797	22.3	B	Signal	0.591
Five Islands Road / Flagstaff Road intersection	10.7	A	Give way/Yield	0.020	7.8	A	Give way/Yield	0.022

**Note - LoS = Level of Service*

Table 6.6 SIDRA modelling results – During construction (with construction traffic)

Intersection	**AM Peak (7:45 am – 8:45 am)**				**PM Peak (4:00 pm – 5:00 pm)**			
	Average Delay (s)	**LoS**	**Control Type**	**Degree of Saturation**	**Average Delay (s)**	**LoS**	**Control Type**	**Degree of Saturation**
Cringila Car Park Road / Five Islands Road	8.9	A	Stop	0.013	12.6	A	Stop	0.069
Loop Road / Cringila Car Park Road	6.3	A	Give way/Yield	0.072	7.8	A	Give way/Yield	0.014
Five Islands Road / Emily Road (Entry)	5.9	A	Give way/Yield	0.330	5.6	A	Give way/Yield	0.270
Five Islands Road / Emily Road (Exit)	6.7	A	Give way/Yield	0.028	6.7	A	Give way/Yield	0.307
Springhill Road / BlueScope Access Road	23.9	B	Signal	0.797	22.3	B	Signal	0.591
Five Islands Road / Flagstaff Road intersection	10.1	A	Give way/Yield	0.019	7.8	A	Give way/Yield	0.228

**Note - LoS = Level of Service*

6.1.3 Heavy vehicle approved routes

PKSW can be accessed by the following heavy vehicle routes approved for use by vehicles up to 26m B-double equivalent:

- Springhill Road.
- Five Islands Road.
- Flinders Street.
- Old Port Road.
- Masters Road (via Springhill Road).
- Princes Motorway (via Five Islands Road or Masters Road).

It is likely that certain specialist plant, equipment or materials may require the use of oversize or overmass (OSOM) vehicles. Where required OSOM permits would be obtained from TfNSW and licenced haulage contractors engaged to manage OSOM movements.

6.1.4 Car parking

Onsite parking at the central car park, with approximately 570 parking spaces, will be available for the expected project workforce. Personnel are expected to park at the central car park, accessed via Loop Road and will be bused to and from the construction site. In addition, the PKSW also has a range of other locations for formal and informal overflow parking should the need arise. Where possible, contractors would be encouraged to shuttle teams from their offsite premises to the PKSW, for example through the use of minibuses. This would reduce the number of onsite light vehicle parking spaces required. No on-street car parking is proposed to be utilised as part of the project so there would be no impacts to offsite on street parking availability to the public.

6.1.5 Public transport

The proposed construction arrangements would not impact train or bus services operating in the vicinity of the construction sites. The additional traffic generated by the construction activities is also expected to have minimal impacts to public transport services.

6.1.6 Transport infrastructure

New transport infrastructure proposed as part of the project is limited to upgrading pavement around the slag handling area. Traffic in this area is limited to internal traffic only and is not open to the public. Pavement types proposed including details of relevant Australian Standards and TfNSW standards used as a basis for design are outlined in Appendix C. No other upgrades to any transport related infrastructure are proposed as part of the project.

6.1.7 Active transport - Pedestrians and bicycle riders

The proposed construction arrangements are not expected to impact pedestrian or bicycle facilities. The additional traffic generated by the construction activities is expected to have minimal impacts to pedestrians and bicycle riders.

6.1.8 Safe Intersection Sight Distance (SISD) analysis

Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections identifies a minimum safe intersection sight distance of 170 metres is required for the construction traffic connection to Five Islands Road via Emily Road which has a posted speed of 80 km/h as presented in Table 6.7.

Table 6.7 Safe intersection sight distance (SISD) and corresponding minimum crest vertical curve size for sealed roads (S<L)

Route ID	Based on approach sight distance for cars[3] h_1 = 1.1, h_2 = 0, d = 0.36[4]; Observation time = 3 sec					
	R_T = 1.5 sec[5]		R_T = 2.0 sec		R_T = 2.5 sec	
	SISD (m)	K	SISD (m)	K	SISD (m)	K
40	67	4.9	73	6	-	-
50	90	8.6	97	10	-	-
60	114	14	123	16	-	-
70	141	22	151	25	-	-
80	**170**	31	181	35	-	-
90	201	43	214	49	226	55
100	234	59	248	66	262	74
110	-	-	285	87	300	97
120	-	-	324	112	341	124
130	-	-	365	143	383	157

Source: Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections
Notes:
K is the length of vertical curve for a 1% change in grade.
To determine SISD for trucks around horizontal curves, use Equation 2 with an observation time of 2.5 sec.
Main Roads Western Australia have adopted a desirable minimum reaction time of 2.5 sec and an absolute minimum reaction time of 2.0 sec.
A reaction time of 1.5 sec is not to be used in Western Australia.
Combinations of design speed and reaction times not shown in this table are generally not used.

Based on the crash data review in Section 4.4, a rear-end collision within the vicinity of the intersection has been reported resulting to a minor injury which can be attributed to the reduced sight distance.

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[3] If the average grade over the braking length is not zero, calculate the approach sight distance (ASD) values using the correction factors in Table 3.4 (or use Equation 1) by applying the average grade over the braking length.

[4] A coefficient of deceleration of greater than 0.36 is not provided in this table. The provision of SISD requires more conservative values than for other sight distance models (e.g. the stopping sight distance model allows values up to 0.46 in constrained situations). This is because there is a much higher likelihood of colliding with hazards at intersections (that is, other vehicles). Comparatively, there is a relatively low risk of hitting a small object on the road (the stopping sight distance model).

[5] A 1.5 sec reaction time is only to be used in constrained situations where drivers will be alert. Typical situations are given in Table 5.2 of AGRD Part 3. The general minimum reaction time is 2 sec.

Figure 6.1 Approach Sight Distance from Five Islands Road

Source: Google Maps

As shown in Figure 6.1, the approach sight distance to the Emily Road access / Five Islands Road intersection is considered acceptable, based on the distance measured through Google Maps. Figure 6.2 shows that the view could potentially be obstructed by an existing tree and the existing grade.

In order to verify the site distance, a site visit was undertaken in September 2021 to observe this potential site restriction and assess if the required SISD is achieved. This confirmed that a minimum of 170 metres SISD is achieved at the Emily Road access / Five Islands Road intersection, as shown at Figure 6.1, which meets the Austroads requirements.

Figure 6.2 Emily Road viewed form Five Islands Road

Source: Google Street View

Figure 6.3 Emily Road viewed form Five Islands Road (site visit)

Source: GHD weekday PM peak site inspection, September 2021

6.1.9 Rail

Construction activities will have no impact on the ongoing operation of freight or passenger rail networks.

6.2 Operational impacts

6.2.1 Traffic impacts

Regular operations of the site will resume after the construction period. Therefore, the operational peak hour traffic is expected to be lower than the peak hour traffic associated with the construction activities. The operation of the project traffic is therefore expected to have minimal traffic impacts in regard to intersection performance or mid-block capacity to the surrounding road network.

6.2.2 Car parking

Once 6BF is operational, personnel are expected to park at designated car parks within PKSW in a similar manner as they currently do for the operation of 5BF. As such, there is expected to be minimal impacts to on-street car parking in the study area.

6.2.3 Public transport

The operation of the project would not impact train or bus services operating in the vicinity of the construction sites. The additional traffic generated by the operation of the project is expected to have minimal impacts to public transport services.

6.2.4 Pedestrians and bicycle riders

The operation of the project would not impact pedestrian or bicycle facilities. The traffic movements associated with the project are expected to have minimal impacts to pedestrians and bicycle riders.

7. Recommendations

7.1 Construction Traffic Management Plan

A Construction Traffic Management Plan (CTMP) will need to be prepared prior to the commencement of works to maintain the safety of all workers and road users within the vicinity of the site. The primary objectives of the CTMP would be:

- To minimise the impact of construction vehicle traffic on the overall operation of the road network.
- To provide continuous, safe, and efficient movement of traffic for both the general public and construction workers.
- Installation of appropriate advance warning signs to inform users of any changed traffic condition or provide directions to contractors not familiar with the site.
- To provide a description of the construction vehicles and the volume of these construction vehicles accessing the construction site.
- To provide information regarding the changed access arrangement and a description of the proposed external routes for vehicles, including the construction vehicles, accessing the site.
- Establishment of a safe pedestrian environment in the vicinity of the site.

All staff and subcontractors engaged on site should be required to undergo site induction. The induction will outline the requirements of the CTMP, including site access routes, environmental and occupational health and safety responsibilities, emergency procedures, potential carpooling opportunities and vehicle height restriction under the power lines, among others. Additionally, the Site Manager will discuss CTMP requirements regularly as a part of “toolbox talks”.

7.2 Traffic management measures

The following are the recommended measures that should be in place prior to the commencement of and during the execution of the construction period:

- Key stakeholders, including owners/operators of adjacent lands and emergency service providers, should be notified of any changes to the traffic management arrangements prior to the commencement of works.
- Truck drivers should be directed to follow the predetermined haulage routes as described in Section 5.5.
- The construction site access layout will be reviewed during design development to consider the turn path required for the construction vehicles.
- No parking of light or heavy vehicles on the public road network.
- Any workers required to undertake works or traffic control shall be suitably trained and hold the required accreditation to carry out works on site and will also be site inducted.
- Provide protection to workers and road users through advanced warning of construction works, speed changes, safety barriers with adequate offsets and deflection allowance, where necessary.
- Site access should be restricted to authorised personnel only and existing employees on site. Pedestrian access to and around the site is to be maintained at all times.
- Roadwork speed zones must be logical, credible, and enforceable. They should only be used where they are self-enforcing or will be enforced. They should be used with other traffic control signs and devices and should not be used in place of more effective traffic controls. They should also be used only while road works are in progress or the lower speed road conditions exist.
- A Transport Access Guide (TAG) should be prepared to identify alternate travel options for visitors and staff to encourage sustainable transport and reduce parking demand. The TAG summarises alternate transport options to access the development, outlining where and how these services can be accessed and the frequency of the service. This could include but is not limited to:
  - Public transport locations (bus and train connection).
  - Active transport (cycle / walking) opportunities.

  - Bicycle infrastructure facilities.
  - Carpooling between workers (subject to COVID-19 safe practices).
- The following environmental requirements should be adhered to:
  - All vehicles transporting loose materials will have the entire load covered and/or secured to prevent any large items, excess dust or debris depositing onto the roadway during travel to and from the site, including but not limited to construction rumble strips/wheels wash at the site egress location.
  - The lead contractors will monitor the roads leading to and from the site and take all necessary steps to rectify any road deposits caused by site vehicles, to maintain the safety of all road users.
  - Vehicles operating to, from and within the site shall do so in a manner, which does not create unreasonable or unnecessary noise or vibration.
  - Public roads and access points will not be obstructed by any materials, vehicles, refuse skips or the like, under any circumstances.

8. Conclusion

8.1 Overview

The purpose of this TIA is to document the results of the assessment of potential traffic impacts during the construction and operation of the project and includes the following scope:

- Review of the existing road and transport conditions, traffic volumes and crash data.
- Review of the construction works of the project and its access arrangements.
- Assessment of the potential impacts of the proposed construction works and the performance of the intersections during construction.
- Determine suitable mitigation measures to minimise impacts.

8.2 Key findings

The key findings of this TIA are summarised as:

- Analysis of the traffic survey conducted by Matrix Traffic and Transport Data Pty Ltd to Tuesday, 7 September 2021 identified the weekday morning traffic peak hour occurs between 7:45 am to 8:45 am and weekday afternoon traffic hour occurs between 4:00 pm to 6:00 pm.
- The construction of the project is expected to generate approximately 600 light vehicle movements, 100 bus movements, and 200 truck movements per day over a three-year period.
- The construction site for the project will be accessed primarily via Cringila Car Park Road in the northwest and via Flagstaff Road in the southeast.
- Train and bus services are available in proximity to the project site and workers should be encouraged to use such alternate transport options in addition to carpooling (subject to COVID-19 safe practices).
- Active transport facilities in proximity to the project site are limited to footpaths/shared paths along Springhill Road, Five Islands Road, Cringila Car Park Road, Old Port Road and BlueScope Access Road.
- A review of five-years of crash statistics identified that the predominant crash types are rear-end collisions and collisions with parked vehicles at daytime and off-carriageway left on right bend into objects and parked vehicles at night. These could be attributed to the reduced sight distance around bends (when compared to straight alignment) or poor driver behaviour such as speeding and tailgating.
- The current traffic data indicates that the majority of key roads in the vicinity of the project are expected to operate within the acceptable capacity for weekday morning and afternoon peak periods.
- The SIDRA 8 intersection modelling indicates that the construction traffic would have minor impacts on the operation of the intersections within the study area. These intersections would continue to operate with a satisfactory LoS under the peak construction traffic scenario for the project.
- Regular operations will resume after construction. Hence, the operational peak hour traffic is lower than the peak hour traffic associated with the construction activities. The operations are therefore expected to have minimal traffic impacts on the surrounding road network.
- The construction and operation of the project will not impact on-street parking and public and active transport movements.

8.3 Final conclusion

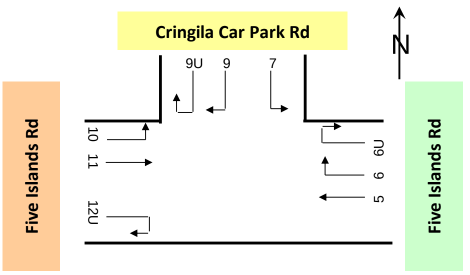
Based on the assumptions and investigations undertaken by GHD and the conclusions drawn in this TIA, it is considered that the proposed project will not have an adverse impact on the road system, subject to the recommended mitigation measures being applied.

Appendix A

Traffic Survey Data

Job No.	: AUNSW1595
Client	: GHD Pty Ltd
Suburb	: Port Kembla
Location	: 1. Five Islands Rd / Cringila Car Park Rd
Day/Date	: Tue, 7th Sept 2021
Weather	: Fine
Description	: Classified Intersection Count
	: 15 mins Data

	Class 1	Class 2
Classifications	Lights	Heavies

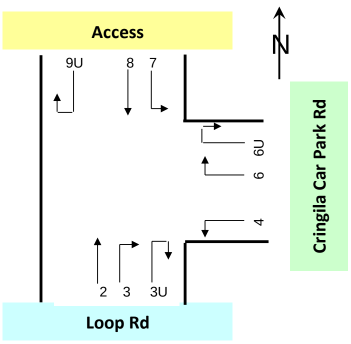


Approach	**Five Islands Rd**								
Direction	**Direction 5 (Through)**			**Direction 6 (Right Turn)**			**Direction 6U (U Turn)**		
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**
5:00 to 5:15			**0**			**0**			**0**
5:15 to 5:30			**0**			**0**			**0**
5:30 to 5:45			**0**			**0**			**0**
5:45 to 6:00			**0**			**0**			**0**
6:00 to 6:15			**0**			**0**			**0**
6:15 to 6:30			**0**			**0**			**0**
6:30 to 6:45			**0**			**0**			**0**
6:45 to 7:00			**0**			**0**			**0**
7:00 to 7:15			**0**			**0**			**0**
7:15 to 7:30			**0**			**0**			**0**
7:30 to 7:45			**0**			**0**			**0**
7:45 to 8:00			**0**			**0**			**0**
8:00 to 8:15			**0**			**0**			**0**
8:15 to 8:30			**0**			**0**			**0**
8:30 to 8:45			**0**			**0**			**0**
8:45 to 9:00			**0**			**0**			**0**
AM Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
16:00 to 16:15			**0**			**0**			**0**
16:15 to 16:30			**0**			**0**			**0**
16:30 to 16:45			**0**			**0**			**0**
16:45 to 17:00			**0**			**0**			**0**
17:00 to 17:15			**0**			**0**			**0**
17:15 to 17:30			**0**			**0**			**0**
17:30 to 17:45			**0**			**0**			**0**
17:45 to 18:00			**0**			**0**			**0**
PM Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Approach	**Cringila Car Park Rd**									**Five Islands Rd**								
Direction	**Direction 7 (Left Turn)**			**Direction 9 (Right Turn)**			**Direction 9U (U Turn)**			**Direction 10 (Left Turn)**			**Direction 11 (Through)**			**Direction 12U (U Turn)**		
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**
5:00 to 5:15	4	0	**4**			**0**	0	0	**0**	8	0	**8**	41	9	**50**			**0**
5:15 to 5:30	3	0	**3**			**0**	0	0	**0**	23	0	**23**	76	6	**82**			**0**
5:30 to 5:45	6	0	**6**			**0**	0	0	**0**	44	2	**46**	103	6	**109**			**0**
5:45 to 6:00	2	0	**2**			**0**	0	0	**0**	44	0	**44**	127	8	**135**			**0**
6:00 to 6:15	6	0	**6**			**0**	0	0	**0**	30	1	**31**	116	9	**125**			**0**
6:15 to 6:30	5	1	**6**			**0**	0	0	**0**	32	2	**34**	153	11	**164**			**0**
6:30 to 6:45	2	0	**2**			**0**	0	0	**0**	43	2	**45**	286	24	**310**			**0**
6:45 to 7:00	3	0	**3**			**0**	0	0	**0**	33	0	**33**	280	20	**300**			**0**
7:00 to 7:15	4	0	**4**			**0**	0	0	**0**	26	3	**29**	183	29	**212**			**0**
7:15 to 7:30	1	0	**1**			**0**	0	0	**0**	19	1	**20**	187	29	**216**			**0**
7:30 to 7:45	1	0	**1**			**0**	0	0	**0**	20	2	**22**	222	30	**252**			**0**
7:45 to 8:00	0	0	**0**			**0**	0	0	**0**	11	1	**12**	250	22	**272**			**0**
8:00 to 8:15	1	0	**1**			**0**	0	0	**0**	11	2	**13**	219	30	**249**			**0**
8:15 to 8:30	5	1	**6**			**0**	0	0	**0**	7	2	**9**	252	27	**279**			**0**
8:30 to 8:45	6	0	**6**			**0**	0	0	**0**	5	0	**5**	248	27	**275**			**0**
8:45 to 9:00	1	1	**2**			**0**	0	0	**0**	7	1	**8**	246	32	**278**			**0**
AM Totals	**50**	**3**	**53**	**0**	**0**	**0**	**0**	**0**	**0**	**363**	**19**	**382**	**2,989**	**319**	**3,308**	**0**	**0**	**0**
16:00 to 16:15	8	0	**8**			**0**	0	0	**0**	5	4	**9**	366	13	**379**			**0**
16:15 to 16:30	4	0	**4**			**0**	0	0	**0**	4	1	**5**	341	16	**357**			**0**
16:30 to 16:45	6	0	**6**			**0**	0	0	**0**	4	0	**4**	337	13	**350**			**0**
16:45 to 17:00	9	5	**14**			**0**	0	0	**0**	8	0	**8**	315	9	**324**			**0**
17:00 to 17:15	12	0	**12**			**0**	0	0	**0**	7	0	**7**	280	15	**295**			**0**
17:15 to 17:30	7	1	**8**			**0**	0	0	**0**	12	0	**12**	303	7	**310**			**0**
17:30 to 17:45	8	2	**10**			**0**	0	0	**0**	12	0	**12**	222	11	**233**			**0**
17:45 to 18:00	5	1	**6**			**0**	0	0	**0**	15	0	**15**	191	15	**206**			**0**
PM Totals	**59**	**9**	**68**	**0**	**0**	**0**	**0**	**0**	**0**	**67**	**5**	**72**	**2,355**	**99**	**2,454**	**0**	**0**	**0**

Job No. : AUNSW1595
Client : GHD Pty Ltd
Suburb : Port Kembla
Location : 2. Loop Rd / Cringila Car Park Rd

Day/Date : Tue, 7th Sept 2021
Weather : Fine
Description : Classified Intersection Count
: 15 mins Data



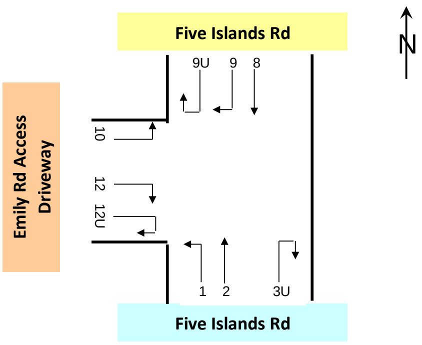
	Class 1	Class 2
Classifications	Lights	Heavies

Approach	Loop Rd												Cringila Car Park Rd					
Direction	Direction 2 (Through)			Direction 3 (Right Turn)			Direction 3U (U Turn)			Direction 4 (Left Turn)			Direction 6 (Right Turn)			Direction 6U (U Turn)		
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total
5:00 to 5:15	12	1	**13**	0	0	**0**	0	0	**0**	3	0	**3**	6	0	**6**	0	0	**0**
5:15 to 5:30	14	0	**14**	2	0	**2**	0	0	**0**	3	0	**3**	21	0	**21**	0	0	**0**
5:30 to 5:45	30	2	**32**	6	0	**6**	0	0	**0**	8	0	**8**	32	2	**34**	0	0	**0**
5:45 to 6:00	22	0	**22**	6	0	**6**	0	0	**0**	6	0	**6**	29	0	**29**	2	0	**2**
6:00 to 6:15	25	3	**28**	1	1	**2**	0	0	**0**	4	0	**4**	27	2	**29**	0	0	**0**
6:15 to 6:30	36	4	**40**	0	0	**0**	0	0	**0**	7	1	**8**	30	1	**31**	0	0	**0**
6:30 to 6:45	34	1	**35**	6	0	**6**	0	0	**0**	7	0	**7**	36	1	**37**	0	0	**0**
6:45 to 7:00	34	10	**44**	1	0	**1**	0	0	**0**	9	0	**9**	26	1	**27**	0	0	**0**
7:00 to 7:15	31	7	**38**	1	0	**1**	0	0	**0**	6	0	**6**	20	2	**22**	0	0	**0**
7:15 to 7:30	37	15	**52**	1	0	**1**	0	0	**0**	4	0	**4**	15	2	**17**	0	0	**0**
7:30 to 7:45	13	4	**17**	2	0	**2**	0	0	**0**	5	0	**5**	14	2	**16**	0	0	**0**
7:45 to 8:00	13	2	**15**	1	0	**1**	0	0	**0**	4	0	**4**	8	1	**9**	0	0	**0**
8:00 to 8:15	5	2	**7**	0	1	**1**	0	0	**0**	1	2	**3**	13	1	**14**	0	0	**0**
8:15 to 8:30	4	2	**6**	0	0	**0**	0	0	**0**	2	2	**4**	5	0	**5**	0	0	**0**
8:30 to 8:45	7	2	**9**	1	0	**1**	0	0	**0**	1	0	**1**	3	0	**3**	0	0	**0**
8:45 to 9:00	11	5	**16**	1	0	**1**	0	0	**0**	0	0	**0**	6	1	**7**	0	0	**0**
AM Totals	**328**	**60**	**388**	**29**	**2**	**31**	**0**	**0**	**0**	**70**	**5**	**75**	**291**	**16**	**307**	**2**	**0**	**2**
16:00 to 16:15	9	3	**12**	0	0	**0**	0	0	**0**	2	3	**5**	3	1	**4**	0	0	**0**
16:15 to 16:30	7	0	**7**	0	0	**0**	0	0	**0**	0	1	**1**	4	0	**4**	0	0	**0**
16:30 to 16:45	7	0	**7**	0	0	**0**	0	0	**0**	1	0	**1**	3	0	**3**	0	0	**0**
16:45 to 17:00	3	0	**3**	1	1	**2**	0	0	**0**	4	0	**4**	7	0	**7**	0	0	**0**
17:00 to 17:15	5	4	**9**	0	0	**0**	0	0	**0**	5	0	**5**	5	1	**6**	0	0	**0**
17:15 to 17:30	8	2	**10**	1	1	**2**	0	0	**0**	2	0	**2**	11	0	**11**	0	0	**0**
17:30 to 17:45	7	1	**8**	2	0	**2**	0	0	**0**	2	0	**2**	11	0	**11**	0	0	**0**
17:45 to 18:00	9	0	**9**	1	0	**1**	0	0	**0**	3	0	**3**	7	0	**7**	0	0	**0**
PM Totals	**55**	**10**	**65**	**5**	**2**	**7**	**0**	**0**	**0**	**19**	**4**	**23**	**51**	**2**	**53**	**0**	**0**	**0**

Approach	Access								
Direction	Direction 7 (Left Turn)			Direction 8 (Through)			Direction 9U (U Turn)		
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total
5:00 to 5:15	3	0	**3**	12	0	**12**	0	0	**0**
5:15 to 5:30	2	0	**2**	8	0	**8**	0	0	**0**
5:30 to 5:45	4	0	**4**	3	0	**3**	0	0	**0**
5:45 to 6:00	1	0	**1**	9	0	**9**	0	0	**0**
6:00 to 6:15	3	0	**3**	7	0	**7**	0	0	**0**
6:15 to 6:30	2	1	**3**	6	2	**8**	0	0	**0**
6:30 to 6:45	1	0	**1**	6	2	**8**	0	0	**0**
6:45 to 7:00	5	0	**5**	7	1	**8**	0	0	**0**
7:00 to 7:15	3	0	**3**	2	1	**3**	0	0	**0**
7:15 to 7:30	0	0	**0**	3	2	**5**	0	0	**0**
7:30 to 7:45	2	0	**2**	4	0	**4**	0	0	**0**
7:45 to 8:00	1	0	**1**	1	0	**1**	0	0	**0**
8:00 to 8:15	2	0	**2**	5	3	**8**	0	0	**0**
8:15 to 8:30	5	1	**6**	12	2	**14**	0	0	**0**
8:30 to 8:45	3	0	**3**	7	2	**9**	0	0	**0**
8:45 to 9:00	1	1	**2**	10	4	**14**	0	0	**0**
AM Totals	**38**	**3**	**41**	**102**	**19**	**121**	**0**	**0**	**0**
16:00 to 16:15	9	0	**9**	29	4	**33**	0	0	**0**
16:15 to 16:30	4	0	**4**	8	0	**8**	0	0	**0**
16:30 to 16:45	6	1	**7**	9	3	**12**	0	0	**0**
16:45 to 17:00	9	3	**12**	22	4	**26**	0	0	**0**
17:00 to 17:15	9	0	**9**	24	0	**24**	0	0	**0**
17:15 to 17:30	5	0	**5**	15	1	**16**	0	0	**0**
17:30 to 17:45	7	3	**10**	14	2	**16**	0	0	**0**
17:45 to 18:00	5	0	**5**	23	2	**25**	0	0	**0**
PM Totals	**54**	**7**	**61**	**144**	**16**	**160**	**0**	**0**	**0**

Job No. : AUNSW1595
Client : GHD Pty Ltd
Suburb : Port Kembla
Location : 3. Five Islands Rd / Emily Rd Access Driveway

Day/Date : Tue, 7th Sept 2021
Weather : Fine
Description : Classified Intersection Count
: 15 mins Data



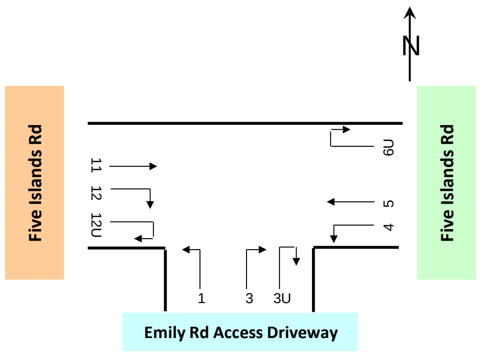
	Class 1	Class 2
Classifications	Lights	Heavies

Approach	**Five Islands Rd**								
Direction	**Direction 1 (Left Turn)**			**Direction 2 (Through)**			**Direction 3U (U Turn)**		
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**
5:00 to 5:15	9	0	**9**	104	13	**117**			**0**
5:15 to 5:30	11	0	**11**	137	15	**152**			**0**
5:30 to 5:45	26	0	**26**	180	16	**196**			**0**
5:45 to 6:00	17	0	**17**	159	21	**180**			**0**
6:00 to 6:15	18	2	**20**	181	14	**195**			**0**
6:15 to 6:30	30	0	**30**	233	13	**246**			**0**
6:30 to 6:45	26	1	**27**	314	23	**337**			**0**
6:45 to 7:00	19	4	**23**	254	26	**280**			**0**
7:00 to 7:15	8	4	**12**	219	26	**245**			**0**
7:15 to 7:30	7	5	**12**	257	25	**282**			**0**
7:30 to 7:45	3	1	**4**	246	23	**269**			**0**
7:45 to 8:00	4	0	**4**	296	32	**328**			**0**
8:00 to 8:15	1	0	**1**	263	21	**284**			**0**
8:15 to 8:30	1	1	**2**	253	19	**272**			**0**
8:30 to 8:45	1	1	**2**	282	28	**310**			**0**
8:45 to 9:00	8	1	**9**	245	35	**280**			**0**
AM Totals	**189**	**20**	**209**	**3,623**	**350**	**3,973**	**0**	**0**	**0**
16:00 to 16:15	9	0	**9**	345	19	**364**			**0**
16:15 to 16:30	1	0	**1**	253	20	**273**			**0**
16:30 to 16:45	4	0	**4**	272	14	**286**			**0**
16:45 to 17:00	2	0	**2**	296	17	**313**			**0**
17:00 to 17:15	1	0	**1**	290	15	**305**			**0**
17:15 to 17:30	7	0	**7**	250	8	**258**			**0**
17:30 to 17:45	6	1	**7**	227	11	**238**			**0**
17:45 to 18:00	5	0	**5**	226	9	**235**			**0**
PM Totals	**35**	**1**	**36**	**2,159**	**113**	**2,272**	**0**	**0**	**0**

Approach	**Five Islands Rd**									**Emily Rd Access Driveway**								
Direction	**Direction 8 (Through)**			**Direction 9 (Right Turn)**			**Direction 9U (U Turn)**			**Direction 10 (Left Turn)**			**Direction 12 (Right Turn)**			**Direction 12U (U Turn)**		
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**
5:00 to 5:15			**0**			**0**			**0**	0	0	**0**			**0**			**0**
5:15 to 5:30			**0**			**0**			**0**	0	0	**0**			**0**			**0**
5:30 to 5:45			**0**			**0**			**0**	0	0	**0**			**0**			**0**
5:45 to 6:00			**0**			**0**			**0**	0	0	**0**			**0**			**0**
6:00 to 6:15			**0**			**0**			**0**	0	0	**0**			**0**			**0**
6:15 to 6:30			**0**			**0**			**0**	0	0	**0**			**0**			**0**
6:30 to 6:45			**0**			**0**			**0**	0	0	**0**			**0**			**0**
6:45 to 7:00			**0**			**0**			**0**	0	0	**0**			**0**			**0**
7:00 to 7:15			**0**			**0**			**0**	0	0	**0**			**0**			**0**
7:15 to 7:30			**0**			**0**			**0**	0	0	**0**			**0**			**0**
7:30 to 7:45			**0**			**0**			**0**	0	0	**0**			**0**			**0**
7:45 to 8:00			**0**			**0**			**0**	0	0	**0**			**0**			**0**
8:00 to 8:15			**0**			**0**			**0**	0	0	**0**			**0**			**0**
8:15 to 8:30			**0**			**0**			**0**	0	0	**0**			**0**			**0**
8:30 to 8:45			**0**			**0**			**0**	0	0	**0**			**0**			**0**
8:45 to 9:00			**0**			**0**			**0**	0	0	**0**			**0**			**0**
AM Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
16:00 to 16:15			**0**			**0**			**0**	0	0	**0**			**0**			**0**
16:15 to 16:30			**0**			**0**			**0**	0	0	**0**			**0**			**0**
16:30 to 16:45			**0**			**0**			**0**	0	0	**0**			**0**			**0**
16:45 to 17:00			**0**			**0**			**0**	0	0	**0**			**0**			**0**
17:00 to 17:15			**0**			**0**			**0**	0	0	**0**			**0**			**0**
17:15 to 17:30			**0**			**0**			**0**	0	0	**0**			**0**			**0**
17:30 to 17:45			**0**			**0**			**0**	0	0	**0**			**0**			**0**
17:45 to 18:00			**0**			**0**			**0**	0	0	**0**			**0**			**0**
PM Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Job No.	: AUNSW1595
Client	: GHD Pty Ltd
Suburb	: Port Kembla
Location	: 4. Five Islands Rd / Emily Rd Access Driveway
Day/Date	: Tue, 7th Sept 2021
Weather	: Fine
Description	: Classified Intersection Count
	: 15 mins Data

	Class 1	Class 2
Classifications	Lights	Heavies

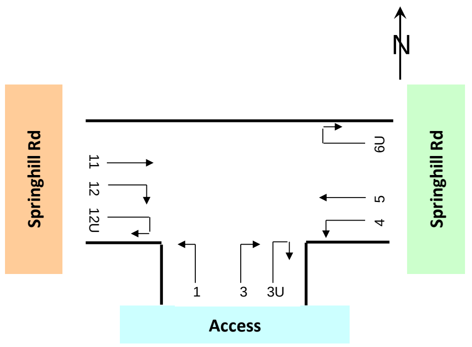


Approach	**Emily Rd Access Driveway**									**Five Islands Rd**								
Direction	**Direction 1 (Left Turn)**			**Direction 3 (Right Turn)**			**Direction 3U (U Turn)**			**Direction 4 (Left Turn)**			**Direction 5 (Through)**			**Direction 6U (U Turn)**		
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**
5:00 to 5:15	12	0	**12**			**0**	0	0	**0**			**0**	103	13	**116**			**0**
5:15 to 5:30	7	0	**7**			**0**	0	0	**0**			**0**	136	14	**150**			**0**
5:30 to 5:45	4	1	**5**			**0**	0	0	**0**			**0**	178	18	**196**			**0**
5:45 to 6:00	12	0	**12**			**0**	0	0	**0**			**0**	168	20	**188**			**0**
6:00 to 6:15	5	0	**5**			**0**	0	0	**0**			**0**	170	13	**183**			**0**
6:15 to 6:30	8	1	**9**			**0**	0	0	**0**			**0**	232	15	**247**			**0**
6:30 to 6:45	7	0	**7**			**0**	0	0	**0**			**0**	312	22	**334**			**0**
6:45 to 7:00	11	0	**11**			**0**	0	0	**0**			**0**	261	21	**282**			**0**
7:00 to 7:15	3	0	**3**			**0**	0	0	**0**			**0**	204	29	**233**			**0**
7:15 to 7:30	7	2	**9**			**0**	0	0	**0**			**0**	260	26	**286**			**0**
7:30 to 7:45	6	1	**7**			**0**	0	0	**0**			**0**	269	24	**293**			**0**
7:45 to 8:00	6	0	**6**			**0**	0	0	**0**			**0**	274	31	**305**			**0**
8:00 to 8:15	5	0	**5**			**0**	0	0	**0**			**0**	268	18	**286**			**0**
8:15 to 8:30	5	2	**7**			**0**	0	0	**0**			**0**	260	22	**282**			**0**
8:30 to 8:45	5	0	**5**			**0**	0	0	**0**			**0**	280	28	**308**			**0**
8:45 to 9:00	7	1	**8**			**0**	0	0	**0**			**0**	249	34	**283**			**0**
AM Totals	**110**	**8**	**118**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3,624**	**348**	**3,972**	**0**	**0**	**0**
16:00 to 16:15	29	6	**35**			**0**	0	0	**0**			**0**	322	18	**340**			**0**
16:15 to 16:30	10	0	**10**			**0**	0	0	**0**			**0**	263	21	**284**			**0**
16:30 to 16:45	9	2	**11**			**0**	0	0	**0**			**0**	292	13	**305**			**0**
16:45 to 17:00	23	1	**24**			**0**	0	0	**0**			**0**	281	18	**299**			**0**
17:00 to 17:15	24	0	**24**			**0**	0	0	**0**			**0**	281	14	**295**			**0**
17:15 to 17:30	16	1	**17**			**0**	0	0	**0**			**0**	271	7	**278**			**0**
17:30 to 17:45	13	1	**14**			**0**	0	0	**0**			**0**	212	11	**223**			**0**
17:45 to 18:00	24	2	**26**			**0**	0	0	**0**			**0**	242	10	**252**			**0**
PM Totals	**148**	**13**	**161**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2,164**	**112**	**2,276**	**0**	**0**	**0**

Approach	**Five Islands Rd**								
Direction	**Direction 11 (Through)**			**Direction 12 (Right Turn)**			**Direction 12U (U Turn)**		
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**
5:00 to 5:15			**0**			**0**			**0**
5:15 to 5:30			**0**			**0**			**0**
5:30 to 5:45			**0**			**0**			**0**
5:45 to 6:00			**0**			**0**			**0**
6:00 to 6:15			**0**			**0**			**0**
6:15 to 6:30			**0**			**0**			**0**
6:30 to 6:45			**0**			**0**			**0**
6:45 to 7:00			**0**			**0**			**0**
7:00 to 7:15			**0**			**0**			**0**
7:15 to 7:30			**0**			**0**			**0**
7:30 to 7:45			**0**			**0**			**0**
7:45 to 8:00			**0**			**0**			**0**
8:00 to 8:15			**0**			**0**			**0**
8:15 to 8:30			**0**			**0**			**0**
8:30 to 8:45			**0**			**0**			**0**
8:45 to 9:00			**0**			**0**			**0**
AM Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
16:00 to 16:15			**0**			**0**			**0**
16:15 to 16:30			**0**			**0**			**0**
16:30 to 16:45			**0**			**0**			**0**
16:45 to 17:00			**0**			**0**			**0**
17:00 to 17:15			**0**			**0**			**0**
17:15 to 17:30			**0**			**0**			**0**
17:30 to 17:45			**0**			**0**			**0**
17:45 to 18:00			**0**			**0**			**0**
PM Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Job No.	: AUNSW1595
Client	: GHD Pty Ltd
Suburb	: Port Kembla
Location	: 5. Springhill Rd / Bluescope Access
Day/Date	: Tue, 7th Sept 2021
Weather	: Fine
Description	: Classified Intersection Count
	: 15 mins Data

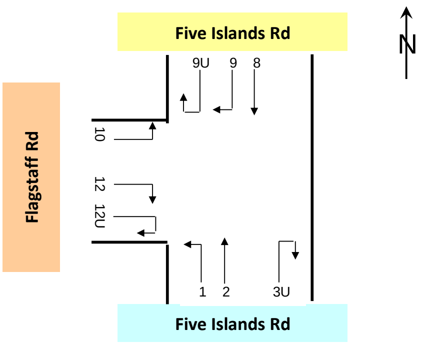
	Class 1	Class 2
Classifications	Lights	Heavies



Matrix Traffic and Transport Data

Approach	**Access**									**Springhill Rd**								
Direction	**Direction 1 (Left Turn)**			**Direction 3 (Right Turn)**			**Direction 3U (U Turn)**			**Direction 4 (Left Turn)**			**Direction 5 (Through)**			**Direction 6U (U Turn)**		
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**
5:00 to 5:15	4	2	**6**	0	0	**0**	0	0	**0**	2	0	**2**	24	6	**30**	0	0	**0**
5:15 to 5:30	3	1	**4**	1	0	**1**	0	0	**0**	5	0	**5**	31	14	**45**	0	0	**0**
5:30 to 5:45	7	1	**8**	1	0	**1**	0	0	**0**	3	0	**3**	49	14	**63**	0	0	**0**
5:45 to 6:00	11	4	**15**	3	0	**3**	0	0	**0**	2	0	**2**	54	21	**75**	0	0	**0**
6:00 to 6:15	5	1	**6**	0	0	**0**	0	0	**0**	5	0	**5**	56	15	**71**	0	0	**0**
6:15 to 6:30	9	1	**10**	0	0	**0**	0	0	**0**	5	0	**5**	83	19	**102**	0	0	**0**
6:30 to 6:45	13	3	**16**	1	1	**2**	0	0	**0**	15	1	**16**	141	11	**152**	0	0	**0**
6:45 to 7:00	30	0	**30**	4	0	**4**	0	0	**0**	15	1	**16**	123	20	**143**	0	0	**0**
7:00 to 7:15	31	2	**33**	6	0	**6**	0	0	**0**	9	0	**9**	112	17	**129**	0	0	**0**
7:15 to 7:30	7	2	**9**	1	2	**3**	0	0	**0**	9	4	**13**	133	29	**162**	0	0	**0**
7:30 to 7:45	4	4	**8**	1	0	**1**	0	0	**0**	8	2	**10**	175	29	**204**	0	0	**0**
7:45 to 8:00	1	5	**6**	2	0	**2**	0	0	**0**	6	2	**8**	145	26	**171**	0	0	**0**
8:00 to 8:15	2	2	**4**	1	0	**1**	0	0	**0**	1	0	**1**	141	15	**156**	0	0	**0**
8:15 to 8:30	0	4	**4**	3	0	**3**	0	0	**0**	6	0	**6**	152	25	**177**	0	0	**0**
8:30 to 8:45	2	2	**4**	3	0	**3**	0	0	**0**	4	0	**4**	184	22	**206**	0	0	**0**
8:45 to 9:00	2	2	**4**	2	0	**2**	0	0	**0**	3	0	**3**	173	27	**200**	0	0	**0**
AM Totals	**131**	**36**	**167**	**29**	**3**	**32**	**0**	**0**	**0**	**98**	**10**	**108**	**1,776**	**310**	**2,086**	**0**	**0**	**0**
16:00 to 16:15	17	1	**18**	6	0	**6**	0	0	**0**	1	0	**1**	319	16	**335**	0	0	**0**
16:15 to 16:30	12	2	**14**	6	0	**6**	0	0	**0**	0	0	**0**	298	9	**307**	0	0	**0**
16:30 to 16:45	13	5	**18**	4	0	**4**	0	0	**0**	2	0	**2**	326	6	**332**	0	0	**0**
16:45 to 17:00	8	3	**11**	8	1	**9**	0	0	**0**	2	1	**3**	320	8	**328**	0	0	**0**
17:00 to 17:15	6	3	**9**	4	0	**4**	0	0	**0**	3	0	**3**	455	7	**462**	0	0	**0**
17:15 to 17:30	10	2	**12**	2	0	**2**	0	0	**0**	6	0	**6**	321	6	**327**	0	0	**0**
17:30 to 17:45	14	2	**16**	4	0	**4**	0	0	**0**	3	0	**3**	252	12	**264**	0	0	**0**
17:45 to 18:00	8	0	**8**	0	0	**0**	0	0	**0**	2	0	**2**	238	7	**245**	0	0	**0**
PM Totals	**88**	**18**	**106**	**34**	**1**	**35**	**0**	**0**	**0**	**19**	**1**	**20**	**2,529**	**71**	**2,600**	**0**	**0**	**0**

Approach	**Springhill Rd**								
Direction	**Direction 11 (Through)**			**Direction 12 (Right Turn)**			**Direction 12U (U Turn)**		
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**
5:00 to 5:15	29	10	**39**	13	2	**15**	0	0	**0**
5:15 to 5:30	47	25	**72**	20	3	**23**	0	0	**0**
5:30 to 5:45	92	19	**111**	14	5	**19**	1	0	**1**
5:45 to 6:00	117	25	**142**	30	0	**30**	0	0	**0**
6:00 to 6:15	111	22	**133**	21	1	**22**	0	0	**0**
6:15 to 6:30	188	11	**199**	51	4	**55**	0	0	**0**
6:30 to 6:45	215	21	**236**	78	4	**82**	0	0	**0**
6:45 to 7:00	263	15	**278**	52	5	**57**	0	0	**0**
7:00 to 7:15	166	18	**184**	33	7	**40**	0	0	**0**
7:15 to 7:30	230	26	**256**	19	2	**21**	0	0	**0**
7:30 to 7:45	292	22	**314**	11	7	**18**	1	0	**1**
7:45 to 8:00	367	22	**389**	8	2	**10**	0	0	**0**
8:00 to 8:15	331	31	**362**	6	4	**10**	0	0	**0**
8:15 to 8:30	391	31	**422**	3	4	**7**	0	0	**0**
8:30 to 8:45	347	26	**373**	5	2	**7**	0	0	**0**
8:45 to 9:00	312	25	**337**	7	2	**9**	0	0	**0**
AM Totals	**3,498**	**349**	**3,847**	**371**	**54**	**425**	**2**	**0**	**2**
16:00 to 16:15	227	14	**241**	1	6	**7**	0	0	**0**
16:15 to 16:30	222	13	**235**	0	0	**0**	0	0	**0**
16:30 to 16:45	202	8	**210**	2	1	**3**	0	0	**0**
16:45 to 17:00	190	5	**195**	2	0	**2**	0	0	**0**
17:00 to 17:15	161	4	**165**	13	1	**14**	0	0	**0**
17:15 to 17:30	178	10	**188**	20	2	**22**	0	0	**0**
17:30 to 17:45	111	7	**118**	15	1	**16**	0	0	**0**
17:45 to 18:00	137	5	**142**	2	0	**2**	0	0	**0**
PM Totals	**1,428**	**66**	**1,494**	**55**	**11**	**66**	**0**	**0**	**0**



Job No. : AUNSW1595
Client : GHD Pty Ltd
Suburb : Port Kembla
Location : 6. Five Islands Rd / Flagstaff Rd

Day/Date : Tue, 7th Sept 2021
Weather : Fine
Description : Classified Intersection Count
: 15 mins Data

	Class 1	Class 2
Classifications	Lights	Heavies

Approach	**Five Islands Rd**								
Direction	**Direction 1 (Left Turn)**			**Direction 2 (Through)**			**Direction 3U (U Turn)**		
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**
5:00 to 5:15	4	0	**4**	119	8	**127**			**0**
5:15 to 5:30	4	0	**4**	157	7	**164**			**0**
5:30 to 5:45	6	0	**6**	206	10	**216**			**0**
5:45 to 6:00	9	0	**9**	173	13	**186**			**0**
6:00 to 6:15	7	0	**7**	196	14	**210**			**0**
6:15 to 6:30	13	0	**13**	274	7	**281**			**0**
6:30 to 6:45	15	0	**15**	365	19	**384**			**0**
6:45 to 7:00	11	0	**11**	281	22	**303**			**0**
7:00 to 7:15	2	1	**3**	221	23	**244**			**0**
7:15 to 7:30	1	0	**1**	261	24	**285**			**0**
7:30 to 7:45	1	1	**2**	252	14	**266**			**0**
7:45 to 8:00	2	0	**2**	294	23	**317**			**0**
8:00 to 8:15	2	0	**2**	262	17	**279**			**0**
8:15 to 8:30	2	0	**2**	236	10	**246**			**0**
8:30 to 8:45	2	0	**2**	269	15	**284**			**0**
8:45 to 9:00	2	0	**2**	240	26	**266**			**0**
AM Totals	**83**	**2**	**85**	**3,806**	**252**	**4,058**	**0**	**0**	**0**
16:00 to 16:15	1	0	**1**	295	6	**301**			**0**
16:15 to 16:30	0	0	**0**	225	11	**236**			**0**
16:30 to 16:45	1	0	**1**	256	10	**266**			**0**
16:45 to 17:00	3	0	**3**	252	11	**263**			**0**
17:00 to 17:15	3	0	**3**	260	8	**268**			**0**
17:15 to 17:30	1	0	**1**	227	2	**229**			**0**
17:30 to 17:45	0	0	**0**	217	8	**225**			**0**
17:45 to 18:00	0	0	**0**	195	5	**200**			**0**
PM Totals	**9**	**0**	**9**	**1,927**	**61**	**1,988**	**0**	**0**	**0**

Approach	**Five Islands Rd**									**Flagstaff Rd**								
Direction	**Direction 8 (Through)**			**Direction 9 (Right Turn)**			**Direction 9U (U Turn)**			**Direction 10 (Left Turn)**			**Direction 12 (Right Turn)**			**Direction 12U (U Turn)**		
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**
5:00 to 5:15			**0**			**0**			**0**	1	1	**2**			**0**	0	0	**0**
5:15 to 5:30			**0**			**0**			**0**	2	0	**2**			**0**	0	0	**0**
5:30 to 5:45			**0**			**0**			**0**	3	2	**5**			**0**	0	0	**0**
5:45 to 6:00			**0**			**0**			**0**	0	1	**1**			**0**	0	0	**0**
6:00 to 6:15			**0**			**0**			**0**	2	0	**2**			**0**	0	0	**0**
6:15 to 6:30			**0**			**0**			**0**	2	0	**2**			**0**	0	0	**0**
6:30 to 6:45			**0**			**0**			**0**	4	0	**4**			**0**	0	0	**0**
6:45 to 7:00			**0**			**0**			**0**	3	1	**4**			**0**	0	0	**0**
7:00 to 7:15			**0**			**0**			**0**	16	1	**17**			**0**	0	0	**0**
7:15 to 7:30			**0**			**0**			**0**	8	1	**9**			**0**	0	0	**0**
7:30 to 7:45			**0**			**0**			**0**	1	1	**2**			**0**	0	0	**0**
7:45 to 8:00			**0**			**0**			**0**	4	2	**6**			**0**	0	0	**0**
8:00 to 8:15			**0**			**0**			**0**	3	1	**4**			**0**	0	0	**0**
8:15 to 8:30			**0**			**0**			**0**	2	1	**3**			**0**	0	0	**0**
8:30 to 8:45			**0**			**0**			**0**	6	0	**6**			**0**	0	0	**0**
8:45 to 9:00			**0**			**0**			**0**	5	0	**5**			**0**	0	0	**0**
AM Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**62**	**12**	**74**	**0**	**0**	**0**	**0**	**0**	**0**
16:00 to 16:15			**0**			**0**			**0**	13	0	**13**			**0**	0	0	**0**
16:15 to 16:30			**0**			**0**			**0**	8	0	**8**			**0**	0	0	**0**
16:30 to 16:45			**0**			**0**			**0**	5	0	**5**			**0**	0	0	**0**
16:45 to 17:00			**0**			**0**			**0**	5	1	**6**			**0**	0	0	**0**
17:00 to 17:15			**0**			**0**			**0**	10	0	**10**			**0**	0	0	**0**
17:15 to 17:30			**0**			**0**			**0**	8	0	**8**			**0**	0	0	**0**
17:30 to 17:45			**0**			**0**			**0**	6	0	**6**			**0**	0	0	**0**
17:45 to 18:00			**0**			**0**			**0**	3	0	**3**			**0**	0	0	**0**
PM Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**58**	**1**	**59**	**0**	**0**	**0**	**0**	**0**	**0**

Appendix B

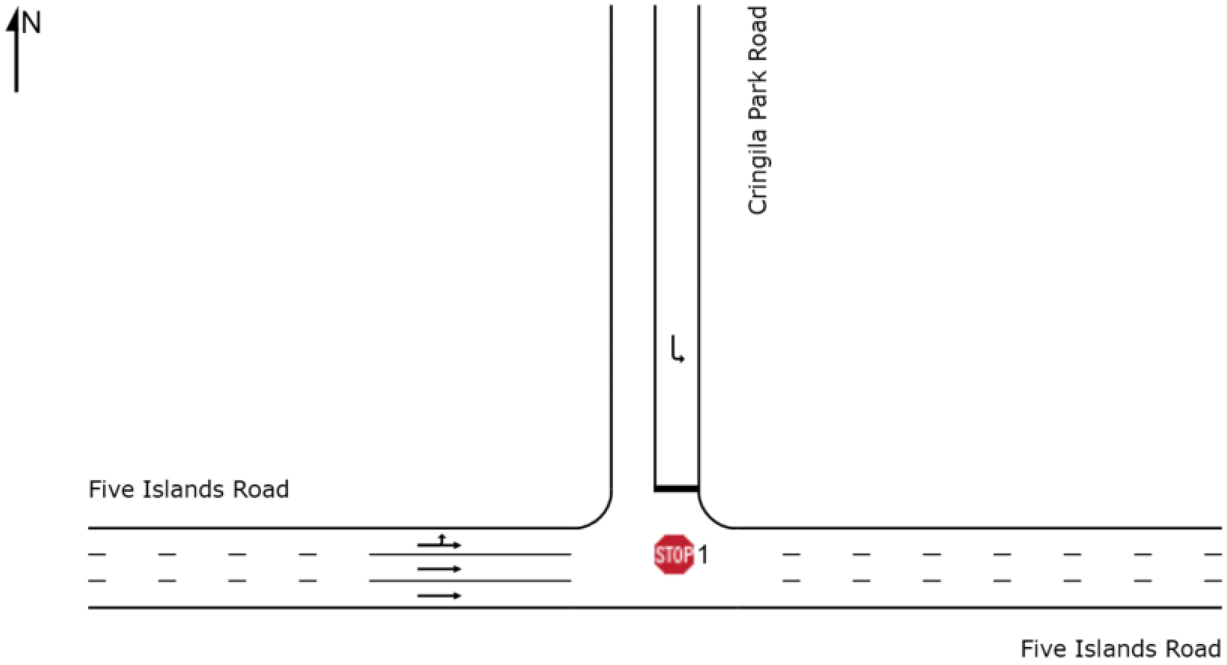
SIDRA Results Summary

Site 1: Cringilla Car Park Road and Five Islands Road

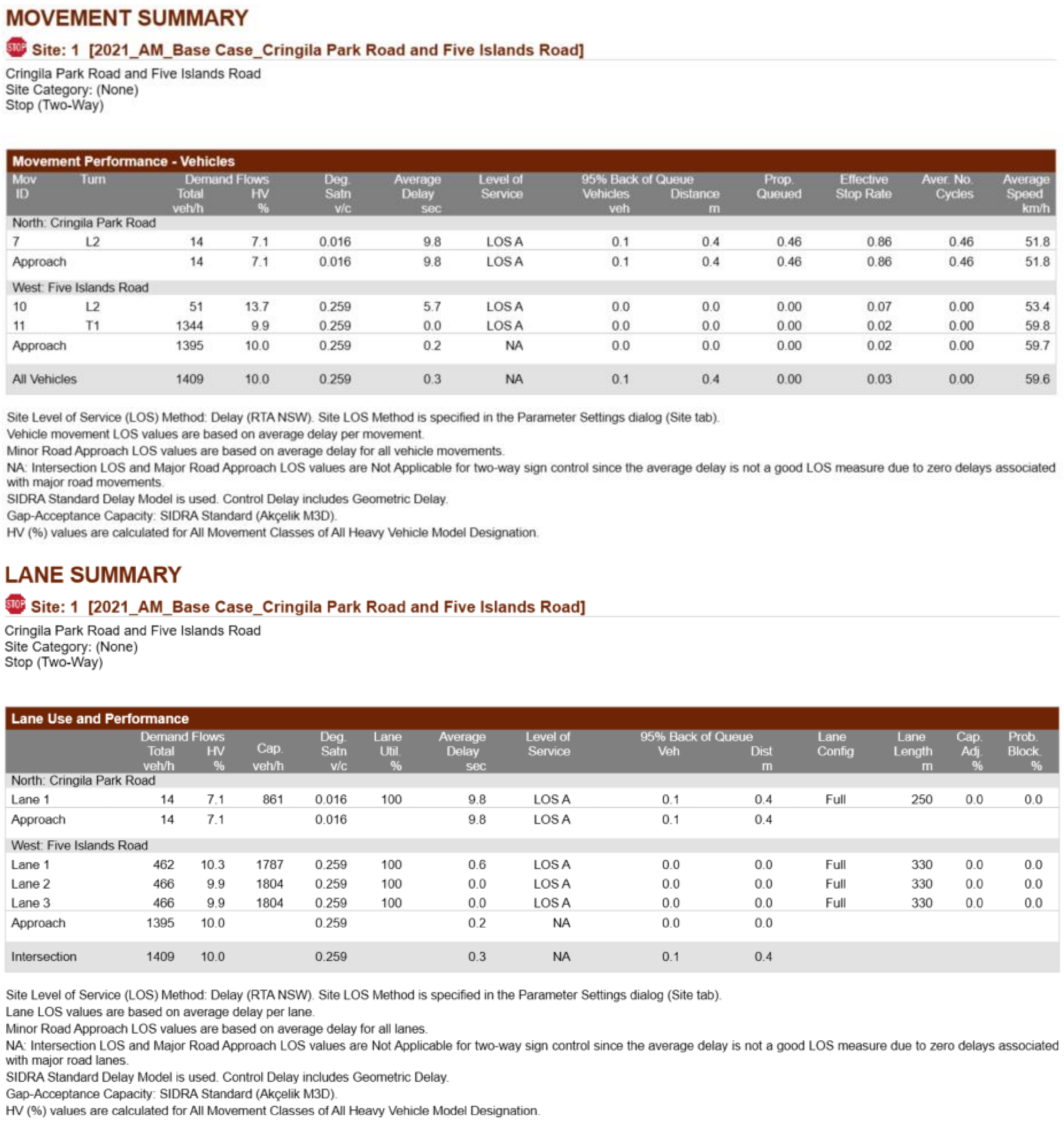
SITE LAYOUT

Site: 1 [2021_AM_Base Case_Cringila Park Road and Five Islands Road]

Cringila Park Road and Five Islands Road
Site Category: (None)
Stop (Two-Way)



Site 1: Cringilla Car Park Road and Five Islands Road 2021 AM Peak



MOVEMENT SUMMARY

Site: 1 [2021_AM_Base Case_Cringila Park Road and Five Islands Road]

Cringila Park Road and Five Islands Road
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
North: Cringila Park Road												
7	L2	14	7.1	0.016	9.8	LOS A	0.1	0.4	0.46	0.86	0.46	51.8
Approach		14	7.1	0.016	9.8	LOS A	0.1	0.4	0.46	0.86	0.46	51.8
West: Five Islands Road												
10	L2	51	13.7	0.259	5.7	LOS A	0.0	0.0	0.00	0.07	0.00	53.4
11	T1	1344	9.9	0.259	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.8
Approach		1395	10.0	0.259	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.7
All Vehicles		1409	10.0	0.259	0.3	NA	0.1	0.4	0.00	0.03	0.00	59.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: 1 [2021_AM_Base Case_Cringila Park Road and Five Islands Road]

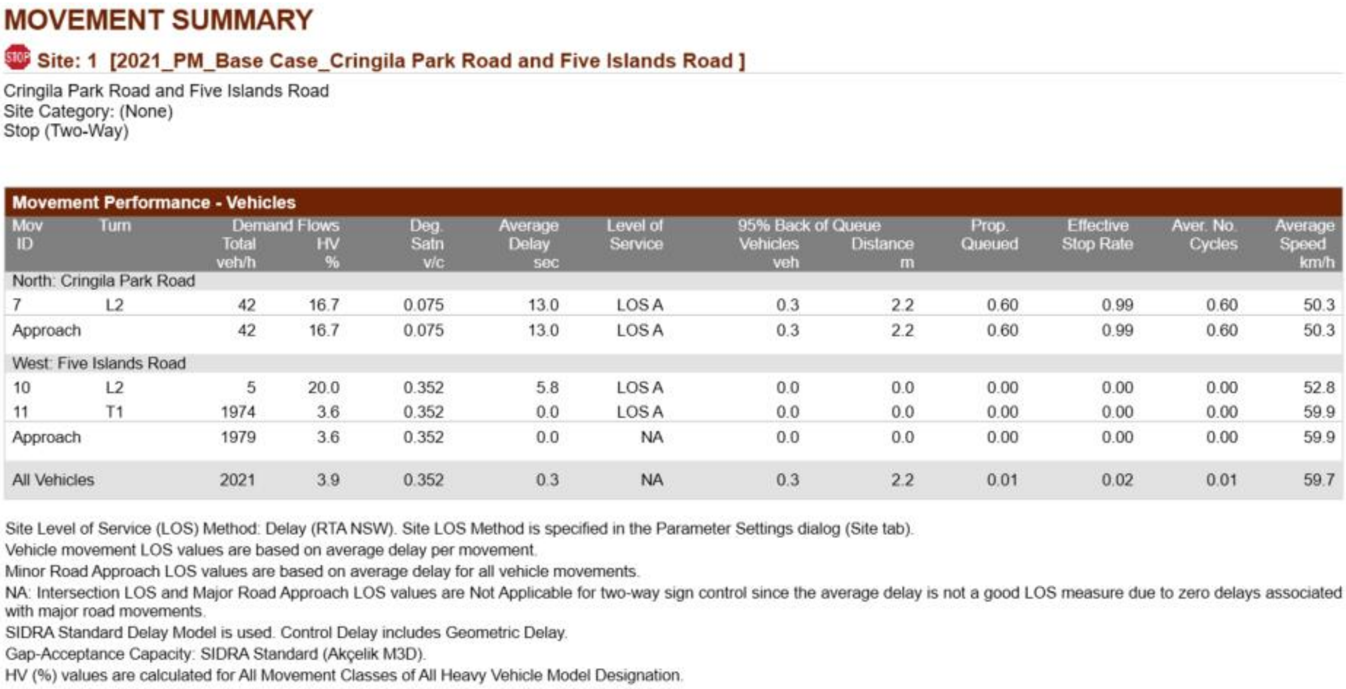
Cringila Park Road and Five Islands Road
Site Category: (None)
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
North: Cringila Park Road													
Lane 1	14	7.1	861	0.016	100	9.8	LOS A	0.1	0.4	Full	250	0.0	0.0
Approach	14	7.1		0.016		9.8	LOS A	0.1	0.4				
West: Five Islands Road													
Lane 1	462	10.3	1787	0.259	100	0.6	LOS A	0.0	0.0	Full	330	0.0	0.0
Lane 2	466	9.9	1804	0.259	100	0.0	LOS A	0.0	0.0	Full	330	0.0	0.0
Lane 3	466	9.9	1804	0.259	100	0.0	LOS A	0.0	0.0	Full	330	0.0	0.0
Approach	1395	10.0		0.259		0.2	NA	0.0	0.0				
Intersection	1409	10.0		0.259		0.3	NA	0.1	0.4				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 1: Cringilla Car Park Road and Five Islands Road 2021 PM Peak



MOVEMENT SUMMARY

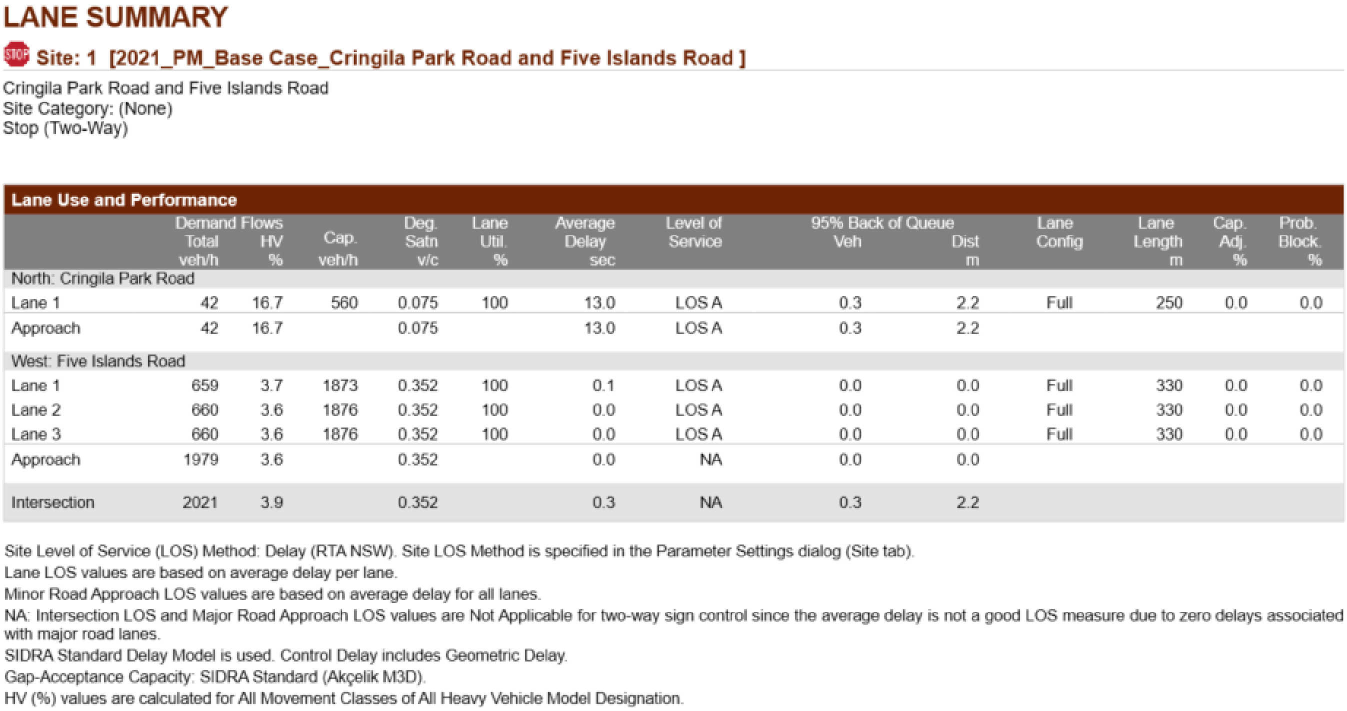
Site: 1 [2021_PM_Base Case_Cringila Park Road and Five Islands Road]

Cringila Park Road and Five Islands Road
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
North: Cringila Park Road												
7	L2	42	16.7	0.075	13.0	LOS A	0.3	2.2	0.60	0.99	0.60	50.3
Approach		42	16.7	0.075	13.0	LOS A	0.3	2.2	0.60	0.99	0.60	50.3
West: Five Islands Road												
10	L2	5	20.0	0.352	5.8	LOS A	0.0	0.0	0.00	0.00	0.00	52.8
11	T1	1974	3.6	0.352	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1979	3.6	0.352	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
All Vehicles		2021	3.9	0.352	0.3	NA	0.3	2.2	0.01	0.02	0.01	59.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



LANE SUMMARY

Site: 1 [2021_PM_Base Case_Cringila Park Road and Five Islands Road]

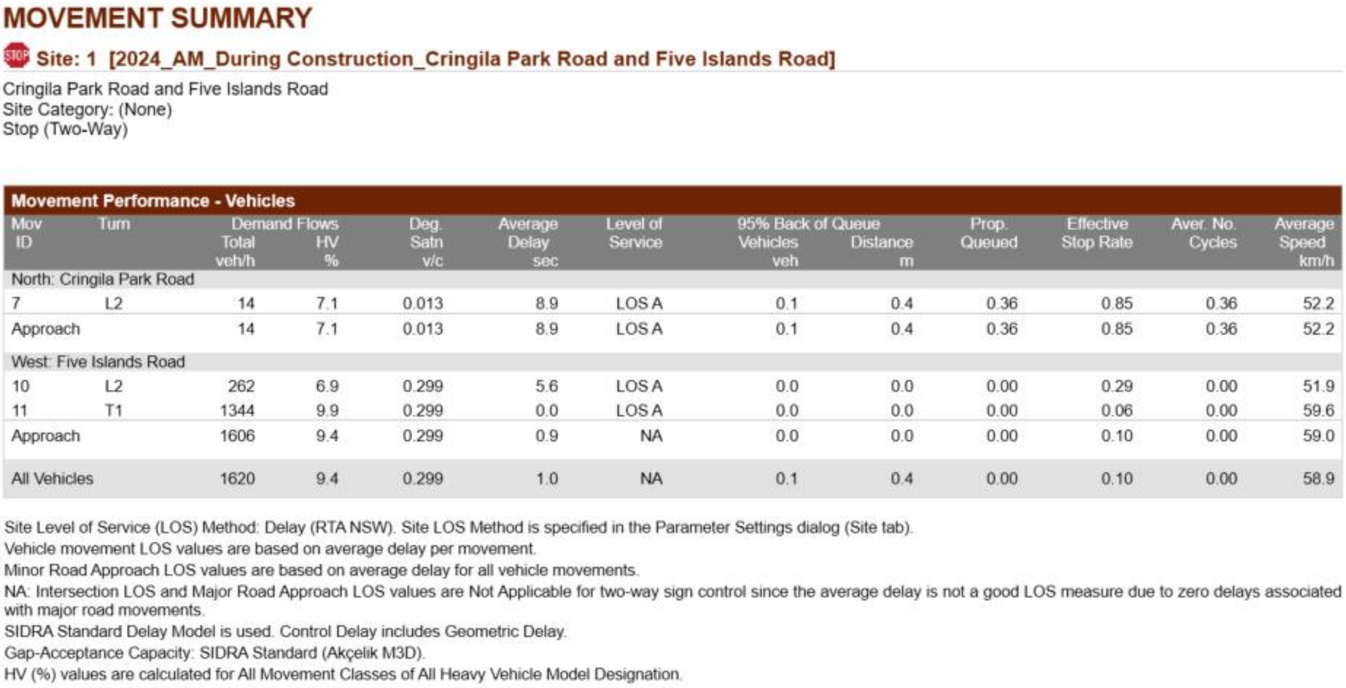
Cringila Park Road and Five Islands Road
Site Category: (None)
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
North: Cringila Park Road													
Lane 1	42	16.7	560	0.075	100	13.0	LOS A	0.3	2.2	Full	250	0.0	0.0
Approach	42	16.7		0.075		13.0	LOS A	0.3	2.2				
West: Five Islands Road													
Lane 1	659	3.7	1873	0.352	100	0.1	LOS A	0.0	0.0	Full	330	0.0	0.0
Lane 2	660	3.6	1876	0.352	100	0.0	LOS A	0.0	0.0	Full	330	0.0	0.0
Lane 3	660	3.6	1876	0.352	100	0.0	LOS A	0.0	0.0	Full	330	0.0	0.0
Approach	1979	3.6		0.352		0.0	NA	0.0	0.0				
Intersection	2021	3.9		0.352		0.3	NA	0.3	2.2				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 1: Cringilla Car Park Road and Five Islands Road 2024 AM Peak



MOVEMENT SUMMARY

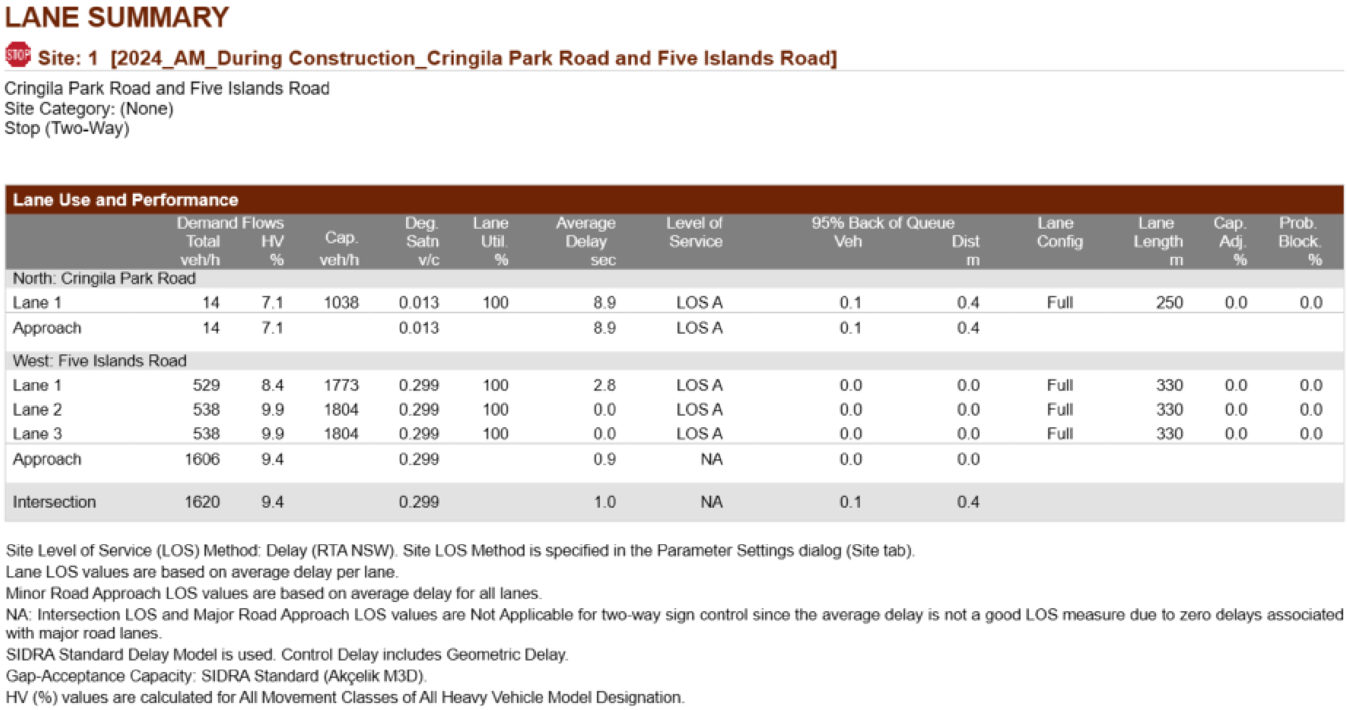
Site: 1 [2024_AM_During Construction_Cringila Park Road and Five Islands Road]

Cringila Park Road and Five Islands Road
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
North: Cringila Park Road												
7	L2	14	7.1	0.013	8.9	LOS A	0.1	0.4	0.36	0.85	0.36	52.2
Approach		14	7.1	0.013	8.9	LOS A	0.1	0.4	0.36	0.85	0.36	52.2
West: Five Islands Road												
10	L2	262	6.9	0.299	5.6	LOS A	0.0	0.0	0.00	0.29	0.00	51.9
11	T1	1344	9.9	0.299	0.0	LOS A	0.0	0.0	0.00	0.06	0.00	59.6
Approach		1606	9.4	0.299	0.9	NA	0.0	0.0	0.00	0.10	0.00	59.0
All Vehicles		1620	9.4	0.299	1.0	NA	0.1	0.4	0.00	0.10	0.00	58.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



LANE SUMMARY

Site: 1 [2024_AM_During Construction_Cringila Park Road and Five Islands Road]

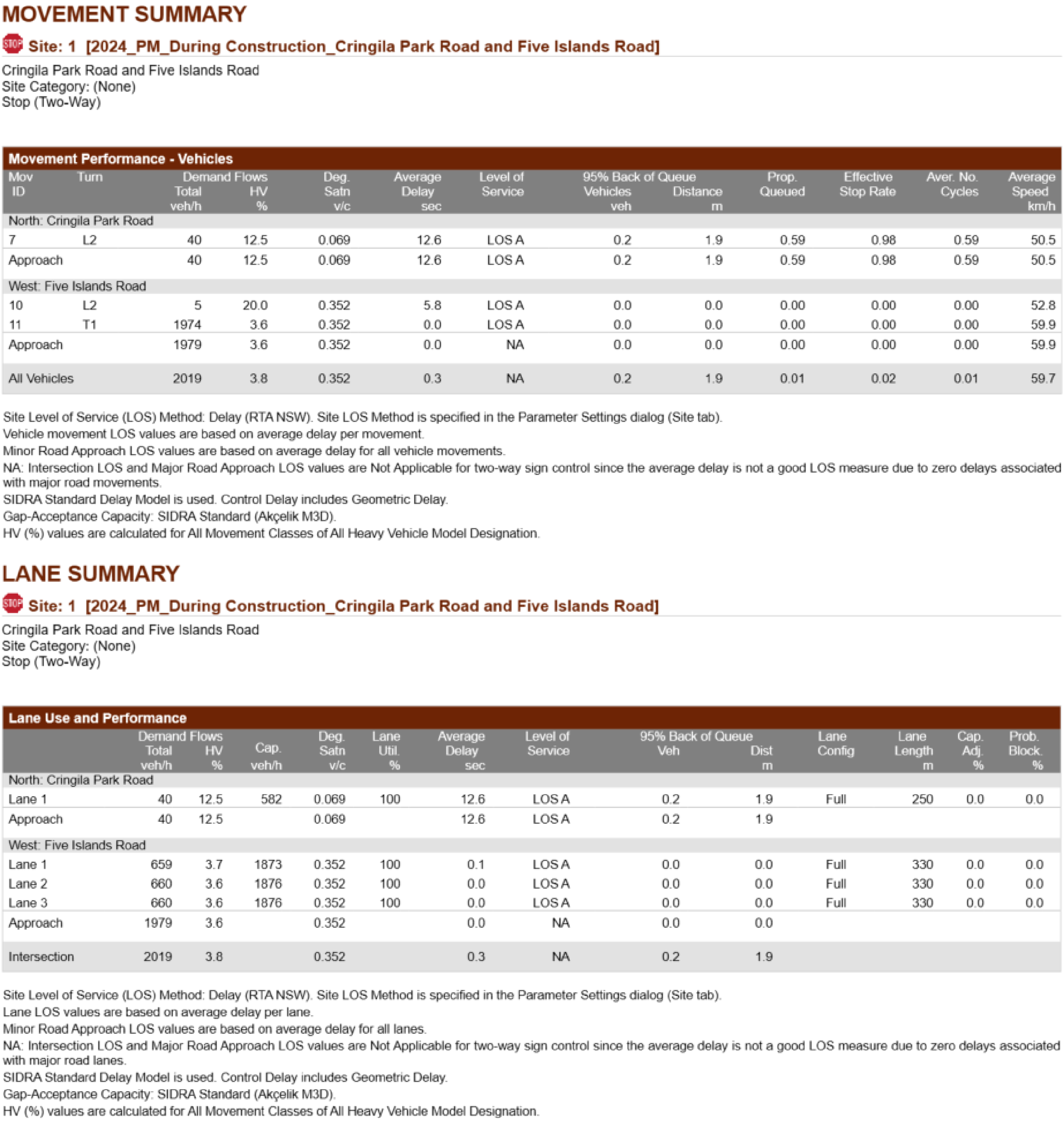
Cringila Park Road and Five Islands Road
Site Category: (None)
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
North: Cringila Park Road													
Lane 1	14	7.1	1038	0.013	100	8.9	LOS A	0.1	0.4	Full	250	0.0	0.0
Approach	14	7.1		0.013		8.9	LOS A	0.1	0.4				
West: Five Islands Road													
Lane 1	529	8.4	1773	0.299	100	2.8	LOS A	0.0	0.0	Full	330	0.0	0.0
Lane 2	538	9.9	1804	0.299	100	0.0	LOS A	0.0	0.0	Full	330	0.0	0.0
Lane 3	538	9.9	1804	0.299	100	0.0	LOS A	0.0	0.0	Full	330	0.0	0.0
Approach	1606	9.4		0.299		0.9	NA	0.0	0.0				
Intersection	1620	9.4		0.299		1.0	NA	0.1	0.4				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 1: Cringilla Car Park Road and Five Islands Road 2024 PM Peak



MOVEMENT SUMMARY

Site: 1 [2024_PM_During Construction_Cringila Park Road and Five Islands Road]

Cringila Park Road and Five Islands Road
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
North: Cringila Park Road												
7	L2	40	12.5	0.069	12.6	LOS A	0.2	1.9	0.59	0.98	0.59	50.5
Approach		40	12.5	0.069	12.6	LOS A	0.2	1.9	0.59	0.98	0.59	50.5
West: Five Islands Road												
10	L2	5	20.0	0.352	5.8	LOS A	0.0	0.0	0.00	0.00	0.00	52.8
11	T1	1974	3.6	0.352	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1979	3.6	0.352	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
All Vehicles		2019	3.8	0.352	0.3	NA	0.2	1.9	0.01	0.02	0.01	59.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: 1 [2024_PM_During Construction_Cringila Park Road and Five Islands Road]

Cringila Park Road and Five Islands Road
Site Category: (None)
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
North: Cringila Park Road													
Lane 1	40	12.5	582	0.069	100	12.6	LOS A	0.2	1.9	Full	250	0.0	0.0
Approach	40	12.5		0.069		12.6	LOS A	0.2	1.9				
West: Five Islands Road													
Lane 1	659	3.7	1873	0.352	100	0.1	LOS A	0.0	0.0	Full	330	0.0	0.0
Lane 2	660	3.6	1876	0.352	100	0.0	LOS A	0.0	0.0	Full	330	0.0	0.0
Lane 3	660	3.6	1876	0.352	100	0.0	LOS A	0.0	0.0	Full	330	0.0	0.0
Approach	1979	3.6		0.352		0.0	NA	0.0	0.0				
Intersection	2019	3.8		0.352		0.3	NA	0.2	1.9				

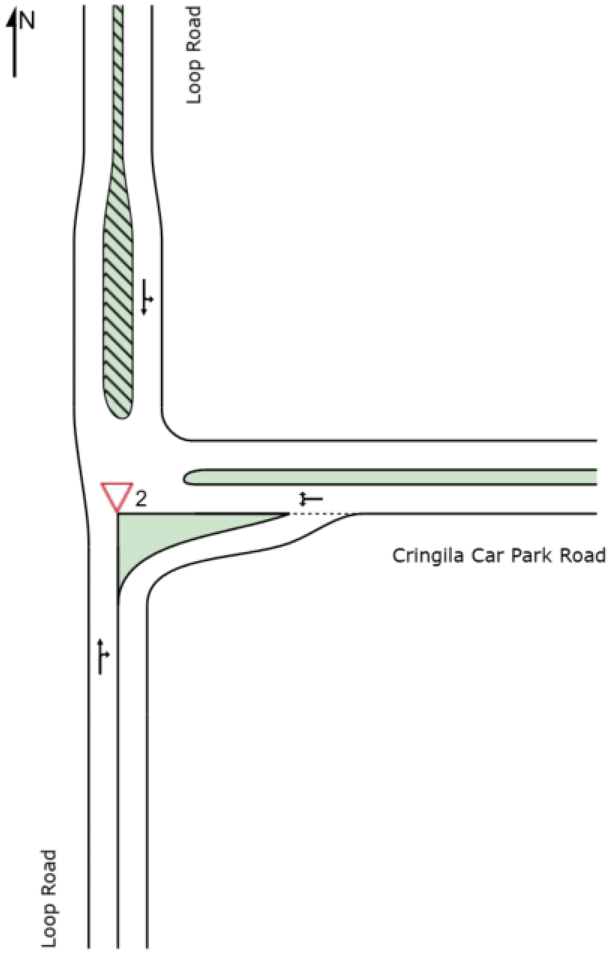
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 2: Loop Road and Cringilla Car Park Road

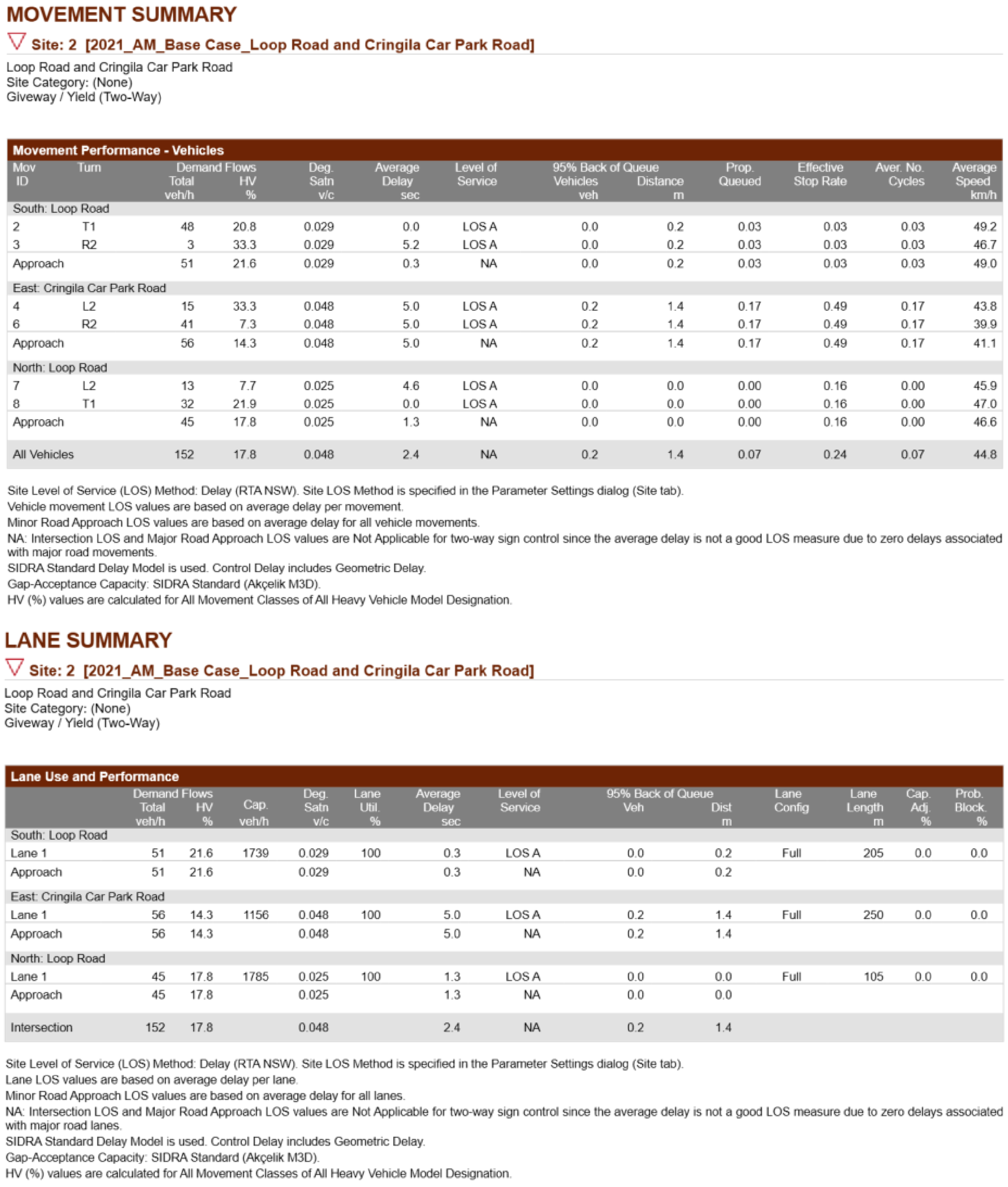
SITE LAYOUT

▽ Site: 2 [2021_AM_Base Case_Loop Road and Cringila Car Park Road]

Loop Road and Cringila Car Park Road
Site Category: (None)
Giveway / Yield (Two-Way)



Site 2: Loop Road and Cringilla Car Park Road 2021 AM Peak



MOVEMENT SUMMARY

▽ Site: 2 [2021_AM_Base Case_Loop Road and Cringila Car Park Road]

Loop Road and Cringila Car Park Road
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Loop Road												
2	T1	48	20.8	0.029	0.0	LOS A	0.0	0.2	0.03	0.03	0.03	49.2
3	R2	3	33.3	0.029	5.2	LOS A	0.0	0.2	0.03	0.03	0.03	46.7
Approach		51	21.6	0.029	0.3	NA	0.0	0.2	0.03	0.03	0.03	49.0
East: Cringila Car Park Road												
4	L2	15	33.3	0.048	5.0	LOS A	0.2	1.4	0.17	0.49	0.17	43.8
6	R2	41	7.3	0.048	5.0	LOS A	0.2	1.4	0.17	0.49	0.17	39.9
Approach		56	14.3	0.048	5.0	NA	0.2	1.4	0.17	0.49	0.17	41.1
North: Loop Road												
7	L2	13	7.7	0.025	4.6	LOS A	0.0	0.0	0.00	0.16	0.00	45.9
8	T1	32	21.9	0.025	0.0	LOS A	0.0	0.0	0.00	0.16	0.00	47.0
Approach		45	17.8	0.025	1.3	NA	0.0	0.0	0.00	0.16	0.00	46.6
All Vehicles		152	17.8	0.048	2.4	NA	0.2	1.4	0.07	0.24	0.07	44.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ Site: 2 [2021_AM_Base Case_Loop Road and Cringila Car Park Road]

Loop Road and Cringila Car Park Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Loop Road													
Lane 1	51	21.6	1739	0.029	100	0.3	LOS A	0.0	0.2	Full	205	0.0	0.0
Approach	51	21.6		0.029		0.3	NA	0.0	0.2				
East: Cringila Car Park Road													
Lane 1	56	14.3	1156	0.048	100	5.0	LOS A	0.2	1.4	Full	250	0.0	0.0
Approach	56	14.3		0.048		5.0	NA	0.2	1.4				
North: Loop Road													
Lane 1	45	17.8	1785	0.025	100	1.3	LOS A	0.0	0.0	Full	105	0.0	0.0
Approach	45	17.8		0.025		1.3	NA	0.0	0.0				
Intersection	152	17.8		0.048		2.4	NA	0.2	1.4				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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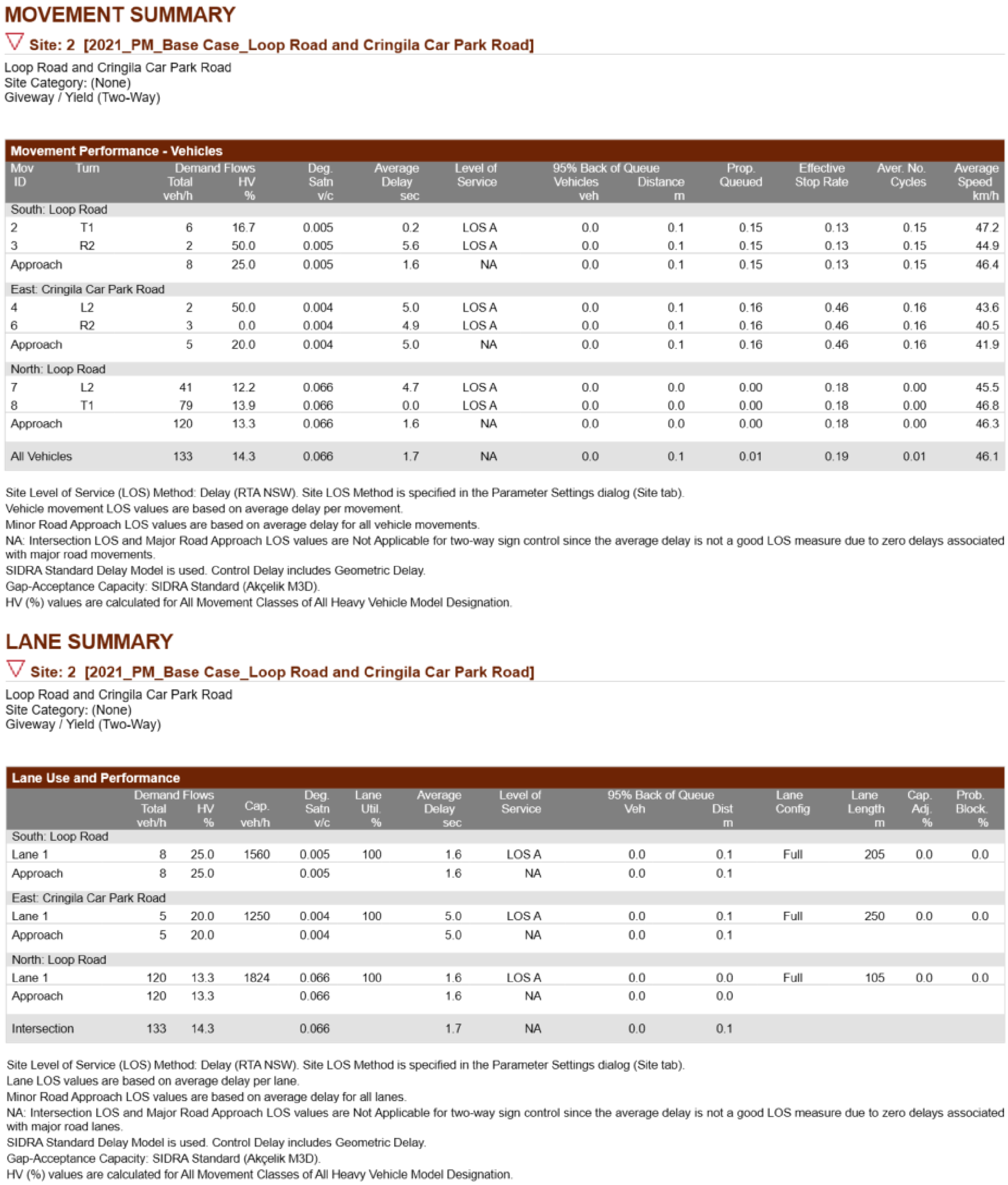
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 2: Loop Road and Cringilla Car Park Road 2021 PM Peak



MOVEMENT SUMMARY

Site: 2 [2021_PM_Base Case_Loop Road and Cringila Car Park Road]

Loop Road and Cringila Car Park Road
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Loop Road												
2	T1	6	16.7	0.005	0.2	LOS A	0.0	0.1	0.15	0.13	0.15	47.2
3	R2	2	50.0	0.005	5.6	LOS A	0.0	0.1	0.15	0.13	0.15	44.9
Approach		8	25.0	0.005	1.6	NA	0.0	0.1	0.15	0.13	0.15	46.4
East: Cringila Car Park Road												
4	L2	2	50.0	0.004	5.0	LOS A	0.0	0.1	0.16	0.46	0.16	43.6
6	R2	3	0.0	0.004	4.9	LOS A	0.0	0.1	0.16	0.46	0.16	40.5
Approach		5	20.0	0.004	5.0	NA	0.0	0.1	0.16	0.46	0.16	41.9
North: Loop Road												
7	L2	41	12.2	0.066	4.7	LOS A	0.0	0.0	0.00	0.18	0.00	45.5
8	T1	79	13.9	0.066	0.0	LOS A	0.0	0.0	0.00	0.18	0.00	46.8
Approach		120	13.3	0.066	1.6	NA	0.0	0.0	0.00	0.18	0.00	46.3
All Vehicles		133	14.3	0.066	1.7	NA	0.0	0.1	0.01	0.19	0.01	46.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: 2 [2021_PM_Base Case_Loop Road and Cringila Car Park Road]

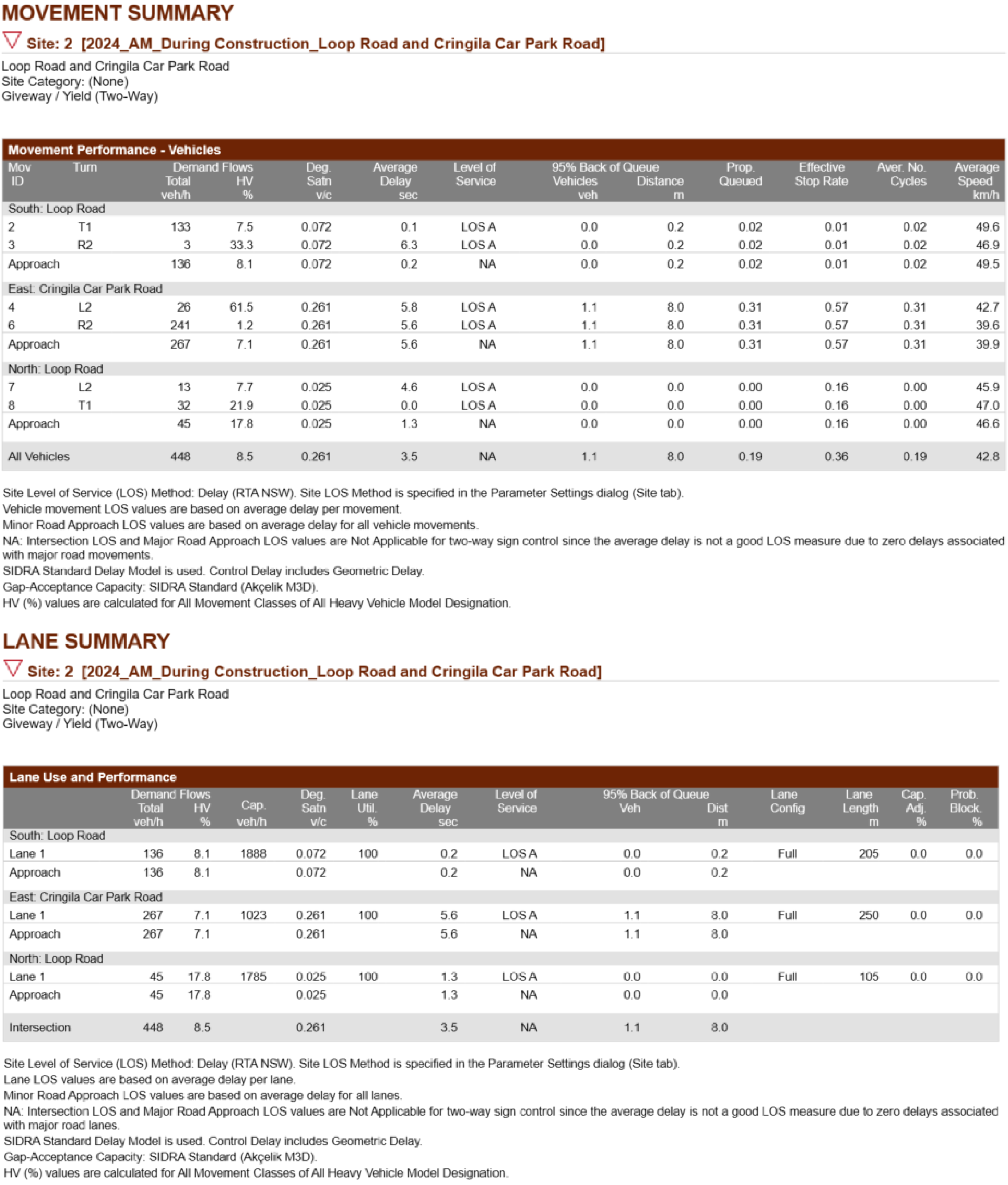
Loop Road and Cringila Car Park Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Loop Road													
Lane 1	8	25.0	1560	0.005	100	1.6	LOS A	0.0	0.1	Full	205	0.0	0.0
Approach	8	25.0		0.005		1.6	NA	0.0	0.1				
East: Cringila Car Park Road													
Lane 1	5	20.0	1250	0.004	100	5.0	LOS A	0.0	0.1	Full	250	0.0	0.0
Approach	5	20.0		0.004		5.0	NA	0.0	0.1				
North: Loop Road													
Lane 1	120	13.3	1824	0.066	100	1.6	LOS A	0.0	0.0	Full	105	0.0	0.0
Approach	120	13.3		0.066		1.6	NA	0.0	0.0				
Intersection	133	14.3		0.066		1.7	NA	0.0	0.1				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 2: Loop Road and Cringilla Car Park Road 2024 AM Peak



MOVEMENT SUMMARY

▽ Site: 2 [2024_AM_During Construction_Loop Road and Cringila Car Park Road]

Loop Road and Cringila Car Park Road
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Loop Road												
2	T1	133	7.5	0.072	0.1	LOS A	0.0	0.2	0.02	0.01	0.02	49.6
3	R2	3	33.3	0.072	6.3	LOS A	0.0	0.2	0.02	0.01	0.02	46.9
Approach		136	8.1	0.072	0.2	NA	0.0	0.2	0.02	0.01	0.02	49.5
East: Cringila Car Park Road												
4	L2	26	61.5	0.261	5.8	LOS A	1.1	8.0	0.31	0.57	0.31	42.7
6	R2	241	1.2	0.261	5.6	LOS A	1.1	8.0	0.31	0.57	0.31	39.6
Approach		267	7.1	0.261	5.6	NA	1.1	8.0	0.31	0.57	0.31	39.9
North: Loop Road												
7	L2	13	7.7	0.025	4.6	LOS A	0.0	0.0	0.00	0.16	0.00	45.9
8	T1	32	21.9	0.025	0.0	LOS A	0.0	0.0	0.00	0.16	0.00	47.0
Approach		45	17.8	0.025	1.3	NA	0.0	0.0	0.00	0.16	0.00	46.6
All Vehicles		448	8.5	0.261	3.5	NA	1.1	8.0	0.19	0.36	0.19	42.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ Site: 2 [2024_AM_During Construction_Loop Road and Cringila Car Park Road]

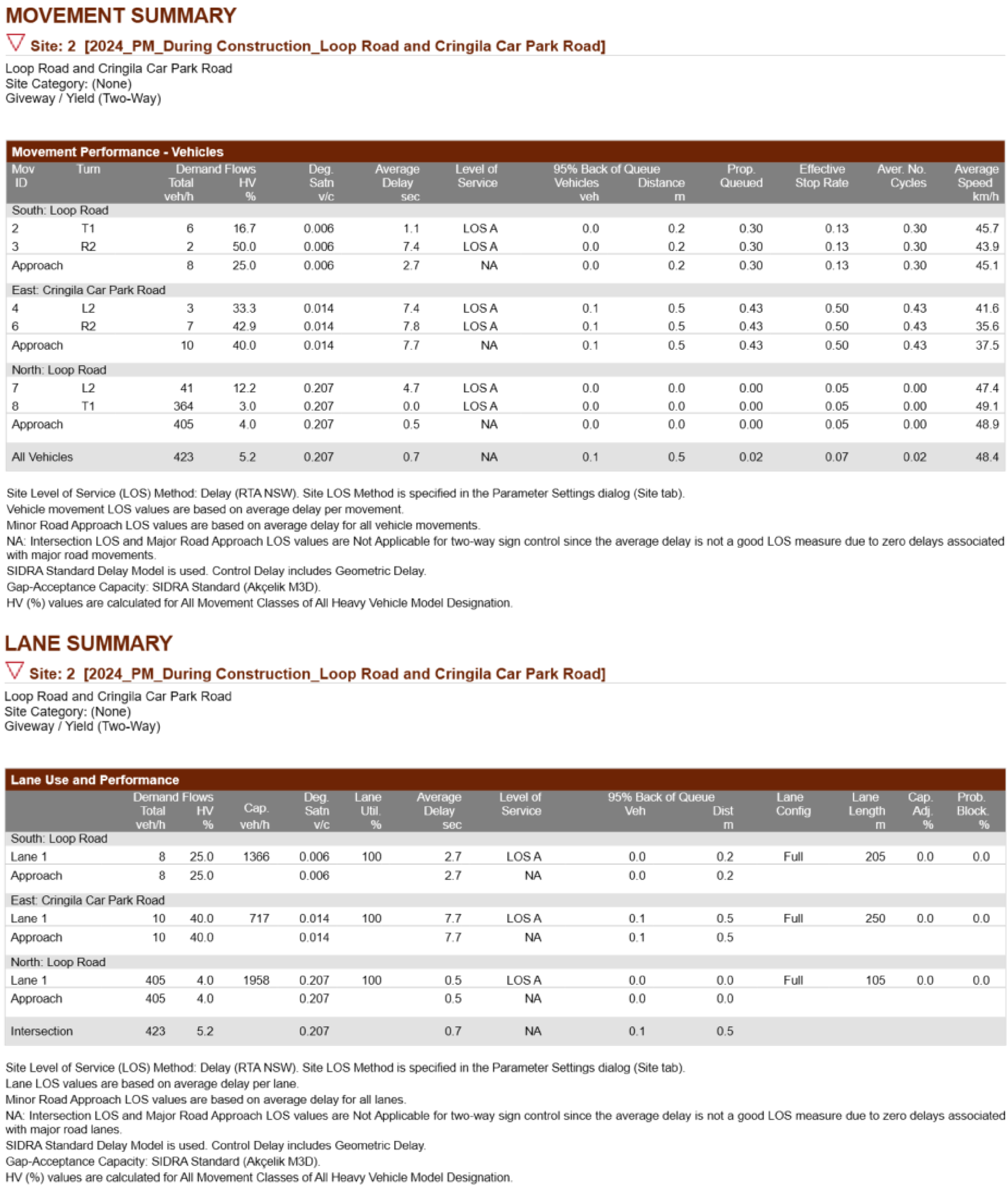
Loop Road and Cringila Car Park Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Loop Road													
Lane 1	136	8.1	1888	0.072	100	0.2	LOS A	0.0	0.2	Full	205	0.0	0.0
Approach	136	8.1		0.072		0.2	NA	0.0	0.2				
East: Cringila Car Park Road													
Lane 1	267	7.1	1023	0.261	100	5.6	LOS A	1.1	8.0	Full	250	0.0	0.0
Approach	267	7.1		0.261		5.6	NA	1.1	8.0				
North: Loop Road													
Lane 1	45	17.8	1785	0.025	100	1.3	LOS A	0.0	0.0	Full	105	0.0	0.0
Approach	45	17.8		0.025		1.3	NA	0.0	0.0				
Intersection	448	8.5		0.261		3.5	NA	1.1	8.0				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 2: Loop Road and Cringilla Car Park Road 2024 PM Peak



MOVEMENT SUMMARY

▽ Site: 2 [2024_PM_During Construction_Loop Road and Cringila Car Park Road]

Loop Road and Cringila Car Park Road
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Loop Road												
2	T1	6	16.7	0.006	1.1	LOS A	0.0	0.2	0.30	0.13	0.30	45.7
3	R2	2	50.0	0.006	7.4	LOS A	0.0	0.2	0.30	0.13	0.30	43.9
Approach		8	25.0	0.006	2.7	NA	0.0	0.2	0.30	0.13	0.30	45.1
East: Cringila Car Park Road												
4	L2	3	33.3	0.014	7.4	LOS A	0.1	0.5	0.43	0.50	0.43	41.6
6	R2	7	42.9	0.014	7.8	LOS A	0.1	0.5	0.43	0.50	0.43	35.6
Approach		10	40.0	0.014	7.7	NA	0.1	0.5	0.43	0.50	0.43	37.5
North: Loop Road												
7	L2	41	12.2	0.207	4.7	LOS A	0.0	0.0	0.00	0.05	0.00	47.4
8	T1	364	3.0	0.207	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	49.1
Approach		405	4.0	0.207	0.5	NA	0.0	0.0	0.00	0.05	0.00	48.9
All Vehicles		423	5.2	0.207	0.7	NA	0.1	0.5	0.02	0.07	0.02	48.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ Site: 2 [2024_PM_During Construction_Loop Road and Cringila Car Park Road]

Loop Road and Cringila Car Park Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Loop Road													
Lane 1	8	25.0	1366	0.006	100	2.7	LOS A	0.0	0.2	Full	205	0.0	0.0
Approach	8	25.0		0.006		2.7	NA	0.0	0.2				
East: Cringila Car Park Road													
Lane 1	10	40.0	717	0.014	100	7.7	LOS A	0.1	0.5	Full	250	0.0	0.0
Approach	10	40.0		0.014		7.7	NA	0.1	0.5				
North: Loop Road													
Lane 1	405	4.0	1958	0.207	100	0.5	LOS A	0.0	0.0	Full	105	0.0	0.0
Approach	405	4.0		0.207		0.5	NA	0.0	0.0				
Intersection	423	5.2		0.207		0.7	NA	0.1	0.5				

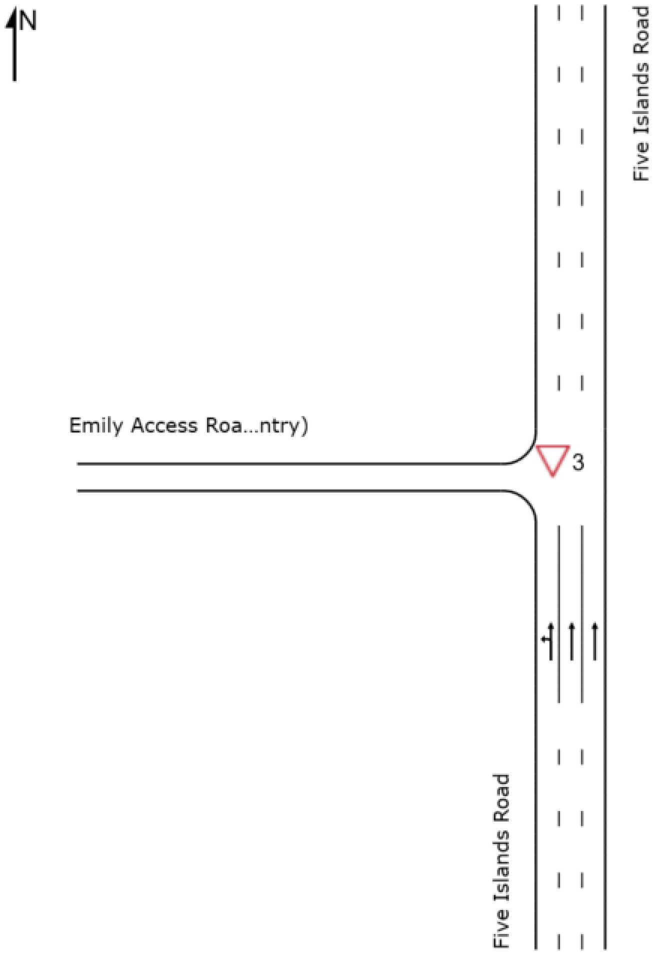
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 3: Five Islands Road and Emily Road (Entry)

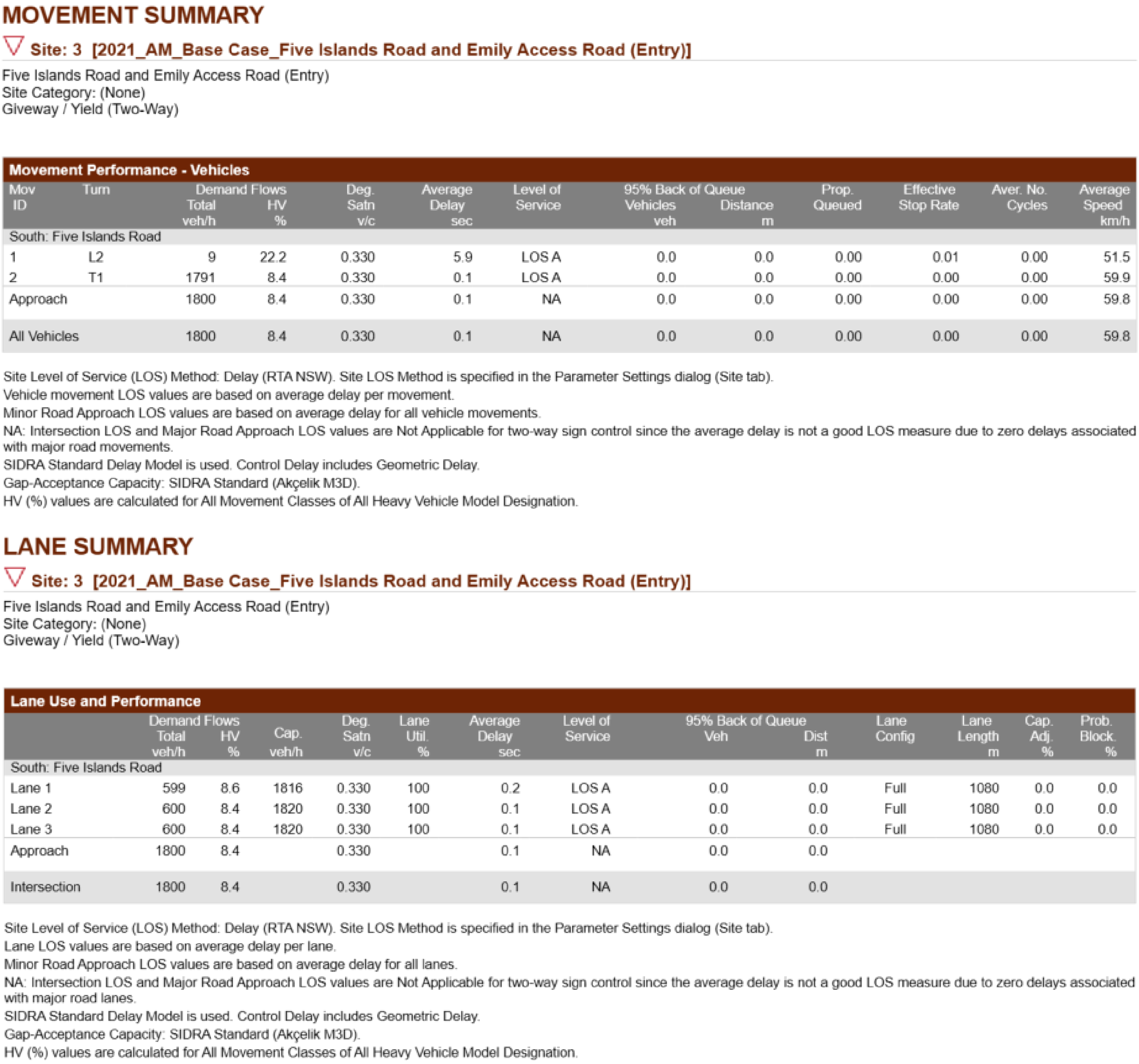
SITE LAYOUT

▽ Site: 3 [2021_AM_Base Case_Five Islands Road and Emily Access Road (Entry)]

Five Islands Road and Emily Access Road (Entry)
Site Category: (None)
Giveway / Yield (Two-Way)



Site 3: Five Islands Road and Emily Road (Entry) 2021 AM Peak



MOVEMENT SUMMARY

Site: 3 [2021_AM_Base Case_Five Islands Road and Emily Access Road (Entry)]

Five Islands Road and Emily Access Road (Entry)
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Five Islands Road												
1	L2	9	22.2	0.330	5.9	LOS A	0.0	0.0	0.00	0.01	0.00	51.5
2	T1	1791	8.4	0.330	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1800	8.4	0.330	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
All Vehicles		1800	8.4	0.330	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: 3 [2021_AM_Base Case_Five Islands Road and Emily Access Road (Entry)]

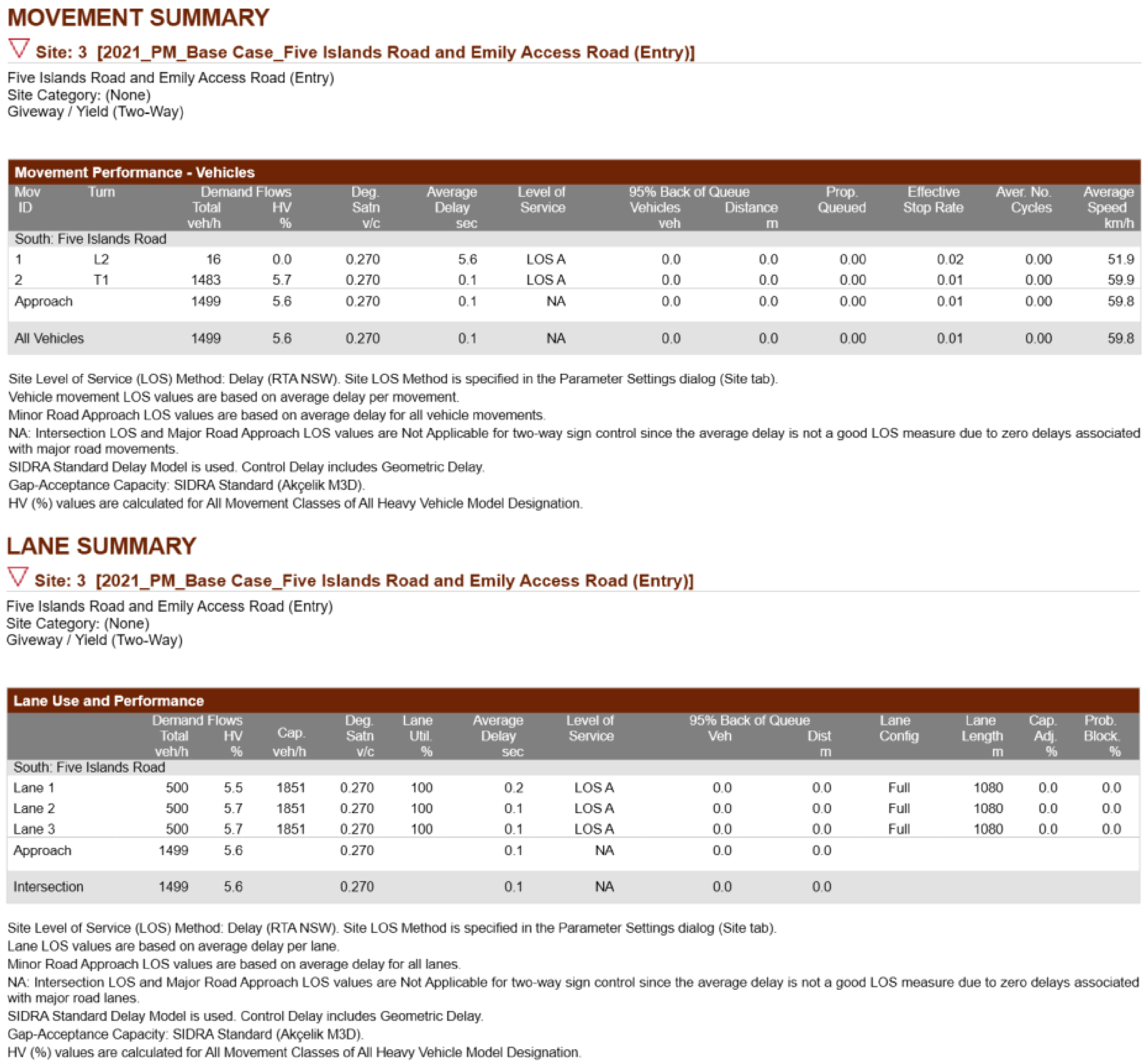
Five Islands Road and Emily Access Road (Entry)
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Five Islands Road													
Lane 1	599	8.6	1816	0.330	100	0.2	LOS A	0.0	0.0	Full	1080	0.0	0.0
Lane 2	600	8.4	1820	0.330	100	0.1	LOS A	0.0	0.0	Full	1080	0.0	0.0
Lane 3	600	8.4	1820	0.330	100	0.1	LOS A	0.0	0.0	Full	1080	0.0	0.0
Approach	1800	8.4		0.330		0.1	NA	0.0	0.0				
Intersection	1800	8.4		0.330		0.1	NA	0.0	0.0				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 3: Five Islands Road and Emily Road (Entry) 2021 PM Peak



MOVEMENT SUMMARY

▽ Site: 3 [2021_PM_Base Case_Five Islands Road and Emily Access Road (Entry)]

Five Islands Road and Emily Access Road (Entry)
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Five Islands Road												
1	L2	16	0.0	0.270	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	51.9
2	T1	1483	5.7	0.270	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
Approach		1499	5.6	0.270	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles		1499	5.6	0.270	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ Site: 3 [2021_PM_Base Case_Five Islands Road and Emily Access Road (Entry)]

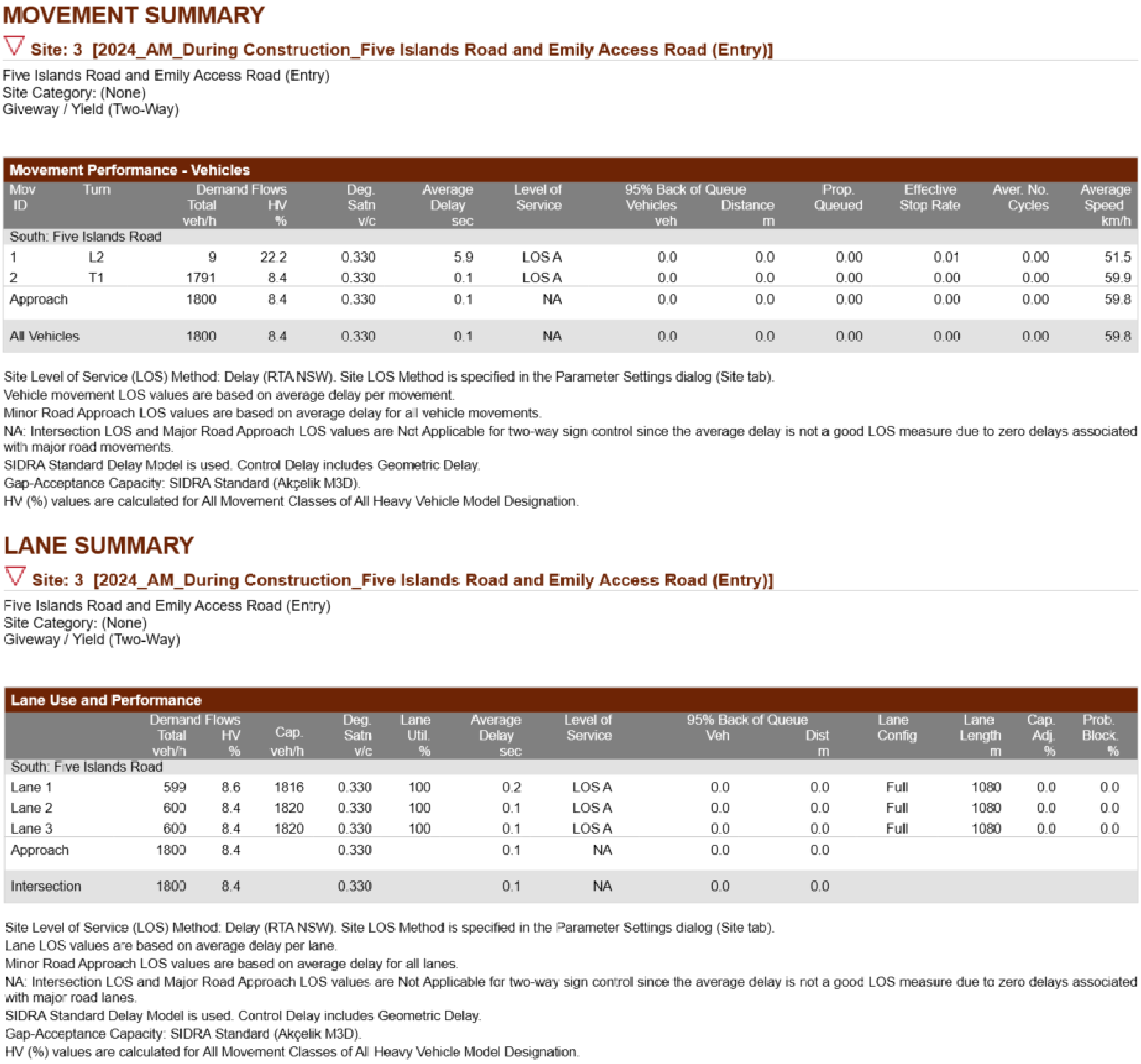
Five Islands Road and Emily Access Road (Entry)
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Five Islands Road													
Lane 1	500	5.5	1851	0.270	100	0.2	LOS A	0.0	0.0	Full	1080	0.0	0.0
Lane 2	500	5.7	1851	0.270	100	0.1	LOS A	0.0	0.0	Full	1080	0.0	0.0
Lane 3	500	5.7	1851	0.270	100	0.1	LOS A	0.0	0.0	Full	1080	0.0	0.0
Approach	1499	5.6		0.270		0.1	NA	0.0	0.0				
Intersection	1499	5.6		0.270		0.1	NA	0.0	0.0				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 3: Five Islands Road and Emily Road (Entry) 2024 AM Peak



MOVEMENT SUMMARY

Site: 3 [2024_AM_During Construction_Five Islands Road and Emily Access Road (Entry)]

Five Islands Road and Emily Access Road (Entry)
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Five Islands Road												
1	L2	9	22.2	0.330	5.9	LOS A	0.0	0.0	0.00	0.01	0.00	51.5
2	T1	1791	8.4	0.330	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1800	8.4	0.330	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
All Vehicles		1800	8.4	0.330	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: 3 [2024_AM_During Construction_Five Islands Road and Emily Access Road (Entry)]

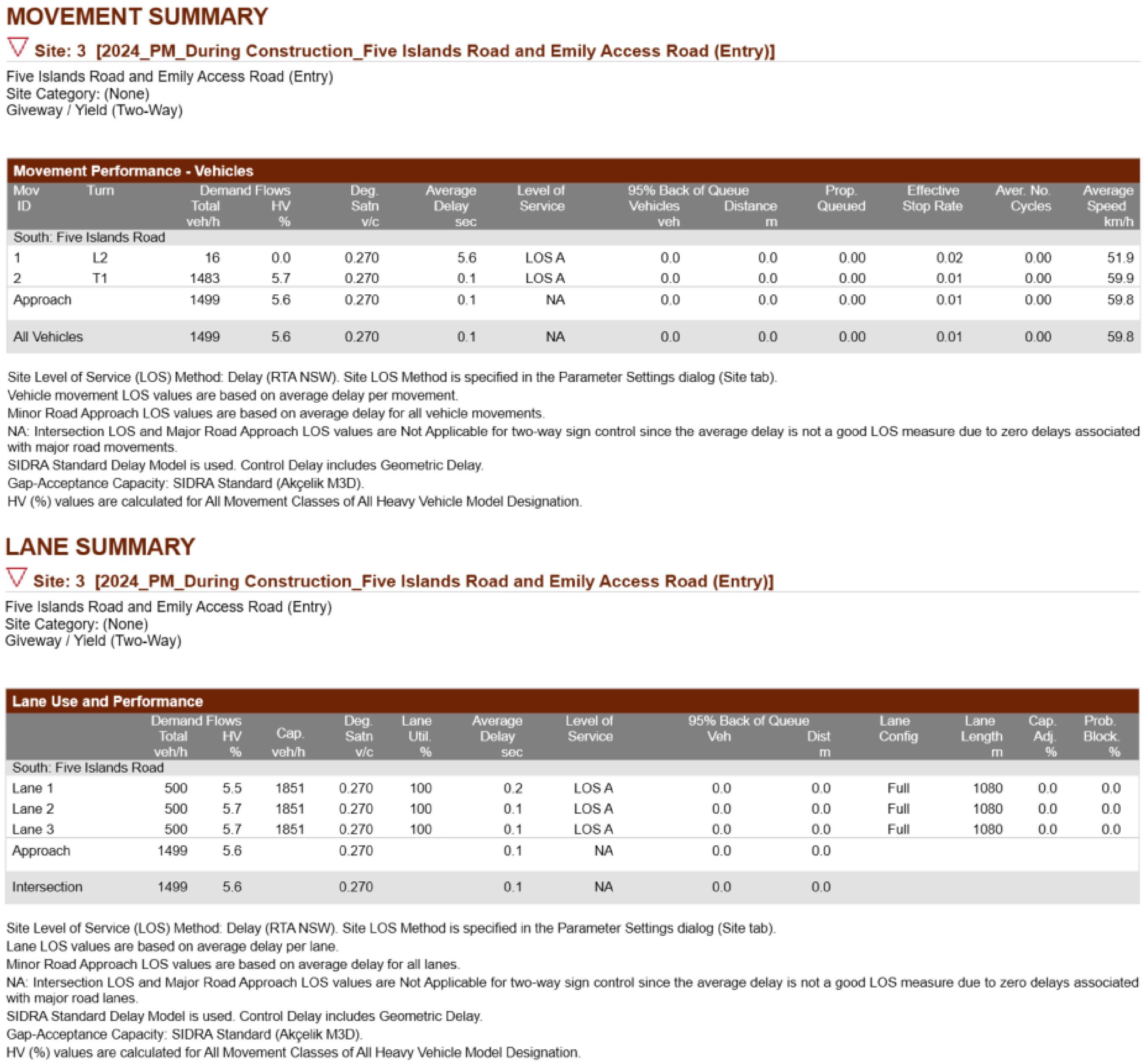
Five Islands Road and Emily Access Road (Entry)
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Five Islands Road													
Lane 1	599	8.6	1816	0.330	100	0.2	LOS A	0.0	0.0	Full	1080	0.0	0.0
Lane 2	600	8.4	1820	0.330	100	0.1	LOS A	0.0	0.0	Full	1080	0.0	0.0
Lane 3	600	8.4	1820	0.330	100	0.1	LOS A	0.0	0.0	Full	1080	0.0	0.0
Approach	1800	8.4		0.330		0.1	NA	0.0	0.0				
Intersection	1800	8.4		0.330		0.1	NA	0.0	0.0				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 3: Five Islands Road and Emily Road (Entry) 2024 PM Peak



MOVEMENT SUMMARY

▽ **Site: 3 [2024_PM_During Construction_Five Islands Road and Emily Access Road (Entry)]**

Five Islands Road and Emily Access Road (Entry)
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Five Islands Road												
1	L2	16	0.0	0.270	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	51.9
2	T1	1483	5.7	0.270	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
Approach		1499	5.6	0.270	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles		1499	5.6	0.270	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ **Site: 3 [2024_PM_During Construction_Five Islands Road and Emily Access Road (Entry)]**

Five Islands Road and Emily Access Road (Entry)
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Five Islands Road													
Lane 1	500	5.5	1851	0.270	100	0.2	LOS A	0.0	0.0	Full	1080	0.0	0.0
Lane 2	500	5.7	1851	0.270	100	0.1	LOS A	0.0	0.0	Full	1080	0.0	0.0
Lane 3	500	5.7	1851	0.270	100	0.1	LOS A	0.0	0.0	Full	1080	0.0	0.0
Approach	1499	5.6		0.270		0.1	NA	0.0	0.0				
Intersection	1499	5.6		0.270		0.1	NA	0.0	0.0				

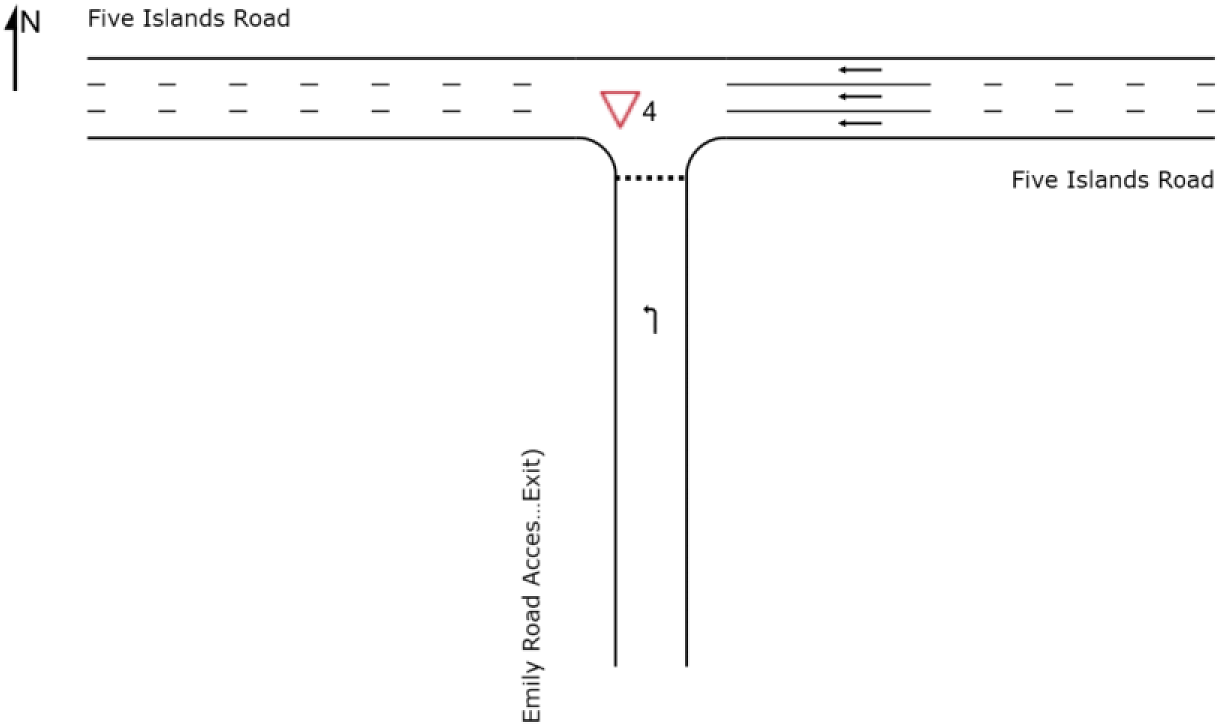
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 4: Five Islands Road and Emily Road (Exit)

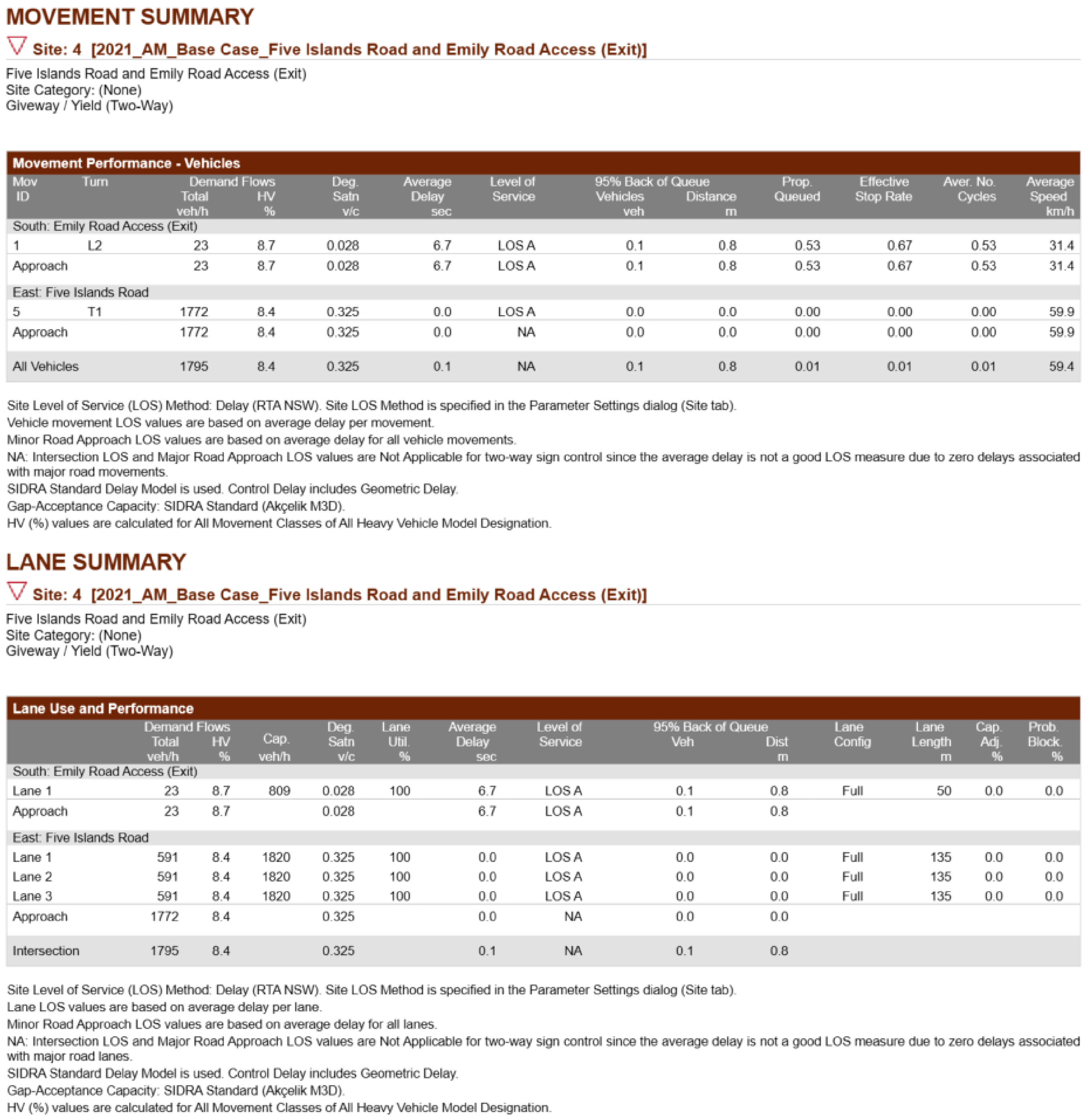
SITE LAYOUT

▽ Site: 4 [2021_AM_Base Case_Five Islands Road and Emily Road Access (Exit)]

Five Islands Road and Emily Road Access (Exit)
Site Category: (None)
Giveway / Yield (Two-Way)



Site 4: Five Islands Road and Emily Road (Exit) 2021 AM Peak



MOVEMENT SUMMARY

▽ Site: 4 [2021_AM_Base Case_Five Islands Road and Emily Road Access (Exit)]

Five Islands Road and Emily Road Access (Exit)
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Emily Road Access (Exit)												
1	L2	23	8.7	0.028	6.7	LOS A	0.1	0.8	0.53	0.67	0.53	31.4
Approach		23	8.7	0.028	6.7	LOS A	0.1	0.8	0.53	0.67	0.53	31.4
East: Five Islands Road												
5	T1	1772	8.4	0.325	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1772	8.4	0.325	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
All Vehicles		1795	8.4	0.325	0.1	NA	0.1	0.8	0.01	0.01	0.01	59.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ Site: 4 [2021_AM_Base Case_Five Islands Road and Emily Road Access (Exit)]

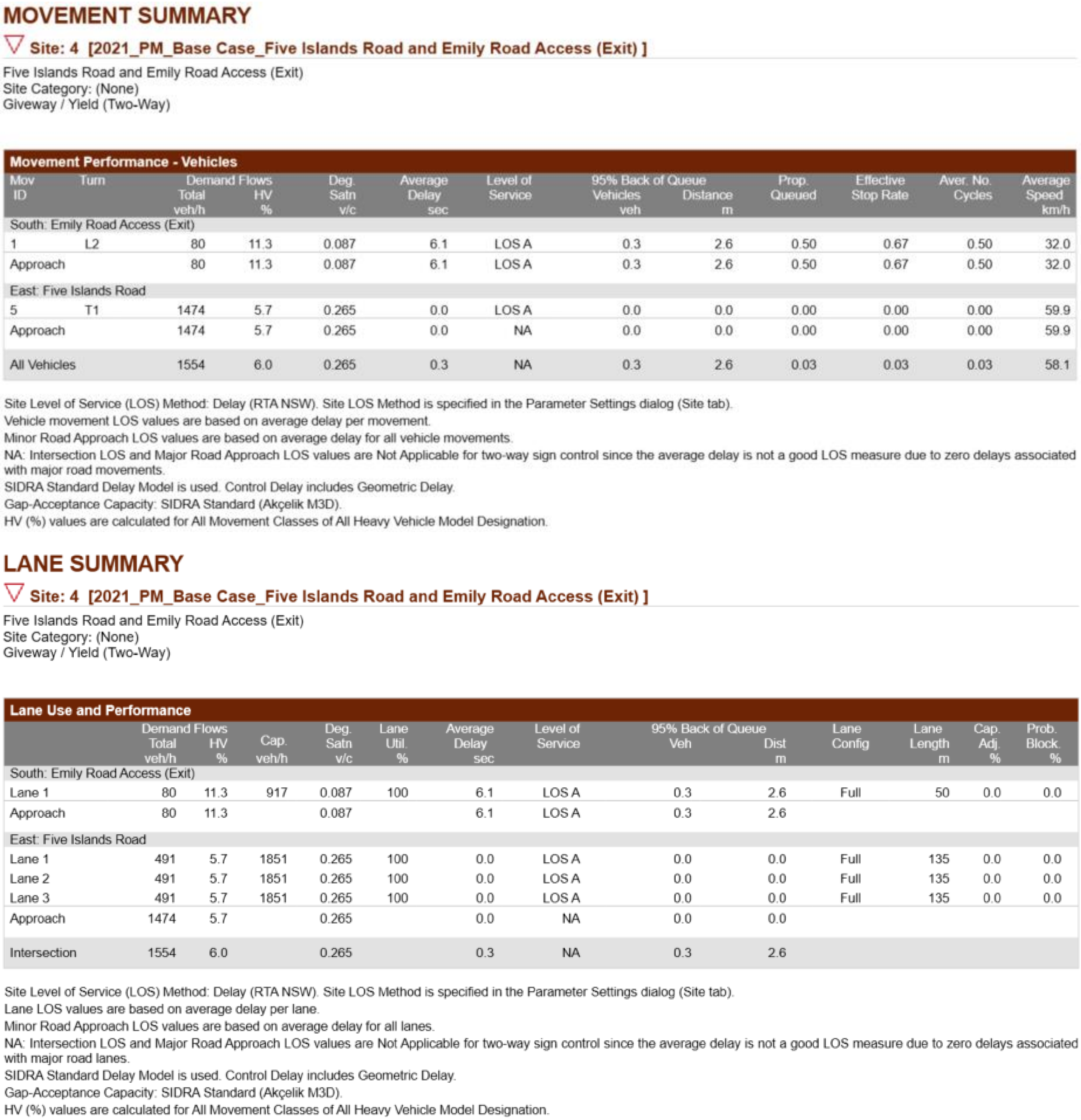
Five Islands Road and Emily Road Access (Exit)
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Emily Road Access (Exit)													
Lane 1	23	8.7	809	0.028	100	6.7	LOS A	0.1	0.8	Full	50	0.0	0.0
Approach	23	8.7		0.028		6.7	LOS A	0.1	0.8				
East: Five Islands Road													
Lane 1	591	8.4	1820	0.325	100	0.0	LOS A	0.0	0.0	Full	135	0.0	0.0
Lane 2	591	8.4	1820	0.325	100	0.0	LOS A	0.0	0.0	Full	135	0.0	0.0
Lane 3	591	8.4	1820	0.325	100	0.0	LOS A	0.0	0.0	Full	135	0.0	0.0
Approach	1772	8.4		0.325		0.0	NA	0.0	0.0				
Intersection	1795	8.4		0.325		0.1	NA	0.1	0.8				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 4: Five Islands Road and Emily Road (Exit) 2021 PM Peak



MOVEMENT SUMMARY

▽ Site: 4 [2021_PM_Base Case_Five Islands Road and Emily Road Access (Exit)]

Five Islands Road and Emily Road Access (Exit)
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Emily Road Access (Exit)												
1	L2	80	11.3	0.087	6.1	LOS A	0.3	2.6	0.50	0.67	0.50	32.0
Approach		80	11.3	0.087	6.1	LOS A	0.3	2.6	0.50	0.67	0.50	32.0
East: Five Islands Road												
5	T1	1474	5.7	0.265	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1474	5.7	0.265	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
All Vehicles		1554	6.0	0.265	0.3	NA	0.3	2.6	0.03	0.03	0.03	58.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ Site: 4 [2021_PM_Base Case_Five Islands Road and Emily Road Access (Exit)]

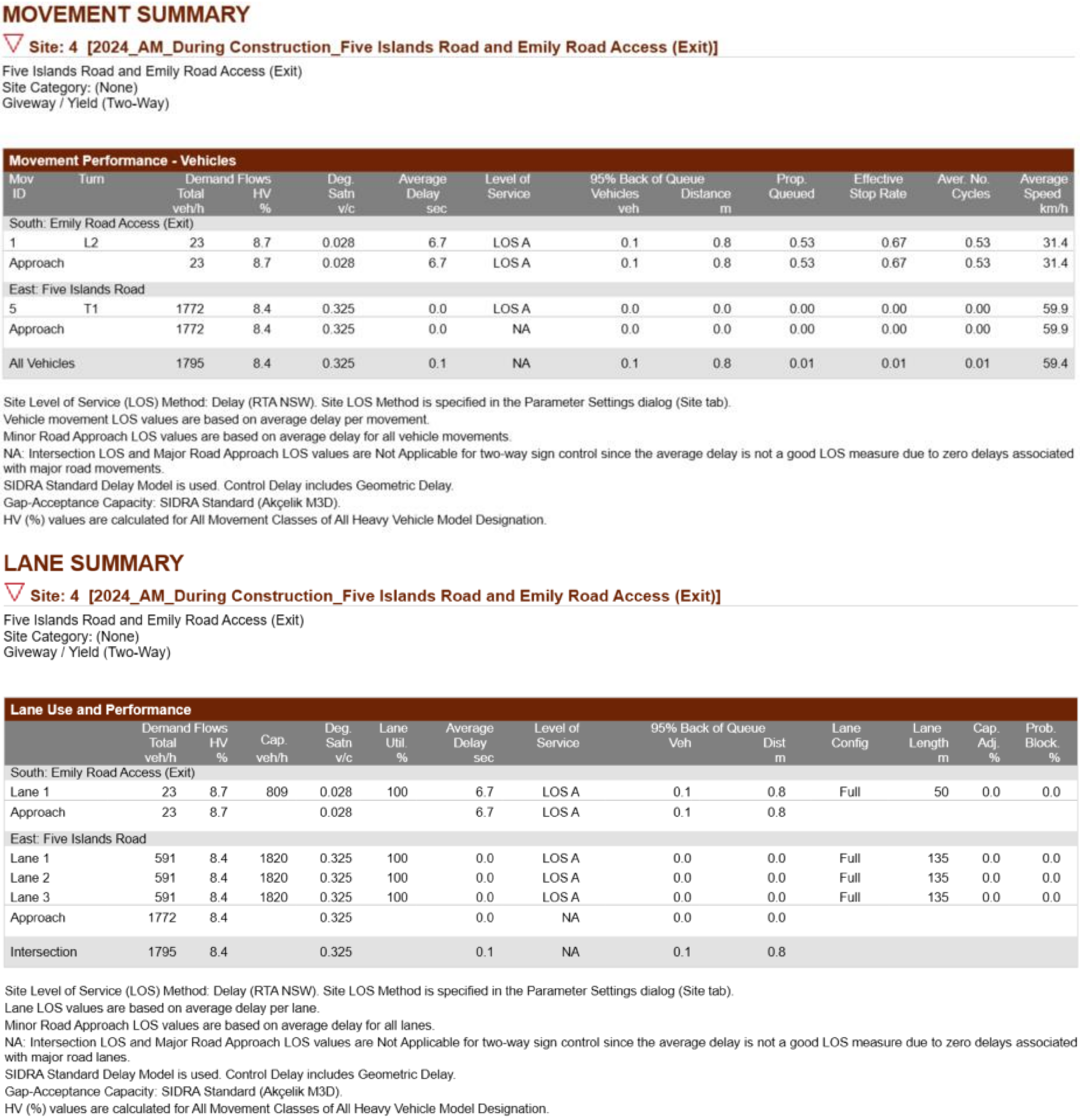
Five Islands Road and Emily Road Access (Exit)
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Emily Road Access (Exit)													
Lane 1	80	11.3	917	0.087	100	6.1	LOS A	0.3	2.6	Full	50	0.0	0.0
Approach	80	11.3		0.087		6.1	LOS A	0.3	2.6				
East: Five Islands Road													
Lane 1	491	5.7	1851	0.265	100	0.0	LOS A	0.0	0.0	Full	135	0.0	0.0
Lane 2	491	5.7	1851	0.265	100	0.0	LOS A	0.0	0.0	Full	135	0.0	0.0
Lane 3	491	5.7	1851	0.265	100	0.0	LOS A	0.0	0.0	Full	135	0.0	0.0
Approach	1474	5.7		0.265		0.0	NA	0.0	0.0				
Intersection	1554	6.0		0.265		0.3	NA	0.3	2.6				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 4: Five Islands Road and Emily Road (Exit) 2024 AM Peak



MOVEMENT SUMMARY

▽ Site: 4 [2024_AM_During Construction_Five Islands Road and Emily Road Access (Exit)]

Five Islands Road and Emily Road Access (Exit)
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Emily Road Access (Exit)												
1	L2	23	8.7	0.028	6.7	LOS A	0.1	0.8	0.53	0.67	0.53	31.4
Approach		23	8.7	0.028	6.7	LOS A	0.1	0.8	0.53	0.67	0.53	31.4
East: Five Islands Road												
5	T1	1772	8.4	0.325	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1772	8.4	0.325	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
All Vehicles		1795	8.4	0.325	0.1	NA	0.1	0.8	0.01	0.01	0.01	59.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ Site: 4 [2024_AM_During Construction_Five Islands Road and Emily Road Access (Exit)]

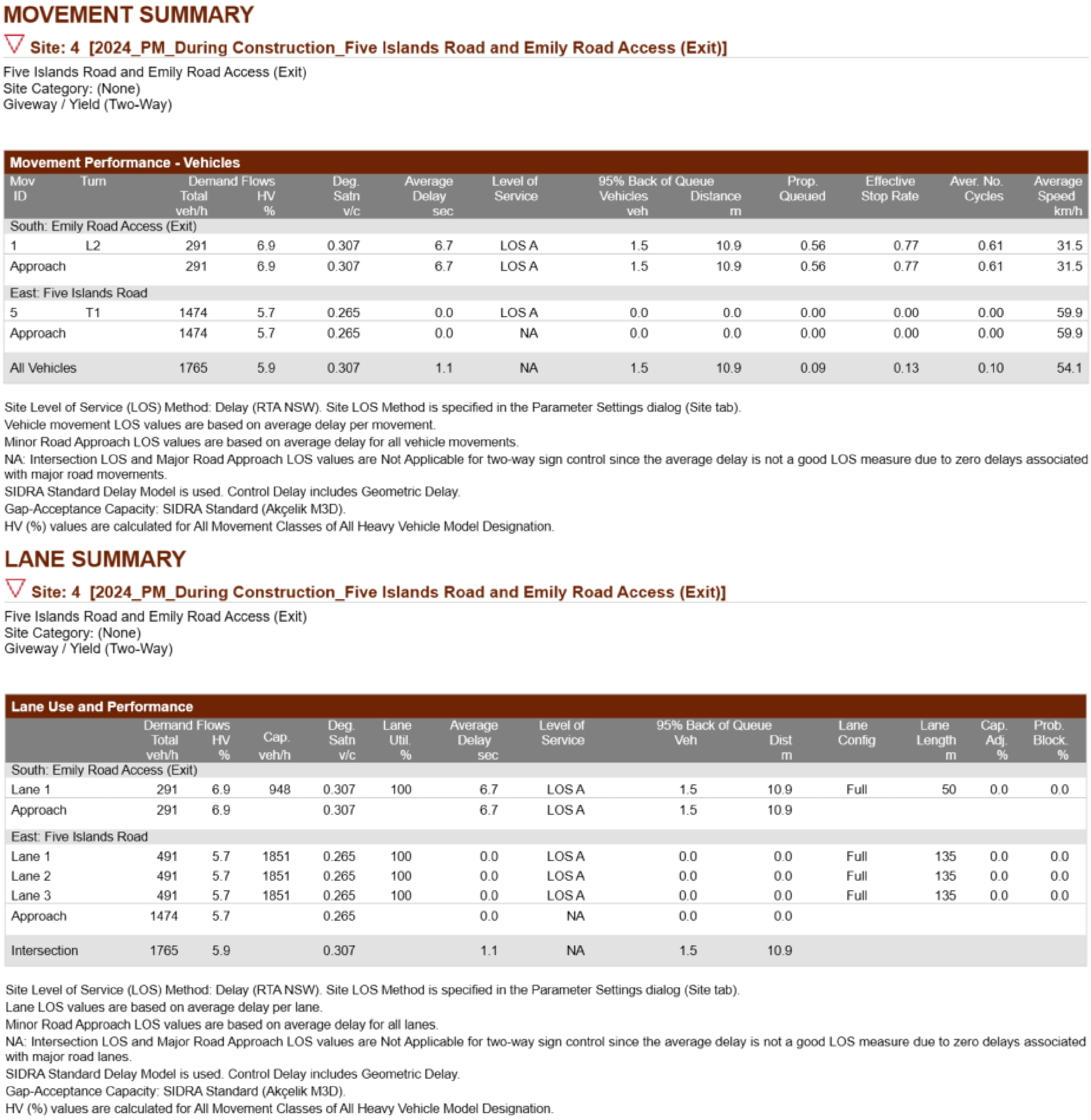
Five Islands Road and Emily Road Access (Exit)
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Emily Road Access (Exit)													
Lane 1	23	8.7	809	0.028	100	6.7	LOS A	0.1	0.8	Full	50	0.0	0.0
Approach	23	8.7		0.028		6.7	LOS A	0.1	0.8				
East: Five Islands Road													
Lane 1	591	8.4	1820	0.325	100	0.0	LOS A	0.0	0.0	Full	135	0.0	0.0
Lane 2	591	8.4	1820	0.325	100	0.0	LOS A	0.0	0.0	Full	135	0.0	0.0
Lane 3	591	8.4	1820	0.325	100	0.0	LOS A	0.0	0.0	Full	135	0.0	0.0
Approach	1772	8.4		0.325		0.0	NA	0.0	0.0				
Intersection	1795	8.4		0.325		0.1	NA	0.1	0.8				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 4: Five Islands Road and Emily Road (Exit) 2024 PM Peak



MOVEMENT SUMMARY

Site: 4 [2024_PM_During Construction_Five Islands Road and Emily Road Access (Exit)]

Five Islands Road and Emily Road Access (Exit)
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Emily Road Access (Exit)												
1	L2	291	6.9	0.307	6.7	LOS A	1.5	10.9	0.56	0.77	0.61	31.5
Approach		291	6.9	0.307	6.7	LOS A	1.5	10.9	0.56	0.77	0.61	31.5
East: Five Islands Road												
5	T1	1474	5.7	0.265	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1474	5.7	0.265	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
All Vehicles		1765	5.9	0.307	1.1	NA	1.5	10.9	0.09	0.13	0.10	54.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: 4 [2024_PM_During Construction_Five Islands Road and Emily Road Access (Exit)]

Five Islands Road and Emily Road Access (Exit)
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Emily Road Access (Exit)													
Lane 1	291	6.9	948	0.307	100	6.7	LOS A	1.5	10.9	Full	50	0.0	0.0
Approach	291	6.9		0.307		6.7	LOS A	1.5	10.9				
East: Five Islands Road													
Lane 1	491	5.7	1851	0.265	100	0.0	LOS A	0.0	0.0	Full	135	0.0	0.0
Lane 2	491	5.7	1851	0.265	100	0.0	LOS A	0.0	0.0	Full	135	0.0	0.0
Lane 3	491	5.7	1851	0.265	100	0.0	LOS A	0.0	0.0	Full	135	0.0	0.0
Approach	1474	5.7		0.265		0.0	NA	0.0	0.0				
Intersection	1765	5.9		0.307		1.1	NA	1.5	10.9				

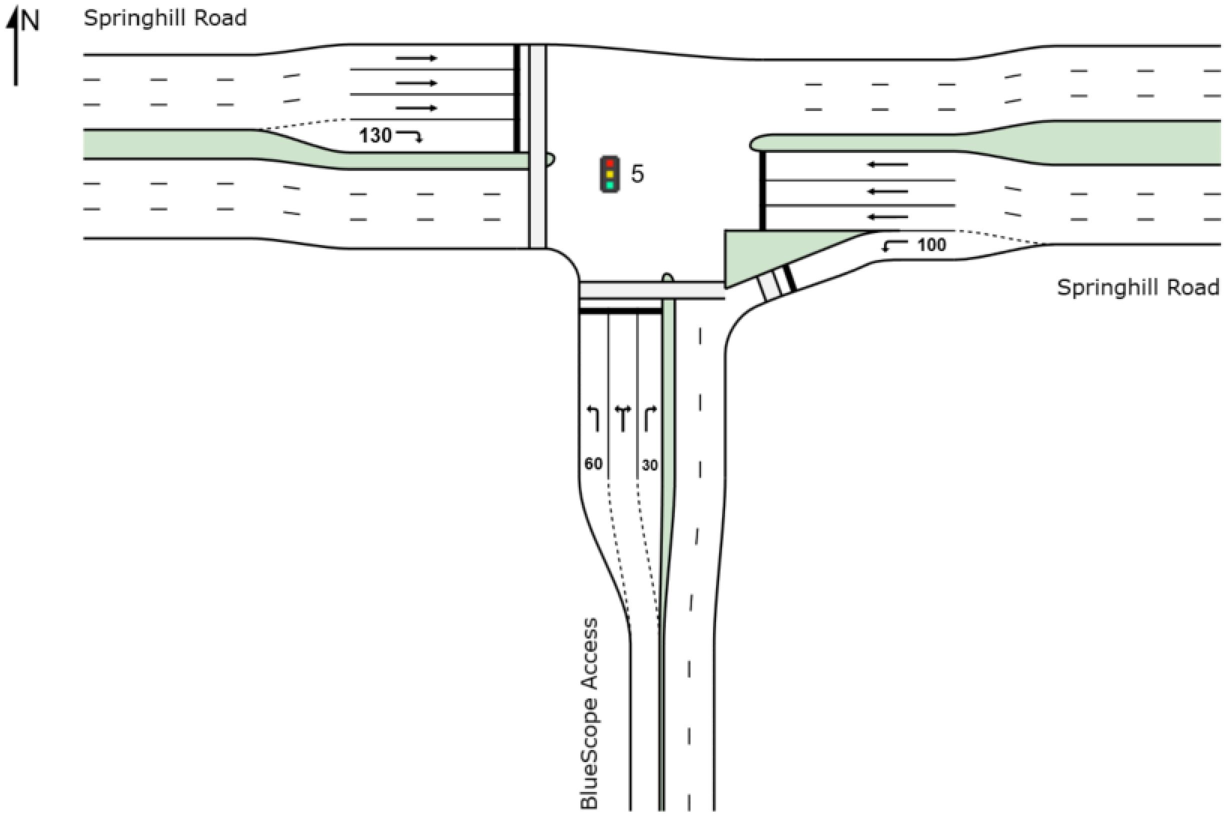
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 5: Springhill Road and BlueScope Access Road (Exit)

SITE LAYOUT

Site: 5 [2021_AM_Base Case_Springhill Road and BlueScope Access]

Springhill Road and BlueScope Access
Site Category: (None)
Signals - Fixed Time Isolated



Site 5: Springhill Road and BlueScope Access Road (Exit) 2021 AM Peak

MOVEMENT SUMMARY

Site: 5 [2021_AM_Base Case_Springhill Road and BlueScope Access]

Springhill Road and BlueScope Access
Site Category: (None)
Signals - Fixed Time Isolated   Cycle Time = 60 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m				km/h
South: BlueScope Access												
1	L2	24	70.8	0.045	23.2	LOS B	0.4	4.1	0.77	0.67	0.77	30.0
3	R2	12	0.0	0.045	30.7	LOS C	0.3	2.6	0.90	0.66	0.90	29.4
Approach		36	47.2	0.045	25.7	LOS B	0.4	4.1	0.81	0.66	0.81	29.8
East: Springhill Road												
4	L2	25	12.0	0.145	36.0	LOS C	0.7	5.5	0.94	0.71	0.94	28.0
5	T1	497	12.5	0.308	17.9	LOS B	3.9	30.3	0.81	0.66	0.81	57.4
Approach		522	12.5	0.308	18.8	LOS B	3.9	30.3	0.82	0.66	0.82	56.0
West: Springhill Road												
11	T1	1315	7.1	0.797	25.3	LOS B	13.5	100.6	0.98	0.94	1.17	51.3
12	R2	45	35.6	0.293	37.2	LOS C	1.3	12.2	0.96	0.74	0.96	35.8
Approach		1360	8.1	0.797	25.7	LOS B	13.5	100.6	0.98	0.93	1.17	50.8
All Vehicles		1918	10.0	0.797	23.8	LOS B	13.5	100.6	0.93	0.85	1.07	51.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: 5 [2021_AM_Base Case_Springhill Road and BlueScope Access]

Springhill Road and BlueScope Access
Site Category: (None)
Signals - Fixed Time Isolated   Cycle Time = 60 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: BlueScope Access													
Lane 1	17	70.8	374	0.045	100	21.4	LOS B	0.4	4.1	Short	60	0.0	NA
Lane 2	11	46.4	235	0.045	100	27.5	LOS B	0.3	2.6	Full	80	0.0	0.0
Lane 3	8	0.0	183	0.045	100	32.2	LOS C	0.2	1.6	Short	30	0.0	NA
Approach	36	47.2		0.045		25.7	LOS B	0.4	4.1				
East: Springhill Road													
Lane 1	25	12.0	173	0.145	100	36.0	LOS C	0.7	5.5	Short	100	0.0	NA
Lane 2	164	12.5	533	0.308	100	17.9	LOS B	3.8	29.5	Full	370	0.0	0.0
Lane 3	164	12.5	533	0.308	100	17.9	LOS B	3.8	29.5	Full	370	0.0	0.0
Lane 4	169	12.5	547	0.308	100	17.9	LOS B	3.9	30.3	Full	370	0.0	0.0
Approach	522	12.5		0.308		18.8	LOS B	3.9	30.3				
West: Springhill Road													
Lane 1	438	7.1	550	0.797	100	25.3	LOS B	13.5	100.6	Full	620	0.0	0.0
Lane 2	438	7.1	550	0.797	100	25.3	LOS B	13.5	100.6	Full	620	0.0	0.0
Lane 3	438	7.1	550	0.797	100	25.3	LOS B	13.5	100.6	Full	620	0.0	0.0
Lane 4	45	35.6	154	0.293	100	37.2	LOS C	1.3	12.2	Short	130	0.0	NA
Approach	1360	8.1		0.797		25.7	LOS B	13.5	100.6				
Intersection	1918	10.0		0.797		23.8	LOS B	13.5	100.6				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 5: Springhill Road and BlueScope Access Road (Exit) 2021 PM Peak

MOVEMENT SUMMARY

Site: 5 [2021_PM_Base Case_Springhill Road and BlueScope Access]

Springhill Road and BlueScope Access
Site Category: (None)
Signals - Fixed Time Isolated   Cycle Time = 50 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: BlueScope Access												
1	L2	52	17.3	0.080	17.0	LOS B	0.8	6.3	0.70	0.69	0.70	42.2
3	R2	32	3.1	0.080	26.5	LOS B	0.4	3.1	0.91	0.68	0.91	31.4
Approach		84	11.9	0.080	20.6	LOS B	0.8	6.3	0.78	0.68	0.78	38.4
East: Springhill Road												
4	L2	6	16.7	0.030	29.7	LOS C	0.1	1.1	0.91	0.65	0.91	31.3
5	T1	391	3.1	0.429	21.8	LOS B	3.1	22.4	0.94	0.75	0.94	54.1
Approach		397	3.3	0.429	21.9	LOS B	3.1	22.4	0.94	0.74	0.94	53.8
West: Springhill Road												
11	T1	529	4.5	0.591	22.8	LOS B	4.3	31.5	0.97	0.80	1.03	53.3
12	R2	12	58.3	0.074	30.9	LOS C	0.3	3.0	0.91	0.68	0.91	38.9
Approach		541	5.7	0.591	23.0	LOS B	4.3	31.5	0.97	0.80	1.02	53.0
All Vehicles		1022	5.3	0.591	22.3	LOS B	4.3	31.5	0.95	0.77	0.97	52.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: 5 [2021_PM_Base Case_Springhill Road and BlueScope Access]

Springhill Road and BlueScope Access
Site Category: (None)
Signals - Fixed Time Isolated   Cycle Time = 50 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: BlueScope Access													
Lane 1	48	17.3	601	0.080	100	16.2	LOS B	0.8	6.3	Short	60	0.0	NA
Lane 2	19	6.1	235	0.080	100	25.9	LOS B	0.4	3.1	Full	80	0.0	0.0
Lane 3	17	3.1	215	0.080	100	26.9	LOS B	0.4	2.8	Short	30	0.0	NA
Approach	84	11.9		0.080		20.6	LOS B	0.8	6.3				
East: Springhill Road													
Lane 1	6	16.7	201	0.030	100	29.7	LOS C	0.1	1.1	Short	100	0.0	NA
Lane 2	129	3.1	301	0.429	100	21.8	LOS B	3.0	21.8	Full	370	0.0	0.0
Lane 3	129	3.1	301	0.429	100	21.8	LOS B	3.0	21.8	Full	370	0.0	0.0
Lane 4	133	3.1	309	0.429	100	21.7	LOS B	3.1	22.4	Full	370	0.0	0.0
Approach	397	3.3		0.429		21.9	LOS B	3.1	22.4				
West: Springhill Road													
Lane 1	176	4.5	298	0.591	100	22.8	LOS B	4.3	31.5	Full	620	0.0	0.0
Lane 2	176	4.5	298	0.591	100	22.8	LOS B	4.3	31.5	Full	620	0.0	0.0
Lane 3	176	4.5	298	0.591	100	22.8	LOS B	4.3	31.5	Full	620	0.0	0.0
Lane 4	12	58.3	163	0.074	100	30.9	LOS C	0.3	3.0	Short	130	0.0	NA
Approach	541	5.7		0.591		23.0	LOS B	4.3	31.5				
Intersection	1022	5.3		0.591		22.3	LOS B	4.3	31.5				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 5: Springhill Road and BlueScope Access Road (Exit) 2024 AM Peak

MOVEMENT SUMMARY

Site: 5 [2024_AM_During Construction_Springhill Road and BlueScope Access]

Springhill Road and BlueScope Access
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: BlueScope Access												
1	L2	24	70.8	0.045	23.2	LOS B	0.4	4.1	0.77	0.67	0.77	30.0
3	R2	12	0.0	0.045	30.7	LOS C	0.3	2.6	0.90	0.66	0.90	29.4
Approach		36	47.2	0.045	25.7	LOS B	0.4	4.1	0.81	0.66	0.81	29.8
East: Springhill Road												
4	L2	29	10.3	0.166	36.0	LOS C	0.8	6.4	0.95	0.71	0.95	28.0
5	T1	497	12.5	0.308	17.9	LOS B	3.9	30.3	0.81	0.66	0.81	57.4
Approach		526	12.4	0.308	18.9	LOS B	3.9	30.3	0.82	0.67	0.82	55.8
West: Springhill Road												
11	T1	1315	7.1	0.797	25.3	LOS B	13.5	100.6	0.98	0.94	1.17	51.3
12	R2	56	28.6	0.350	37.3	LOS C	1.7	14.5	0.97	0.75	0.97	35.8
Approach		1371	8.0	0.797	25.8	LOS B	13.5	100.6	0.98	0.93	1.17	50.7
All Vehicles		1933	9.9	0.797	23.9	LOS B	13.5	100.6	0.93	0.85	1.07	51.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: 5 [2024_AM_During Construction_Springhill Road and BlueScope Access]

Springhill Road and BlueScope Access
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: BlueScope Access													
Lane 1	17	70.8	374	0.045	100	21.4	LOS B	0.4	4.1	Short	60	0.0	NA
Lane 2	11	46.4	235	0.045	100	27.5	LOS B	0.3	2.6	Full	80	0.0	0.0
Lane 3	8	0.0	183	0.045	100	32.2	LOS C	0.2	1.6	Short	30	0.0	NA
Approach	36	47.2		0.045		25.7	LOS B	0.4	4.1				
East: Springhill Road													
Lane 1	29	10.3	175	0.166	100	36.0	LOS C	0.8	6.4	Short	100	0.0	NA
Lane 2	164	12.5	533	0.308	100	17.9	LOS B	3.8	29.5	Full	370	0.0	0.0
Lane 3	164	12.5	533	0.308	100	17.9	LOS B	3.8	29.5	Full	370	0.0	0.0
Lane 4	169	12.5	547	0.308	100	17.9	LOS B	3.9	30.3	Full	370	0.0	0.0
Approach	526	12.4		0.308		18.9	LOS B	3.9	30.3				
West: Springhill Road													
Lane 1	438	7.1	550	0.797	100	25.3	LOS B	13.5	100.6	Full	620	0.0	0.0
Lane 2	438	7.1	550	0.797	100	25.3	LOS B	13.5	100.6	Full	620	0.0	0.0
Lane 3	438	7.1	550	0.797	100	25.3	LOS B	13.5	100.6	Full	620	0.0	0.0
Lane 4	56	28.6	160	0.350	100	37.3	LOS C	1.7	14.5	Short	130	0.0	NA
Approach	1371	8.0		0.797		25.8	LOS B	13.5	100.6				
Intersection	1933	9.9		0.797		23.9	LOS B	13.5	100.6				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 5: Springhill Road and BlueScope Access Road (Exit) 2024 PM Peak

MOVEMENT SUMMARY

Site: 5 [2024_PM_During Construction_Springhill Road and BlueScope Access]

Springhill Road and BlueScope Access
Site Category: (None)
Signals - Fixed Time Isolated   Cycle Time = 50 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: BlueScope Access												
1	L2	63	14.3	0.092	17.3	LOS B	0.9	7.3	0.71	0.69	0.71	42.7
3	R2	36	2.8	0.092	26.5	LOS B	0.5	3.7	0.91	0.69	0.91	31.4
Approach		99	10.1	0.092	20.6	LOS B	0.9	7.3	0.78	0.69	0.78	38.9
East: Springhill Road												
4	L2	6	16.7	0.030	29.7	LOS C	0.1	1.1	0.91	0.65	0.91	31.3
5	T1	391	3.1	0.429	21.8	LOS B	3.1	22.4	0.94	0.75	0.94	54.1
Approach		397	3.3	0.429	21.9	LOS B	3.1	22.4	0.94	0.74	0.94	53.8
West: Springhill Road												
11	T1	529	4.5	0.591	22.8	LOS B	4.3	31.5	0.97	0.80	1.03	53.3
12	R2	12	58.3	0.074	30.9	LOS C	0.3	3.0	0.91	0.68	0.91	38.9
Approach		541	5.7	0.591	23.0	LOS B	4.3	31.5	0.97	0.80	1.02	53.0
All Vehicles		1037	5.2	0.591	22.3	LOS B	4.3	31.5	0.94	0.77	0.97	52.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: 5 [2024_PM_During Construction_Springhill Road and BlueScope Access]

Springhill Road and BlueScope Access
Site Category: (None)
Signals - Fixed Time Isolated   Cycle Time = 50 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: BlueScope Access													
Lane 1	57	14.3	613	0.092	100	16.3	LOS B	0.9	7.3	Short	60	0.0	NA
Lane 2	23	6.1	244	0.092	100	25.9	LOS B	0.5	3.7	Full	80	0.0	0.0
Lane 3	20	2.8	215	0.092	100	27.0	LOS B	0.5	3.3	Short	30	0.0	NA
Approach	99	10.1		0.092		20.6	LOS B	0.9	7.3				
East: Springhill Road													
Lane 1	6	16.7	201	0.030	100	29.7	LOS C	0.1	1.1	Short	100	0.0	NA
Lane 2	129	3.1	301	0.429	100	21.8	LOS B	3.0	21.8	Full	370	0.0	0.0
Lane 3	129	3.1	301	0.429	100	21.8	LOS B	3.0	21.8	Full	370	0.0	0.0
Lane 4	133	3.1	309	0.429	100	21.7	LOS B	3.1	22.4	Full	370	0.0	0.0
Approach	397	3.3		0.429		21.9	LOS B	3.1	22.4				
West: Springhill Road													
Lane 1	176	4.5	298	0.591	100	22.8	LOS B	4.3	31.5	Full	620	0.0	0.0
Lane 2	176	4.5	298	0.591	100	22.8	LOS B	4.3	31.5	Full	620	0.0	0.0
Lane 3	176	4.5	298	0.591	100	22.8	LOS B	4.3	31.5	Full	620	0.0	0.0
Lane 4	12	58.3	163	0.074	100	30.9	LOS C	0.3	3.0	Short	130	0.0	NA
Approach	541	5.7		0.591		23.0	LOS B	4.3	31.5				
Intersection	1037	5.2		0.591		22.3	LOS B	4.3	31.5				

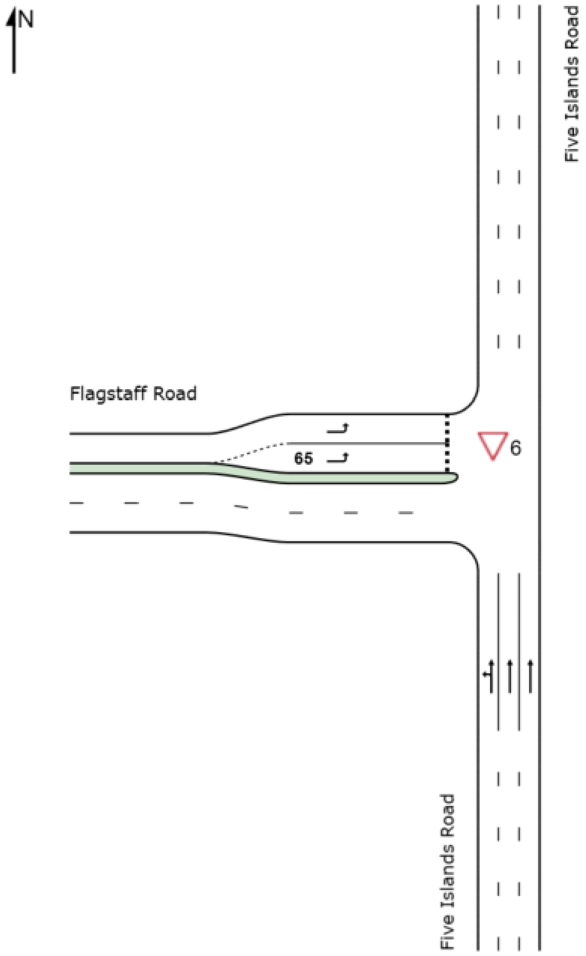
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 6: Five Islands Road and Flagstaff Road

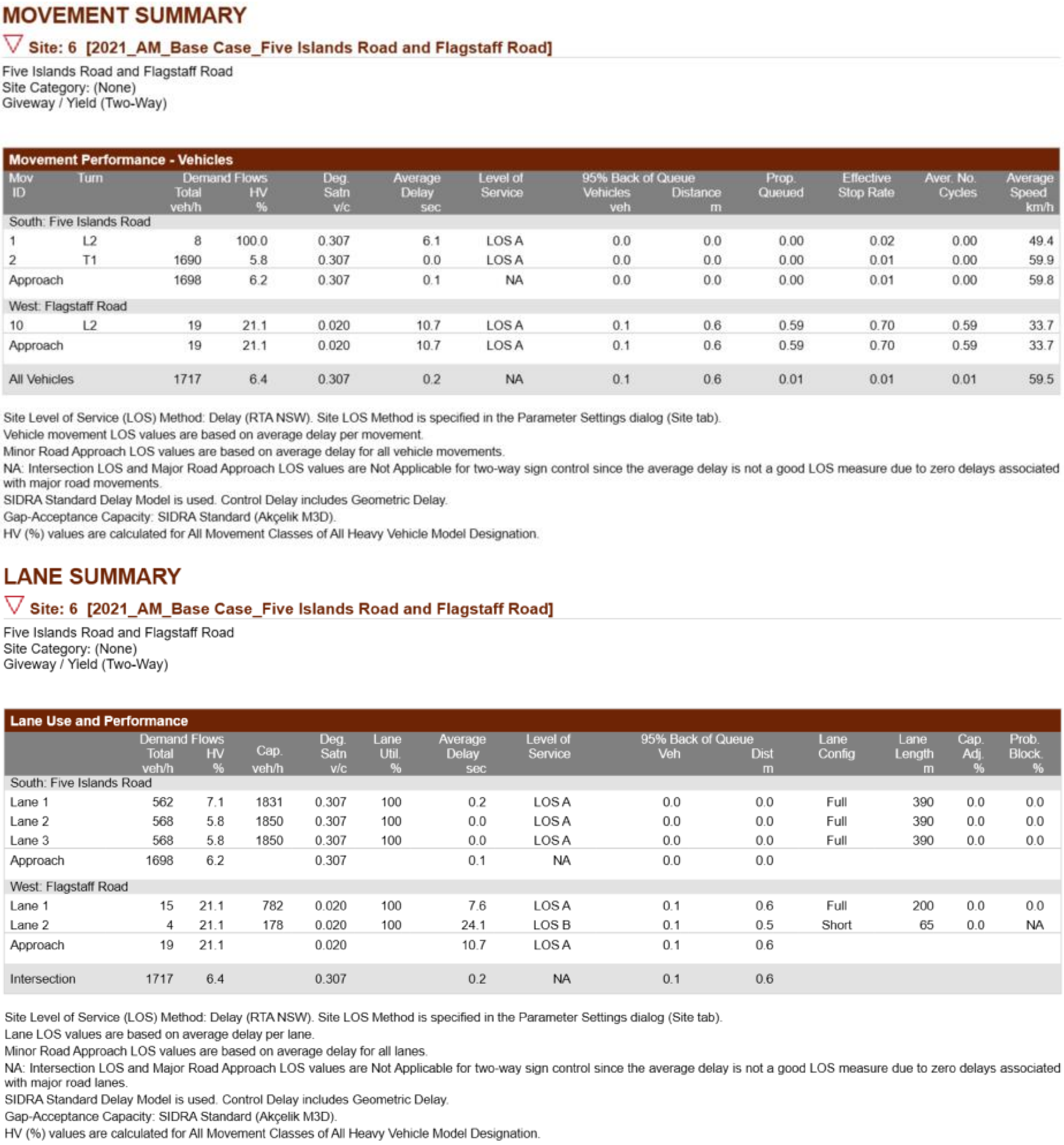
SITE LAYOUT

▽ Site: 6 [2021_AM_Base Case_Five Islands Road and Flagstaff Road]

Five Islands Road and Flagstaff Road
Site Category: (None)
Giveway / Yield (Two-Way)



Site 6: Five Islands Road and Flagstaff Road 2021 AM Peak



MOVEMENT SUMMARY

▽ Site: 6 [2021_AM_Base Case_Five Islands Road and Flagstaff Road]

Five Islands Road and Flagstaff Road
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Five Islands Road												
1	L2	8	100.0	0.307	6.1	LOS A	0.0	0.0	0.00	0.02	0.00	49.4
2	T1	1690	5.8	0.307	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
Approach		1698	6.2	0.307	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
West: Flagstaff Road												
10	L2	19	21.1	0.020	10.7	LOS A	0.1	0.6	0.59	0.70	0.59	33.7
Approach		19	21.1	0.020	10.7	LOS A	0.1	0.6	0.59	0.70	0.59	33.7
All Vehicles		1717	6.4	0.307	0.2	NA	0.1	0.6	0.01	0.01	0.01	59.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ Site: 6 [2021_AM_Base Case_Five Islands Road and Flagstaff Road]

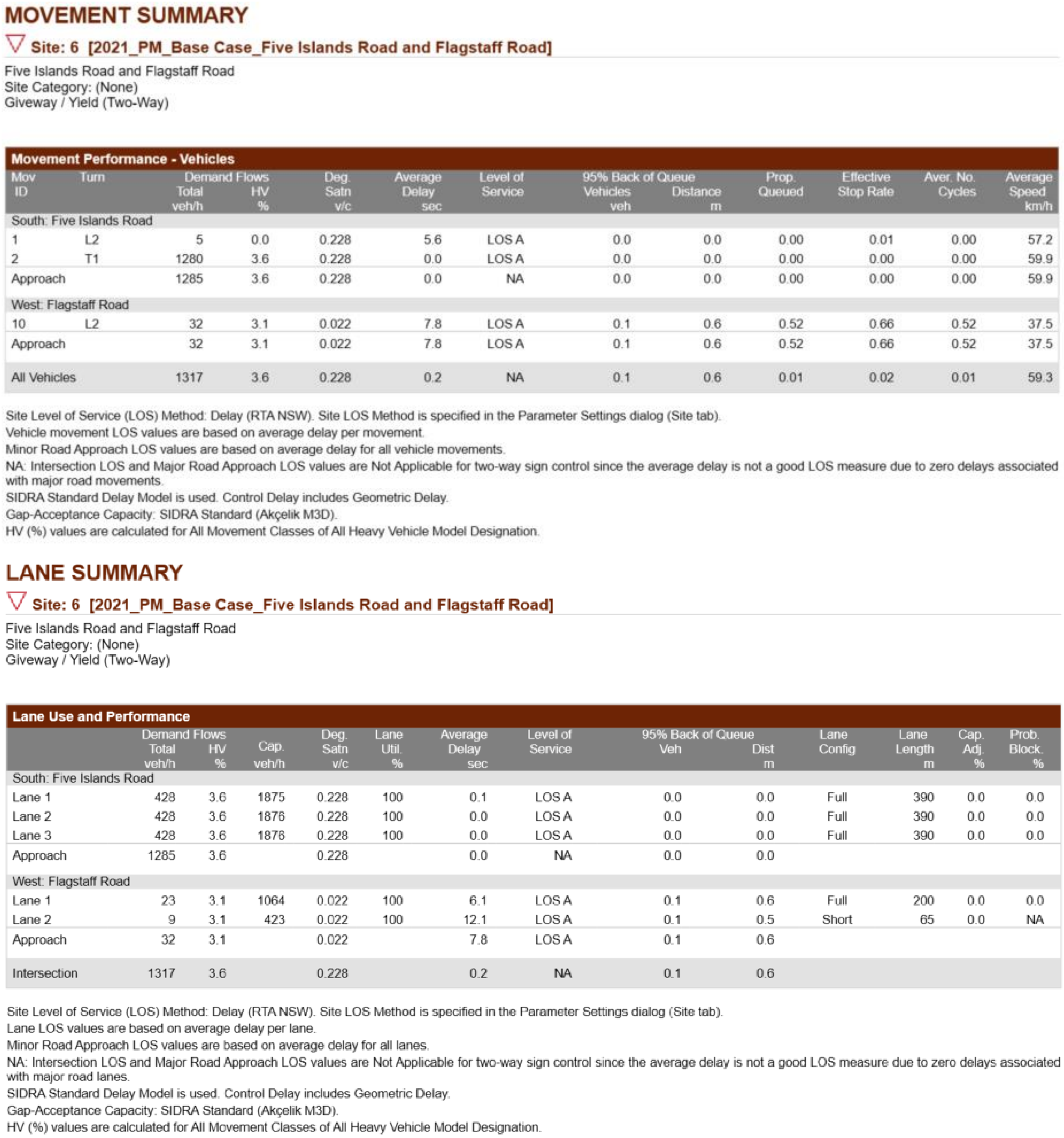
Five Islands Road and Flagstaff Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Five Islands Road													
Lane 1	562	7.1	1831	0.307	100	0.2	LOS A	0.0	0.0	Full	390	0.0	0.0
Lane 2	568	5.8	1850	0.307	100	0.0	LOS A	0.0	0.0	Full	390	0.0	0.0
Lane 3	568	5.8	1850	0.307	100	0.0	LOS A	0.0	0.0	Full	390	0.0	0.0
Approach	1698	6.2		0.307		0.1	NA	0.0	0.0				
West: Flagstaff Road													
Lane 1	15	21.1	782	0.020	100	7.6	LOS A	0.1	0.6	Full	200	0.0	0.0
Lane 2	4	21.1	178	0.020	100	24.1	LOS B	0.1	0.5	Short	65	0.0	NA
Approach	19	21.1		0.020		10.7	LOS A	0.1	0.6				
Intersection	1717	6.4		0.307		0.2	NA	0.1	0.6				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 6: Five Islands Road and Flagstaff Road 2021 PM Peak



MOVEMENT SUMMARY

▽ Site: 6 [2021_PM_Base Case_Five Islands Road and Flagstaff Road]

Five Islands Road and Flagstaff Road
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Five Islands Road												
1	L2	5	0.0	0.228	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	57.2
2	T1	1280	3.6	0.228	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1285	3.6	0.228	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Flagstaff Road												
10	L2	32	3.1	0.022	7.8	LOS A	0.1	0.6	0.52	0.66	0.52	37.5
Approach		32	3.1	0.022	7.8	LOS A	0.1	0.6	0.52	0.66	0.52	37.5
All Vehicles		1317	3.6	0.228	0.2	NA	0.1	0.6	0.01	0.02	0.01	59.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ Site: 6 [2021_PM_Base Case_Five Islands Road and Flagstaff Road]

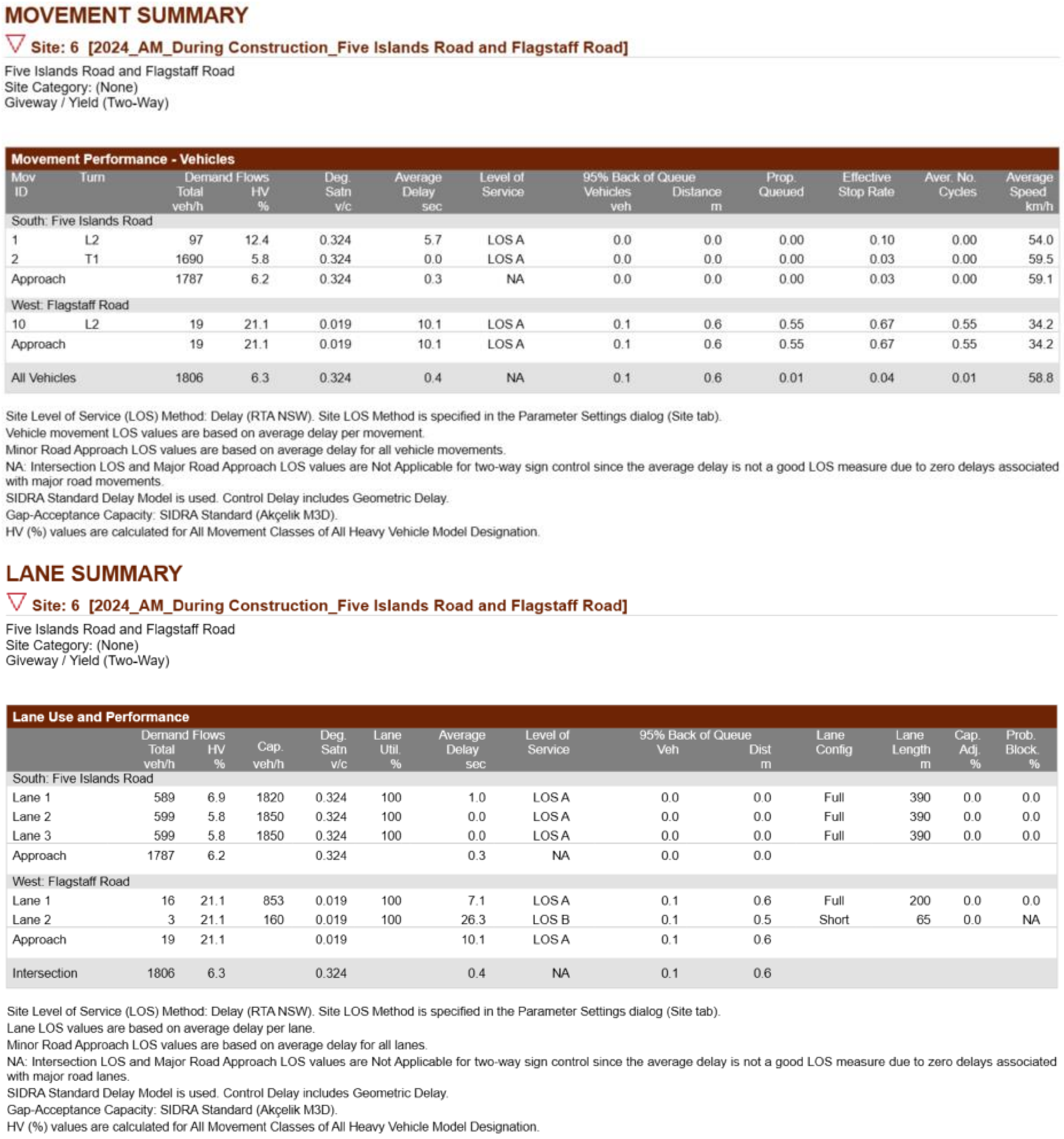
Five Islands Road and Flagstaff Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Five Islands Road													
Lane 1	428	3.6	1875	0.228	100	0.1	LOS A	0.0	0.0	Full	390	0.0	0.0
Lane 2	428	3.6	1876	0.228	100	0.0	LOS A	0.0	0.0	Full	390	0.0	0.0
Lane 3	428	3.6	1876	0.228	100	0.0	LOS A	0.0	0.0	Full	390	0.0	0.0
Approach	1285	3.6		0.228		0.0	NA	0.0	0.0				
West: Flagstaff Road													
Lane 1	23	3.1	1064	0.022	100	6.1	LOS A	0.1	0.6	Full	200	0.0	0.0
Lane 2	9	3.1	423	0.022	100	12.1	LOS A	0.1	0.5	Short	65	0.0	NA
Approach	32	3.1		0.022		7.8	LOS A	0.1	0.6				
Intersection	1317	3.6		0.228		0.2	NA	0.1	0.6				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 6: Five Islands Road and Flagstaff Road 2024 AM Peak



MOVEMENT SUMMARY

▽ Site: 6 [2024_AM_During Construction_Five Islands Road and Flagstaff Road]

Five Islands Road and Flagstaff Road
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Five Islands Road												
1	L2	97	12.4	0.324	5.7	LOS A	0.0	0.0	0.00	0.10	0.00	54.0
2	T1	1690	5.8	0.324	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.5
Approach		1787	6.2	0.324	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.1
West: Flagstaff Road												
10	L2	19	21.1	0.019	10.1	LOS A	0.1	0.6	0.55	0.67	0.55	34.2
Approach		19	21.1	0.019	10.1	LOS A	0.1	0.6	0.55	0.67	0.55	34.2
All Vehicles		1806	6.3	0.324	0.4	NA	0.1	0.6	0.01	0.04	0.01	58.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ Site: 6 [2024_AM_During Construction_Five Islands Road and Flagstaff Road]

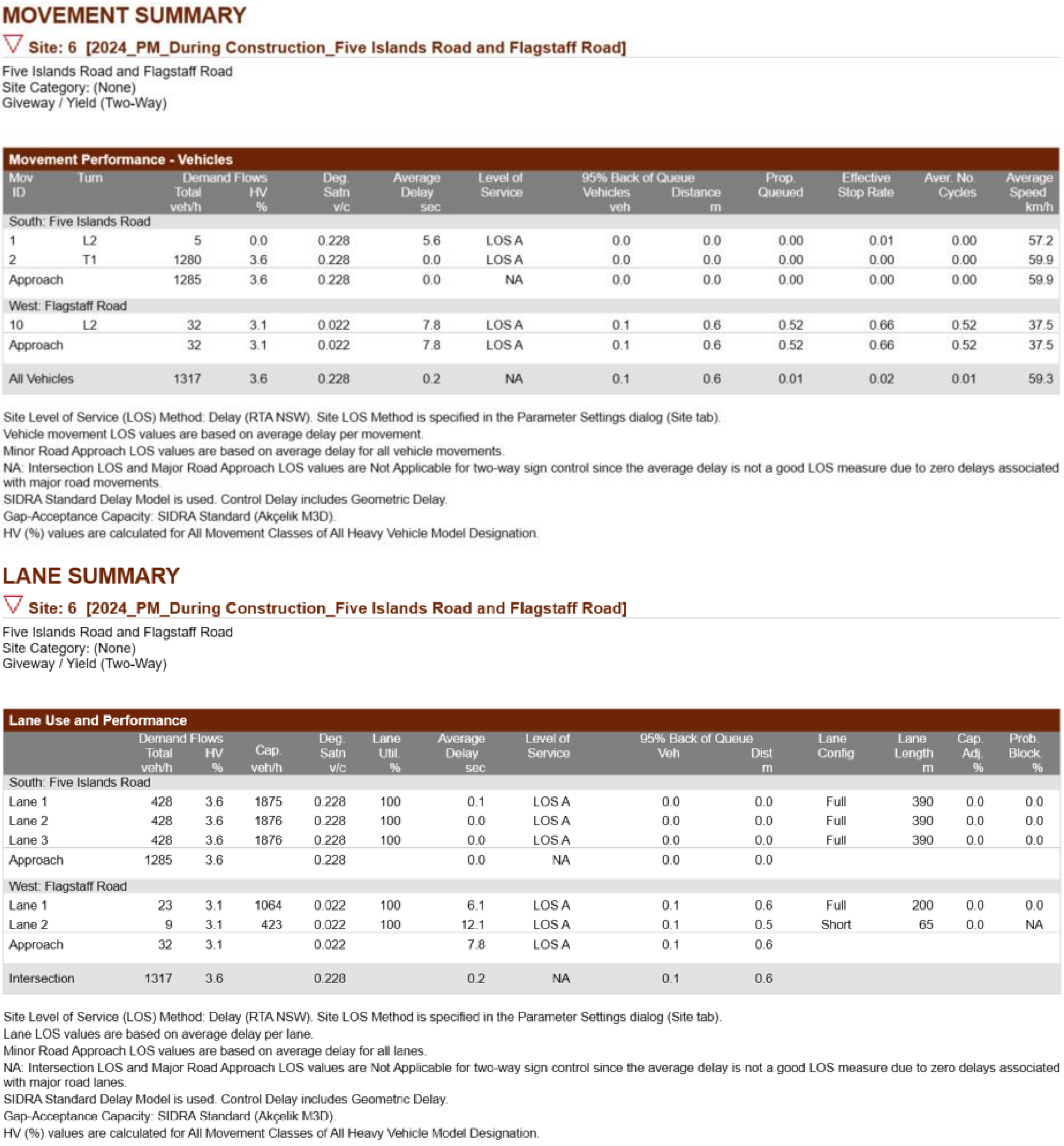
Five Islands Road and Flagstaff Road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Five Islands Road													
Lane 1	589	6.9	1820	0.324	100	1.0	LOS A	0.0	0.0	Full	390	0.0	0.0
Lane 2	599	5.8	1850	0.324	100	0.0	LOS A	0.0	0.0	Full	390	0.0	0.0
Lane 3	599	5.8	1850	0.324	100	0.0	LOS A	0.0	0.0	Full	390	0.0	0.0
Approach	1787	6.2		0.324		0.3	NA	0.0	0.0				
West: Flagstaff Road													
Lane 1	16	21.1	853	0.019	100	7.1	LOS A	0.1	0.6	Full	200	0.0	0.0
Lane 2	3	21.1	160	0.019	100	26.3	LOS B	0.1	0.5	Short	65	0.0	NA
Approach	19	21.1		0.019		10.1	LOS A	0.1	0.6				
Intersection	1806	6.3		0.324		0.4	NA	0.1	0.6				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Site 6: Five Islands Road and Flagstaff Road 2024 PM Peak



MOVEMENT SUMMARY

Site: 6 [2024_PM_During Construction_Five Islands Road and Flagstaff Road]

Five Islands Road and Flagstaff Road
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Five Islands Road												
1	L2	5	0.0	0.228	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	57.2
2	T1	1280	3.6	0.228	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1285	3.6	0.228	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Flagstaff Road												
10	L2	32	3.1	0.022	7.8	LOS A	0.1	0.6	0.52	0.66	0.52	37.5
Approach		32	3.1	0.022	7.8	LOS A	0.1	0.6	0.52	0.66	0.52	37.5
All Vehicles		1317	3.6	0.228	0.2	NA	0.1	0.6	0.01	0.02	0.01	59.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: 6 [2024_PM_During Construction_Five Islands Road and Flagstaff Road]

Five Islands Road and Flagstaff Road
Site Category: (None)
Giveway / Yield (Two-Way)

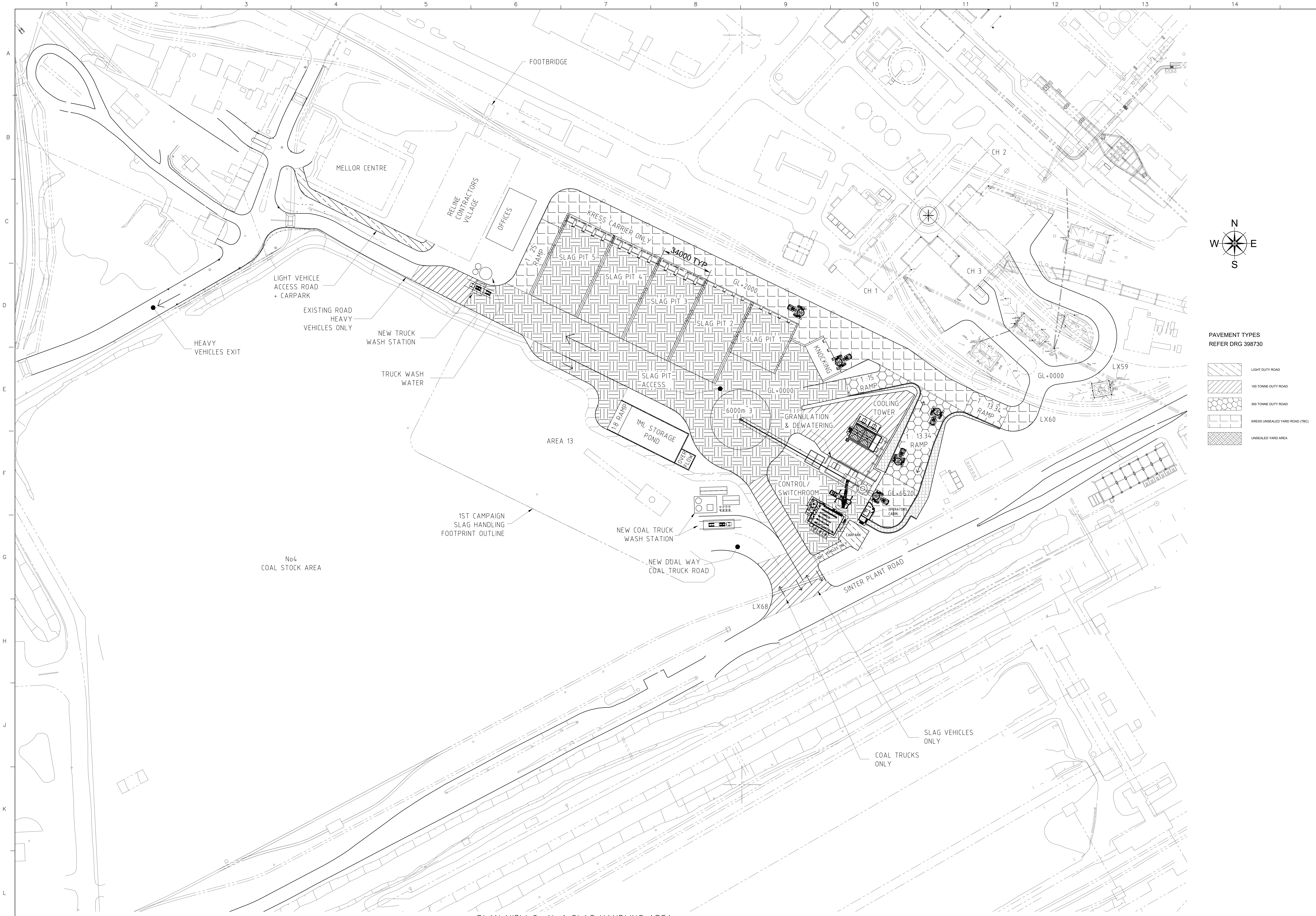
Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Five Islands Road													
Lane 1	428	3.6	1875	0.228	100	0.1	LOS A	0.0	0.0	Full	390	0.0	0.0
Lane 2	428	3.6	1876	0.228	100	0.0	LOS A	0.0	0.0	Full	390	0.0	0.0
Lane 3	428	3.6	1876	0.228	100	0.0	LOS A	0.0	0.0	Full	390	0.0	0.0
Approach	1285	3.6		0.228		0.0	NA	0.0	0.0				
West: Flagstaff Road													
Lane 1	23	3.1	1064	0.022	100	6.1	LOS A	0.1	0.6	Full	200	0.0	0.0
Lane 2	9	3.1	423	0.022	100	12.1	LOS A	0.1	0.5	Short	65	0.0	NA
Approach	32	3.1		0.022		7.8	LOS A	0.1	0.6				
Intersection	1317	3.6		0.228		0.2	NA	0.1	0.6				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix C

Slag handling area pavement upgrade



PLAN VIEW On No.6 SLAG HANDLING AREA

SCALE 1:1000

C	DATE 12/10/2021	PROJECT/WBS No	CHANGE APPROVAL No -
DRAWING STATUS:			
REVISED PAVEMENT TYPES - - -			
DRAWN: L. CICCARELLI		CHECKED: L. CICCARELLI	
O/No, CONT. NAME & REF No: -			
DE/SPEC: -			
DE/SPEC: -			
RESP ENG: L. CICCARELLI		REGN APPR: P. DI PIETRO	

B	DATE 02/09/21	PROJECT/WBS No	CHANGE APPROVAL No -
DRAWING STATUS:			
REVISED KRESS HAUL ROADS - - -			
DRAWN: L. CICCARELLI		CHECKED:	
O/No, CONT. NAME & REF No: -			
DE/SPEC: -			
DE/SPEC: -			
RESP ENG: L. CICCARELLI		REGN APPR: P. DI PIETRO	

A	DATE 21/07/21	PROJECT/WBS No	CHANGE APPROVAL No -
DRAWING STATUS: ISSUED FOR COMMENT			
NEW DRAWING - - -			
DRAWN: L. CICCARELLI		CHECKED: -	
O/No, CONT. NAME & REF No: -			
DE/SPEC: -			
DE/SPEC: -			
RESP ENG: L. CICCARELLI		REGN APPR: P. DI PIETRO	

DRAWING REVISIONS

FUNCTIONAL LOCATION CODES

INDEX CODES

REFERENCE DRAWINGS
-

BLUESCOPE STEEL Port Kembla Steelworks

DISC. ENGINEER OR SPECIALIST L. CICCARELLI	SUPERVISOR -
ORDER No: -	CONTRACTOR/SUPPLIER REF No: -

CONTRACTOR DETAILS

TITLE BLOCK TO COMPLY WITH SP-ENG-DES-196, VERSION CURRENT AT "DATE DRN"

B1

No.6 BLAST FURNACE
SERVICES
SLAG HANDLING
LAYOUT AND ARRANGEMENTS
CONCEPT PAVEMENT TYPES

CHANGE APPROVAL NUMBER:
PROJECT/WBS No:

DRAWN L. CICCARELLI	CHECKED	DISC. ENGINEER OR SPECIALIST
DISC. ENGINEER OR SPECIALIST	RESPONSIBLE ENGINEER	REGISTRATION APPROVAL

AUTOCAD FILE NAME: SLG-DWG-MECH-BSL-6BFPROP0035-C.DWG AUTOCAD PRINT: 12/10/2021 09:09 AM

DATE DRN
21/07/21

SCALE
1:1000

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DRAWING STATUS: ISSUED FOR COMMENT

REV No
C

FULL SIZE 0 50 100 150 200 250 300

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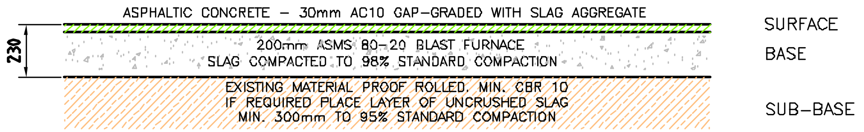
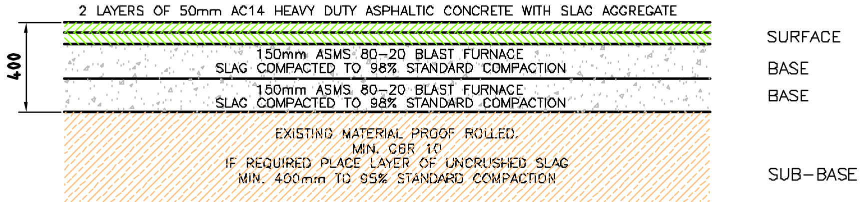


3 LIGHT DUTY ROAD

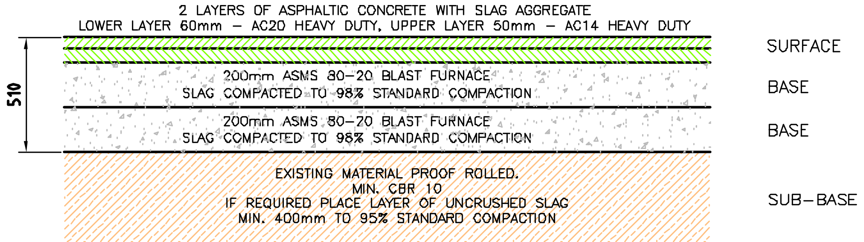
FOR GENERAL ROADS, OCCASIONAL HEAVY VEHICLES



PROOF ROLL & REMOVE "SOFT" MATERIAL & REPLACE WITH UNCRUSHED SLAG

3 100 TONNE DUTY ROAD

FOR HEAVY HAULAGE ROADS, OCCASIONAL OVERSIZE VEHICLES

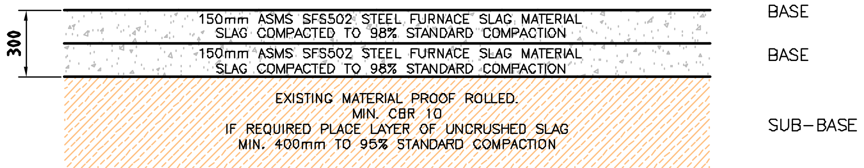


PROOF ROLL & REMOVE "SOFT" MATERIAL & REPLACE WITH UNCRUSHED SLAG

300 TONNE DUTY ROAD

3

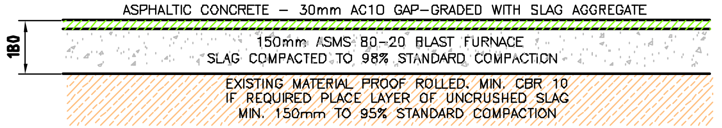
FOR OVERSIZE VEHICLE ROADS



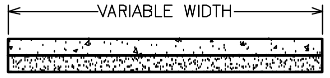
PROOF ROLL & REMOVE "SOFT" MATERIAL & REPLACE WITH UNCRUSHED SLAG

3 UNSEALED YARD AREA

FOR HEAVY VEHICLES
DO NOT USE SFS502 MATERIAL IF AREA IS TO BE AC SEALED



3 CARPARK



FOOTPATH

TYPICAL SECTION
SCALE 1:16

75mm 25MPa CONCRETE
75mm THICK LAYER – 6mm SLAG CRUSHER FINES
WITH SL62 MESH, 30 TOP COVER 2

3 PAVEMENT NOTES

1. THESE TYPICAL PAVEMENTS ARE A GUIDANCE ONLY. THE SELECTION OF THE APPROPRIATE PAVEMENT IS TO BE DESIGNED BY A SUITABLY QUALIFIED DESIGN ENGINEER TAKING INTO ACCOUNT TRAFFIC VOLUMES, DUTY LIFE, SUB-BASE SOIL CONDITIONS AND PERFORMANCE REQUIREMENTS.

2. ASPHALTIC CONCRETES TO CONFORM TO RTA SPECIFICATION R116 FOR HEAVY DUTY ASPHALT AND AS2150

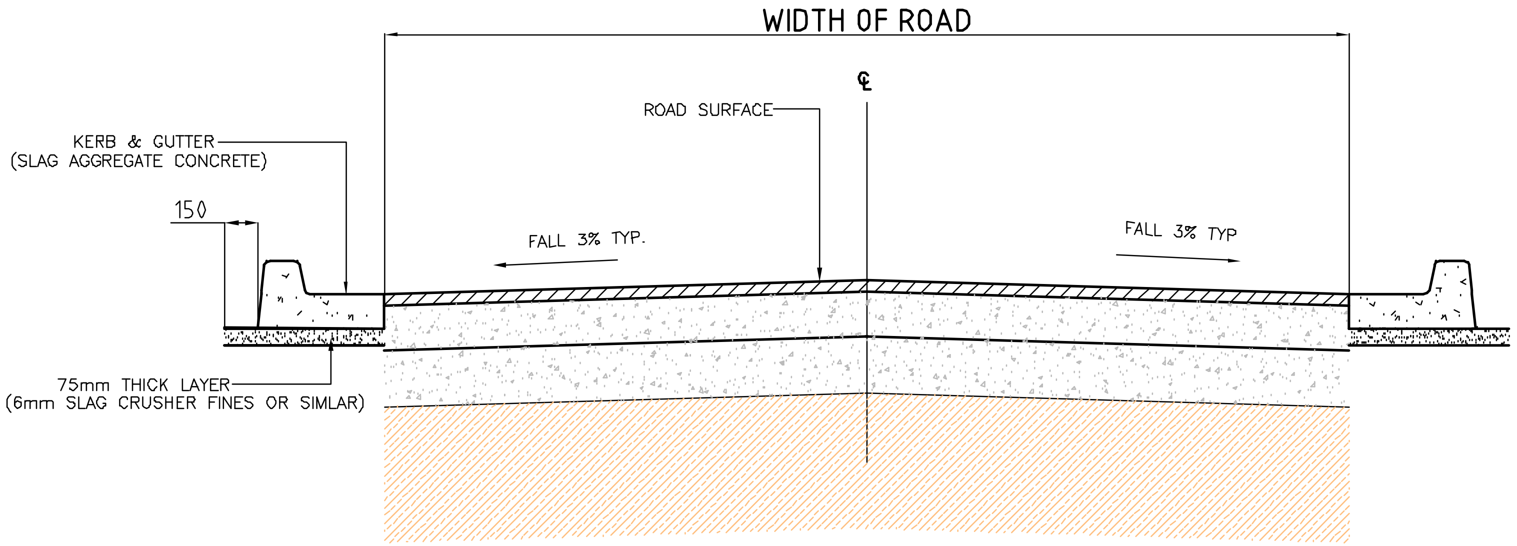
3. TYPICAL PAVEMENT CONSTRUCTION FOR PORT KEMBLA STEELWORKS SITE ONLY. GEOTECHNICAL INVESTIGATION SHOULD BE CARRIED OUT ON SUB-BASES LESS THAN CBR 10

4. POLYMER MODIFIED BINDER SHALL BE CONSIDERED IN ASPHALTIC CONCRETE BY THE DESIGN ENGINEER FOR ROUNDABOUTS WITH HEAVY TRAFFIC LOADS.

5. CONCRETE PAVEMENTS CAN ALSO BE CONSIDERED FOR SPECIAL LOAD SITUATIONS.

6. 2 COAT SPPAY SEAL CAN BE USED FOR LIGHT ROADS AND CARPARKS. DESIGN ENGINEER TO INVOLVED.

7. ROADBASE MATERIALS TO CONFORM TO RTA SPECIFICATION 3052



ROAD TYPICAL SECTION

NOT TO SCALE

ROAD CROSSFALLS – TYPICAL PAVEMENT CROSSFALLS.

ROAD SURFACE	TRAFFIC LANE (%).	SHOULDER (%).
CEMENT CONCRETE	2.0 – 3.0	2.0 – 4.0
ASPHALTIC CONCRETE	2.5 – 3.0	2.5 – 4.0
SPRAYED SEAL	3.0 – 4.0	3.0 – 4.0
UNSEALED	1.0 – 2.0	1.0 – 2.0

REFERENCES

RTA ROAD DESIGN GUIDE
AS 1742.1
AS 1742.2
AS 1742.7
AS 1742.10
AS 1742.11
AS 1742.13
AS 2150
RTA SPECIFICATION R116

ROAD WIDTHS

ROAD CLASSIFICATION	WIDTH (m).
SERVICE	7
ARTERIAL	9
OVERSIZE VEHICLE	10 / 12

DENOTES REVISIONS OF SK68945-SHEET3
PAVEMENT DEPTHS CHANGED
SELECT MATERIAL ZONE ADDED
ROAD WIDTH CHANGED

NOTE:
THIS DRAWING SUPERSEDES
BSL DWG SK68945_SHEET 3

FOOTWAY CROSSFALLS

MINIMUM	DESIRABLE	MAXIMUM
2%	3%	5%

No. OFF	ITEM	DESCRIPTION	REMARKS	MATERIAL No.

BLUESCOPE STEEL
Port Kembla Steelworks

DRAWING PRODUCED BY :-
TECHNOLOGY & ENVIRONMENT DEPARTMENT
INDUSTRIAL ARCHITECTURE
AUTOCAD SAVE NAME: 398730_112
CONTRACTOR/SUPPLIER REF No:

CONTRACTOR IDENTIFICATION
RESPONSIBLE ENGINEER
SUPERVISOR
ORDER No:
EWR/TASK:
TITLE BLOCK TO COMPLY WITH SP-ENG-DES-196

GENERAL WORKS
CIVIL STANDARDS
ROADS
ROAD PAVEMENT TYPES & CROSS SECTION DETAILS

REFERENCE DRAWINGS
SK68945 - SHEET 3

CHANGE APPROVAL NUMBER:
DRAWN: ROBYN JACKSON, PEA
CHECKED: DAVID DE SANTI
RESPONSIBLE ENGINEER: DAVID DE SANTI
DISC. ENGINEER / SPECIALIST:
DISC. ENGINEER / SPECIALIST:
REGISTRATION APPROVAL: DAVID DE SANTI

SCALE 1:16
DATE DRN. 28/12/15
INDEX CODE No'S
A1-38-004

398730
APPROVED FOR CONSTRUCTION

3

EWR/TASK:	DATE: 24/2/19	EWR/TASK:	DATE: 18/09/17	EWR/TASK:	DATE: 28/12/15
CHANGE APPROVAL No:		CHANGE APPROVAL No:		CHANGE APPROVAL No:	
CONTR:		CONTR:		CONTR:	
3 PAVEMENT CROSS-SECTIONS AMENDED PAVEMENT NOTES ADDED		2 NOTES ADDED CONCRETE DEPTHS EDITED		1 NEW DRAWING	
DRAWN: DAVID DE SANTI		DRAWN: D.FREEMAN		DRAWN: R.JACKSON	
RESP ENG: DAVID DE SANTI		RESP ENG: DAVID DE SANTI		RESP ENG: DAVID DE SANTI	
REGN APPROVAL: DAVID DE SANTI		REGN APPROVAL: DAVID DE SANTI		REGN APPROVAL: DAVID DE SANTI	

DRAWING AMENDMENT

FULL SIZE 0 50 100 150 200 250 300

ghd.com

→ The Power of Commitment

Appendix J

Greenhouse Gas Assessment

Blast Furnace No. 6 Reline Project

Greenhouse Gas Report

BlueScope Steel (AIS) Pty Ltd

07 March 2022

→ The Power of Commitment

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Sydney, New South Wales 2000, Australia
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Document status

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S4	0	Pantju Nam	Sue Trahair		Karl Rosen		04/02/22
S4	1	Pantju Nam	Sue Trahair	On file.	Karl Rosen		07/03/22

Executive summary

BlueScope Steel (AIS) Pty Ltd’s (BlueScope) Port Kembla Steelworks (PKSW) operation in NSW includes two blast furnaces. No. 5 Blast Furnace (5BF) is currently operating, while No. 6 Blast Furnace (6BF) is currently in care and maintenance. 5BF is expected to continue to produce (molten) iron on a continuous basis until it reaches the end of its operational life at some stage between 2026 and 2030. BlueScope is proposing a move of iron manufacture from 5BF to 6BF, after 5BF ceases operation. 6BF last produced iron in 2011, at which point it was taken out of service and placed into care and maintenance. To prepare 6BF to become operational again, major maintenance works are required (the project). The project aims to return 6BF to service through a reline process that will be carried out while 5BF continues to operate.

GHD Pty Ltd (GHD) was commissioned by BlueScope to prepare a Greenhouse Gas (GHG) assessment for the project. GHD has carried out this GHG assessment in accordance with relevant international, national, state, and local policies, using methodologies which are representative of good GHG accounting in Australia.

Construction emissions from the project rely upon data from other sections of the Environmental Impact Statement, as well as data supplied by BlueScope. Construction emissions are estimated to be 30,000 tCO$_2$-e, or approximately 9,800 tCO$_2$-e per annum over the three-year construction period. Emissions during construction are minor and approximately 0.1% of annual operational emissions.

Operational emissions from the project rely upon Scope 1 and 2 emissions data provided by BlueScope. The quantity of GHG emissions for the operation of PKSW, of which 6BF will be a component, was approximately 6,869,000 tCO$_2$-e per annum in FY2021. The assessment of Scope 1 and 2 operational emissions concluded that 6BF will have a similar GHG emissions profile to 5BF with improvements (reductions) in GHG emissions intensity from the commencement of operations of 6BF. Over $100 million of project scope is directed at environmental improvements, including $80 million of improvements which are designed to deliver reductions in GHG emissions. This will mean that the project will make a near-term positive environmental impact, relative to current 5BF operations. The scope of the project is intended to address the dual aims of the project: to secure BlueScope’s domestic ironmaking needs from 2026, as well as provide a bridge to transition from current blast furnace technology to new and emerging low emissions technologies once available at commercial, viable scale.

Construction emissions from the project rely upon data from other sections of the Environmental Impact Statement, as well as data supplied by BlueScope. Construction emissions are estimated to be 30,000 tCO$_2$-e, or approximately 9,800 tCO$_2$-e per annum over the three-year construction period. Emissions during construction are minor and approximately 0.1% of annual operational emissions.

This GHG assessment is supported by qualitative information taken from the Climate Action Report published in 2021 (Climate Action Report) by BlueScope’s parent company, BlueScope Steel Limited (BSL). GHD considers this to be an appropriate assessment approach in the context of the complex operations of an integrated iron and steelmaking facility such as PKSW. In adopting this approach, GHD has also had regard to the fact that the project is essentially a like for like replacement of current ironmaking operations at 5BF.

Current steelmaking technology is a GHG intensive activity. For example, in 2020, the average GHG emissions intensity of steelmakers reporting to Worldsteel using BF-BOF technology was 2.33 tCO$_2$-e per tonne of crude steel produced. During this period, the GHG emissions intensity of steelmaking at PKSW was 2.21 tCO$_2$-e per tonne of crude steel produced, comparing favourably to the average reported by Worldsteel. This means that for 2020, PKSW was within the top quartile of reporters in terms of lowest GHG emissions intensity for integrated steel plants globally, using the Worldsteel calculation methodology (based on ISO 14404 series).

BSL’s publication of its Climate Action Report acknowledges the role the steel industry can play in the transition to a net zero emissions future, including its use as a critical component of renewable energy and transport infrastructure. To achieve net zero emissions in steelmaking, commercialisation of breakthrough technologies and supporting infrastructure will be needed.

The availability of breakthrough low GHG emissions ironmaking technologies was considered by BlueScope in assessing options for the future configuration of PKSW. However, as technologies that are suitable for use at PKSW are unlikely to be available and commercially viable at scale until a time well after that required to replace 5BF, the only technically feasible and commercially viable option for BlueScope to continue steelmaking at Port

Kembla in the short to medium term is to progress with the existing configuration and reline 6BF. The reline of 6BF provides a ‘bridge’ to transition from the current blast furnace technology to new and emerging low emissions technologies when they are commercially available.

The GHG reduction measures incorporated in the project design are outlined in section 6 of this report. These measures include the installation of a Top Gas Recovery Turbine to generate electricity, installation of a Waste Gas Heat Recovery system to reduce fuel consumption at the stoves, installation of dual lances at the tuyeres to enable the use of alternative reductants such as hydrogen-rich Coke Ovens Gas and renewable hydrogen, and optimisation of raw material inputs. These measures are part of a broader suite of climate-related projects at Port Kembla that have the potential to further reduce GHG emissions intensity.

In addition to these measures and outside of the scope of the project, BlueScope and BSL are currently investigating emerging technologies such as the use of sustainably sourced biochar as a replacement for pulverised coal used in the blast furnace and, in partnership with Shell Energy Operations Pty Ltd, the design, build and operation of a 10 MW renewable energy hydrogen electrolyser to test the use of renewable hydrogen in the blast furnace at PKSW. BSL has also signed a Memorandum of Understanding with Rio Tinto Group to explore using renewable hydrogen to replace coking coal to directly reduce iron ore sourced from the Pilbara region. Other GHG emission reduction investments made by BSL external to the project are outlined in section 3.

This GHG assessment has been informed by GHG emission data reported for existing operations and the targets and goals set by BSL in the Climate Action Report (noting the enablers essential to those targets being met are explained in the Climate Action Report), including those relating to BlueScope’s operations at PKSW. The aims and objectives of the Climate Action Report are considered to be consistent with international, national, state, and local GHG policies which are outlined in section 3 of this report.

Similarly, the commitment of BlueScope over the campaign life of 6BF to continue research and investment in emerging technologies for PKSW, including 6BF, to more substantially reduce GHG emissions, are considered by GHD to be consistent with international, national, state and local GHG policies aimed at achieving a net zero future.

Contents

Table index

Figure index

Terms and abbreviations

Abbreviation	Description
ABS	Australian Bureau of Statistics
AR	Assessment Report
BF	Blast Furnace
BFG	Blast Furnace Gas
BlueScope	BlueScope Steel (AIS) Pty Ltd
BOF	Basic Oxygen Furnace
BSL	BlueScope Steel Limited
°C	Degrees Celsius
C	Carbon
C&D	Construction and Demolition
CBAM	Carbon Border Adjustment Mechanism
CCUS	Carbon Capture Usage and Storage
CH_4	Methane
COG	Coke Ovens Gas
CO_2	Carbon dioxide
CO2CRC	CO_2 Cooperative Research Centre
CSSI	Critical State Significant Infrastructure
DPIE	Department of Planning, Industry and Environment
DRI	Direct Reduced Iron
DISER	Department of Industry, Science, Energy and Resources
EAF	Electric Arc Furnace
EF	Emission Factor
EIS	Environmental Impact Statement
EP&A	Environmental Planning and Assessment 1979
EU	European Union
FY	Financial year
GHD	GHD Pty Ltd
GHG	Greenhouse gas
GHG Protocol	Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard
GWP	Global Warming Potential
H_2	Hydrogen
HBI	Hot Briquetted Iron
HPCOG	High Pressure Coke Ovens Gas
IPCC	Intergovernmental Panel on Climate Change
ISO	International Standards Association
kg	Kilograms
kL	Kilolitre
km	Kilometres

Abbreviation	Description
kPa	Kilopascal
kW/m^2	Kilowatts per square metre
LGA	Local Government Area
LPG	Liquefied Petroleum Gas
m	Metres
MSW	Municipal Solid Waste
Mtpa	Million tonnes per annum
MW	Megawatt
MWh	Megawatt hour
N_2O	Nitrous oxide
NG	Natural Gas
NGA	National Greenhouse Accounts
NGER	National Greenhouse and Energy Reporting
NGER Act	National Greenhouse and Energy Reporting Act 2007
NSW	New South Wales
PCI	Pulverized Coal Injection
PKSW	Port Kembla Steelworks
RCPs	Representation Concentration Pathways
SEARs	Secretary’s Environmental Assessment Requirements
SF_6	Sulphur hexafluoride
scrap	scrap steel
SRD	State and Regional Development
t	Tonnes
tCO_2-e	Tonnes of carbon dioxide equivalent
TCFD	Task Force on Climate-related Financial Disclosures
TRL	Technology Readiness Level
TRT	Top Gas Recovery Unit
UN	United Nations
USD	United States Dollar

1. Introduction

1.1 Background and project overview

BlueScope Steel (AIS) Pty Ltd’s (BlueScope) Port Kembla Steelworks (PKSW) operation in NSW includes two blast furnaces. No. 5 Blast Furnace (5BF) is currently operating, while No. 6 Blast Furnace (6BF) is in care and maintenance.

5BF is expected to continue to produce (molten) iron on a continuous basis until it reaches the end of its operational life at some stage between 2026 and 2030. BlueScope is proposing a move of iron manufacture from 5BF to 6BF, after 5BF ceases operation.

6BF last produced iron in 2011, at which point it was taken out of service and placed into care and maintenance. To prepare 6BF to become operational again, major maintenance works are required (the project). The project aims to return 6BF to service through a reline process that will be carried out while 5BF continues to operate.

The project has been declared Critical State Significant Infrastructure (CSSI) in accordance with section 5.13 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and Schedule 5 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP).

1.2 Purpose of this report

GHD Pty Ltd (GHD) was commissioned by BlueScope to prepare a greenhouse gas (GHG) assessment for the project. This report will support the preparation of an Environmental Impact Statement (EIS) under the EP&A Act for the project.

This report addresses the relevant criteria in the NSW Secretary’s Environmental Assessment Requirements (SEARs) for the project issued in July 2021 (as outlined in Section 3.7).

As such, this report focuses on the impact of GHG emissions associated with the ongoing iron making from 6BF once 5BF comes to the end of its current campaign.

1.3 Proponent details

BlueScope Steel (AIS) Pty Ltd (BlueScope) (ABN 19 000 019 625) is a wholly owned subsidiary of BlueScope Steel Limited (BSL) (ABN 16 000 011 058). BlueScope is the owner and operator of PKSW and is the proponent for the project. BlueScope is one of Australia’s leading manufacturers, and one of only two primary producers of iron and steel in Australia, and together with BSL, is a global leader in finished and semi-finished steel products.

1.4 Limitations

This report has been prepared by GHD for BlueScope Steel (AIS) Pty Ltd and may only be used and relied on by BlueScope Steel (AIS) Pty Ltd for the purpose agreed between GHD and BlueScope Steel (AIS) Pty Ltd as set out in Section 1.2.

GHD otherwise disclaims responsibility to any person other than BlueScope Steel (AIS) Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by BlueScope Steel (AIS) Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2. Methodology

2.1 Overview

The SEARS (refer Section 3.1) require an assessment of GHG emissions associated with the project, but do not mandate a specific standard, protocol, or methodology for the GHG assessment. This assessment has been undertaken in accordance with the principles of ISO 14064-2 and National Greenhouse and Energy Reporting (NGER) (Measurement) Determination 2008 for measuring emissions, in the following steps:

- Review relevant legislation, guidelines and policy documents to establish the regulatory context for the GHG assessment. Refer Section 3.
- Describe the existing environment, PKSW, and the proposed project. Refer Section 4.
- Establish baseline GHG emissions for PKSW inclusive of the existing operation of 5BF and assess the likely GHG emissions from 6BF. Refer Section 5.
- Assess potential GHG emissions reduction measures that may be applicable to the operation of 6BF and review their viability for incorporation into the project. Refer Section 6.

2.2 Greenhouse gases and global warming potentials

The GHGs considered in this assessment and the corresponding global warming potential (GWP) for each GHG are listed in Table 2.1. GWP is a metric used to quantify and communicate the relative contributions of different substances to climate change over a given time horizon. GWP accounts for the radiative efficiencies of various gases and their lifetimes in the atmosphere, allowing for the impacts of individual gases on global climate change to be compared relative to those for the reference gas carbon dioxide (CO_2).

The GWPs from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment report and section 2.02 of the National Greenhouse and Energy Reporting (NGER) Regulations 2008, updated July 2021, were used in this assessment.

Table 2.1 Greenhouse gases and 100-year global warming potentials

Greenhouse gas	Global warming potential
Carbon dioxide (CO_2)	1
Methane (CH_4)	28
Nitrous oxide (N_2O)	265
Sulphur hexafluoride (SF_6)	23,500

2.3 Assessment approach

Relevant sections of the following documents were used for the purposes of defining appropriate methods for quantification of emissions from individual sources from existing operations:

- NGER (Measurement) Determination 2008 (as amended) and NGER Act 2007, Commonwealth Department of Environment and Energy
- Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (GHG Protocol) (World Business Council for Sustainable Development and World Resources Institute, 2015)

These guidelines are considered representative of good practice GHG accounting in Australia and are applicable to the project.

The methodology undertaken for this GHG assessment is semi-quantitative using the data provided by BlueScope and BlueScope reports for the operational emissions of the project. Therefore, the assessment will use existing GHG emissions calculated by BlueScope.

2.3.1 Construction phase emission sources

The following emission sources were included in the assessment boundary for the construction stage:

- Diesel used in plant and equipment
- Transport of plant, materials and equipment to the site, and removal of waste from the site
- Worker commuting, including private transport to/from the site, and buses used around the site
- Electricity from the NSW grid
- Disposal of waste
- Acetylene for welding
- Natural gas use during commissioning of the 6BF.

2.3.2 Operations phase emission sources

The following emission sources were included in the assessment boundary for the operations stage:

- Scope 1 and 2 emissions from iron and steelmaking activities.

2.4 Assumptions and exclusions

The following were excluded from the GHG assessment:

- The scope of this assessment did not include detailed analysis of Scope 3 emissions. Scope 3 emissions associated with construction of the project will be comparable to when BlueScope undertakes periodic maintenance shutdowns and are considered relatively minor. The Scope 3 emissions associated with the operation of 6BF will not materially differ from existing operations, given 5BF and 6BF use the same technology to make iron, and only one furnace will be operating at a time. The Scope 3 emissions from the production of iron ore and coal will therefore remain relatively consistent and as such, a detailed analysis of Scope 3 emissions has not been undertaken.
- No significant vegetation clearing is required by the project with the exception of some weeds on established hardstand areas. Therefore, emissions associated with vegetation clearing are negligible and do not require further consideration.
- Emissions during the operation of the project which are likely to be negligible compared with other emissions from the proposal, include:
  - Emissions associated with combustion of fuels used in minor quantities such as LPG, gasoline, solvents, oils and greases during maintenance and inspection activities.
  - Emissions associated with the leakage of hydrofluorocarbons. The project may use negligible quantities of hydrofluorocarbons for refrigeration and air conditioning during operation of the proposal, and therefore have not been included in this assessment.
- Emissions during the operation of the project which will be the same as current operations, including:
  - Transport of workers to site
  - Transport of raw materials to the site
  - Transport of products and co-products from the site

3. Industry, legislative and policy context

3.1 Secretary's environmental assessment requirements

Table 3.1 outlines the SEARs relevant to GHG.

Table 3.1 Greenhouse gas SEARs

Requirements	Where addressed
An assessment of the greenhouse gas emissions of the project and any measures to minimise emissions intensity, improve energy efficiency and adopt new technologies to reduce emissions in the medium to long term	– Section 5 impact assessment – Section 6 GHG reduction measures and technologies – Section 7 mitigation measures

3.2 Steel industry context

The traditional blast furnace methodology for iron and steel production is carbon intensive: the process relies on the stripping of oxygen from ferrous ores using carbon (in the form of coke) as the reductant. Currently, approximately 73% of the world's iron production is via the blast furnace pathway. Every tonne of steel globally produced across all steel manufacturing technologies in 2020 emitted, on average, 1.85 tonnes of CO_2, equating to 7 to 9 percent of global CO_2 emissions in that year (Worldsteel Association, 2021). Consequently, steel manufacturers across the globe are increasingly facing a decarbonisation challenge. This challenge is driven by three key developments that go beyond the Paris Agreement (McKinsey & Company, 2020):

- *Further tightening of carbon emission regulations.* This is manifested in CO_2 reduction targets, as well as rising CO_2 emission prices as outlined in the European Green Deal.
- *Growing investor and public interest in sustainability*. For example, the Institutional Investors Group on Climate Change, a global network with 250-plus investors and over USD 30 trillion in assets under management, has raised expectations for the steel industry to safeguard its future in the face of climate change. At the same time, global investment firm BlackRock has confirmed its commitment to environmentally responsible business development and sustainable investing.
- *Changing customer requirements and growing demand for carbon-friendly steel products*. A trend that has already been observed in various industries, including the auto industry, where manufacturers have the aim of eliminating carbon emissions completely from their entire value chains (including their suppliers) and taking on a full life cycle perspective in future.

A recent study of 20 global steelmakers estimates that the global steel industry may find approximately 14 percent of steel companies' potential value is at risk if they are unable to decrease their environmental impact under a 2°C scenario (refer to Section 3.3.1 for more information regarding Intergovernmental Panel on Climate Change, climate scenario), where global carbon prices rise to USD 100 per tonne of CO_2 (McKinsey & Company, 2020). Results range from 2 percent to 30 percent for individual companies.

To reduce its GHG emissions, the steel industry has identified a range of measures to be implemented. These are reflected in BSL's first Climate Action Report published in 2021 (Climate Action report), and include:

- Reducing emissions in response to climate science, technology availability and the timing of key investment decisions
- Creating carbon efficient and climate resilient solutions for customers
- Increasing the use of affordable and reliable renewable energy
- Using quality, cost-effective carbon offsets only where direct abatement is not feasible
- Making the case for local, sustainable steel use
- Monitoring and appropriately managing climate risks and engaging with external stakeholders and partners.

BlueScope and BSL acknowledge the part they can play in the steel industry's transition to net zero. The Climate Action Report, the contents of which are discussed further in section 3.7, describes the strategies which will underpin this transition for BSL, including the transition which has already commenced and which will continue at BlueScope's PKSW.

It should also be acknowledged that steel is a fundamental part of any future renewable economy. Steel will be required for all alternative energy systems used to power the economy in the future. Further, steel is a fundamental part of the circular economy, being infinitely recyclable. In playing its part in supplying materials to drive the renewable economy BlueScope and BSL acknowledge that this needs to be undertaken with reduced CO_2 intensity.

3.3 Global policy context

Australia is one of 191 countries plus the European Union that have committed to keeping global temperature rises to well below 2°C through the Paris Agreement under the United Nations Framework Convention on Climate Change (Paris Agreement). Over 73 of these countries, including Australia, have set a goal of reaching net zero GHG emissions by 2050. Some countries may also start acting beyond the commitments of the Paris Agreement. Action on climate change at the diplomatic and national levels is mirrored in many parts of the global community. Details of Australia's commitment to meeting globally agreed targets are outlined in Section 3.4.

More than 175 of the world's largest companies have committed to reducing their emissions to net zero by 2050, and local governments and community groups are increasingly looking for opportunities to invest in emissions reduction initiatives. The Intergovernmental Panel on Climate Change (IPCC) provides scientific information on anthropogenic climate change which is relied upon in global agreements (such as the Paris Agreement) on how to mitigate and adapt to future climatic conditions.

3.3.1 Intergovernmental Panel on Climate Change

The IPCC strongly recommends limiting the global temperature increase to 1.5°C, to prevent the impacts of climate change significantly increasing. These impacts amplify rapidly between just 1.5°C and 2°C of temperature increase. The IPCC has reported that limiting global warming to 1.5°C will require "rapid and far-reaching" transitions in land, energy, industry, buildings, transport, and cities. Global net human-caused emissions of CO_2 will need to fall by about 45 percent from 2010 levels by 2030, reaching 'net zero' around 2050. This means that any remaining emissions will need to be balanced by removing CO_2 from the air (IPCC, 2021). The ideal scenario to slow warming would be Representation Concentration Pathways (RCPs)[1] 2.6, however, according to the IPCC the world is on track for RCP 6.0 or RCP 8.5 if no measures are implemented in the next decade (IPCC, 2021). Table 3.2 details the IPCC's RCPs.

Table 3.2 Climate Change Emission Scenarios

Global climate response	Climate scenario	Projected increase in global surface temperature	IPCC report source
Strong immediate response, emissions peak by 2020, with rapid decline in emissions thereafter from global participation and application of technologies	**RCP 2.6**, atmospheric concentration of CO_2 projected at approximately 420 ppm by 2100	Mean projected increase **1.0°C** Anomaly range +0.3 to 1.7°C (by 2081 – 2100)	Assessment Report (AR)5 (IPCC, 2014)
Slower response, emissions peak around 2040, then decline	**RCP 4.5**, atmospheric concentration of CO_2 projected at approximately 540 ppm by 2100	Mean projected increase **1.8°C** Anomaly range +1.1 to 2.6°C (by 2081 – 2100)	AR5 (IPCC, 2014)

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[1] RCPs are concentration pathways used in the IPCC which show different greenhouse gas concentration (not emissions) trajectories to illustrate possible climate futures (e.g. a high emissions future meaning increased temperatures or a low emissions future with less temperature increase) which are dependent on the volume of GHG emissions in the future.

Global climate response	Climate scenario	Projected increase in global surface temperature	IPCC report source
Slow response, application of mitigation strategies and technologies	**RCP 6.0**, atmospheric concentration of CO_2 projected at approximately 660 ppm by 2100	Mean projected increase **2.2°C** Anomaly range +1.4 to 3.1°C (by 2081 – 2100)	AR5 (IPCC, 2014)
Little curbing of emissions, continuing rapid rise throughout the 21st century	**RCP 8.5**, atmospheric concentration of CO_2 projected at approximately 940 ppm by 2100 and continuing to increase	Mean projected increase **3.7°C** Anomaly range +2.6 to 4.8°C (by 2081 – 2100)	AR5 (IPCC, 2014)

3.4 National policy context

The Australian government is taking a technology led approach, implemented via a whole-of-economy plan, to achieve a net zero emissions target by 2050. This plan is outlined in *Australia's Long-Term Emissions Reduction Plan* (Australian Government, 2021).

3.4.1 Australia's Long-Term Emissions Reduction Plan

Australia's Long-Term Emissions Reduction Plan (the Plan), published in 2021, is a whole-of-economy plan that aims to achieve net-zero emissions by 2050. The Plan emphasises the Australian Government's commitment to promoting employment, particularly in regional Australia, whilst also continuing to pursue opportunities for economic growth through international partnerships.

The Plan relies on lowering technology costs as opposed to raising taxes to reduce emissions. Examples of technology that will be promoted under the Plan include clean hydrogen, low-cost solar, energy storage, low emissions steel and aluminium, carbon capture and storage and soil carbon. The Plan aims to not only lower the costs of these existing technologies, but also to investigate emerging technologies such as livestock feed to reduce methane emissions. Approximately $20 billion of Government funding will underpin this Technology Investment Roadmap by 2030.

By maintaining a focus on expanding choices for Australian consumers and businesses, the Plan aims to incentivise buy-in and promote interest in developing industry specific decarbonisation plans with realistic targets and an attitude of accountability. By utilising a holistic, all-economy approach, the Plan aims to create clean energy supply chains involving all market sectors. This is based on a four-pronged approach which includes:

- Driving down technology costs
- Enabling development at scale
- Seeking opportunities in new and traditional markets
- Fostering global collaboration

The Plan highlights the crucial role that needs to be played by regional industries, including industries in the traditional energy production and energy intensive sectors which, according to the Plan, have formed the backbone of Australian exports. The Plan advocates for a voluntary decarbonisation approach as it acknowledges the ongoing demand for coal, gas and carbon intensive exports globally. The Plan reflects the view of the Australian Government that transitioning to other energy producing or utilising industries, such as clean hydrogen and renewable energy, requires a delicate balancing act as Australia aims to retain its position as a global exporter of coal and gas in the interim (Australia Government, 2021).

The Plan outlines how the Australian Government plans to achieve net zero GHG emissions by 2050. As discussed later in this report, the project incorporates technologies which will, immediately upon commencement of ironmaking from the relined 6BF, reduce GHG emissions intensity from iron and steelmaking at PKSW relative to emissions from current operations. In addition, the project includes features to facilitate transition to emerging new low emissions technology once proven at commercial scale. The project is therefore consistent with the aims and objectives of the Plan.

3.5 State policy context

3.5.1 NSW 2040 Economic Blueprint

The NSW 2040 Economic Blueprint (NSW Government 2019) (the Blueprint) aims to inform views on what the NSW economy can achieve over the next two decades. The Blueprint has been informed by research on economic, jobs and productivity trends, and through broad consultation with various stakeholders. The Blueprint identifies a range of recommendations to enhance the performance of the NSW economy guided by the following aspirations:

- A two-trillion-dollar economy after 2040
- Healthy, productive people
- Vibrant, well-connected cities
- Productive, vibrant regions
- Innovative, world-class businesses
- Sustainable environmental and resources management
- Better government performance

A key aspect of the Blueprint in achieving the above aspirations is a focus on economic growth, advanced manufacturing and new industries. The project will contribute to these areas through the significant capital investment being made, and the jobs and revenue it will deliver to the NSW economy, once operational and also during construction. Additionally, the continued production of steel at PKSW will benefit downstream manufacturing industries, helping to promote the development of advanced GHG reduction mechanisms, for example, by supplying steel for renewable energy infrastructure and projects.

In relation to the aspiration of innovative, world-class businesses, the Blueprint recommends encouraging high growth future industries, more advanced manufacturing, and growing the local defence industry supply chain. The project will help realise these recommendations by maintaining the domestic supply of steel products to manufacturing businesses within these sectors. This will contribute to the State’s capacity to secure defence procurements and facilitate the growth of new businesses and industries, as well as reduce the transport of materials from overseas, thereby decreasing transport-related GHG emissions. The Blueprint identifies that sustainable environmental and resource management is required to have an innovative industrial base, liveable cities, productive jobs, and high living standards.

The potential impacts of the GHGs from the project and associated reduction measures have been assessed throughout this report. BlueScope has incorporated commercially proven GHG reduction technologies into the project, as well as measures which will facilitate the transition to emerging new low emissions technology once proven at commercial scale. The project is therefore considered to be consistent with the aspiration of sustainable environmental and resource management.

3.5.2 NSW Climate Change Policy Framework

The NSW Government has released the NSW Climate Change Policy Framework, which commits NSW to the aspirational objectives of achieving net zero emissions by 2050, helping NSW to become more resilient to a changing climate.

The policy framework defines the NSW Government’s role in reducing GHG emissions and adapting to the impacts of climate change. The Net Zero Plan Stage 1: 2020-2030 (Net Zero Plan) is the first stage implemented under the NSW Climate Change Policy Framework. It outlines how the NSW Government’s climate change objectives will be achieved over the current decade. Plans for the following two decades will be released in stages to enable incorporation of evolving technologies, and to allow for continual improvement over time with the aim of achieving net zero emissions by 2050.

Net Zero Plan Stage 1: 2020–2030

The Net Zero Plan Stage 1: 2020–2030 outlines four key priorities for reducing emissions in the period 2020 to 2030. These are:

- Drive uptake of proven emission reduction technologies
- Empower consumers and businesses to make sustainable choices
- Invest in the next wave of emissions reduction innovation
- Ensure that NSW leads by example

As discussed in section 6, BlueScope has incorporated commercially proven GHG emission reduction technologies into the project, as well as measures which will facilitate the transition to emerging new low emissions technology once proven at commercial scale. The project is therefore consistent with the NSW Climate Change Policy Framework and Net Zero Plan Stage 1: 2020–2030.

3.6 Local policy context

Wollongong City Council (Council) has developed and implemented the following plans and strategies of relevance to GHG:

- Wollongong City Council Climate Change Mitigation Plan 2020
- Sustainable Wollongong 2030

3.6.1 Climate Change Mitigation Plan 2020

The objectives of Wollongong City Council's Climate Change Mitigation Plan 2020 are to:

1. Lead the community in emissions reduction and climate change action.
2. Reduce Council's GHG emissions through effective energy management and improving energy efficiency.
3. Reduce Council's GHG emissions through the increased use of renewable energy and alternative fuels.
4. Reduce Council's GHG emissions from landfill through resource recovery and gas capture.
5. Support the community and businesses to reduce their GHG emissions.

3.6.2 Sustainable Wollongong 2030

The Sustainable Wollongong 2030 strategy outlines how the City of Wollongong will work together with key stakeholders to create a sustainable future and a more liveable city. The strategy provides the overarching framework and goals to create a sustainable Wollongong. It identifies six priority areas and six related goals relevant to fostering increased sustainability in Wollongong. Of relevance to the project are:

- Priority area 1 goal: Environmental and climate leadership underpins Council decision-making and service delivery which inspires the same in others.
- Priority area 2 goal: Together protect our environment, reduce emissions and increase resilience to climate change.
- Priority area 3 goal: We will achieve net zero emissions by 2030 for Council operations and together achieve net zero emissions by 2050 for the city.

As a significant employer and contributor to the local community, BlueScope is cognisant of the role it plays in assisting the Council in achieving its goals. As demonstrated by BSL's Climate Action Report, BlueScope, as the largest Australian company within the BSL group of companies, is committed to showing leadership in reducing emissions from its operations. The project, through the incorporation of GHG reduction technologies which have been proven to be viable at commercial scale, as well as measures which will allow for the transition to emerging new low emissions technology once proven at commercial scale, is consistent with the goals of both the Council's Climate Change Mitigation Plan 2030 and the Sustainable Wollongong 2030 strategy.

3.7 BlueScope context

BlueScope's parent company, BSL, has embedded climate strategy into its corporate strategy and has set a goal of pursuing net zero GHG emissions across its global operations by 2050. Achieving the 2050 net zero goal is highly dependent on several enablers, including the commerciality of emerging and breakthrough technologies, the availability of affordable and reliable renewable energy and hydrogen, the availability of quality raw materials, and the appropriate policy settings. BSL has also established medium term targets of a 12% improvement in Scope 1 and 2 GHG emissions intensity by 2030 for its steelmaking activities, and a 30% improvement GHG emissions intensity by 2030 for its non-steelmaking activities[2].

The company has taken a range of measures to enhance its management of climate change risks and opportunities, including reporting annually in line with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). The importance of the climate change strategy is evidenced by the refocus of the Board Committee previously known as the Audit and Risk Committee to issues around sustainability, including climate change, and the corresponding change of name to the Risk and Sustainability Committee of the Board. The company has also established a Climate Change Council, introduced shadow carbon pricing for the evaluation of major capital projects, and invested in a solar power purchasing agreement equivalent to 20 per cent of its Australian electricity consumption. In February 2021, BSL appointed a Chief Executive Climate Change to lead its global climate change response and help drive the company's decarbonisation pathway.

BlueScope and BSL are also participating in and leading several collaborations with industry and research organisations, including ResponsibleSteel, the Net Zero Steel Pathway Methodology Project, the Australian Industry Energy Transition Initiative project, and with the University of Wollongong.

To achieve net zero emissions in steelmaking, commercialisation of breakthrough technologies and supporting infrastructure will be needed. The availability of breakthrough low carbon ironmaking technologies has been an important consideration in assessing options for the future configuration of PKSW. As these technologies require significant development, and are unlikely to be commercially viable at industrial-scale for use in the specific circumstances at Port Kembla Steelworks prior to the end of the current 5BF campaign, the most technically feasible and economically viable option for BlueScope at this time is to progress with the project. As emerging and breakthrough technologies are developed over time to full commercial scale, the strong cash-flows and earnings capability of the Australian Steel Products business, of which BlueScope is a part, is expected to provide significant capacity to transition to these technologies as and when they become technically and commercially viable for use in the Australian context. While breakthrough technologies continue to be developed, there is scope to optimise production processes to reduce GHG emissions through existing and emerging technologies.

Raw material availability will be crucial to secure steel production capability in the near and longer term and to support the transition to net zero. Securing access to the raw materials that are currently used in the blast furnace process, such as metallurgical coal, will be critical in the early transition period, as will be securing future raw material requirements, such as Direct Reduced Iron (DRI) and renewable hydrogen.

BSL and BlueScope are working with partners across the industry, including research and academic bodies to explore emerging and breakthrough technologies to support their decarbonisation pathway. In October 2021 BSL and Rio Tinto signed a Memorandum of Understanding (MOU) to research and design low-emissions processes and technologies for the steel value chain across iron ore processing, iron and steelmaking and related technologies. The two priority action areas for immediate exploration are:

- **Hydrogen Direct Reduction and Iron Melter**

  This concept will involve producing a low emissions iron feed for consumption at Port Kembla and will explore the direct reduction of Rio Tinto's Pilbara iron ores, with the intent of using renewable hydrogen produced from renewable electricity. The direct reduced iron (DRI) from this process will be melted in an electrical furnace, powered with renewable electricity, to produce iron suitable for the steelmaking process.
- **Enhancing existing processes**

  BSL and Rio Tinto will cooperate to explore the development of projects involving iron ore processing and technologies directed at reducing carbon emissions from existing iron and steelmaking processes.

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[2] The Climate Action Report contains further details on the Climate Change strategy and the scope and boundaries of the net zero goal and medium term targets

In December 2021, BSL signed a Memorandum of Understanding with Shell Energy Operations Pty Ltd to collaborate on two projects:

- **Pilot renewable hydrogen electrolyser plant at the Port Kembla Steelworks**
  This initial project will investigate designing, building and operating a 10 MW renewable hydrogen electrolyser to explore and test the use of renewable hydrogen in the blast furnace at BlueScope's Port Kembla Steelworks. The ambition is to demonstrate hydrogen as a pathway towards low emissions steelmaking. The hydrogen could also potentially be used for other purposes, such as to feed a pilot direct reduced iron (DRI) plant.
- **llawarra hydrogen hub concept**
  The MoU also provides for BlueScope and Shell to collaborate with other organisations to explore a "hydrogen hub" in the Illawarra. This project will explore options for hydrogen supply and offtake, renewable energy supply and hydrogen and electricity infrastructure. The project will also examine the logistics infrastructure required for a commercially viable hydrogen supply chain in the Illawarra.

Along with its Finley Solar Farm Power Purchase Agreement in NSW, in late 2020 BSL announced a $20 million investment to develop a Renewable Manufacturing Zone at PKSW. Half of this investment will be allocated to companies aspiring to build manufacturing capability, particularly in the renewable energy sector in NSW, with an immediate focus on supporting the manufacture of wind tower, solar farm, and pumped hydro electricity transmission facilities. The remaining half of the investment will be directly investing into PKSW to support the development of technology solutions in steelmaking, such as the development of renewable hydrogen projects.

3.7.1 BlueScope Steel Limited's Climate Action Report

In 2021, BSL published its first Climate Action Report (BSL, 2021). The Climate Action Report builds on BSL's earlier reporting on climate change issues over several years in its annual Sustainability Reports and, prior to that, in its annual Community, Safety and Environment reports.

The Climate Action Report outlines its goal of pursuing net zero scope 1 and 2 GHG emissions across all BSL operations by 2050. The Climate Action Report acknowledges that achieving this goal is dependent on several enablers including:

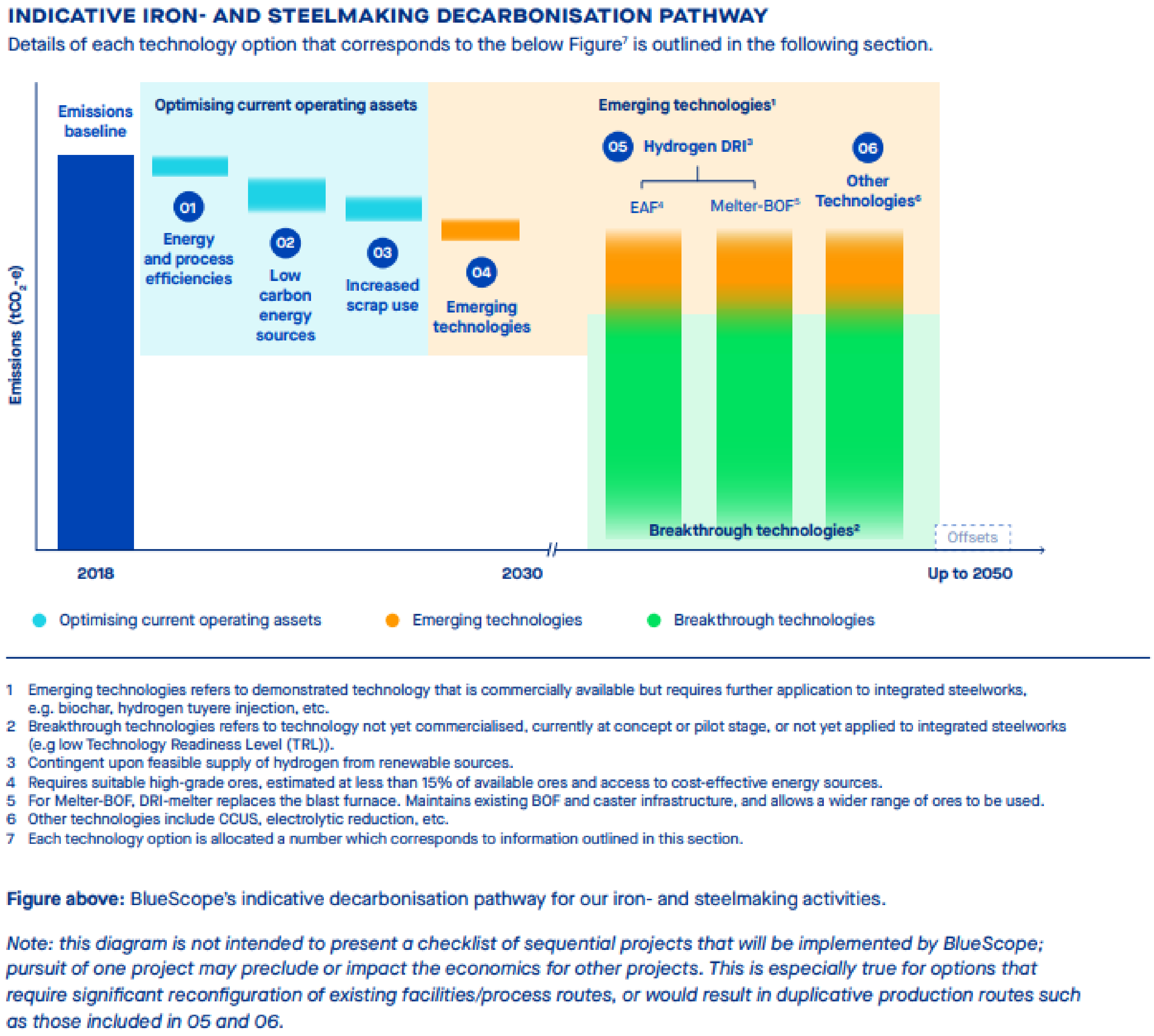
- Evolution of emerging and breakthrough technologies to viable, commercial scale.
- Access to affordable and reliable renewable energy.
- Availability of appropriate volumes of competitively priced hydrogen from renewable sources.
- Access to appropriate quality and quantity of raw materials in both the near and longer-term.
- Public policy that supports investment in decarbonisation and avoids risk of carbon leakage.

For its steelmaking sites, including PKSW as well as its sites in North America and New Zealand, BSL's mid-term goal is to achieve a 12 per cent Scope 1 and 2 GHG emissions intensity reduction target by 2030, relative to FY2018. This translates into a target of 1 per cent year-on-year emission intensity reduction (from the 2018 baseline) across steelmaking activities. In addition, for its non-steelmaking activities, BSL has set a target of a 30 percent reduction in Scope 1 and 2 emissions by 2030, also relative to FY2018.

The decarbonisation pathway for steelmaking is represented visually in the Climate Action Report and is shown in Figure 3.1.

While the opportunities described in the Climate Action Report remain under assessment and development, BlueScope and BSL have taken a range of measures to enhance their management of climate change risks and opportunities, including reporting annually in line with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). The importance of the climate change strategy is evidenced by the refocus of the Board Committee, previously known as the Audit and Risk Committee, to issues around sustainability, including climate change, and the corresponding change of name to the Risk and Sustainability Committee. BSL has also established a Climate Change Council and introduced shadow carbon pricing for the evaluation of major capital projects. In February 2021, BSL appointed a Chief Executive Climate Change to lead its global climate change response and help drive the company's decarbonisation pathway.

BlueScope and BSL are also actively participating in and leading several collaborations with industry and research organisations, including World Steel, Responsible Steel, the Net Zero Steel Pathway Methodology Project, the Australian Industry Energy Transition Initiative project, and with the University of Wollongong.



INDICATIVE IRON- AND STEELMAKING DECARBONISATION PATHWAY

Details of each technology option that corresponds to the below Figure[7] is outlined in the following section.

1 Emerging technologies refers to demonstrated technology that is commercially available but requires further application to integrated steelworks, e.g. biochar, hydrogen tuyere injection, etc.
2 Breakthrough technologies refers to technology not yet commercialised, currently at concept or pilot stage, or not yet applied to integrated steelworks (e.g low Technology Readiness Level (TRL)).
3 Contingent upon feasible supply of hydrogen from renewable sources.
4 Requires suitable high-grade ores, estimated at less than 15% of available ores and access to cost-effective energy sources.
5 For Melter-BOF, DRI-melter replaces the blast furnace. Maintains existing BOF and caster infrastructure, and allows a wider range of ores to be used.
6 Other technologies include CCUS, electrolytic reduction, etc.
7 Each technology option is allocated a number which corresponds to information outlined in this section.

Figure above: BlueScope's indicative decarbonisation pathway for our iron- and steelmaking activities.

Note: this diagram is not intended to present a checklist of sequential projects that will be implemented by BlueScope; pursuit of one project may preclude or impact the economics for other projects. This is especially true for options that require significant reconfiguration of existing facilities/process routes, or would result in duplicative production routes such as those included in 05 and 06.

Figure 3.1 Indicative iron and steelmaking decarbonisation pathway (BSL Climate Action Report, 2020)

BSL and BlueScope GHG reductions progress

Since FY2018 BSL has reduced its steelmaking GHG emissions intensity by 1.8 per cent (that is, across the three steelmaking sites in PKSW, North America and New Zealand), and has also reduced the GHG emissions intensity of its midstream non-steelmaking activities by 6.3 per cent.

Taking a longer-term perspective, since 2005, absolute GHG emissions from BSL's steelmaking operations have decreased by 28 per cent, while GHG emissions intensity has reduced by 21 per cent.

Greenhouse gas reduction measures are further outlined in Chapter **Error! Reference source not found.**. The commitment of BlueScope and BSL to meeting the GHG objectives set out in the Climate Action Report is demonstrated by the GHG reductions achieved to date as well as the significant investment which continues to be made in reducing the GHG intensity of operations at Port Kembla and across BSL's global footprint.

3.7.2 BlueScope Steel Limited Sustainability Report FY2021

The FY2021 BSL Sustainability Report outlines BSL’s strategy for achieving its sustainability goals, including the Climate Change goals for BSL and BlueScope described in Section 3.7.1. BSL’s strategy emphasises the need for strong returns and sustainable outcomes over the next five years and beyond, with investment in carbon reduction technologies a core element of the strategy, alongside product and service innovation and delivery of safe, inclusive and diverse workplaces.

3.8 GHG applicable legislation and guidelines

Legislation and guidelines applicable to the GHG assessment include:

- National Greenhouse and Energy Reporting Act 2007 (NGER Act)
- National Greenhouse and Energy Reporting Regulations 2008
- National Greenhouse and Energy Reporting (Measurement) Determination 2008
- National Greenhouse and Energy Reporting Regulations 2008
- National Greenhouse Accounts Factors 2021
- AS ISO 14064-1:2006 Greenhouse gases – Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals
- Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (GHG Protocol) (World Business Council for Sustainable Development and World Resources Institute, 2015)
- Intergovernmental Panel on Climate Change Sixth Assessment Report (2021)

These guidelines are considered representative of good practice GHG accounting in Australia and are applicable to the project.

NSW State legislation does not currently include any specific requirements in relation to GHG assessments for industrial projects. As detailed in Section 3.1, the SEARs do not mandate a specific standard, protocol, or methodology for the GHG assessment. As a subset of the requirements for assessment of air quality impacts, the SEARs require an assessment of the GHG emissions of the project and any measures to minimise emissions intensity, improve energy efficiency and adopt new technologies to reduce emissions in the medium to long term.

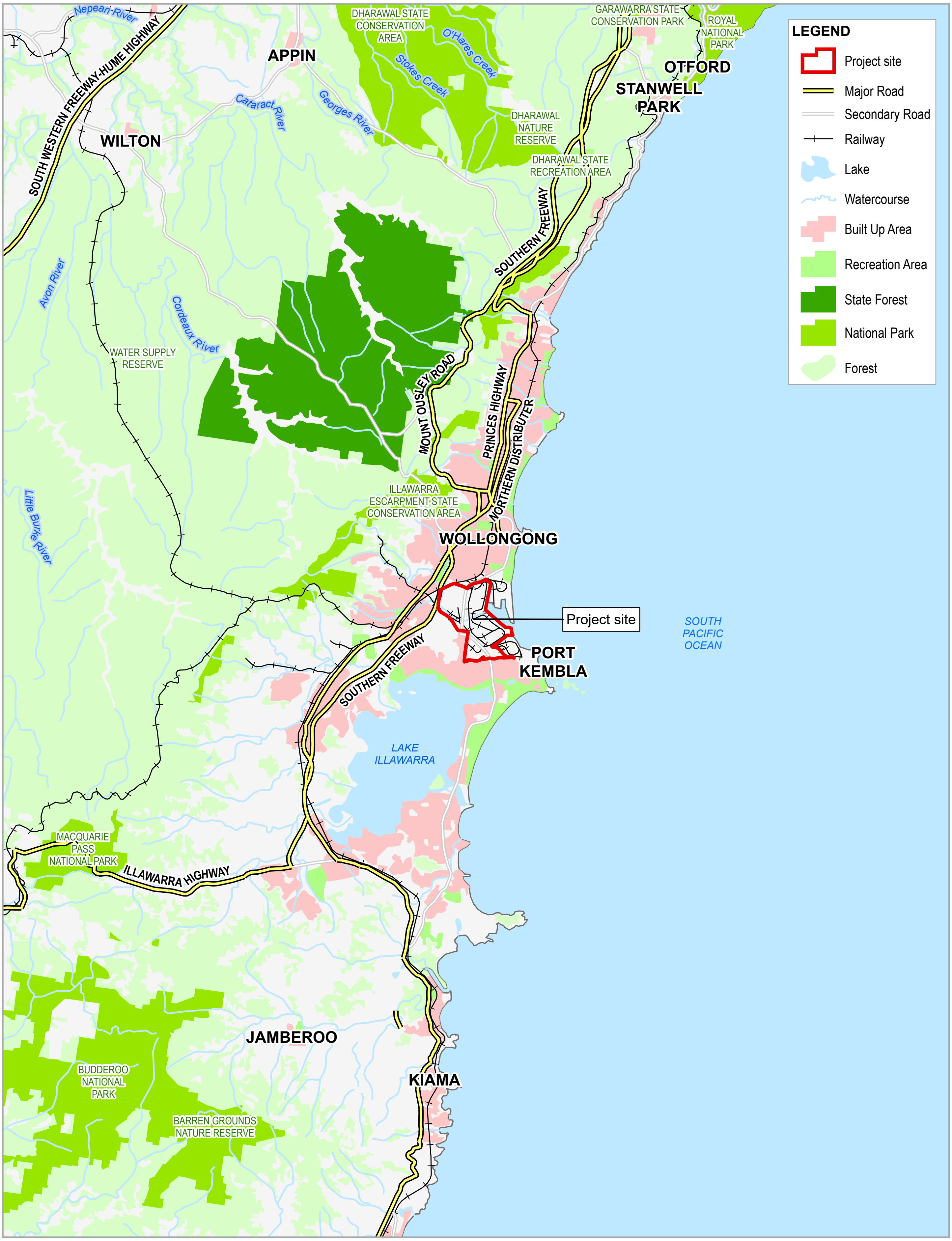
4. Existing environment

4.1 Overview

The project is located within an industrial site of approximately 750 hectares (ha) at Port Kembla in the Wollongong LGA and Illawarra region of NSW. Sydney is approximately 80 kilometres (km) to the north of Port Kembla, while the Wollongong central business district is approximately 2.5 km to the north and Lake Illawarra is approximately 3 km to the south. Port Kembla is the main industrial centre of the Illawarra region.

Key features of Port Kembla are the heavy industrial area and the port, including industrial developments such as PKSW, fertiliser production facilities and petroleum hydrocarbon storage and wholesaling. PKSW is zoned IN3 Heavy Industrial and the port of Port Kembla is zoned SP1 – Special Activities. The Inner Harbour, specifically developed as an all-weather shipping port, covers approximately 60 ha with around 2.9 km of commercial shipping berths. BlueScope operates five berths in the Inner Harbour that supply materials for PKSW.

The area surrounding Port Kembla industrial area is primarily occupied by residential development. These urban areas provide small and large-scale retail outlets, community services (e.g. medical facilities, hospital, schools and sporting facilities) and commercial facilities (e.g. banking and post office). The closest urban developments to PKSW are the suburbs of Cringila, Berkeley, Lake Heights, Warrawong and Port Kembla to the south, and Unanderra, Cobblers Hill, Mount St Thomas, Coniston and Figtree to the north and west. The urban areas of Cringila are located adjacent to the No. 1 Works and No. 2 Works areas and are the nearest to the project area, being approximately 1.2 km to the southwest as shown on Figure 4.1 and Figure 4.2.



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Kilometres

Map Projection: Transverse Mercator
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GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Greenhouse Gas Report

Regional Location

Project No.	**12541101**
Revision No.	**0**
Date	**04/02/2022**

FIGURE 4-1

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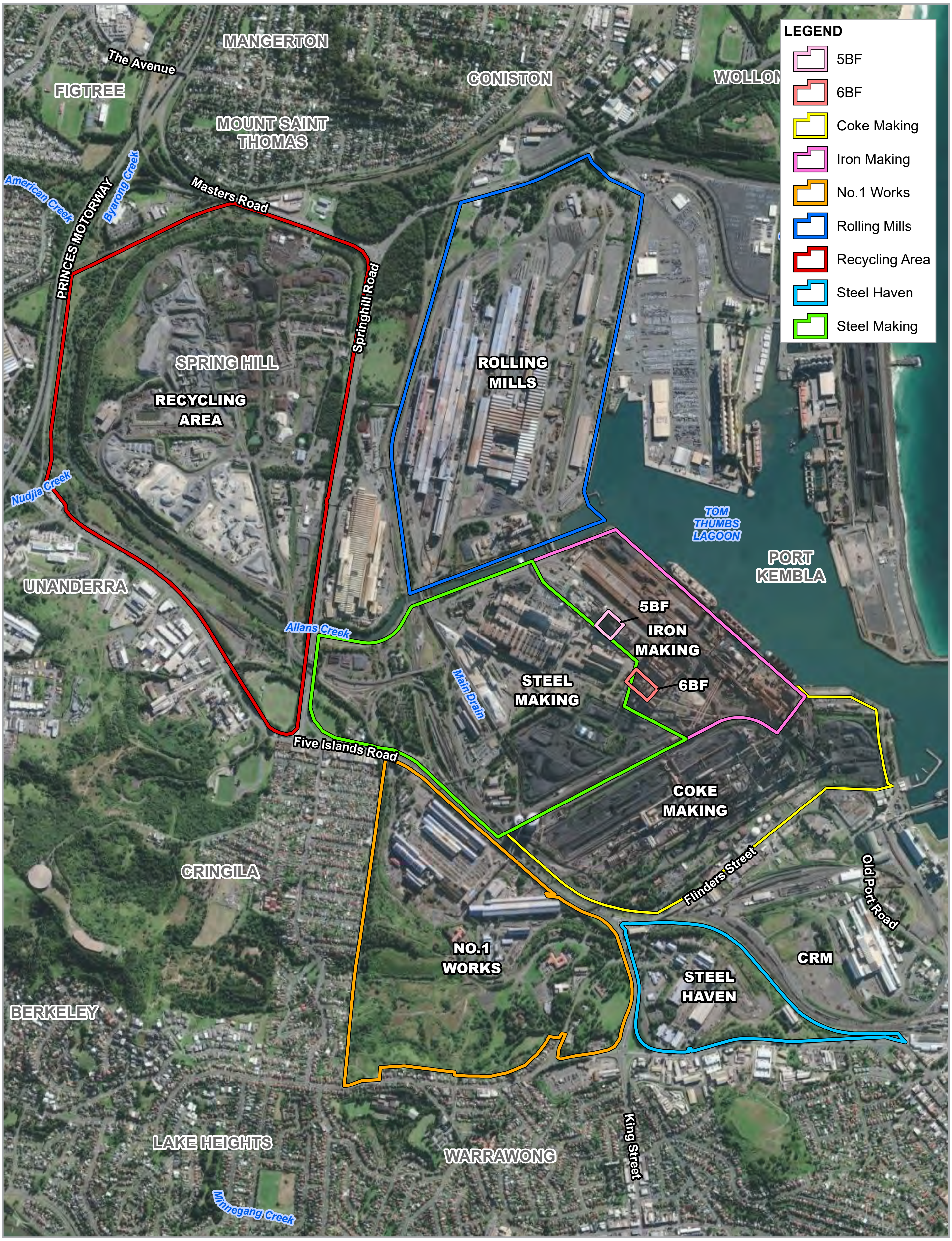

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Greenhouse Gas Report

Port Kembla Steelworks site layout and locality

Project No. 12541101
Revision No. 0
Date 04/02/2022

FIGURE 4-2

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4.2 Port Kembla Steelworks

PKSW currently operates as an integrated iron and steel plant utilising Blast Furnace ironmaking and Basic Oxygen Furnace steelmaking (BF-BOF operating model). The plant is co-located with hot rolling mills for plate and coil and has adjacent manufacturing facilities for cold rolling, coated products, flat products and welded beams. The plant's current output is approximately 3.1 million metric tonnes of steel per year (Mtpa). Of the steel produced, around 2.5 Mtpa services the domestic market with the remainder being exported. PKSW is Australia's only manufacturer of upstream flat steel products. Together, PKSW and the other facilities owned by BSL around Australia employ approximately 6,200 people.

Iron and steelmaking via BF-BOF technology, as is used at PKSW, results in the production of GHGs as a by-product of the reduction reaction used to convert the iron ore into iron. GHGs produced by current operations at PKSW are predominantly CO_2, with low levels of methane (CH_4) and sulphur hexafluoride (SF_6).

BSL reports annually on its total Australian net energy consumption and GHG emissions under the National Greenhouse and Energy Reporting Scheme (NGERS) in accordance with the methodology prescribed by the National Greenhouse and Energy Reporting (Measurement) Determination 2008 (Measurement Determination). The GHG emissions from PKSW, as well as its energy use and consumption, are included in BSL's report.

The Measurement Determination recognises the complexity of measuring GHG emissions from an integrated steelworks in which the BF is not operated independently from other steelmaking processes. The Measurement Determination provides a specific methodology to determine emissions arising from the use of coke as a carbon reductant (called a carbon mass balance approach) which involves:

- Calculating the carbon content of fuels and other carbonaceous inputs.
- Calculating the carbon content in products leaving the activity (that is, of an integrated steelworks) during the relevant year.
- Calculating the carbon content in waste by-products leaving the activity during the relevant year, other than as an emission of greenhouse gas.
- Calculating the carbon content in the amount of the change in stocks of inputs, products and waste products held within the boundary of the activity during the relevant year.

This approach is used to determine the majority of GHG emissions from PKSW, which arise from the use of metallurgical coal in the iron and steelmaking process, comprising approximately 92 per cent of total GHG emissions from PKSW in any one year. The Measurement Determination does not require an allocation of GHG emissions to different plant areas within the integrated steelworks. Of particular relevance to the project, the gas generated by the blast furnace (Blast Furnace Gas or BFG) is captured and circulated around PKSW for use as an energy source, with the location of gas usage determined on a daily basis by operational need.

The integrated nature of the steelworks which makes it impracticable to assess GHG emissions from a single BF is demonstrated by the PKSW integrated operation diagram shown in Figure 4.3. The diagram illustrates the process flow from the material inputs, various operational facilities and respective output pathways, through to the Hot Strip Mill and Plate Mill where the steel is made into flat rolled products. It shows how Coke Ovens Gas (COG), generated during the cokemaking process, and BFG, are captured and circulated for use as an energy source across multiple operational facilities at PKSW from which emissions will ultimately occur.

BlueScope uses other methodologies provided under the Measurement Determination as required to capture other sources of GHG emissions from PKSW, such as those arising from fuel consumption (in particular, natural gas). Emissions from the use of electricity at PKSW are accounted for separately as required by the reporting requirements.

In financial year 2021, PKSW emitted a total of 6,868,848 tonnes of carbon dioxide equivalent (tCO_2-e), comprised of:

– Scope 1 emissions:	6,260,763 tCO_2-e
– Scope 2 emissions:	608,085 tCO_2-e.

The GHG emission intensity of steelmaking at PKSW (tonnes of CO_2-e per tonne of crude steel produced) reported for FY2021 was 2.14 tCO_2-e per tonne of crude steel produced.

BSL is a member of the World Steel Association (Worldsteel) and also participates in Worldsteel's climate action data collection program. In FY2020, the average GHG emissions intensity of steelmakers reporting to Worldsteel using BF-BOF technology was 2.33 tCO_2-e per tonne of crude steel produced. During this period, the GHG emissions intensity of steelmaking at PKSW was 2.21 tCO_2-e per tonne of crude steel produced, comparing favourably to the average reported by Worldsteel. For FY2020, PKSW was within the top quartile of reporters for integrated steel plants (i.e. lowest emitters), using the Worldsteel calculation methodology (based on ISO 14404 series).

Scope 3 emissions have been recently included in BSL's Sustainability and Climate Action Reports. The Climate Action Report refers to BSL's FY2021 commencement of reporting of its Scope 3 GHG emissions profile with its broader climate and sustainability disclosures. Based on the review of Scope 3 GHG emissions from existing operations and the fact that the majority of Scope 3 emission sources would be unchanged by the project, the move of ironmaking from 5BF to 6BF is unlikely to result in material change to Scope 3 emissions. While such Scope 3 emissions are not directly related to the project, as detailed in Section 3.7, BlueScope and BSL are committed to working with stakeholders and partners to reduce Scope 3 GHG emissions.

The co-products from steel manufacturing have many uses, including road base, cement manufacture, pigments and fertiliser. A key co-product produced at the blast furnace is Granulated Blast Furnace Slag which is used as a general cementitious replacement for Portland Cement in concrete construction to lower GHG emissions. The use of blast furnace slag from PKSW in this way supports the avoidance of more than 400,000 tCO_2-e of GHG emissions every year relative to traditional cement making processes. BlueScope will continue to investigate further opportunities to implement circular economy principles as a key component of waste management and reduction initiatives.

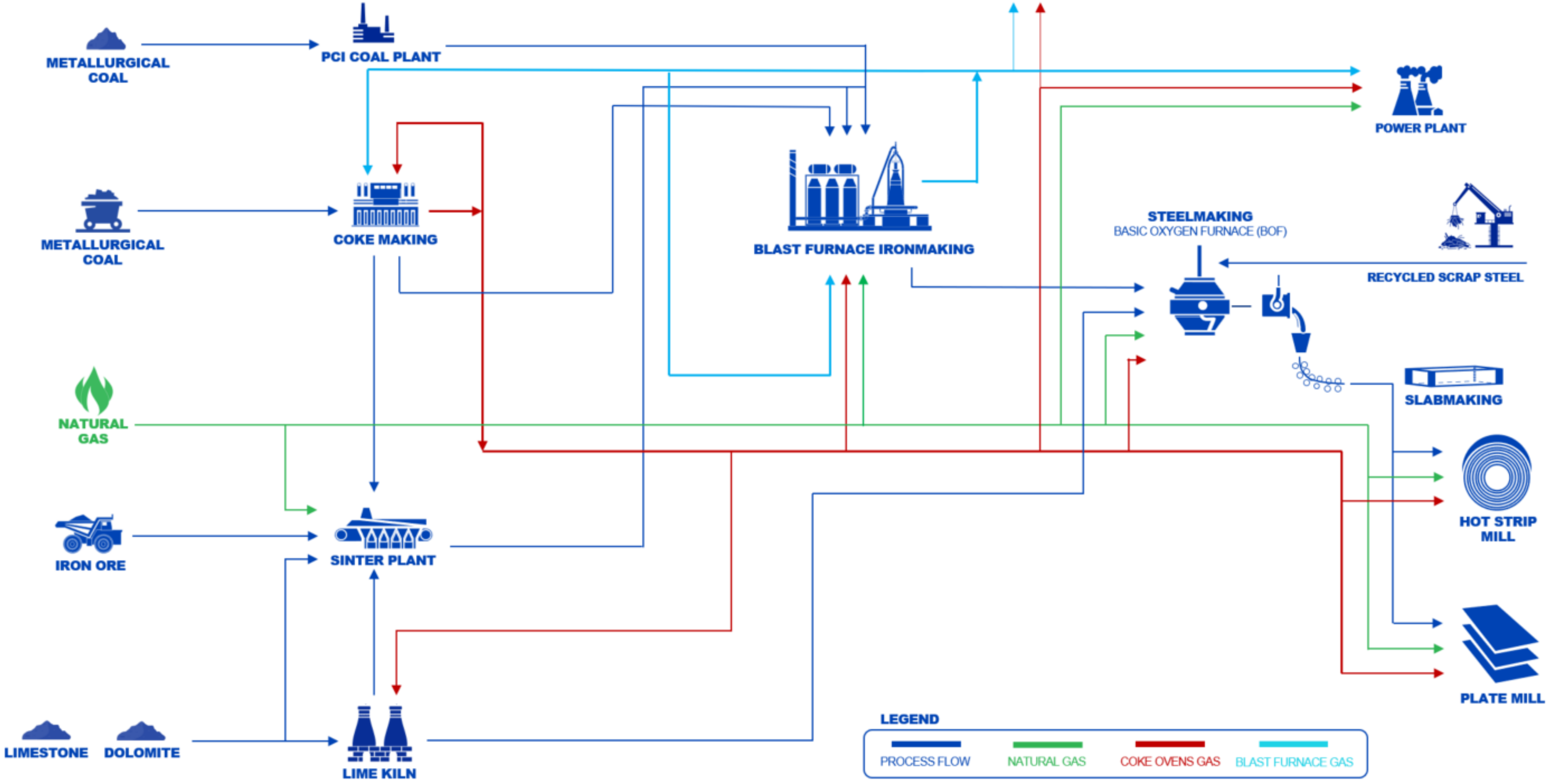

Figure 4.3 Integrated steelworks schematic

4.3 Project summary

The current operational campaign of 5BF is expected to extend to as late as 2030. Whilst the current furnace is operating well, as time moves closer to the campaign end date, the risk of unplanned shutdown will progressively increase as its condition deteriorates with age and use. By the mid-2020s, this risk is predicted to increase. For this reason, to prevent operational discontinuity and safeguard supply, it is considered prudent risk management to have 6BF ready for operation from mid to late 2026.

The project involves the relining of 6BF over a period of approximately 3 years to return it to service and commence ironmaking after 5BF ceases operation. For the purpose of the EIS and GHG assessment, the project area includes 6BF and the operational emissions. The project area is shown in Figure 4.4.

The reline of the furnace initially involves removal of remaining burden material and iron skull, followed by stripping of the staves, refractories and hearth from inside the shell. In places, repairs to the furnace shell will be required. Once stripped, installation of the new hearth, sidewall refractories and staves will be completed, together with repairs/replacement of the tuyeres, tapholes, furnace cooling systems and instrumentation. Significant work will also be required to prepare each of the 6BF ancillary systems for continuous operation across the length of the new campaign. Following construction, 6BF will be commissioned and ramped up for operation. Cold commissioning of 6BF will occur while 5BF remains operational, however ironmaking at 5BF will conclude prior to ironmaking commencing at 6BF. The project will see advances in technology being used including several improvements in 6BF compared to the currently operating 5BF, resulting in lower overall emissions from the site.

A summary of the key project elements and characteristics is provided in Table 4.1.

Table 4.1 Project summary

Project element	Summary
Construction	Major construction work will be required within the blast furnace and surrounding facilities and will involve removing the remaining burden materials, refractory bricks and blocks and staves within the interior of the blast furnace for replacement. Any required repairs or replacement of ancillary equipment or structures will also be carried out.
Access	The majority of the construction traffic will access the site via the major roads that service the Port Kembla industrial area, including the Princes Motorway and Princes Highway, Shellharbour Road, Springhill Road, Five Islands Road and Masters Road. No changes to existing access arrangements are proposed.
Overhaul of Ironmaking components and systems	– Raw materials handling – Sinter plant – Blast furnace – Stockhouse and charging system – Blast furnace vessel – Cooling system – Casthouse – Hot blast system – Off gas system – Slag handling
Blast furnace slag	Slag produced from the blast furnace is processed into two products, granulated slag and rock slag. Slag is sold for use in the manufacture of other products, such as cement and road base. Ground granulated blast furnace slag can be used to significantly reduce the CO_2 emissions associated with the manufacture and use of concrete.[3]
Commissioning	Commissioning involves the following: – All services brought back into live condition. – Various parts of plant re heated. – Pressure and leak tests conducted. – Cooling systems filled and flushed. – Furnace dried out and charged with kindling and burden material. – Gas system purged and furnace ‘blown in’. – Furnace progressively heated until regular casting of iron and slag commences. – Full production reached within one to two months.

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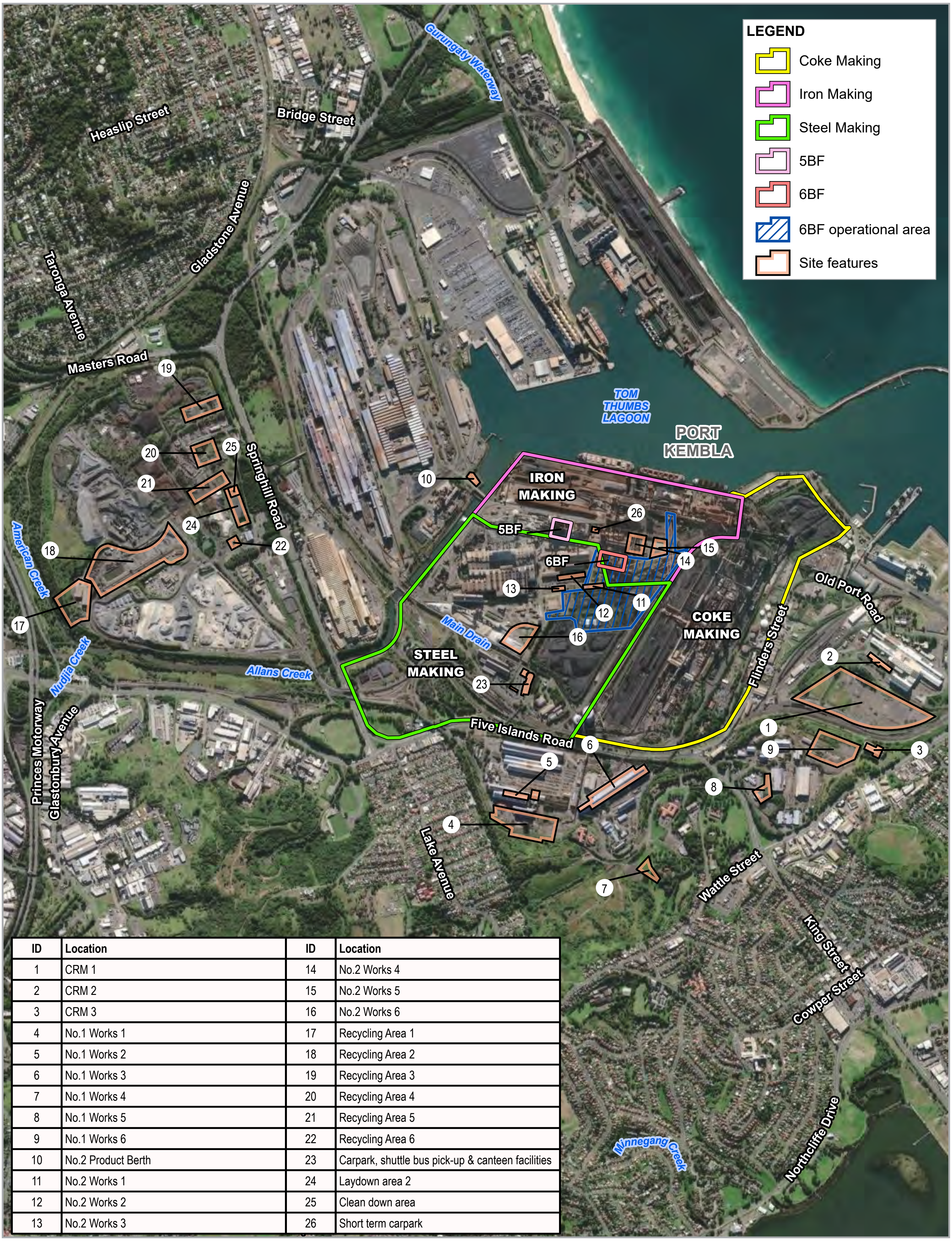
[3] A 60% slag mix reduces the CO_2 emissions for a typical 32 MPa concrete mix by 53%. This is significant given concrete is the 2nd most used substance in the world after water (from “A Guide to the Use of Iron Blast Furnace Slag in Cement and Concrete” - ASA Data Sheet 5).

Project element	Summary
Operations	Operation of 6BF will be generally the same as existing operations utilised at 5BF, including: – Processing and transport of raw materials (iron ore, metallurgical coal, coke, fluxes). – Production of sinter (agglomeration of iron ore, coke and limestone dust) for use within the blast furnace. – Production of approximately 2.7 Mtpa of iron from 6BF. – Processing of approximately 0.88 Mtpa of blast furnace slag for use as construction products.
Construction work hours	Where practical, and subject to the final construction program, construction will be carried out during the following construction hours: – Monday to Friday: 7.00 am to 6.00 pm. – Saturday: 7.00 am to 6.00 pm. – Sundays and public holidays: no work. A number of construction activities will be scheduled to be undertaken as night works. Final construction phase will require 24-hour construction (estimated to be a period of 5 months). Further, 24-hour construction may be required for an extended period if 6BF is required online earlier than 2026.
Construction duration	Approximately 3 years
Operational duration	Approximately 20 years



ID	Location	ID	Location
1	CRM 1	14	No.2 Works 4
2	CRM 2	15	No.2 Works 5
3	CRM 3	16	No.2 Works 6
4	No.1 Works 1	17	Recycling Area 1
5	No.1 Works 2	18	Recycling Area 2
6	No.1 Works 3	19	Recycling Area 3
7	No.1 Works 4	20	Recycling Area 4
8	No.1 Works 5	21	Recycling Area 5
9	No.1 Works 6	22	Recycling Area 6
10	No.2 Product Berth	23	Carpark, shuttle bus pick-up & canteen facilities
11	No.2 Works 1	24	Laydown area 2
12	No.2 Works 2	25	Clean down area
13	No.2 Works 3	26	Short term carpark

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Greenhouse Gas Report

Project No. 12541101
Revision No. 0
Date 04/02/2022

Key project features

FIGURE 4-4

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5. Impact assessment

5.1 Construction

Emissions during construction have been estimated based on the assumptions listed in Table 5.1. The estimated emissions are shown in Table 5.2. Emission factors have been sourced from the NGER (Measurement) Determination and the National Greenhouse Accounts (NGA, 2021)

Table 5.1 Construction emission assumptions

Emission source	Assumptions
Construction equipment diesel use	Fuel use for construction equipment was estimated based on the type and number of equipment, weeks of use, daily hours of operation and fuel use per hour (sourced from equipment manufacturers data). Equipment includes cranes, excavators, rollers, graders, piling rigs, forklifts, concrete trucks and other trucks.
Electricity from grid (NSW)	The quantity of electricity used was estimated by BlueScope based on the type of equipment/ building, the estimated number of days during the construction program and the consumption per day. Electricity is used in site sheds and lighting, and for small power tools, electric welders, compressors, etc. (Note: large equipment and machinery is normally diesel-driven and is included in the ‘construction equipment diesel use’ above).
Worker commute	There would be up to 300 car trips per day over the construction period, for contractors and construction workers. All vehicles were conservatively assumed to be diesel. Fuel use for passenger vehicles is from the Australian Bureau of Statistics (ABS) Survey of Motor Vehicle Use in Australia (ABS, 2020).
Transport Buses	Buses transport workers around the site. There would be approximately 50 bus trips per day over the construction period. Fuel use for buses is from ABS, 2020.
Transport major equipment and materials	There would be approximately 100 trucks accessing the site per day over the construction period (delivery of equipment and materials to the site and removal of waste from the site). Fuel use from trucks is from ABS, 2020.
Waste (MSW and C&D)	Approximately 100 t of Municipal Solid Waste (MSW) and 7,500 t of Construction and Demolition (C&D) waste would be generated during the construction period. Disposal of this waste to landfill generates GHG.
Welding	Acetylene gas would be used for welding and cutting during demolition, modifications and construction of new structures. The quantity of acetylene used was estimated by BlueScope based on the estimated number of welding days and the consumption per day.
Commissioning	Natural gas will be used during commissioning for drying and heating. The quantity of natural gas used was estimated by BlueScope based on commissioning of previous BFs.

Table 5.2 Construction and commissioning emissions

Emission source	Value		Fuel Type/ parameter	Emissions
	Quantity	Units		tCO_2-e
Total diesel consumption	6,803	kL	Diesel (Stationary)	18,435
Electricity from grid (NSW)	5,688	MWh	Electricity from grid (NSW)	4,494
Worker commute	726	kL	Diesel (Transport)	1,974
Transport Buses	287	kL	Diesel (Transport)	781
Transport major equipment and materials	650	kL	Diesel (Transport)	1,767
Waste (MSW & C&D)	7,600	t waste	Waste (C&D)	1,660
Welding	105,350	m^3	Acetylene	213
Commissioning	56,000	m^3	Natural gas	113
Total emissions				29,437

The quantity of GHG emissions estimated to occur during the full construction period is approximately 30,000 tCO_2-e, or approximately 9,800 tCO_2-e per annum over the three-year construction period. Emissions during construction are minor and only 0.1% of annual operational emissions (as detailed in section 5.2 below).

5.2 Operation

As outlined in Section 4.2, due to the complex integrated nature of PKSW, it is not feasible to extract a separate GHG emission rate for blast furnace operation alone. GHD therefore considers it appropriate to take an integrated approach to quantifying and assessing impacts associated with the project. When assessing the potential impact of project emissions, the following needs to be considered:

- The project represents ongoing operations with ironmaking transferring from 5BF to 6BF.
- The operation of 6BF will have a similar emissions profile to 5BF, with the exception of proposed GHG mitigation strategies (refer Section 6) which will either:
  - Provide GHG reduction from the commencement of operation of 6BF, or
  - Enable the introduction of future GHG reduction technologies as they become commercially viable, such as the use of renewable hydrogen to displace fossil fuel-based energy sources that will enable GHG emissions reductions over the medium to longer term.

It is noted that BSL has announced that the opportunities for GHG emissions reductions enabled by the 6BF reline are part of a broader suite of climate-related projects at Port Kembla that have further potential to reduce GHG emissions intensity.

A summary of Scope 1 and 2 GHG emissions, calculated in accordance with the NGER methodology, from the operation of PKSW for FY2020 and FY2021 is presented in Table 5.3. Scope 1 emissions contributed 91% of total GHG emissions in FY2021, while Scope 2 emissions contributed around 9% of the total GHG emissions from the site. The total GHG emissions presented in Table 5.3 include emissions from the current operation of 5BF.

Table 5.3 Summary of PKSW annual emissions

GHG Emissions (tCO_2-e)	2020	2021
Scope 1	6,103,129	6,260,763
Scope 2	558,237	608,085
Scope 3 (not included in total)	Not reported	1,125,456
Total	6,661,366	6,868,848
Steel production (tonnes)	3,012,548	3,209,637
Intensity (tonnes CO_2-e/tonne steel)	2.211	2.140

Source: Climate Action Report 2021

Overall, the project will have a net improvement (reduction) in GHG emissions intensity per tonne of steel produced, with significant potential for further improvements to be made as new and emerging low emissions technologies become viable. A review of currently available and future technologies along with those selected for implementation by the project is provided in Section 6.

5.3 Impact of emissions

Australia’s national GHG emissions, by sector for the year to June 2021 and year 2019 (the most recent year available) are presented in Table 5.4 Total emissions for the year to June 2021 are 498.9 $MtCO_2$-e, and 518.9 $MtCO_2$-e for year 2019.

The most recently published state-based emissions inventory is for 2019. NSW GHG emissions, by sector, for the 2019 year are also presented in Table 5.4. Total annual emissions for NSW are 136.6 $MtCO_2$-e.

Table 5.4 National and NSW GHG emissions

Emissions Source	Australia Emissions Year to June 2021 ($MtCO_2$-e) [1]	2019 Australia Emissions ($MtCO_2$-e) [2]	2019 NSW Emissions ($MtCO_2$-e) [3]
Energy – Electricity	163.9	278.9	94.7
Energy – Stationary Energy (excluding electricity)	99.4		
Energy – Transport	91.2	100.5	27.6
Energy – Fugitive Emissions	48.7	51.0	12.7
Industrial Processes and Product Use	31.1	32.6	12.8
Agriculture	75.0	69.8	16.3
Waste	14.0	12.4	4.8
Land Use, Land Use Change and Forestry	-24.4	-26.3	-12.5
Overall Total	**498.9**	**518.9**	**136.6**

Source:

1. Table 3, Department of Industry, Science, Energy and Resources (DISER) "Quarterly Update of Australia's National Greenhouse Gas Inventory: June 2021" December 2021

2. Table 2.1, DISER, "National Inventory Report 2019", April 2021

3. DISER "State and Territory Greenhouse Gas Inventories 2019", 2021

The quantity of Scope 1 and 2 emissions from PKSW operations reported for FY2021 were 6,868,848 tCO_2-e (approximately 6.9 $MtCO_2$-e) per annum. These emissions represent less than 1.4% of the total Australia emissions, and approximately 5% of NSW emissions, based on the available data presented in Table 5.4.

Scope 1 and 2 emissions associated with the operations of the PKSW are above the threshold of 25,000 tCO_2-e per annum for facility level reporting under the NGER Act so require annual reporting under the NGER scheme. Scope 1 emissions associated with the operations of the proposed project are also above the threshold of 100,000 tCO_2-e per annum for the NGER Safeguard Mechanism – therefore the site has a safeguard baseline emissions number which if exceeded would require offsetting of emissions above the baseline, for example by the purchase of Australian carbon credit units.

Scope 1 and 2 emissions associated with the operations of the PKSW before and after the project are well above both NGER facility and Safeguard thresholds. PKSW will continue to be reported as a separate facility under the NGER Act. As a result of the project (subject to planning approval), the estimated emissions from PKSW are not expected to exceed the PKSW safeguard baseline.

6. Greenhouse gas reduction measures

6.1 Overview

To achieve net zero emissions in steelmaking, commercialisation of breakthrough technologies and supporting infrastructure will be needed. The availability of breakthrough low GHG emissions ironmaking technologies has been an important consideration for BlueScope in assessing options for the future configuration of PKSW. For this reason, the scope of the project is intended to address the dual aims of securing BlueScope's domestic ironmaking needs from 2026, as well as providing a bridge to transition from current blast furnace technology to new and emerging low emissions technologies once available at commercial, viable scale.

While breakthrough technologies are still being developed, there is scope to optimise production processes to reduce GHG emissions through existing and emerging technologies.

As discussed by McKinsey & Company (2020), BF-BOF initiatives can improve efficiency and/or decrease production losses in different ways, for example:

1. Optimising the BF burden mix by maximising the iron content in raw materials to decrease the usage of coal as a reductant.
2. Increasing the use of alternative fuels to pulverized coal injection (PCI), for example, biochar (refer Section 6.4.1), biomass, or hydrogen (either as Coke Ovens Gas or renewable hydrogen).
3. Increasing use of Blast Furnace Gas and Coke Ovens Gas as an energy source.

These processes may have the potential to decrease GHG emissions without eliminating them, but do not offer fully carbon-neutral steel production (McKinsey & Company, 2020). PKSW already seeks to maximise the use of process gases as an energy source as displayed in Figure 4.3. As BF-BOF efficiency programs only result in a reduction in GHG emissions without eliminating them entirely, they are not a long-term solution. Biomass reductants and carbon capture and usage are either only feasible in certain regions or are still in the early stages of development (McKinsey & Company, 2020).

While BlueScope and other BF-BOF steel manufacturers continue to research and investigate lower-emissions technologies, steel, as one of the world's most highly recycled materials, has an important place in a low carbon future. Scrap steel (scrap) currently contributes to approximately 32% of steel products and for approximately 25% of the steel produced at PKSW. In FY2021, over 800,000 tonnes of scrap were recycled at PKSW through the BF-BOF route. There are limits, however, on the amount of scrap which can be used in the BF-BOF process: first, scrap supply cannot meet demand either locally or globally and secondly, there is a thermal limit on how much scrap can be used in the steelmaking process[4].

Raw material availability will be crucial to secure steel production capability in the near and longer term and to support the transition to net zero. Securing access to the raw materials that are currently used in the blast furnace process, such as metallurgical coal (or other mixes of different types of 'clean' metallurgical coal), will be one of the options in the early transition period, as will be securing future raw material requirements, such as Direct Reduced Iron (DRI) and renewable hydrogen.

As part of its Climate Action Plan, on 7 December 2021, BSL announced its commitment to establish a 10 MW electrolyser on the PKSW site, as part of a Memorandum of Understanding with Shell Energy. A hydrogen electrolyser is a system that breaks water into hydrogen and oxygen molecules using electricity in a process called electrolysis. The proposed 10 MW electrolyser will be one of the largest electrolysers in Australia, although it is estimated that a 300 MW electrolyser would be required to generate enough hydrogen to replace carbon as a reductant for total volume of crude steel output from the PKSW. Not only will this support the NSW Government's vision for an Illawarra Hydrogen Hub, but for every tonne of renewable hydrogen used in the steelmaking process will result in reductions of CO_2-e emissions.

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[4] As discussed earlier, the BF-BOF is an integrated process and scrap is added to the BOF, rather than the BF itself.

6.2 Technology review

As described in Chapter 4 of the EIS, BlueScope's consideration of project alternatives included extensive research into alternative steelmaking technologies with potential to reduce GHG emissions. Figure 3.1 in section 3.7 of this report shows how some of these technologies may form part of BlueScope's decarbonisation pathway. Currently, however, the alternative technologies which are already available are not viable for new steelmaking plants on the east coast of Australia due to of the lack of affordable natural gas and scrap steel. Electric Arc Furnace (EAF) steelmaking also has very high electricity demand with a 2019 report issued by Worldsteel noting that electricity accounts for roughly 50 percent of the energy input costs for EAFs compared to 7 per cent for BF operations (Schumacher, 2021) and therefore cannot be considered a "green steel" making methodology unless renewable electricity is available to meet this demand.

Table 6.1 outlines the potential partial and full decarbonisation pathways proposed by McKinsey & Company (2020) and identified by BlueScope as potentially viable in the future for adoption at PKSW. The viability of the technology is assessed based on how proven the technology is.

Table 6.1 Summary of potential technologies (sourced from McKinsey & Company (2020) report)

Technology	Description	Example	Viability for PKSW
Partial decarbonisation potential			
Blast Furnace (BF)/ Basic Oxygen Furnace (BOF)	Make efficiency improvements to optimise BF-BOF operations	Optimised BOF inputs (DRI, scrap) increased fuel injection in BF (e.g. hydrogen, PCI)	BSL is assessing the use of both hot briquetted iron (HBI) and DRI as furnace charges, but they come with significant Scope 3 penalties. The installation of the dual lances will allow a potential offset of Scope 1 emissions through the reduction of PCI.
Biomass reductants	Use sustainable biomass as an alternative reductant	Tecnored process[5]	Development of an economically sustainable supply of biochar in Australia is a key enabler for this technology. Research has shown the replacement of PCI coal with biochar to be viable. BlueScope is currently preparing to trial biochar as a pulverised coal replacement at 5BF and, if successful and a sustainable supply chain can be established, will be implemented at 6BF.
Carbon capture and usage	Capture fossil fuel emissions and create new products	Bioethanol production from CO_2 emissions	Research has been undertaken with industry partners to determine the viability of Carbon Capture and Usage and Carbon Capture and Storage at PKSW. CCUS was determined to be economically unviable.
Full decarbonisation potential			
Electric Arc Furnace (EAF)	Maximise secondary flows and recycling by melting more scrap in EAF using renewable energy	EAF – usage to melt scrap	Availability of quality scrap is limited and existing electrical infrastructure is not sufficient to operate large enough EAFs to meet current production demands. EAF has a high electricity demand and the technology cannot be considered decarbonised unless sufficient renewable electricity is available.

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[5] A patented process using agglomerated iron ore fines, flux and carbon bearing fines in a moving bed shaft furnace with side feeders enabling solid fuel addition to produce iron (Noldin J, 2008)

Technology	Description	Example	Viability for PKSW
Direct Reduced Iron (DRI) plus EAF using natural gas	Increase usage of DRI in the EAF	Current DRI plus EAF plants using natural gas (NG)	Technology not currently commercially viable due to lack of affordable natural gas on the east coast of Australia coupled with electricity limitations of EAF technology described above.
DRI plus EAF using H_2	Replace fossil fuels in DRI process with renewable energy or H_2	MIDREX DRI process running on H_2 HYL DRI process running on H_2	No current hydrogen infrastructure to allow this path to be implemented. Limitations of electricity requirements for EAF technology as described above.

The reline of 6BF provides a ‘bridge’ to transition from the current blast furnace technology to new and emerging low emissions technologies. BlueScope has identified a program of enhancements and upgrades to improve the emissions intensity of the balance of the existing BF-BOF steelmaking facilities as described in section **Error! Reference source not found.**. The implementation of established technologies and availability of raw materials will be crucial to secure steel production capability in the near and longer term and to support the transition to net zero technologies such as DRI produced with renewable hydrogen. As emerging and breakthrough technologies are developed over time to full commercial scale, the strong cash-flows and earnings capability of BlueScope and BSL provide significant capacity to transition to these technologies as and when they become technically and commercially viable in Australia.

6.3 Proposed technologies for implementation

BlueScope has incorporated improvements into the design of 6BF which will result in reductions in GHG emissions when compared to those from the current operation of 5BF.

Table 6.2 details the technologies or equipment that are proposed to be installed as part of the operation of 6BF that will assist in reducing GHG emissions when compared with the operation of 5BF.

Table 6.2 Technologies or practices proposed as part of the project

Technology	Description	Potential GHG reduction	Viability
Dual lance tuyeres	Allow the use of additional supplementary gaseous fuels such as Coke Ovens Gas (COG) or hydrogen.	No direct reduction, however, enables COG and hydrogen injection which will reduce GHG emissions by offsetting external metallurgical coal purchases. COG injection has the potential to reduce emissions by approximately 150,000 tCO_2 per year.	Dual lance tuyeres are being designed and will be incorporated into the project design.
Top Gas Recovery Turbine	A Top Gas Recovery Turbine utilises the pressure and thermal energy of blast furnace gases as they leave the furnace to generate electricity. The technology reduces GHG emissions by offsetting external power requirements sourced from fossil fuel generation.	Potential reduction of approximately 11,000 tCO_2 per year in comparison to existing operations.	Proven means of recovering energy from the blast furnace which has been previously implemented on 5BF and will be part of the project design, with improvements which will achieve greater energy recovery on 6BF.

Technology	Description	Potential GHG reduction	Viability
Hot Blast Waste Gas Heat Recovery	Gas to gas heat exchangers recover waste heat from the Hot Blast Stoves allowing a reduction in fuel consumption. The higher efficiency combustion liberates Coke Ovens Gas which can be injected into the dual lance tuyeres displacing a proportionate amount of pulverised coal injection into the furnace. Reduction in GHG emissions via reduced fossil fuel energy consumption.	Potential reduction of approximately 11,000 tCO_2 per year, and enables injection of COG into the blast furnace.	Proven technology which will be part of the project design.
Energy Efficiency	Use of variable speed drives on compressors, pumps and fans, high efficiency motors, and correct equipment selection to avoid over sizing electric motors. Reduction in GHG emissions achieved via reduced fossil fuel energy consumption.	N/A	Proven technology that will be implemented as part of the project.

The incorporation of the technologies identified in Table 6.2 is expected to achieve a reduction of GHG emissions of approximately 172,000 tCO_2-e. This reduction is equivalent to removing over 30,000 cars per year from the road[6]. In addition to these technologies, all operational equipment will be operated and maintained to minimise leaks, accidental venting of gases, or other fugitive GHG emissions to the maximum extent practical.

Furthermore, these technologies will be key enablers of medium to longer-term opportunities to reduce Port Kembla Steelworks' greenhouse gas intensity. These opportunities are part of a broader suite of climate-related projects at Port Kembla that have the potential to significantly reduce GHG emissions intensity. Partnerships and collaborations with governments, technology vendors and industry bodies will be crucial to implementing future technologies.

6.3.1 Dual lance tuyeres

Iron ore, coke and flux materials are 'charged' into the top of the furnace. As the materials descend through the furnace, they are subject to and react with an ascending high speed, high pressure gas stream consisting of preheated air, enrichment oxygen and steam at temperatures in excess of 2,000°C. The gas stream is injected into the furnace through tuyeres positioned above the hearth around the circumference of the furnace. The injection of pulverised coal into the blast furnace is an established technology at PKSW where the coal acts as a fuel and reduces the amount of coke required in the process. The pulverised coal is injected into the blast furnace via an injection lance at the tuyeres.

As part of the project, dual lance tuyeres will be installed at 6BF to enable the injection of hydrogen as an alternate reductant, either in the form of COG[7] or renewable hydrogen, into the blast furnace. These reductants will replace a proportionate amount of the coal currently injected into the blast furnace, thereby reducing Scope 1 GHG emissions.

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[6] Based on US EPA estimate of 4.6 tonnes CO_2-e per car per year and 220 cars = 1kt.

[7] COG is gas generated from cokemaking processes and is used as a fuel at the blast furnace. It is around 60% hydrogen.

6.3.1.1 Coke Ovens Gas as an intermediate source of hydrogen

COG is composed of approximately 60% hydrogen, making it an available source of hydrogen until electrolysis of hydrogen becomes economically viable. The high concentration of hydrogen contained in COG makes it suitable for use as a reductant in the blast furnace. BlueScope is investigating a number of different ways to make more COG available for use in the Blast Furnace (the primary source being the Hot Blast Waste Gas Heat Recovery mentioned above). Before it is injected into the blast furnace, COG needs to be pressurised to approximately 700 kPa. In addition to the work of the project, BlueScope is investigating the installation of a COG compression plant. While this is not part of the project scope, the plant would further enable the use of COG as a reductant in the blast furnace.

The use of COG as a reductant in the blast furnace has the potential to result in CO_2 emission reductions of up to approximately 150,000 tCO_2-e per year.

6.3.1.2 Hydrogen as a reductant

As discussed in section 3.7, BSL has signed a Memorandum of Understanding with Shell Energy Operations Pty Ltd to investigate designing, building and operating a 10 MW renewable energy hydrogen electrolyser to test the use of hydrogen in the blast furnace at PKSW. To produce renewable hydrogen, the electrolyser must be powered by renewable energy.

The electrolyser does not form part of the project scope however, its operation will potentially enable the use of hydrogen as a reductant at the blast furnace.

If successful, it is estimated the 10 MW electrolyser may achieve emission reductions of up to 12,000 tonnes of CO_2 per year and provide the information necessary to allow subsequent installation of a larger electrolyser for more significant reductions once the cost of hydrogen production is economically viable and sufficient renewable electricity is available.

6.3.2 Top Gas Recovery Turbine

A Top Gas Recovery Turbine (TRT) designed to extract power from the furnace top gases in a similar fashion to a hydroelectric generation system will be installed at the top of the furnace. The TRT will let the furnace top pressure down from 200 kPa to approximately 10 kPa, driving an alternator to generate approximately 13 MW of electricity to be consumed within the works.

This technology is currently utilised at PKSW and the new TRT at 6BF will produce approximately 3MW more than the existing TRT installed at 5BF, thereby reducing the amount of electricity externally sourced for the operation of PKSW.

6.3.3 Waste Gas Heat Recovery

A Waste Gas Heat Recovery unit will be installed on the 6BF stoves. This technology uses heat pipes to transfer energy directly from the flue gas into both the BFG and combustion air supplied to the stoves.

This technology is not currently implemented at PKSW and its installation at 6BF will reduce the need for enrichment gas, COG, to be used at the stoves. This will enable the use of COG as a reducing agent at the blast furnace to decrease the amount of pulverised coal injected into the furnace.

6.4 Emerging and future breakthrough technologies

BlueScope recognises that the decarbonisation of hard-to-abate industries like iron and steelmaking relies on breakthrough technologies, once proven and scalable. Several hydrogen-based ironmaking technologies are currently being explored across the industry. These range from the injection of hydrogen into existing blast furnace operations to the replacement of current ironmaking technologies with DRI manufactured using renewable hydrogen. Concept studies, prototypes and demonstration plants are being developed, but further significant advances will be needed before these technologies are commercialised. Based on current research, technology and commercial readiness, these technologies are expected to continue to develop over the current and following decade, with significant take-up across the steel industry predicted to occur into the 2040s.

A range of innovative “green steel” ideas are starting to be piloted globally and BlueScope, when examining the possible steel production and supply options to be adopted at the conclusion of the current 5BF campaign, considered the potential use of these breakthrough technologies. Following extensive review of the available options and industry analysis of those developments, BlueScope has concluded that these technologies, and the supporting infrastructure required to implement them (such as a cost competitive renewable hydrogen supply chain) will not be commercialised at a viable scale in time to maintain production once the current campaign of 5BF concludes in the mid to late 2020s.

6.4.1 Biochar

Producing biochar captures 50 percent of the CO_2 that would otherwise escape during waste decomposition and retains most of it for up to 100 years. McKinsey & Company (2020) estimate that biochar technology is less than a decade away from the point when it could start having a real impact: by 2030, it could sequester roughly 2 Mtpa of CO_2.

The use of biochar is identified as an emerging technology in BSL’s Climate Action Report (refer Figure 3.1). This process involves the use of sustainably sourced charcoal from forestry or construction industry waste as a coal substitute. Biochar is currently used as a reductant in some iron and steel plants overseas (such as Brazil) however, the availability of sustainable biochar in Australia is currently limited. A key enabler of this technology will be the development of an economically sustainable source of biochar in Australia.

In 2006, BlueScope partnered with CSIRO and OneSteel in a successful Worldsteel CO_2 Breakthrough R&D (CO2BT) program on the potential use of renewable carbon-based (biochar) materials. In the case of renewable carbon-based materials, the objective was to partially replace coal in various processes, particularly for a) pulverised coal injection (PCI) into the BF, b) metallurgical coal in coke ovens, c) anthracite in iron ore sintering and d) calcined anthracite in steel decarburisation. At the conclusion of the CO2BT program in 2012, the suitability of biochar had been demonstrated at a technical and pilot-scale level for all four applications.

BlueScope is currently evaluating options for the use of biochar as PCI into the BF, through potential supply of biomass/biochar, pyrolysis equipment capable of producing large quantities of biochar, and plant trials at 5BF. If trials are successful and a sustainable supply chain can be established, BlueScope will be able to introduce biochar into the relined 6BF.

It is estimated that biochar has the potential to achieve reductions of up to 450,000 tonnes of CO_2 per annum.

6.4.2 Hydrogen-based Direct Reduced Iron (DRI) / Electric Arc Furnace (EAF) steelmaking

Hydrogen-based DRI coupled with steel production using an EAF is technically feasible and already considered to be part of a potential long-term solution for decarbonizing the steel industry on a large scale. The question is not whether but when and to what extent this transformation will happen.

While integrated manufacturers produce steel from iron ore and need coal as a reductant, EAF producers use steel scrap or direct reduced iron (DRI) as their main raw material and sometimes pig iron in billets. The existing commercial production of DRI is achieved by subjecting pelletised iron ore to natural gas or COG. The hydrogen and carbon monoxide in the natural gas or coal gas react with the oxygen in the iron ore reducing it to iron and generating water and/or CO_2.

Significant attention is being given by the media to the potential for the use of renewable hydrogen as a reductant source to reduce the carbon footprint of steelmaking processes using the DRI process. However, this technology remains at pilot stage; in 2019 its technology readiness level (TRL) was assessed by the Australian Renewable Energy Agency as 1 – 6, indicating the requirement for further research, development and demonstration. The recent report of the Australian Industry Energy Transition Initiative predicts that this technology will be commercially available only in 2035 and this prediction may in fact be optimistic having regard to the timeframes in which step changes in iron and steelmaking technologies typically occur.

There are external factors affecting the immediate implementation of renewable hydrogen-based DRI-EAF steelmaking including production technology, limited power supply, and hydrogen supply security (McKinsey & Company, 2020):

- *Production technology*: While transitioning the process to an entirely hydrogen-powered process is technically feasible, the technology has yet to be proven on a large scale (McKinsey & Company, 2020).
- *Limited power supply*: Renewable hydrogen-based steel creates a need for a significant capacity increase in electricity derived from renewables. To put this into perspective, the total energy required to produce two million tonnes of hydrogen-based steel is about 8.8 Terawatt-hour, which equates to the output from 300 to 1,100 wind turbines (depending on the output capacity of current and future turbines) (McKinsey & Company, 2020). The development of a commercial renewable hydrogen industry requires the availability of renewable electricity to increase substantially. A low-cost, large-scale, reliable supply of renewables is critical to reducing the cost of renewable hydrogen production sufficiently to bring it into the range of commercial viability for industrial use in iron and steelmaking.
- *Hydrogen-supply security*: The future shift to hydrogen-based steel production relies heavily on the broad availability of renewable hydrogen on an industrial scale. Producing two million tonnes of hydrogen-based steel requires 144,000 tonnes of hydrogen (McKinsey & Company, 2020).

As reported by the European Parliamentary Research Service (2020), the production of 1 tonne of steel requires 50 kg of hydrogen. Currently, the largest electrolyser in Australia is 1.25 MW, capable of producing 480 kg of hydrogen per day (AGIG, 2021). PKSW produces approximately 8,000 tonnes of iron per day, therefore, to maintain existing production rates, approximately 400,000 kg of hydrogen would be required per day.

BSL and Shell Energy Operations Pty Ltd have signed a Memorandum of Understanding to investigate, design, build and operate a 10 MW renewable energy hydrogen electrolyser to explore and test the use of renewable hydrogen in the blast furnace at PKSW (refer section 3.7). If successful, it is estimated the 10 MW electrolyser may achieve emission reductions of up to 12,000 tonnes of CO_2 per year. While an improvement, BlueScope estimates up to a 300 MW electrolyser would be required to service the blast furnace.

In addition to the limitations posed by the availability of renewable hydrogen, the transition of steelmaking technology from BF-BOF to renewable hydrogen-based DRI-EAF requires changes to raw material inputs. Currently only 15-20% of iron ores available globally are suitable for use as a DRI feed in a DRI/EAF process configuration. A sudden transition to renewable hydrogen-based DRI-EAF technology by the steelmaking sector could result in rising price premiums given an uncertainty of a secure DRI supply, thereby negatively affecting the economic viability of the production method.

One of the priority action areas of the Memorandum of Understanding signed by BSL and Rio Tinto is to explore the direct reduction of Rio Tinto’s Pilbara ores, which are not currently suitable for direct reduction using the commercially available DRI-EAF technology, to overcome this limitation.

6.4.3 Hydrogen-based Direct Reduced Iron (DRI) / Melter / Basic Oxygen Furnace (BOF)

An alternative process for the use of lower-grade ore sources that are unsuitable for DRI-EAF steel production is to add a Melter process after the DRI process. Such technology exists and can be used to remove the metal oxide impurities (‘gangue’) that are present in the Pilbara hematite based ores. This process also enables the existing BOF-Caster configuration that is part of an integrated steelworks to continue to be utilised, without the need to invest in an additional conversion process. The limitations of renewable hydrogen production and availability for DRI discussed above remain applicable to this technology. As with the DRI-EAF technology, the DRI-Melter-BOF process is electricity-intensive.

Hematite ores such as those which are predominant in the Pilbara region of Australia are not currently suitable for direct reduction using the commercially available DRI-EAF technology due to the levels of gangue present in the material but may be suitable for DRI-Melter-BOF technology. One of the priority action areas of the Memorandum of Understanding signed by BSL and Rio Tinto is to explore the direct reduction of Rio Tinto’s Pilbara ores, to determine the suitability of this technology in the future.

6.4.4 Direct electrolysis of iron ore

Direct electrolysis of iron ore is a proposed technology currently undergoing small pilot trials overseas. It involves the reduction of iron ore using electro-chemical processes rather than using chemical reductants.

This electricity intensive process could potentially be a zero emission technology if utilising 100 per cent renewable energy however, the technology is in its early stages and must be further developed to overcome engineering issues, and pilot trials upscaled before it can be considered technically and economically viable at the scale required.

6.4.5 Blast Furnace coupled with Carbon Capture, Utilisation and Storage (CCUS)

Carbon Capture Utilisation and Storage (CCUS) involves capturing CO_2 emissions at the source, removing impurities, compressing the CO_2 for transport, and either utilising it to create other products or permanently storing it in underground geological formations.

In 2018 to 2019, BlueScope partnered with the CO_2 Cooperative Research Centre (CO2CRC) to explore potential pathways for reducing GHG emissions in steel production through CCS and CCU. A high-level evaluation of the economic viability of transport (piping or shipping) and storage location options for captured CO_2 from Port Kembla was carried out by CO2CRC and the Sydney University. In addition, utilisation of CO_2- and CO-rich gases to provide high-quality, value-added products using innovative biochemical and chemical processes have been considered. Further work on the potential to use plant generated gases to produce ethanol was completed, with many different scenarios considered, including hydrogen and methane.

Findings are yet to be released publicly, however, CCUS opportunities will not be progressed at this stage, as they were determined to be economically unviable.

7. Mitigation measures

7.1 Construction

Construction stage emissions are minor. Measures such as the use of appropriately sized equipment, minimising use and turning off engines where practical will minimise GHG emissions during construction.

7.2 Operations

Mitigation measures have been outlined in Sections 3.7 and 6. The mitigation measures for the project form part of BlueScope's GHG reduction and climate targets. Section 6.3 details technologies that will be incorporated into the operation of the project. A reduction in GHG emissions relative to current 5BF operations is anticipated through the implementation, installation or undertaking of the following:

- Dual lance tuyeres.
- Waste Gas Heat Recovery unit installed on 6BF stoves.
- Top Recovery Turbine installed to extract energy from gases vented from the top of the blast furnace.
- Energy efficiency initiatives such as use of high efficiency motors and variable speed drives on auxiliary equipment.
- Maintenance and operation of equipment to minimise leaks, accidental venting of gases or other fugitive GHG emissions to the extent practical.

In addition to the mitigation measures proposed above, BlueScope is committed to identifying and investigating possible measures to be implemented to reduce net GHG emissions from the operation of 6BF. This will include but is not limited to:

- Optimising raw material mixes.
- Replacing a portion of the pulverised coal currently used in the blast furnace process with alternative reductants such as COG, renewable hydrogen and/or biochar.
- Investigation and review of emerging technologies to determine commercial and economic viability.

BlueScope and BSL will continue to undertake regular reporting on total PKSW net energy consumption and GHG emissions under the NGERS in accordance with the methodology prescribed by the National Greenhouse and Energy Reporting (Measurement) Determination 2008 (Measurement Determination).

Sustainability and Climate Change strategies will be regularly reviewed against evolving regulatory, corporate or other policy over the life of the 6BF campaign to ensure the GHG management strategies are managed in accordance with evolving stakeholder expectations.

BlueScope will also continue to maximise the use of steel manufacturing co-products to offset carbon intensive material inputs into industrial processes e.g. the use of Granulated Blast Furnace Slag as a cementitious replacement for Portland Cement in concrete construction to lower GHG emissions.

8. Conclusions

The quantity of GHG emissions estimated to occur during the full construction and commissioning period are approximately 30,000 tCO_2-e, or approximately 9,800 tCO_2-e per annum. Emissions during construction are minor and approximately 0.1% of annual operational emissions.

In line with current operations, annual emissions from the project will account for less than 1.4% of Australia's annual GHG emissions and approximately 5% of NSW's annual GHG emissions, based on currently available data.

Over the life of the project GHG emissions are predicted to reduce through the implementation of proven technologies including dual lance tuyeres, top recovery gas turbine, waste gas heat recovery and COG injection. These technologies are anticipated to reduce GHG emissions by approximately 172,000 tCO_2-e or approximately 2.5% based on FY2021 emissions. These technologies also provide scope for further reductions. The scope of the project is intended to address the dual aims of the project: to secure BlueScope's domestic ironmaking needs from 2026, as well as provide a bridge to transition from current blast furnace technology to new and emerging low emissions technologies once available at commercial, viable scale

Emissions reductions would also be achieved through the implementation of various other technologies as they become proven and commercially viable. This includes the use of biochar as a pulverised coal replacement, hydrogen-based DRI following installation of a hydrogen electrolyser at PKSW and installation of a COG compression plant.

Measures will be implemented to minimise and reduce GHG emissions and energy usage in relation to the 6BF reline project. Whilst the project represents a continuation of 'business as usual' as iron production is transferred from 5BF to 6BF, ongoing measures implemented by BlueScope as part of the project will ensure ongoing reductions in GHG emissions are achieved.

Consistent with the commitments made by BSL in their Climate Action Report, BlueScope is committed to continue research and investment in emerging technologies for PKSW over the campaign life of 6BF to more substantially reduce GHG emissions. This approach is considered by GHD to be consistent with international, national, state and local GHG policies aimed at achieving a net zero future.

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Appendix K

Biodiversity

Database searches

BRAW Waiver

NSW
GOVERNMENT
Planning,
Industry &
Environment

Contact Name: Deana Burn
Number: 02 9274 6453
Email: deana.burn@planning.nsw.gov.au

Mr Simon Murphy
Environmental Planner
GHD Pty Ltd
PO Box 5403
Hunter Region Mail Centre
NEWCASTLE NSW 2310

Dear Mr Murphy

BlueScope Blast Furnace 6 Reline Project (SSI-22545215)
Approval of the Waiver of Requirement to Prepare a Biodiversity Development Assessment Report

I refer to your correspondence received on 11 June 2021, seeking to waive the requirement to prepare a biodiversity development assessment report (BDAR) for the State significant infrastructure application for the BlueScope Blast Furnace 6 Reline Project.

Description of proposed development
Reline, commission and operate Blast Furnace No. 6 at the Port Kembla Steelworks.

Under section 7.9(2) of the *Biodiversity Conservation Act 2016* (BC Act):
"*Any such application is to be accompanied by a biodiversity assessment report unless the Planning Agency Head and the Environment Agency Head determine that the proposed development is not likely to have any significant impact on the biodiversity values".*

This letter is to confirm that the Planning Secretary of the Department of Planning, Industry and Environment and the Chief Executive of the Environment, Energy and Science Group have determined that the proposed project as described above is not likely to have any significant impact on biodiversity values and that a BDAR is not required to accompany any application for infrastructure approval for the proposed project.

Evidence that the Chief Executive of the Environment, Energy and Science Group has determined that the proposed development is not likely to have any significant impacts on biodiversity values is attached and dated 28 July 2021.

If there are any amendments to the proposed project, a new request for a BDAR waiver determination will be required or a BDAR may need to be prepared.

Should you have any further enquiries, please contact Deana Burn, Planning Services, at the Department on the above contact details.

Yours sincerely

C. Ritchie

5 August 2021

Chris Ritchie
Director
Industry Assessments
(as delegate of the Planning Secretary)

Encl: Determination, Environment, Energy and Science Group
Determination, Department of Planning, Industry and Environment

Attachment D

Determination under clause 7.9(2) of the Biodiversity Conservation Act 2016

I, Chris Ritchie, Director Industry Assessments, Planning Services, of the Department of Planning, Industry and Environment, under clause 7.9(2) of the *Biodiversity Conservation Act 2016*, determine that the proposed project is not likely to have any significant impact on biodiversity values and therefore a Biodiversity Development Assessment Report (BDAR) is not required.

Proposed project means relining, commissioning and operation of Blast Furnace No. 6 at the Port Kembla Steelworks and as detailed in the “BDAR waiver application dated 11 June 2021”. If the proposed project changes so that it is no longer consistent with this description, a further waiver request is required.

C. Ritchie

5 August 2021

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Director **Date**
Industry Assessments
Planning Services
Department of Planning, Industry and Environment
(as delegate of the Planning Secretary)

Determination under clause 7.9(2) of the Biodiversity Conservation Act 2016

I, Michael Saxon, Director South East Branch, Conservation and Regional Delivery Division of the Office of Environment and Heritage, under clause 7.9(2) of the *Biodiversity Conservation Act 2016*, determine that the proposed development is unlikely to have any significant impact on biodiversity values and a Biodiversity Development Assessment Report (BDAR) **is therefore not required**.

Proposed development means the development as described in Schedule 1. If the proposed development changes so that it is no longer consistent with this description, a further request to waive the requirement for a BDAR must be lodged or a BDAR prepared.

If you do not lodge the development application related to this determination for the proposed development within 2 years of the issue date of this determination, you must either prepare a BDAR or lodge a new request to have the BDAR requirement waived.

28/7/2021

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Michael Saxon
South East Branch
Biodiversity and Conservation Division

Date

SCHEDULE 1 – Description of the proposed development

BlueScope Blast Furnace No. 6 Reline (SSI-22545215)

The proposal is to reline an existing blast furnace to allow for the ongoing manufacture of steel at the Port Kembla BlueScope Pty steelworks.

The blast furnace site is located within a heavily industrialised site, with no native vegetation present and very little threatened species habitat, connectivity or potential for presence.

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Public Report of all Valid Records of Threatened (listed on BC Act 2016) ,Commonwealth listed ,CAMBA listed ,JAMBA listed or ROKAMBA listed Entities in selected area [North: -34.36 West: 150.79 East: 150.99 South: -34.56] returned a total of 17,013 records of 133 species.
Report generated on 24/08/2021 3:44 PM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Amphibia	Myobatrachidae	3116	*Pseudophryne australis*		Red-crowned Toadlet	V,P		17	ℹ
Animalia	Amphibia	Hylidae	3166	*Litoria aurea*		Green and Golden Bell Frog	E1,P	V	479	ℹ
Animalia	Amphibia	Hylidae	3039	*Litoria littlejohni*		Littlejohn's Tree Frog	V,P	V	1	ℹ
Animalia	Amphibia	Limnodynastidae	3042	*Heleioporus australiacus*		Giant Burrowing Frog	V,P	V	3	ℹ
Animalia	Reptilia	Cheloniidae	2004	*Caretta caretta*		Loggerhead Turtle	E1,P	E	1	ℹ
Animalia	Reptilia	Cheloniidae	2007	*Chelonia mydas*		Green Turtle	V,P	V	5	ℹ
Animalia	Reptilia	Cheloniidae	2008	*Eretmochelys imbricata*		Hawksbill Turtle	P	V	1	ℹ
Animalia	Reptilia	Varanidae	2287	*Varanus rosenbergi*		Rosenberg's Goanna	V,P		1	ℹ
Animalia	Reptilia	Elapidae	2676	*^Hoplocephalus bungaroides*		Broad-headed Snake	E1,P,2	V	4	ℹ
Animalia	Aves	Anatidae	0216	*Oxyura australis*		Blue-billed Duck	V,P		40	ℹ
Animalia	Aves	Anatidae	0214	*Stictonetta naevosa*		Freckled Duck	V,P		40	ℹ
Animalia	Aves	Phaethontidae	0108	*Phaethon lepturus*		White-tailed Tropicbird	P	C,J	3	ℹ
Animalia	Aves	Columbidae	0025	*Ptilinopus magnificus*		Wompoo Fruit-Dove	V,P		2	ℹ
Animalia	Aves	Columbidae	0021	*Ptilinopus regina*		Rose-crowned Fruit-Dove	V,P		2	ℹ
Animalia	Aves	Columbidae	0023	*Ptilinopus superbus*		Superb Fruit-Dove	V,P		3	ℹ
Animalia	Aves	Apodidae	0335	*Apus pacificus*		Fork-tailed Swift	P	C,J,K	2	ℹ
Animalia	Aves	Apodidae	0334	*Hirundapus caudacutus*		White-throated Needletail	P	V,C,J,K	7	ℹ
Animalia	Aves	Diomedeidae	0086	*Diomedea exulans*		Wandering Albatross	E1,P	E	1417	ℹ
Animalia	Aves	Diomedeidae	0847	*Diomedea gibsoni*		Gibson's Albatross	V,P	V	1	ℹ
Animalia	Aves	Diomedeidae	0859	*Thalassarche impavida*		Campbell Albatross	P	V	1	ℹ

Animalia	Aves	Diomedeidae	0088	*Thalassarche melanophris*	Black-browed Albatross	V,P	V	9	ℹ
Animalia	Aves	Diomedeidae	0862	*Thalassarche salvini*	Salvin's Albatross	P	V	1	ℹ
Animalia	Aves	Procellariidae	0072	*Ardenna carneipes*	Flesh-footed Shearwater	V,P	J,K	2	ℹ
Animalia	Aves	Procellariidae	0070	*Ardenna grisea*	Sooty Shearwater	P	J	4	
Animalia	Aves	Procellariidae	0069	*Ardenna pacifica*	Wedge-tailed Shearwater	P	J	7831	
Animalia	Aves	Procellariidae	0071	*Ardenna tenuirostris*	Short-tailed Shearwater	P	C,J,K	408	
Animalia	Aves	Procellariidae	0853	*Calonectris leucomelas*	Streaked Shearwater	P	C,J,K	2	
Animalia	Aves	Procellariidae	0929	*Macronectes giganteus*	Southern Giant Petrel	E1,P	E	16	ℹ
Animalia	Aves	Procellariidae	0937	*Macronectes halli*	Northern Giant-Petrel	V,P	V	2	ℹ
Animalia	Aves	Procellariidae	8684	*Pterodroma leucoptera leucoptera*	Gould's Petrel	V,P	E	1	ℹ
Animalia	Aves	Procellariidae	0067	*Puffinus assimilis*	Little Shearwater	V,P		2	ℹ
Animalia	Aves	Fregatidae	0095	*Fregata ariel*	Lesser Frigatebird	P	C,J,K	1	
Animalia	Aves	Sulidae	0102	*Sula leucogaster*	Brown Booby	P	C,J,K	1	
Animalia	Aves	Ciconiidae	0183	*Ephippiorhynchus asiaticus*	Black-necked Stork	E1,P		3	ℹ
Animalia	Aves	Ardeidae	0197	*Botaurus poiciloptilus*	Australasian Bittern	E1,P	E	3	ℹ
Animalia	Aves	Ardeidae	0196	*Ixobrychus flavicollis*	Black Bittern	V,P		16	ℹ
Animalia	Aves	Accipitridae	0218	*Circus assimilis*	Spotted Harrier	V,P		1	ℹ
Animalia	Aves	Accipitridae	0226	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V,P		39	ℹ
Animalia	Aves	Accipitridae	0225	*Hieraaetus morphnoides*	Little Eagle	V,P		7	ℹ
Animalia	Aves	Accipitridae	0230	^^*Lophoictinia isura*	Square-tailed Kite	V,P,3		11	ℹ
Animalia	Aves	Accipitridae	8739	^^*Pandion cristatus*	Eastern Osprey	V,P,3		31	ℹ
Animalia	Aves	Haematopodidae	0131	*Haematopus fuliginosus*	Sooty Oystercatcher	V,P		55	ℹ
Animalia	Aves	Haematopodidae	0130	*Haematopus longirostris*	Pied Oystercatcher	E1,P		18	ℹ
Animalia	Aves	Charadriidae	0141	*Charadrius leschenaultii*	Greater Sand-plover	V,P	V,C,J,K	6	ℹ
Animalia	Aves	Charadriidae	0139	*Charadrius mongolus*	Lesser Sand-plover	V,P	E,C,J,K	2	ℹ
Animalia	Aves	Charadriidae	8006	*Pluvialis fulva*	Pacific Golden Plover	P	C,J,K	8	
Animalia	Aves	Charadriidae	0136	*Pluvialis squatarola*	Grey Plover	P	C,J,K	18	

Animalia	Aves	Charadriidae	T453	*Thinornis cucullatus cucullatus*	Eastern Hooded Dotterel	E4A	V	5	ℹ
Animalia	Aves	Rostratulidae	0170	*Rostratula australis*	Australian Painted Snipe	E1,P	E	1	ℹ
Animalia	Aves	Scolopacidae	0157	*Actitis hypoleucos*	Common Sandpiper	P	C,J,K	2	
Animalia	Aves	Scolopacidae	0129	*Arenaria interpres*	Ruddy Turnstone	P	C,J,K	25	
Animalia	Aves	Scolopacidae	0163	*Calidris acuminata*	Sharp-tailed Sandpiper	P	C,J,K	29	
Animalia	Aves	Scolopacidae	0166	*Calidris alba*	Sanderling	V,P	C,J,K	18	ℹ
Animalia	Aves	Scolopacidae	0164	*Calidris canutus*	Red Knot	P	E,C,J,K	10	ℹ
Animalia	Aves	Scolopacidae	0161	*Calidris ferruginea*	Curlew Sandpiper	E1,P	CE,C,J,K	10	ℹ
Animalia	Aves	Scolopacidae	0978	*Calidris melanotos*	Pectoral Sandpiper	P	J,K	3	
Animalia	Aves	Scolopacidae	0162	*Calidris ruficollis*	Red-necked Stint	P	C,J,K	15	
Animalia	Aves	Scolopacidae	0165	*Calidris tenuirostris*	Great Knot	V,P	CE,C,J,K	10	ℹ
Animalia	Aves	Scolopacidae	0168	*Gallinago hardwickii*	Latham's Snipe	P	J,K	13	
Animalia	Aves	Scolopacidae	0167	*Limicola falcinellus*	Broad-billed Sandpiper	V,P	C,J,K	3	ℹ
Animalia	Aves	Scolopacidae	0153	*Limosa lapponica*	Bar-tailed Godwit	P	C,J,K	33	
Animalia	Aves	Scolopacidae	0152	*Limosa limosa*	Black-tailed Godwit	V,P	C,J,K	2	ℹ
Animalia	Aves	Scolopacidae	0149	*Numenius madagascariensis*	Eastern Curlew	P	CE,C,J,K	22	ℹ
Animalia	Aves	Scolopacidae	0150	*Numenius phaeopus*	Whimbrel	P	C,J,K	2	
Animalia	Aves	Scolopacidae	0155	*Tringa brevipes*	Grey-tailed Tattler	P	C,J,K	12	
Animalia	Aves	Scolopacidae	0156	*Tringa incana*	Wandering Tattler	P	J	9	
Animalia	Aves	Scolopacidae	0158	*Tringa nebularia*	Common Greenshank	P	C,J,K	25	
Animalia	Aves	Scolopacidae	0159	*Tringa stagnatilis*	Marsh Sandpiper	P	C,J,K	5	
Animalia	Aves	Scolopacidae	0160	*Xenus cinereus*	Terek Sandpiper	V,P	C,J,K	5	ℹ
Animalia	Aves	Stercorariidae	0128	*Stercorarius parasiticus*	Arctic Jaeger	P	C,J,K	3	
Animalia	Aves	Stercorariidae	0945	*Stercorarius pomarinus*	Pomarine Jaeger	P	C,J,K	1	
Animalia	Aves	Laridae	0109	*Chlidonias leucopterus*	White-winged Black Tern	P	C,J,K	16	
Animalia	Aves	Laridae	0111	*Gelochelidon nilotica*	Gull-billed Tern	P	C	1	
Animalia	Aves	Laridae	0972	*Gygis alba*	White Tern	V,P		2	ℹ
Animalia	Aves	Laridae	0112	*Hydroprogne caspia*	Caspian Tern	P	J	59	
Animalia	Aves	Laridae	0120	*Onychoprion fuscata*	Sooty Tern	V,P		4	ℹ
Animalia	Aves	Laridae	0953	*Sterna hirundo*	Common Tern	P	C,J,K	6	
Animalia	Aves	Laridae	0117	*Sternula albifrons*	Little Tern	E1,P	C,J,K	258	ℹ

Animalia	Aves	Laridae	0115	*Thalasseus bergii*	Crested Tern	P	J	4855	ℹ
Animalia	Aves	Cacatuidae	0268	^^*Callocephalon fimbriatum*	Gang-gang Cockatoo	V,P,3		64	ℹ
Animalia	Aves	Cacatuidae	0265	^*Calyptorhynchus lathami*	Glossy Black-Cockatoo	V,P,2		6	ℹ
Animalia	Aves	Psittacidae	0260	*Glossopsitta pusilla*	Little Lorikeet	V,P		11	ℹ
Animalia	Aves	Psittacidae	0309	^^*Lathamus discolor*	Swift Parrot	E1,P,3	CE	36	ℹ
Animalia	Aves	Psittacidae	0302	^^*Neophema pulchella*	Turquoise Parrot	V,P,3		3	ℹ
Animalia	Aves	Psittacidae	0709	^^*Polytelis anthopeplus monarchoides*	Regent Parrot (eastern subspecies)	E1,P,3	V	1	ℹ
Animalia	Aves	Psittacidae	0277	^^*Polytelis swainsonii*	Superb Parrot	V,P,3	V	1	ℹ
Animalia	Aves	Strigidae	0246	^^*Ninox connivens*	Barking Owl	V,P,3		1	ℹ
Animalia	Aves	Strigidae	0248	^^*Ninox strenua*	Powerful Owl	V,P,3		42	ℹ
Animalia	Aves	Tytonidae	0250	^^*Tyto novaehollandiae*	Masked Owl	V,P,3		5	ℹ
Animalia	Aves	Tytonidae	9924	^^*Tyto tenebricosa*	Sooty Owl	V,P,3		19	ℹ
Animalia	Aves	Dasyornithidae	0519	^*Dasyornis brachypterus*	Eastern Bristlebird	E1,P,2	E	4	ℹ
Animalia	Aves	Meliphagidae	0603	*Anthochaera phrygia*	Regent Honeyeater	E4A,P	CE	3	ℹ
Animalia	Aves	Meliphagidae	0448	*Epthianura albifrons*	White-fronted Chat	V,P		1	ℹ
Animalia	Aves	Meliphagidae	0598	*Grantiella picta*	Painted Honeyeater	V,P	V	1	ℹ
Animalia	Aves	Meliphagidae	8303	*Melithreptus gularis gularis*	Black-chinned Honeyeater (eastern subspecies)	V,P		1	ℹ
Animalia	Aves	Neosittidae	0549	*Daphoenositta chrysoptera*	Varied Sittella	V,P		2	ℹ
Animalia	Aves	Campephagidae	0428	*Coracina lineata*	Barred Cuckoo-shrike	V,P		1	ℹ
Animalia	Aves	Pachycephalidae	0405	*Pachycephala olivacea*	Olive Whistler	V,P		2	ℹ
Animalia	Aves	Artamidae	8519	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V,P		1	ℹ
Animalia	Aves	Petroicidae	0380	*Petroica boodang*	Scarlet Robin	V,P		1	ℹ
Animalia	Aves	Petroicidae	0382	*Petroica phoenicea*	Flame Robin	V,P		2	ℹ
Animalia	Aves	Petroicidae	0383	*Petroica rodinogaster*	Pink Robin	V,P		1	ℹ
Animalia	Mammalia	Dasyuridae	1008	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P	E	3	ℹ
Animalia	Mammalia	Phascolarctidae	1162	*Phascolarctos cinereus*	Koala	V,P	V	15	ℹ

Animalia	Mammalia	Burramyidae	1150	*Cercartetus nanus*	Eastern Pygmy-possum	V,P		11	ℹ
Animalia	Mammalia	Petauridae	1137	*Petaurus norfolcensis*	Squirrel Glider	V,P		2	ℹ
Animalia	Mammalia	Pseudocheiridae	1133	*Petauroides volans*	Greater Glider	P	V	23	ℹ
Animalia	Mammalia	Pteropodidae	1280	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	504	ℹ
Animalia	Mammalia	Vespertilionidae	1353	*Chalinolobus dwyeri*	Large-eared Pied Bat	V,P	V	1	ℹ
Animalia	Mammalia	Vespertilionidae	1372	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V,P		3	ℹ
Animalia	Mammalia	Vespertilionidae	1357	*Myotis macropus*	Southern Myotis	V,P		3	ℹ
Animalia	Mammalia	Vespertilionidae	1361	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V,P		2	ℹ
Animalia	Mammalia	Miniopteridae	1346	*Miniopterus australis*	Little Bent-winged Bat	V,P		4	ℹ
Animalia	Mammalia	Miniopteridae	3330	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	V,P		12	ℹ
Animalia	Mammalia	Dugongidae	1558	*Dugong dugon*	Dugong	E1,P		1	ℹ
Animalia	Mammalia	Otariidae	1882	*Arctocephalus pusillus doriferus*	Australian Fur-seal	V,P		10	ℹ
Animalia	Mammalia	Balaenopteridae	1575	*Megaptera novaeangliae*	Humpback Whale	V,P	V	2	ℹ
Animalia	Mammalia	Physeteridae	1578	*Physeter macrocephalus*	Sperm Whale	V,P		2	ℹ
Plantae	Flora	Apocynaceae	1226	*Cynanchum elegans*	White-flowered Wax Plant	E1	E	65	ℹ
Plantae	Flora	Davalliaceae	8085	*^^Arthropteris palisotii*	Lesser Creeping Fern	E1,3		1	ℹ
Plantae	Flora	Ericaceae	7752	*Epacris purpurascens var. purpurascens*		V		3	ℹ
Plantae	Flora	Fabaceae (Caesalpinioideae)	8772	*Senna acclinis*	Rainforest Cassia	E1		3	ℹ
Plantae	Flora	Fabaceae (Faboideae)	2797	*Chorizema parviflorum*	Chorizema parviflorum Benth. in the Wollongong and Shellharbour Local Government Areas	E2		1	ℹ
Plantae	Flora	Fabaceae (Faboideae)	2974	*Pultenaea aristata*	Prickly Bush-pea	V	V	48	ℹ

Plantae	Flora	Fabaceae (Mimosoideae)	6577	*Acacia baueri subsp. aspera*		V		3	i
Plantae	Flora	Myrtaceae	11397	*Gossia acmenoides*	Gossia acmenoides population in the Sydney Basin Bioregion south of the Georges River	E2		11	i
Plantae	Flora	Myrtaceae	4283	*Rhodamnia rubescens*	Scrub Turpentine	E4A		38	i
Plantae	Flora	Myrtaceae	4293	*Syzygium paniculatum*	Magenta Lilly Pilly	E1	V	3	i
Plantae	Flora	Proteaceae	9678	*Grevillea raybrownii*		V		1	i
Plantae	Flora	Rutaceae	5839	*Zieria granulata*	Illawarra Zieria	E1	E	9	i
Plantae	Flora	Solanaceae	11442	*Solanum celatum*		E1		20	i
Plantae	Flora	Thymelaeaceae	6965	*Pimelea curviflora var. curviflora*		V	V	2	i
Plantae	Flora	Thymelaeaceae	6190	*Pimelea spicata*	Spiked Rice-flower	E1	E	6	i

Australian Government

Department of Agriculture,
Water and the Environment

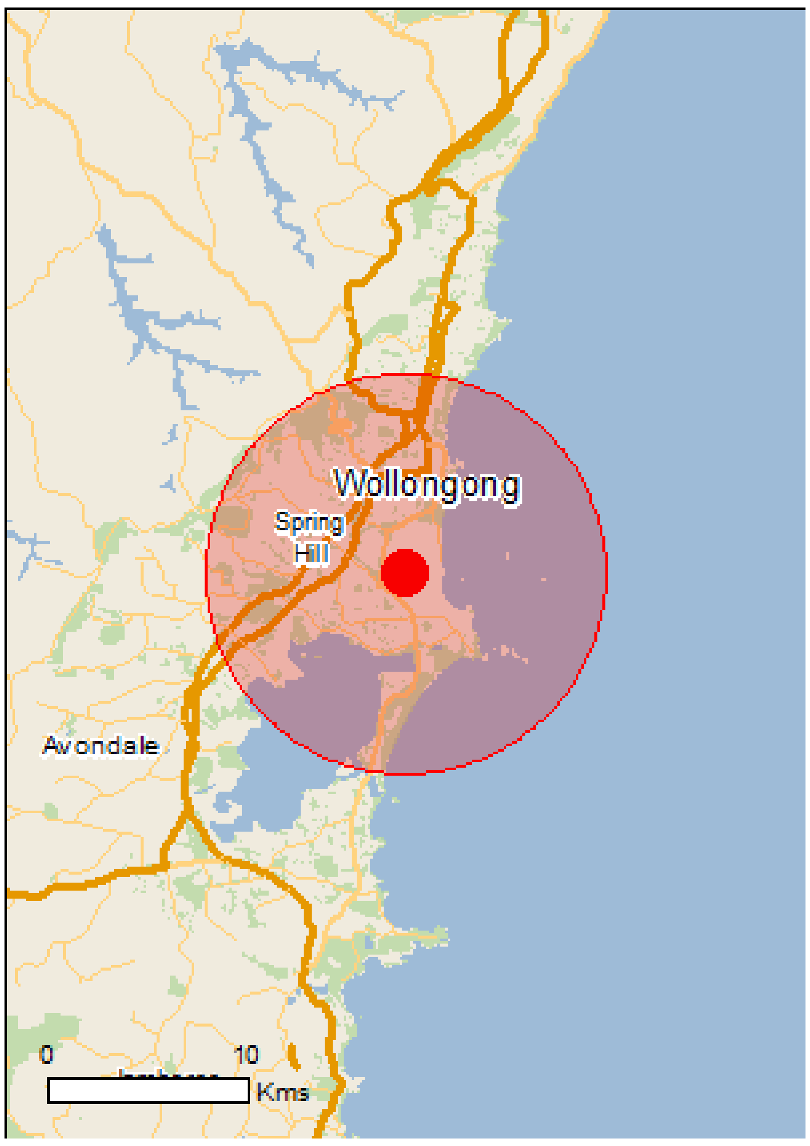
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 24/08/21 16:19:08



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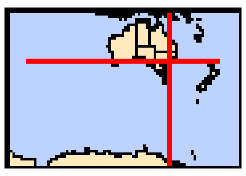
Coordinates
Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	7
Listed Threatened Species:	94
Listed Migratory Species:	75

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	14
Commonwealth Heritage Places:	None
Listed Marine Species:	104
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	3
Regional Forest Agreements:	None
Invasive Species:	50
Nationally Important Wetlands:	3
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Coastal Upland Swamps in the Sydney Basin Bioregion	Endangered	Community likely to occur within area
Illawarra and south coast lowland forest and woodland ecological community	Critically Endangered	Community likely to occur within area
Illawarra-Shoalhaven Subtropical Rainforest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area

Name	Status	Type of Presence
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis cucullatus cucullatus Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat likely to occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat likely to occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Litoria littlejohni Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Isoodon obesulus obesulus Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Acacia bynoeana Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area
Allocasuarina glareicola [21932]	Endangered	Species or species habitat may occur within area
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat known to occur within area
Genoplesium baueri Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid [7528]	Endangered	Species or species habitat likely to occur within area
Grevillea raybrownii [65665]	Vulnerable	Species or species habitat may occur within area
Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat known to occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat likely to occur within area
Persoonia hirsuta Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat known to occur within area
Persoonia nutans Nodding Geebung [18119]	Endangered	Species or species habitat may occur within area
Pimelea spicata Spiked Rice-flower [20834]	Endangered	Species or species habitat known to occur within area
Pomaderris brunnea Rufous Pomaderris, Brown Pomaderris [16845]	Vulnerable	Species or species habitat may occur within area
Prasophyllum affine Jervis Bay Leek Orchid, Culburra Leek-orchid, Kinghorn Point Leek-orchid [2210]	Endangered	Species or species habitat may occur within area
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat likely to occur within area
Pterostylis saxicola Sydney Plains Greenhood [64537]	Endangered	Species or species habitat may occur within area
Pultenaea aristata [18062]	Vulnerable	Species or species habitat likely to occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area
Thelymitra kangaloonica Kangaloon Sun Orchid [81861]	Critically Endangered	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat may occur within area
Zieria granulata Hill Zieria, Hilly Zieria, Illawarra Zieria [17147]	Endangered	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Hoplocephalus bungaroides Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed		Foraging, feeding or

Name	Threatened	Type of Presence
Shearwater [82404]		related behaviour likely to occur within area
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat likely to occur within area
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Ardenna tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sternula albifrons Little Tern [82849]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area

Name	Threatened	Type of Presence
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Postal Corporation
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Trading Bank of Australia
Commonwealth Land - Defence Housing Authority
Commonwealth Land - Defence Service Homes Corporation
Defence - AIRTC WOLLONGONG
Defence - Graovac House
Defence - HYDROGRAPHIC OFFICE
Defence - LAKE ILLAWARRA CADET FACILITY
Defence - THROSBY TRG DEPOT-PORT KEMBLA
Defence - TS ALBATROSS-WOLLONGONG
Defence - WOLLONGONG MULTI-USER DEPOT

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area

Name	Threatened	Type of Presence
Calidris tenuirostris		
Great Knot [862]	Critically Endangered	Roosting known to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat known to occur within area
Catharacta skua		
Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus		
Double-banded Plover [895]		Roosting known to occur within area
Charadrius mongolus		
Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus		
Red-capped Plover [881]		Roosting known to occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni		
Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi		
Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Eudyptula minor		
Little Penguin [1085]		Breeding known to occur within area
Fregata ariel		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor		
Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Gallinago megala		
Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura		
Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes		
Grey-tailed Tattler [59311]		Roosting known to occur within area
Himantopus himantopus		
Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area

Name	Threatened	Type of Presence
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Larus dominicanus Kelp Gull [809]		Breeding known to occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur

Name	Threatened	Type of Presence
		within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat likely to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Puffinus tenuirostris Short-tailed Shearwater [1029]		Breeding known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable*	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Cosmocampus howensis Lord Howe Pipefish [66208]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Whales and other Cetaceans

[Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area

Name	Status	Type of Presence
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves

[Resource Information]

Name	State
Berkeley	NSW
Five Islands	NSW
Illawarra Escarpment	NSW

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat may occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Feral deer		
Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis		
Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus		
House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus		
Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus		
Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus		
Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa		
Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes		
Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides		
Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia		
Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus		
Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides		
Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus		
Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Asparagus scandens		
Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
Cabomba caroliniana		
Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera		
Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera		
Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata		
Bitou Bush [16332]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Cytisus scoparius		
Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Eichhornia crassipes		
Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista monspessulana		
Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana		
Broom [67538]		Species or species habitat may occur within area
Lantana camara		
Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum		
African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana		
Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma		
Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp.		
Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata		
Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate		
Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla		
Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta		
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis		
Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus		
Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Coomaditchy Lagoon	NSW
Five Islands Nature Reserve	NSW
Lake Illawarra	NSW

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-34.46203 150.88375

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Appendix L

AHIMS search results

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : BlueScope

Client Service ID : 616068

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
52-5-0187	Primbee 3;	AGD	56	306340	6180410	Open site	Valid	Shell : -, Artefact : -	Midden	647,102212
	Contact	**Recorders**	Mrs.Caryll Sefton					**Permits**		
52-5-0188	Primbee 1;	AGD	56	306800	6180340	Open site	Valid	Artefact : -	Open Camp Site	102212
	Contact	**Recorders**	ASRSYS					**Permits**		
52-5-0189	Primbee 2;	AGD	56	306480	6180330	Open site	Valid	Artefact : -	Open Camp Site	102212
	Contact	**Recorders**	ASRSYS					**Permits**		
52-2-1285	Wollami Point;	AGD	56	303300	6181600	Open site	Valid	Shell : -, Artefact : -	Midden	1330,102212
	Contact	**Recorders**	Kerry Navin					**Permits**		
52-2-1286	Elephant site;	AGD	56	303950	6181350	Open site	Valid	Shell : -, Artefact : -	Midden	1330,102212
	Contact	**Recorders**	Kerry Navin,S Hamm					**Permits**		
52-2-1287	Hooka Pt. 2;	AGD	56	301090	6181400	Open site	Valid	Shell : -, Artefact : -	Midden	1330,102212
	Contact	**Recorders**	Kerry Navin					**Permits**		
52-2-1288	Hooka Pt. 3;	AGD	56	301800	6181700	Open site	Valid	Shell : -, Artefact : -	Midden	1330,102212
	Contact	**Recorders**	Kerry Navin					**Permits**	1876	
52-2-1289	North Beach 2	GDA	56	308600	6181700	Open site	Valid	Shell : -, Artefact : -	Midden	1330,102212
	Contact	**Recorders**	Kerry Navin,Niche Environment and Heritage,Miss.Layne Holloway					**Permits**	4544	
52-2-1290	North Beach 1;	GDA	56	308300	6182700	Open site	Partially Destroyed	Shell : -, Artefact : -	Midden	1330,102212
	Contact	**Recorders**	Kerry Navin,Niche Environment and Heritage,Miss.Layne Holloway					**Permits**	602,1471,4544	
52-2-0534	Big Island	AGD	56	309630	6181370	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Illawarra Prehistory Group					**Permits**		
52-2-0033	Berkeley;Hooker Point;	AGD	56	301548	6181337	Open site	Valid	Shell : -, Artefact : -	Midden	729,102212
	Contact	**Recorders**	University of Sydney					**Permits**	1876	
52-2-1728	Red point;	AGD	56	309000	6181000	Open site	Valid	Shell : -, Artefact : -	Midden	102212
	Contact	**Recorders**	Mr.Neville Baker					**Permits**		
52-2-0059	Primbee;Coomaditchy Lagoon	AGD	56	306863	6180802	Closed site	Valid	Artefact : -, Shell : -	Midden,Shelter with Deposit	102212
	Contact	**Recorders**	O.B Pryor					**Permits**		
52-2-0072	Red Point; 1	GDA	56	308319	6181196	Open site	Valid	Burial : -, Shell : -, Artefact : -	Midden	102212
	Contact	**Recorders**	Dal Birrell,Bill Sullivan,Niche Environment and Heritage,Miss.Layne Holloway					**Permits**		
52-2-0476	Red Point	GDA	56	308600	6181780	Open site	Not a Site	Shell : -, Artefact : -	Midden,Open Camp Site	102212
	Contact	**Recorders**	James Farrell,Niche Environment and Heritage,Miss.Layne Holloway					**Permits**	4544	
52-2-2203	Gloucestor Ave	GDA	56	308230	6182540	Open site	Valid	Artefact : -		102212
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Niche Environment and Heritage,Niche					**Permits**	1371,4544	
52-2-2261	Gooseberry Island 1	AGD	56	302000	6180850	Open site	Valid	Shell : -, Artefact : -		102212
	Contact	**Recorders**	Cheryl Stanborough					**Permits**		

Report generated by AHIMS Web Service on 24/08/2021 for Poppy Kiem for the following area at Lat, Long From : -34.5, 150.83 - Lat, Long To : -34.43, 150.95. Number of Aboriginal sites and Aboriginal objects found is 33

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports	Contact	Recorders	Permits
52-2-3024	BR1 Berkeley	AGD	56	302776	6183010	Open site	Valid	Artefact : 1		102212		Unknown Author	1938
52-2-3208	Hill 60/ Red Point	AGD	56	309000	6181000	Open site	Valid	Aboriginal Resource and Gathering : -		102212	T Russell	Ms.Sue Wesson	
52-2-3209	Goosberry Island	AGD	56	302000	6180900	Open site	Valid	Aboriginal Ceremony and Dreaming : -		102212	T Russell	Ms.Sue Wesson	
52-2-3201	Hooka Island	AGD	56	301300	6180900	Open site	Valid	Aboriginal Ceremony and Dreaming : -		102212	T Russell	Ms.Sue Wesson	
52-2-3202	Five Islands	AGD	56	308650	6181250	Open site	Valid	Aboriginal Ceremony and Dreaming : -, Aboriginal Resource and Gathering : -		102212		Ms.Sue Wesson	4544
52-2-3197	Mt Kembla	AGD	56	302000	6186500	Open site	Valid	Aboriginal Ceremony and Dreaming : 1, Aboriginal Resource and Gathering : 1		102212	T Russell	Ms.Sue Wesson	
52-2-3199	Fig Tree Site	AGD	56	303075	6186850	Open site	Valid	Aboriginal Ceremony and Dreaming : -, Aboriginal Resource and Gathering : -		102212	T Russell	Ms.Sue Wesson	
52-2-3200	Coomaditchie/Official Camps	AGD	56	307000	6181000	Open site	Valid	Aboriginal Ceremony and Dreaming : -, Habitation Structure : -		102212		Ms.Sue Wesson	
52-2-3618	BSS-OS-1	AGD	56	304670	6185580	Open site	Valid	Artefact : -		102212		Mills Archaeological & Heritage Services Pty Ltd	
52-5-0081	Red Point Parkyn's Beach	AGD	56	307595	6180816	Open site	Valid	Shell : -, Artefact : -	Midden	877,2048,102212		K Jeffcoat	
52-2-3675	Figtree TRE; Amaroo Avenue	GDA	56	302222	6186473	Open site	Valid	Modified Tree (Carved or Scarred) : -		102212		Mr.Mark Simon	
52-2-4238	Red Point 2	GDA	56	308969	6181168	Open site	Valid	Shell : -					

Report generated by AHIMS Web Service on 24/08/2021 for Poppy Kiem for the following area at Lat, Long From : -34.5, 150.83 - Lat, Long To : -34.43, 150.95. Number of Aboriginal sites and Aboriginal objects found is 33

NSW GOVERNMENT

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : BlueScope

Client Service ID : 616068

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	Matthew Kelleher					**Permits**	3917	
52-2-4245	Restriction applied. Please contact ahims@environment.nsw.gov.au.					Open site	Valid			
	Contact	**Recorders**	Mr.Roy Barker					**Permits**		
52-2-4344	Restriction applied. Please contact ahims@environment.nsw.gov.au.					Open site	Valid			
	Contact	**Recorders**	Mr.Paul House					**Permits**	4544	
52-2-4502	Gloucester Boulevarde Midden 01	GDA	56	308493	6182251	Open site	Valid	Artefact : -, Shell : -		
	Contact	**Recorders**	Niche Environment and Heritage,Miss.Layne Holloway					**Permits**	4544	
52-2-4673	PORT KEMBLA MIDDEN	GDA	56	307950	6181308	Open site	Valid	Shell : 1		
	Contact	**Recorders**	Miss.Rose O'Sullivan,Mr.SINSW Heritage					**Permits**		

**** Site Status**

Valid - The site has been recorded and accepted onto the system as valid

Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground

Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

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Report generated by AHIMS Web Service on 24/08/2021 for Poppy Kiem for the following area at Lat, Long From : -34.5, 150.83 - Lat, Long To : -34.43, 150.95. Number of Aboriginal sites and Aboriginal objects found is 33

AHIMS Web Services (AWS)

Search Result

Your Ref/PO Number : BlueScope

Client Service ID : 616068

GHD - Newcastle

Date: 24 August 2021

24 Honeysuckle Drive
Newcastle New South Wales 2300

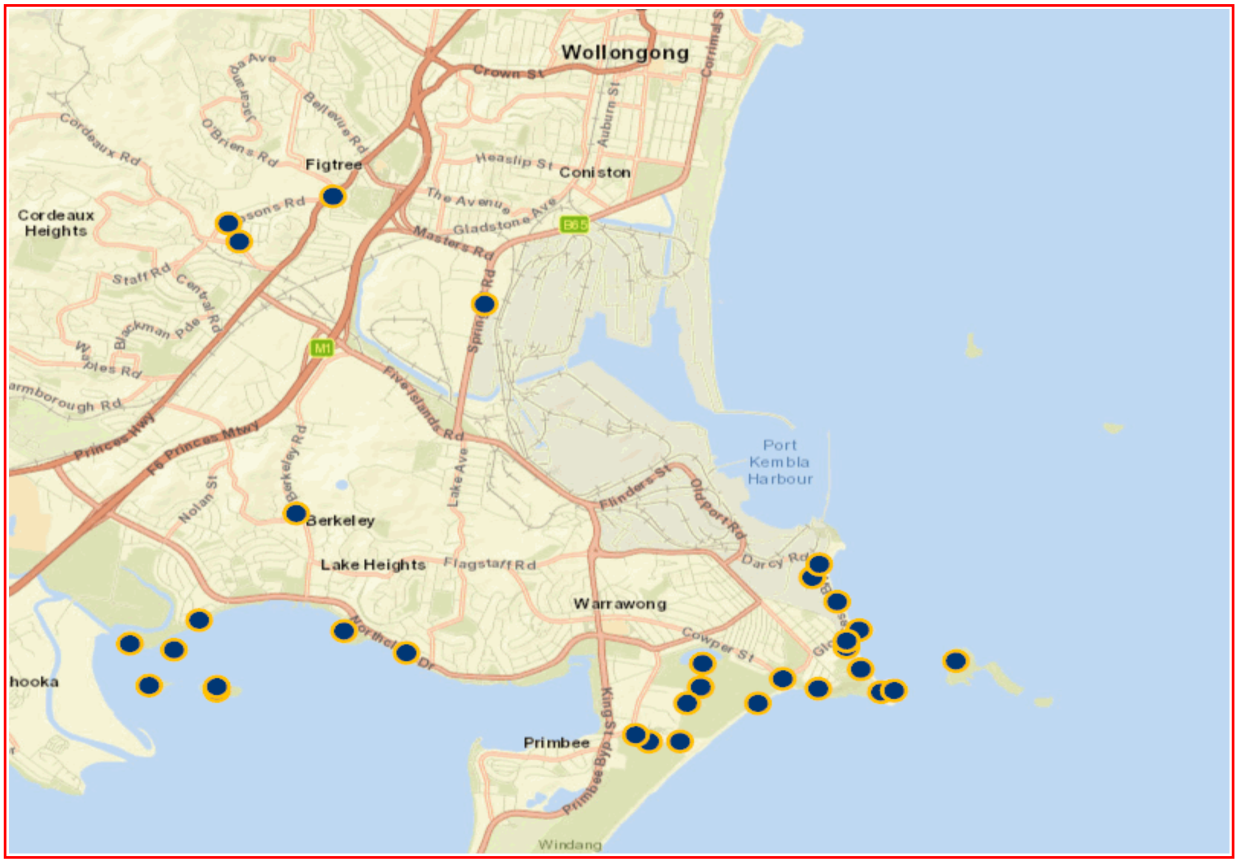
Attention: Poppy Kiem

Email: poppy.kiem@ghd.com

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -34.5, 150.83 - Lat, Long To : -34.43, 150.95, conducted by Poppy Kiem on 24 August 2021.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

33	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

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