Government of Western Australia
Department of Water and Environmental Regulation

Decision Report

Application for Works Approval

Part V Division 3 of the *Environmental Protection Act 1986*

Works Approval Number	W6964/2024/1
Applicant	Hamersley Iron Pty Limited (Trading as: Rio Tinto Limited)
ACN	004 558 276
File number	DER2024/000462 / APP-0025982
Premises	BioIron Pilot Plant Project 60 Office Road, East Rockingham WA 6168 Legal description Lot 1728 on Deposited Plan 166742 As defined by the coordinates in Schedule 1 of the works approval
Date of report	28 July 2025
Proposed Decision	Works approval granted

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MANAGER, PROCESS INDUSTRIES
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

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1. Decision summary

This decision report documents the assessment of potential risks to the environment and public health from emissions and discharges during the construction and operation of the premises. As a result of this assessment, works approval W6964/2024/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this decision report, the Department of Water and Environmental Regulation (the department; DWER) has considered and given due regard to its regulatory framework and relevant policy documents which are available at https://dwer.wa.gov.au/regulatory-documents.

2.2 Application summary and overview of premises

On 26 August 2024, the applicant submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act).

The application is to undertake construction and time limited operations of a new BioIron™ Pilot Plant. The premises is approximately 2 km west of the residential area of Kwinana.

The premises relates to the categories and assessed production / design capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in works approval W6964/2024/1. The infrastructure and equipment relating to the premises category and any associated activities which the department has considered in line with *Guideline: Risk Assessments* (DWER 2020) are outlined in works approval W6964/2024/1.

2.2.1 Proposed facility

The applicant is proposing to construct and operate a BioIron™ Pilot Plant that uses technology to deliver low-carbon steel, using sustainable biomass and microwave energy to produce metallic iron from Pilbara iron ore in the BioIron™ Furnace (also referred to as linear hearth furnace).

The pilot plant will be designed to produce around one tonne of iron product per hour of operation and will be constructed to further test and develop the BioIron™ process. The pilot plant will process fine iron ore material from the Pilbara blended with a biomass source of wheat straw or sawdust to produce a pig iron product. The pig iron also known as crude iron product that is used by the iron industry in the production of steel. It is developed by smelting iron ore in a blast furnace.

The pilot plant will be operated in campaigns that are expected to last 8 weeks each. Between each campaign there will be a three-week shut down for plant modifications. In total, the plant will be operating for approximately 2000 hours annually. The applicant is proposing to operate in two shifts from Sunday evening until Thursday afternoon.

Infrastructure

The infrastructure and equipment proposed is summarised below:

- Material Handling and Processing
- Milling and storage
- Briquetting and Storage
- Slag Management and Disposal
- Utilities and Supporting Infrastructure

- Stockpiling Areas
- Water and gas infrastructure, Electrical and Control, Miscellaneous Equipment and Infrastructure and Fire Mitigation

Raw Materials

Raw materials will be delivered at appropriate size for use in briquetting. The applicant is proposing that the biomass will be delivered in a pelletised form that will need to be broken into smaller particles at the plant, due to the low bulk density of fine biomass. Iron ore and straw pellets will be used as raw material as well as lime sand (the major fluxing material is likely to be dry limestone but may also include dry dolomite and magnesite), dolomite and magnesite (fluxing material), graphite (additive), instrument air (pneumatic systems, dust collection systems and valves), water (cooling water, demineralised water), nitrogen (inertisation), and natural gas (furnace start-up, assist with off-gas combustion and mould heating burner (pig casting)). Figure 1 below shows the proposed process flow.

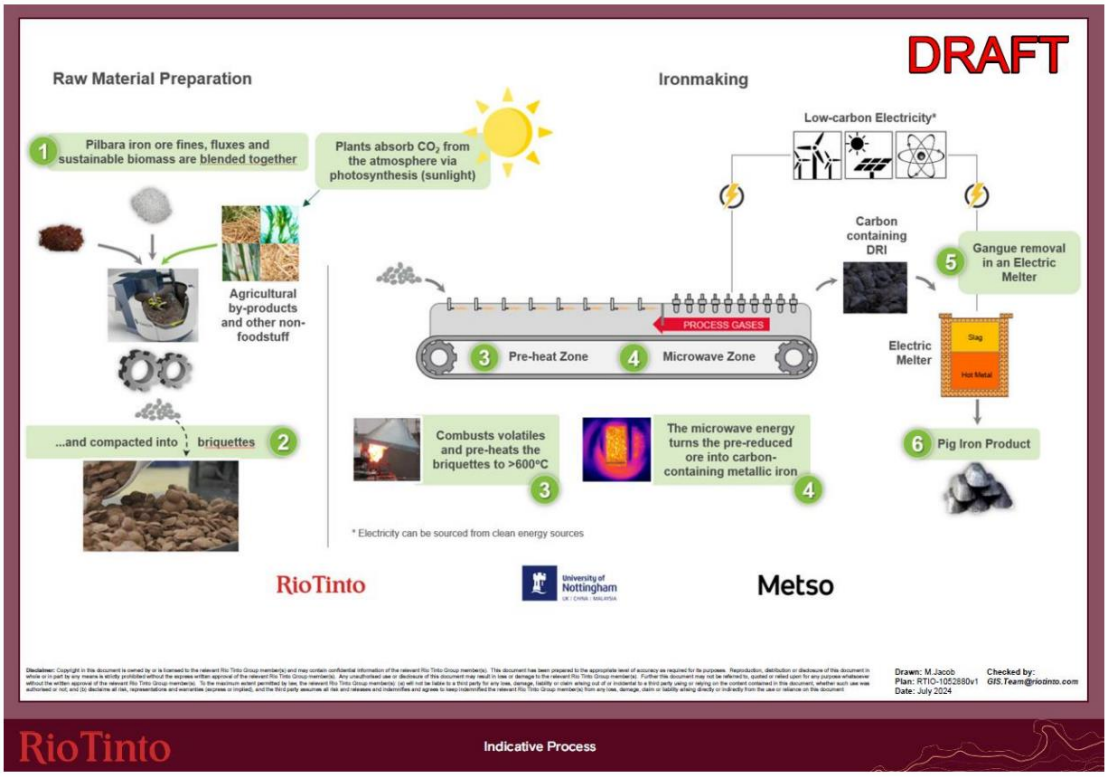

Figure 1: Process flow diagram

2.2.2 Description of process

Green briquetting

After the raw materials are mixed, they are fed to the briquetting machine. Briquettes are produced and fed continuously into the furnace, but they can be directed to a stockpile momentarily (for a maximum of 8 hours) to accommodate changes in the required furnace dust dispersion.

After raw materials are processed into briquettes, the briquettes are screened to remove fines, which can be recycled to the mixer feed or diverted out of the system. Typically, 10 – 20% of the briquettes are expected to be fines. Briquettes that pass screening successfully continue into the BioIron^{TM} furnace.

BioIron Furnace – Pre-reduction zone

The BioIron^{TM} furnace is divided into two sections: Pre-reduction/preheating and microwave

zone. Pre-reduction section of the furnace uses conventional natural gas burners to preheat the chamber. Warm, oxygen depleted gas downstream of the process gas fan is recycled to the preheating zone to minimise the air intake into the furnace.

Rows of air lances provide combustion air for the complete or partial oxidation of the pyrolysis products over the pre-reduction section. The air flows are controlled based on the desired temperature of the top space.

Briquettes are transferred from the prereduction section to microwave section through motor driven compactor roll, which improves the homogeneity of the bed depth presentation across the pan width. The roller is also intended to assist in preventing gas and dust ingress to the microwave section.

BioIron™ furnace – Microwave zone

In the microwave zone of the BioIron™ furnace, the briquettes are converted into highly metallised carbon containing Directly Reduced Iron (DRI). The microwave zone is powered by generators and the microwaves introduced through wave guides and horns. The arrangement of the (up to) twelve microwave horns is such that the energy across the width of the conveyor is homogenous. If needed, the power from one generator can be split across two horns in future to achieve desired energy.

The microwave section of the furnace incorporates several sealing measures to prevent microwave leakages and to maintain them below required levels. The microwave hood will be cooled by ambient air to prevent the steel shell structure from an uncontrollable heat expansion. The off gas is routed from the microwave process to the pre-reduction furnace.

DRI handling:

In the BioIron™ furnace, DRI is discharged into a screw cooler, which cools the DRI prior to its transportation into several silos to passivate the material. Passivation occurs by holding the material in the silos for a sufficiently long time whilst purging with an air/nitrogen mixture.

After passivation, the cold DRI is stored prior to transportation offsite. In future DRI fines can be briquetted onsite. The dried briquettes will be fed into an induction furnace for smelting or alternatively transported off site for disposal or testing.

Melting and casting

The induction furnace will melt the DRI fines into molten iron and slag. The molten iron will be collected in hot metal ladles and transported to a pig casting machine using the overhead travelling crane. The pig casting machine will produce ingots weighing 15.8 kg each. The ingots will be left to cool naturally and then relocated to a bunker and stockpiled for possible sale to a foundry.

The slag will be deposited into a slag trolley and cooled for disposal at an offsite facility. Approximately 700 tonne of slag will be formed annually.

Off gas Handling

As the briquettes are reduced into DRI, process gases will be generated which may be partially or fully combusted internally to provide energy for the pre-reduction zone of the BioIron™ furnace. These process gases will include particles and dust. The furnace off gas may contain unburned hydrocarbons (UHC) as well as particulate matter and needs to be treated before releasing into the environment.

The UHC's will be burned in a natural gas burner, the post combusted gas will then be cooled through a spray cooler and the addition of dilution air. The cooled off gas will be fed through a baghouse to remove the fine particles prior to discharge into the environment via an exhaust gas fan and stack.

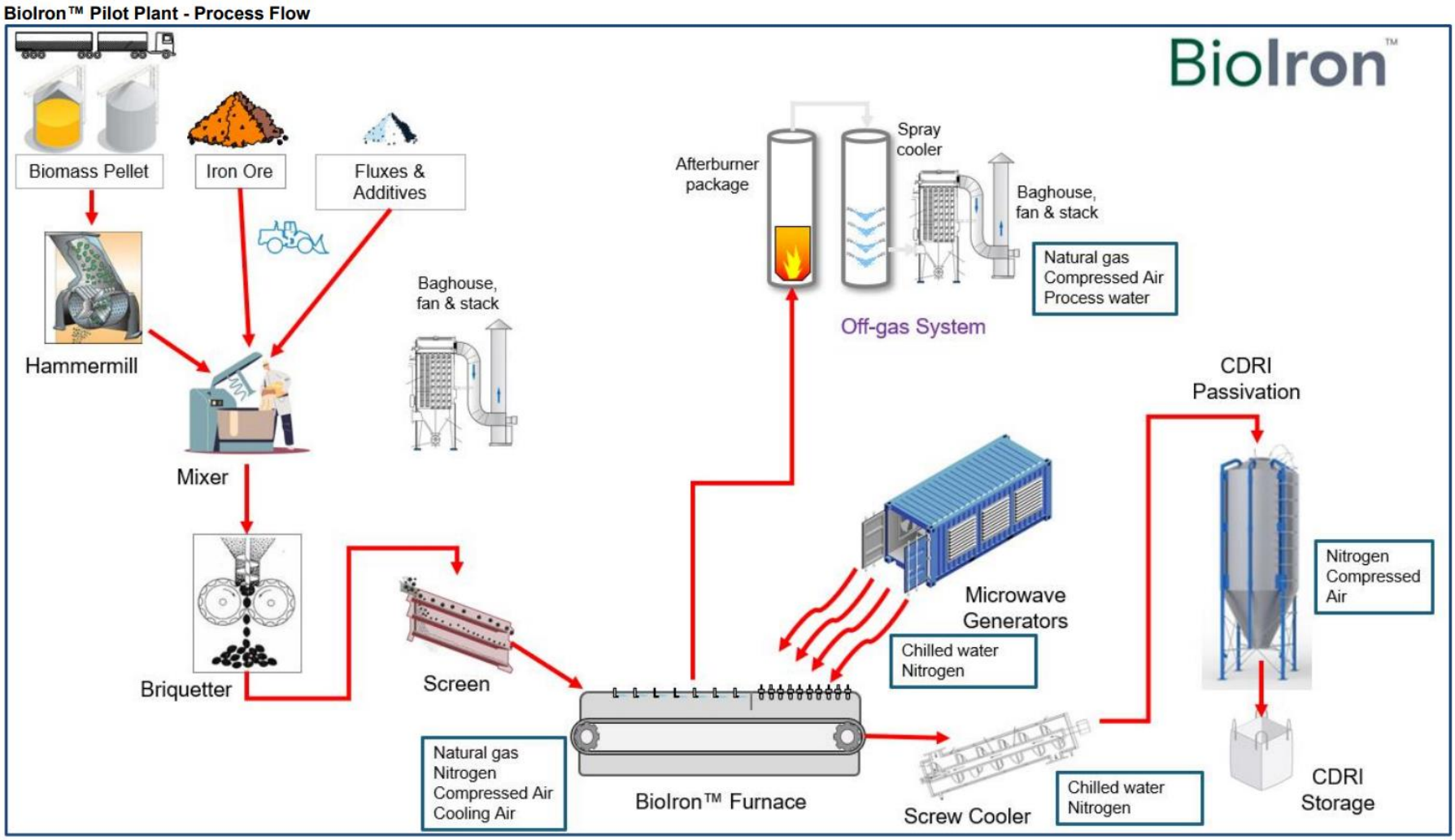

Figure 2: Process Flow

Figure 3: Waste generation and collection areas

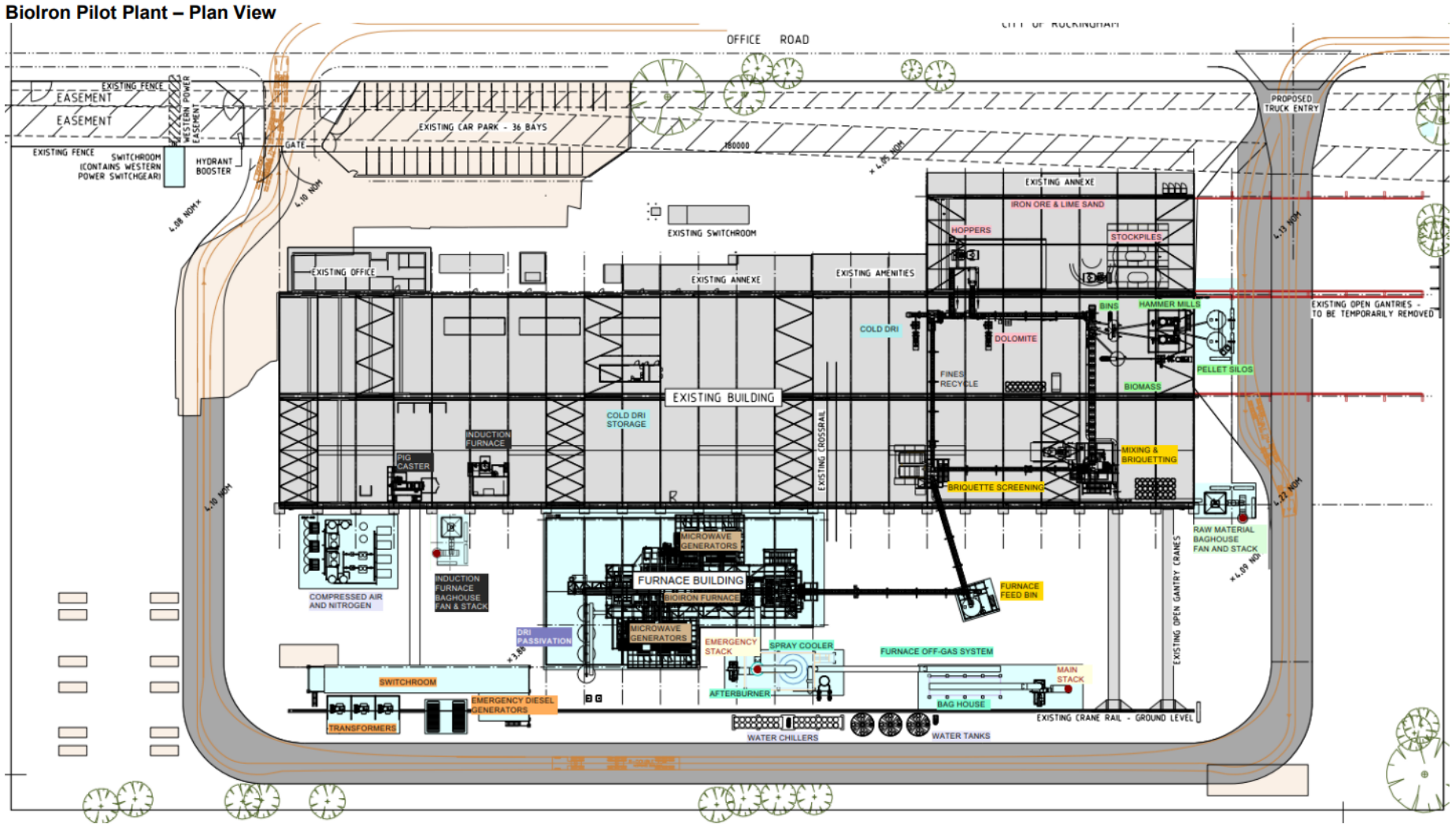

Figure 4: Site Plan

3. Other relevant approvals

3.1 Planning and Land Use Agreement

The premises is zoned as Special Industry in the City of Rockingham Town Planning Scheme, where industrial development is largely subject to planning permission.

The City of Rockingham provided the following advice in relation to the proposal:

Pursuant to the City's Town Planning Scheme No. 2 (TPS2), the subject property is located in the 'Special Industry' zone. The proposed BioIron Pilot Plant Project is considered 'Industry – General (Licensed)' land use which is defined in TPS2 as follows: -

> 'means an industry which is category of Prescribed Premises set out to registration set out in schedule 2 of the *Environmental Protection Regulations 1987'*

Pursuant to TPS2, an 'Industry – General (Licensed)' land use is an 'A' land use in the Special Industry Zone meaning that the use is not permitted unless the local government has exercised its discretion by granting Development Approval after giving special notice in accordance with Clause 64 of the deemed provisions.

Key Finding: The delegated officer notes that it is the responsibility of the applicant to ensure that all necessary approvals are obtained for the premises, including those under planning legislation, and any works are undertaken in accordance with those approvals.

3.2 *Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1999* and *Environmental Protection (Kwinana) (Atmospheric Waste) Regulation 1992*

Kwinana is a major heavy industrial area 30 kilometres south of Perth. Most industry is concentrated in a strip of land about eight kilometres long bordering the Indian ocean. The Environmental Protection Authority recognised the potential for the air quality around Kwinana to become degraded and therefore established an Environmental Protection Policy (EPP) in 1992 to maintain acceptable air quality.

The Kwinana EPP defines three areas (Area A, B and C) where:

- Area A is the area of land on which heavy industry is located;
- Area B is outside area A and is zoned for industrial purposes from time to time under Metropolitan Region Scheme or a town planning scheme. Area B is intended as a buffer area surrounding industry;
- Area C is beyond Areas A and B, predominantly rural and residential.

The premises is located in the Kwinana Industrial Area and is located within Area A of the Kwinana EPP heavy industrial area as shown in Figure 5 and Figure 6.

It is noted that the closest sensitive receptor is located within Area B, the buffer zone that is situated between Area A heavy industry and the predominantly rural and residential Area C. The buffer is in place to minimise potential impacts from industrial activities on the surrounding areas.

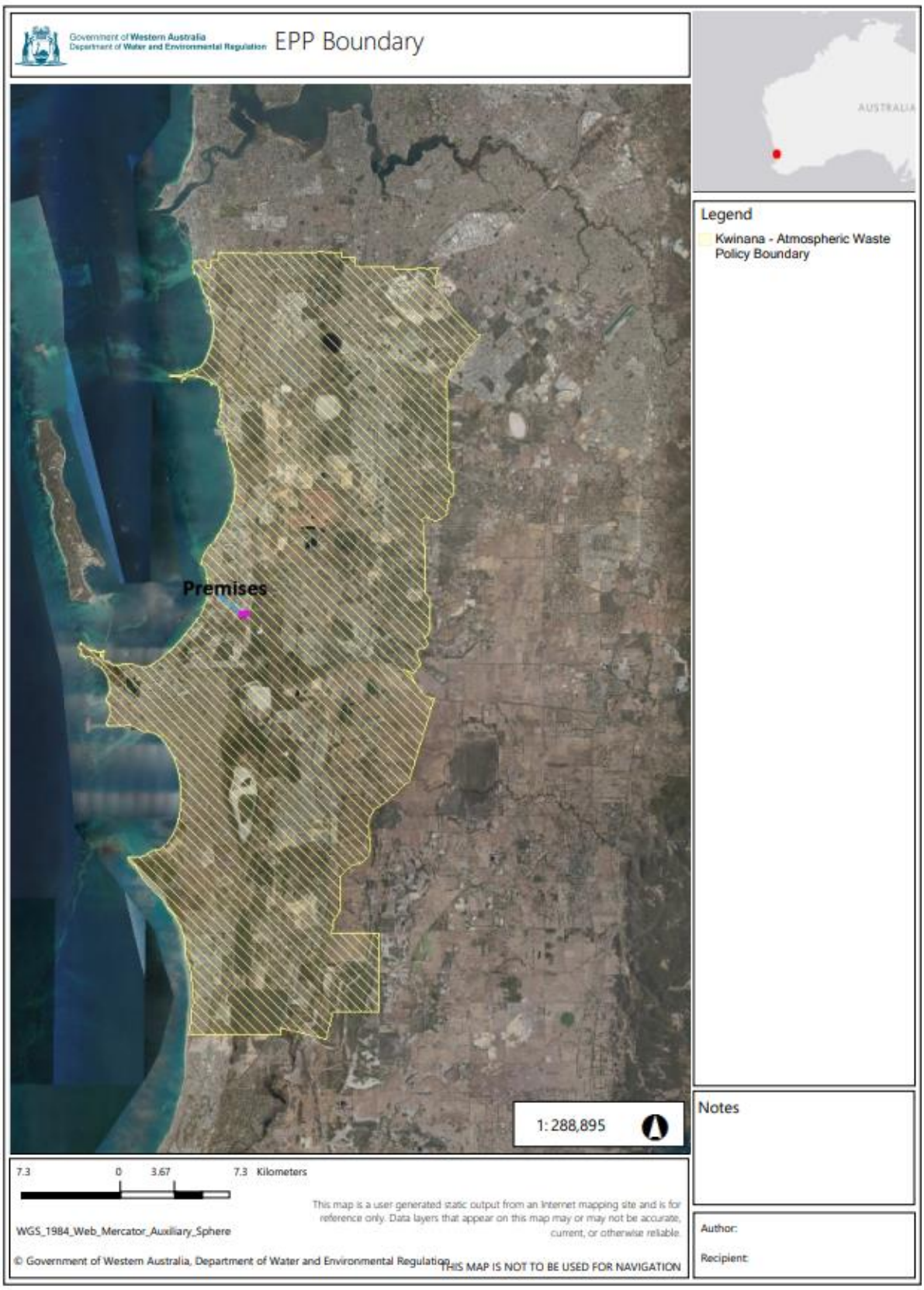

Figure 5: Kwinana - Atmospheric Waste Policy Boundary

Figure 6: Kwinana EPP Area A, B and C

3.3 Radiological Council (Health Department) and Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)

In Western Australia, the responsibility for the regulation of the use of radiation lies with the Radiological Council, the Council is an independent Statutory authority appointed under the *Radiation Safety Act 1975*. The Act and the associated *Radiation Safety (General) Regulations 1983*, require compliance with standards and various codes of practice drawn up by the Australian Radiation and Nuclear Safety Agency.

The application consists of the BioIron^{TM} furnace that is divided into a preheating and microwave zone. Due to the implementation of the microwave furnace and the microwave radiation that is associated with the technology, the Radiological Council will require notification of this application.

Key Finding: The delegated officer has considered the information relating to the regulatory approvals for this premises and notes that radiation safety is managed under *Radiation Safety Act 1975* legislation and therefore not considered further as part of this assessment. It is the responsibility of the applicant to ensure compliance with all relevant requirements under the *Radiation Safety Act 1975*.

4. Risk assessment

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guideline: Risk Assessments* (DWER 2020).

To establish a risk event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission.

4.1 Source-pathways and receptors

4.1.1 Emissions and controls

The key emissions and associated actual or likely pathways during premises construction and operation which have been considered in this Decision Report are detailed in Table 1 below. Table 1 also details the control measures the applicant has proposed to assist in controlling these emissions where necessary.

Table 1: Emission sources and application controls during the construction and operation of the premises

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Construction of the new processing facilities including earth works	Air / windborne pathway	• Daily monitoring of meteorological conditions to identify and prepare or modify activities for conditions which increase the risk of windblown dust. • During high winds, if dust is being generated, earthmoving will be restricted if dust cannot be adequately managed. • If required (and practicable) construction materials will be dampened. • Vehicle speeds will be restricted to 25km/hr to minimise the generation of dust. • A complaints register will be established. • The construction site shall be kept clean to minimise dust accumulation with the surrounding area.
Noise	Construction of the new processing facilities including earth works	Air / windborne pathway	• Machinery that produces the lowest practical level of noise will be selected. • Construction activities will be limited to between 0700 and 1900 Monday to Sunday, excluding public holidays. • Maintenance schedules will be followed to ensure that equipment is in good condition. • A complaints register shall be established and maintained.
Commissioning and Operations (including time limited operations)			
Dust	Unloading and storage of iron ore	Air / windborne pathway	• Iron ore – the unloading area is located within the existing building, with one side open to the external areas. • Iron ore – The raw material will be delivered into ground-level walled concrete bunkers. • A dust suppression fogging system will be located on the concrete bunkers and will be operational during unloading of the ore and where required during reclaiming activities. • Stockpiles will be located indoors and covered to mitigate dust emissions. • Misting sprays are provided to control moisture off the iron ore for dust control during unloading and handling.
	Unloading and storage of Biomass		• Biomass bins (surge bins) – these filters are cylindrically shaped dust collectors. The stainless-steel body contains vertically mounted poly filter elements. During the filling separator from the air flow by the filters drop back into the silos once an integrated automatic pulse jet cleaning system has removed it from the filter media. These filters are easy to access and can be inspected weekly to determine if they need replacement. Similar units are fitted to the biomass pellet silo bins although these units include a fan. • The biomass pellets are delivered to the premises in covered blower trailers and unloaded directly into silos. • The silos are fitted with individual dust filtration units to filter dust and effectively mitigate the risk of dust escaping from the silos. • Covered belt conveyors and screw conveyors will be used for handling of biomass throughout the production process, which effectively reduces the potential for dust emissions during operation. • Raw Materials baghouse (also known as Bag House in Table 10 of Air Quality Assessment) dust extraction system will also extract any dust from dust generating sources. • A dedicated dust extraction system will be used to manage dust generated during transfers to and from the premises. The baghouse removes dust from the air and deposits the removed dust into bags (or bins) for later disposal at a licensed waste management facility. • Each bag or bin will be checked for signs of damage before they are transported away from the premises for disposal.
	General site operations		• Washdown of vehicles leaving site, if necessary. • Enclosed or covered transport vehicles. • Transport operators have effective emergency response plans and capability to respond to release of trucked materials. • Dust on internal roads will be prevented through road sweeping, if required.
	Feed preparation equipment (Hammer Mills, Feed Mixer and Briquette Press)		• The feed preparation equipment will comply with Australian Standards to ensure that it meets or exceeds safety and environmental requirements. • The feed preparation equipment is fully enclosed to contain biomass and iron ore dust, and a dust extraction system to Raw Materials Baghouse, will extract dust generating sources. • Covers, seals and a specialised dust collection system (raw materials baghouse) will be implemented to maintain a clean and safe environment. • Due to the potential explosive dust atmosphere created by the processing equipment, controls to reduce or eliminate risk of sparks will be implemented which include tramp metal detection, hazardous area rating construction and the use of 'rock-box' lining systems. • The feed preparation equipment will incorporate safety features such as emergency stops, interlocks, and guarding to protect operators during operation and maintenance and the design will allow for each of accessibility for inspection, cleaning and maintenance.

Emission	Sources	Potential pathways	Proposed controls

			• The design of the fire mitigation system shall comply with the following Australian Standards:
			  ○ AS 1940: The storage and handling of flammable and combustible liquids
			  ○ AS 1851: Maintenance of fire protection systems and equipment
			  ○ AS 2118: Automatic fire sprinkler systems
			  ○ AS 5062: Gas suppression systems for fire protection
			  ○ AS 5601: Gas installations
			  ○ AS60079 series: Explosive atmospheres standards
			  ○ AS 3000: Electrical installations (for electrical components)

Air emissions including particulate matter, Carbon Monoxide, Nitrogen	BioIron Furnace (also referred to as Linear Hearth Furnace) (including pre-heating zone, microwave zone and furnace) Induction Furnace Off-gas burner	Air / windborne pathway	• Off-gas system baghouse- a dedicated dust extraction system will used to manage dust generation during the production process. • The section of the furnace incorporates several sealing measures to prevent leakages of microwave energy and to maintain them below required safety levels. The microwave hood will be cooled by ambient air to prevent the steel shell structure from an uncontrollable heat expansion. • The microwave furnace is designed to comply with Australian Standards so that microwave energy is safely contained within the furnace. • The off-gas burner is designed to reduce pollutants. • The post combusted hot gas will be chilled through a spray cooler with the addition of dilution air. Once the off gas is cooled down sufficiently, it will be fed to a baghouse to remove the fine particles and discharged into the atmosphere via an exhaust gas fan and stack (Main Stack 1).
Dust containing hazardous materials	Waste stored on site	Direct discharge to land	**Dust:** • Approximately 168 tonnes per annum of dust from biomass will be created, this will be transported off site. • Approximately 72 tonnes per annum of dust from the furnace off-gas will be created, this will be transported off site. • An induction furnace baghouse that is suitable for the higher temperature of the dust laden gas exiting the furnace. The bag for this baghouse will need to be suitable for the higher temperature. • Green briquette fines– primarily reintroduced into the briquette feed. If reintroduction is not possible e.g. due to poor briquette quality, change of blend, fines are to be disposed of off-site at an appropriately licensed facility. **DRI** • The DRI fines are cooled to ambient temperature and passivated in silos for a period of 60-72hrs using nitrogen/air. • Once passivation is complete the DRI will be discharged from the silos into a bag/drum filling system. • This process will be dust tight and discharged into bags / drums will be sealed. • The bags or drums will be lifted by forklift and stored inside the building. • Drums will be used for longer storage or transport off-site whereas sealed bags will be used for DRI that will be briquetted and fed to the induction furnace. • The DRI passivation bins are now likely to be located outside of the furnace building and will have a dedicated concrete bund with a holding tank in case of spillage. • Approximately 675 tonnes per annum of off specification DRI will be disposed of a licensed facility.
Discharge of slag – highly acidic material	Stockpiling waste material (Slag)	Overland runoff	• The slag is highly acidic material and may contain ferric/ ferrous oxide up to 20%. • Approximately 700 tonnes per annum of slag will be stored on site. • The slag will be discharged from the induction furnace using the back-tiling facility into a slag trolley. • The slag will then be poured from the trolley into ground bays to cool prior to be broken up for disposal. • The broken-up slag will be stored in a concrete bunker. • The area between the induction furnace and ground bay will be concrete in case of any spills. • Slag will then be transported offsite by trucks to an appropriate waste facility.
Fire / Smoke	Biomass unloading and handling and Biomass storage	Air / windborne pathway	• Due to the potential explosive dust atmosphere created by the processing equipment, controls to reduce or eliminate risk of sparks will be implemented which include tramp metal detection, hazardous area rating construction and the use of ‘rock-box’ lining systems. • The feed preparation equipment will incorporate safety features such as emergency stops, interlocks, and guarding to protect operators during operation and maintenance and the design will allow for each of accessibility for inspection, cleaning and maintenance. The design of the fire mitigation system shall comply with the following Australian Standards: • AS 1940: The storage and handling of flammable and combustible liquids • AS 1851: Maintenance of fire protection systems and equipment

Emission	Sources	Potential pathways	Proposed controls
			• AS 2118: Automatic fire sprinkler systems • AS 5062: Gas suppression systems for fire protection • AS 5601: Gas installations • AS60079 series: Explosive atmospheres standards • AS 3000: Electrical installations (for electrical components)
Chemical and hydrocarbon spills	General operations of the facility	Overland runoff	• Chemicals and hydrocarbons will be stored according to Australian Standards. • The lime sand used in the process will be stored in a concrete bunker. • Dolomite will be stored in sealed bulka bags on a concrete slab until required. • Any spillage from damage to the bags will be captured on the slab. This area will be inspected daily during operations and spills cleaned using a portable industrial vacuum or similar. • The Deisel storage will be stored in 1.2kL self-bunded trailer designed to AS1940 and AS1692. The trailer will be fitted with a single vehicle dispensing package. The refuelling will be for the loader only. Filing of the trailer tank will be at a nearby commercial facility. • The location of the trailer will be located away from daily operations and incorporate concrete bunding / spill grate under the refuelling area. The trailer is supplied with a fully stocked spill kit. • In case of soil contamination, the contaminated soil will be removed offsite to an approved disposal facility.
Noise	General operations of the facility	Air / windborne pathway	• Select machinery that produces the lowest practical level of noise. • Maintain machinery / plant equipment in accordance with the manufacture's specifications. • Screening or enclosing stationery items of equipment with acoustic enclosures to reduce operating noise levels.
Wastewater	Wastewater from operations	Overland runoff	Wastewater will be expected from the following processes on site: • Iron ore dust suppression sprays- sprays will only be operated during loading / unloading operations and low amount of moisture addition (<0.1%). • Mixer water – this water forms part of the raw material process. • Off gas spray cooler – water evaporates due to high temperature in the process. The sprays will only operate when the furnace / afterburner is operating. The slab in this area is bunded in case on an upset condition. • Chilled water – for the furnace process is a closed system using distilled water. • Approximately 920m^3 of wastewater per annum will be collected in a sump onsite and removed intermittently by a vacuum truck for disposal off site as a suitability licensed waste management facility. • Induction furnace emergency cooling water – upset conditions only – sump to collect – not considered for wastewater.

Contaminated stormwater	Operations and waste storage area	Overland runoff	• Potentially contaminated stormwater will be retained on site prior to disposal at a licensed facility.
			• The site has an existing stormwater drainage infrastructure (soak wells and pipework)
			• A new pre-cast concrete soak well to be installed 1500mm diameter / 1800 deep with trafficable grated lids in the areas where the design is likely to increase.
			• Impervious areas with contaminated runoff will not be allowed to free drain to the surrounding ground or into pervious soak wells.
			• Flow from contaminated areas will be contained by concrete bunding and directed into impervious concrete sumps which will be emptied via sucker truck and contaminated runoff will be taken off site for treatment.
			• These sumps are to be sized on the maximum daily rainfall figure of 212mm.
			• Potential sources of contaminated stormwater are:
			  • East end of existing sheds.
			  • Off-gas spray cooler
			  • Passivation silos

4.2 Receptors

In accordance with the *Guideline: Risk Assessment* (DWER 2020), the Delegated Officer has excluded the applicant's employees, visitors, and contractors from its assessment. Protection of these parties often involves different exposure risks and prevention strategies, and is provided for under other state legislation.

Table 2 and Figure 7 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises *(Guideline: Environmental Siting* (DWER 2020)).

Table 2: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	**Distance from activity / prescribed premises**
Residential Premises	560m north-east of the Premises boundary
Residential Premises (suburb of Calista)	2 km east of the Premises boundary
Environmental receptors	**Distance from activity / prescribed premises**
Environmentally Sensitive Areas	The whole of East Rockingham is part of a wide ESA. The area has its ESA status based on area's threatened ecological community (TEC). The ESA abuts the southern boundary of Lot 1728. The area has been cleared of native vegetation.
Hydrography WA 250K – Surface water body	1.4 km northeast of the premises boundary
Groundwater	Cockburn groundwater area within premises boundary. Groundwater elevations beneath the site range from 1 and 3 m AHD. Groundwater was recorded at a depth of approximately 2.5 m bgl in the onsite monitoring wells. Perth Groundwater Atlas suggest groundwater flows in a westerly direction.
TECs/PECs	0.88km east of the premises boundary and 0.77km south south-west of the premises boundary: Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain 0.42km south of the premises boundary: Woodlands over Sedgelands in Holocene dune swales of the southern Coastal Plan (floristic community type 19 as originally described in Gibson et al. 1994) Note: the site has been cleared of native vegetation, historically. There is no Native Vegetation Clearing Permit on the Department's Geocortex mapping system.
RIWI Act – Groundwater Area	Within premises boundary

Figure 7: Distance to sensitive receptors

4.3 Air Quality Impacts

The applicant submitted an Air Quality Impact Assessment to support their application that included quantitative assessment of emissions from the operation of the premises (Rio Tinto, BioIron Air Quality Assessment, Ramboll, 2024). An updated Air Quality Assessment Report was submitted in April 2025 (Rio Tinto, BioIron Air Quality Assessment, Ramboll February 2025).

The pollutants of concern that are associated with the plant operations from the metallic iron making process using a Linear Health Furnace include Nitrogen (NO_2), particulate matter ($PM_{2.5}$), carbon monoxide (CO), Sulphur Dioxide (SO_2) arsenic (As), barium (Ba), chlorine (Cl), chromium III (Cr-III), copper (Cu), manganese (Mn), lead (Pb), vanadium (V) and zinc (Zn).

The air quality impact assessment utilised the following sources to establish air quality guideline criteria:

- Air Quality Modelling Guidance Notes (Department of Environment, March 2006);
- The Draft Guideline: Air Emissions (DWER, October 2019); and
- The National Environment Protection Measures (NEPMs).

The criteria included in the assessment is presented in Table 3.

Table 3: Air Quality criteria

Pollutant	Averaging Period	Criteria µg/m³	Reference
Nitrogen Dioxide (NO_2)	1-hour	151	NEPC (2021)
	Annual	28	
Particulate Matter < 2.5 ($PM_{2.5}$)	24-hours	23	
	Annual	7	
Carbon Monoxide (CO)	1-hour	30,000	DWER (2019)
	8-hours	10,000	
Sulphur Dioxide (SO_2)	1-hour	262	DWER (2021)
	24-hours	52	
	Annual	52	NEPC (2021)

Pollutant	Averaging Period	Criteria µg/m³	Reference
Arsenic (As) & Compounds	1-hour	0.09	DWER (2019)
	24-hours	0.027	
	Annual	0.0027	
Barium (Ba) (Soluble Compound)	1-hour	9	
Chlorine (Cl)	1-hour	50	
Chromium (III) (Cr-III) Compounds	1-hour	9	
	24-hours	0.46	
Copper (Cu) & Compounds (Dusts)	1-hour	18	
	24-hours	0.92	
Manganese (Mn) & Compounds	24-hours	0.14	
Lead (Pb) & Compounds	Annual	0.46	
Vanadium (V)	24-hours	0.92	
Zinc (Zn)	24-hours	46	

Notes

1. Referenced to 25ºC, and 101.3 kPa.

Air dispersion modelling undertaken included use of the Gaussian dispersion models DISPMOD (Version 2005) and the American Metrological Society / Environmental Protection Agency Regulatory Model (AERMOD) (Version 23132) to predict the air quality impacts from the premises.

Three scenarios were provided including emission point sources from the main stack, emergency vent stack, bag-house and induction furnace stack.

Table 4 shows a summary of the scenarios modelled. A total of 14 operational scenarios were modelled, where six (6) scenarios 1 and 2 (normal operations) and 5 - 8 (max calorific value and startup/turndown) were assumed to have continuous operation year-round, and the remaining scenarios 3 - 4 (combustion trip) and 9 – 14 (emergency scenarios) were assumed to only happen once a year, for a 5-minute duration. The cumulative assessment was considered for pollutants of concern for which regional monitoring data was available that includes Co, NO_2, $PM_{2.5}$, and SO_2.

Table 4: Overview of Modelled scenarios

SC ID	Description	Assumed Operation Status
SC1	Nominal Operation Scenario	Continuous
SC2	Nominal Operation Scenario with Future KIA	
SC3	Combustion Trip Scenario	5 mins, Once a Year
SC4	Combustion Trip Scenario with Future KIA	
SC5	Max Calorific Value (CV) Scenario	Continuous
SC6	Max Calorific Value (CV) Scenario with Future KIA	
SC7	Start-Up/Turn-Down Scenario	
SC8	Start-Up/Turn-Down Scenario with Future KIA	
SC9	Emergency Vent Stack Scenario #1	5 mins, Once a Year
SC10	Emergency Vent Stack Scenario #1 with Future KIA	
SC11	Emergency Vent Stack Scenario #2	
SC12	Emergency Vent Stack Scenario #2 with Future KIA	
SC13	Emergency Vent Stack Scenario #3	
SC14	Emergency Vent Stack Scenario #3 with Future KIA	

Note: Start-up and Turn-Down are expected to occur for a period of 12 hours up to 74 times in a year but have been conservatively modelled as occurring continuously.

Table 5 shows the expected emissions for scenarios 1 and 2 (normal operations).

Table 5: Summary of Annual Average Predicted Ground level concentrations (GLCs)

Scenario #1									
Receptor		Annual Average Predicted GLCs (µg/m³) in Isolation					Annual Average Predicted GLCs (µg/m³) Cumulative of Background		
Pollutant		NO_2	$PM_{2.5}$	SO_2	As	Pb	NO_2	$PM_{2.5}$	SO_2
Guideline		**2.80E+01**	**7.00E+00**	**5.20E+01**	**2.70E-03**	**4.60E-01**	**2.80E+01**	**7.00E+00**	**5.20E+01**
Background Concentration		**1.13E+01**	**6.96E+00**	**5.24E+00**	-	-	**1.13E+01**	**6.96E+00**	**5.24E+00**
Max Offsite		3.37E+00	1.45E+01	1.11E+00	4.01E-04	8.02E-04	1.47E+01	2.15E+01	6.35E+00
Rec_001	Wells Park	1.26E-01	1.87E-01	3.77E-02	6.41E-06	1.28E-05	1.14E+01	7.15E+00	5.28E+00
Rec_002	Golf Course	1.78E-01	1.63E-01	4.62E-02	6.31E-06	1.26E-05	1.15E+01	7.13E+00	5.29E+00
Rec_003	Thomas Oval	1.29E-01	9.36E-02	3.18E-02	3.93E-06	7.85E-06	1.14E+01	7.06E+00	5.27E+00
Rec_004	Oval	1.00E-01	9.70E-02	2.65E-02	3.74E-06	7.49E-06	1.14E+01	7.06E+00	5.27E+00
Rec_005	Nearest Residence	1.11E-01	8.12E-02	2.76E-02	3.46E-06	6.93E-06	1.14E+01	7.04E+00	5.27E+00
Rec_006	North Rockingham	7.58E-02	1.14E-01	2.21E-02	3.96E-06	7.92E-06	1.14E+01	7.08E+00	5.26E+00
Rec_007	Residence 3 (SE)	8.04E-02	6.76E-02	2.06E-02	2.75E-06	5.50E-06	1.14E+01	7.03E+00	5.26E+00
Rec_008	Hope Valley	7.42E-02	6.62E-02	1.93E-02	2.65E-06	5.30E-06	1.14E+01	7.03E+00	5.26E+00
Rec_009	Callista Primary School	5.71E-02	4.81E-02	1.47E-02	1.96E-06	3.92E-06	1.13E+01	7.01E+00	5.25E+00
Rec_010	Wombat Wallow Childcare Centre	7.46E-02	5.24E-02	1.85E-02	2.29E-06	4.58E-06	1.14E+01	7.01E+00	5.26E+00
Receptor		GLCs as % of Criteria							
Pollutant		NO_2	$PM_{2.5}$	SO_2	As	Pb	NO_2	$PM_{2.5}$	SO_2
Guideline		**2.80E+01**	**7.00E+00**	**5.20E+01**	**2.70E-03**	**4.60E-01**	**2.80E+01**	**7.00E+00**	**5.20E+01**
Max Offsite		12%	207%	2%	15%	<1%	52%	307%	12%
Rec_001	Wells Park	<1%	3%	<1%	<1%	<1%	41%	102%	10%
Rec_002	Golf Course	<1%	2%	<1%	<1%	<1%	41%	102%	10%
Rec_003	Thomas Oval	<1%	1%	<1%	<1%	<1%	41%	101%	10%
Rec_004	Oval	<1%	1%	<1%	<1%	<1%	41%	101%	10%
Rec_005	Nearest Residence	<1%	1%	<1%	<1%	<1%	41%	101%	10%
Rec_006	North Rockingham	<1%	2%	<1%	<1%	<1%	41%	101%	10%
Rec_007	Residence 3 (SE)	<1%	<1%	<1%	<1%	<1%	41%	100%	10%
Rec_008	Hope Valley	<1%	<1%	<1%	<1%	<1%	41%	100%	10%
Rec_009	Callista Primary School	<1%	<1%	<1%	<1%	<1%	41%	100%	10%
Rec_010	Wombat Wallow Childcare Centre	<1%	<1%	<1%	<1%	<1%	41%	100%	10%

Summary of modelled outcomes

A summary of the findings of the Air Quality Impact Assessment was submitted by the applicant, indicating that:

- No exceedances were predicted for the maximum 1-hour average NO_2 GLCs in isolation, however, exceedances were predicted offsite for the cumulative assessment for scenarios number 2, 5, 6 and, where the maximum cumulative offsite predicted GLC was 181 µg/m^3, approximately 120% of the 1-hour average NO_2 criteria (predicted at / near the boundary of the facility).
- No exceedances were predicted at any of the sensitive receptor locations for the maximum 1-hour average NO_2 criteria and across the modelling domain for the annual average NO_2 criteria.
- It was noted that the predicted concentrations at the nearest sensitive receptor on Wellard Road were below the NO_2 criteria however the model predicted an exceedance of the 1-hour average criteria within close proximity (~200m) of the residence for the max calorific values model scenario. Whilst the basis of the modelling is conservative and the applicant noted inherent uncertainty in any air dispersion modelling, the impact assessment identified that monitoring for NO_2 be conducted in close proximity to the residence for a year to demonstrate compliance with the relevant criteria.
- Exceedances of the maximum 24-hour average, $PM_{2.5}$ criteria were predicted for each of the applicable operation scenarios (1, 5 and 7) in isolation and cumulatively where the maximum predicted GLC (cumulative) was 60.5µg/m^3, approximately 263% of the 24-hour average $PM_{2.5}$. Based on those contour plots, the modelling identified these predicted GLCs will occur only at / close to the boundary of the site, with predicted GLCs at all sensitive receptors remaining below the 24-hour $PM_{2.5}$ criteria.
- Exceedances of the annual average $PM_{2.5}$ criteria were predicted offsite and at sensitive receptor locations for each of the applicable operating scenarios (Scenario 1, 5 and 7) in either isolation or cumulatively, where the maximum predicted GLC (cumulative) was 21.5µg/m^3, approximately 307% of the annual average $PM_{2.5}$ criteria. Although exceedances are predicted across the modelling domain for the cumulative assessment the predicted results in isolation show that applicants contribution of $PM_{2.5}$ at each of the sensitive receptors location is no more than 3% of the annual average $PM_{2.5}$ criteria and the annual average monitored background concentration of $PM_{2.5}$ is attributable to majority of the contribution to the exceedances (background representing 99% of the criteria).
- Exceedances of the maximum 24-hour average Mn criteria were predicted offsite for applicable scenarios 1 and 5 in isolation, where the maximum predicted GLC was 0.00235µg/m^3, approximately 175% of the 24-hour average Mn criteria. Exceedances were modelled to occur only at / close to the site boundary, with all receptor locations remaining below the maximum 24-hour average Mn criteria.
- All other pollutants remained below their respective short and long term ambient air quality criteria.

4.3.1 DWER Technical review of the air quality assessment

A technical review of the air quality impact assessment was conducted by the department and determined that:

- In general, the modelling is in accordance with the DWER *Air Quality Modelling Guidance Notes*, and it is consistent with previous modelling in the area.
- The department notes that uncertainty is associated with all air dispersion modelling, and predicted concentrations should be regarded as reasonable estimates rather than reliable or accurate predictions, assuming that the model input data and configuration are reasonable.

- The Applicant has not assessed PM_{10}, which would typically also be assessed if there are $PM_{2.5}$ emissions. The department's Air Quality Branch recommends that PM_{10} emissions are verified during plant commissioning to ensure they are consistent with current estimates.
- Background emissions have been included in appropriate modelling scenarios using the 75 percentile concentrations of CO, NO_2, $PM_{2.5}$ and SO_2 from DWER monitoring stations at South Lake, North Rockingham and Wattleup. Where a substance was monitored at multiple locations the largest value was used. NO_2 and SO_2 emissions from nearby facilities were also explicitly included in the modelling scenarios.
- The applicant has used two air quality dispersion models to account for different metrological processes:
    - DISPMOD – to account for the effects of coastal fumigation
    - AERMOD – to account for building downwash.

  This is a common approach for assessing air pollution dispersion in Kwinana. The applicant has provided a discussion on how the differences between the two models were reconciled and Air Quality Branch advises that this is a conservative technique that addresses any potential concerns.
- 14 different scenarios were considered by the assessment, these scenarios cover a wide range of emissions characteristics and are considered sufficient to assess the risk associated with the proposed plant.
- The modelling results indicated exceedances of the annual $PM_{2.5}$ criteria which was exceeded at all receptors but the contribution from the proposal was about 3% and therefore not significant in terms of incremental contribution. In cumulative impact situations such as for this proposal where the estimated environmental impact is relatively small but would occur in the context of other emission sources and regional background levels in the airshed, consideration of broader airshed management issues is recommended.
- The department supports the consultant's recommendation that ambient monitoring for a minimum of 12 months to be undertaken near additional residential receptor on Wellard Road to assess the NO_2 levels.

4.4 Noise Impacts

The applicant submitted an Environmental Noise Assessment (*Herring Storer Acoustics, Environmental Noise Assessment, June 2024*) as part of their application, that assessed the potential noise emissions from the premises to determine compliance with the *Environmental Protection (Noise) Regulations 1997.*

The closest noise sensitive premises (R4 Lot 50 Wellard) is situated approximately 560 metres northeast of the Premises boundary as shown in Figure 8. It is noted that this premises (R4) is located in the Kwinana EPP Area B Buffer, as discussed in section 3.2.

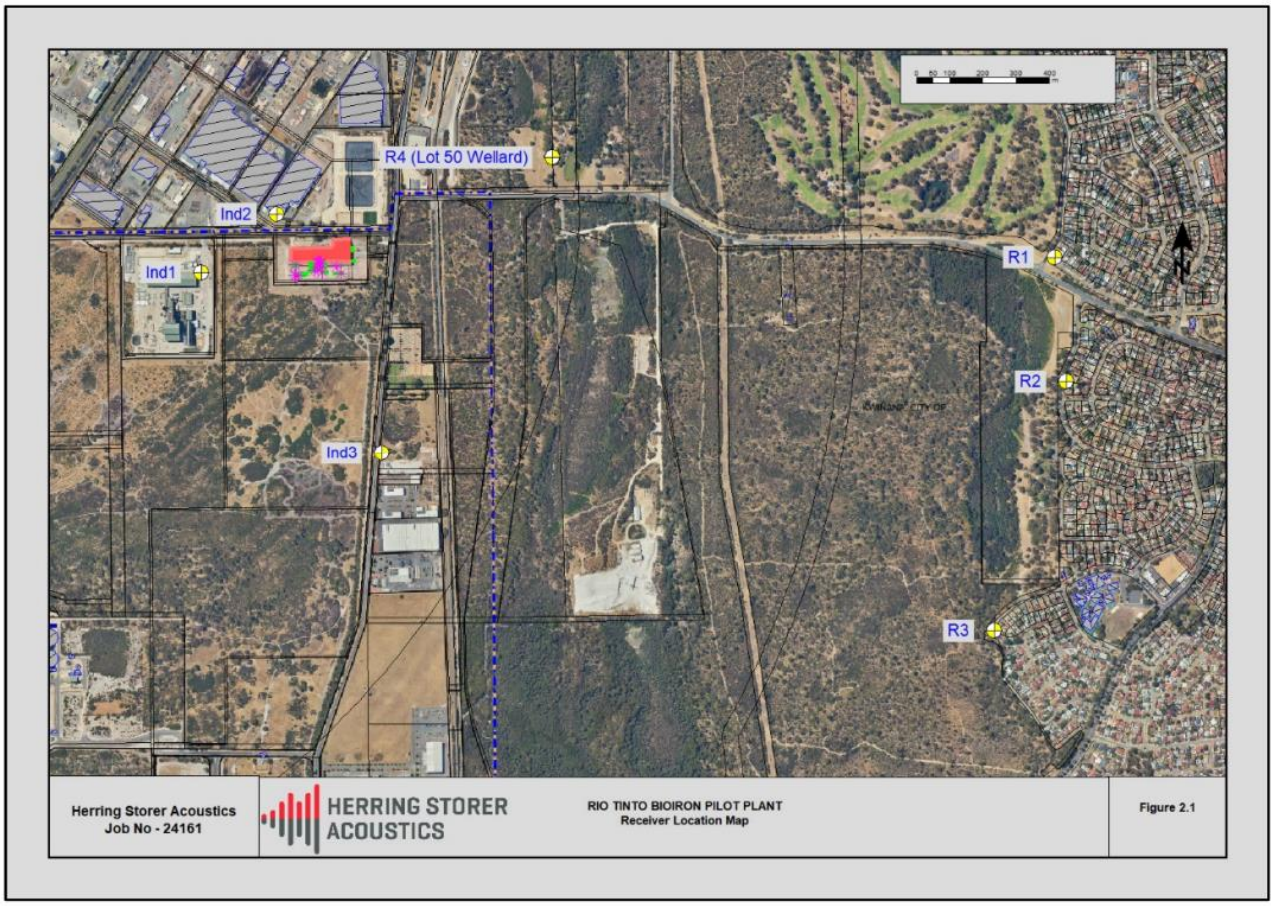

Figure 8: Noise sensitive receptors

Noise emissions (noise received at the receptor) at the nearest neighbouring residential premises were modelled using SoundPlan. Sound power levels were used for the noise modelling were based on both manufacturer data and measured sound pressure levels of similar equipment proposed at the premises.

The modelling of noise levels has been based on noise sources and sound power levels shown in Figure 9 and Table 6.

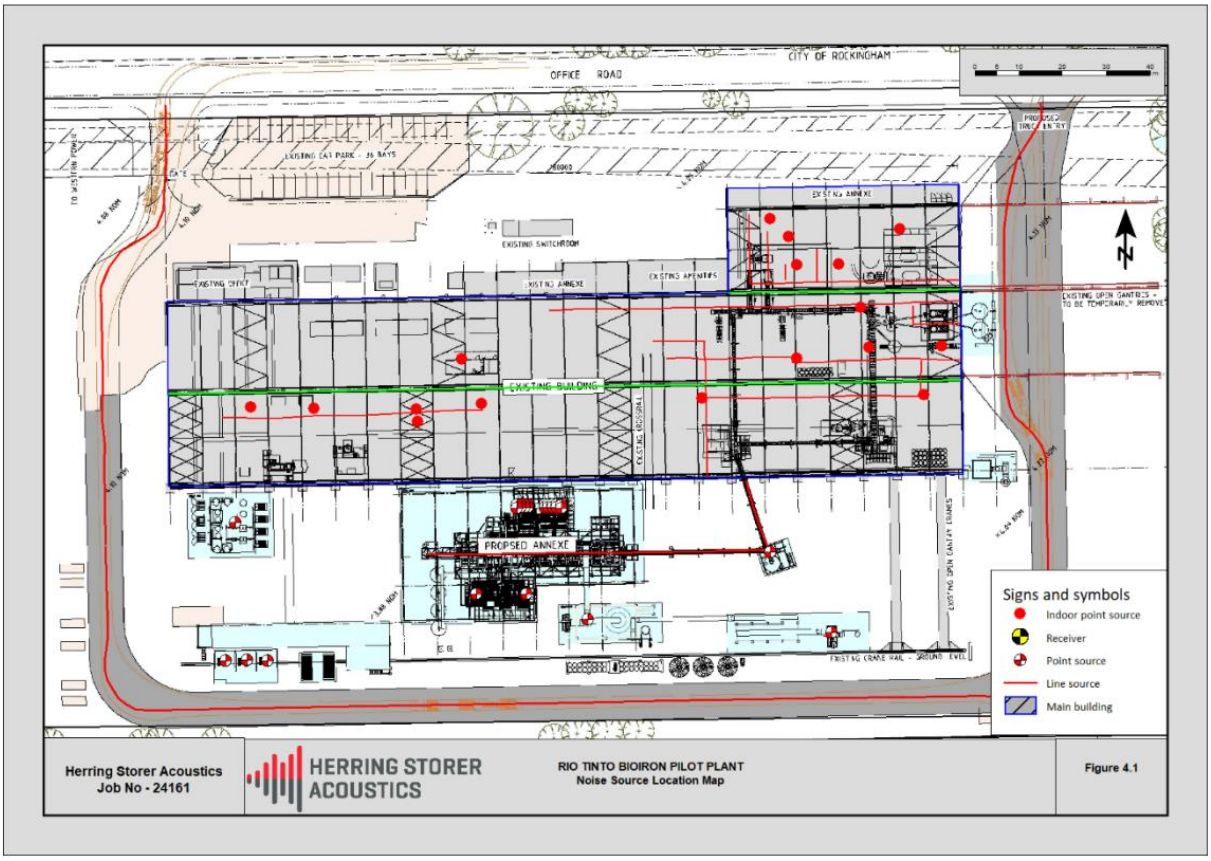

Figure 9: BioIron Facility Noise Source

Table 6: Sound Power Levels

Noise Sources	Sound Power Level dB(A)
Belt Feeder Conveyor	79/m2
Hammer Mill	105
Mixer	93
Screen	94
Fans	84
Dust System	97
Pig Casting Machine	100
Water Spray /Steam Release	101
Extraction System	97
Front End Loader	105
Forklift	87
Semi Rear Tipper	98
Screw Feeder	85
Feed Hopper	95
Static Grizzly	94
Vibrating Table	100
Chain Conveyor	84/m2
Gas Furnace	105
2 X 12 Microwave Horns	<60
Axles And Drive Shaft	90
24x 50kW Generators OR 12x 100kW Generators	73
Overhead Crane	90
Water Spray	85
Compactor / Hydraulics	95
Loading Into Skip Bins / Banging	105
Induction Furnace	<70
2x Compressor 50kw	102
Nitrogen Generator System	100

The premises will be operated in two shifts from Sunday evening until Thursday afternoon. Possible maintenance work will take place on Fridays.

Two noise emission scenarios were considered for the operation of the plant:

- Scenario 1 – Night operations (BioIron plant)
- Scenario 2 – Day Operations (BioIron Plant, transport in and out of site, loading and unloading)

The operating scenarios considered all noise sources from the proposed facilities operating at the same time. Modelling was conducted with the noise sources located inside the building, or if external, outside.

The assigned levels were developed using the criteria from the *Environmental Protection (Noise) Regulations 1997.* The most critical assessment parameter is the L_{A10} noise level at a sensitive receptor 2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays.

The results of the calculated noise levels for both scenarios are shown in Table 7.

Table 7: Calculated noise levels

Receiver Name	Scenario 1 – Night Operations	Scenario 2 – Day Operations
R1	30	30
R2	29	29
R3	29	29
R4 (Area B)	42	42
Ind1	47	48
Ind2	52	54
Ind3	45	45

For information purposes a summary of the average noise level for each daily regulatory time period is shown in Table 8 below.

Table 8: Summary noise levels.

Day / Date	Bioiron Site Monitor			Residential Premise Monitor		
	Day 0700 to 1900	Evening 1900 to 2200	Night 2200 to 0700	Day 0700 to 1900	Evening 1900 to 2200	Night 2200 to 0700
Wednesday, 12 March 2025	0.0	0.0	55.2	0.0	0.0	44.5
Thursday, 13 March 2025	54.5	48.2	50.7	50.5	44.9	45.5
Friday, 14 March 2025	53.4	47.7	49.1	51.2	42.1	45.1
Saturday, 15 March 2025	55.7	58.8	45.7	51.4	46.1	42.5
Sunday, 16 March 2025	53.5	45.5	43.3	49.2	42.6	42.1
Monday, 17 March 2025	52.3	47.3	47.3	49.8	42.9	42.9
Tuesday, 18 March 2025	53.6	47.8	39.6	49.4	44.5	35.4
Average (Good Days)	**54**	**49**	**49**	**50**	**44**	**44**

Assessment:

The Acoustic Report included an assessment that assumed that during the night period, the operational noise when received at sensitive receptors will not have a 'tonality' characteristic, given the distance and the noise levels approaching the existing background noise levels. Therefore, characteristics such as tonality, would not be applicable. At noise emission levels of around 30db(A) it will result in the noise emission not being 'technically tonal', although that does not mean that some

characteristics would not be audible. However, for the industrial boundaries, the noise levels are likely to contain tonal characteristics, hence a 5dB(A) penalty has been applied to the nearby industrial receiver. The adjusted levels are shown in Table 9.

Table 9: Adjustments and assessable level of noise emissions L_{A10}dB(A) night operations

Noise Measurement Location	Calculated Noise Level Scenario 1 Day Time L_{A10}	Applicable Adjustments to Measured Noise Levels, Characteristics Where Noise Emission is NOT music			Assessable Noise Level
		Tonality	Modulation	Impulsiveness	
R1	30	-	-	-	30
R2	29	-	-	-	29
R3	29	-	-	-	29
R4 (Area B)	42	-	-	-	42
Ind1	47	+5	-	-	52
Ind2	52	+5	-	-	57
Ind3	45	+5	-	-	50

The outcome of the noise modelling study indicates that noise emissions will meet the assigned noise level as shown in Table 10.

Table 10: Assessment of noise levels

Scenario	Receiver	Assessable Noise Level, dB(A)	Applicable Times of Day	Applicable L_{A10} Assigned Noise Level (dB)	Exceedance to Assigned Noise Level L_{A10} (dB)
Scenario 1 Nighttime	R1	30	Night (22:00 to 07:00)	35	Complies
	R2	29			Complies
	R3	29			Complies
	R4 (Area B)	42	Night (22:00 to 07:00)	43	Complies
	Ind1	52	All Hours	75	Complies
	Ind2	57			Complies
	Ind3	50			Complies

The plant will largely operate within the shed structures and significant noise sources are not expected outside of the facility. During commissioning, the applicant is proposing to monitor noise levels to confirm this assessment, and any additional noise barriers or other mitigation measures will be implemented if necessary.

4.4.1 DWER Technical Review

A technical review of the noise impact assessment was conducted by the department and provided the following advice:

1. Ambient noise monitoring has been undertaken by Herring Storer Acoustics (HSA) at both the site of the proposed plant as well as R4 (i.e. the nearest noise sensitive receiver) and the results have been produced in Table 8. However, the metrics used in the table has not been identified (it is presumed by the Environmental Noise Branch to be an L_{Aeq}).
2. Further to point 1, it does not appear HSA has undertaken an assessment of the ambient noise measurement data to determine what noise being received is extraneous noise (e.g. due to wind or rain) or that which can be attributed to nearby industrial businesses in the Rockingham/Kwinana area. This is a valid consideration in relation to R4 for the emissions from the proposed plant may

be considered to be significantly contributing. Should the assessment of the ambient noise measurements determine that the expected emissions from the BioIron plant would be significantly contributing, the department would expect the emissions from the proposed plant meet a level not less than 5dB below the adjusted assigned level for R4 in order the emissions are no longer considered to be significantly contributing.

3. In relation to adjustments for tonality, it is noted that HSA have applied tonal adjustment to the adjacent industrial receivers (Ind 1 thru 3), but not to any of the residential receivers (R1 thru 4), citing background levels at the residential receivers would result in tonality no longer being present. It is observed Ind 1-3 are in the region of 45 m to 600 m from the proposed plant and will have the tonality adjustment applied, however R4 which is approximately 560 m away will not. On this basis it appears to be difficult to support the position taken by HSA. This may be better informed should an assessment of the ambient noise measurements as discussed in point 2 be undertaken. Should however the ambient noise assessment be found mainly contributed by the neighbouring industries in line with comments in point 2 and therefore lower levels would need to be achieved, then tonality at R4 would likely be masked and the adjustment may not be needed.
4. In relation to the ambient noise monitoring HSA state, "*During this period, weather conditions were monitored via the Bureau of Meteorology web site as to any weather conditions which may have unduly influenced noise levels*". The HSA report does not identify which Bureau of Meteorology weather station was used for this exercise, nor its relevance and appropriateness in relation to the locations of the ambient noise monitoring.
5. The 3D rendering of the plant as shown in supporting documentation indicates the wall is not fully constructed down to ground level and includes a gap of what appears to be several metres. It is unclear if this is indeed the case and if so, if it has been incorporated into the acoustic model.

4.5 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for each identified emission source and takes into account potential source-pathway and receptor linkages as identified in Section.4.1 Where linkages are in-complete they have not been considered further in the risk assessment.

Where the applicant has proposed mitigation measures/controls (as detailed in Section 4.1), these have been considered when determining the final risk rating. Where the delegated officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

Additional regulatory controls may be imposed where the applicant's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 11.

Works approval W6964/2024/1 that accompanies this decision report authorises construction and time-limited operations. The conditions in the issued works approval, as outlined in Table 11 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

A licence is required following the time-limited operational phase authorised under the works approval to authorise emissions associated with the ongoing operation of the premises i.e. metal smelting or refining activities. A risk assessment for the operational phase has been included in this decision report, however licence conditions will not be finalised until the department assesses the licence application.

Table 11: Risk assessment of potential emissions and discharges from the premises during construction, commissioning and operation

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Construction								
Construction of new processing facilities	Dust	Air / windborne pathway causing impacts to health and amenity	Sensitive receptor located 560m north-east of the premises	Refer to Section 4.1	C = Minor L = Unlikely **Medium Risk**	Y	N/A	The delegated officer has considered the controls proposed by the applicant as acceptable for managing the potential risks of dust emission during construction.
	Noise			Refer to Section 4.1	C = Minor L = Unlikely **Medium Risk**	Y	N/A	The delegated officer has considered the controls proposed by the applicant as acceptable for managing the potential risks of noise emissions during construction.
Commissioning and Operation (including time limited operations)								
Unloading and storage of iron ore, biomass and general site operations	Dust	Air / windborne pathway causing impacts to health and amenity	Sensitive receptor located 560m north-east of the premises	Refer to Section 4.1	C = Minor L = Unlikely **Medium Risk**	Y	Condition 1, 7	The delegated officer has considered the controls proposed by the applicant including the use of baghouses, covering covers, using foggers/misters as acceptable for managing the potential risks of dust emissions during commissioning and time limited operations of the premises. These controls have been included as conditions on the works approval.
	Noise	Air / windborne pathway causing impacts to health and amenity	Sensitive receptor located 560m north-east of the premises	Refer to Section 4.1	C = Minor L = Possible **Medium Risk**	N	**Condition 21, 22, 23 and 24**	The delegated officer has reviewed the noise modelling based on the proposed design and all identified receptors. It is noted that the assessment identified some concerns regarding aspects of tonality, and whether the premises is likely to be 'significantly contributing' to noise. To confirm, the delegated officer considers that applicant proposed noise monitoring be undertaken to confirm the modelling results from the acoustic report and confirm that the noise emissions from the premises will comply with the *Environmental Protection (Noise) Regulations 1997*. Therefore, additional conditions have been included on the works approval to verify that the noise modelling is correct, and if the assessment finds that noise emissions do not comply, the works approval must prepare and submit a report to ensure that noise will no longer lead to any contravention of the *Environmental Protection (Noise) Regulations 1997.*
	Chemical and hydrocarbon spill	Overland runoff potentially causing ecosystem disturbance or impacting surface water quality	Groundwater 2.5 mbgl	Refer to Section 4.1	C = Minor L = Rare **Low Risk**	Y	Condition 1, 7	The delegated officer has considered the applicant's controls for storing hazardous material to Australian Standards as sufficient in managing the potential emissions from the storage of hazardous materials. The applicant's controls have been included as conditions on the works approval.
Commissioning and operation of plant including BioIron Furnace (including pre-heating zone, microwave zone and furnace), Induction Furnace, Off-gas burner	Air emissions including particulate matter, carbon monoxide and nitrogen dioxide	Air / windborne pathway causing impacts to health and amenity	Sensitive receptor located 560m north-east of the premises	Refer to Section 4.1	C = Minor L = Possible **Medium Risk**	Y	Conditions 1, 7, 8, 9, 10 and 11 **Condition 4 and 5**	The delegated officer reviewed the air quality modelling based on the proposed design and all identified receptors and determined that air quality at all sensitive receptors is not expected to be significantly impacted by air emissions from the premises. The assessment identified that the predicted concentrations at the nearest sensitive receptor at Wellard Road were below the NO_2 criteria however the model predicted an exceedance of the 1-hour average criteria within close proximity of the residence. The Department of Health has also raised some concerns regarding the level of $PM_{2.5}$ at the closest sensitive receptor. The Department's Air Quality Branch recommends that ambient monitoring for a minimum of 12 months to be undertaken near the additional receptor on Wellard Road to assess the NO_2 levels. An additional condition has been included on the works approval that require the applicant to submit an Ambient Air Quality Monitoring Plan that requires the applicant to submit a plan prior to commissioning, and implemented during commissioning and time limited operations to monitor air quality emissions from the premise at the closest sensitive receptor. The applicant's proposed controls including off-gas baghouse, raw materials baghouse, bag filters, off-gas burner, furnace and stack design and construction details have been included in the works approval.
Biomass unloading and handling. Feed preparation equipment including Hammer Mills, Feed Mixer, and Briquetting press)	Explosive dust creation Smoke	Air / windborne pathway causing impacts to health and amenity	Sensitive receptor located 560m north-east of the premises	Refer to Section 4.1	C = Minor L = Possible **Medium Risk**	Y	Condition 1	The applicant has proposed to manage potential emissions of smoke from the unloading of biomass by ensuring that fire mitigation systems are in place according to Australian Standards. The delegated officer considers that the risks of has been adequately addressed. The applicant's controls have been included as conditions.

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Operations and waste storage area	Stormwater contaminated with sediment or iron rich process water, sediments or hydrocarbons.	Overland runoff potentially causing ecosystem disturbance or impacting surface water quality	Groundwater 2.5 mbgl	Refer to Section 4.1	C = Minor L = Unlikely **Medium Risk**	Y	Conditions 1 and 7	The delegated officer has considered the proposed controls for management of stormwater including diversion of clean uncontaminated stormwater, adequate storage of potentially contaminated stormwater. The applicant's controls have been included as conditions on the works approval.
Stockpiling waste material (slag)	Discharge of slag - highly acidic material	Overland runoff potentially causing ecosystem disturbance or impacting surface water quality	Groundwater 2.5 mbgl	Refer to Section 4.1	C = Moderate L = Unlikely **Medium Risk**	Y	Condition 1 and 7	The delegated officer has considered the applicant's controls for the storing and management of slag as sufficient in managing the potential emissions. The applicant's controls have been included as conditions on the works approval.
Stockpiling waste material (DRI)	Dust	Air / windborne pathway causing impacts to health and amenity	Sensitive receptor located 560m north-east of the premises	Refer to Section 4.1	C = Minor L = Unlikely **Medium Risk**	Y	Condition 1 and 7	The delegated officer has considered the applicant's controls for the storing and management of DRI as sufficient in managing the potential emissions. The applicant's controls have been included as conditions on the works approval.
Process wastewater	Wastewater	Overland runoff potentially causing ecosystem disturbance or impacting surface water quality	Groundwater 2.5 mbgl	Refer to Section 4.1	C = Minor L = Rare **Low Risk**	Y	Condition 1 and 7	The delegated officer has considered the applicant's controls for wastewater including bunding and collection sumps as sufficient in managing the potential emissions. The applicant's controls have been included as conditions on the works approval.

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guideline: Risk Assessments* (DWER 2020).

Note 2: Proposed applicant controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls imposed by department.

5. Consultation

Table 12 provides a summary of the consultation undertaken by the department.

Table 12: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website on 20 August 2021	None received	N/A
Local Government Authority advised of proposal on 24 September 2024	The City of Rockingham replied on 10 October 2024 advising that they had received a Development Application and provided additional comments to the department after their review and assessment of the revised Environmental Noise Assessment (dated April 2025) and the revised Air Quality Assessment Report (dated February 2025), which were submitted to the City recently. These comments were forwarded for the department's consideration. Further on 28 November 2024, the Department was contacted by the City of Rockingham and advised that a new receptor had been identified as part of their consultation process. <u>Environmental Noise Assessment</u> • The City notes that the acoustic assessment has applied a +8dB influencing factor (IF) for 1045 Wellard Road to which the predicted 43dB noise levels comply, however, it is not understood how the consultant has calculated 8db. The City's calculation for the IF of 1045 Wellard Road is 39dB (+4) to which the noise levels would not comply. The City seeks confirmation from DWER as to the IF that would apply to 1045 Wellard Road. <u>Air Quality Assessment</u> • The modelling submitted indicates most exceedances of air quality criteria are close to the development boundary. The City notes there were predicted exceedances at or close to 1045 Wellard Road for NO_2 1-hr average and $PM_{2.5}$ annual average, which may require further investigation due to uncertainties or air dispersion modelling. The City seeks advice in relation to the air quality assessment as to whether DWER considers if any further action/investigation is required in this context.	Noted. The Departments consideration of noise and air emissions associated with the works approval assessment is detailed in section 4.3 and 4.4 of this decision report. Additional monitoring conditions are included in the works approval to address the uncertainties regarding both air and noise emissions. Following the identification of the residential receptor at 1045 Wellard Road, the applicant has conducted additional modelling assessments, this information is detailed in section 4.3. and 4.4.
Department of Health were advised of the proposal on 3 October 2024.	Advice was sought from the Department of Health (DoH) in relation to this project and the risks associated with microwave and ionising radiation. The Environmental Health Directorate (DoH) provided the following comments for consideration: • The $PM_{2.5}$ standard is a non-threshold value, which effectively means any increase in $PM_{2.5}$ levels at receptor locations, such as the predicted 3% increase, can result in increased frequency and/or severity of health impacts. As such it is important that dust monitoring and dust mitigation measures are	Noted. The department has considered the air quality assessment in section 4.3 of this decision report. Where necessary, dust emission controls have been conditioned within

	considered as conditions of approval. • The dust management measures outlined in Table 3.1 and 4.1 of the Environmental Management Plan (Ramboll, 2024) (EMP) are generic and lack the necessary detail for effective dust control. The plan does not clearly specify key dust emission sources across various stages of operation, including product transport, unloading, storage and processing. • A more comprehensive description of site-specific points and the corresponding controls are available in Table 13-1 of the Works Approval Supporting Document. For example, dust extraction systems, dust suppression sprays, water trucks restricted speeds, indoor stockpile storage, unloading processes and covered conveyors. Ideally these control measures would have been listed in the EMP to ensure consistent implementation and monitoring across the site. • Consideration should be given to incorporating provisions for air quality monitoring during the operation of the trial plant, particularly with the inclusion of $PM_{2.5}$ to allow for adaptive management should emissions exceed anticipated levels.	the works approval, including ambient air quality monitoring.
Radiological Council were advised of the proposal and advice requested on 9 October 2024.	Advice was sought from the Radiological Council in regard to the requirements for the *Radiation Safety Act 1975* in relation to this facility. The Radiological Council provided the following advice: • The risks associated with radiation are regulated by the Council under *Radiation Safety Act 1975* (the Act) and its regulations. Registration (possession authorisation) and licensing (use authorisation) will be required under the Act for prescribed radioactive substances, irradiating apparatus and electronic products. • X-ray analysis equipment is prescribed irradiating apparatus under the Act. Under the Regulations to the Act, the apparatus and it use are required to comply with Australia's Code of practice for protection against ionizing radiation emitted from x-ray analysis equipment (1984) published by the National Health and Medical Research Council. The Code addresses those risks associated with apparatus. Compliance with other radiation codes will also be required within 14 days of taking possession of the apparatus. • Microwave ovens are not prescribed electronic products under the Act and therefore registration and licensing for use are not required. However, microwave emissions must comply with the limits set out in Australia's Radiation Protection Standard for Liming Exposure to Radiofrequency Fields – 100 kHz to 300 GHz (2021) published by the Australian Radiation Protection and Nuclear Safety Agency.	Noted. The Department considers it is the responsibility of the works approval holder to ensure they have the required approvals in place under the *Radiation Safety Act 1975.*
Applicant was provided with draft documents on 27 June 2025	The Applicant provided a response on 16 July 2025, refer to Appendix 1	Refer to Appendix 1

6. Conclusion

Based on the assessment in this decision report, the delegated officer has determined that a works approval will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

References

1. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
2. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
3. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.

Appendix 1: Summary of applicant's comments on risk assessment and draft conditions

Condition	Summary of applicant's comment	Department's response
Construction Phase – Condition 1, Table 1	To allow flexibility in the final layout of equipment and infrastructure, an "infrastructure footprint" was requested and provided within Figure 1. Given there is no longer a minor departure condition, it is requested that the Condition 1 (Table 1) infrastructure location column content be altered to state the following for all items of infrastructure: *"As show in Figure 1 and generally in accordance with the layout shown in Figure 2 Schedule 1".* RTIO understands and accepts that the location of authorised discharge points may need to be static and remain "As depicted in Figure 2, in Schedule 1", but requests that the location of these items (8-11) also have a degree of flexibility to reduce the need for potential future amendments. The applicant also provided minor update/clarifications to infrastructure specifications.	The department has accepted the changes requested in regards to the design and construction installation requirement for the BioIron Furnace and microwave, milling and storage equipment and stockpiling areas. The department considers that the existing design and construction / installation requirements will be sufficient in managing the potential emissions. The applicant's request regarding the flexibility of the infrastructure location is accepted by the department. The existing condition 2, that requires the submission of an Environmental Compliance Plan with as constructed plans and detailed site plan for each infrastructure item specified in Condition 1 will be sufficient in managing minor changs to the location and layout of infrastructure and does not change the risk or intent of the condition.
Condition 9	Condition 9, Table 2 requires updates to align with updates requested above for Condition 1, Table 1.	Noted and accepted.
Condition 10	It is requested that Condition 10 (Table 3) be updated to align with the updates requested above for Condition 1, Table 1. There is potential for minor changes to the final location of infrastructure / equipment associated with discharges / emissions. The variation in location is likely to be minimal (<50 metres) and will be contained within the infrastructure footprint.	The applicant's request regarding the flexibility of the infrastructure location is accepted by the department. The existing condition 2, that requires the submission of an Environmental Compliance Plan with as constructed plans and detailed site plan for each infrastructure item specified in Condition 1 will be sufficient in managing minor changs to the location and layout of infrastructure and does not change the risk or intent of the condition.
Time Limited Operations	It is requested that Condition 15 be amended so that TLO may be entered at any date following the works approval holder meeting the requirements of Condition 14.	The department has considered this request and added clarification text to condition 14 regarding the commencement

Condition	Summary of applicant's comment	Department's response
	The date TLO commenced date will be documented in the TLO report.	of TLO, noting that this change does not change the risk or intent of the condition.
Formatting and condition numbering updates	Correction to formatting issues with the draft documents.	Noted. The typographical errors have been corrected.
Decision Report:	Please acknowledge that the infrastructure will be limited to the infrastructure footprint and the intent of the infrastructure footprint is to allow for minor changes to orientation, layout or final configuration without triggering the need for further amendments.	The department acknowledges that the applicant has requested flexibility in the infrastructure footprint, and notes that the applicant has confirmed that the infrastructure will remain generally in accordance with the layout.

Appendix 2: Application validation summary

SECTION 1: APPLICATION SUMMARY			
Application type			
New works approval	☒		
Date application received		26/08/2024	
Applicant and premises details			
Applicant name/s (full legal name/s)		Hammersley Iron Pty Limited	
Does the following information in the application form match those listed in the current ASIC company extract?		Applicant name/s (full legal names): Yes ☒ No ☐ ASIC Company Extract – Hamersley Iron Pty Limited ACN 004 558 276	Trading name (if applicable): Yes ☒ No ☐ N/A ☐ Rio Tinto Limited
		Australian Company Number (ACN): Yes ☒ No ☐	Registered business address: Yes ☒ No ☐
Has the applicant demonstrated occupancy (proof of occupier status)?		Yes ☒ No ☐ Certificate of Title – Lupomar Pty Ltd of PO Box 5059 Dalkeith WA 6009 Lease – between Lupomar and Rio Tinto Shared Services Pty Limited ACN 11306077	Certificate of title ☐ General lease ☒ Expiry: 01/02/2030 Mining lease / tenement ☐ Expiry: Other evidence ☐ Expiry:
Premises name		BioIron Pilot Plant Project	
Premises location		Lot 1728 on Certificate of Title (CT) Volume 1912 Folio 815 Lot 1728 on Deposited Plan 166742	
Local Government Authority		City of Rockingham	
Application documents			
HPCM file reference number		Instrument (folder): DER2024/000462 Application (subfolder): DWERDT994631	
Key application documents (supporting information provided in addition to the application form)		Works approval supporting document: b) ASIC Extract c) Authorisation letter d) Premises map e) Environmental Commissioning Plan f) Stakeholder Consultation g) Environmental Management Plan h) Waste Management Plan i) Cost breakdown and WA fee	
Scope of application/assessment			
Summary of proposed activities and/or changes to existing operations		Construction of new equipment and infrastructure, such as an annex to house the new BioIron furnace. Refurbishment of existing equipment and infrastructure.	

Category number/s (activities that cause the premises to become a prescribed premises)

Table 1: Prescribed premises categories

Prescribed premises category and description	Proposed production or design capacity[1]	Proposed changes to the existing production or design capacity[1] (amendments only)	Proposed activities, processes, or operations, including any changes to existing operations (if amendment)
44	8,736 tonnes per annum	N/A	Construction and operation: BioIron Microwave Furnace, Induction furnace, Linear Hearth Furnace

Are there any outstanding Notices of Amendment that need to be amended in the works approval / licence (if applicable)?	Notice of amendment of licence expiry dates (2016) Yes ☐ No ☒ Notice of amendment of licence reporting requirements (2022) Yes ☐ No ☒ Amendment Notices Yes ☐ No ☒	
Are there any unresolved DWER referred amendments from Regulatory Assurance to Industry Regulation relating to this premises?	Yes ☐ No ☒	DWER amendment referral HPCM file reference number(s):
Category specific checklists		
Are there any of DWER's prescribed premises category checklists (application form annexes) relevant to the scope of the application?	Yes ☐ No ☒	
Does the application include a completed version of the relevant prescribed premises category checklist(s)?	Yes ☐ No ☒ N/A ☐	
Is the prescribed premises category checklist(s) supported by a category/activity-specified checklist and if yes, has this been completed?	Yes ☐ No ☐ N/A ☒	HPCM file reference for separate category validation checklist(s):
Legislative context and other approvals		
Has the applicant referred, or do they intend to refer, their proposal to the EPA under Part IV of the EP Act as a significant proposal?	Yes ☐ No ☒	Referral decision No: Assessed under Part IV ☐ Managed under Part V ☐
Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes ☐ No ☒	Ministerial statement No: EPA Report No:
Is the proposal a Major Project or subject to a State Agreement Act?	Yes ☐ No ☒	Lead Agency:
Has the proposal been referred and/or assessed under the EPBC Act?	Yes ☐ No ☒	Reference No:
Has the applicant obtained approval for their Mining Proposal?	Yes ☐ No ☐ N/A ☒	Reg ID: Status: Not submitted If No or N/A, explain why? Mining proposal approval is only required if the prescribed premises is located on a mining tenement or tenement types regulated by DEMIRS.
Has the applicant obtained all relevant planning approvals?	Yes ☐ No ☒ N/A ☐	Approval: Planning approval is currently under assessment with the City of Rockingham Expiry date:
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes ☐ No ☒	CPS No: No clearing is proposed.
Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes ☐ No ☒	Application reference No: Licence/permit No: No clearing is proposed.
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes ☐ No ☒	Application reference No: Licence/permit No:
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP	Yes ☐ No ☒	Name: Cockburn Groundwater Area Type: Proclaimed Groundwater Area

Act)?		Has Regulatory Services (Water) been consulted? Yes ☐ No ☐ N/A ☐ Regional office: Kwinana Peel
Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes ☐ No ☒	Name: N/A Priority: N/A Are the proposed activities/ landuse compatible with the PDWSA (refer to WQPN 25)? Yes ☐ No ☐ N/A ☐
Is the Premises subject to any other Acts or subsidiary regulations (e.g. *Dangerous Goods Safety Act 2004, Environmental Protection (Controlled Waste) Regulations 2004, State Agreement Act xxxx*)?	Yes ☒ No ☐	*WHS Mines Safety and Inspection Regulations 1995* *Radiation Safety Act 1975*
Is the Premises within an Environmental Protection Policy (EPP) Area or State Environmental Policy (SEP) Area (e.g. Western Swamp Tortoise Habitat EPP, Peel Inlet – Harvey Estuary EPP, Kwinana Atmospheric Wastes EPP, Goldfields Residential Areas Sulfur Dioxide EPP, *State Environmental (Cockburn Sound) Policy 2015*)?	Yes ☒ No ☐	*State Environmental (Cockburn Sound) Policy 2005* *Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1999 and Environmental Protection (Kwinana) (Atmospheric Wastes) Regulations 1992*
Is the Premises subject to any EPP or SEP requirements?	Yes ☒ No ☐	If Yes, include details here, e.g. Site is subject to SO_2 requirements of Kwinana EPP.
Is the Premises a known or suspected contaminated site under the *Contaminated Sites Act 2003*?	Yes ☒ No ☐	Classification: possibly contaminated – investigation required (PC–IR) Date of classification: 2010