APPENDIX 6 - Citronen (preliminary) Environmental Management Plan July 2014

1. Project Environmental Management

Objective

- Manage the environmental impacts of the Citronen Project in line with Ironbark environmental management principles and the management measures outlined in this EIA and EMP.

Project activity	Environmental impact	Action	Project stage	Responsibility
Implementation of EMP and EIA	NA	Ironbark will implement the Project in line with the environmental measures detailed in this EIA and EMP	All phases of Project	Ironbark
Contract documents	NA	Environmental management measures detailed in this EMP will be included in relevant contract documents and the technical specification prepared for the Project	All phases of Project	Ironbark, Construction Contractor
Inductions	NA	Environmental issues and management measures will be included in site inductions for Ironbark and contract staff	All phases of Project	Ironbark, Construction Contractor
Internal audits - operations	NA	A system of internal audits will be put in place to monitor compliance with all environmental and compliance operational requirements, including those set out in the EMP. The internal audit system should specify the scheduling, competence of auditors, recording and reporting of audit findings, and corrective actions and their verification.	All phases of Project	Ironbark
Internal audits - EMS	NA	A system of annual internal audits will be put in place to monitor conformance with the elements of Ironbark's EMS. The internal audit system should specify the scheduling, competence of auditors, recording and reporting of audit findings, and corrective actions and their verification.	All phases of Project	Ironbark
Non – compliance register	NA	A register of non-compliance will be kept and regularly updated to include	All phases of Project	Ironbark

		all non-compliances and improvement actions arising from the internal audits		
Environmental incidents register	NA	A system shall be put in place to record, report, correct and verify and environmental incidents on site. These shall be maintained on an environmental impacts register	All phases of Project	Ironbark, Construction Contractor
Training and awareness	NA	Procedures shall be put in place that specify the requirements for training and awareness for all site and other Project personnel to ensure actions specified in the EMP are implemented effectively and efficiently	All phases of Project	Ironbark, Construction Contractor
Compliance with this EMP and relevant legislation.	NA	During the Project, compliance with environmental management measures will be regularly monitored. Any non-conformances will be addressed and improvement actions implemented	All phases of Project	Ironbark

2. Vegetation and Flora

Objectives

- Avoid adverse impacts on biological diversity;
- Maintain the abundance, diversity, geographic distribution and productivity of vegetation communities;
- Protect flora species of particular conservation significance; and
- Avoid introduction and spread of invasive weeds which may have a negative impact on existing vegetation communities.

Project activity	Environmental impact	Action	Project stage	Responsibility
Project planning, mine design	Loss of vegetation	Minimise disturbance by planning infrastructure to have as small a footprint as possible	Pre-construction	Ironbark
Clearing	Loss of vegetation Disturbance of soil layer Loss of fauna habitat	During construction works, clearing of remnant vegetation will be avoided as far as practicable	All phases of Project	Ironbark, Construction Contractor
		No vegetation is to be disturbed for temporary works such as access tracks, spoil areas or site offices		
		Vehicles and equipment will not be parked or driven over vegetation to be retained		
		If useable topsoil is present, conserve it for use in progressive and end of mine rehabilitation		
Introduction of weeds	Minimise the introduction and spread of weeds within and from site.	Clean machinery prior to arriving on site as there will be no wash down facilities available and equipment will not be granted entry if not thoroughly clean	All phases of Project	Ironbark, Construction Contractor
		Machinery and vehicle hygiene measures will avoid the inadvertent spread of weeds throughout the site	All phases of Project	Ironbark, Construction Contractor
		Any weeds encountered on site will be eradicated or controlled using the least toxic methods practicable (i.e. physical or other means of removal before the use of chemicals)	All phases of Project.	Ironbark, Construction Contractor

3. Fauna

Objectives

- Maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge; and
- Protect fauna species of particular conservation significance (such as red list species).

Project activity	Environmental impact	Action	Project stage	Responsibility
Damming of Lake Platinova	Loss of freshwater habitat	Water required for processing will be sourced from dewatering and TSF in conjunction with lake water Monitor water levels monthly. Arctic char health and abundance will be monitored.	Operations	Ironbark
		On closure the embankment will be manipulated as to allow the water to return to natural water level	Rehabilitation	
Construction of port facility	Loss of marine habitat	No action required at this stage as minimal impact anticipated due to small area of disturbance	NA	NA
Shipping in Citronen and Frederick E Hyde fjords	Disturbance to fauna	No action required at this stage as minimal impact anticipated due shipping outside the breeding season of ringed seal and the low frequency of journeys in a three month window	NA	NA
		Sightings of fauna during the journeys will be recorded	Operations	Ironbark, Shipping Contractor
Shipping along north-east coast of Greenland	Disturbance to fauna (in open water and also NEW polynya)	Sightings of fauna during the journeys will be recorded	Operations	Ironbark, Shipping Contractor

Presence of mine	Disturbance to fauna	Prohibit movements of people and vehicles (snowmobiles and All-Terrain Vehicles) outside the Project area during the period March to mid August (i.e. staff should not be allowed to go exploring the area), unless prior management approval has been given	All phases of project	Ironbark
Vehicle/equipment movement, hunting or poaching	Direct fauna mortality	Ensure stipulated speed limits are enforced along roads to minimise the risk of road kills	Construction, Operation, Decommissioning	Ironbark, Construction Contractor
		Ensure that truck drivers and other staff are trained to be aware of animal hazards and how to minimize any negative consequences		
		Ensure that food waste is not left exposed to attract scavengers to site		
		Prohibit poaching of muskoxen and other animals by company employees and contractors, as is regulation in National Parks		
		Native fauna shall not be captured, fed, harmed or disturbed. If fauna relocation is required, the Ironbark environmental representative shall be contacted.		
		Any incidental death or harm to fauna shall be reported in the site incident reporting system		
		Drill holes (or similar) shall be capped after completion of drilling		

4. Watercourses and Surface Water Quality

Objectives

- Maintain the quantity of surface water so that existing environmental values are protected; and
- Ensure the quality of surface water does not exceed regulatory limits, or adversely affect environmental values.

Project activity	Environmental impact	Action	Project stage	Responsibility
Removal of water from Eastern River (to Lake Platinova)	Disruption to Eastern River flow dynamics	No action required at this stage as no impact anticipated due to high natural flow of river (and absence of vertebrate fauna species) Monitor Eastern River water level, flow and water discharge during flows	Operations	Ironbark
	Contamination of Lake Platinova	Water quality of Eastern River will be sampled and analysed in the first weeks prior to pumping. Pumping will only commence once water quality is below agreed guideline limits. Pit dewatering water will be pumped to the river on the downstream side of the Lake to prevent any entering the lake.	Operations	Ironbark
		Monitor arctic char population in Lake Platinova. Determine satisfactory abundance levels. If required introduce arctic char from nearby lakes to supplement the population.	Rehabilitation	Ironbark
Damming of Lake Platinova	Alteration to lake natural levels	Water required for processing will be sourced from dewatering and TSF in conjunction with lake water	Operations	Ironbark
		Monitor water levels monthly		
		Arctic char health and abundance will be monitored		
		On closure the embankment will be manipulated as to return the water level back as close to the original as possible	Rehabilitation	Ironbark
	Removal of discharge channel to Eastern River	The discharge channel between Lake Platinova and Eastern River will be reinstated after operations	Operations	Ironbark

Dewatering from Discovery open pit to Eastern River	Contamination of Eastern River	Monitor volume of dewatering effluent from the pit.	Operations	Ironbark
		Water chemistry is showing insignificant amounts of metal concentrations. Continue geochemical testing of pit water. Analyse pit water prior to dewatering. Investigate alternatives for water disposal should acceptable water quality not be achieved.		
		Melting water will be prevented from entering the pit by construction of diversion drains and pit crest bunding		
Dewatering of underground mines (exposed rock wall may contain sulphides)	Contamination of receiving environment	Water will be pumped from underground to the process plant or direct to TSF. On closure ice backfill and permafrost will prevent ARD formation	Operations	Ironbark
Construction of mine facilities	Interruption to surface water flow	Diversion drains and bunding will be constructed where required to re-direct water flow to Eastern River	Pre-construction, Construction, Operations	Ironbark, Construction Contractor
		Maintain a minimum setback of 50 m from drainage lines for disturbances unless otherwise approved		
		Take water quality samples if potential contaminants are believed to have reached natural drainage channels		
		Ensure no construction material (such as gravel, blue metal) are left in river beds or banks or other watercourses or drainage channels		
Construction of haul roads	Interruption to surface water flow	Culverts will be constructed where natural flows of water need to be maintained	Pre-construction, construction	Ironbark
		Remove culverts at mine closure	Rehabilitation	

5. Air Quality/Dust

Objectives

- Ensure that emissions (particulates) do not adversely affect environmental values or the health, welfare or amenity of people by meeting statutory requirement and acceptable standards.

Project activity	Environmental impact	Action	Project stage	Responsibility
Project feasibility planning and design	NA	Choose vehicles and other equipment based on energy efficiency technologies to optimise emissions rates	Pre-construction	Ironbark
Construction activities, clearing of vegetation	Contamination of environment from deposition of dust. Dust in the mine area contains heavy metals, including zinc and lead.	Construction methods will be employed that will keep dust generation to a minimum, and as required provide for the management of dust by watering the works area, roads and other areas immediately adjacent to the works when possible	Construction, Operation	Ironbark, Construction Contractor
		Clearing will be done as per the agreed Clearing Plan within the construction plan and kept to a minimum. "Blanket" clearing will not be practised.		
Loading and hauling ore and waste		Use water to suppress dust emissions from unsealed roads, stockpiles and work areas when possible	Construction, Operation, Decommissioning	Ironbark, Construction Contractor
Blasting		No physical control of dust is available for blasting due to safety reasons. Blasting will only occur during times when wind conditions are optimal for minimal dust generation.	Construction, Operation, Decommissioning	Ironbark
Crushing		Crushing will be done within a sealed building. Any dust will be filtered with appropriate bag houses equipment.	Construction, Operation, Decommissioning	Ironbark, Construction Contractor
Conveying ore and concentrate		All conveyors will be covered to minimise dust from crushed ore and concentrate	Construction, Operation, Decommissioning	Ironbark, Construction Contractor
Loading concentrate	(cont.)	Concentrate will be loaded using covered conveyors, hatches on cargo	Construction, Operation,	Ironbark,

	Contamination of environment from deposition of dust. Dust in the mine area contains heavy metals, including zinc and lead.	holds and a sock fitted to the telescopic chute which discharges directly to the hold	Decommissioning	Construction Contractor
Tailings facility surface		Maintain thin layer of wet tailings/ice cover through deposition technique to minimise dust blowing off surface	Operations, closure	Ironbark
All other mine activities		Maintain diesel power plant, vehicles and other fuel powered equipment in accordance with manufacture's specifications to minimise on emissions	All phases of Project.	Ironbark, Construction Contractor
		Apply further dust suppression controls where dust levels are deemed excessive		
		No materials (including rubber or plastic products, waste oil or any other waste material) are to be burned unless authorised		
		Dust will be monitored in a regular basis		
		Report any dust levels that are deemed excessive as an environmental event		

6. Greenhouse Gases

Objectives

- Ensure that greenhouse gas emissions do not adversely affect environmental values or the health, welfare or amenity of people by meeting statutory requirements and acceptable standards.

Project activity	Environmental impact	Action	Project stage	Responsibility
The diesel power plant, shipping and vehicles generate carbon dioxide and other greenhouse gases	Increase in Greenland greenhouse gas emissions	Use the best available technique (BAT) to ensure emissions are kept at a minimum possible and reduce energy use through energy efficient practices	All phases of project	Ironbark

7. Noise, Vibration and Light

Objectives

- Ensure that noise levels at Citronen comply with statutory requirements and acceptable (and appropriate) standards;
- Ensure that vibration levels at Citronen comply with statutory requirements and acceptable (and appropriate) standards.

Project activity	Environmental impact	Action	Project stage	Responsibility
Noise disturbance from construction and operation of Project	Local disturbance and displacement from habitats of mammals, fish and birds	During detailed design and sighting of infrastructure avoid disturbance as far as practicable areas with continuous vegetation including wetlands. This can be done by fine-scale mapping of sensitive areas around the waste rock dump, access roads and port.	Pre-construction, Construction, Operation	Ironbark, Construction Contractor
Noise and vibration levels		Ensure equipment is appropriately fitted, maintained or substituted with noise reduction devices if necessary, to comply with Project noise level requirements	Construction, Operation, Decommissioning	Ironbark, Construction Contractor
		Manage activities according to weather conditions and proximity to noise sensitive areas to minimise impact of noise and vibration issues		
		Helicopter travel will be planned taking into account sensitive coastal areas and periods to minimise disturbance		
		Observations of fauna during shipping will be recorded		
		Specific procedures, actions and responsibilities to avoid or minimise impacts on marine mammals and seabirds will be integrated into the EMP in case species are encountered during shipping		
		No significant noise will be generated within five kilometres of a bird cliff if it is occupied by murre (*Uria aalge*), thick-billed murres (*Uria lomvia)*, little auks (*Alle alle*), kittiwakes (*Rissa tridactyla*), northern fulmar (*Fulmarus glacialis)* or great cormorants (*Phalacrocorax carbo*).		

8. Waste Rock Management

Objectives

- Ensure that the post mining landform is safe, stable and is compatible with the intended post mining land use and surrounding environment.
- Ensure that waste is contained and isolated so it does not result in long term impacts on the surrounding environment.

Project activity	Environmental impact	Action	Project stage	Responsibility
Removal of ore and waste rock open pit	Permanent open pit void	Model potential development of pit lake and monitor water quality. Continue geochemical characterisation of pit wall run-off.	Construction, Operation, Closure	Ironbark
		Develop a Waste Rock Management Plan		
Removal ore and waste rock underground	Contamination of environment	Contain most waste rock in mined out section	Operations	Ironbark
		Permafrost will prevent ARD formation		
Construction and maintenance of waste rock dump and DMS rejects dump	Contamination of environment from leachates from waste rock	Construct diversion drains and bunds on the mountain (upper) side of the waste dump to prevent melting water from entering the dump	Construction, Operation	Ironbark, Construction Contractor
		Blend waste rock to prevent ARD formation		
		Continue waste characterisation testing of waste throughout the project to ensure that pre-project testing results and assumptions are valid		
	Potential waste dump slope failure, resulting in mine waste entering Eastern River	Design Waste rock dump to ensure rapid drainage of water	Pre-construction, Construction, Operations, Rehabilitation and Closure	Ironbark
		Construct diversion bund at toe of dump to divert water away from dump edge		
		At closure, batter down outermost slopes from angle of repose to gentler slope of 20°, with berms every 10m vertical height.		
	Aesthetic impact of waste rock dump and DMS Rejects dump	Plan waste rock dump and DMS reject dump to blend as far as practicable possible with surrounding landscape	Pre-construction, Construction, Operations	Ironbark

9. Tailings Storage Facility Management

Objectives

- Ensure that the post mining landform is safe, stable and is compatible with the intended post mining land use and surrounding environment.
- Ensure that waste is contained and isolated so it does not result in long term impacts on the surrounding environment.

Project activity	Environmental impact	Action	Project stage	Responsibility
Construction and operation of tailings pond	Contamination of environment due to seepage from TSF	The TSF will be an enclosed, lined facility that results in no release of seepage to the environment	Construction, Operation, Decommissioning	Ironbark, Construction Contractor
		Construct diversion drain and bunding to prevent melting water from the mountain slope behind the tailings facility from entering the facility		
		The water level in the facility will be monitored and engineered to prevent any overflow. Cut off valves and alarms will be installed. Excess water will be pumped from facility if required.		
		Deposition method will promote permafrost to minimise potential for ARD formation in long term		
		Cap with benign waste rock layer on closure		
		Develop a Tailings Storage Facility Management Plan		
	Failure of TSF wall resulting in tailings entering environment	Construct TSF as per design for safe and stable facility	Construction, Operations	Ironbark, Construction Contractor
		Maintain adequate freeboard in facility		
		Maintain emergency spillway for 1:100 rain events		
		Construct diversion drain and bunding to prevent melting water from the mountain slope behind the tailings facility from entering the facility		
	Aesthetic impact of tailings facility	Plan tailings facility to blend as far as practicable possible with surrounding landscape	Pre-construction	Ironbark
	Facility attracts mammals and/or birds	No action required as no anticipated impact due to lack of food resources on facility, frozen state of water and tailings for majority of year (due to deposition method)	NA	
		Monitor facility use by fauna	Operations	

10. Shipping of Product

Objectives

- Ensure that shipping does not adversely impact on the abundance, diversity, geographic distribution and productivity of marine mammals and avifauna through the avoidance or management of adverse impacts and improvement in knowledge;
- Ensure that shipped cargo is contained and isolated so it does not result in release to the surrounding environment; and
- Protect fauna that are listed on the Greenland list of threatened species.

Project activity	Environmental impact	Action	Project stage	Responsibility
Shipping off the north-east coast of Greenland	Disturbance of marine mammals and seabirds in marine and coastal areas	Observations of fauna during shipping will be recorded	Construction, Operations	Ironbark, Shipping Contractor
		Specific procedures, actions and responsibilities to avoid or minimise impacts on marine mammals and seabirds will be integrated into the EMP in case species are encountered during shipping		
		No significant noise will be generated within five kilometres of an identified known sensitive bird cliff		
	Unplanned release of fuel oil, chemicals or concentrate	Ice-class bulk carriers will be used to transport concentrate.		
		Purpose built sealed tanks will be used for fuel storage and transport		
		A project specific Fuel and Oil Spill Contingency Plan will be developed		
		Regular maintenance of storage tanks will be undertaken to ensure fulfilment of regulatory requirements for offshore use and reduce the possibility of rupture or leaks		
		Refuelling operations will be conducted in calm weather conditions and rigorous monitoring of the refuelling operations will be carried out		
	General activities, emissions and discharges	Sewage, grey water and kitchen waste will be treated, handled and discharged according to MARPOL standards		
		Bilge and drainage water will be treated and discharged to MARPOL standards		
		The ballast water will always be exchanged mid-ocean on the Citronen – marsahlling port shipping route in order to minimise the risk of introducing new species in ports of origin or destination		

11. Waste and Hazardous Substances Management

Objectives

- Ensure that mine wastes and hazardous substances are contained and isolated so they do not result in long-term impacts on the surrounding environment; and
- Ensure that other wastes are contained, treated or collected so there is no long-term impact on the environment.

Project activity	Environmental impact	Action	Project stage	Responsibility
Transport, storage and handling of fuel, oil, explosives and chemicals	Contamination of land or water from unplanned releases of hazardous substances	Design and construct hazardous material storage facilities with suitable impermeable materials	Operations	Ironbark
		All hazardous substances will be contained and stored within appropriate bunded facilities. Areas with high potential for contamination (such as workshops) will be contained on impermeable hardstand areas.		
		Develop specific management plans and procedures for the transport, handling and storage of hazardous substances such as explosives, fuel, lubricants and chemicals		
Transport and storage of concentrate	Contamination of land	Concentrate will be stored in an enclosed building on a gravel pad with a liner	Operations	Ironbark
		Procedures will be put in place to control track in/out issues within the concentrate shed		
Waste disposal including putrescible, medical, industrial, waste oil, tyres, sewage etc	Contamination of land or water	Develop a Waste Management Plan prior to Construction and Operations Hazardous waste that cannot be disposed or treated on site will be contained and packaged as per applicable standards and shipped off site to an approved facility	Construction, Operations	Ironbark
		Domestic putrescible waste, medical waste and waste oil will be incinerated		
		Industrial waste will be recycled, where possible, buried or incinerated		
		Non-combustible waste and tyres will be buried at the site landfill		
		Waste water will be treated within a package sewage treatment plant and the effluent disposed of in the eastern River, the dried sludge disposed of in the waste dump		

12. Archaeology and Cultural Heritage

Objectives

- Ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.

Project activity	Environmental impact	Action	Project stage	Responsibility
Site development	Disturbance of the "three-stone archaeological site" or any newly discovered sites	No disturbance of the probable anthropology structure and near surroundings (15m radius) on the eastern shore of Citronen Fjord is to occur prior to archaeological registration and documentation by a person(s) from the Greenland National Museum	Pre-Construction	Ironbark
		If any material of potential archaeological or cultural heritage significance are uncovered or revealed, works will immediately cease within 20m of the material and the Greenland National Museum, or other appropriate authority, will be notified as soon as practicable	All phases of Project.	Ironbark, Construction Contractor

13. Emergency Preparedness

Objectives

- Ensure that potential environmental emergency situations are adequately planned, documented, practised and resourced to ensure that minimal environmental impact occurs.

Project activity	Environmental impact	Action	Project stage	Responsibility
Site operations	Increased and uncontrolled environmental impact from unplanned emergency situations	Develop and update Site Emergency Response Plan Update MPL-001 Loss of Containment and Emergency Management Plan prior to construction and operations	All phases of Project	Ironbark
Shipping	Increased and uncontrolled environmental impact from unplanned emergency situations	Develop and update Shipping Emergency Response Plan Update MPL-001 Loss of Containment and Emergency Management Plan prior to construction and operations	All phases of Project	Ironbark and Shipping Contractor