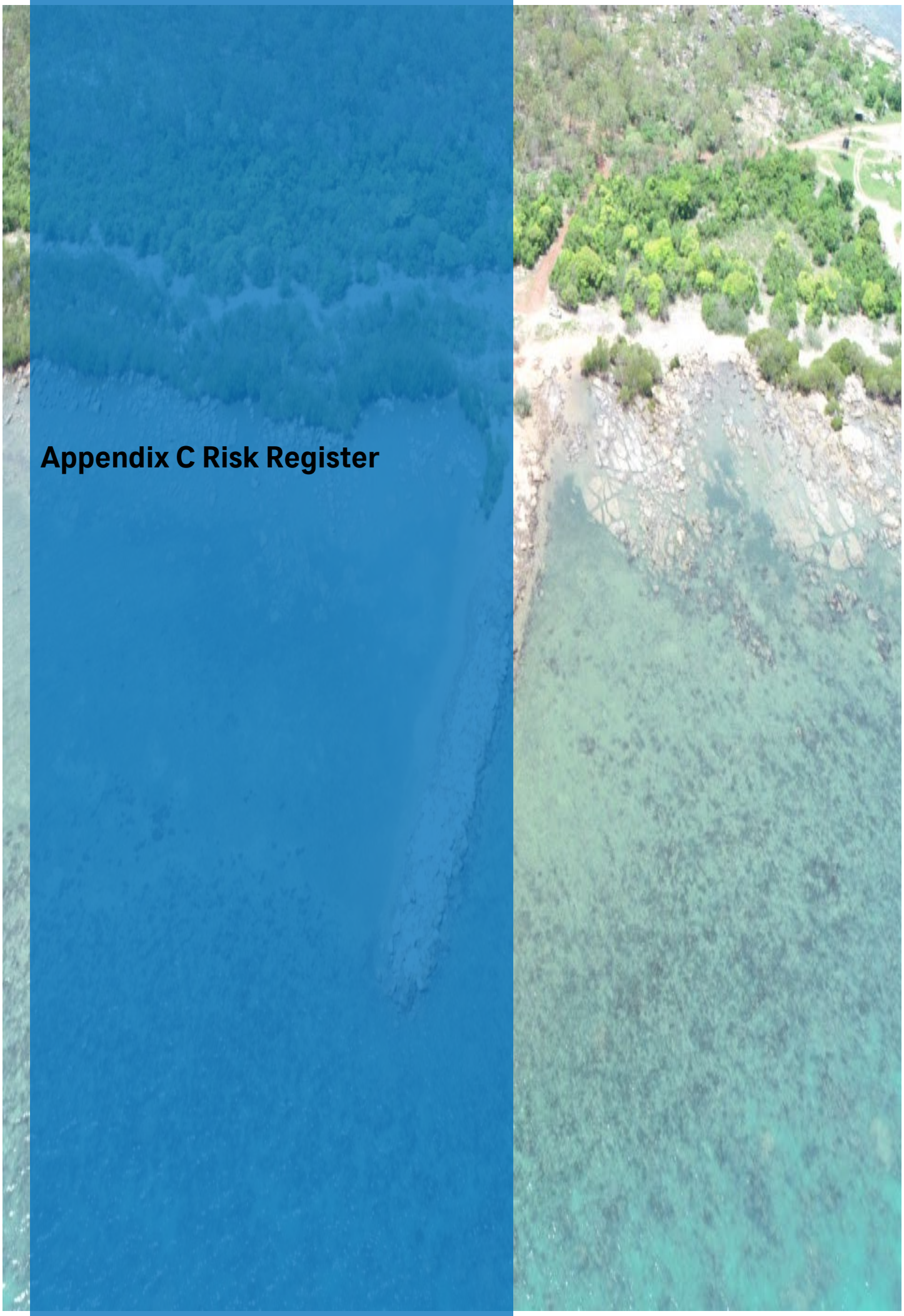


Appendix C Risk Register

Risk Analysis Matrix

Likelihood	Consequence				
	(1) Insignificant	(2) Minor	(3) Moderate	(4) Major	(5) Significant
(A) Almost certain	High (15)	High (10)	Extreme (6)	Extreme (3)	Extreme (1)
(B) Likely	Moderate (19)	High (14)	High (9)	Extreme (5)	Extreme (2)
(C) Possible	Low (22)	Moderate (18)	High (13)	Extreme (8)	Extreme (4)
(D) Unlikely	Low (24)	Low (21)	Moderate (17)	High (12)	Extreme (7)
(E) Rare	Low (25)	Low (23)	Moderate (20)	High (16)	High (11)

	Lower Range Value	Upper Range Value
Extreme	1	8
High	9	16
Moderate	17	20
Low	21	25

Consequence Classification

NT EPA Themes and Factors		Consequence				
Theme	Factors	(1) Insignificant	(2) Minor	(3) Moderate	(4) Major	(5) Significant
Land	Terrestrial Environmental Quality	Negligible impact to isolated area.	Contained low impact, not impacting on any environmental values of soil or land.	Uncontained impact, able to be rectified in short-term without causing pollution or contamination to soil or land.	Extensive hazardous impact on an environmental value requiring long-term remediation of soil or land.	Uncontained hazardous impact with residual effect, even with long term remediation of soil or land.
	Terrestrial Ecosystem	Alteration or disturbance to an isolated area that is unlikely to affect the habitat, species or ecosystem functioning.	Alteration or disturbance to less than 5% of a specific terrestrial habitat, species or ecosystem functioning in a regional context, resulting in a minor, recoverable impact within 1 year.	Alteration or disturbance to 5-30% of a specific terrestrial habitat, species or ecosystem functioning in a regional context, resulting in a moderate, recoverable impact within 1-2 years.	Alteration or disturbance to 30-70% of a specific terrestrial habitat, species or ecosystem functioning in a regional context, result in a major, recoverable impact within 3-10 years.	Alteration of more than 70% of a specific terrestrial habitat, species or ecosystem functioning resulting in an extinction or permanent change or reduce threshold level below 30%. Recovery, if possible is greater than 10 years.
Water	Hydrological Processes	Negligible impact to hydrological processes in Project area (surface or groundwater) and no consequence to the use of water.	Contained low impact to hydrological processes within or outside Project area (surface or groundwater) with minor recoverable impact within 1 year.	Uncontained impact to hydrological processes that will affect the use of the water including outside the Project area but can be remediated in the short-term (1-2 years).	Extensive impact to hydrological processes that will affect the use of the water including outside the Project area and requires long-term remediation (3-10 years).	Uncontained hazardous impact to hydrological processes with residual effect, even with long-term remediation (greater than 10 years).
	Inland Water Environmental Quality	Negligible impact to water quality (surface or groundwater) in Project area and no consequence to the human or ecological uses of the water.	Contained low impact to water quality (surface or groundwater) within or outside the Project area with minor recoverable impact within 1 year.	Uncontained impact to water quality that will affect the human or ecological use of the water including outside the Project area but can be remediated in the short-term (1-2 years).	Extensive impact to water quality that will affect the human or ecological use of the water including outside the Project area and requires long-term remediation (3-10 years).	Uncontained hazardous impact to water quality with residual effect, even with long-term remediation (greater than 10 years).
	Aquatic Ecosystems	Negligible impact to aquatic ecosystems through quality or flow changes in Project area, but unlikely to affect the habitat, species or ecosystem functioning.	Contained low impact to aquatic ecosystems through quality or flow changes within or outside the Project area, with minor recoverable impact within 1 year.	Uncontained impact to aquatic ecosystems through quality or flow changes, with moderate consequence to habitat, species or ecosystem functioning including outside the Project area but can be remediated in the short-term (1-2 years).	Extensive impact to aquatic ecosystems that will affect the species or ecosystem functioning including outside the Project area and requires long-term remediation (3-10 years).	Uncontained impact to aquatic ecosystem with residual effect, even with long-term remediation (greater than 10 years).
Sea	Coastal Processes	Negligible impacts to coastal processes through flow and physical changes in the Project area with no adverse impacts to coastal environmental values.	Contained low impact to coastal processes through flow and physical changes within or outside the Project area, with minor recoverable impact within 1 year.	Uncontained impact to coastal processes through flow and physical changes outside the Project area, with moderate recoverable impact in the short-term (1-2 years).	Extensive impact to coastal processes through flow and physical changes outside the Project area, which requires long-term remediation (3-10 years).	Uncontained impact to coastal processes with residual effect, even with long-term remediation (greater than 10 years).
	Marine Environmental Quality	Negligible impact to water quality, sediment and biota in Project area and no consequence to the human or ecological uses of the water.	Contained low impact to water quality, sediment and biota within or outside the Project area with minor recoverable impact within 1 year.	Uncontained impact to water quality, sediment and biota that will affect the human or ecological use of the water including outside the Project area but can be remediated in the short-term (1-2 years).	Extensive impact to water quality, sediment and biota that will affect the human or ecological use of the water including outside the Project area and requires long-term remediation (3-10 years).	Uncontained hazardous impact to water quality, sediment and biota with residual effect, even with long-term remediation (greater than 10 years).
	Marine Ecosystems	Negligible impact to marine habitats through quality or flow changes in Project area, but unlikely to affect the habitat, species or ecosystem functioning.	Contained low impact to marine habitats through quality or flow changes within or outside the Project area, with minor recoverable impact within 1 year.	Uncontained impact to marine habitats through quality or flow changes, with moderate consequence to habitat, species or ecosystem functioning including outside the Project area but can be remediated in the short-term (1-2 years).	Extensive impact to marine ecosystems that will affect the species or ecosystem functioning including outside the Project area and requires long-term remediation (3-10 years).	Uncontained impact to marine ecosystem with residual effect, even with long-term remediation (greater than 10 years).
Air	Air Quality	Negligible impacts on air quality within Project area with no impacts to human health or environmental values (air, land, water, or marine).	Contained low impact to air quality within or outside Project area with minor recoverable impact within 1 year.	Uncontained impact to air quality that will affect human health or environmental values including outside the Project area but can be remediated in the short-term (1-2 years).	Extensive impact to air quality that will affect human health or environmental values including outside the Project area and requires long-term remediation (3-10 years).	Uncontained hazardous impact to air quality with residual effect, even with long-term remediation (greater than 10 years).
	Atmospheric Processes	Net zero greenhouse gas emissions (GHG), considering mitigation of emissions and emissions offsets.	Scope 1 and 2 emissions contribute up to 0.025% of the NT GHG inventory.	Scope 1 and 2 emissions contribute up to 0.050% of the NT GHG inventory.	Scope 1 and 2 emissions contribute up to 0.075% of the NT GHG inventory.	Scope 1 and 2 emissions contribute 0.10% or greater of the NT GHG inventory.

People	**Community and Economy**	Incident with or without minor injury. No impact on human health or very minor short term inconvenience or symptoms OR Adverse or positive local social or economic implications that are brief or periodic.	Injuries requiring first aid treatment. Minor short term inconvenience or symptoms to human health OR Adverse or positive local or regional, social or economic implications that last for 1 year.	Injury or illness requiring medical treatment. Short term or reversible disabling effect (impairment) to human health OR Adverse or positive local or regional, social or economic implications that last for 1-2 years.	Injuries requiring hospitalisation. Serious long term or permanent disabling effects on human health Adverse or positive local, regional or territory-wide, social or economic implications that last for 3-10 years.	Loss of life / fatality or long term or permanent disabling effects on human health Adverse or positive local, regional territory-wide or national, social or economic implications that last for greater than years.
	Culture and Heritage	No identifiable impact on Indigenous or Non-Indigenous Heritage Sites within the Project area AND/OR no impact to cultural values.	Partial removal of one or more Indigenous or Non-Indigenous archaeological sites on a specific landform within the Project area AND/OR minor temporary (<1 yr) impacts to cultural values.	Complete removal of one or more Indigenous or Non-Indigenous archaeological sites on a specific landform within or outside the Project area AND/OR moderate short-term (1-2 yr) impacts to cultural values.	Complete or partial removal of multiple Indigenous or Non-Indigenous archaeological sites on different landforms within or outside the Project area AND/OR major long-term (3-10 yr) impact to cultural values.	Complete or partial removal of multiple Indigenous or Non-Indigenous archaeological sites on all landforms across and surrounding the Project area AND/OR major long-term (>10 yr) impact to cultural values.
	Human Health	Incident with or without minor injury. No impact on human health or very minor short term inconvenience or symptoms.	Injuries requiring first aid treatment. Minor short term inconvenience or symptoms to human health.	Injury or illness requiring medical treatment. Short term or reversible disabling effect (impairment) to human health.	Injuries requiring hospitalisation. Serious long term or permanent disabling effects on human health.	Loss of life / fatality or long term or permanent disabling effects on human health.

Level of Certainty

Control Rank	Description	Guidance
C1	Low	Risk ranking is based on subjective opinion or relevant past experiences.
C2	Moderate	Risk ranking is based on similar conditions being observed previously and/or qualitative analysis.
C3	High	Risk ranking is based on testing, high fidelity modelling or simulation, use of prototype or experiments. Analysis is based on verified models and/or data. Assessment is based on an historical basis.

Table 1: Theme: Land - Factors: Terrestrial Environmental Quality and Terrestrial Ecosystem

Inherent Risk									Residual risk					
Risk #	Relevant Factors	Source of Impact	Potential Consequence	Project Phase(s)	Likli	Cons	Risk	Risk	Mitigation & Management	Likli	Cons	Risk	Risk	Level of Certainty	Justification of Certainty and Residual Risk
L-1	TEQ and TE	Vegetation clearing for the Project	**Direct** - Disturbance of a total 10.21 ha of land for the Project leading to loss of 10.21 ha of potential fauna habitat. Fragmentation of a population and/or habitat modification and/or lifecycle disruption and/or impact on the size of a population for flora and terrestrial fauna. Impact to protected sensitive NT terrestrial flora species and their habitat (namely Masked Owl and Northern Quoll). Noting, significant refinements have been made to the Project over the past 12 months to reduce direct vegetation clearing extent and habitat disturbance. Destabilised soils. Potential soil erosion, loss of topsoil and sedimentation (through both water and wind erosive forces). Characteristics of soils, including chemical, physical, biological and aesthetic qualities are degraded in the vegetation clearing area. Resulting in less productive soils and potential impacts (through the abovementioned erosion) on adjacent land. **Indirect or Cumulative** - Increased disturbance and lost productivity of soils in the wider northern Groote Eylandt area due to Project and other minor GHAC developments such as the 2 ha of existing Section 19 developments in the Little Paradise area. The total cumulative clearing of eucalyptus woodland in northern Groote Eylandt is roughly 118.75 ha over the next 10 years. Resulting in reduced local capacity of soils to perform ecological functions and a cumulative increase in erosion contributing to dust and waterway sedimentation.	Construction	A	2	10	High	> Adherence to Ground Disturbance Procedures. > Progressive clearing. > Implement erosion and sediment controls in accordance with site-specific ESCPs. > Implementation of the Threatened Species Management Plan. > Clearly mark limits of clearing. > Avoid land clearing during the Wet Season (Dec-May). > Have a trained fauna spotter on site during clearing operations. > Fauna spotter to check and clear tree hollows prior to clearing. > Limit construction and clearing to times of the year when fauna are least vulnerable (e.g. avoiding breeding period). > All site preparation will be undertaken in accordance with Land Clearing Guidelines (DENR, 2019). > Minimise clearing and disturbance to monsoon vine forest (VMU2; 0.2 ha to be cleared) and mangrove closed forest (VMU1; none to be cleared) that are of cultural and ecological significance. > Retain hollow logs and woody debris piles to provide den sites for northern quolls and refuges for other fauna following clearing. > Avoid clearing in dense vegetation along drainage lines, wetland areas, outer margins of sandstone habitats and monsoon forests.	C	2	18	Moderate	C3	High. Clearing minimised as far as practical with refinements to the Project over the past 12 months based on ecological surveys. Clearing areas will be marked out prior to any clearing activities. Communication with employees and contractors. Low chance of habitat fragmentation due to widespread vegetation within the region and colocating disturbance footprints. Adherence to ESCP controlled developed in accordance with IECA international standards is widely accepted as preventing or limiting offsite impacts from soils destabilisation and erosive factors.
L-2	TEQ and TE	Poor water quality runoff	**Direct** - Primary contaminant of concern in runoff is sediment, thus resulting in increased turbidity of drainage lines and marine coastal areas. This could result in poor quality drinking water for fauna and sedimentation of riparian environments for which terrestrial fauna inhabit. Habitat modification and/or lifecycle disruption and/or impact on the size of a population (flora and/or terrestrial fauna). Contamination of soil and groundwater medium. Alteration of soil characteristics, including chemical, physical, biological and aesthetic qualities. Lost potential for direct species health implication (reduced physical health or mortality). Inability of impacted soils to maintain biological qualities to support standard flora and fauna. **Indirect or Cumulative** - Potential transportation of sediments and material throughout the Project area and external. GHAC has progressed two separate Section 19 developments (total of 2 ha disturbance) adjacent to the Lease 1 and 2 areas. There is potential for cumulative runoff water quality impacts if ESCP measures are not properly implemented or controls maintained. Due to the small size of the Section 19 disturbances, any cumulative impacts are anticipated to be minor; however, due to their proximity to the coast ESCP controls will be important to implement. All other known proposed GHAC developments are outside the local catchment for the Project and unlikely to contribute cumulatively. Biological and human health implications (primary contaminant of concern being microbial from onsite treated effluent disposal). Contamination of downstream environments and groundwater sources resulting in human health risks that would necessitate the prohibition of groundwater as a source of water supply for the Project and potential prevention of recreation and fishing in discrete areas.	Construction Operation	C	2	18	Moderate	> Adherence to Ground Disturbance Procedures. > Progressive clearing. > Implement erosion and sediment controls in accordance with site-specific ESCPs (including monitoring and inspection). > Land Suitability Assessments (LSA) and Site and Soil Evaluations (SSE) are to be prepared for each portion of the development where onsite treatment is proposed. > DIPL review and approval of development specific LSA and SSEs as part of the subsequent development assessment process. > Weekly inspections of freeboard and structural integrity of stormwater management infrastructure > Continued use of ESC, stormwater controls and bunds.	D	2	21	Low	C3	Adherence to ESCP controlled developed in accordance with IECA international standards is widely accepted as preventing or limiting offsite impacts from soils destabilisation and erosive factors, improves certainty. LSA and SSE prior to achieving devleopment consent from DIPL informs the site-specific wastewater treatment and disposal arrangements considering soil capacity and loading. High certainty that such an approach will prevent poor water quality runoff and contamination of groundwater used for human consumption.
L-3	TEQ	Failure of water tanks/pipes/pumps	**Direct** - Water or effluent released from raw or potable water pipes, or the transfer pipes associated with the aquaculture facility potentially causing localised soil or surface water contamination. Loss of native vegetation or habitat causing instability or soils and leading to erosion. Any loss from such an event is anticipated to be minimal due to the small diameter piping proposed to be utilised and the benign contents of the piping systems. **Indirect or Cumulative** - Potential increase in cumulative concentration of sediments within drainage lines and watercourses as a result of any sediment erosion indirectly caused by loss of vegetation from contamination. Increased downstream depositions and siltation impacts. Also, indirect impact of reduced ability for successful revegetation due to loss of topsoils in the location of the release.	Operation	D	2	21	Low	> Aquaculture facility tanks and pipes protected from machinery impact. > Release limiting procedures implemented for aquaculture facility. > Pipelines, pumps and tanks selected for appropriate water capacity. > Engineering standards adhered to for equipment. > Pumps are operated in accordance to supplier specification and operating manuals. > Installation of automated operating alarms to alert of pipe pressure drops. > Weekly inspections for structural integrity, leaks and subsequent maintenance. > Completion of maintenance as per manufacture scheduled recommendations. > Emergency response procedures. > Training and induction including emergency response.	E	1	25	Low	C3	High levels of certainty that there is low potential for pipes and tank ruptures and low consequence of a failure. Based on engineering design. Standard Industry practice.
L-4	TEQ and TE	Erosion of site infrastructure or stockpiles leading to sedimentation	**Direct** - Movement of soil or rock material from site infrastructure contributing to exposed surface and erosions, lack of vegetation, loss of topsoils, inability to re-establish vegetation. **Indirect or Cumulative** - Contribution to exposed ground in the project area and general locality. Diminished complexity and biological integrity of project area and local soils. Potential indirect structure stability issues.	Construction, Operation, Closure	D	2	21	Low	> Implementation of Erosion and Sediment Control Plan (ESCP). > Ongoing and regular inspections of project areas and after rainfall events (as per ESCP). > Avoid land clearing during wet season. > Minimise concentrated flow of surface water and ponding (drain lines, sediment bunds, liners etc). > Revegetation of exposed areas where not proposed to be utilised. > Stable design of landforms. > Construction of project infrastructure with suitable materials.	D	1	24	Low	C2	Moderate level of certainty as the site contains soils that are potentially dispersive and may be susceptible to erosion under certin conditions. Howevr, adherence to ESCP controlled developed in accordance with IECA international standards is widely accepted as preventing or limiting offsite impacts from soils destabilisation and erosive factors, improves certainty.

L-5	TEQ and TE	Release of hazardous chemicals or materials during storage and handling onsite.	**Direct -** Direct impact to soil quality and indirect impact to waterways through overland flows. Contamination of immediate surrounding environment, potential destruction of vegetation, loss of biodiversity, ecological integrity and ecological functioning in the area of impact. Alteration of soil and ecological characteristics, including chemical, physical, biological and aesthetic qualities. Potential direct mortality of flora and fauna that come into contact with the released chemical. Hazardous material storage for the project will be very limited. Discrete minor storages may occur at the following sites: > Marine (vessel refuelling), > Logistics camp (for vehicle maintenance activities and fuel), > Aquaculture facility (packaged cleaning chemicals). **Indirect or Cumulative** - Indirect spread of chemicals throughout the environment through indiscriminate or unknown movement and spills of minor hazardous chemicals could occur with improper storage and use.	Construction, Operation	D	2	21	Low	> Design, storage and handling of hazardous materials to Australian Standards and regulations. > No facility in the project will include major hazardous chemical storage. > Any storage or fuel (diesel) will be in double bunded vessels contained, in a protected area (e.g. bollarded) and with an external bund capacity of 1.5 times the volume of the vessel. > Regular maintenance of storage facilities. > Ensure containment bunding and MDSDs available. > Weekly inspections of storage areas, tanks, containers. > Develop Emergency Response Plan and include in inductions. > Weekly inspections of storage areas for leaks or damages. > Spill kits available around the site and procedures and training for the cleaning up of hazardous spills. The spill kit for the marina will include a floating boom. > Spills will be cleaned immediately. > All vehicles, plant and equipment will be maintained in good working order (e.g. regular servicing) and operated as intended. > Any refuelling trucks will carry a spill kit capable of containing any spills. > Appropriate spill response equipment will be located at all refuelling and liquid chemical storage locations including containment and recovery equipment. > In the event of a spill, work will be shut down at the spill site. > Material contaminated as a result of a spill (e.g. soil or solid absorbent) must be removed (i.e. excavated or cleaned up) and placed in an appropriate container or taken off site to prevent further contamination. > An accredited chemical waste contractor will be engaged to dispose of the material and to provide copies of Waste Transport Certificates and Certificates of Disposal for each consignment.	E	2	23	Low	C3	Highly unlikely for major spill as well tested industry standards used and all other hazardous chemicals will be minor quantities of packaged substances (e.g. cleaning supplies, oils and greases for vehicle maintenance). While minor spills that are easily contained and cleaned are possible, there is high certainty that large spills are unlikely based on limited storage and use proposed for the project, and established standard operatig procedures for handling and storage of these substances. Weekly inspections will ensure any minor leaks or spills are contained and cleaned up preventing larger spills.
L-6	TEQ and TE	Release of hazardous chemicals or materials during transportation to site.	**Direct -** Contamination of soil and water. Contamination of surrounding environment, potential destruction of vegetation, loss of biodiversity, ecological integrity and ecological functioning in the area of impact. Alteration of soil and ecological characteristics, including chemical, physical, biological and aesthetic qualities. Potential direct mortality of flora and fauna that come into contact with the released chemical. **Indirect or Cumulative -** Indirect spread of chemicals throughout the environment through indiscriminate or unknown movement of soils (e.g. on vehicle tyres) or in downstream drainage line.	Construction, Operation	D	2	21	Low	> Standard pre-requirements for contractors (must meet standard requirements and licencing). > Appropriate site access for large vehicles and vessels. > Ensure transportation contractors undertake standard pre-departure checks. > All external operators to complete induction that includes transportation safety considerations. > Emergency management plan, spill response for transport incidents on site.	E	2	23	Low	C3	Highly unlikely for major spill to occur as well tested industry standards are used and the project will not be requiring the transport of significant volumes of hazardous chemicals.Only small packaged chemicals will be required. High levels of certainty that large spills are unlikely.
L-7	TEQ and TE	Production of waste and inappropriate storage of the waste onsite.	**Direct -** Where inappropriate storage vessels and management are used there is potential to increase pest fauna and feral/predator species (i.e. dingoes, cats) causing reduction in native wildlife population. This could directly increase native fauna mortality in the local area. Contamination of soil in the area proximal to the domestic waste receptacle where inappropriate storage vessels and management is used. Alteration of soil characteristics, including chemical, physical, biological and aesthetic qualities. Aesthetic qualities of the land are degraded due to the disposal of waste in the area. Currently there are two open tips on Groote Eylandt which convert waste to landfill. These are managed by the mining company South32 who are planning on closing the current dry tips and rehabilitate the land as the South32 mine is decommissioned. It is understood the ALC are investigating long-term options and the project facilities will utilise the existing waste facilities until the long-term solution is available. **Indirect or Cumulative** - Indirect spread of chemicals and/or living organisms (e.g. bacteria - *E.coli*) throughout the environment through indiscriminate or unknown movement of contaminated soils (e.g. on vehicle tyres or wind) or via downstream drainage lines.	Construction, Operation	C	2	18	Moderate	> Secure dustbin lids. > Establish dedicated hardstand at each commercial project site to for waste receptacles. > Weekly inspections of waste areas and general tidiness of sites. > Design and construct wast collection areas in accordance with relevant standards. > Segregation of general waste and recycling of waste where possible. > Adhering to disposal licence conditions.	D	2	21	Low	C3	Low probability as inert rubbish is continually managed and the waste collection areas will be small/contained. Waste area for the commercial facilities will be impervious.
L-8	TEQ and TE	Use of project machinery, equipment, vehicles and activities causing fire through sparks or heat ignition source.	**Direct -** Damage to existing fauna habitat, including areas that potentially provide for listed threatened flora or fauna species. Direct mortality for flora and fauna. Damage to topsoil composition and vegetation binding soils. Thus, resulting in the increased ability for soils to erode and disperse. Also, potential contamination of soils due to fire extinguishers (depending on where it happens) and material consumed by the fire which could adversely affect the establishment of vegetation and success of rehabilitation. **Indirect or Cumulative** - Indirect loss of nutrients from topsoil dispersal and reduced viability of soils to re-establish vegetation, leading to potential introduction or spread of weeds. Potential increase in cumulative concentration of sediments within the downstream watercourse as a result of any sediment discharged. Increased downstream depositions and siltation impacts. Also, indirect impact causing reduced ability for successful revegetation due to loss of topsoils.	Construction, Operation	C	2	18	Moderate	> Incorporate fire breaks into the design of each development area for the project. > In consultation with the ALC Rangers, establish a fire management regime in and surrounding the project area that manages loads and controls bushfire intensity. > Establish hot work procedures. > Regular inspections sources of heat/power. > Fire prevention equipment such as reels and extinguishers will be provided and validated in specified areas on site. Smoking and hot works will only be permitted in designated areas, clear of any flammable material or vegetation. > Emergency contact numbers will be given to all contractors during site induction and displayed once common areas are established. > Training and inductions include Emergency Response Plan.	D	2	21	Low	C3	High. Based on similar conditions. Adherence to the hot works procedures and implementation of the standard management actions listed.

L-9	TEQ and TE	Dust generation from project activities such as vehicular movements, stockpiled soil and earthworks.	**Direct** - Dust emissions impact upon onsite and surronding vegetation, human and fauna health. Loss of productive topsoil inhibiting growth potential of retained media. **Indirect or Cumulative** - Potential cumulative dust lift-off and deposition in the wider area in conjunction with surrounding activities. Potential increase in cumulative concentration of sediments within the adjacent drainage line as a result of any sediment discharged. Increased downstream depositions and siltation impacts into Bartalumba Bay. Also, indirect impact causing reduced ability for successful revegetation due to loss of topsoils.	Construction, Operation	C	2	18	Moderate	> Dust suppression around site (e.g., water cart spraying). > Implement the ESCP. > Progressive clearing. > Avoid clearing on windy days. > Visual monitoring and individual assessment of dust emissions prior to undertaking tasks or attending work areas. > Speed limits for vehicle movements. > Stockpiled soil will be appropriately stabilised to minimise dust generation.	C	1	22	Low	C3	Controls are industry standards and easily implemented.
L-10	TEQ and TE	Noise and vibration emissions from construction and operational activities (e.g. vehicle movements and blasting).	**Direct -** Ground vibration from material dropping or large vehicle movements could have an adverse impact on local fauna and residents in proximity to northern Little Paradise. Change in fauna behaviour due to noise emissions including behavioural change. **Indirect or Cumulative** - Potential increase in cumulative impacts on humans and fauna from other activities in the northern Groote area.	Construction, Operation	C	2	18	Moderate	> Monitoring of area surrounding high vibration activites for ground instability. > Prioritise movement of equipment, construction and maintenance activities for daytime hours. > Enforcing speed limits to ensure that all operations are operating at the lowest possible noise level to minimise the impacts of noise and vibration upon nearby residents and wildlife. >Mitigate noise by properly maintaining all equipment in accordance with manufacturers specifications. > Where possible, choose the "Buy Quiet" option for the purchase of equipment. > Undertake investigation of noise complaints and implement changes. > Maintenance of equipment/machinery.	C	1	22	Low	C3	The project is generally remote from sensitive receptors and potential impacts from vibrations are easily controlled. However, noise and vibration is a standard emission for such projects and the likelihood of occurrence has been set as such.
L-11	TEQ and TE	Construction and operational activities (incl. vegetation clearing) result in introduction of new weeds and spread of existing weeds into new areas.	**Direct** - Impact of reduced ability for successful revegetation due to weed spread. Impact on native vegetation. Increased fire risk. Reduced foraging and nesting grounds for fauna. **Indirect or Cumulative** - Increased weed species in the area negatively affecting rehabilitation potential and contributing to rehabilitation failure. Cumulatively impacting general terrestrial fauna species abundance and lack of biodiversity.	Construction, Operation	C	2	18	Moderate	> Annual weed mapping (by June each year) to understand nature of the spread of weeds and plan weed control activities accordingly. > Conduct seasonal weed control activities in accordance with the project Weed Management Plan. > Strict adherence to the Biosecurity Management Plan to prevent introduction and spread of weeds. > Weed hygiene procedures - including inspection and wash down of all vehicles and machinery (as per BMP). > Establish and implement appropriate control fire regime for the project area in consultation with ALC Rangers. > Construction material required for site will be inspected prior to entry to site (e.g. any fill material). > No unauthorised plant or vegetative material to be brought to site.	D	2	21	Low	C3	The level of certainty is high for weed control as mitigation measures have been used successfully for weed management.GHAC is well resourced to implement the Weed Management Plan and Biosecurity Management Plan requirements.
L-12	TEQ and TE	Increased density of weed infestations.	**Direct** - Impact of reduced ability for successful revegetation due to weed spread. Impact on native vegetation. Increased fire risk. Reduced foraging and nesting grounds for fauna **Indirect or Cumulative** - Increased weed species in the area negatively affecting rehabilitation potential and contributing to rehabilitation failure. Cumulative impacting general terrestrial fauna species abundance and lack of biodiversity.	Construction, Operation	C	2	18	Moderate	> Annual weed mapping (by June each year) to understand nature of the spread of weeds and plan weed control activities accordingly. > Conduct seasonal weed control activities in accordance with the project Weed Management Plan. > Strict adherence to the Biosecurity Management Plan to prevent spread of weeds. > Establish and implement appropriate control fire regime for the project area in consultation with ALC Rangers.	D	2	21	Low	C3	The level of certainty is high for weed control as mitigation measures have been used successfully for weed management.GHAC is well resourced to implement the Weed Management Plan and Biosecurity Management Plan requirements.
L-13	TE	Artificial light emissions from construction and/or operation of the Project.	**Direct** - Disrupt lifecycle processes of fauna and or impact on the size of the populations. Emissions including artificial light can affect both nocturnal and diurnal animals by disrupting natural behaviour, with intensity and duration of exposure potentially evoking different responses. Impacts from increased light levels include disorientation from or attraction toward artificial sources of light; mortality from collisions with structures; and effects on light-sensitive cycles of species (e.g. breeding and migration for fauna and flowering in plants). **Indirect or Cumulative** - Potential increase in cumulative impact on fauna. An artificial increase in lighting can also influence the abundance and behaviour of predators.	Construction, Operation	C	2	18	Moderate	> Implementation of lighting controls in the Threatened Species Management Plan and the biting Insect Management Plan. > With the exception of safety lighting, lights installed on the marina are to designed to prevent light spill that may influence marine fauna activities to the greatest extent possible. > Vehicles, plant and machinery to be switched off when not in use. > Use of low voltage/wattage light bulbs where possible.	D	2	21	Low	C3	The level of certainty is high as the project will not greatly affect threatened species in the localised area due to light spill.
L-14	TE	Vehicle/machinery interaction with terrestrial fauna	**Direct** - Loss of life or injury to fauna species. **Indirect and Cumulative** - Potential increase in cumulative impact on fauna in conjunction other activities in northern Groote Eylandt.	Construction, Operation	C	2	18	Moderate	> Vehicles not to park on vegetation areas (to prevent hot engines causing wildfire). > Vehicles to remain on designated tracks. > Speed limit to be implemented across the project area. > Inductions include information regarding fauna species. > Vehicles to drive to conditions (e.g. dawn and dusk). > Monitor access roads and, if necessary, review controls.	C	1	22	Low	C2	Moderate certainty that project will not greatly effect threatened species due to direct interactions. Impacts to species are most likely due to direct loss of habitat. Driving behaviour will be enforced by GHAC.
L-15	TEQ and TE	Works causing risk of acid sulfate soils (ASS).	**Direct** - Ground disturbance/clearing may result in risk of oxidation of ASS and subsequent mobilising heavy metals and acidification products. Potential impact to groundwater, surface water, coastal waters and terrestrial fauna and flora. This is highest for activities associated with the marina, logistics base and aquaculture facility. **Indirect and Cumulative** - none noted.	Construction	C	2	18	Moderate	> Implementation of ASS management controls: - training onsite personnel to identify/assess for ASS - treatment options including: * lime treatment of ASS from onshore trenching activities as required * validation of lime treatment effectiveness > Any ASS will be stockpiled on a bunded limestone pad for treatment and until validate effectiveness of treatment if access to wet parking disposal is not possible. > Onshore works will be planned to minimise the amount of time the soil is exposed to the air. >ASS to be used as backfill will be treated and validated before it is used as backfill. > If ASS is encountered, works will cease, and ASS controls implemented prior to works continuing. > Sediment and erosion controls will be implemented as per site-specific ESCPs. > Minimise clearing and limit both the spatial extent of exposed earth and period of exposure.	E	2	23	Low	C3	The level of certainty is high for limiting the risk of intercepting and impacts from encountering ASS.GHAC is well resourced to implement the ASS management controls.

L-16	TE	Activities in the intertidal zone disturbing migratory species and their habitat	**Direct** - Direct loss of migratory species habitat and disturbance due to project activities (e.g., noise emissions). Potential for disturbance and trampling of nests near the marina should terns breed in this location. **Indirect and Cumulative** - Increase in the general disturbance for the northern Groote Eylandt area and reduction of habitat (considered with regard to the separate Winchelsea Mine development)	Construction, Operation	C	2	18	Moderate	> With the exception of the marina and aquaculture discharge, no other direct impacts are to occur in the intertidal areas surrounding the project. > Strict water quality discharge requirements will be adhered to for the aquculture facility water discharges (in accordance with a Waste Discharge Licence). > All disturbances will be minimised where possible and kept within the site boundary. > Clearing will be kept within surveyed area, to approved construction drawings. > An ESCP is to be included in the contractors Construction Environment Management Plan (CEMP) and include measures to prevent erosion, sedimentation and pooling during site preparation and permanently for operations. > Chemical storage will be located away from drainage channels, appropriate bunding and spill response kits maintained. > A weed management plan will be established. > Avoid construction of the marina during tern breeding seasons. If nesting is found to occur around the project area, instigate monitoring during the breeding seasons to identify nesting areas / individual nests and to ensure these areas remain minimally disturbed by operational activities.	D	2	21	Low	C3	With the exception of the marina and aquaculture discharge, the project components have been setback from the coast. The aquaculture facility will be required to adhere to discharge requirements set in a Waste Discharge Licence). As per the ecology reporting, potential impacts to migratory species are anticipated to be minimal. However, modelling of the discharge dillution and spread has not been completed and therefore a low certainty is applied to this risk categorisation.
L-17	TEQ and TE	Compaction of soils	**Direct** - Compaction of soils as a result of machinery and vehicle movement may impact the topsoil and inhibit vegetation growth. **Indirect and Cumulative** - Contribution to wider area of compacted soils in the general locality. Cumulative increase in runoff and decreased infiltration of precipitation.	Construction, Operation	B	2	14	High	> Clearly mark limits of clearing. > All disturbances will be minimised where possible and kept within the site boundary >Only clearing what is absolutely necessary for the portion of the project to be implemented. > Progressive clearing. > Planning and allocation of appropriate rehabilitation media (topsoil and organic matter).	C	1	22	Low	C3	High. Clearing minimised as far as practical with refinements to the Project over the past 12 months based on ecological surveys. Clearing areas will be marked out prior to any clearing activities, progressive clearing employed and rehabilitation of areas cleared and not required for development.

Table 2: Theme: Water - Factors: Hydrological Processes, Inland Water Environmental Quality and Aquatic Ecosystems

Inherent Risk										Residual risk					
Risk #	Relevant Factors	Source of Impact	Potential Consequence	Project Phase(s)	Likli	Cons	Risk	Risk	Mitigation & Management	Likli	Cons	Risk	Risk	Level of Certainty	Justification of Certainty and Residual Risk
W-1	AE	Vegetation clearing for the Project	**Direct** - Disturbance of a total 10.21 ha of land for the Project leading to loss of 10.21 ha of potential fauna habitat. Resulting in destabilised soils, potential erosion, loss of topsoil and sedimentation of local waterways. Alteration of characteristics of water, including chemical, physical, biological and aesthetic qualities are degraded in the vegetation clearing area. Resulting in less productive aquatic ecosystems and potential impacts (through the abovementioned erosion). Potential decreased infiltration during precipitation, increased runoff (quantities and velocities) resulting alterations to drainage line (including scouring and incising). Characteristics of soils, including chemical, physical, biological and aesthetic qualities are degraded in the vegetation clearing area. Resulting in less productive soils and potential impacts (through the abovementioned erosion). **Indirect or Cumulative** - Increased disturbance and lost productivity of surface water features in the wider northern Groote Eylandt area due to project and other minor GHAC developments such as the existing Section 19 developments in the Little Paradise area. Resulting in reduced local capacity of surface water features to perform ecological functions and a cumulative increase in erosion contributing to waterway sedimentation. Sediment runoff into aquatic habitats can cause increased turbidity, decreased oxygen levels, changes in channel morphology and altered sediment composition in substrates. Cumulative or indirectly sediments that runoff due to vegetation clearing could adversely impact downstream marine habitats that support fish populations important to recreational fishing and traditional activities (reduced fish abundance).	Construction Operation	C	2	18	Moderate	> Adherence to Ground Disturbance Procedures. > Progressive clearing and rehabilitation. > Implement erosion and sediment controls in accordance with the site-specific ESCPs. >Only clearing what is absolutely necessary for the portion of the project to be implemented. > Implementation of the Threatened Species Management Plan. > Clearly mark limits of clearing. > Avoid land clearing during the Wet Season (Dec-May). > Have a trained fauna spotter on site during clearing operations. > Fauna spotter to check and clear tree hollows prior to clearing. > Limit construction and clearing to times of the year when fauna are least vulnerable (e.g. avoiding breeding period). > All site preparation will be undertaken in accordance with Land Clearing Guidelines (DENR, 2019).	D	2	21	Low	C3	High. Clearing minimised as far as practical with refinedments to the Project over the past 12 months based on ecological surveys. Clearing areas will be marked out prior to any clearing activities. Communication with employees and contractors. Adherence to ESCP controlled developed in accordance with IECA international standards is widely accepted as preventing or limiting offsite impacts from soils destabilisation and erosive factors.
W-2	AE	Disturbance to sites of conservation and cultural heritage significance through sedimentation or hydrocarbon spills.	**Direct and Cumulative -** Direct and cumulative long-term impact to SOCS and cultural heritage significance and indirect impacts to species that this area of refuge. Impact has the potential to influence water quality and change flow paths.	Construction, Operation	D	2	21	Low	> Project design to ensure water diversion to vegetated areas and are maintained as close to natural flows as practicable. > An ESCP is to be included in the contractors EMP and include measures to prevent erosion, sedimentation and pooling during site preparation and permanently for operations. > Drains will be installed across the site to divert clean surface water to stable land areas and away from the site where soil is exposed. > Part of the site preparation, construction and operation phases, all erosion and sediment control infrastructure will be regularly checked during the wet season for effectiveness and integrity and remediated where systems fail.	D	2	21	Low	C3	Controls are industry standards and easily implemented.

Table 3: Theme Sea - Factors: Coastal Processes, Marine Environmental Quality and Marine Ecosystems

Inherent Risk										Residual risk					
Risk #	Relevant Factors	Source of Impact	Potential Consequence	Project Phase(s)	Likli	Cons	Risk	Risk	Mitigation & Management	Likli	Cons	Risk	Risk	Level of Certainty	Justification of Certainty and Residual Risk
S-1	MEQ and ME	Project vessel activities resulting in underwater noise emissions.	**Direct** - Underwater noise from vessels including vessel engines, onboard machinery and activities on the vessel. could result in: -masking of vocalisations and signals from predators and prey -modification of fauna behaviour (avoidance, attraction and disruption of normal behaviour) -physical injury to fauna from exposure to excessive noise (barotrauma, hearing loss including (TTS & PTS). **Indirect or Cumulative** - Cumulative disturbance impacts to marine fauna disturbance in Bartalumba Bay potentially altering species habits.	Construction, Operation	D	3	13	High	> Personnel trained in marine fauna observation present during construction activities. > All marine fauna interactions and observations will be appropriately recorded and reported to relevant authorities. > Vessel inductions will address marine fauna risks and the required management controls. > Vessels to be operated within the designated and approved speed limit. > Where practicable, adopt a soft start of vessels engines and movement to allow fauna to move away. > Vessel engines maintained as per planned maintenance system. > Ensure compliance with Part 8 of the EPBC Regulations 2000, which includes controls for minimising the risk of collision with marine fauna. specifically: + Apply the following Caution Zones, as per the meaning of Division 8.1 of the EPBC Regulations: − 300 m for whales; − 150 m for dolphins; − 150 for turtles. + When operating a vessel or equipment within a Caution Zone: − Operate the vessel or equipment at a constant speed of less than six knots and minimise noise. − Make sure the vessel or equipment does not drift or approach closer than: - 100 m for whales - 50 m for dolphins, turtles or whale sharks. − If the cetacean, turtle or whale shark shows signs of being disturbed, immediately withdraw (where safe to do so) from the Caution Zone at a constant speed of less than knots. + Post a lookout for cetaceans, turtles and whale sharks while within a Caution Zone. + Not approach, pursue or restrict the movement of cetaceans, turtles or whale sharks.	C	2	18	Moderate	C2	Controls are industry standards and easily implemented.
S-2	MEQ and ME	Poor water quality runoff.	**Direct** - Primary contaminant of concern in runoff is sediment, thus resulting in increased turbidity of intertidal and marine coastal areas of Bartalumba Bay (including mangroves). This could result sedimentation of intertidal environments for which marine fauna inhabit. Habitat modification and/or lifecycle disruption and/or impact on the size of a population (intertidal flora, benthic flora and/or marine fauna). **Indirect or Cumulative** - Potential transportation of sediments and material throughout the Project area and external. GHAC has progressed two separate Section 19 developments (total of 2 ha disturbance) adjacent to the Lease 1 and 2 areas. There is potential for cumulative runoff water quality impacts if ESCP measures are not properly implemented or controls maintained. Due to the small size of the Section 19 disturbances, any cumulative impacts are anticipated to be minor; however, due to their proximity to the coast ESCP controls will be important to implement.	Construction Operation	D	3	17	Moderate	> Adherence to Ground Disturbance Procedures. > Progressive clearing. > Implement erosion and sediment controls in accordance with the site-specific ESCPs (including monirotng and inspection). > Land Suitability Assessments (LSA) and Site and Soil Evaluations (SSE) are to be prepared for each portion of the development where onsite treatment is proposed. > DIPL review and approval of development specific LSA and SSEs as part of the subsequent development assessment process. > Groundwater monitoring for the water supply. > Weekly inspections of freeboard and structural integrity of stormwater management infrastructure > Continued use of ESC, stormwater controls and bunds. > Maximise stormwater runoff pond capacity prior to wet season.	D	2	21	Low	C3	Adherence to ESCP controlled developed in accordance with IECA international standards is widely accepted as preventing or limiting offsite impacts from soils destabilisation and erosive factors, improves certainty. LSA and SSE prior to achieving devleopment consent from DIPL informs the site-specific wastewater treatment and disposal arrangements considering soil capacity and loading. High certainty that such an approach will prevent poor water quality runoff and contamination of groundwater used for human consumption.
S-3	MEQ and ME	Release of hazardous chemicals or materials during storage and handling onsite.	**Direct** - Contamination of marine surface water and sediments. Potential direct mortality impacts to marine and benthic flora and fauna. Adverse impacts to intertidal areas and their ecosystem functioning. **Indirect or Cumulative** - Potential transportation of contaminated sediments and material outside the project area. Resulting in reduced local capacity of the marine environment to perform ecological functions and support biodiversity.	Construction, Operation	C	2	18	Moderate	> Design, storage and handling of hazardous materials to Australian Standards and regulations. > No facility in the project will include major hazardous chemical storage. > Any storage or fuel (diesel) will be in double bunded vessels contained, in a protected area (e.g. bollarded) and with an external bund capacity of 1.5 times the volume of the vessel. > Regular maintenance of storage facilities. > Ensure containment bunding and MDSDs available. > Weekly inspections of storage areas, tanks, containers. > Develop Emergency Response Plan and include in inductions. > Weekly inspections of storage areas for leaks or damages. > Spill kits available around the site and procedures and training for the cleaning up of hazardous spills. The spill kit for the marina will include a floating boom. > Spills will be cleaned immediately. > All vehicles, plant and equipment will be maintained in good working order (e.g. regular servicing) and operated as intended. > Any refuelling trucks will carry a spill kit capable of containing any spills. > Appropriate spill response equipment will be located at all refuelling and liquid chemical storage locations including containment and recovery equipment. > In the event of a spill, work will be shut down at the spill site. > Material contaminated as a result of a spill (e.g. soil or solid absorbent) must be removed (i.e. excavated or cleaned up) and placed in an appropriate container or taken off site to prevent further contamination. > An accredited chemical waste contractor will be engaged to dispose of the material and to provide copies of Waste Transport Certificates and Certificates of Disposal for each consignment.	E	2	23	Low	C3	Highly unlikely for major spill as well tested industry standards used and with the exception of fuel storage at the logistics base and vehicle operations centre, all other hazardous chamicals will be minor quantities of packaged substances (e.g. cleaning supplies, oils and greases for vehicle maintenance). While minor spills that are easily contained and cleaned are possible, there is high certainty that large spills are unlikely based on limited storage and use proposed for the project, and established standard operatig procedures for handling and storage of these substances. Weekly inspections will ensure any minor leaks or spills are contained and cleaned up preventing larger spills.
S-4	CP and ME	Construction of the marina altering coastal processes and impacting the surrounding marine and intertidal environment.	**Direct** - Alteration of coastal processes resulting in increased bed scouring, sand accretion or silt sedimentation in areas surrounding the marina. Direct loss of approximately 6 ha of benthic habitat from the marina footprint. **Indirect or Cumulative** - Increased sediment and sand built up in the Bartalumba Bay area cumulatively with other structures. Cumulative loss of benthic habitat.	Construction, Operation	A	2	10	High	> Design, of marina to minimise sand accretion, wave deflection and scouring. > Implement vessel speed limits in proximity to the marina to limit benthic scouring during operation. > Vessel operating area surrounding the marina restricted to channel and berths	A	1	10	High	C3	Metocean analysis including hydrodynamic modelling shows scouring and accretion from the wharf are almost certain; however, the level of this impact is considered generally insignificant.

S-5	ME	Light emission from project vessels.	**Direct -** Change in fauna behaviour due to light emissions from vessels including: - disrupting nesting turtles - disorientating hatchlings - hatchlings getting caught in vessel light pools with increased predation - attract seabirds and shorebirds **Indirect or Cumulative -** Cumulative disturbance impacts to marine fauna disturbance in Bartalumba Bay potentially altering species habits.	Construction, Operation	C	3	13	High	> Vessel searchlights will only be operated in an emergency situation. > Shielding, where practicable, and/or orienting operational lights (excluding navigational lighting) on vessels to limit light spill to the environment. > Housekeeping measures will be adopted, including requiring all crew to keep shutters on windows closed at night, to limit light emissions from vessels. > The wharf and GHAC vessels utilising the wharf shall be fitted with turtle friendly (low vapour sodium or LED) directional lighting (requirement applies to external lighting only). > Identify highest intensity lights and replace with luminaire types considered appropriate for use near marine turtle nesting habitat. > Minimise direct light spill on the ocean surface by adjusting orientation of lights and installing shielding (on GHAC vessels and the marina).	D	2	21	Low	C2	Controls are industry standards and easily implemented.
S-6	MEQ and ME	Accidental dropping of objects from project vessels resulting from: - Loss of control of suspended loads - Loss of equipment off vessel deck - Largest object - sea container	**Direct -** If an object is dropped overboard, potential impacts would be limited to minor and localised disturbance of the seabed and benthic habitats near the dropped object. Benthic habitat loss.	Construction, Operation	C	2	18	Moderate	> Implementation of approved standards and procedures for outboard lifts, including: - lifting operations to be undertaken by competent personnel - use of appropriate and certified lifting equipment and accessories - preventative maintenance will be undertaken on the key lifting equipment as per manufacturer's specifications - consideration of weather conditions (e.g. no heavy lifts undertaken in severe weather conditions). > All lifting and winching equipment will undergo inspection, testing and certification as per Applicable Laws and Applicable Codes and Standards. > Objects dropped overboard are recovered (if possible) to mitigate the environmental consequences from objects remaining in the marine environment, unless the environmental consequences are negligible, or safety risks are disproportionate to the environmental consequences.	D	2	21	Low	C3	Controls are easily implemented.
S-7	MEQ and ME	Introduction of invasive marine species (IMS) to the project vessels or vessels using marina.	**Direct -** Potential establishment of IMS in the marine environment as a result of the project requires IMS to: - be present on a vector (biofouling on activity vessels and ballast water are considered credible vectors) - be released from the vector - establish in the receiving environment. If established, impact could include localised (seabed and water column near the Operational Area) to widespread impacts, if successfully establishes to new areas. IMS could displace and outcompete local species. Vessels are the most common vector for the translocation of IMS in the marine environment. IMS can be introduced or spread when vessels are mobilised to the operational area, particularly if the vessels originate from international waters with similar water temperatures (e.g. south-east Asia). IMS may be present as biofouling (e.g. adult sessile organisms) on vessel hulls and submersible equipment, and in the ballast water (e.g. as larvae). IMS require suitable habitat to become established in an area; many potential IMS are sessile benthic organisms (e.g. mussels). **Indirect or Cumulative -** Potential indirect adverse impact to the Groote Archipelago fisheries industry.	Construction, Operation and Decommissioning	C	5	4	Extreme	> Compliance with Project's Biosecurity Management Plan. > Vessels operating from the marina will have a suitable anti-fouling coating in accordance with the Protection of the *Sea (Harmful Anti-fouling Systems) Act 2006* (Cth) (as applicable for vessel size, type and class), including: - Marine Order 98 (Marine Pollution – Anti-fouling Systems) including (as required by vessel class): - a valid International Anti-fouling System Certificate.. > Ballast water management will comply with MARPOL requirements (as applicable to class), Australian Ballast Water Management Requirements and *Biosecurity Act 2015*. > Ballast water discharges will comply with the requirements of the Australian Ballast Water Management Requirements, which implements the requirements of the *Biosecurity Act 2015* (Cth) and the International Convention for the Control and Management of Ships' Ballast Water and Sediments (as appropriate for vessel class), including: - no discharge of high-risk ballast water within 12 nautical miles of coastlines, including any ports - maintain a ballast water record system to record the management of all ballast water taken up and discharged - implementation of approved methods of ballast water management - vessel equipped with Ballast Water Management Plan - vessels maintain a Ballast Water Recording System. > Vessels having suitable anti-fouling coating (marine growth prevention system) in accordance with the *Protection of the Sea Act 2006*.	D	3	17	Moderate	C3	Nominated controls are generally standard. The marina will be a small operation and GHAC will implement strict biosecurity measures in consultation with the ALC.
S-8	ME	Marine fauna interaction from project related vessels.	**Direct -** Vessels undertaking construction of the marina and post-construction operations may present a hazard to marine fauna that occur at or near the water surface. Collisions may result in behavioural impacts, physical injury to, or the death of the fauna involved. **Indirect or Cumulative -** Cumulative disturbance impacts to marine fauna disturbance in Bartalumba Bay potentially altering species habits.	Construction, Operation	C	3	13	High	> Personnel trained in marine fauna observation present during construction activities. > All marine fauna interactions and observations will be appropriately recorded and reported to relevant authorities. > Vessel inductions will address marine fauna risks and the required management controls. > Vessels to be operated within the designated and approved speed limit. > Where practicable, adopt a soft start of vessels engines and movement to allow fauna to move away. > Vessel movements will comply with Part 8 of the EPBC Regulations 2000 which includes controls for minimising the risk of collision with marine fauna, specifically: + Apply the following Caution Zones, as per the meaning of Division 8.1 of the EPBC Regulations: − 300 m for whales; − 150 m for dolphins; − 150 for turtles. + When operating a vessel or equipment within a Caution Zone: − Operate the vessel or equipment at a constant speed of less than six knots and minimise noise. − Make sure the vessel or equipment does not drift or approach closer than: - 100 m for whales - 50 m for dolphins, turtles or whale sharks. − If the cetacean, turtle or whale shark shows signs of being disturbed, immediately withdraw (where safe to do so) from the Caution Zone at a constant speed of less than knots. + Post a lookout for cetaceans, turtles and whale sharks while within a Caution Zone. + Not approach, pursue or restrict the movement of cetaceans, turtles or whale sharks.	E	3	20	Moderate	C2	Controls are industry standards and easily implemented.

S-9	MEQ and ME	Loss of hazardous and non-hazardous waste into the marine environment.	**Direct -** Decreases to water quality. Decreases in sediment quality, and impacts to fauna from entanglement and / or ingestion. Accidental release into the marine environment of non-hazardous solid wastes including paper, plastics and packaging, and hazardous solid wastes such as batteries, fluorescent tubes, medical wastes, and aerosol cans may be lost unintentionally to the marine environment, potentially impacting sensitive receptors. Impacts to fauna may result in injury or mortality through entanglement and/or ingestion, however while this would reasonably be expected to impact upon individual animals; no population-scale impacts would credibly occur. **Indirect or Cumulative -** Potential cumulative impacts to marine species than may already be distressed from commercial activity in the norther Groote Eylandt area (e.g., due to GEMCO operations).	Construction, Operation	C	2	18	Moderate	> Standard waste management infrasturcture established at the wharf. > Waste management procedure implemented to reduce the risk of unplanned release of waste to sea from GHAC vessels. The procedure will include standards for: - bin types - lids and covers - waste segregation - bin storage - packaged harmful substances to be propoerly packed, marked, labelled, stowed and secured > Any loss/discharge of harmful materials will be reported to AMSA RCC via a marine pollution report (POLREP). > HSE inductions - cover requirements for waste management, e.g. lable and cover waste skips and bins. > No waste (garbage) discharged to sea.	D	2	21	Low	C3	Controls are easily implemented.
S-10	MEQ and ME	Hydrocarbon and chemical release to the marine environment.	**Direct -** In the event that the spill is not contained on deck or on the marina structure, there would be a release to the marine environment, which would be likely to rapidly disperse and evaporate. Vessels undertaking activities will routinely have a range of chemicals and hydrocarbons onboard, including: - fuel for portable / deck equipment, - hydraulic fluid, - paints and lubricants, - preservation chemicals (corrosion inhibitor, biocides etc.), and - miscellaneous chemicals (e.g. cleaning fluids). Small spills of these may occur when the chemicals/hydrocarbons are in use or from leaks in storage areas. If spilled these liquids may be lost to the marine environment. Localised reduction in water quality / toxicity to marine fauna / flora.	Construction, Operation	D	2	21	Low	> Design, storage and handling of hazardous materials to Australian Standards and regulations. > No facility in the project will include major hazardous chemical storage. > Any storage or fuel (diesel) will be in double bunded vessels contained, in a protected area (e.g. bollarded) and with an external bund capacity of 1.5 times the volume of the vessel. > Regular maintenance of storage facilities. > Ensure containment bunding and MDSDs available. > Weekly inspections of storage areas, tanks, containers. > Develop Emergency Response Plan and include in inductions. > Weekly inspections of storage areas for leaks or damages. > Spill kits available around the site and procedures and training for the cleaning up of hazardous spills. The spill kit for the marina will include a floating boom. > Chemicals and hydrocarbons will be managed in accordance with standard maritime practices as per vessel SOPEP. > Vessels shall be equipped and crewed in accordance with the *Navigation Act 2012* (Cth) and the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* (Cth) (as applicable for vessel size, type and class), including implementing: - Marine Order 91 (Marine Pollution Prevention – Oil), including (as required by vessel class): - A deck drainage system capable of controlling the content of discharges for areas of high risk of fuel/oil/grease or hazardous chemical contamination. - Waste oil storage is available. - Have a valid International Oil Pollution Prevention (IOPP) Certificate. - Have a vessel-specific SOPEP. - Maintain an oil record book. > Inspection and maintenance for all equipment using hydrocarbons and/or chemicals.	D	2	21	Low	C3	While minor spills that are easily contained and cleaned are possible, there is high certainty that large spills are unlikely based on limited storage and use proposed for the project, and established standard operatig procedures for handling and storage of these substances. Weekly inspections will ensure any minor leaks or spills are contained and cleaned up preventing larger spills.

Table 4: Theme Air - Factors: Air Quality and Atmospheric Processes

Inherent Risk										Residual risk					
Risk #	Relevant Factors	Source of Impact	Potential Consequence	Project Phase(s)	Likli	Cons	Risk	Risk	Mitigation & Management	Likli	Cons	Risk	Risk	Level of Certainty	Justification of Certainty and Residual Risk
A-1	AQ	Dust generation from project activities such as vehicular movements, stockpiled soil and earthworks.	**Direct** - Dust emissions impact upon onsite and surronding vegetation, human and fauna health. **Indirect or Cumulative** - Potential cumulative dust lift-off and deposition in the wider area in conjunction with surrounding activities.	Construction, Operation	D	3	17	Moderate	> Dust suppression around site (e.g., water cart spraying). > Implement the site-specific ESCPs. > Progressive clearing and progressive rehabilitation. > Avoid clearing on windy days. > Visual monitoring and individual assessment of dust emissions prior to undertaking tasks or attending work areas. > Speed limits for vehicle movements. > Stockpiled soil will be appropriately stabilised to minimise dust generation.	D	2	21	Low	C3	Controls are industry standards and easily implemented.
A-2	AP	Greenhouse gas emissions from land clearing activities and construction.	**Direct -** Impacts to atmosphere contaminate levels adding to the greenhouse gas emissions from the clearing of 10.21 ha of eucalyptus woodland. **Indirect or Cumulative -** Contribution to the Northern Territories overall emissions and contribution to the greenhouse effect.	Construction	A	1	15	High	> All disturbances will be minimised where possible and kept within the site boundary and approved disturbance footprint. > The Project detailed design is to limit the clearing extent and maximise retention of vegetation within the Project area. > Boundaries will remain within existing fence line and surveyed markers along road easements. > Onsite burning of any material will not be undertaken without appropriate permits and/or supervision by local fire authorities. > Reuse of cleared vegetation on site to be utilised, where possible, to reduce offsite transportation, burning or decomposition (e.g. chipping for erosion control, salvaging for fauna hollows, salvage for local woodworking or cultural purposes etc.). > All vehicles, plant and equipment will be maintained in good working order (e.g. regular servicing) and operated as intended with appropriate emission control equipment. > Selection of energy efficient equipment and vehicles will be preferred where practical, with a life cycle perspective. > Employee inductions to include vehicle operating instructions to reduce fuel consumption (e.g. no prolonged engine idling). > Plant equipment to be switched off when not in operation for periods of more than 30 minutes.	B	1	19	Moderate	C3	Although the oveall GHG contribution from project clearing is minimal, the impact is known with certainty. The certainty of the impact does not change,
A-3	AQ and AP	Diesel particulates, gaseous emissions from machinery, vehicles and generators.	**Direct -** Impacts to atmosphere contaminate levels potentially impacting human health. **Indirect or Cumulative -** Decreased local air quality in association with other activities (e.g., GEMCO power station).	Construction, Operation,	C	2	18	Moderate	> All vehicles, plant and equipment will be maintained in good working order (e.g. regular servicing) and operated as intended with appropriate emission control equipment. > Selection of energy efficient equipment and vehicles will be preferred where practical, with a life cycle perspective. > Employee inductions to include vehicle operating instructions to reduce fuel consumption (e.g. no prolonged engine idling). > Plant equipment to be switched off when not in operation for periods of more than 30 minutes.	D	2	21	Low	C3	While contribution is certain the level of contribution will be minimal and largely insignificant in the local setting. Emissions are predicted to dissipate quickly without offsite human health impacts.
A-4	AQ and AP	Atmospheric emissions from vessels combustion engines impacting on air quality.	**Direct -** Atmospheric emissions from vessels combustion engines and impacting on air quality. Atmospheric emissions from activity vessels can result in deterioration of local air quality, while emissions of greenhouse gas emissions (GHG) can cause an incremental increase in global GHG concentrations. **Indirect or Cumulative -** Decreased local air quality in association with other activities (e.g., GEMCO power station).	Construction, Operation	A	1	15	High	> Atmospheric emissions from vessel combustion engines managed in accordance with standard maritime practice (MARPOL). > Vessels will be suitably equipped and crewed in accordance with the Navigation Act 2012 (Cth), including implementing: - Marine Order 97 (Marine Pollution Prevention – Air Pollution) including (as required by vessel class): - a valid International Air Pollution Prevention (IAPP) Certificate and/or Engine International Air Pollution Prevention (EIAPP) Certificate and/or International Energy Efficiency (IEE) Certificate - a Ship Energy Efficiency Management Plan (SEEMP) - use of incinerators in accordance with Annex VI of the MARPOL Convention - ODS record book - use of low sulphur fuel.	D	2	21	Low	C3	Standard operational requirements for marine vessels.

Table 5: Theme: People - Factors: Community and Economy, Culture and Heritage and Human Health

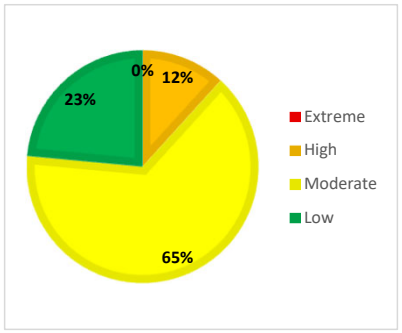
Inherent Risk					Residual Risk					
Risk #	Relevant Factors	Source of impact	Risk	Mitigation & Monitoring	Prob	Cons	Risk	Risk	Level of Certainty	Certainty and Justification of Residual Risk
P-1	CE	Emissions from clearing, dust, noise, artificial light associated with construction and/or operation of the project aspects.	Moderate	> If necessary, vegetation for screening. > Detailed engineering design of infrastructure. > Monitor complaints register. > Dust suppression around site. > Implementation of ESCPs to reduce dust liff-off. > Progressive clearing and progressive rehabilitation. > Avoid clearing on windy days. > Ongoing consultation with surrounding community members to inform of project activities.	D	1	24	Low	C3	High certainty that project will not greatly effect sensitive receptors in the localised area.
P-2	CE and HH	Additional traffic and associated road safety concerns.	High	> Schedule delivery's at staged times so road is not inundated with trucks. > Increase road safety signage. > GHAC to undertake ongoing consultation with the local community > Move project equipment via the Little Paradise marina once constructed to avoid residential and higher traffic areas.	C	2	18	Moderate	C2	Moderate certainty. Similar conditions. Administrative Controls. Implementing thorough road safety planning and administration of traffic will reduce the risk of traffic and accidents and therefore moderate residual risk is expected.
P-3	CE	Influx of workers to the local community seeking housing	Low	> Recruit locally from within existing labour pool and local community. > Provision of a Project specific accommodation camp.	D	1	24	Low	C3	High certainty. Administrative controls and inclusion of accommodation within the project.
P-4	CE and HH	Influx of workers to the local community in general	Low	> Recruit locally from within existing labour pool and local community. > Induction and traininf of staff involved in the project is to include GHAC and community expectation. > Establish a complaints and feedback register. > Establish clear mechanisms for ongoing stakeholder engagement.	D	1	24	Low	C2	Moderate. Similar conditions. Administrative Controls.
P-5	CE	Increased demand for local services and supplies	Moderate	> Acquire any additional services on commercial terms. > Local, Indigenous and Groote Archipelago-based service providers will be used with priority.	B	3	9	High	C2	Moderate certainty. Similar conditions. Administrative Controls.
P-6	CH	Disturbance of sites/objects of heritage significance heritage items or places and sacred sites.	Low	> Upfront and ongoing engagement and survey over the Project area with the TOs regarding Aboriginal Sacred Sites. > Consultation with AAPA and authority certificate application. > Adherence to ground disturbance/clearing procedures. > In the event that potential archaeological sites are discovered, all works in the immediate area should cease and the Heritage Branch and ALC will be contacted for instructions.	E	2	23	Low	C3	High certainty. Based on cultural heritage study involing surveys, and granted AAPA authority certificate.
P-7	CE	Interactions with other marine users from the movement of project-related vessels.	Moderate	> Ongoing stakeholder consultation with relevant stakeholders (including applicable notifications) to to minimise adverse impacts on other marine users. > Implementation of precautionary zones around the marina to mitigate against adverse interactions. > Engagement with local stakeholder that are marine users. > Vessels associated with the project will be equipped and crewed in accordance with the *Navigation Act 2012* (Cth) (as applicable for vessel size, type and class), including implementing: - Marine Order 21 (Safety and emergency procedures), including: -safety measures such as manning and watchkeeping. - Marine Order 27 (Safety of navigation and radio equipment), including: - radio equipment and communications -navigation safety measures and equipment - danger, urgency and distress signals and messages. - Marine Order 30 (Prevention of Collisions), including: - lights and signals as applicable to vessel class per COLREGS requirements. - Marine Order 71 (Masters and Deck Officers), including: - all master, mate and watchkeeper officer duties undertaken by crew certified as applicable to vessel class per STWC requirements.	D	2	21	Low	C3	High certainty. Area is a low marine traffic location and the marina component of the project will not significantly increase movements or exacrebate interactions or restrictions on existing users.
P-8	CE	Pressure on resource requirements such as food, water, accommodation and fuel.	Low	> Water onsite will be sourced from a new groundwater supply. > Continual consultation with the key stakeholders (including community organisations) though all phases of the Project. > Gradual development of the project to allow for logistic operators to adjust shipment requirements.	D	2	21	Low	C3	Gradual development of the project is not expected to significantly impact regular supplies to Groote Eylandt.

P-9	CE	Opportunities for suppliers and businesses in the NT region to support the construction and operation of the Project.	High	> Local, Indigenous and Groote Archipelago-based service providers will be used with priority.	A	3	6	Extreme	C3	GHAC procurement prioritisation approach means there is high certainty that positive impacts will be realised in the region.
P-10	CE and HH	Noise and vibration of construction activities impacting the township and local residents.	High	> Noise from clearing and trenching will be kept to minimum intensity and expected to be short. > Noise shall be controlled by constructing predominately during daytime hours and equipment serviced regularly. > The NT EPA Noise Management Framework Guideline (2018) will be followed through out site preparation activities.	D	2	21	Low	C3	High certainty that project will not greatly effect sensitive receptors in the localised area.
P-11	CE and HH	Aesthetic impacts due to visible dust emissions from the project.	Moderate	> Speed limit restrictions will be implemented on site to reduce dust generation. > A water cart will be used to wet frequently used access tracks where possible. > All access tracks will be maintained and the main access to the site will be compacted with gravel.	D	2	21	Low	C3	Controls are industry standards and easily implemented.
P-12	CE and HH	Aesthetics impacts from clearing native vegetation.	Moderate	> Continual consultation with the key stakeholders though all phases of the project. > All disturbances will be minimised and kept within the site boundary. > Clearing will be kept within surveyed area and to approved construction drawings. > Boundaries will remain within existing fence line and established markers.	D	2	21	Low	C2	All project area will include landscaping and retention of vegetation for screening purposes. The location of the project also limits potential aesthetic impacts.
P-13	CH	Cultural heritage sites damaged by dust generation.	Low	> Speed limit restrictions will be implemented on site to reduce dust generation. > A water cart will be used to wet frequently used access tracks where possible. > All access tracks will be maintained and the main access to the site will be compacted with gravel.	E	2	23	Low	C3	Controls are industry standards and easily implemented.
P-14	CH	Unauthorised access damaging cultural and archaeological heritage sites.	High	> If a heritage site or artefact is discovered during clearing activities, all works will cease immediately, and notification provided to ALC and the Heritage Branch under the Heritage Act 2011 (NT) provisions. > Cultural heritage awareness training will be provided to all personnel during site inductions. > No-Go Zones shall be established prior to clearing activities of existing cultural heritage sites. > Restrict site access for Project employees and contractors, no public access or unauthorised personnel.	E	3	20	Moderate	C3	Controls are industry standards and easily implemented.
P-15	CE	Introduction of invasive marine species (IMS) due to the project vessels or vessels using marina.	Extreme	> Compliance with Project's Biosecurity Management Plan. > Vessels operating from the marina will have a suitable anti-fouling coating in accordance with the Protection of the *Sea (Harmful Anti-fouling Systems) Act 2006* (Cth) (as applicable for vessel size, type and class), including: - Marine Order 98 (Marine Pollution – Anti-fouling Systems) including (as required by vessel class): - a valid International Anti-fouling System Certificate.. > Ballast water management will comply with MARPOL requirements (as applicable to class), Australian Ballast Water Management Requirements and *Biosecurity Act 2015* . > Ballast water discharges will comply with the requirements of the Australian Ballast Water Management Requirements, which implements the requirements of the *Biosecurity Act 2015* (Cth) and the International Convention for the Control and Management of Ships' Ballast Water and Sediments (as appropriate for vessel class), including: - no discharge of high-risk ballast water within 12 nautical miles of coastlines, including any ports - maintain a ballast water record system to record the management of all ballast water taken up and discharged - implementation of approved methods of ballast water management - vessel equipped with Ballast Water Management Plan - vessels maintain a Ballast Water Recording System. > Vessels having suitable anti-fouling coating (marine growth prevention system) in accordance with the *Protection of the Sea Act 2006* .	D	3	17	Moderate	C3	Nominated controls are generally standard. The marina will be a small operation and GHAC will implement strict biosecurity measures in consultation with the ALC.
P-16	CE and HH	Spread of disease through biting insects	High	> Setback project infrastructure from biting insect habitat > Implement biting insect controls in accordance with the BIMP which has been guided by NT Health study and recommendations	D	3	17	Moderate	C3	The NT Health study provides good understanding of the species of risk and areas of potenital concern, Controls have been established based on NT Health recommendations.
P-17	HH	Use of project machinery, equipment, vehicles and activities causing fire through sparks or heat ignition source	High	> Incorporate fire breaks into the design of each development area for the project. > In consultation with the ALC Rangers, establish a fire management regime in and surrounding the project area that manages loads and controls bushfire intensity. > Establish hot work procedures. > Regular inspections sources of heat/power. > Fire prevention equipment such as reels and extinguishers will be provided and validated in specified areas on site. Smoking and hot works will only be permitted in designated areas, clear of any flammable material or vegetation. > Emergency contact numbers will be given to all contractors during site induction and displayed once common areas are established. > Training and inductions include Emergency Response Plan.	E	5	11	High	C3	While the liklihood of such an event occuring is significantly reduced by the controls the potential consequence level does not change due to the potential loss of life/fatality. Such a scenario exists with the ignition of any uncontrolled ignition and bushfire during the dry season in the NT. These controls are easily implemented and monitored. Therefore, this is allocated as a high certainty.

P-18	HH	Poor water quality runoff	Low	> Adherence to Ground Disturbance Procedures. > Land Suitability Assessments (LSA) and Site and Soil Evaluations (SSE) are to be prepared for each portion of the development where onsite treatment is proposed. > DIPL review and approval of development specific LSA and SSEs as part of the subsequent development assessment process. > Groundwater monitoring for the water supply.	E	2	23	Low	C3	LSA and SSE prior to achieving devleopment consent from DIPL informs the site-specific wastewater treatment and disposal arrangements considering soil capacity and loading. High certainty that such an approach will prevent poor water quality runoff and contamination of groundwater used for human consumption.
P-19	HH	Diesel particulates, gaseous emissions from machinery, vehicles and generators	Moderate	> All vehicles, plant and equipment will be maintained in good working order (e.g. regular servicing) and operated as intended with appropriate emission control equipment. > Selection of energy efficient equipment and vehicles will be preferred where practical, with a life cycle perspective. > Employee inductions to include vehicle operating instructions to reduce fuel consumption (e.g. no prolonged engine idling). > Plant equipment to be switched off when not in operation for periods of more than 30 minutes.	D	2	21	Low	C3	While contribution is certain the level of contribution will be minimal and largely insignificant in the local setting. Emissions are predicted to dissipate quickly without offsite human health impacts.
P-20	HH	Dust generation from project activities such as vehicular movements, stockpiled soil and earthworks.	Moderate	> Dust suppression around site (e.g., water cart spraying). > Implement the site-specific ESCPs. > Progressive clearing and progressive rehabilitation. > Avoid clearing on windy days. > Visual monitoring and individual assessment of dust emissions prior to undertaking tasks or attending work areas. > Speed limits for vehicle movements. > Stockpiled soil will be appropriately stabilised to minimise dust generation.	D	2	21	Low	C3	Controls are industry standards and easily implemented.

Theme: Land - Factors: Terrestrial Environmental Quality and Terrestrial Ecosystem

Inherent Risk



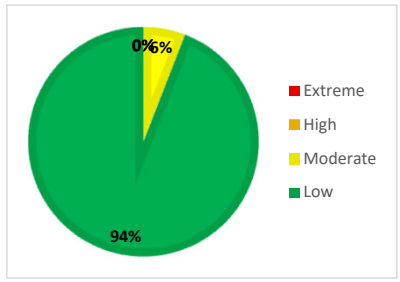
Extreme	High	Moderate	Low
0	2	11	4

Total	17

Residual Risk

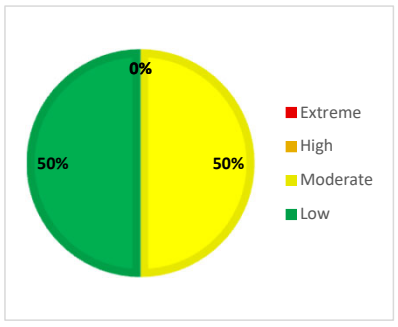
Extreme	High	Moderate	Low
0	0	1	16

Total	17



Theme: Water - Factors: Hydrological Processes, Inland Water Environmental Quality and Aquatic Ecosystems

Inherent Risk



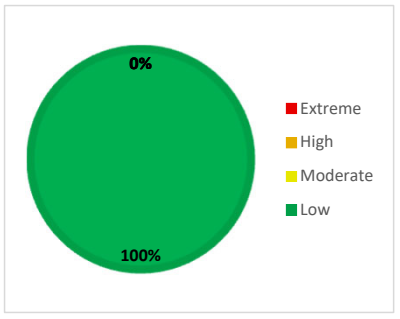
Extreme	High	Moderate	Low
0	0	1	1

Total	2

Residual Risk

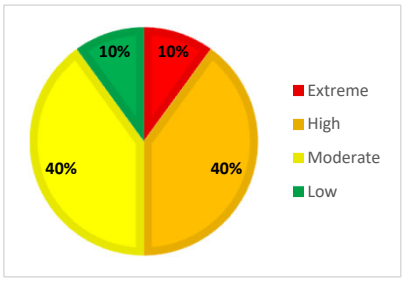
Extreme	High	Moderate	Low
0	0	0	2

Total	2



Theme Sea - Factors: Coastal Processes, Marine Environmental Quality and Marine Ecosystems

Inherent Risk



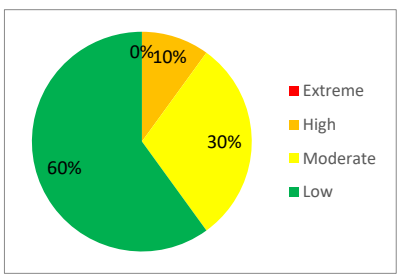
Extreme	High	Moderate	Low
1	4	4	1

Total	10

Residual Risk

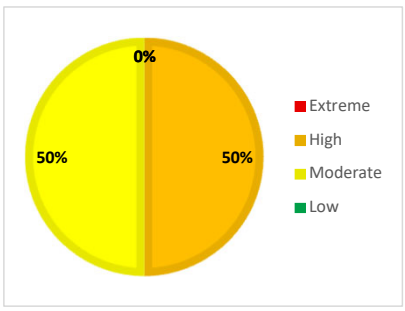
Extreme	High	Moderate	Low
0	1	3	6

Total	10



Theme Air - Factors: Air Quality and Atmospheric Processes

Inherent Risk



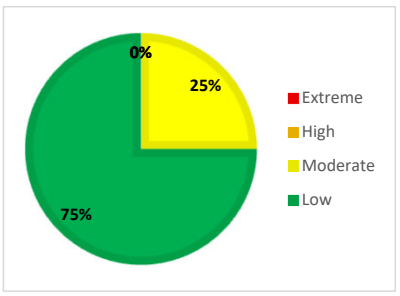
Extreme	High	Moderate	Low
0	2	2	0

Total	4

Residual Risk

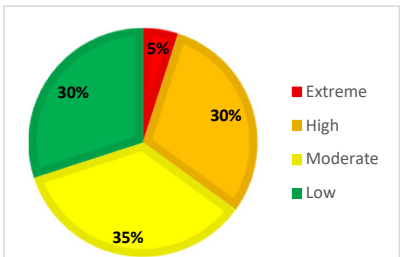
Extreme	High	Moderate	Low
0	0	1	3

Total	4



Theme: People - Factors: Community and Economy, Culture and Heritage and Human Health

Inherent Risk



Extreme	High	Moderate	Low
1	6	7	6

Total	20

Residual Risk

Extreme	High	Moderate	Low
1	2	4	13

Total	20