			Consequence				
			Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
			May happen in exceptional circumstances (e.g. once in 100 years)	Could happen sometime (e.g. once in 10 years).	Might occur occasionally (e.g. once per year)	Will probably occur in most circumstances (e.g. once per month)	Expected to occur in most circumstances (e.g. once per week)
Likelihood	Almost certain	A	Moderate (1)	Moderate (3)	High (2)	Catastrophic (1)	Catastrophic (3)
	Likely	B	Low (3)	Moderate (2)	High (1)	High (4)	Catastrophic (2)
	Possible	C	Low (2)	Low (6)	Moderate (4)	High (3)	High (6)
	Unlikely	D	Low (1)	Low (5)	Low (8)	Moderate (6)	High (5)
	Rare	E	Very Low (1)	Low (4)	Low (7)	Moderate (5)	Moderate (7)

		Consequence				
		Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
		May happen in exceptional circumstances (e.g. once in 100 years)	Could happen sometime (e.g. once in 10 years).	Might occur occasionally (e.g. once per year)	Will probably occur in most circumstances (e.g. once per month)	Expected to occur in most circumstances (e.g. once per week)
	Consequence Level					
Environmental	**Ecosystem Function (need to consider resilience and resistance)**	Alteration or disturbance to ecosystem within natural variability. Ecosystem interactions may have changed but it is unlikely that there would be any detectable change outside natural variation or occurrence	Measurable changes to the ecosystem components without a major change in function(no loss of components or introduction of new species that affects ecosystem function). Recovery in less than 1 year.	Measurable changes to the ecosystem components without major change in function (not loss of components or introduction of new species that affects ecosystem function). Recovery in 1 to 2 years following completion of Project construction.	Measurable changes to the ecosystem components with a major change in function.Recovery (i.e. within historic natural variability) in 3 to 10 years following completion of Project Construction.	Long term and possibly irreversible damage to one or more ecosystem functions. Recovery, if at all, greater than 10 years following completion of Project Construction.
	Habitat, communities and/or assemblages	Alteration or disturbance to habitat within natural variability. Less than 1% of the area of habitat affected or removed	1 to 5% of the area of habitat affected in a major way or removed. Reestablishment in less than 1 year (relative to component seasonality) following completion of Project construction.	5 to 30% of the area of habitat affected in a major way or removed. Reestablishment in 1 to 2 years following completion of Project construction	3 to 90% of the area of habitat affected in a major way or removed. Reestablishment in 3 to 10 years following completion of Project construction.	Greater than 90% of the area of habitat affected in a major way or removed. Reestablishment, if at all, greater than 10 years following completion of Project construction.
	Species and/or groups of species (including protected species)	Population size or behaviour may have changed but it is unlikely that there would be any detectable change outside natural variation/occurrence.	Detectable change to population size and/or behaviour, with no detectable impact on population viability (recruitment, breeding, recovery) or dynamics. Recovery in less than 1 year (relative to species lifecycle) following completion of Project Construction.	Detectable change to population size and/or behaviour, with no detectable impact on population viability (recruitment, breeding, recovery) or dynamics. Recovery in 1 to 2 years following completion of Project Construction.	Detectable change to population size and/or behaviour, with no detectable impact on population viability, or dynamics. Recovery (i.e. within historic natural variability) in 3 to 10 years following completion of Project Construction.	Local extinctions are imminent/immediate or population no longer viable. Recovery, if at all, greater than 10 years following completion of Project Construction.
Property and Infrastructure	**Cost to repair/replace (and lost revenues**	Approximate range from $0 to $0.1 million.	Approximate range from $0.1 to $1 million.	Approximate range from $1 to $10 million.	Approximate range from $10 million to $100 million	Approximate range from $100 million to $1 billion.
Social	Non-Aboriginal Heritage	No measurable alterations to existing natural and human processes already impacting on heritage sites.	Detectable impact to State or Commonwealth significant site with heritage values remaining largely intact. ORPartial reduction in heritage value intrinsic to non-State/Commonwealth significant site.	Partial reduction in heritage value intrinsic to non-State/Commonwealth significant site.ORSubstantial reduction in heritage value intrinsic to non-State/Commonwealth significant site.	Substantial reduction in heritage value intrinsic to non-State/Commonwealth significant site.ORComplete loss of heritage value intrinsic to non-State/Commonwealth significant site.	Complete loss of heritage value intrinsic to State or Commonwealth significant site.
	AboriginalHeritage*	No measurable change in existing natural or human processes impacting on Indigenous Heritage Sites in any CDP Project Area.	Partial removal of one or more Indigenous archaeological sites on a specific landform within a single CDP Project Area.	Complete removal of one or more Indigenous archaeological sites on a specific landform within a single CDP Project Area.	Complete or partial removal of multiple Indigenous archaeological sites on different landforms within more than one CDP Project Area.	Complete or partial removal of multiple Indigenous archaeological sites on all landforms across Port Phillip Bay.
Public health and safety	Minor injury/illness	Minor injury or illness to less than 10 individuals	Minor injury or illness to between 10 and 100 individuals	Minor injury or illness to between 100 and 1000 individuals.		
	Major injury/illness	Major injury or illness to 1 individual.	Major injury or illness to between 1 and 10 individuals.	Major injury or illness to between 10 and 100 individuals	Major injury or illness to between 100 and 1000 individuals	
	Fatality/serious injury, disability			fatality or serious injury	Between 1 and 10 fatalities or serious injuries.	Greater than 10 fatalities or serious injuries.

Mining

Phase	Theme	Environmental Factors/Objective	Environmental values and sensitivities	Main Activity	Sub Activity	Hazards (Source)	Potential Environmental Direct Impact (pathway)	Potential Environmental Impact (Receptors of concern) Impacts are measurable changes to the environment as a direct result of project activities (e.g. m2 losses of habitat, or mg/l increases in a substance concentration).	Indirect impacts/Cumulative Impacts	Rationale	Likelihood	Consequence	Inherent risk	Mitigation and management	Likelihood2	Consequence	Residual risk
Operations	Air	Air Quality	Protect air quality and minimise emissions and their impact so that the chemical, physical and biological characteristics of air are maintained	Mining footprint	haulage/traffic	Dust generation from vehicular movements around site affecting sensitive NT and MNES flora species and their habitat	air	Impacts of manganese dust affecting air quality of terrestrial ecosystems health and function			B	3	High (1)	A water truck will be used to supress dust generation. ROM waste material from initial pre-strip and overburden will be used to maintain and sheet roads. Stockpiling of topsoil will be avoided.	C	2	Low (6)
Operations	Air	Air Quality	Protect air quality and minimise emissions and their impact so that the chemical, physical and biological characteristics of air are maintained	Open Cut mining	Haulage/excavations/loading/traffic movements	Manganese ore in dust created from vehicular and machinery movements in open pits.	air	Impacts of manganese dust affecting air quality of terrestrial ecosystems health and function	Manganese dust affecting human health, surface water systems affecting quality of surface water in creeks and streams and aquatic ecosystems.		B	3	High (1)	A water truck will be used to supress dust generation. ROM waste material from initial pre-strip and overburden will be used to maintain and sheet roads. Stockpiling of topsoil will be avoided.	C	2	Low (6)
Operations	Air	Air Quality	Protect air quality and minimise emissions and their impact so that the chemical, physical and biological characteristics of air are maintained	Ore conveyor system	Conveyor of manganese ore from process plant to northern export corridor	Dust generation during conveyor manganese ore	Land	Impacts of manganese dust affecting air quality of terrestrial ecosystems health and function	Manganese dust affecting human health, surface water systems affecting quality of surface water in creeks and streams and aquatic ecosystems.		B	2	Moderate (2)	Dust suppression during loading activities potentially with the use of a sprinkler system. Establish a dust management plan.	C	2	Low (6)
Operations	Air	Air Quality	Protect air quality and minimise emissions and their impact so that the chemical, physical and biological characteristics of air are maintained	Process plant and Plant	Ore processing - crush plant, process plant screening and conveyor	Dust generation from crushing and screening manganese ore	Land	Impacts of manganese dust affecting air quality of terrestrial ecosystems health and function	Manganese dust affecting human health, surface water systems affecting quality of surface water in creeks and streams and aquatic ecosystems.		B	3	High (1)	Hoppers will be installed around the conveyor system. Sprinklers will be used to reduce dust generation.	C	2	Low (6)
Operations	Air	Air Quality	Protect air quality and minimise emissions and their impact so that the chemical, physical and biological characteristics of air are maintained	ROM pad	haulage, ore storage and loading of ore to crusher	Dust generation during haulage and loading to crusher manganese ore	Land	Impacts of manganese dust affecting air quality of terrestrial ecosystems health and function	Manganese dust affecting human health, surface water systems affecting quality of surface water in creeks and streams and aquatic ecosystems.	Further studies on solar/ hydrogen combinations for zero emissions which will contribute to the NT governments aspirational target of achieving net zero greenhouse emissions by 2050".	B	2	Moderate (2)	A water truck will be used to supress dust generation. ROM waste material from initial pre-strip and overburden will be used to maintain and sheet roads. Stockpiling of topsoil will be avoided.	C	2	Low (6)
Operations	Air	Atmospheric processes	Contribution to the NT greenhouse gas emissions	Diesel power station co generation (solar and diesel)	Diesel consumption and emission to air	Diesel emissions to air	Air	Impact to atmospheric contaminates levels adding to the greenhouse gas emissions	Diesel emissions affecting human health, surface water systems affecting quality of surface water in creeks and streams and aquatic ecosystems.		B	2	Moderate (2)	Diesel consumption will be recorded and reported when required. All vehicles, machinery and equipment will be maintained as per manufacturers manual. Equipment will only operate at specified capacity.	C	2	Low (6)
Operations	Air	Atmospheric processes	Contribution to the NT greenhouse gas emissions	Mining footprint	Diesel consumption from vehicles and equipment	Diesel combustions form vehicles and equipment (pumps, power station) emissions to air	Air	Impact to atmospheric contaminates levels adding to the greenhouse gas emissions	Indirect impacts to Human health, terrestrial, marine and aquatic ecosystems		B	2	Moderate (2)	Diesel consumption will be recorded and reported when required. All vehicles, machinery and equipment will be maintained as per manufacturers manual. Equipment will only operate at specified capacity.	C	2	Low (6)
Construction	Land	Terrestrial ecosystems	sensitive or significant vegetation/ buffers	Mining footprint	Land clearing	Disturbance to protected areas containing sensitive habitats and function	land	Impact to areas which protect sensitive habitats and function	Erosion causing sedimentation to aquatic fresh and marine ecological communities	Terrestrial ecological studies were completed for exploration activities, not mining. Important habitat types such as monsoon forest and wetlands represent a minor component of the study (EMS, 2019).	B	3	High (1)	A 300m tree buffer from the coastline to inland has been established to protect coastal terrestrial and aquatic communities. Site inductions to include No-Go and buffer areas. Appropriate signage or markers will be maintained at buffer boundaries.	B	3	High (1)
Construction	Land	Terrestrial ecosystems	Species of social, cultural, livelihood and/or economic significance	Mining footprint	Land clearing	Disturbance to species of social or cultural significance	land	Impact to sites of cultural significance protected for their cultural importance. Environmentally Restricted Area	Impact to culturally protected areas	A cultural heritage field survey was conducted from 13 to 24 November 2017 on behalf of the ALC who coordinated permissions to access Winchelsea Island from Traditional Owners and arranged for TOs to accompany the survey (SHIM 2018). Several extensive shell midden sites were identified in the west and south of the island. Sites range in significance from low to high, with a number of sites containing a complex of different cultural values, including significance according to Aboriginal tradition, and a concern of the Anindilyakwa owners of the island. The cultural heritage assessment determined that there were 10 sites likely to be directly impacted by any exploration or mining activities, largely by clearing for coastal access. Of these four are rated as having high significance	B	4	High (4)	A cultural heritage management plan is to be established. It will include a 300m buffer zone from the high tide mark around the whole island as an exclusion zone. Establish a ESCP to prevent coastal erosion and damage to remaining heritage sites. Initiate appropriate dust management. Site inductions and education to include No-Go and buffer areas including areas off tenement. Appropriate signage or markers will be maintained at buffer boundaries. TOs will be consulted if removal of heritage sites are required for construction activities. All vehicles and machinery will remain on established roads.	B	4	High (4)
Construction	Land	Terrestrial ecosystems	Listed threatened species and their habitats (NT and Commonwealth)	Mining footprint	Land clearing	Disturbance to sensitive NT and MNES flora species and their habitat	land	Impact to protect sensitive NT and MNES terrestrial flora species and their habitat	Impact to protect sensitive NT and MNES terrestrial flora species and their habitat		B	3	High (1)	A 300m tree buffer from the coastline to inland has been established to protect coastal terrestrial and aquatic communities. Site inductions to include No-Go and buffer areas. Appropriate signage or markers will be maintained at buffer boundaries. Appropriate signage or markers will be maintained at buffer boundaries.	D	2	Low (5)
Construction	Land	Terrestrial ecosystems	Listed threatened species and their habitats (NT and Commonwealth)	Mining footprint	Land clearing	Disturbance to sensitive NT and MNES fauna species and their habitat	land	Impact to protect sensitive NT and MNES terrestrial fauna species and their habitat	Impact to protect sensitive NT and MNES terrestrial fauna species and their habitat		B	3	High (1)	Avoid any large habitat trees with hollows suitable for masked owls with a minimum 10m buffer. Avoid standing dead trees or large old growth trees with hollows that may support wildlife density sites, particularly for the northern quoll and masked owl. Avoid clearing in dense vegetation along drainage lines and monsoon forests (established buffer zones). Establish and enforce No-Go areas adjacent to the approved clearing areas, to minimise the area of disturbance and minimise areas required to be rehabilitated.	B	3	High (1)
Construction	Land	Terrestrial ecosystems	Migratory species and their habitat	Mining footprint	Land clearing	Disturbance to migratory species and their habitat	land	Impact to migratory species and their habitat		Terrestrial ecological studies were completed for exploration activities, not mining, and reported that the Project area is not listed on the Ramsar Convention. A desktop study showed there were 43 migratory species with the potential to occur within 10km of the Project area. A reconnaissance survey determined of the 43 migratory species, 10 could have the possibility or likelihood to occur within the Project area. These 10 species include all 6 turtles and the Lesser Sand Plover and Greater Sand Plover which are not listed in the EPBC search.	B	4	High (4)	Other than construction and operating activities at the Winchelsea Island, all other mining activities will remain away from coastal areas and wetland areas of WI. A 300m buffer will be maintained from mangrove communities preventing coastal disruption. Signage will be installed in high usage areas. Staff inductions will discuss No-Go areas including buffer areas. Preferable clearing should be undertaken when migratory species are not present. Incident register will be maintained.	B	2	Moderate (4)

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Phase	Theme	Environmental Factors/Objective	Environmental values and sensitivities	Main Activity	Sub Activity	Hazards (Source)	Potential Environmental Direct Impact (pathway)	Potential Environmental Impact (Receptors of concern) Impacts are measurable changes to the environment as a direct result of project activities (e.g. m2 losses of habitat, or mg/l increases in a substance concentration).	Indirect impacts/Cumulative Impacts	Rationale	Likelihood	Consequence	Inherent risk	Mitigation and management	Likelihood2	Consequence	Residual risk
Construction	Land	Terrestrial ecosystems	Locally endemic species or species with restricted habitat	Mining footprint	Land clearing	Disturbance to locally endemic species or species with restricted habitat	land	Impact to locally endemic species or species with restricted habitat		Sida sp. Groote Eylandt listed as NE is restricted to the Groote archipelago.	B	4	High (4)	Clearing vegetation will be minimised as much as practical through design, layout and controls. Disturbance will be minimised to the mining footprint and all vehicle movement will remain on established roads.	B	4	**High (4)**
Construction	Land	Terrestrial ecosystems	Species that are data deficient and their status is unknown	Mining footprint	Land clearing	Disturbance to species that are data deficient and their status is unknown	land	Impact to species that are data deficient and their status is unknown		Sida sp. Groote Eylandt is relatively common across Winchelsea Island and could be largely restricted to it. While Sida sp. Groote Eylandt has also been collected from neighbouring Groote Eylandt the extent of its occurrence there has not been fully established. There is an urgent need for the taxonomic status of this species to be resolved and for its threat level to be properly assessed. Twenty-three seasonally dominant and annual plant species recorded in the broader region and that potentially occur in forest and woodland habitats within the study area are listed as Not Evaluated (NE) or Data Deficient (DD) under the TPWC Act 2014	B	4	High (4)	Site inductions to include No-Go and buffer areas. Appropriate signage or markers will be maintained at buffer boundaries. Appropriate signage or markers will be maintained at buffer boundaries.	B	4	**High (4)**
Construction	Land	Terrestrial ecosystems	Protected area of reserve, including Indigenous Protected Area	Mining footprint	Land clearing	Disturbance to protected area of reserve, including Indigenous Protected Areas and mangrove buffer zones	land	Impact to protected area of reserve, including Indigenous Protected Area and Mangrove buffer zones		These areas will be defined during the impact process and consultation.	B	4	High (4)	Disturbance on IPAs will be in consultation with the Traditional Owners. Any areas of significance will be managed with a 300m buffer. Mangrove communities will also be protected with a 300m buffer. Site inductions to include No-Go and buffer areas. Appropriate signage or markers will be maintained at buffer boundaries. Appropriate signage or markers will be maintained at buffer boundaries.	B	3	**High (1)**
Construction	Land	Terrestrial ecosystems	Existing conservation and management activities	Mining footprint	Land clearing	Disturbance to existing conservation and management activities	land	Impact to existing conservation and management activities		These areas will be defined during the impact process and consultation.	C	4	High (3)	The Anindilyakwa Advancement Aboriginal Corporation consists of traditional owners. Mining activities will be consistent with the Anindilyakwa Land Council IPA Plan of Management. Regular discussions and meetings will occur with all key stakeholders so that environmental management is undertaken to coincide with other community groups existing plans.	D	3	**Low (8)**
Construction	Land	Terrestrial ecosystems	Introduced species and/ or invasive species	Mining footprint	Land clearing	Introduction of species and /or invasive species on Winchelsea Island via the mobilisation of land clearing equipment and supplies contaminated with introduced species and /or invasive species	land	Impact to Winchelsea Island biodiversity resulting in impacting the overall species abundance and diversity and function and cultural and economic resources			C	3	Moderate (4)	A biosecurity area will be established on LPA. This will be a laydown and inspection area before export to Winchelsea Island. Biosecurity and quarantine measures will be implemented for all imported equipment, machinery and products. Strict clean guidelines will be implemented for weed, pest and disease free import to Groote Eylandt. Management actions will coincide with existing Anindilyakwa IPA Management Plan and biosecurity legislation. All imports arriving to the biosecurity area will be clean and inspected upon arrival. Biosecurity importance will be incorporated into the induction and describe biosecurity control measures.	D	3	**Low (8)**
Construction	Land	Terrestrial Environmental Quality	Characteristics of soils, including chemical, physical, biological and aesthetic qualities	Mining footprint	Diesel fuel storage and dispensing area	Hydrocarbon spillage and leaks to open ground	land	Impact to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Inland water quality of water in surface water features in creeks and intermittent streams		C	2	Low (6)	Spill immediately cleaned, Spill kits will be available close to areas where chemicals are being used or kept. Handling and storage of combustible and flammable liquids in accordance with AS1940:2004.	D	2	**Low (5)**
Construction	Land	Terrestrial Environmental Quality	Characteristics of soils, including chemical, physical, biological and aesthetic qualities	Mining footprint	Land clearing	Disturbance to the physical and biological and aesthetics qualities of the soil surface and surface during land clearing	land	Impact to the physical and biological and aesthetics qualities of the soil surface and surface and subsurface during land clearing			B	3	High (1)	All clearing will be kept within the scope of works and all areas that will no longer be required during operation will be progressively rehabilitated. All clearing over creek and drainage lines will be managed in a ESCP.	B	2	Moderate (2)
Operations	Land	Terrestrial ecosystems	Sensitive/significant vegetation or buffers, protected area of reserve, biological and functional diversity	Dry tailings stockpile area	temporary storage of dry tailings prior to mobilisation into Primary Resource pit	Soil erosion from stockpiles during wet season months resulting in sedimentation onto land surfaces	Land	Localised impact of overburden covering soil surface to the soil chemical, physical, biological and aesthetic qualities.	Indirect impact of sediments to surface water streams and creeks.		B	3	High (1)	Dry tailings and rejects from the process plant will be immediately hauled back to the excavated Primary Resource pit for backfilling. Stockpiles will remain in the pit in an area completed for mining.	C	2	**Low (6)**
Operations	Land	Terrestrial ecosystems	Sensitive/significant vegetation and listed threatened species and their habitat (NT and Commonwealth)	Mining footprint	haulage/traffic	Dust generation from vehicular movements around site affecting sensitive NT and MNES flora species and their habitat	land	Dust covering sensitive NT and MNES flora species and their habitat			B	3	High (1)	A water truck will be used to supress dust generation. ROM waste material from initial pre-strip and overburden will be used to maintain and sheet roads. Stockpiling of topsoil will be avoided.	C	2	**Low (6)**
Operations	Land	Terrestrial ecosystems	Introduced species and/ or invasive species	Mining footprint	Weed and Pest Management	Introduction of species and /or invasive species on Winchelsea Island via the mobilisation of operational equipment and supplies contaminated with introduced species and /or invasive species	land	Impact to Winchelsea Island biodiversity resulting in impacting the overall species abundance and diversity and function and cultural and economic resources			C	4	High (3)	A biosecurity area will be established on LPA. This area will act as a laydown area until machinery, equipment and supplies are satisfactorily inspected and cleared of weed seed and pests.	D	4	Moderate (6)
Operations	Land	Terrestrial ecosystems	Listed threatened species (NT and Commonwealth)	Open Cut mining	haulage/traffic	Sensitive NT and MNES terrestrial fauna species interaction with vehicles	land	wildlife injury/death			C	2	Low (6)	Monitoring and recording wildlife road collision incidents throughout construction and operation to help remediate 'high risk' collision areas and set conditions for attending to injured native wildlife. Appropriate speed limits will also be in place throughout the site and all contractors will be educated on the risks to local fauna to minimise impacts when driving.	D	2	**Low (5)**

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Operations	Land	Terrestrial ecosystems	Sensitive/significant vegetation or buffers, protected area of reserve, biological and functional diversity	Overburden stockpile area	Storage of overburden	Soil erosion from stockpiles during wet season months resulting in sedimentation onto land surfaces	land	Localised impact of overburden covering soil surface to the soil chemical, physical, biological and aesthetic qualities.	Indirect impact of sediments to surface water streams and creeks.	A low strip ratio 0.8:1 (waste bcm:ore tonnes) and the potential to free dig the resource. Drill and blasting will not be required. Use of a hydraulic hammer may be required to support the free dig excavation. In addition, the resource is very shallow so the maximum depth of mining will not exceed 25m and in the main deposit have an average maximum depth of 6m.	B	3	High (1)	Due to the low strip ratio, the need for overburden dumps will be minimal with the majority of material being used in the construction of roads and hard stands. Long term storage will be located away from drainage lines and appropriately bunded. All runoff will be captured on site and appropriately managed.	C	2	**Low (6)**
Operations	Land	Terrestrial ecosystems	Sensitive/significant vegetation or buffers, protected area of reserve, biological and functional diversity	Land clearing	Gravel pit	Soil erosion during wet season months resulting in sedimentation onto land surfaces	land	Localised impact of sediment covering soil surface to the soil chemical, physical, biological and aesthetic qualities.	Indirect impact of sediments to surface water streams and creeks.		B	3	High (1)	Gravel Pit to have appropriate erosion controls. All clean water will be diverted into vegetated areas.	C	2	**Low (6)**
Operations	Land	Terrestrial ecosystems	Sensitive/significant vegetation or buffers, protected area of reserve, biological and functional diversity	Land clearing	Timber Mill	Disturbance to sensitive NT and MNES terrestrial flora species	land	Impact to Winchelsea Island biodiversity resulting in impacting the overall species abundance and diversity and function and cultural and economic resources	Indirect impact of sediments to surface water streams and creeks.		B	3	High (1)	Timber Mill to appropriate permits in place to remove timber from the island	C	2	**Low (6)**
Operations	Land	Terrestrial ecosystems	Sensitive/significant vegetation or buffers, protected area of reserve, biological and functional diversity	Process Plant	Tailings Clarifier tanks	Tank and pipework failure	land	Localised impact of tailings covering soil surface to the soil chemical, physical, biological and aesthetic qualities.	Indirect impact or regional spread of tailings via surface water streams and creeks and coastal marine communities including mangroves and wetlands.		C	2	Low (6)	Tanks and pipework and equipment will be routinely checked and maintained. Any faulty or aging equipment will be replaced immediately.	C	2	**Low (6)**
Operations	Land	Terrestrial ecosystems	Listed threatened species, migratory species, endemic species.	Waste generation, handling and storage	Putrescibles, scrap materials, steel and plastic drums, wooden pallets, plastic and steel pipe work, process plant parts	Fauna entrapment	Land	Impact to the visual amenity of the area caused by wind blown, mishandled, illegally disposed rubbish to land, water and sea	Aquatic surface water and marine ecosystems		D	2	Low (5)	Fauna entrapment will be minimised through the management of waste. Storage and laydown areas will be inspected. Open containers and/ or drums will be closed with a lid.	D	2	**Low (5)**
Operations	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities	Diesel power station co generation (solar and diesel) for process plant, lighting, office and maintenance areas	Diesel generator to operate pump	Hydrocarbon spillage and leaks to open ground	Land	Localised impact to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Aquatic ecosystems and marine ecosystems	May also look at Solar and hydrogen. 10 ha of land 120 mega litre annually	C	2	Low (6)	Spill immediately cleaned, Spill kits will be available close to areas where chemicals are being used or kept. Handling and storage of combustible and flammable liquids in accordance with AS1940:2004.	D	2	**Low (5)**
Operations	Land	Terrestrial Environmental Quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities the biological processes that depend on soil quality	Fuel storage and dispensing area (50,000 litres)	Diesel fuel storage and dispensing area	Hydrocarbon spillage and leaks to open ground	Land	Localised impact to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Inland water quality of water in surface water features in creeks and intermittent streams	A bulk diesel storage facility will be designed to ensure compliance with all safety and environmental requirements. A number of self-bunded, modular fuel tanks will be provided	C	4	High (3)	Spill immediately cleaned, sufficient bunding in place. Handling and storage of combustible and flammable liquids in accordance with AS1940:2004. Keep an incident register,	C	2	**Low (6)**
Operations	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities the biological processes that depend on soil quality	Maintenance area workshop for mobile and fixed)	hydrocarbon handling and minor storage	hydrocarbon spillage and leaks to open ground	land	Localised impact around maintenance area to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Inland water quality of water in surface water features in creeks and intermittent streams		C	4	High (3)	Spill immediately cleaned, Spill kits will be available close to areas where chemicals are being used or kept. Handling and storage of combustible and flammable liquids in accordance with AS1940:2004.	C	2	**Low (6)**
Operations	Land	Terrestrial environmental quality	Chemical, physical, biological characteristics of soils and aesthetic qualities	Ore conveyor system	Conveyor ore from process plant to northern export corridor	Manganese ore spillage from conveyor to open ground	Land	Localised impact from manganese ore spillage to the soil chemical, physical, biological and aesthetic qualities.	Indirect impact or regional spread of tailings via surface water streams and creeks and coastal marine communities including mangroves and wetlands.		C	2	Low (6)	SOP produced for loading conveyor and spill or over piling preventative measures in place.	D	2	**Low (5)**
Operations	Land	Terrestrial Environmental Quality	Chemical, physical, biological characteristics of soils and aesthetic qualities	Process Plant	Pipeline and infrastructure	Tailings pipework failure	land	Localised impact of tailings covering soil surface to the soil chemical, physical, biological and aesthetic qualities.	Indirect impact or regional spread of tailings via surface water streams and creeks and coastal marine communities including mangroves and wetlands.		C	2	Low (6)	All pipeline will be monitored and inspected regularly. Where pipe failure occurs, immediate spill response is required. All contaminated soil will be dug and placed into tailings area.	C	2	**Low (6)**
Operations	Land	Terrestrial environmental quality	Chemical, physical, biological characteristics of soils and aesthetic qualities	Raw water dam and smaller dams	Diesel generator to operate pump	hydrocarbon spillage and leaks to open ground	land	Localised impact to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Aquatic ecosystems and marine ecosystems		C	2	Low (6)	Spill immediately cleaned, Spill kits will be available close to areas where chemicals are being used or kept. Handling and storage of combustible and flammable liquids in accordance with AS1940:2004.	D	2	**Low (5)**
Operations	Land	Terrestrial environmental quality	Chemical, physical, biological characteristics of soils and aesthetic qualities Biological processes that depend on soil quality	Sewerage treatment plant and irrigation area (bio sewage)	Diesel generator to operate pump	Hydrocarbon spillage and leaks to open ground	Land	Localised impact to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Aquatic ecosystems and marine ecosystems		C	2	Low (6)	Spill immediately cleaned, Spill kits will be available close to areas where chemicals are being used or kept. Handling and storage of combustible and flammable liquids in accordance with AS1940:2004.	D	2	**Low (5)**
Operations	Land	Terrestrial environmental quality	Chemical, physical, biological characteristics of soils and aesthetic qualities Biological processes that depend on soil quality	Sewerage treatment plant and irrigation area (bio sewage)	Storage of sewage	Sewerage tank and pipework sewage spills and leaks	Land	Localised impacts to the health of all employees from irrigated water containing elevated levels of E.coli and or coliforms.	Localised impacts to the health of all employees from irrigated water containing elevated levels of E.coli and or coliforms entering creeks and streams.		D	3	Low (8)	The small wastewater treatment facility will be established to capture run off from the MIA and treat it to allow reuse for dust suppression and wash down. Pipework and equipment will be routinely checked and maintained. Effluent from the site ablution facilities will be treated in a modular sewerage treatment plant and re-used for environmental purposes	D	3	**Low (8)**
Operations	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities the biological processes that depend on soil quality	Vehicle and plant washdown	Oil water separator	Oily water over spill and leaks to open ground	land	Localised impact around maintenance area to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Inland water quality of water in surface water features in creeks and intermittent streams		C	2	Low (6)	Spill immediately cleaned, Spill kits will be available close to areas where chemicals are being used or kept. Handling and storage of combustible and flammable liquids in accordance with AS1940:2004.	D	2	**Low (5)**
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial ecosystems	Listed threatened species, migratory species, endemic species.	Infrastructure - all mining areas including office areas, ablutions, maintenance area workshop for mobile and fixed, process plant, washdown area	For post mining land use for site to be returned to a safe, stable, environment with no post mining activity the office areas, ablutions, maintenance area workshop and associated infrastructure to be decommissioned and removed from Winchelsea Island by barge.	Fauna entrapment	land	Impact to the visual amenity of the area caused by wind blown, mishandled, illegally disposed rubbish to land, water and sea	Aquatic surface water and marine ecosystems		D	3	Low (8)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. All infrastructure will be removed from site, disturbed areas rehabilitated and scraped. Contaminated soil will be scraped and placed in the Primary Resource Pit	D	2	**Low (5)**

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Phase	Theme	Environmental Factors/Objective	Environmental values and sensitivities	Main Activity	Sub Activity	Hazards (Source)	Potential Environmental Direct Impact (pathway)	Potential Environmental Impact (Receptors of concern) Impacts are measurable changes to the environment as a direct result of project activities (e.g. m2 losses of habitat, or mg/l increases in a substance concentration).	Indirect impacts/Cumulative Impacts	Rationale	Likelihood	Consequence	Inherent risk	Mitigation and management	Likelihood2	Consequence	Residual risk
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial ecosystems	Introduced species and/ or invasive species	Mining footprint- includes all areas disturbed by infrastructure and domains	Spread with local, endemic seed mix sourced from either Groote or Winchelsea Island to avoid weed and mainland native species contamination not suitable to Winchelsea Island.	Sowing of plant species not suited to the Winchelsea Island environmental conditions and values or become invasive outcompeting native vegetation	Land	Impact to Terrestrial ecosystems biological and functional diversity	Cumulative impacts as a result of no follow-up monitoring or remedial, management programmes for a post mining land scape		D	3	Low (8)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. All infrastructure will be removed from site, disturbed areas rehabilitated and scraped. Where possible local sourced seed or seeds locally found in the area will be used for re seeding.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial ecosystems	Listed threatened species, migratory species, endemic species.	Waste Management	All wastes are to be removed from Winchelsea Island by barge.	Fauna entrapment	Land	Impact to the visual amenity of the area caused by wind blown, mishandled, illegally disposed rubbish to land, water and sea	Aquatic surface water and marine ecosystems		D	3	Low (8)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. All infrastructure will be removed from site, disturbed areas rehabilitated and scraped. All mining waste will be taken off the island by barge to an appropriate disposal facility.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities	Infrastructure-Diesel Power Station (Solar and Diesel),power poles and associated infrastructure	For post mining land use for site to be returned to a safe, stable, environment with no post mining activity the diesel power station power poles and associated infrastructure from the site to be decommissioned and removed from Winchelsea Island by barge.	Soil contamination from hydrocarbons	Land	Localised impact to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Aquatic ecosystems and marine ecosystems		C	2	Low (6)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. All infrastructure will be removed from site, disturbed areas rehabilitated and scraped. Contaminated soil will be scraped and placed in the Primary Resource Pit	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities	Infrastructure-Fuel storage and dispensing area (50,000 litres)	For post mining land use for site to be returned to a safe, stable, environment with no post mining activity the Fuel storage and dispensing area to be decommissioned and removed from Winchelsea Island by barge.	Soil contamination from hydrocarbons	Land	Localised impact to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Aquatic ecosystems and marine ecosystems		C	4	High (3)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. All infrastructure will be removed from site, disturbed areas rehabilitated and scraped. Contaminated soil will be scraped and placed in the Primary Resource Pit	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities	Infrastructure-Sewerage treatment plant and irrigation area (bio sewerage)	For post mining land use for a future economic activity sewerage treatment plant to remain at site	Sewage effluent contaminating soil	Land	Localised impact to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Aquatic ecosystems and marine ecosystems		D	3	Low (8)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. All infrastructure will be removed from site, disturbed areas rehabilitated and scraped. Contaminated soil will be scraped and placed in the Primary Resource Pit	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities	Infrastructure-Sewerage treatment plant and irrigation area (bio sewerage)	For post mining land use for site to be returned to a safe, stable, environment with no post mining activity the sewerage treatment pant and irrigation area to be decommissioned and removed from Winchelsea Island by barge.	Sewage effluent contaminating soil	Land	Localised impact to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Aquatic ecosystems and marine ecosystems		D	3	Low (8)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. All infrastructure will be removed from site, disturbed areas rehabilitated and scraped. Contaminated soil will be scraped and placed in the Primary Resource Pit	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial Environmental quality	Soil characterise including the physical, and aesthetic qualities are supported and maintained	Mining footprint- includes all areas disturbed by infrastructure and domains	Revegetation by direct seeding	Disturbed land and soils with no vegetation cover subject to erosion	land	Soil loss by erosion of surface land impacting the chemical, physical, biological and aesthetic qualities which support vegetation growth and land structure stability	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		D	3	Low (8)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. All infrastructure will be removed from site, disturbed areas rehabilitated and scraped. Where possible local sourced seed or seeds locally found in the area will be used for re seeding.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial Environmental quality	Soil characterise including the physical, and aesthetic qualities are supported and maintained	Mining footprint Includes all areas disturbed by infrastructure including laydown areas	Deep rip, shape final landform to natural drainage pathways	Disturbed land and soils with no vegetation cover is subject to erosion	Land	Soil loss by erosion of surface land impacting the chemical, physical, biological and aesthetic qualities which support vegetation growth and land structure stability	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		D	3	Low (8)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. All infrastructure will be removed from site, disturbed areas rehabilitated and scraped. Appropriate erosion measures will be implemented to prevent soil loss and erosion.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial Environmental quality	Soil characterise including the physical, and aesthetic qualities are supported and maintained	Post Closure Monitoring, remediation and management	surface and ground water monitoring, land management activities (weed/pest and fire), biosecurity management, remediation management.	Environmental monitoring and management not met to Closure Mine Plan commitments	Land and water				D	3	Low (8)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. Ongoing monitoring of key environmental areas that were disturbed by mining activities. This will include and not limited to surface water, ground water, revegetation growth, erosion and sedimentation monitoring.	D	2	Low (5)
Construction	People	Culture and Heritage	scared sites, cultural heritage items and places	Mining footprint	Land clearing	Disturbance to protected scared sites, culture and heritage	People	Impact to sites of cultural significance protected for their cultural importance.	Impact to culturally protected areas	A cultural heritage field survey was conducted from 13 to 24 November 2017 on behalf of the ALC who coordinated permissions to access Winchelsea Island from Traditional Owners and arranged for TOs to accompany the survey (SHIM 2018). Several extensive shell midden sites were identified in the west and south of the island. Sites range in significance from low to high, with a number of sites containing a complex of different cultural values, including significance according to Aboriginal tradition, and a concern of the Anindityakwa owners of the island. The cultural heritage assessment determined that there were 10 sites likely to be directly impacted by any exploration or mining activities, largely by clearing for coastal access. Of these four are rated as having high significance . Trading is thought to have occurred annually for roughly 900 years. Trading of sea cucumber or trepang was highly sought and a valuable trade item in Southern China (Clark and May 2013)" in cultural heritage section (Macassan) instead of my original reference of 1700s.	B	4	High (4)	A cultural heritage management plan is to be established. It will include a 300m buffer zone from the high tide mark around the whole island as an exclusion zone and exclude proposed jetty extension area. Establish a ESCP to prevent coastal erosion and damage to remaining heritage sites. Initiate appropriate dust management. Site inductions and education to include No-Go and buffer areas. Appropriate signage or markers will be maintained at buffer boundaries. TOs will be consulted if removal of heritage sites are required for construction activities. All vehicles and machinery will remain on established roads.	B	4	High (4)
Operations	People	Communities and Economy	Jobs and businesses including tourism, education, Aboriginal rights and interests	Development of Clan Based Enterprises to supporting mining project and provide economic and social development and security to the aboriginal community.	Plant operators, training and safety, nursery, rehabilitation, environmental monitoring, security, bio security, Stevedoring and marine services barging,	Employment opportunities provided only to fly in fly out workers and non indigenous	People	No economic growth due to lack of employment, business (tourism, aquaculture, industry, education) opportunities to the Groote Eylandt aboriginal communities	No income from mine providing benefit to the enhancement (education, lifestyles, mental health and wellbeing) and economy for the aboriginal communities.	The royalties from this Project is expected to provide additional revenue (+/- $130,000,000) to the Aboriginal Benefit Account (ABA) which will benefit all aboriginal communities in the NT" to People positive impacts of the risk assessment if you have this section included	C	4	High (3)	Winchelsea Mining Pty Ltd to develop a Clan Based Enterprise to supporting mining project and provide economic and social development and security to the aboriginal community. This will include plant operators, training and safety, nursery, rehabilitation, environmental monitoring, security, bio security, Stevedoring and marine services barging,	E	2	Low (1)
Operations	People	Communities and Economy	Resources including water supply and food sources, transport networks and mobility, infrastructure and services, Aboriginal rights and interests	Development of Infrastructure and services supporting mining project and provide economic and social development and security to aboriginal communities.	in developed Infrastructure, housing and utilities (electricity, water)	Poor quality and or inadequate infrastructure services development in place during mining and post mining (roads, utilities, transport networks)	People	Mine developed Infrastructure, housing and utilities (electricity, water) do not provide any support for the growth of future generations of Groote Island aboriginal communities.	No adequate infrastructure or utilities created to benefit the enhancement (education, lifestyles, mental health and wellbeing) and economy for the aboriginal communities.	All buildings and infrastructure items will be approved by Winchelsea Mining to ensure compliance with relevant approvals, authorisations and standards. The royalties from this Project is expected to provide additional revenue (+/- $130,000,000) to the Aboriginal Benefit Account (ABA) which will benefit all aboriginal communities in the NT" to People positive impacts of the risk assessment if you have this section included	C	4	High (3)	All infrastructure will have the following principles: fit of repurpose and cost effective equipment and infrastructure, modular design of key items with maximum use of prefabricated, relocatable buildings and low environmental impact and easy site rehabilitation upon conclusion of the project.	D	1	Low (1)
Operations	People	Communities and Economy	Amenity (visual considerations)	Waste generation, handling and storage	Putrescibles, scrap materials, steel and plastic drums, wooden pallets, plastic and steel pipe work, process plant parts	Wind blown rubbish	Land	Impact to the visual amenity of the area caused by wind blown, mishandled, illegally disposed rubbish to land, water and sea	Aquatic surface water and marine ecosystems		B	3	High (1)	Waste will be managed accordingly as per waste management plan. The plan will include in order of waste avoidance, reduction, reuse, recover waste resources and waste disposal.	D	2	Low (5)
Operations	People	Human Health	Air quality	Open Cut mining, process plant	hanging of manganese ore	Injection of manganese ore and dust form operations	people	Localised impacts to the health of all employees from ingestion of dust particulate matter containing manganese ore.			B	3	High (1)	A water truck will be used to supress dust generation. A complaints register will be maintained.	D	2	Low (5)
Operations	People	Human Health	Drinking and recreational water	Sewerage treatment plant and irrigation area (bio sewage)	Irrigating treated water	Bacteria (E.coli, Total Coliforms) in irrigated water affecting human health	People	Localised impacts to the health of all employees from irrigated water containing elevated levels of E.coli and or coliforms.	Localised impacts to the health of all employees from irrigated water containing elevated levels of E.coli and or coliforms entering creeks and streams.		C	3	Moderate (3)	Regular monitoring, inspections and water monitoring will be undertaken. Water quality will meet irrigation guideline values.	D	3	Low (8)

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Rehabilitation/ Closure/ Post Closure	People	Communities and Economy	Amenity (visual considerations)	Infrastructure - all mining areas including office areas, ablutions, maintenance area workshop for mobile and fixed, process plant, washdown area	For post mining land use for site to be returned to a safe, stable, environment with no post mining activity the office areas, ablutions, maintenance area workshop and associated infrastructure to be decommissioned and removed from Winchelsea Island by barge.	Strewn rubbish including putrescibles, scrap materials, steel and plastic drums, wooden pallets, plastic and steel pipe work, process plant parts	people	Impact to the visual amenity of the area caused by wind blown, mishandled, illegally disposed rubbish to land, water and sea	Aquatic surface water and marine ecosystems		C	4	High (3)	All mining waste will be taken off the island via barge and taken for correct disposal to a refuge facility.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	People	Communities and economy	public well being	Open cut Pits	Construction of Abandonment bunds and stabilisation of pit walls	Construction of abandonment bunds around pit perimeter to prevent inadvertent public access into pit and stabilisation of pit walls to prevent slope failure and maintain a safe and stable area.	people	Impact to the well being and safety of visitors to Winchelsea Island post mining	Freshwater systems entering coastal brackish and marine water and ecological communities (Mangrove swamps)		C	4	High (3)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. It will include re-shaping and removing existing infrastructure such as bunding.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	People	Communities and Economy	Jobs including tourism and education, aboriginal rights and interests including right of access	Post Mining providing future the Aboriginal communities	Post Mining to create local employment opportunities for post closure monitoring	Local businesses are not prioritised to undertake monitoring	People	Post mining, the Groote Eylandt communities and economy are not enhanced	No employment opportunity for local workforce		C	4	High (3)	Continual consultation with the key stakeholders though all phases of mining Company to set obligations, targets and policies to sustainable development projects.	D	4	Moderate (6)
Rehabilitation/ Closure/ Post Closure	People	Communities and Economy	Amenity (visual considerations)	Waste Management	All wastes are to be removed from Winchelsea Island by barge.	wind blown rubbish	Land	Impact to the visual amenity of the area caused by wind blown, mishandled, illegally disposed rubbish to land, water and sea	Aquatic surface water and marine ecosystems		C	4	High (3)	Ensure all demonisation audits are completed and signed off to ensure no wastes are left behind.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Water	Aquatic ecosystems	Threatened species, biota and their habitats health and function, culturally sensitive species, aquatic ecosystem integrity.	Dams - Raw water dam and smaller dams	For post mining land use for site to be returned to a safe, stable, environment with no post mining activity the Raw water dam and smaller dams walls to be removed and drainage realigned and area ripped across the contour	Affecting the health of aquatic biota and their habitats	s/water	Impacts to the health of threatened biota in inland waterways and biological and functional diversity of surface water systems.	Indirect impact to coastal processes which support marine ecosystems (mangroves) and marine ecosystems from reduced inflows to coastal communities.		D	3	Low (8)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. All infrastructure will be removed from site, disturbed areas rehabilitated and scraped. Contaminated soil will be scraped and placed in the Primary Resource Pit	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Water	Hydrological Processes	Supply and quantity of water in surface water features (creeks and intermittent streams)	Open cut Pits	Reshaping surface surrounds to manage drainage	Reshaping land surfaces for drainage altering and creating unnatural realignment of creeks and streams reducing or preventing flows downstream	s/water	Impacts to the ecological health of downstream creeks and intermittent streams	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		D	3	Low (8)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. All infrastructure will be removed from site, disturbed areas rehabilitated and scraped. Appropriate erosion measures will be implemented to prevent soil loss and erosion. The Primary Resource Pit would be backfilled with dry tailings produced from the vacuum pressed filter. Top soil would be pushed over the dry tailings and revegetated. The residual void will be designed to overflow.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Water	Inland environmental water quality	Quality of water in surface and ground water features	Open cut Pits	Water retained in open cut pits	Degraded of water quality from exposure to pit walls and deposited tailings	s/water	Impacts to the pit water quality	Overtopping of pits to drainage lines and seepage into groundwater		B	3	High (1)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Water	Aquatic Ecosystems	Supply and quantity of water in surface water features (creeks and intermittent streams)	Mining footprint Includes all areas disturbed by infrastructure including laydown areas	Deep rip, shape final landform to natural drainage pathways	Creeks and streams alignment is not consistent to the surround landforms and catchment area significantly reducing/preventing downstream flows	s/water	Impacts to the downstream aquatic habitats which support the aquatic biota lifecycle and health	Indirect impact to coastal processes which support marine ecosystems (mangroves) and marine ecosystems from reduced inflows to coastal communities.		C	4	High (3)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. It will include re-shaping areas no longer required for aquatic farming. Appropriate erosion measures will be implemented to prevent soil loss and erosion of creek lines.	D	2	Low (5)
Construction	Water	Aquatic ecosystems	The supply of groundwater and its interaction with surface ecosystems	Mining footprint	Groundwater drawdown	Groundwater drawdown affecting environmental values of aquatic ecosystems and supporting habitats	g/water	Reduced water table elevation due to dewatering has the potential to reduce access to groundwater by riparian vegetation.	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands		C	4	High (3)	Regular monitoring and evaluation of groundwater levels will take place during the life of mine and appropriate management strategies will be developed and implemented if required. Maximum depths of the open cut pit will be 25m, though 6m will be the target depth for most of excavations.	C	4	High (3)
Construction	Water	Aquatic ecosystems	The supply of groundwater and its interaction with surface ecosystems	Mining footprint	Groundwater drawdown	Groundwater drawdown affecting environmental values of aquatic ecosystems and supporting habitats	g/water	Drawdown of groundwater impacting local GDEs, habitat persistence and alluvial vegetation communities.	Impacting coastal ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge		C	4	High (3)	Regular monitoring and evaluation of groundwater levels will take place during the life of mine and appropriate management strategies will be developed and implemented if required. Maximum depths of the open cut pit will be 25m, though 6m will be the target depth for most of excavations.	C	4	High (3)
Construction	Water	Aquatic ecosystems	Integrity of aquatic ecosystems and the ecological services they provide	Mining footprint	Land clearing	Disturbance to protected areas containing sensitive habitats and function	water	Impact to areas which protect sensitive habitats and function	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.	Terrestrial ecological studies were completed for exploration activities, not mining. Important habitat types such as monsoon forest and wetlands represent a minor component of the study (EMS, 2019).	B	3	High (1)	A 300m tree buffer from the coastline to inland has been established to protect coastal terrestrial and aquatic communities. Site inductions to include No-Go and buffer areas. Appropriate signage or markers will be maintained at buffer boundaries.	C	2	Low (6)
Construction	Water	Aquatic ecosystems	Aquatic habitats including the biodiversity, ecological integrity and ecological functioning	Mining footprint	Land clearing	Soil loss from land clearing causing sedimentation to surface creeks and streams	water	Impacting aquatic ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		B	3	High (1)	An ESCP will be developed to prevent soil loss as a result of land clearing. Mine site design and correct ESC will minimise soil loss. Rehabilitation will be undertaken to areas that are no longer required following construction and operations. ESC will include and not limited to diversion drains, sediment ponds, bunding. Scheduled water monitoring will be undertaken.	C	2	Low (6)
Construction	Water	Aquatic ecosystems	The supply and quantity of water in surface water features including rivers, lakes, wetlands, swamps, creeks, billabongs, intermittent streams, mangroves and drainage lines	Mining footprint	Land clearing	Land clearing disrupting the natural alignment of creeks and streams impacting the environmental values to downstream aquatic ecosystems	s/water	Reduction of inflows to creek lines and consequent reduction in long-term habitat persistence.		Most creeks and streams are ephemeral, ceasing flow during drier conditions (EMS, 2019).	B	3	High (1)	All clean surface runoff will be diverted away from site and into existing ephemeral drainage channels. All watercourse crossing onsite will have engineered culverts and scour protection to minimise disruption to downstream aquatic ecosystems. Scheduled regular monitoring will be undertaken.	C	3	Moderate (4)
Construction	Water	Aquatic ecosystems	The supply, quantity and quality of water in surface water features including rivers, lakes, wetlands, swamps, creeks, billabongs, intermittent streams, mangroves and drainage lines.	Mining footprint	Land clearing	Land clearing disrupting the natural alignment of creeks and streams impacting the environmental values to down stream aquatic ecosystems	s/water	Mortality of aquatic fauna due to changed water regimes and water quality		Most creeks and streams are ephemeral, ceasing flow during drier conditions (EMS, 2019).	B	3	High (1)	All clean surface runoff will be diverted away from site and into existing ephemeral drainage channels. All watercourse crossing onsite will have engineered culverts and scour protection to minimise disruption to downstream aquatic ecosystems. Scheduled regular monitoring will be undertaken.	C	3	Moderate (4)

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Construction	Water	Aquatic ecosystems	Aquatic habitats including the biodiversity, ecological integrity and ecological functioning	Mining footprint	Surface water runoff and flooding events from cleared operational areas	Sedimentation affecting the health of biota and their habitats	s/water	Impacting aquatic ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge	Impacting coastal ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge		B	3	High (1)	An ESCP will be developed to prevent soil loss as a result of land clearing. Mine site design and correct ESC will minimise soil loss. Rehabilitation will be undertaken to areas that are no longer required following construction and operations. ESC will include and not limited to diversion drains, sediment ponds, bunding. Scheduled water monitoring, sediment and biological sampling will be undertaken.	C	2	Low (6)
Construction	Water	Hydrological Processes	Supply and quantity of water in surface water features (creeks and intermittent streams)	Mining footprint	Land clearing	Land clearing disrupting the natural alignment of creeks and streams reducing or presenting flows downstream	water	Impacts to the ecological health of downstream creeks and intermittent streams	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.	Most creeks and streams are ephemeral, ceasing flow during drier conditions (EMS, 2019).	B	3	High (1)	All clean surface runoff will be diverted away from site and into existing ephemeral drainage channels. All watercourse crossing onsite will have engineered culverts and scour protection to minimise disruption to downstream aquatic ecosystems. Scheduled regular monitoring will be undertaken.	C	3	Moderate (4)
Construction	Water	Hydrological Processes	The supply and quantity of water in surface water features including rivers, lakes, wetlands, swamps, creeks, billabongs, intermittent streams, mangroves and drainage lines	Mining footprint	Placement of critical infrastructure (process plant, tailings dam, buildings, haul roads and access roads)	Placement of infrastructure domains(tailings dam, open pits) causing obstruction to natural surface flow paths, streamflow's and semi permanent/permanent pools preventing/diverting seasonal flows to downstream aquatic ecosystems	s/water	Impacts to surface water systems flow paths and flood zones preventing downstream surface flows to aquatic ecological communities	Freshwater systems entering coastal brackish and marine water and ecological communities (Mangrove swamps)	Most creeks and streams are ephemeral, ceasing flow during drier conditions (EMS, 2019). Permanent and ephemeral wetlands are located on WI, to the north western boundary of the proposed mineral lease. Critical infrastructure are located in known flood pathways.	B	3	High (1)	All clean surface runoff will be diverted away from site and into existing ephemeral drainage channels. All watercourse crossing onsite will have engineered culverts and scour protection to minimise disruption to downstream aquatic ecosystems. Scheduled regular monitoring will be undertaken.	C	3	Moderate (4)
Construction	Water	Hydrological Processes	The quality of water in surface water features including rivers, lakes, swamps, creeks, intermittent streams	Mining footprint	Surface water runoff and flooding events from cleared operational areas	Soil loss from cleared areas causing sedimentation to surface creeks and streams	s/water	Degradation of instream habitat and water including downstream aquatic habitat from increased sedimentation through uncontrolled releases and sediment runoff.	Impacting coastal ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge		B	3	High (1)	An ESCP will be developed to prevent soil loss as a result of land clearing. Mine site design and correct ESC will minimise soil loss. Rehabilitation will be undertaken to areas that are no longer required following construction and operations. ESC will include and not limited to diversion drains, sediment ponds, bunding. Scheduled water monitoring will be undertaken.	C	2	Low (6)
Construction	Water	Hydrological Processes	Supply and quantity of water in surface water features (creeks and intermittent streams)	Mining footprint	Surface water runoff and flooding events from cleared operational areas	Sedimentation to surface creeks and streams from uncontrolled releases of surface water	s/water	Increased sedimentation through uncontrolled releases and sediment runoff changing flood extents as there is less storage available for rainfall events.	Reduced water quality from cleared areas		B	3	High (1)	An ESCP will be developed to prevent soil loss as a result of land clearing and operations. Mine site design and correct ESC will minimise soil loss. Rehabilitation will be undertaken to areas that are no longer required following construction and operations. ESC will include and not limited to diversion drains, sediment ponds, bunding. Scheduled water monitoring, sediment and biological sampling will be undertaken.	C	2	Low (6)
Construction	Water	Inland water environmental quality	Supply and quality of water in surface water features (creeks and intermittent streams)	Mining footprint	Creation of new roads and access tracks	Land clearing disrupting the natural alignment of creeks and streams impacting the environmental values to down stream aquatic ecosystems	s/water	Impacts to the ecological health of downstream creeks and intermittent streams	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		B	3	High (1)	All clean surface runoff will be diverted away from site and into existing ephemeral drainage channels. All watercourse crossing onsite will have engineered culverts and scour protection to minimise disruption to downstream aquatic ecosystems.	C	3	Moderate (4)
Construction	Water	Inland water environmental quality	The quality of water in surface water features including rivers, lakes, swamps, creeks, intermittent streams	Mining footprint	Equipment operation, chemical/hydrocarbon use, spills, seepage	Release of pollutants affecting the environmental values of downstream aquatic ecosystems	water	Accidental release of pollutants causes degradation of instream habitat and water including downstream aquatic habitat.	Impacting coastal ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge		D	4	Moderate (6)	Establish measures to minimise spills onsite. Fuel and chemical storage, transport and use will be designed in accordance with industry standards. Spill response kits will be maintained on site for prevention and control.	D	2	Low (5)
Construction	Water	Inland water environmental quality	The quality of water in surface water features including rivers, lakes, swamps, creeks, intermittent streams	Mining footprint	Equipment operation, chemical/hydrocarbon use, spills, seepage	Release of pollutants affecting the environmental values of downstream aquatic ecosystems	water	Decreases in water quality (i.e. lower DO levels and higher turbidity) from accidental release of pollutants.	Impacting coastal ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge		D	4	Moderate (6)	Establish measures to minimise spills onsite. Fuel and chemical storage, transport and use will be designed in accordance with industry standards. Spill response kits will be maintained on site for immediate control. Develop a SOP for actions, response and reporting. Monitor water quality (If flowing) immediately following event	D	2	Low (5)
Construction	Water	Inland water environmental quality	The quality of groundwater	Mining footprint	Equipment operation, chemical/hydrocarbon use, spills, seepage	Release of pollutants affecting the environmental values of groundwater and associated ecosystems	g/water	Accidental release of contaminants to shallow groundwater may impact groundwater quality.	Impacting coastal ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge		D	4	Moderate (6)	Establish measures to minimise spills onsite. Fuel and chemical storage, transport and use will be designed in accordance with industry standards. Spill response kits will be maintained on site for immediate control. Develop a SOP for actions, response and reporting. Monitor ground water quality following the event for signs of contamination.	D	2	Low (5)
Construction	Water	Inland water environmental quality	The quality of water in surface water features including rivers, lakes, swamps, creeks, intermittent streams	Mining footprint	Land clearing	Soil loss from land clearing causing sedimentation to surface creeks and streams through overland flows and flooding events	water	Impacts to the quality of water in surface water features including creeks and streams	Reduced water quality from cleared areas		B	3	High (1)	An ESCP will be developed to prevent soil loss as a result of land clearing. Mine site design and correct ESC will minimise soil loss. Rehabilitation will be undertaken to areas that are no longer required following construction and operations. ESC will include and not limited to diversion drains, sediment ponds, bunding. Scheduled water monitoring, sediment and biological sampling will be undertaken.	C	2	Low (6)
Operations	Water	Aquatic ecosystems	The supply and quantity of water in surface water features including rivers, lakes, wetlands, swamps, creeks, billabongs, intermittent streams, mangroves and drainage lines	Mining footprint	Land clearing	Land clearing disrupting the natural alignment of creeks and streams impacting the environmental values to downstream aquatic ecosystems	s/water	Reduction of inflows to creek lines and consequent reduction in long-term habitat persistence.	Impacting coastal ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge	Most creeks and streams are ephemeral, ceasing flow during drier conditions (EMS, 2019). Permanent and ephemeral wetlands are located on WI, to the north western boundary of the proposed mineral lease and away from proposed activities.	B	3	High (1)	All clean surface runoff will be diverted away from site and into existing ephemeral drainage channels. All watercourse crossing onsite will have engineered culverts and scour protection to minimise disruption to downstream aquatic ecosystems. Scheduled regular monitoring will be undertaken.	C	3	Moderate (4)
Operations	Water	Aquatic ecosystems	The supply, quantity and quality of water in surface water features including rivers, lakes, wetlands, swamps, creeks, billabongs, intermittent streams, mangroves and drainage lines.	Mining footprint	Land clearing	Land clearing disrupting the natural alignment of creeks and streams impacting the environmental values to down stream aquatic ecosystems	s/water	Mortality of aquatic fauna due to changed water regimes and water quality		Most creeks and streams are ephemeral, ceasing flow during drier conditions (EMS, 2019).	B	3	High (1)	All clean surface runoff will be diverted away from site and into existing ephemeral drainage channels. All watercourse crossing onsite will have engineered culverts and scour protection to minimise disruption to downstream aquatic ecosystems. Scheduled regular monitoring will be undertaken.	C	3	Moderate (4)
Operations	Water	Aquatic ecosystems	Aquatic habitats including the biodiversity, ecological integrity and ecological functioning	Mining footprint	Surface water runoff and flooding events from cleared operational areas	Affecting the health of biota and their habitats	s/water	Impacting aquatic ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge			B	4	High (4)	A small wastewater treatment facility will be established to capture run off from the MIA and treat for reuse in dust suppression and wash down activities. Water storage will be a combination of tanks and purpose-built dams. An ESCP will be developed to prevent soil loss as a result of land clearing and operations. Mine site design and correct ESC will minimise soil loss. Rehabilitation will be undertaken to areas that are no longer required following construction and operations. ESC will include and not limited to diversion drains, sediment ponds, bunding. Scheduled water monitoring, sediment and biological sampling will be undertaken.	C	2	Low (6)

Mining

Phase	Theme	Environmental Factors/Objective	Environmental values and sensitivities	Main Activity	Sub Activity	Hazards (Source)	Potential Environmental Direct Impact (pathway)	Potential Environmental Impact (Receptors of concern) Impacts are measurable changes to the environment as a direct result of project activities (e.g. m2 losses of habitat, or mg/l increases in a substance concentration).	Indirect impacts/Cumulative Impacts	Rationale	Likelihood	Consequence	Inherent risk	Mitigation and management	Likelihood2	Consequence	Residual risk
Operations	Water	Aquatic ecosystems	Threatened species, biota and their habitats health and function, culturally sensitive species, aquatic ecosystem integrity.	Open Cut mining	Pit dewatering	Threatened species and groundwater dependent ecosystems affected by groundwater drawdown	water	Impacts to the health of threatened biota in inland waterways and biological and functional diversity of surface water systems.	Indirect impact to coastal processes which support marine ecosystems (mangroves) and marine ecosystems from reduced inflows to coastal communities.	Maximum depths of the open cut pit will be 25m, though 6m will be the target depth for most of excavations.	C	4	High (3)	Discussions have commenced for transporting water from Groote Island to Winchelsea Island which will ultimately avoid the requirement for bore abstraction. Regular monitoring and evaluation of groundwater levels will take place during the life of mine and appropriate management strategies will be developed and implemented if required.	C	4	**High (3)**
Operations	Water	Aquatic Ecosystems	Threatened species, biota and their habitats health and function, culturally sensitive species, aquatic ecosystem integrity.	Raw water dam and smaller dams	Diversion and capture of surface water for supply to process plant and mine	Diversion of creeks and streams to freshwater dam significantly reducing or presenting flows downstream	s/water	Impacts to the downstream aquatic habitats which support the aquatic biota lifecycle and health	Indirect impact to coastal processes which support marine ecosystems (mangroves) and marine ecosystems from reduced inflows to coastal communities.	Most creeks and streams are ephemeral, ceasing flow during drier conditions (EMS, 2019). Permanent and ephemeral wetlands are located on WI, to the north western boundary of the proposed mineral lease	B	3	High (1)	All clean surface runoff will be diverted away from site and into existing ephemeral drainage channels. All watercourse crossing onsite will have engineered culverts and scour protection to minimise disruption to downstream aquatic ecosystems. Scheduled regular monitoring will be undertaken.	C	3	Moderate (4)
Operations	Water	Hydrological Processes	The quality of water in surface water features including rivers, lakes, swamps, creeks, intermittent streams	Mining footprint	Surface water runoff and flooding events from cleared operational areas	Soil loss from land clearing causing sedimentation to surface creeks and streams through overland flows and flooding events	s/water	Degradation of instream habitat and water including downstream aquatic habitat from increased sedimentation through uncontrolled releases and sediment runoff.	Impacting coastal ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge		B	3	High (1)	An ESCP will be developed to prevent soil loss as a result of land clearing and operations. Mine site design and correct ESC will minimise soil loss. Rehabilitation will be undertaken to areas that are no longer required following construction and operations. ESC will include and not limited to diversion drains, sediment ponds, bunding. Scheduled water monitoring, sediment and biological sampling will be undertaken.	C	2	**Low (6)**
Operations	Water	Hydrological Processes	Supply and quantity of water in surface water features (creeks and intermittent streams)	Mining footprint	Surface water runoff and flooding events from cleared operational areas	Sedimentation to surface creeks and streams from uncontrolled releases of surface water	s/water	Increased sedimentation through uncontrolled releases and sediment runoff changing flood extents as there is less storage available for rainfall events.	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands		B	3	High (1)	An ESCP will be developed to prevent soil loss as a result of land clearing and operations. Mine site design and correct ESC will minimise soil loss. Rehabilitation will be undertaken to areas that are no longer required following construction and operations. ESC will include and not limited to diversion drains, sediment ponds, bunding. Scheduled water monitoring, sediment and biological sampling will be undertaken.	C	2	**Low (6)**
Operations	Water	Hydrological Processes	The supply and quantity of water in surface water features.	Mining footprint	Surface water runoff and flooding events from cleared operational areas	Sedimentation to surface creeks and streams	s/water	Impacts to the quantity of surface water into creeks and streams			B	3	High (1)	An ESCP will be developed to prevent soil loss as a result of land clearing and operations. Mine site design and correct ESC will minimise soil loss. Rehabilitation will be undertaken to areas that are no longer required following construction and operations. ESC will include and not limited to diversion drains, sediment ponds, bunding. Scheduled water monitoring, sediment and biological sampling will be undertaken.	C	2	Low (6)
Operations	Water	Hydrological Processes	Supply and quantity of water in surface water features	Open Cut mining	Groundwater abstraction from bores for mine operations	Potential for the supply and quantity of surface water features connected to groundwater aquifers have altered flows affecting surface water creeks, intermittent streams, and wetlands	g/water	Impact to the supply and quantity of surface water connected to groundwater aquifers including creeks, intermittent streams, and wetlands	Altered surface water flows to creeks, streams and wetlands	The anticipated water usage for the site on Winchelsea Island, including for the process plant, dust suppression and ablutions supply are under development.	C	4	High (3)	Mobilisation of water from Groote Island to Winchelsea Island to ultimately avoid the requirement for bore abstraction.	C	4	High (3)
Operations	Water	Hydrological Processes	Supply of quantity of water I surface water features	Open Cut mining	Pit dewatering	Pit dewatering causing groundwater drawdown and affecting the supply and quantity of surface water to surface water features including creeks, intermittent streams, and wetlands	water	Impact to the supply and quantity of surface water connected to groundwater aquifers including creeks, intermittent streams, and wetlands	Altered groundwater inflows to creeks and streams	Maximum depths of the open cut pit will be 25m, though 6m will be the target depth for most of excavations.	C	4	High (3)	Regular monitoring and evaluation of groundwater levels will take place during the life of mine and appropriate management strategies will be developed and implemented if required.	C	4	Moderate (4)
Operations	Water	Hydrological Processes	Culturally important water features or other features affected by water level	Open Cut mining	Pit dewatering	Potential for the supply and quantity of surface water features connected to groundwater aquifers have altered flows affecting surface water creeks, intermittent streams, and wetlands	water	Impact to culturally important water features or other features affected by water level	Altered groundwater inflows to creeks and streams		C	4	High (3)	Regular monitoring and evaluation of groundwater levels will take place during the life of mine and appropriate management strategies will be developed and implemented if required.	C	4	**High (3)**
Operations	Water	Hydrological Processes	Supply and quantity of water in surface water features	Process Plant	Groundwater abstraction from bores for process plant operations	Potential for the supply and quantity of surface water features connected to groundwater aquifers have altered flows affecting surface water creeks, intermittent streams, and wetlands	g/water	Impact to the supply and quantity of surface water connected to groundwater aquifers including creeks, intermittent streams, and wetlands	Altered surface water flows to creeks, streams and wetlands	The anticipated water usage for the site on Winchelsea Island, including for the process plant, dust suppression and ablutions supply are under development.	B	4	High (4)	Mobilisation of water from Groote Island to Winchelsea Island to avoid the requirement for bore abstraction.	B	4	**High (4)**
Operations	Water	Hydrological Processes	Supply and quantity of water in surface water features (creeks and intermittent streams)	Raw water dam and smaller dams	Diversion and capture of surface water for supply to process plant and mine	Diversion of creeks and streams to freshwater dam significantly reducing or presenting flows downstream	s/water	Impacts to the ecological health of downstream creeks and intermittent streams	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		B	3	High (1)	All clean surface runoff will be diverted away from site and into existing ephemeral drainage channels. All watercourse crossing onsite will have engineered culverts and scour protection to minimise disruption to downstream aquatic ecosystems. Scheduled regular monitoring will be undertaken.	C	3	Moderate (4)
Operations	Water	Inland water environmental quality	Supply and quality of water in surface water features (creeks and intermittent streams)	Ablutions	storage of sewerage	enter surface water creeks and streams	Streams, land	surface water aquatic ecosystems	ground water aquatic ecosystems		D	3	Low (8)	Spill response procedure developed, containment facilities , clean up and correct disposal of contaminated soil	D	2	**Low (5)**
Operations	Water	Inland water environmental quality	The quality of water in surface water features including rivers, lakes, swamps, creeks, intermittent streams	Mining footprint	Equipment operation, chemical/hydrocarbon use, spills, seepage	Release of pollutants affecting the environmental values of downstream aquatic ecosystems	water	Accidental release of pollutants causes degradation of instream habitat and water including downstream aquatic habitat.	Impacting coastal ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge		C	2	Low (6)	Spill immediately cleaned, Spill kits will be available close to areas where chemicals are being used or kept. Handling and storage of combustible and flammable liquids in accordance with AS1940:2004. Surface water monitoring will be taken immediately following spill.	D	2	**Low (5)**
Operations	Water	Inland water environmental quality	The quality of groundwater	Mining footprint	Equipment operation, chemical/hydrocarbon use, spills, seepage	Release of pollutants affecting the environmental values of groundwater and associated ecosystems	g/water	Accidental release of contaminants to shallow groundwater may impact groundwater quality.	Impacting coastal ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge		C	2	Low (6)	Spill immediately cleaned, Spill kits will be available close to areas where chemicals are being used or kept. Handling and storage of combustible and flammable liquids in accordance with AS1940:2004. Ground water monitoring will determine potential contamination.	D	2	**Low (5)**
Operations	Water	Inland water environmental quality	The quality of water in surface water features including rivers, lakes, swamps, creeks, intermittent streams	Mining footprint	Surface water runoff and flooding events from cleared operational areas	Sedimentation to surface creeks and streams	s/water	Impacts to the quality of water in surface water features including creeks and streams			B	3	High (1)	An ESCP will be developed to prevent soil loss as a result of land clearing and operations. Mine site design and correct ESC will minimise soil loss. Rehabilitation will be undertaken to areas that are no longer required following construction and operations. ESC will include and not limited to diversion drains, sediment ponds, bunding. Scheduled water monitoring, sediment and biological sampling will be undertaken.	C	2	**Low (6)**
Operations	Water	inland water environmental quality	Supply and quality of water in surface water features (creeks and intermittent streams)	Open Cut mining	Pit dewatering	Pit flooding and over topping to surface water features during extreme rainfall and flooding events	water	Impacts to the health of threatened biota in inland waterways and biological and functional diversity of surface water systems.			B	4	High (4)	A water management plan will be developed to determine overall pit capacity, operating levels and maximum operating levels. Pumping infrastructure will be used to maintain water inventory on site at a capacity to manage high rainfall events and potential flooding	C	3	Moderate (4)

Mining

Phase	Theme	Environmental Factors/Objective	Environmental values and sensitivities	Main Activity	Sub Activity	Hazards (Source)	Potential Environmental Direct Impact (pathway)	Potential Environmental Impact (Receptors of concern) Impacts are measurable changes to the environment as a direct result of project activities (e.g. m2 losses of habitat, or mg/l increases in a substance concentration).	Indirect impacts/Cumulative Impacts	Rationale	Likelihood	Consequence	Inherent risk	Mitigation and management	Likelihood2	Consequence	Residual risk
Operations	Water	Inland water environmental quality	The quality of water in groundwater features including aquifers and water tables	Open Cut mining	Placement of dry tailings into the base of open pits during operations	Tailings encounter with ground water	g/water	Impact of tailings seepage to groundwater (aquifers and water tables)	Indirect and cumulative impacts from uncontrolled seepage to groundwater during operations.		C	4	High (3)	Regular monitoring and evaluation of groundwater levels will take place during the life of mine and appropriate management strategies will be developed and implemented if required.	C	4	**High (3)**
Operations	Water	Inland water environmental quality	Supply and quality of water in surface water features (creeks and intermittent streams)	Process Water Dam	Storage of waste water from compressed tailings to be reused in the process plant, dust suppression	Waste water overtopping during extreme rainfall/flood events	s/water	Impacts to the ecological health of downstream creeks and intermittent streams	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		C	4	High (3)	A water management plan will be developed to determine overall capacity, operating levels and maximum operating levels. Treatment infrastructure will be used to maintain water inventory on site at a capacity to manage high rainfall events. Regular surface water monitoring will be undertaken. An incident register will be maintained.	C	4	**High (3)**
Operations	Water	Inland water environmental quality	Supply and quality of water in surface water features (creeks and intermittent streams)	Process Water Dam	Storage of waste water from compressed tailings to be reused in the process plant, dust suppression	Process water Dam failure due to wall slope instability (structure), seepage failure, seismic failure resulting in release of wastewater	s/water	Impacts to the ecological health of downstream creeks and intermittent streams	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		C	4	High (3)	A suitably qualified engineering consultant to design, supervise construction and sign off on dam construction. During operations, operating levels will be maintained to include 1/1000 and 1/500 rainfall events. Regular dam wall inspections sutural integrity and sign off by site manager during operations.	D	4	Moderate (6)
Operations	Water	Inland water environmental quality	Supply and quality of water in surface water features (creeks and intermittent streams)	ROM pad	Surface water runoff from ROM pad during wet season	Mineralised (Manganese ore) sedimentation to surface creeks and streams	s/water	Impacts to the quality of water in surface water features including creeks and streams	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		B	4	High (4)	A small wastewater treatment facility will be established to capture run off from the MIA and treat for reuse in dust suppression and wash down activities. Water storage will be a combination of tanks and purpose-built dams. All onsite runoff will be captured and diverted to these facilities for treatment. Scheduled water monitoring, sediment and biological sampling will be undertaken.	C	2	**Low (6)**
Rehabilitation/ Closure/ Post Closure	Water	Hydrological Processes	Supply and quantity of water in surface water features (creeks and intermittent streams)	Dams - Raw water dam and smaller dams	For post mining land use for site to be returned to a safe, stable, environment with no post mining activity the Raw water dam and smaller dams walls to be removed and drainage realigned and area ripped across the contour	Creeks and streams alignment are not consistent to the surround landforms and catchment area significantly reducing/preventing downstream flows.	s/water	Impacts to the ecological health of downstream creeks and intermittent streams	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		C	4	High (3)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. It will include re-shaping and removing infrastructure not required for agricultural purposes.	D	2	**Low (5)**
Rehabilitation/ Closure/ Post Closure	Water	Hydrological processes	Supply and quantity of water in surface water features (creeks and intermittent streams)	Mining footprint Includes all areas disturbed by infrastructure including laydown areas	Deep rip, shape final landform to natural drainage pathways	Creeks and streams alignment is not consistent to the surround landforms and catchment area significantly reducing/preventing downstream flows	s/water	Impacts to the ecological health of downstream creeks and intermittent streams	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		C	4	High (3)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. It will include re-shaping areas no longer required for aquatic farming. Appropriate erosion measures will be implemented to prevent soil loss and erosion of creek lines.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Water	Hydrological processes	Supply and quantity of water in surface water features (creeks and intermittent streams)	Mining footprint Includes all areas disturbed by infrastructure including laydown areas	Deep rip, shape final landform to natural drainage pathways	Creeks and streams alignment is not consistent to the surround landforms and catchment area significantly reducing/preventing downstream flows	s/water	Reduction of inflows to creek lines and consequent reduction in long-term habitat persistence.	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		C	4	High (3)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. It will include re-shaping areas no longer required for aquatic farming. Appropriate erosion measures will be implemented to prevent soil loss and erosion of creek lines.	D	2	**Low (5)**
Rehabilitation/ Closure/ Post Closure	Water	Inland water environmental quality	The quality of water in surface water features including rivers, lakes, swamps, creeks, intermittent streams	Mining footprint	Equipment operation, chemical/hydrocarbon use, spills, seepage	Release of pollutants affecting the environmental values of downstream aquatic ecosystems	water	Accidental release of pollutants causes degradation of instream habitat and water including downstream aquatic habitat.	Impacting coastal ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge		C	4	High (3)	Spill immediately cleaned, Spill kits will be available close to areas where chemicals are being used or kept. Handling and storage of combustible and flammable liquids in accordance with AS1940:2004. All chemical waste will be correctly bunded for transport and taken off the island via barge. Planning prior to mine closure will see minimal chemical being stored on site.	D	2	**Low (5)**
Rehabilitation/ Closure/ Post Closure	Water	Inland water environmental quality	The quality of groundwater	Mining footprint	Equipment operation, chemical/hydrocarbon use, spills, seepage	Release of pollutants affecting the environmental values of groundwater and associated ecosystems	g/water	Accidental release of contaminants to shallow groundwater may impact groundwater quality.	Impacting coastal ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge		C	3	Moderate (4)	Spill immediately cleaned, Spill kits will be available close to areas where chemicals are being used or kept. Handling and storage of combustible and flammable liquids in accordance with AS1940:2004. All chemical waste will be correctly bunded for transport and taken off the island via barge. Planning prior to mine closure will see minimal chemical being stored on site.	D	2	**Low (5)**
Rehabilitation/ Closure/ Post Closure	Water	Inland water environmental quality	Supply and quality of water in surface water features (creeks and intermittent streams)	Roads, access roads	Subject to consultation with the Traditional owners some roads to remain open for access for the post mine land use activity. the remainder will be Deep rip, shape final landform to natural drainage pathways	Access roads and tracks that are not to be left for access for post closure monitoring continue are not maintained causing erosion along creeks and stream lines impacting the environmental values to down stream aquatic ecosystems	s/water	Impacts to the ecological health of downstream creeks and intermittent streams	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		C	2	Low (6)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. It will include re-shaping roads no longer required for aquatic farming. Appropriate erosion measures will be implemented to prevent soil loss and erosion of creek lines. Consultation will be undertaken with the ALC to determine if roads are required for monitoring or other purposes.	D	2	**Low (5)**
Rehabilitation/ Closure/ Post Closure	Water	Inland environmental water quality	Quality of water in surface and ground water features	Open cut Pit	Placement of dry tailings into the base of Primary Resource Pit	Tailings mobilise into pit water depleting water quality and pit overtopping into surface water environment	water	Impacts to the ecological health of downstream creeks and intermittent streams	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		C	3	Moderate (4)	All rehabilitation will be undertaken in accordance with approved Mine Closure Plan.	D	2	**Low (5)**

Little Paradise Area

Phase	Theme	Environmental Factors/Objective	Environmental values and sensitivities	Main Activity	Sub Activity	Hazards (Source)	Potential Environmental Direct Impact (pathway)	Potential Environmental Impact (Receptors of concern) Impacts are measurable changes to the environment as a direct result of project activities (e.g. m2 losses of habitat, or mg/l increases in a substance concentration).	Indirect impacts/Cumulative Impacts	Rationale	Likelihood	Consequence	Inherent risk	Mitigation and management	Likelihood2	Consequence	Residual risk
Operations	Air	Air Quality	Protect air quality and minimise emissions and their impact so that the chemical, physical and biological characteristics of air are maintained	Little Paradise Area	traffic	Dust generation from vehicular movements around site affecting sensitive NT and MNES flora species and their habitat	air	Impacts of dust affecting air quality of terrestrial ecosystems health and function		Winchelsea Mining has purchased three on-road vehicles for the use of the Early Works Crew	B	2	Moderate (2)	A water truck will be used to supress dust generation during construction. Speed limits will reduce dust generation. All cleared areas will be maintained with lawn. Roads will be regularly maintained.	C	2	Low (6)
Operations	Air	Atmospheric processes	Contribution to the NT greenhouse gas emissions	Little Paradise Area	Diesel consumption from vehicles and equipment	Diesel combustions from vehicles and equipment and emissions to air	Air	Impact to atmospheric contaminates levels adding to the greenhouse gas emissions	Indirect impacts to Human health, terrestrial, marine and aquatic ecosystems	Winchelsea Mining has purchased three on-road vehicles for the use of the Early Works Crew.	B	2	Moderate (2)	Diesel consumption will be recorded and reported when required. All vehicles, machinery and equipment will be regularly maintained as per manufacturers manual. Equipment will only operate at specified capacity.	C	2	Low (6)
Construction	Land	Terrestrial ecosystems	Species of social, cultural, livelihood and/or economic significance	Little Paradise Footprint	Land clearing	Disturbance to species of social, cultural features of cultural significance	land	Impact to sites of cultural significance protected for their cultural importance		There are known extensive indigenous and macassan heritage sites on Groote Eylandt and neighbouring islands.	B	4	High (4)	A cultural heritage management plan is to be established. It will include a 300m buffer zone from the high tide mark around the whole island as an exclusion zone and exclude proposed jetty extension area. Establish a ESCP to prevent coastal erosion and damage to remaining heritage sites. Initiate appropriate dust management. Site inductions and education to include No-Go and buffer areas including areas off tenement. Appropriate signage or markers will be maintained at buffer boundaries. TOs will be consulted if removal of heritage sites are required for construction activities. All vehicles and machinery will remain on established roads.	B	4	High (4)
Construction	Land	Terrestrial ecosystems	Listed threatened species and their habitats (NT and Commonwealth)	Little Paradise Footprint	Land clearing	Disturbance to sensitive NT and MNES flora species and their habitat	land	Impact to protect sensitive NT and MNES terrestrial flora species and their habitat	Impact to protect sensitive NT and MNES aquatic flora species and their habitat	No studies have been completed on NT or MNES flora species and their habitats for Little Paradise area.	B	3	High (1)	Avoid any large habitat trees with hollows suitable for masked owls with a minimum 10m buffer. Avoid standing dead trees or large old growth trees with hollows that may support wildlife density sites, particularly for the northern quoll and masked owl. Avoid clearing in dense vegetation along drainage lines and monsoon forests (established buffer zones). Establish and enforce No-Go areas adjacent to the approved clearing areas, to minimise the area of disturbance and minimise areas required to be rehabilitated.	B	3	High (1)
Construction	Land	Terrestrial ecosystems	Migratory species and their habitat	Little Paradise Footprint	Land clearing	Disturbance to migratory species and their habitat	land	Impact to migratory species and their habitat		No studies have been completed on migratory species at Little Paradise. It is understood a ferry will be used to transport workers to and from the mine and a barge to be used to transport equipment.	B	3	High (4)	A 200m buffer will be maintained from mangrove communities preventing coastal disruption as per NT Governments 'Vegetation management in the Northern Territory' guideline. A fence line surrounding the accommodation village and office area will prevent unauthorised access beyond the accommodation boundary. All vehicles will remain on established tracks. Staff inductions will discuss No-Go areas including buffer areas. Preferable clearing should be undertaken when migratory species are not present. Incident register will be maintained.	B	4	High (4)
Construction	Land	Terrestrial ecosystems	Locally endemic species or species with restricted habitat	Little Paradise Footprint	Land clearing	Disturbance to locally endemic species or species with restricted habitat	land	Impact to locally endemic species or species with restricted habitat		No studies have been completed on endemic species and their habitats for Little Paradise area. Sida sp. Groote Eylandt listed as NE is restricted to the Groote archipelago, it may be expected for it to occur at Little Paradise Area.	B	3	High (1)	Clearing vegetation will be minimised as much as practical through design, layout and controls. Top soil will be used are required and not stockpiled. Disturbance will be minimised to the fence line boundary and all vehicle movement will remain on established roads.	B	3	High (1)
Construction	Land	Terrestrial ecosystems	Species of social, cultural, livelihood and/or economic significance	Little Paradise Footprint	Land clearing	Disturbance to species that are data deficient and their status is unknown	land	Impact to species that are data deficient and their status is unknown		No studies have been completed on understanding species that data deficient and their status is unknown for Little Paradise area.	B	3	High (4)	Under the TPWC Act there may potentially be DD or NE species occurring in the LPA. Clearing vegetation will be minimised as much as practical through design, layout and controls.	B	3	High (4)
Construction	Land	Terrestrial ecosystems	Protected area of reserve, including Indigenous Protected Area	Little Paradise Footprint	Land clearing	Disturbance to protected area of reserve, including Indigenous Protected Areas and mangrove buffer zones	land	Impact to protected area of reserve, including Indigenous Protected Area and Mangrove buffer zones			B	4	High (4)	Disturbance on IPAs will be in consultation with the Traditional Owners. Any areas of significance will be managed with a No-Go buffer. Mangrove communities will also be protected with a 200m buffer where possible. Site inductions to include No-Go and buffer areas. Appropriate signage or markers will be maintained at buffer boundaries. Appropriate signage or markers will be maintained at buffer boundaries.	B	4	High (4)
Construction	Land	Terrestrial ecosystems	Introduced species and/ or invasive species	Little Paradise Footprint	Land clearing	Introduction of species and /or invasive species on Winchelsea Island via the mobilisation of land clearing equipment and supplies contaminated with introduced species and /or invasive species	land	Impact to Winchelsea Island biodiversity resulting in impacting the overall species abundance and diversity and function and cultural and economic resources			B	4	High (4)	Biosecurity and quarantine measures will be implemented for all imported equipment, machinery and products. Strict clean guidelines will be implemented for weed, pest and disease free import to Groote Eylandt. Management actions will coincide with existing Anindilyakwa IPA Management Plan and biosecurity legislation. All imports arriving to the biosecurity area will be clean and inspected upon arrival. Biosecurity importance will be incorporated into the induction and describe biosecurity control measures.	D	2	Low (5)
Construction	Land	Terrestrial ecosystems	sensitive or significant vegetation/ buffers	Little Paradise Footprint	Land clearing	Disturbance to protected areas containing sensitive habitat/landforms	land	Impact to areas which protect sensitive habitats/landforms	Erosion causing sedimentation to aquatic fresh and marine ecological communities	No studies have been completed on sensitive habitats at Little Paradise.	B	3	High (1)	A 200m buffer will be maintained from mangrove communities preventing coastal disruption as per NT Governments 'Vegetation management in the Northern Territory' guideline. A fence line surrounding the accommodation village and office area will prevent unauthorised access beyond the accommodation boundary. All vehicles will remain on established tracks. Staff inductions will discuss No-Go areas including buffer areas.	B	3	High (1)
Operations	Land	Terrestrial ecosystems	Introduced species and/ or invasive species	Bio Security Area	Import of products, equipment and machinery	Insufficient biosecurity measures in place	Land	Impact to Winchelsea Island biodiversity resulting in introduced pests, disease and weed species to Groote Eylandt and Winchelsea Island	Direct impact to species and their habitat with cumulative effects		B	4	High (4)	Biosecurity and quarantine measures will be implemented for all imported equipment, machinery and products. Strict clean guidelines will be implemented for weed, pest and disease free import to Groote Eylandt. Management actions will coincide with existing Anindilyakwa IPA Management Plan and biosecurity legislation. All imports arriving to the biosecurity area will be clean and inspected upon arrival. Biosecurity importance will be incorporated into the induction and describe biosecurity control measures.	D	2	Low (5)
Operations	Land	Terrestrial ecosystems	Introduced species and/ or invasive species	Little Paradise footprint which includes all areas disturbed by infrastructure including logistics hub	Weed and Pest Management	Introduction of species and /or invasive species on Winchelsea Island via the mobilisation of operational equipment and supplies contaminated with introduced species and /or invasive species	land	Impact to Winchelsea Island biodiversity resulting in impacting the overall species abundance and diversity and function and cultural and economic resources			B	3	High (1)	Biosecurity and quarantine measures will be implemented for all imported equipment, machinery and products. Strict clean guidelines will be implemented for weed, pest and disease free import to Groote Eylandt. Management actions will coincide with existing Anindilyakwa IPA Management Plan and biosecurity legislation. All imports arriving to the biosecurity area will be clean and inspected upon arrival. Biosecurity importance will be incorporated into the induction and describe biosecurity control measures.	D	2	Low (5)
Operations	Land	Terrestrial ecosystems	Sensitive/significant vegetation and listed threatened species and their habitat (NT and Commonwealth)	Traffic movements to and from Little Paradise	traffic on unsealed roads	Dust generation from vehicular movements around site affecting sensitive NT and MNES flora species and their habitat	land	Dust covering sensitive NT and MNES flora species and their habitat		Winchelsea Mining has purchased three on-road vehicles for the use of the Early Works Crew	B	2	Moderate (2)	Staff will remain on established roads and remain to allocated speed limits. Traffic on Groote Eylandt as a result of this project is not expected to be substantial.	C	2	Low (6)

Little Paradise Area

Phase	Theme	Environmental Factors/Objective	Environmental values and sensitivities	Main Activity	Sub Activity	Hazards (Source)	Potential Environmental Direct Impact (pathway)	Potential Environmental Impact (Receptors of concern) Impacts are measurable changes to the environment as a direct result of project activities (e.g. m2 losses of habitat, or mg/l increases in a substance concentration).	Indirect impacts/Cumulative Impacts	Rationale	Likelihood	Consequence	Inherent risk	Mitigation and management	Likelihood2	Consequence	Residual risk
Operations	Land	Terrestrial ecosystems	Listed threatened species (NT and Commonwealth)	Traffic movements to and from Little Paradise	traffic on unsealed roads	Sensitive NT and MNES terrestrial fauna species interaction with vehicles	land	wildlife injury/death			C	2	Low (6)	Staff will remain on established roads and remain to allocated speed limits. Traffic on Groote Eylandt as a result of this project is not expected to be substantial. Any fauna interactions will be recorded and managed appropriately.	D	2	Low (5)
Operations	Land	Terrestrial ecosystems	Listed threatened species, migratory species, endemic species.	Waste generation, handling and storage	Putrescibles, scrap materials, steel and plastic drums, wooden pallets, plastic and steel pipe work, process plant parts	Fauna entrapment	Land	Impact to the visual amenity of the area caused by wind blown, mishandled, illegally disposed rubbish to land, water and sea	Aquatic surface water and marine ecosystems		D	3	Low (8)	Waste will be managed accordingly as per waste management plan. The plan will include in order of waste avoidance, reduction, reuse, recover waste resources and waste disposal. Where possible, wastes are reused or recycled, however, the majority of domestic waste will be typically disposed of to the landfill on Groote Eylandt. All mining and operating associate waste will be taken back to Darwin for correct disposal.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial ecosystems	Listed threatened species, migratory species, endemic species.	Little Paradise footprint which includes all areas disturbed by infrastructure including logistics hub	For post mining land use for Little Paradise to be returned to a safe, stable, environment.	Fauna entrapment	land	Impact to the visual amenity of the area caused by wind blown, mishandled, illegally disposed rubbish to land, water and sea	Aquatic surface water and marine ecosystems		D	3	Low (8)	Waste will be managed accordingly as per waste management plan. The plan will include in order of waste avoidance, reduction, reuse, recover waste resources and waste disposal. Where possible, wastes are reused or recycled, however, the majority of domestic waste will be typically disposed of to the landfill on Groote Eylandt. All mining and operating associate waste will be taken back to Darwin for correct disposal.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial ecosystems	Introduced species and/ or invasive species	Little Paradise footprint which includes all areas disturbed by infrastructure including logistics hub	Spread with local, endemic seed mix sourced from either Groote or Winchelsea Island to avoid weed and mainland native species contamination not suitable to	Sowing of plant species not suited to the Groote Eylandt environmental conditions and values or become invasive outcompeting native vegetation	Land	Impact to Terrestrial ecosystems biological and functional diversity	Cumulative impacts as a result of no follow-up monitoring or remedial, management programmes for a post mining land scape		C	3	Moderate (4)	All clean surface runoff will be diverted away from site . Where possible local sourced seed or seeds locally found in the area will be used for re seeding. Scheduled regular monitoring will be undertaken.	D	3	Low (8)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial ecosystems	Listed threatened species, migratory species, endemic species.	Waste Management	building materials, putrescibles, scrap materials, steel and plastic drums, wooden pallets, plastic and steel pipe work.	Fauna entrapment	Land	Impact to the visual amenity of the area caused by wind blown, mishandled, illegally disposed rubbish to land, water and sea	Aquatic surface water and marine ecosystems		D	3	Low (8)	Waste will be managed accordingly as per waste management plan. The plan will include in order of waste avoidance, reduction, reuse, recover waste resources and waste disposal. Where possible, wastes are reused or recycled, however, the majority of domestic waste will be typically disposed of to the landfill on Groote Eylandt. All mining and operating associate waste will be taken back to Darwin for correct disposal.	D	2	Low (5)

Little Paradise Area

Phase	Theme	Environmental Factors/Objective	Environmental values and sensitivities	Main Activity	Sub Activity	Hazards (Source)	Potential Environmental Direct Impact (pathway)	Potential Environmental Impact (Receptors of concern) Impacts are measurable changes to the environment as a direct result of project activities (e.g. m2 losses of habitat, or mg/l increases in a substance concentration).	Indirect impacts/Cumulative Impacts	Rationale	Likelihood	Consequence	Inherent risk	Mitigation and management	Likelihood2	Consequence	Residual risk
Construction	Land	Terrestrial Environmental Quality	Introduced species and/ or invasive species	Bio Security Area	Import of products, equipment and machinery	Insufficient biosecurity measures in place	Land	Impact to Winchelsea Island ecosystems resulting in introduced pests, disease and weed species to Groote Eylandt and Winchelsea Island	Direct impact to species and their habitat with cumulative effects		B	4	High (4)	Biosecurity and quarantine measures will be implemented for all imported equipment, machinery and products. Strict clean guidelines will be implemented for weed, pest and disease free import to Groote Eylandt. Management actions will coincide with existing Anindilyakwa IPA Management Plan and biosecurity legislation. All imports arriving to the biosecurity area will be clean and inspected upon arrival. Biosecurity importance will be incorporated into the induction and describe biosecurity control measures.	D	2	Low (5)
Construction	Land	Terrestrial Environmental Quality	Characteristics of soils, including chemical, physical, biological and aesthetic qualities	Little Paradise Footprint	Diesel fuel storage and dispensing area	Hydrocarbon spillage and leaks to open ground	land	Impact to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Inland water quality of water in surface water features in creeks and intermittent streams		C	2	Low (6)	Spill immediately cleaned, Spill kits will be available close to areas where chemicals are being used or kept. Handling and storage of combustible and flammable liquids in accordance with AS1940:2004.	D	2	Low (5)
Construction	Land	Terrestrial Environmental Quality	Characteristics of soils, including chemical, physical, biological and aesthetic qualities	Little Paradise Footprint	Land clearing	Disturbance to the physical and biological and aesthetics qualities of the soil surface and surface during land clearing	land	Impact to the physical and biological and aesthetics qualities of the soil surface and surface and subsurface during land clearing			B	3	High (1)	All clearing will be kept within the scope of works and all areas that will no longer be required during operation will be rehabilitated. Dust will be managed. Clearing will be kept minimal and unnecessary clearing will be avoided. Buildings and infrastructure will be designed and suited to existing environment. Consultation to the Groote Eylandt community will be undertaken throughout the planning, mining and rehabilitation phases. A complaints register will be maintained.	C	3	Moderate (4)
Operations	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities the biological processes that depend on soil quality	Maintenance area workshop for mobile and fixed)	hydrocarbon handling and minor storage	hydrocarbon spillage and leaks to open ground	land	Localised impact around maintenance area to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Inland water quality of water in surface water features in creeks and intermittent streams		C	2	Low (6)	All storage of chemical and hydrocarbons will be in accordance with Australian Standards. All generators and pumps will be appropriately bunded. Spill kits will be located in areas of stored hydrocarbon. Where a spill occurs, spills will be immediately cleaned, Machinery and equipment will be maintained regularly.	D	2	Low (5)
Operations	Land	Terrestrial environmental quality	Chemical, physical, biological characteristics of soils and aesthetic qualities Biological processes that depend on soil quality	Sewerage treatment plant and irrigation area (bio sewage)	Diesel generator to operate pump	Hydrocarbon spillage and leaks to open ground	Land	Localised impact to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Aquatic ecosystems and marine ecosystems		C	2	Low (6)	All storage of chemical and hydrocarbons will be in accordance with Australian Standards. All generators and pumps will be appropriately bunded. Spill kits will be located in areas of stored hydrocarbon. Where a spill occurs, spills will be immediately cleaned, Machinery and equipment will be maintained regularly.	D	2	Low (5)
Operations	Land	Terrestrial environmental quality	Chemical, physical, biological characteristics of soils and aesthetic qualities Biological processes that depend on soil quality	Sewerage treatment plant and irrigation area (bio sewage)	Storage of sewage	Sewerage tank and pipework sewage spills and leaks	Land	Localised impacts to the health of all employees from irrigated water containing elevated levels of E.coli and or coliforms.	Localised impacts to the health of all employees from irrigated water containing elevated levels of E.coli and or coliforms entering creeks and streams.	Effluent from the site ablution facilities will be treated in a modular sewerage treatment plant and re-used for environmental purposes	C	2	Low (6)	Sewerage treatment plant and all associated pipework will be inspected and maintained on a scheduled basis. The design of the sewerage treatment plant will suit remote setting and be entirely closed.	D	2	Low (5)
Operations	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities the biological processes that depend on soil quality	Vehicle and plant washdown	Oily water separator	Oily water over spill and leaks to open ground	land	Localised impact around maintenance area to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Inland water quality of water in surface water features in creeks and intermittent streams		C	2	Low (6)	All storage of chemical and hydrocarbons will be in accordance with Australian Standards and regulations. All generators, pumps and oil separators will be appropriately bunded and designed. Spill kits will be located in areas of stored hydrocarbon. Where a spill occurs, spills will be immediately cleaned, Machinery and equipment will be maintained regularly.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities	Infrastructure-Diesel Power Station (Solar and Diesel),power poles and associated infrastructure	For post mining land use for site to be returned to a safe, stable, environment.	Soil contamination from hydrocarbons	Land	Localised impact to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Aquatic ecosystems and marine ecosystems		C	3	Moderate (4)	Rehabilitation will be in accordance with approved Mine Closure Plan.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities	Infrastructure-Fuel storage and dispensing area (50,000 litres)	For post mining land use for site to be returned to a safe, stable, environment.	Soil contamination from hydrocarbons	Land	Localised impact to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Aquatic ecosystems and marine ecosystems		C	3	Moderate (4)	Rehabilitation will be in accordance with approved Mine Closure Plan.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities	Infrastructure-Sewerage treatment plant and irrigation area (bio sewerage)	For post mining land use for a future economic activity sewerage treatment plant to remain at site	Sewage effluent contaminating soil	Land	Localised impact to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Aquatic ecosystems and marine ecosystems		C	3	Moderate (4)	Rehabilitation will be in accordance with approved Mine Closure Plan.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial Environmental quality	Soil characterise including the physical, and aesthetic qualities are supported and maintained	Little Paradise footprint which includes all areas disturbed by infrastructure including logistics hub	Deep rip, shape final landform to natural drainage pathways	Disturbed land and soils with no vegetation cover is subject to erosion	Land	Soil loss by erosion of surface land impacting the chemical, physical, biological and aesthetic qualities which support vegetation growth and land structure stability	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.	B	3	High (1)	All clean surface runoff will be diverted away from site . Rehabilitation will include seeding with locally sourced seed. Scheduled regular monitoring will be undertaken.	C	2	Low (6)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial Environmental quality	Soil characterise including the physical, and aesthetic qualities are supported and maintained	Little Paradise footprint which includes all areas disturbed by infrastructure including logistics hub	Revegetation by direct seeding	Disturbed land and soils with no vegetation cover subject to erosion	land	Soil loss by erosion of surface land impacting the chemical, physical, biological and aesthetic qualities which support vegetation growth and land structure stability	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		B	3	High (1)	All clean surface runoff will be diverted away from site . Rehabilitation will include seeding with locally sourced seed. Scheduled regular monitoring will be undertaken.	C	2	Low (6)
Rehabilitation/ Closure/ Post Closure	Land	Terrestrial Environmental quality		Infrastructure-Diesel Power Station (Solar and Diesel),power poles and associated infrastructure	For post mining land use for a future economic activity Diesel Power station to remain at site	Soil contamination from hydrocarbons	Land	Localised impact to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Aquatic ecosystems and marine ecosystems		C	3	Moderate (4)	Rehabilitation will be in accordance with approved Mine Closure Plan.	D	2	Low (5)
Operations	People	Communities and Economy	Jobs and businesses including tourism, education, Aboriginal rights and interests	Development of Clan Based Enterprises to supporting mining project and provide economic and social development and security to the aboriginal community.	Plant operators, training and safety, nursery, rehabilitation, environmental monitoring, security, bio security, Stevedoring and marine services barging,	Employment opportunities provided only to fly in fly out workers and non indigenous	People	No economic growth due to lack of employment, business (tourism, aquaculture, industry, education) opportunities to the Groote Island aboriginal communities	No income from mine providing benefit to the enhancement (education, lifestyles, mental health and wellbeing) and economy for the aboriginal communities.		C	3	High (4)	Winchelsea Mining Pty Ltd to develop a Clan Based Enterprise to supporting mining project and provide economic and social development and security to the aboriginal community. This will include plant operators, training and safety, nursery, rehabilitation, environmental monitoring, security, bio security, Stevedoring and marine services barging, Aquaculture, hatchery, ponds & oyster farms, forestry	D	1	Low (1)
Operations	People	Communities and Economy	Resources including water supply and food sources, transport networks and mobility, infrastructure and services, Aboriginal rights and interests	Development of Infrastructure and services supporting mining project and provide economic and social development and security to aboriginal communities.	in developed Infrastructure, housing and utilities (electricity, water)	Poor quality and or inadequate infrastructure services development in place during mining and post mining (roads, utilities, transport networks)	People	Mine developed Infrastructure, housing and utilities (electricity, water) do not provide any support for the growth of future generations of Groote Island aboriginal communities.	No adequate infrastructure or utilities created to benefit the enhancement (education, lifestyles, mental health and wellbeing) and economy for the aboriginal communities.	All buildings and infrastructure items will be approved by Winchelsea Mining to ensure compliance with relevant approvals, authorisations and standards	C	4	High (3)	All infrastructure will have the following principles: fit of repurpose and cost effective equipment and infrastructure, modular design of key items with maximum use of prefabricated, relocatable buildings and low environmental impact and easy site rehabilitation upon conclusion of the project.	D	1	Low (1)
Operations	People	Communities and Economy	Amenity (visual considerations)	Waste generation, handling and storage	Putrescibles, scrap materials, steel and plastic drums, wooden pallets, plastic and steel pipe work, process plant parts	wind blown rubbish	Land	Impact to the visual amenity of the area caused by wind blown, mishandled, illegally disposed rubbish to land, water and sea	Aquatic surface water and marine ecosystems		B	3	High (1)	Waste will be managed accordingly as per waste management plan. The plan will include in order of waste avoidance, reduction, reuse, recover waste resources and waste disposal. Where possible, wastes are reused or recycled, however, the majority of domestic waste will be typically disposed of to the landfill on Groote Eylandt. All mining and operating associate waste will be taken back to Darwin for correct disposal.	D	2	Low (5)

Little Paradise Area

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Rehabilitation/ Closure/ Post Closure	People	Communities and Economy	Resources including water supply and food sources, transport networks and mobility, infrastructure and services, Aboriginal rights and interests	Post Mining providing future the Aboriginal communities	Post Mining to create sustainable developments and business for the current and future Groote Island Aboriginal Communities	Post mining there are no sustainable business opportunities continuing or can be created to support the growth and enhancing of the Groote Island current and future generations	People	Post mining, the Groote Island communities and economy are not enhanced	No businesses opportunities or services (health care, education facilities) created to benefit the enhancement (education, lifestyles, mental health and wellbeing) and economy for the aboriginal communities.		C	4	High (3)	Continual consultation with the key stakeholders though all phases of mining Company to set obligations, targets and policies to sustainable development projects.	D	4	Moderate (6)
Rehabilitation/ Closure/ Post Closure	People	Communities and Economy	Amenity (visual considerations)	Waste Management	All wastes are to be removed from Little Paradise to an approved landfill at Groote Island.	wind blown rubbish	Land	Impact to the visual amenity of the area caused by wind blown, mishandled, illegally disposed rubbish to land, water and sea	Aquatic surface water and marine ecosystems		D	3	Low (8)	Waste will be managed accordingly as per waste management plan. The plan will include in order of waste avoidance, reduction, reuse, recover waste resources and waste disposal. Where possible, wastes are reused or recycled, however, the majority of domestic waste will be typically disposed of to the landfill on Groote Eylandt. All mining and operating associate waste will be taken back to Darwin for correct disposal.	D	2	Low (5)
Operations	People	Human Health	Drinking and recreational water	Sewerage treatment plant and irrigation area (bio sewage)	Irrigating treated water	Bacteria (E.coli, Total Coliforms) in irrigated water affecting human health	People	Localised impacts to the health of all employees from irrigated water containing elevated levels of E.coli and or coliforms.	Localised impacts to the health of all employees from irrigated water containing elevated levels of E.coli and or coliforms entering creeks and streams.		C	2	Low (6)	Sewerage treatment plant and all associated pipework will be inspected and maintained on a scheduled basis. Water will be tested to make sure it meets irrigation guidelines.	D	2	Low (5)
Construction	Sea	Coastal Processes	Coastal morphology and stability of coastal processes	Little Paradise Jetty	Construction of Jetty extension	Sedimentation and erosion of coastal systems	Coast	Impacts to coastal processes from construction activities leading to increased sedimentation and erosion			B	3	High (1)	Erosion and sedimentation control plan will be incorporated into MMP. Retain as much ground cover as possible. The site will be monitored for erosion or sedimentation. Diversion drains and rock arms be implemented where feasible.	D	2	Low (5)
Operations	Sea	Coastal Processes	Coastal morphology and stability of coastal processes	Little Paradise Jetty	Operation of the jetty	Sedimentation and erosion of coastal systems	Coast	Impacts to coastal processes from construction activities leading to increased sedimentation and erosion			B	2	Moderate (2)	Erosion and sedimentation control plan will be incorporated into MMP. Retain as much ground cover as possible on cleared areas. Water diversion will be implemented and appropriate controls put in place where erosion forms.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Sea	Coastal Processes		Little Paradise Jetty	Subject to consultation with the Traditional Owners, the jetty may remain in place for access for post land use	Removal of infrastructure that could be used post mining	Coast			Consultation will be undertaken with the ALC to determine if the jetty is to remain and used by the community.	C	2	Low (6)	Continual consultation with the key stakeholders though all phases of mining Company to set obligations, targets and policies to sustainable development projects.	C	2	Low (6)
Construction	Sea	Marine Ecosystems	Migratory species and their habitat	Little Paradise Jetty	Construction of Jetty extension	Disturbance to migratory species and their habitat	land	Impact to migratory species and their habitat			B	3	High (1)	Preferable construction of the jetty should be avoided during migration periods. Coastal impact should be minimal, clearing only to the approved footprint. Coastal areas outside of this will be protected from clearing, potential ASS forming soils and erosion during operations. The jetty design and construction will reduce impact to potential coastal and marine areas used by migratory species.	B	3	High (1)
Construction	Sea	Marine ecosystems	Conservation significant marine and coastal fauna and critical habitat such as nesting, breeding or foraging habitat. Integrity of marine ecosystems and the ecological services they apply, provision of refuge, food supply.	Construction of jetties	Rock arm construction	Covering existing and functioning marine habitat	Direct to sea bed	Loss of sea bed biota		A geomorphic assessment was undertaken to determine potential impacts to coastal processes associated with the barge landing site extension. The study assessed sediment dynamics and transport through the evaluation of historic imagery and environmental influence (Damara WA Pty Ltd 2019). Another study for the barge landing site extension was undertaken over two days which assessed the impact of the extensions on the benthic biota. In summary, a total of eight sites were photographed at the potential barge landing extension disturbance area and another four sites approximately 20 m parallel. Photographic assessment of benthic habitat recorded a total of eight coral genera and two seagrass species Enhalus acoroides and Halophila ovalis. It was concluded the barge extensions will not have a significant impact on the benthic communities or marine biota generally (EcOz Environmental Consultants 2019). The temporal length of the survey is however not expected to capture sufficient detail on the benthic community".	B	2	Moderate (2)	Study to determine suitability for location of rock arm to minimise impact of fringing reef	B	2	Moderate (2)
Construction	Water	Aquatic ecosystems	Aquatic habitats including the biodiversity, ecological integrity and ecological functioning	Little Paradise Area	Surface water runoff from cleared areas	Soil loss from land clearing affecting the health of biota and their habitats	s/water	Impacting health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural significance, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge		LPA lies just outside of the Groote Eylandt Beneficial Use Area.	B	2	Moderate (2)	All clean surface runoff will be diverted away from the accommodation area. Works will be undertaken in the dry season. All site runoff will be of good quality and diverted into existing drainage channels. Large cleared areas will be maintained as lawn during operations to prevent erosion.	C	2	Low (6)
Construction	Water	Aquatic ecosystems	Aquatic habitats including the biodiversity, ecological integrity and ecological functioning	Little Paradise Footprint	Land clearing	Affecting the health of biota and third habitats	water	Impacting aquatic ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		B	2	Moderate (2)	All clean surface runoff will be diverted away from the accommodation area. Works will be undertaken in the dry season. All site runoff will be of good quality and diverted into existing drainage channels. Large cleared areas will be maintained as lawn during operations to prevent erosion.	D	2	Low (5)
Operations	Water	Aquatic ecosystems	Aquatic habitats including the biodiversity, ecological integrity and ecological functioning	Little Paradise Area	Surface water runoff from operational areas	Affecting the health of biota and their habitats	s/water	Impacting coastal ecosystems threatened species, health of the biota , habitats supporting the lifecycle of aquatic biota, species of social and cultural, integrity of aquatic ecosystems, biological and functional diversity, provision of refuge			C	2	Low (6)	All surface runoff from the accommodation and office area will be free of contaminants through the correct spill, erosion and sedimentation controls.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Water	Aquatic Ecosystems	Supply and quantity of water in surface water features (creeks and intermittent streams)	Little Paradise footprint which includes all areas disturbed by infrastructure including logistics hub	Deep rip, shape final landform to natural drainage pathways	Creeks and streams alignment is not consistent to the surround landforms and catchment area significantly reducing/preventing downstream flows	s/water	Impacts to the downstream aquatic habitats which support the aquatic biota lifecycle and health	Indirect impact to coastal processes which support marine ecosystems (mangroves) and marine ecosystems from reduced inflows to coastal communities.	NR Maps shows no drainage lines or permanent/ temporary water pools across the proposed disturbance area.	D	2	Low (5)	All clean surface runoff will be diverted away from site and into existing ephemeral drainage channels. All watercourse crossing onsite will have engineered culverts and scour protection to minimise disruption to downstream aquatic ecosystems.	D	3	Low (5)
Construction	Water	Hydrological Processes	Supply and quantity of water in surface water features (creeks and intermittent streams)	Little Paradise Footprint	Land clearing	Land clearing disrupting the natural alignment of creeks and streams reducing or presenting flows downstream	water	Impacts to the ecological health of downstream creeks and intermittent streams	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		B	2	Moderate (2)	All clean surface runoff will be diverted away from site and into existing ephemeral drainage channels. All watercourse crossing onsite will have engineered culverts and scour protection to minimise disruption to downstream aquatic ecosystems.	D	2	Low (5)

Little Paradise Area

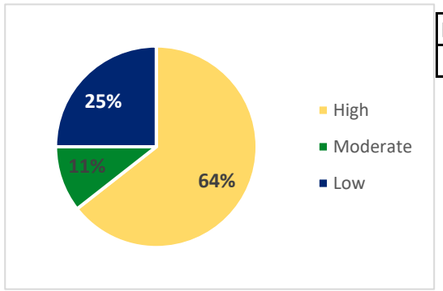
Phase	Theme	Environmental Factors/Objective	Environmental values and sensitivities	Main Activity	Sub Activity	Hazards (Source)	Potential Environmental Direct Impact (pathway)	Potential Environmental Impact (Receptors of concern) Impacts are measurable changes to the environment as a direct result of project activities (e.g. m2 losses of habitat, or mg/l increases in a substance concentration).	Indirect impacts/Cumulative Impacts	Rationale	Likelihood	Consequence	Inherent risk	Mitigation and management	Likelihood2	Consequence	Residual risk
Construction	Water	Hydrological Processes	The supply and quantity of water in surface water features including rivers, lakes, wetlands, swamps, creeks, billabongs, intermittent streams, mangroves and drainage lines	Little Paradise Footprint	Placement of infrastructure (buildings, access roads)	Placement of infrastructure domains(tailings dam, open pit) causing obstruction to natural surface flow paths, streamflow's and semi permanent/permanent pools preventing/diverting seasonal flows to downstream aquatic ecosystems	s/water	Impacts to surface water systems flow paths preventing downstream surface flows to aquatic ecological communities	Freshwater systems entering coastal brackish and marine water and ecological communities (Mangrove swamps)	NR Maps shows no drainage lines or permanent/ temporary water pools across the proposed disturbance area.	D	2	Low (5)	All clean surface runoff will be diverted away from site and into existing ephemeral drainage channels. All watercourse crossing onsite will have engineered culverts and scour protection to minimise disruption to downstream aquatic ecosystems.	D	3	Low (5)
Operations	Water	Hydrological Processes	The supply and quantity of water in surface water features.	Mining footprint	Surface water runoff from operational areas	Sedimentation to surface creeks and streams	s/water	Impacts to the quantity of surface water into creeks and streams			B	2	Moderate (2)	A ESCP will be developed. All clean surface runoff will be diverted away from the accommodation area. Works will be undertaken in the dry season. All site runoff will be of good quality and diverted into existing drainage channels. Large cleared areas will be maintained as lawn during operations to prevent erosion.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Water	Hydrological processes	Supply and quantity of water in surface water features (creeks and intermittent streams)	Little Paradise footprint which includes all areas disturbed by infrastructure including logistics hub	Deep rip, shape final landform to natural drainage pathways	Creeks and streams alignment is not consistent to the surround landforms and catchment area significantly reducing/preventing downstream flows	s/water	Impacts to the ecological health of downstream creeks and intermittent streams	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.	NR Maps shows no drainage lines or permanent/ temporary water pools across the proposed disturbance area.	D	3	Low (5)	All clean surface runoff will be diverted away from site and into existing ephemeral drainage channels. All watercourse crossing onsite will have engineered culverts and scour protection to minimise disruption to downstream aquatic ecosystems.	D	4	Low (5)
Construction	Water	Inland water environmental quality	Supply and quality of water in surface water features (creeks and intermittent streams)	Little Paradise Footprint	creation of new roads and access tracks	Land clearing disrupting the natural alignment of creeks and streams impacting the environmental values to down stream aquatic ecosystems	s/water	Impacts to the ecological health of downstream creeks and intermittent streams	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.	NR Maps shows no drainage lines across the proposed disturbance area.	D	2	Low (5)	All clean surface runoff will be diverted away from site and into existing ephemeral drainage channels. All watercourse crossing onsite will have engineered culverts and scour protection to minimise disruption to downstream aquatic ecosystems.	D	2	Low (5)
Construction	Water	Inland water environmental quality	The quality of water in surface water features including rivers, lakes, swamps, creeks, intermittent streams	Little Paradise Footprint	Land clearing	Sedimentation to surface creeks and streams	water	Impacts to the quality of water in surface water features including creeks and streams	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.		B	2	Moderate (2)	All clean surface runoff will be diverted away from the accommodation area. Works will be undertaken in the dry season. All site runoff will be of good quality and diverted into existing drainage channels. Large cleared areas will be maintained as lawn during operations to prevent erosion.	D	2	Low (5)
Operations	Water	Inland water environmental quality	The quality of water in surface water features including rivers, lakes, swamps, creeks, intermittent streams	Little Paradise Area	Surface water runoff from operational areas	Sedimentation to surface creeks and streams	s/water	Impacts to the quality of water in surface water features including creeks and streams			B	2	Moderate (2)	A ESCP will be developed. All clean surface runoff will be diverted away from the accommodation area. Works will be undertaken in the dry season. All site runoff will be of good quality and diverted into existing drainage channels. Large cleared areas will be maintained as lawn during operations to prevent erosion.	D	2	Low (5)
Rehabilitation/ Closure/ Post Closure	Water	Inland water environmental quality	Supply and quality of water in surface water features (creeks and intermittent streams)	Roads, access roads	Subject to consultation with the Traditional owners some roads to remain open for access for the post mine land use activity. the remainder will be Deep rip, shape final landform to natural drainage pathways	Access roads and tracks that are not to be left for access for post closure monitoring continue are not maintained causing erosion along creeks and stream lines impacting the environmental values to down stream aquatic ecosystems	s/water	Impacts to the ecological health of downstream creeks and intermittent streams	Indirect impact from reduced inflows to coastal communities including mangroves and wetlands.	Consultation will be undertaken with the ALC to determine if roads are required for monitoring or other purposes.	C	2	Low (6)	Consultation will be undertaken with the ALC to determine if roads are required for monitoring or other purposes. All rehabilitation will be undertaken in accordance with approved Mine Closure Plan. It will include re-shaping roads no longer required for aquatic farming. Appropriate erosion measures will be implemented to prevent soil loss and erosion of creek lines. Consultation will be undertaken with the ALC to determine if roads are required for monitoring or other purposes.	D	2	Low (5)

Winchelsea jetty Extension, floating jetty and wharf

Phase	Theme	Environmental Factors/Objective	Environmental values and sensitivities	Main Activity	Sub Activity	Hazards (Source)	Potential Environmental Impact (pathway)	Potential Environmental Impact (Receptors of concern)	Indirect impacts/Cumulative Impacts	Rational	Likelihood	Consequence	Inherent risk	Mitigation and management	Likelihood	Consequence	Residual risk
Construction	Air	Air quality	The chemical, physical and biological characteristics of air	Construction of Pioneer Wharf Extension and Northern Export Corridor	Clearing and earth moving with heavy machinery	Dust emissions from land clearing activities	Atmosphere	Visual aesthetics, dust impacting air quality, impacting remaining vegetation, cultural sites and coastal areas.			B	2	Moderate (2)	Dust suppression through the use of a water truck. Water will be sourced from raw water dam. All vehicles and machinery to remain on established roads. Avoid over clearing and rehabilitate in areas no longer in use.	D	2	Low (5)
Construction	Land	Terrestrial ecosystems	Sensitive/significant vegetation and listed threatened species and their habitat (NT and Commonwealth). Ecological function for species present on the island.	Construction of Pioneer Wharf Extension and Northern Export Corridor	General construction activities	Fire ignition from smoking or machinery	Land	Loss of habitat and species		The area for the proposed northern export corridor was not included in the reconnaissance terrestrial survey as it lies outside of the granted EL and proposed ML. A preliminary desktop assessment was undertaken however using EPBC Protect Matters Search Tool which identified 28 threatened fauna species listed under the EPBC Act within 10km of the Project. A vegetation map of Winchelsea Island was used to determine the overall vegetation class of the northern export corridor. This area is dominated by mixed woodlands or open forests (Class 14) and pockets of dry closed forests or thickets on sand (Class 2)" in Terrestrial Ecology section.	D	3	Low (8)	Designated smoking areas, machinery maintained regularly and kept in working order. Fire management plan established. Appropriate fire fighting equipment will be maintained and staff will be trained. Sufficient clearing will reduce fuel loads surrounding operational and construction areas.	D	3	Low (6)
Construction	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities	Construction of Pioneer Wharf Extension and Northern Export Corridor	General construction activities	Accidental spill of oil, fuel from crane, equipment or machinery	Land	Impact to the soil chemical, physical, biological and aesthetic qualities. Affect the biological soil processes	Inland water quality of water in surface water features in creeks and intermittent streams		D	2	Low (5)	Spill response procedure developed, Spill immediately cleaned, Spill kits will be available close to areas where chemicals are being used or kept. Regular maintenance of equipment and machinery as per manufacturers manual.	D	2	Low (5)
Construction	Land	Terrestrial ecosystems	Remaining vegetation and function	Construction of Pioneer Wharf Extension and Northern Export Corridor	Construction activities generating dust	Dust generation from land clearing activities	Airborne	Impact to sensitive vegetation, threatened species habitat, cultural heritage areas and marine environment.			B	2	Moderate (2)	Dust suppression through the use of a water truck in high use or large cleared areas. Clearing will be minimised where possible through mine design.	D	2	Low (5)
Construction	Land	Terrestrial ecosystems	Listed threatened species and their habitats (NT and Commonwealth)	Mining footprint	Land clearing	Disturbance to sensitive NT and MNES fauna species and their habitat	land	Impact to protect sensitive NT and commonwealth fauna species and their habitat	Impact to protect sensitive NT and commonwealth fauna species and their habitat		B	3	High (1)	Avoid any large habitat trees with hollows suitable for masked owls with a minimum 10m buffer. Avoid standing dead trees or large old growth trees with hollows that may support wildlife density sites, particularly for the northern quoll and masked owl. Avoid clearing in dense vegetation along drainage lines and monsoon forests (established buffer zones). Establish and enforce No-Go areas adjacent to the approved clearing areas, to minimise the area of disturbance and minimise areas required to be rehabilitated.	B	3	High (1)
Construction	Land	Landforms	Protected area of reserve, including Indigenous Protected Area	Construction of Pioneer Wharf Extension and Northern Export Corridor	General construction activities	Disturbance to protected area of reserve, including Indigenous Protected Areas	Land	Impact to protected area of reserve, including Indigenous Protected Area			A	3	High (2)	Disturbance on IPAs will be in consultation with the Traditional Owners. Any areas of significance will be managed with a 300m buffer. Mangrove communities will also be protected with a 300m buffer. Site inductions to include No-Go and buffer areas. Appropriate signage or markers will be maintained at buffer boundaries. Appropriate signage or markers will be maintained at buffer boundaries.	A	2	Moderate (3)
Operation	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities	Operation	Loading and operating of conveyor - Northern Export Corridor Wharf	Accidental spill of oil, fuel, from equipment or machinery	Land	Contamination and possible loss of marine species and habitat			D	2	Low (5)	Spill response procedure developed, Spill immediately cleaned, Spill kits will be available close to areas where chemicals are being used or kept. Regular maintenance of equipment and machinery as per manufacturers manual.	D	2	Low (5)
Operation	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities	Processed manganese for export	Storing product on RoM	Sedimentation and erosion of manganese product into waterways, coastal areas	Land, waterways	Contamination and sedimentation of waterways and coastal area of stockpiles			B	3	High (1)	ESCP established. All mine water will be diverted back to the mine for treatment and re-use. RoM and storage of all product is stockpiled away from coastal areas and waterways.	D	3	Low (8)
Operation	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities	Operation	Loading of conveyor - Northern Export Corridor Wharf	Accidental spill of processed manganese onto open ground	Land	Contamination of soil if left uncleaned			C	2	Low (6)	SOP developed for loading conveyor and spill or over piling preventative measures in place.	D	2	Low (5)
Operation	Land	Terrestrial environmental quality	characteristics of soils, including chemical, physical, biological and aesthetic qualities	Operation	Failure of conveyor - Northern Export Corridor Wharf	Accidental spill of processed manganese onto open ground	Land	Contamination of soil			C	3	Low (6)	SOP produced for loading conveyor and spill or over piling preventative measures in place. Conveyor to be maintained on a regular basis.	D	2	Low (5)
Construction	People	Community, jobs and business	Jobs and businesses including tourism, education, Aboriginal rights and interests	Construction of Pioneer Wharf Extension and Northern Export Corridor	General construction activities	Employment opportunities provided only to fly in fly out workers and non indigenous	Community	No economic growth due to lack of employment, business (tourism, aquaculture, industry, education) opportunities to the Groote Island aboriginal communities			B	3	High (1)	This will provide new employment and upskilling opportunities for general and specialised roles	B	3	High (1)
Construction	People	Aesthetics and recreation, communities, food sources	Aesthetics and recreation	Construction of Pioneer Wharf Extension and Northern Export Corridor	Pile driving foundations into sea bed	Visible turbidity from pile driving activities	Ocean, coastal communities	Public perception activities look environmentally damaging	Direct		B	2	Moderate (2)	Work methods will minimise potential impact. Avoid any unnecessary disturbance of sea bed. Maintain a complaint and incident register. Establish a No-Go area for recreational fishing.	B	2	Moderate (2)
Construction	People	Cultural heritage	Important or significant country	Construction of Pioneer Wharf Extension and Northern Export Corridor	General construction activities	Disturbance to known cultural heritage and archaeological sites along coastal areas	Coast line	Impact to sites of cultural significance protected for their cultural importance		Known high significance cultural heritage sites occur in the coastal Blue Mud area, close to the proposed jetty extension in the Queue area (Appendix H). Trading is thought to have occurred annually for roughly 900 years. Trading of sea cucumber or trepang was highly sought and a valuable trade item in Southern China (Clark and May 2013)" in cultural heritage section (Macassan) instead of my original reference of 1700s.	B	4	High (4)	A cultural heritage management plan is to be established. It will include a 300m buffer zone from the high tide mark around the whole island as an exclusion zone Establish a ESCP to prevent coastal erosion and damage to remaining heritage sites. Initiate appropriate dust management. Site inductions and education to include No-Go and buffer areas. Appropriate signage or markers will be maintained at buffer boundaries. TOs will be consulted if removal of heritage sites are required for construction activities. All vehicles and machinery will remain on established roads.	B	4	High (4)
Construction	People	Cultural Heritage	Important or significant country	Construction of Pioneer Wharf Extension and Northern Export Corridor	General construction activities	Offshore works have the potential to disturb unrecorded submerged sites	Direct	Impact to cultural heritage, company reputation		Trading is thought to have occurred annually for roughly 900 years. Trading of sea cucumber or trepang was highly sought and a valuable trade item in Southern China (Clark and May 2013)" in cultural heritage section (Macassan) instead of my original reference of 1700s.	C	3	Moderate (4)	Undertake heritage and archaeological survey before commencing works.	D	2	Low (5)
Construction	People	Human health	Public wellbeing	Construction of Pioneer Wharf Extension and Northern Export Corridor	General construction activities	Public safety during recreational fishing in the Bay and hunting	Direct	Accident with recreational vessel causing human injury or death			D	4	Moderate (6)	Include a no go zone around jetties. Liaise with community members	D	2	Low (5)
Construction	People	Human health	Public wellbeing	Construction of Pioneer Wharf Extension and Northern Export Corridor	Operations	Public safety during recreational fishing in the Bay and hunting	Direct	Accident with recreational vessel causing human injury or death			D	4	Moderate (6)	Include a no go zone around jetties. Liaise with community members	D	2	Low (5)
Construction	People	Human health	Public wellbeing	Construction of Pioneer Wharf Extension and Northern Export Corridor	pile driving foundations into sea bed	Noise generated from construction of the jetties and wharf, in particular pile driving	Airborne	Disruption to the community			B	2	Moderate (2)	Undertake loud construction noise during the day only and avoid night time works, liaise with community on project progress and establish a complaints register. All machinery will be maintained regularly and operated under normal capacity.	D	2	Low (5)
Construction	Sea	Marine ecosystems	Conservation significant marine and coastal fauna and critical habitat such as nesting, breeding or foraging habitat. Species of social, cultural and/or economic significance	Construction of Pioneer Wharf Extension and Northern Export Corridor	Clearing and earth moving	Land clearing near shoreline displacing migratory species (shorebirds and sea turtles) and destroying habitats	Land	Impact to shore birds and sea turtle habitats		A desktop study showed there were 43 migratory species with the potential to occur within 10km of the Project area (refer to Table 6-2). A reconnaissance survey determined of the 43 migratory species, 10 could have the possibility or likelihood to occur within the Project area. These 10 species include all 6 turtles and the Lesser Sand Plover and Greater Sand Plover which are not listed in the EPBC search.	B	3	High (1)	Preferable construction of the jetties should be avoided during migration periods. Coastal impact should be minimal, clearing only to the approved footprint. Coastal areas outside of this will be protected from clearing, potential ASS forming soils and erosion during operations. The jetties design and construction will reduce impact to potential coastal and marine areas used by migratory species.	B	3	High (1)
Construction	Sea	Coastal processes	Processes that support coastal benthic communities and habitats such as coral reefs, mangroves, salt marshes, seagrass meadows and sponge gardens	Construction of Pioneer Wharf Extension and Northern Export Corridor	Clearing and earth moving	Damage or removal of important ecosystems that provide ecological function such as mangroves and coral assemblages	Coast line	Flora and sensitive species, migratory species			A	3	High (2)	Coastal impact should be minimal, clearing only to the approved footprint. Coastal areas outside of this will be protected from clearing, potential ASS forming soils and erosion during operations. No-Go areas will be established for remaining mangrove communities. The jetties design and construction will reduce impact to potential coastal areas	A	2	Moderate (3)

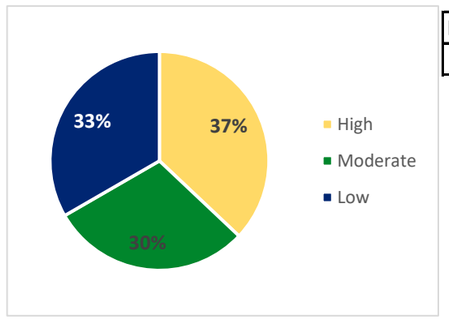
Phase	Theme	Environmental Factors/Objective	Environmental values and sensitivities	Main Activity	Sub Activity	Hazards (Source)	Potential Environmental Impact (pathway)	Potential Environmental Impact (Receptors of concern)	Indirect impacts/Cumulative Impacts	Rational	Likelihood	Consequence	Inherent risk	Mitigation and management	Likelihood	Consequence	Residual risk
Construction	Sea	Marine environmental quality	Quality of water, sediment, biota, ecosystem health, recreational activities, cultural values	Construction of Pioneer Wharf Extension and Northern Export Corridor	Clearing and earth moving	Soil loss from land clearing causing sedimentation to marine environment	Land, ocean	Impact to quality of water, biota, ecosystem health, recreational activities, cultural values			C	3	Moderate (4)	An ESCP will be developed to prevent soil loss as a result of land clearing. Mine site design and correct ESC will minimise soil loss. Rehabilitation will be undertaken to areas that are no longer required following construction and operations. ESC will include and not limited to diversion drains, sediment ponds, bunding.	D	2	Low (5)
Operations	Sea	Marine environmental quality	Quality of water, sediment and biota. Ecosystem health condition	Operations	Loading manganese product onto Handymax ships from conveyor at the Northern Export Corridor	Bad weather impeding on loading activities potentially causing spills from conveyor	Ocean	Contamination, pollution and toxicity of heavy metals	Direct	There is limited available information surrounding the aquatic ecology of Winchelsea Island and the Project area. There is however, an aquatic study conducted by Australian Institute of Marine Science (AIMS) for the whole of the Groote archipelago region. This would provide robust baseline for reference sites for future studies" in Aquatic ecology section	D	4	Moderate (6)	Loading will be postponed during poor weather conditions	D	2	Low (5)
Construction	Sea	Marine ecosystems	Conservation significant marine and coastal flora and vegetation	Construction of Pioneer Wharf Extension and Northern Export Corridor	Clearing and earth moving	Acid Sulphate Soils forming with construction activities	Coastal areas	ASS impacting surrounding vegetation and fauna species.		There is limited available information surrounding the aquatic ecology of Winchelsea Island and the Project area. There is however, an aquatic study conducted by Australian Institute of Marine Science (AIMS) for the whole of the Groote archipelago region. This would provide robust baseline for reference sites for future studies" in Aquatic ecology section	C	3	Moderate (4)	An ESCP will be developed to prevent soil loss as a result of land clearing. Mine site design and correct ESC will minimise soil loss. Rehabilitation will be undertaken to areas that are no longer required following construction and operations. ESC will include and not limited to diversion drains, sediment ponds, bunding.	C	3	Moderate (4)
Construction	Sea	Coastal processes	Processes that support coastal benthic communities and habitats such as coral reefs, mangroves, salt marshes, seagrass meadows and sponge gardens	Construction of Pioneer Wharf Extension and Northern Export Corridor	Removal of important vegetation for coastline stability	Tidal movement impacting on cleared coastline	Coast line	Loss of coastal protection, loss of soil, sedimentation and bank protection.		There is limited available information surrounding the aquatic ecology of Winchelsea Island and the Project area. There is however, an aquatic study conducted by Australian Institute of Marine Science (AIMS) for the whole of the Groote archipelago region. This would provide robust baseline for reference sites for future studies" in Aquatic ecology section	B	3	High (1)	Progressive rehabilitation with coastal species will be undertaken in areas that are no longer required in operations. An ESCP will be developed to prevent soil loss as a result of land clearing. Mine site design and correct ESC will minimise soil loss. ESC will include and not limited to diversion drains, sediment ponds, bunding.	C	2	Low (6)
Construction	Sea	Marine environmental quality	Quality of water, sediment, biota, ecosystem health, recreational activities.	Construction of Pioneer Wharf Extension and Northern Export Corridor	Pile driving foundations into sea bed	Increased turbidity from pile driving	Direct to sea bed, currents	Reduced water quality impacting sea bed biota function		There is limited available information surrounding the aquatic ecology of Winchelsea Island and the Project area. There is however, an aquatic study conducted by Australian Institute of Marine Science (AIMS) for the whole of the Groote archipelago region. This would provide robust baseline for reference sites for future studies" in Aquatic ecology section	C	2	Low (6)	Silt curtains to be used during construction to minimise turbidity.	B	2	Moderate (2)
Construction	Sea	Marine ecosystems	Provision of refuge	Construction of Pioneer Wharf Extension and Northern Export Corridor	Pile driving foundations into sea bed	Airborne noise from generators, pile driving and other construction equipment impacting migratory species and flight paths	Airborne	Disruption to flight path or habitat for migratory species such as marine turtles and shorebirds			B	3	High (1)	Equipment and machinery will be maintained and in good working condition. Appropriate noise monitoring. Avoid excessive noise activities such as pile driving during migration periods.	B	2	Moderate (2)
Construction	Sea	Marine ecosystems	Quality of water, sediment, biota, ecosystem health, recreational activities, cultural values	Construction of Pioneer Wharf Extension and Northern Export Corridor	Pile driving foundations into sea bed	Seabed not suitable for embedment causing unnecessary destruction of communities and other sea bed biota	Direct to sea bed	Unnecessary destruction of coral communities and other sea bed biota.		A study undertaken had been to determine suitability for a barge landing site (Appendix C)	C	2	Low (6)	Bearing capacity of sea bed will be determined and sure up the appropriate location of the jetties.	C	2	Low (6)
Construction	Sea	Marine environmental quality	Quality of water, sediment, biota, ecosystem health, recreational activities, cultural values	Operations	Vessel use and movement	Increased turbidity from vessel motors	Ocean, currents	Reduced water quality impacting sea bed biota function			D	2	Low (5)	Jetties will be extended to sufficient depths for proposed transport and export activities. Vessel docking will not be undertaken during extremely low tides.	D	2	Low (5)
Construction	Sea	Marine ecosystems	Integrity of marine ecosystems and the ecological services they apply, provision of refuge, food supply.	Construction of Pioneer Wharf Extension and Northern Export Corridor	Pile driving foundations into sea bed	Disturbance and loss of seabed biota and species	Direct to sea bed	Sea bed biota and species		Benthic survey indicates area of barge landing had less impact on sea bed biota such as coral assemblages. It is proposed the jetty is an extension of the existing barge landing site. No surveys have been undertaken for the floating jetty and wharf	B	3	High (1)	Work methods will minimise potential impact. Avoid any unnecessary disturbance of sea bed.	B	3	High (1)
Construction	Sea	Marine ecosystems	Conservation significant marine and coastal fauna and critical habitat such as nesting, breeding or foraging habitat	Construction of Pioneer Wharf Extension and Northern Export Corridor	Pile driving foundations into sea bed	Disturbance to threatened and migratory marine species and their habitat	Direct to sea bed, ocean	Disturbance or loss of habitat to threatened and migratory species that use the area to nest, forage and breed. Displacement for migratory shorebirds and marine turtles			B	3	High (1)	Work methods will minimise potential impact. Avoid any unnecessary disturbance of sea bed.	B	3	High (1)
Construction	Sea	Marine ecosystems	Groups of species (species richness and assemblages of species), biological diversity	Construction of Pioneer Wharf Extension and Northern Export Corridor	Pile driving foundations into sea bed	Underwater noise from piling disturbance to marine species	Ocean	Disturbance to marine species			A	2	Moderate (3)	Work methods developed to minimise impacts. Appropriate noise monitoring.	A	2	Moderate (3)
Construction	Sea	Marine environmental quality	Quality of the after, sediment and biota	Construction of Pioneer Wharf Extension and Northern Export Corridor	General construction activities	Accidental spill of oil, fuel from crane, equipment or machinery	Ocean	Potential loss of marine species and habitat			D	2	Low (5)	Spill immediately cleaned with booms and skimmers. Spill kits will be maintained for both land and marine environmental spills. Water sampling undertaken following spill and clean up.	D	2	Low (5)
Operation	Sea	Marine ecosystems	Quality of the after, sediment and biota. Ecosystem health condition	Operation	Operation of the Northern Export Corridor wharf conveyor	Spill of manganese product from conveyor affecting marine ecosystems	Marine environment	Covering sea bed biota, contamination of ground or ocean		There is limited available information surrounding the aquatic ecology of Winchelsea Island and the Project area. There is however, an aquatic study conducted by Australian Institute of Marine Science (AIMS) for the whole of the Groote archipelago region. This would provide robust baseline for reference sites for future studies" in Aquatic ecology section	D	2	Low (5)	Spill immediately cleaned, SOP developed for loading conveyor and spill or over piling preventative measures in place.	D	2	Low (5)
Construction	Sea	Marine environmental quality	Cultural and spiritual values	Construction of Pioneer Wharf Extension and Northern Export Corridor	General construction activities, sedimentation, dust, spills of hydraulic fluids	Disturbance to protected area of reserve, including Indigenous Protected Areas	Ocean	Impact to protected area of reserve, including Indigenous Protected Area		The area of the proposed jetty extension is the site of an existing barge landing/ boat ramp. This site was chosen as it has the least coral and seagrass assemblages (Indopacific Environmental, 2019). No surveys have been undertaken for the floating jetty and wharf site	A	3	High (2)	Remain in approved mining footprint and surveyed area. The area of the proposed jetty extension is the site of an existing barge landing/ boat ramp. This site was chosen as it has the least coral and seagrass assemblages (Indopacific Environmental, 2019). No surveys have been undertaken for the floating jetty and wharf site	A	2	Moderate (3)
Construction	Sea	Marine ecosystems	Conservation significant marine and coastal fauna and critical habitat such as nesting, breeding or foraging habitat	Construction of Pioneer Wharf Extension and Northern Export Corridor	General construction activities	Light pollution impacting marine migratory species and nesting movements	Airborne	Marine fauna - Turtles and Shorebirds			C	3	Moderate (4)	Lighting will be designed to minimise upwards light spill. This will include the use of towers designed to a minimum height, positioning of towers to adequately illuminate working areas and directional shields attached to lamps to minimise horizontal and upwards spill. Limit the use of lighting along the beach to minimise impact on marine turtle that may nest near the Project area.	D	2	Low (5)
Operation	Sea	marine ecosystems	The quality of water close to coastal area	Operation	Failure of conveyor belt - Northern Export Corridor wharf conveyor	Accidental spill of processed manganese	Ocean, coastal area	Pollution of water			C	4	Low (6)	SOP produced for loading conveyor and spill or over piling preventative measures in place. Conveyor to be maintained on a regular basis.	D	3	Low (5)

Inherent risk graph



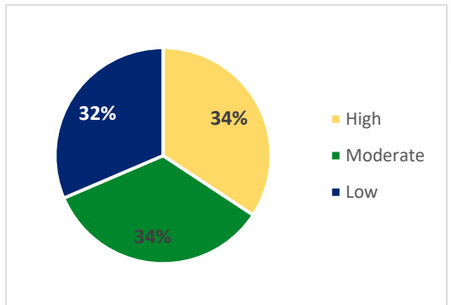
High	Moderate	Low
67	11	26

104



High	Moderate	Low
20	16	18

54



High	Moderate	Low
12	12	11

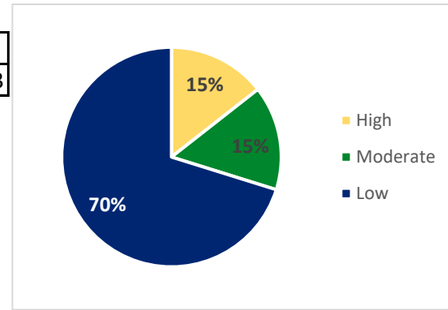
35

Residual Risk

Winchelsea Island Mining

High	Moderate	Low
15	16	73

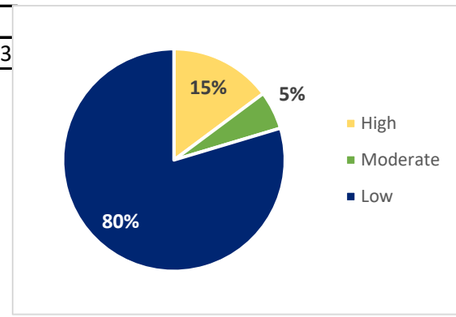
104



Little Paradise area

High	Moderate	Low
8	3	43

54



Pioneer Wharf Extension and Northern Export Corridor

High	Moderate	Low
6	8	21

35