



NT Mining Operations Pty Ltd Union Reefs North Underground Mine

Draft Environmental Impact Statement
and Appendices A - E



KIRKLAND LAKE GOLD

Appendix A – Terms Of Reference for Preparation of an
Environmental Impact Statement; Union Reefs North
Underground Mine

**TERMS OF REFERENCE FOR PREPARATION OF AN
ENVIRONMENTAL IMPACT STATEMENT**

PROPOSAL NAME:	Union Reefs North Underground Mine
LOCATION:	Pine Creek
PROPONENT:	NT Mining Operations Pty Ltd
ISSUED:	25 October 2019

TABLE OF CONTENTS

Abbreviations and Glossary	iii
PART 1 INTRODUCTION	1
1.1 Overview.....	1
1.2 Background.....	1
1.3 Structure of these Terms of Reference.....	2
PART 2 MATTERS TO BE ADDRESSED IN THE DRAFT EIS	2
2.1 Proposal description	2
2.1.1 Development and operation	2
2.1.2 Rehabilitation and closure	4
2.2 Key environmental factors	5
2.2.1 Terrestrial flora and fauna	6
2.2.2 Hydrological processes	9
2.2.3 Inland water environmental quality	11
2.2.4 Aquatic ecosystems.....	13
PART 3 OTHER REQUIREMENTS FOR THE DRAFT EIS	14
3.1 Relevant guidance material / References.....	14
3.2 Public exhibition requirements.....	16
3.2.1 Exhibition period.....	16
3.2.2 Exhibition locations.....	16
Attachment A - The objects and principles of the Environment Protection and Biodiversity Conservation Act 1999	17
Attachment B – Matters that must be addressed by draft public environment report and environmental impact statement	18

ABBREVIATIONS AND GLOSSARY

AMD	acid and/or metalliferous drainage
DENR	Department of Environment and Natural Resources (NT)
DIIS	Department of Industry and Innovation (Australian Government)
DMP	Department of Mines and Petroleum (WA)
DOEE	Department of the Environment and Energy (Australian Government)
DPIR	Department of Primary Industry and Resources (NT)
Draft EIS	Draft Environmental Impact Statement
EIS	Environmental Impact Statement
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ICMM	International Council on Mining and Metals
MCA	Minerals Council of Australia
NOI	Notice of Intent
NT EPA	Northern Territory Environment Protection Authority
the Proposal	the Union Reefs North Underground Mine; the proposed action undergoing environmental impact assessment
the Proponent	NT Mining Operations Pty Ltd (NTMO); the company intending to undertake the proposed action
TOR	Terms of Reference (for an EIS)

PART 1 INTRODUCTION

1.1 Overview

The Union Reefs North Underground Mine (the Proposal) is being assessed by the Northern Territory Environment Protection Authority (NT EPA) under the Environmental Assessment Act 1982 at the level of an Environmental Impact Statement (EIS). The proposal is a 'controlled action' under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). The assessment is being conducted in accordance with the bilateral agreement between the Australian Government and the Northern Territory Government.

These Terms of Reference (TOR) set out the matters relating to the environment that are to be addressed in the Draft EIS for this Proposal, in accordance with clause 8(3) of the Environmental Assessment Administrative Procedures 1984. The Draft EIS must also address all requirements in the NT EPA General Guidance for Proponents Preparing an EIS (NT EPA 2019a). The Proponent must ensure that the assessment documentation adequately addresses the TOR.

1.2 Background

On 9 April 2019, NT Mining Operations Pty Ltd (the Proponent) submitted a notice of intent (NOI) for the Proposal to the NT EPA for consideration under the Environmental Assessment Act 1982. This Proposal is located near Pine Creek, 220km south of Darwin. The Proposal is for a new mining activity on a highly modified brownfield mine site, currently authorised under the Mining Management Act 2001. The site has historically been subject to gold mining.

The Proposal includes:

- dewatering approximately 85 megalitres (ML) from the existing Prospect Pit Lake prior to operations and up to 252ML to 347ML per year during operation over the two year life of mine
- construction of an underground access portal, underground mining, and processing of approximately 280,000 tonnes of ore (existing processing plant)
- processing of 279,089 tonnes of ore yielding 39,232 gold ounces, increasing the process water and tailings output from processing plant
- progressively returning most waste rock from the Proposal to fill the underground void (retaining approximately 20,000m³ of non-acid forming waste rock as the portal bench).

The NT EPA decided on 7 August 2019 that the Proposal requires assessment at the level of an EIS. Further details on the Proposal and the reasons contributing to the NT EPA's decision are outlined in the Statement of Reasons (NT EPA, 2019b) available at: <https://ntepa.nt.gov.au/environmental-assessments/current-projects>.

In July 2019 the Proponent referred the Proposal to the Australian Government under the EPBC Act. On 20 August 2019 a delegate of the Australian Government Minister for the Environment determined that the Proposal is a controlled action and requires assessment and approval under the EPBC Act before it proceeds. The controlling provisions are listed threatened species and communities (sections 18 & 18A).

In accordance with the bilateral agreement the Department of Environment and Energy (DOEE) will have the opportunity to provide comment during the assessment. Once the NT EPA has provided its final assessment report to the DOEE a separate EPBC Act

decision process will commence with its own statutory timeframes. The DOEE advises that under section 74AA of the EPBC Act, it is an offence to commence an action in the absence of an EPBC Act approval.

1.3 Structure of these Terms of Reference

- Part 1 – Introduction: an overview of the Proposal and decisions relating to its environmental assessment.
- Part 2 – Matters to be addressed in the Draft EIS: a description of the information requirements specific to this Proposal. The Proponent is required to address all these matters, relating to the Proposal and the surrounding environment, in its Draft EIS. This part must be read in conjunction with the NT EPA General Guidance for Proponents Preparing an EIS, which outlines the general information that is also required in the Draft EIS.
- Part 3 – Other requirements for the Draft EIS: a list of applicable guidelines and policies, and description of the public exhibition requirements.

PART 2 MATTERS TO BE ADDRESSED IN THE DRAFT EIS

2.1 Proposal description

2.1.1 Development and operation

Provide an overview of all development (dewatering and construction of portal access) and operational aspects of the Proposal as outlined in Table 1. This information is required to allow the reader to understand and evaluate how the proposal may interact with environmental values.

Table 1: Minimum information required in the Proposal description

Topic	Required information
Site layout maps	<ul style="list-style-type: none"> • the precise location and approximate dimensions of Proposal components clearly identifying existing infrastructure, pit lakes, landforms, roads/tracks; and new areas of disturbance, infrastructure (including infrastructure that would be re-established or repurposed), stockpiles, drainage and underground workings • the Proposal layout overlain with environmental values of the site such as the location of occupied adits, waterbodies/waterways • the current land tenure and owner(s) of the land of which the Proposal area covers
Alternatives	<p>Demonstrate that site selection and design has accounted for avoiding potentially significant impacts as far as possible. Discuss:</p> <ul style="list-style-type: none"> • alternative portal locations considered and associated alternative pit lake dewatering and water balance options • alternatives to restricting ghost bat access to OK and Prospect adits during operation <p>For each alternative considered, provide justification of:</p> <ul style="list-style-type: none"> • extent of investigations into the alternative proposal with regard to assessment of impacts on environmental values

Topic	Required information
	<ul style="list-style-type: none"> • why the preferred alternative was selected
Mine development	<ul style="list-style-type: none"> • timeframes and seasonal considerations, for pit dewatering, water treatment and construction of portal access
Mine operation	<ul style="list-style-type: none"> • methods and timeframes for underground mine development • method, timeframe and expected volumes for dewatering and water treatment • volume of ore and waste rock to be mined annually • material characterisation (waste rock and ore), classification and expected volumes of each material type (e.g. non acid-forming, potentially acid-forming) • timeframes and staging of progressive rehabilitation activities proposed during mine operation
Ore processing	<ul style="list-style-type: none"> • brief explanation of the processing method – clarify if consistent with previously authorised activities or describe any variances • volumes and chemical composition of tailings and proposed disposal timeframe and method
Water Use	<ul style="list-style-type: none"> • a water balance (including schematic) and water account for the Proposal¹, based on the Minerals Council of Australia Water Accounting Framework (MCA 2014), incorporating: <ul style="list-style-type: none"> ○ predicted water demand for all phases of the Proposal ○ proposed water supply sources, available volumes and yields (including details of any peak periods and seasonal variations) ○ water volumes and timing for transfer of dewater to water tanks and Crosscourse Pit Lake, during mine development and operations ○ water volume anticipated to remain, if any, in Prospect Pit Lake during dewatering actions ○ confirmation that Crosscourse Pit can accommodate tailings and dewatering from Prospect Pit ○ management of process waters • provide an overview of treatment methodology, include; discharge water quality (including targets in accordance with ANZG (2018) or otherwise), location of the discharge point/s, and schedule for the discharge² if discharge is proposed • based on hydrogeological modelling, material characterisation, and other modelling (e.g. contaminant transport modelling), discuss water quality and levels of pit lakes and dams affected by the Proposal for the short-term (e.g. at closure) and long-term (post-closure) up to at least the time of predicted equilibrium/stability, or 1000 years (whichever occurs first)

¹ noting the Water Act 1992 requires proponents to prepare a plan that demonstrates how and when water will be used over the life of the Proposal. An assessment against Section 90 factors in the Act will be required and any gazetted exemptions should be discussed.

² Wastewater discharge off the mine lease will trigger requirement for an application for a Waste Discharge Licence (WDL).

2.1.2 Rehabilitation and closure

Include a Mine Closure Plan for the Proposal developed according to leading practice guidance (e.g. DIIS 2016; DMP & EPA 2015; ICMM 2019), the principles of the International Council of Mining (ICMM 2015), and as outlined in Table 2. As recommended by the ICMM (2015 and 2019), planning for mine rehabilitation and closure should be an integral part of early mine planning.

Table 2: Minimum information required in the Mine Closure Plan

Topic	Required information
Closure objectives	<ul style="list-style-type: none"> • proposal-specific closure objectives and an explanation of how they are consistent with leading practice guidance, include: <ul style="list-style-type: none"> ○ how these objectives will be met and over what timeframes ○ details of how monitoring results will assist in assessing compliance with the objectives • protection of ghost bat habitat • discuss stakeholder expectations and an outline of methods for reaching agreement with stakeholders on closure objectives • describe any improvements to overall environmental condition of the mine site post underground mining • assess the cumulative impacts of the proposal on the interactions between previous activities and impacts, and the new proposal
General plans	<ul style="list-style-type: none"> • intended closure timeframes • expected post closure monitoring and management arrangements • indicative volumes, sources and characterisation of materials required for rehabilitation and closure (e.g. fill, cover materials) • predicted post-closure water balance
Key components: <ul style="list-style-type: none"> • Open pits / pit lakes • Tailings • Surface waste rock storage • Site drainage • Access portal and underground mine 	For each of the key components associated with the underground mining operations, provide the following: <ul style="list-style-type: none"> • outline all rehabilitation and closure options that have been or are being considered, and where uncertainties remain, outline a process that will be used to decide which closure options will be adopted • evaluate and compare the likely environmental outcomes and the costs, benefits and residual environmental and social risks of the rehabilitation and closure alternatives considered³ • demonstrate that the selected closure option delivers post-closure environmental outcomes with respect to the principles of ecologically sustainable development • explanation of how closure options contribute to meeting the overall closure objectives Also provide, as relevant to the component:

³ Include information on the methods, assumptions and limitations used in any calculations of cost, time and materials required for rehabilitation options.

Topic	Required information
	<ul style="list-style-type: none"> a conceptual site model including landforms and final structures that are designed to divert, capture, retain and/or treat surface runoff from the site future use and/or access requirements, particularly the access portal <p>An assessment of the resulting pit lakes in accordance with Appendix H of the Western Australian Guidelines for Preparing Mine Closure Plans (DMP & EPA 2015), including density driven exchange between pit lake water and surrounding groundwater</p>
Risks to successful rehabilitation and closure	<ul style="list-style-type: none"> describe matters that could influence unanticipated or early care and maintenance and/or closure of the mine, how this may affect rehabilitation objectives, and the contingency and mitigation measures to be implemented

2.2 Key environmental factors

The NT EPA has identified the preliminary key environmental factors that must be addressed in the Draft EIS as they may be significantly impacted by the Proposal. These are listed in Table 3 and have been selected from the NT EPA's environmental factors and objectives (NT EPA 2018a).

Table 3: Preliminary key environmental factors that must be addressed in the Draft EIS

Theme	Key environmental factor	Objective
Land	Terrestrial flora and fauna	Protect the NT's flora and fauna so that biological diversity and ecological integrity are maintained.
Water	Hydrological processes	Maintain the hydrological regimes of groundwater and surface water so that environmental values are protected.
	Inland water environmental quality	Maintain the quality of groundwater and surface water so that environmental values including ecological health, land uses, and the welfare and amenity of people are protected.
	Aquatic ecosystems	Protect aquatic ecosystems to maintain environmental water requirements and the biological diversity of flora and fauna and the ecological functions they perform.

The Draft EIS is to provide an assessment of how the environmental objective of the environmental factors listed in Table 3 would be met. Refer to the NT EPA General Guidance for Proponents Preparing an EIS and requirements detailed below.

If additional potential environmental impacts are identified through the environmental impact assessment process, they must also be included in the Draft EIS, even if this requires addressing additional environmental factors not specified in Table 3.

2.2.1 Terrestrial flora and fauna

The NT EPA and delegate of the Australian Government Minister for the Environment have identified the ghost bat as the only threatened species that has the potential to be significantly impacted by the Proposal. The information requirements, therefore, focus on the ghost bat to provide sufficient information to enable assessment of whether the Proposal is likely to meet the NT EPA’s objective to protect the NT’s flora and fauna so that biological diversity and ecological integrity are maintained. Matters that must be addressed under Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000 are incorporated in this TOR.

Information requirements outlined in Table 4 below should be read in consideration of the general advice provided in sections 2.6 and 3.2 of the NT EPA General Guidance for Proponents Preparing an EIS, objects and principles of the EPBC Act (Attachment A) and matters that must be addressed under the EPBC Act (Attachment B).

Table 4: Minimum information required for assessment of terrestrial flora and fauna

Aspect	Specific information required
Environmental values	<p>Provide a baseline report, including supporting data (for example, but not limited to, targeted surveys and monitoring results for Union Reefs Exploration Drilling Program) for the ghost bat that documents the:</p> <ul style="list-style-type: none"> • location of ghost bats using the Proposal area, include: <ul style="list-style-type: none"> ○ geographic extent of the regional population ○ geographic location of current or previously known colonies ○ characteristics of all known and likely natural and man-made roosts in the Proposal area (provide depth and structure at a minimum for OK, Lady Alice, Union North and Prospect adits) • use (including seasonal use) of natural and man-made roosts within: <ul style="list-style-type: none"> ○ the Proposal area ○ the region (including, but not limited to, known connections with colonies at Springhill and Kohinoor adit) • significance of adits to: <ul style="list-style-type: none"> ○ colonies in the Proposal area region ○ the regional population of ghost bats <p>Discuss likely ghost bat movements, roosting activity and associated significance of activity within the region. Have regard to individuals that are transient or remain within the Proposal area, and consideration of:</p> <ul style="list-style-type: none"> • past and current distribution • recent exploration drilling program • recent seasonal movements • significance of roosting sites • existing and required genetic information <p>Consider presenting information, such as in tables, figures and maps that allows easy comparison of ghost bat and adit values</p>
Potential impacts and risks	<p>Quantify and discuss the potential impact on ghost bats from noise and vibration disturbance including:</p>

Aspect	Specific information required
	<ul style="list-style-type: none"> • susceptibility to low level vibration and limits below what is considered for human comfort levels⁴ and provide the justification and rationale for limits (from suitably qualified ecologists (chiropterologist) in consultation with acoustic engineers) • damage to roost sites through internal collapse or entrance blockages <p>Provide evidence to demonstrate assessment of the risks (consequence and likelihood) and potential impacts on ghost bats (individuals, colony regional population), from temporary exclusion of ghost bats from occupied adits. Include specifically the fate of individuals excluded from adits over weeks to months, rather than limited to a few nights.</p> <p>Quantify and discuss the capacity of known roost structures on-site (Union North and Lady Alice adits) and off-site (Kohinoor Adit and Springhill workings) to accommodate ghost bats excluded during proposed adit closure, consider:</p> <ul style="list-style-type: none"> • potential for significant impact to ghost bats and other obligate cave dwelling bats in currently occupied roosts • mortality through suboptimal roosting and daytime abandonment of roosts • capacity and likelihood for migration to, and use of, alternate roosts <p>Quantify and discuss the consequence of potential impacts on local colony(s) and the regional population resulting from the total loss of ghost bats from affected adits.</p> <p>Provide a robust justification to support claims that impacts considered would not be significant due to the implementation of avoidance measures or no impact pathway.</p> <p>Assessment of impacts should identify relevant short term and long term impact pathways and the full extent of any consequences. This is particularly relevant where the likelihood of impact is low yet the consequence of impact may be high.</p> <p>Provide a detailed assessment of any likely impacts that the proposed action may facilitate on the ghost bat at the local, regional, state and national scale in accordance with the EPBC Act. Include consideration of the precautionary principle.</p>
Mitigation and management	<p>Address any potential impacts identified above in accordance with the mitigation hierarchy (i.e. avoid, minimise, mitigate, restore, offset), specifically, but not limited to:</p> <ul style="list-style-type: none"> • identification of options to avoid exclusion of ghost bats from adits (e.g. active relocation, artificial roost sites, no mining) and provide clear and comparative assessment of the environmental consequences, viability, risk, cost and benefits of each alternative (short, medium and long-term advantages and disadvantages of the options must be discussed) • minimising adit collapse or blockage and daytime ghost bat movements from vibration (e.g. by limiting blast charge weights) • detailed mitigation and management responses, for all phases of the Proposal, to avoid, minimise, mitigate or rehabilitate, impacts on ghost bats <p>For each mitigation measure proposed, provide:</p>

⁴ note that the Australian Standard – AS2187.2 for human comfort limits from ground vibration is not appropriate for ghost bats

Aspect	Specific information required
	<ul style="list-style-type: none"> • the expected or predicted effectiveness of mitigation measures • statutory or policy basis for mitigation measures <p>Provide a consolidated list of mitigation measures proposed to prevent, minimise or mitigate the relevant impacts of the Proposal, including those proposed to be taken by Territory and local governments or the Proponent.</p> <p>Discuss how the proposal has regard to Conservation Advices in accordance with the EPBC Act.</p> <p>Provide an updated Ghost Bat Action Plan incorporating all relevant information identified herein.</p>
Monitoring and reporting	<p>Address, at a minimum:</p> <ul style="list-style-type: none"> • a detailed survey design, including timeframe of monitoring required, to measure the effect on ghost bat individuals and colonies (in Proposal area) and population (in region) if temporary exclusion of ghosts bats from adit closure is undertaken • a detailed monitoring plan to identify impacts on ghost bats and other obligate cave dwelling bats, including: <ul style="list-style-type: none"> ○ appropriate and targeted monitoring to identify whether mitigation measures are successful during mining ○ clear triggers for when changes to activity(including stop work)/monitoring are required ○ clear actions required before activity resumes ○ clear conditions that will be met for when activity may resume ○ clear feedback of monitoring data to inform management actions • expected post closure monitoring and management arrangements • the name of endorsing or approving agency for mitigation measures, monitoring program and action plan • details of consultation undertaken, including: <ul style="list-style-type: none"> ○ the names and qualifications of appropriate experts consulted and/or engaged to design survey and monitoring plans (including Flora and Fauna – DENR) ○ the names and qualifications of third party reviewers ○ details of the scope of consultation or review ○ any documented responses to, or result of, the consultation
Residual impact	<p>Assess the significance of any residual impact or risk of the Proposal to local colonies and the regional ghost bat population should bat mortality occur, and in consideration of the information requirements in Attachment A.</p> <p>In the event that significant residual impacts remain for listed threatened species and/or the environment following application of the proposed mitigation measures, offsets should be proposed.</p> <p>Should this be required, the Proponent must include details of a proposed offset package to be implemented to compensate for the residual significant impact of the Proposal and an analysis of how the offset meets the requirements of the Department of the Environment and Energy EPBC Act Offsets Policy (DSEWPC 2012). Include an appropriate reference to the Offset Policy and how any offset package would be consistent with the offset calculator, or other compensatory</p>

Aspect	Specific information required
	measures that would have a greater conservation gain for the species as per Section 4.2.2 of the Offset Policy.
Separate EPBC conclusion	<p>For the EPBC referral matters, provide an overall conclusion as to the environmental acceptability of the proposal on ghost bats, including:</p> <ul style="list-style-type: none"> • a discussion on the consideration with the requirements of the EPBC Act, including the objects of the EPBC Act, the principles of ecologically sustainable development and the precautionary principle; • reasons justifying undertaking the proposal in the manner proposed, including the acceptability of the avoidance and mitigation measures • if relevant, a discussion of residual impacts and any offsets and compensatory measures proposed or required for significant residual impacts on Ghost Bats, and the relative degree of compensation and acceptability.

2.2.2 Hydrological processes

Provide sufficient information to enable assessment of whether the Proposal is likely to meet the NT EPA’s objective to maintain the hydrological regimes of groundwater and surface water so that environmental values are protected. Information requirements outlined in Table 5 below should be read in consideration of the general advice provided in sections 2.6 and 3.2 of the NT EPA General Guidance for Proponents Preparing an EIS.

Table 5: Minimum information required for assessment of Hydrological processes

Aspect	Specific information required
Environmental values	<p>Characterise the current hydrological regime of the Proposal area and receiving waterways, in particular McKinlay River, which may be impacted by the Proposal.</p> <p>Use maps and/or schematic diagrams of flow directions and long term monitoring data (more than 5 to 10 years) where applicable to describe:</p> <ul style="list-style-type: none"> • the surface water hydrology: <ul style="list-style-type: none"> ○ major and minor rivers, drainage lines and wetlands (permanent and ephemeral) ○ surface water flow directions and rates, based on field data and modelled data ○ water reservoirs (natural and artificial) • groundwater aquifers and hydrological properties: <ul style="list-style-type: none"> ○ depth to aquifers, including temporal variation ○ groundwater contours and flow direction, volumes and yields ○ hydrological connectivity (considering seasonal variation) between groundwater aquifers, existing pits, dams and the Pine Creek bore field (town water supply) of the Proposal area and zone of influence ○ surface connections via springs or recharge zones ○ beneficial uses, specifically groundwater extraction
Potential impacts and risks	The potential impacts and risks to hydrological processes from the Proposal that relate to the effects of dewatering the Prospect Pit and underground mine. For

Aspect	Specific information required
	<p>each potential impact identified below, provide evidence to quantify the expected impact as well as associated risks:</p> <ul style="list-style-type: none"> • provide the current status of groundwater processes and how the Proposal may alter the hydrological regime of the Proposal area, surrounding pit lakes, dams and receiving waters (including groundwater extraction for stock watering and base flows in the Mary River catchment area) • discuss the potential for impact on Pine Creek bore field • demonstrate there will be no impact on Pine Creek town water supply • quantify the groundwater drawdown during operations and post-mining/closure, indicating: <ul style="list-style-type: none"> ○ peak drawdown ○ predicted post-closure recovery of groundwater levels upon stabilisation and in extreme rain events ○ time required for full recovery ○ predicted groundwater level contours at the time of peak drawdown and at the end of the Proposal • quantify the altered surface water flow pathways, volumes and timing (seasonality) that arise from mine dewatering for each phase of the Proposal including post-closure • consider and discuss the discharge to the environment (ground or surface, on-site or off-site, intended or unintended) from the pit lakes, post-closure, based on a predicted water balance of the final pit lakes <p>For impacts considered not significant due to identification of avoidance measures or no impact pathway, provide a robust justification to support this.</p> <p>Assessment of impacts should provide for the full extent of consequence where an impact pathway exists.</p>
Mitigation and management	<p>Address all potential impacts identified above in accordance with the mitigation hierarchy, including, but not limited to:</p> <ul style="list-style-type: none"> • the extent of the depressurisation zone and its effect during dewatering of the underground mine • the extent of groundwater drawdown, on surface and groundwater flows as well as on other water bodies within and adjacent to the Proposal, from dewatering the Prospect Pit and underground mine • impact on beneficial uses of groundwater
Monitoring and reporting	<p>Provide, at a minimum detailed water monitoring program for all phases of the Proposal (including post-closure) for the Proposal which includes:</p> <ul style="list-style-type: none"> • groundwater levels and flows (rate and direction) to address potential drawdown effects • surface water volumes and flow rates
Residual impact	<p>Assess the significance of any residual impact or risk of the Proposal on hydrological processes.</p>

2.2.3 Inland water environmental quality

Provide sufficient information to enable assessment of whether the Proposal is likely to meet the NT EPA’s objective to maintain the quality of groundwater and surface water so that environmental values including ecological health, land uses, and the welfare and amenity of people are protected. Information requirements outlined in Table 6 below should be read in consideration of the general advice provided in sections 2.6 and 3.2 of the NT EPA General Guidance for Proponents Preparing an EIS.

Table 6: Minimum information required for assessment of Inland water environmental quality

Aspect	Specific information required
Environmental values	<p>The environmental values associated with the quality of surface water and groundwater relate to the Proposal’s location in the headwaters of the McKinlay River, the main drainage sub-catchment system to the Mary River Catchment.</p> <p>Provide baseline information to describe the values within and downstream of the Proposal area that could be potentially impacted by the Proposal, including:</p> <ul style="list-style-type: none"> • declared beneficial uses areas of receiving waters downstream of the Proposal (including a map) • permanent pools of water on the McKinlay River • existing users of surface and/or groundwater resources • baseline water quality, including a comparison with relevant water quality guidelines (e.g. ANZG 2018), and incorporating any additional parameters of relevance to the Proposal area, of: <ul style="list-style-type: none"> ○ receiving waters (surface and groundwater), including the McKinlay River and control sites ○ all pit lakes and dams affected by the Proposal, including equivalent data for Lady Alice Pit Lake, Union North Pit Lake, Dam A and Dam C ○ groundwater at all pit lakes and dams within the surrounding area of influence <p>Discuss water quality data (provide dates and comparison against longer term, (more than 5 to 10 years water quality data) providing for dry and wet season scenarios.</p> <p>Analyse and quantify any historic impacts to water quality.</p>
Potential impacts and risks	<p>For each potential impact identified below, provide evidence to quantify the expected impact as well as associated risks:</p> <ul style="list-style-type: none"> • potential impacts on groundwater from acid and metalliferous drainage (AMD) and saline drainage from surface waste rock storage and the ability of the waste rock classification system to identify waste rock that may produce AMD, saline drainage and all contaminants of concern • expected pit water quality during and post mining accounting for the permanent surface storage of waste rock used as the bench in the Prospect Pit • any passive discharge or seepage from: <ul style="list-style-type: none"> ○ surface waste rock storage ○ exposure of historic mining material through dewatering Prospect Pit and/or lowering water levels in other pit lakes and dams

Aspect	Specific information required
	<p>Discuss changes to water quality from the Proposal, including:</p> <ul style="list-style-type: none"> • new impacts from increased output of the existing processing plant • the release of water from the Proposal sites through unintended loss of control/containment or intended discharge • immediate and long term water quality impacts across all water bodies affected by the Proposal • predictions associated with water quality and contaminants of concern between connected mine pit lakes and existing dams with consideration of: <ul style="list-style-type: none"> ○ any recharge of the Prospect Pit and underground mine due to connection with Dam A via Lady Alice and Union North pit lakes ○ lowering of adjacent pit lake and dam levels due to connectivity with the Prospect Pit and underground mine, and any potential for non-benign waste rock present in the walls and floor to be exposed thus oxidise and produce acid, saline and/or metalliferous drainage <p>Information presented should be supported by conceptual site models describing sources of potential contaminants, mechanisms for their release, transport pathways, receptors, and fate of any potentially contaminated waters from the Proposal, with reference to the NT EPA Guidelines on Conceptual Site Models (NT EPA 2013a). A conceptual site model should be provided for each phase of the Proposal, including:</p> <ul style="list-style-type: none"> • development / any dewatering of existing pits/storages • during mining/processing, including any dewatering • to the point equilibrium is reached
Mitigation and management	<p>Provide a draft Water Management Plan identifying the mitigation and management actions that will be provided to ensure that all potential impacts identified above will be sufficiently addressed, including:</p> <ul style="list-style-type: none"> • the approach to avoid or minimise (treat) uncontrolled discharges and/or migration of poor-quality mine affected water requiring discharge, and a predicted schedule for the discharge • the proposed water management measures to: <ul style="list-style-type: none"> ○ avoid cumulative impact from poor water quality ○ provide storage flexibility during operations ○ allow closure objectives to be met • sufficient detail⁵ to demonstrate that mine closure strategies will be implemented to avoid impacts to values dependent on good water quality, both during operation and into the long-term following closure
Monitoring and reporting	<p>Address and include a monitoring plan for all phases of the Proposal (including post-closure) for:</p> <ul style="list-style-type: none"> • pit lakes • groundwater in the vicinity of the Proposal • surface water in the vicinity of the Proposal and downstream

⁵ Including reference to the conceptual Mine Closure Plan required in section 2.1.3

Aspect	Specific information required
Residual impact	Assess the significance of any residual impact or risk of the Proposal on inland water environmental quality.

2.2.4 Aquatic ecosystems

Provide sufficient information to enable assessment of whether the Proposal is likely to meet the NT EPA’s objective to protect aquatic ecosystems to maintain the biological diversity of flora and fauna and the ecological functions they perform. Information requirements outlined in Table 7 below should be read in consideration of the general advice provided in sections 2.6 and 3.2 of the NT EPA General Guidance for Proponents Preparing an EIS.

Table 7: Minimum information required for assessment of Aquatic ecosystems

Aspect	Specific information required
Environmental values	Describe the aquatic ecosystems, including any permanent pools in the McKinlay River, in the area where hydrological processes and inland water environmental quality may be impacted by the Proposal. Describe the regional distribution, abundance or extent of aquatic ecosystems of McKinlay River and comparable control areas
Potential impacts and risks	Quantify and discuss the potential impacts for all phases of the Proposal, related to changes, in comparison to baseline data, in the distribution, abundance or health of aquatic ecosystems and their constituent taxa due to (at a minimum): <ul style="list-style-type: none"> • changes to hydrological processes (including reduction or increase in surface and/or groundwater flows or ephemeral pools) • changes in water quality
Mitigation and management	Identify the mitigation and management actions that will be provided to ensure that all potential impacts identified above to the aquatic ecosystems of McKinlay River, in accordance with the mitigation hierarchy.
Monitoring and reporting	Address and include a monitoring plan, if relevant for, at a minimum: <ul style="list-style-type: none"> • water availability (quantity and quality) for any aquatic ecosystems • distribution, abundance and/or health of aquatic ecosystems and constituent taxa, as applicable
Residual impact	Assess the significance of any residual impact or risk of the Proposal on aquatic ecosystems.

PART 3 OTHER REQUIREMENTS FOR THE DRAFT EIS

3.1 Relevant guidance material / References

As outlined in section 3.1.3 of the NT EPA General Guidance for Proponents Preparing an EIS, the proponent is expected to refer to guidance material considered relevant to the Proposal. A list of such material is provided below, but is not exhaustive. The NT EPA expects the proponent to refer to the most up-to-date and relevant evidence-based information. The Draft EIS should discuss how the Proposal is consistent with guidance material.

- ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines
- APEC, 2018. Mine Closure Checklist for Governments. Asia-Pacific Economic Cooperation.
- Barnett B., Townley L.R., Post V., Evans R. E., Hunt R. J., Peeters L., Richardson S., Werner A. D., Knapton A. and Boronkay A., 2012. Australian Groundwater Modelling Guidelines, Waterlines Report. National Water Commission, Canberra.
- Commonwealth of Australia, 2016. Preventing Acid and Metalliferous Drainage – Leading Practice Sustainable Development Program for the Mining Industry.
- Commonwealth of Australia, 2013. Significant Impact Guidelines 1.1 – Matters of National Environmental Significance, available at <https://www.environment.gov.au/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance>
- Commonwealth of Australia, 2012. Aquatic ecosystems toolkit. Department of Sustainability, Environment, Water, Population and Communities.
- Commonwealth of Australia, 2010 – 2014. Survey Guidelines for Nationally Threatened Species, available at <http://www.environment.gov.au/epbc/policy-statements>
- Commonwealth of Australia, 2000. Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000, available at <https://www.legislation.gov.au/Details/F2016C00914>
- Commonwealth of Australia, 1999. Objects and principles of the Environment Protection and Biodiversity Conservation Act 1999, available at <https://www.environment.gov.au/epbc/about>
- Department of Environment and Natural Resources (DENR). NT Flora and Fauna Atlases at <http://www.lrm.nt.gov.au/nrmapsnt>
- Department of Health (DoH), 2014. Code of practice for on-site wastewater management. Department of Health, Northern Territory Government.
- Department of Health (DoH), 2005. Guidelines for preventing mosquito breeding sites associated with mining sites. Medical Entomology, Department of Health. Northern Territory Government.
- Department of Primary Industry and Resources (DPIR), 2017. Water Management Plan – Chapter 6 of the Mining Management Plan Structure Guide for Mining Operations.

- Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) 2012. Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy. Australian Government, Canberra, Australia. Available at: <http://www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy>
- DIIS, 2016. Mine Closure - Leading Practice Sustainable Development Program for the Mining Industry. Department of Industry and Innovation, Australian Government, Canberra.
- DMP & EPA, 2015. Guidelines for Preparing Mine Closure Plans. Department of Mines and Petroleum & Environmental Protection Authority, Government of Western Australia, Perth, Western Australia.
- ICMM, 2015. ICMM 10 Principles. International Council of Mining & Metals. available at: <https://www.icmm.com/en-gb/about-us/member-commitments/icmm-10-principles/the-principles>
- ICMM, 2017. Position statement on water stewardship. International Council on Mining and Metals, London, UK.
- ICMM, 2019. Integrated Mine Closure, Good Practice Guide, 2nd Edition. International Council on Mining and Metals. London, United Kingdom. Available at: <https://www.icmm.com/en-gb/environment/mine-closure/integrated-mining-closure>
- INAP, 2009. The Global Acid Rock Drainage Guide (incorporating best practices and technology to address acid and metalliferous drainage issues). International Network for Acid Prevention.
- MCA, 2014. Water accounting framework for the minerals industry – User guide. Minerals Council of Australia.
- Northern Territory Department of Health (DoH), 2018. Health requirements for mining and construction. Department of Health, Environmental Health Branch. Available at: <https://www.nt.gov.au/property/building-and-development/health-and-safety/health-requirements-mining-construction-projects>. Last updated 1 March 2018.
- NT EPA, 2019a. General guidance for proponents preparing an environmental impact statement. Northern Territory Environment Protection Authority, Darwin.
- NT EPA, 2019b. Statement of Reasons: NT Mining Operations – Union Reefs North Underground Mine. Northern Territory Environment Protection Authority, Darwin.
- NT EPA, 2019c. Guidance for proponents – stakeholder engagement. Northern Territory Environment Protection Authority, Darwin.
- NT EPA, 2018a. Environmental Factors and Objectives. Northern Territory Environment Protection Authority, Darwin.
- NT EPA, 2018b. Guidance on adaptive management. Northern Territory Environment Protection Authority, Darwin.
- NT EPA, 2018c. Opportunities and timeframes for community engagement in the environmental impact assessment process: Information for proponents and the public. Northern Territory Environment Protection Authority, Darwin.
- NT EPA, 2013a. Guideline on Conceptual Site Models. Northern Territory Environment Protection Authority, Darwin.

- NT EPA, 2013b. Environmental Assessment Guidelines on Acid and Metalliferous Drainage (AMD). Northern Territory Environment Protection Authority, Darwin.
- NT EPA, 2013c. Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites in the NT. Northern Territory Environment Protection Authority, Darwin.
- McCullough, C. D., Marchand, G. & Unseld, J., 2013. Mine closure of pit lakes as terminal sinks: Best available practice when options are limited? *Mine Water and the Environment*, Volume 32, pp. 302-313.
- Threatened Species Scientific Committee (2016). Conservation Advice *Macroderma gigas* ghost bat. Canberra: Department of the Environment. Available at: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/174-conservation-advice-05052016.pdf>

3.2 Public exhibition requirements

The public exhibition requirements are outlined in section 3.6.3 of the NT EPA General Guidance for Proponents Preparing an EIS. In addition to the NT News, the proponent is to advertise in The Australian that the Draft EIS is available for review and comment. Additional specific details are provided below.

3.2.1 Exhibition period

Recognising the Proposal is within an existing operation and brownfield site, and with consideration of the information provided in the NOI for limited potentially significant impacts, the NT EPA proposes a four week public exhibition period for the Draft EIS. This will be confirmed or adjusted during the Draft EIS pre-lodgement phase as necessary.

3.2.2 Exhibition locations

The Draft EIS should be provided to and be made available for public exhibition at:

- NT EPA, Level 1, Arnhemica House, 16 Parap Road, Parap
- Department of Primary Industry and Resources, 3rd Floor, Paspalis Centrepoint, 48 Smith Street Mall, Darwin
- Northern Territory Library, Parliament House, Darwin
- Environment Centre Northern Territory, Unit 3, 98 Woods St, Darwin.
- Northern Land Council, 45 Mitchell St, Darwin
- Victoria Daly Regional Council – Pine Creek Office, 55 Moule St, Pine Creek

Attachment A - The objects and principles of the Environment Protection and Biodiversity Conservation Act 1999

3 Objects of the Act

- (a) to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance; and
- (b) to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources; and
- (c) to promote the conservation of biodiversity; and
- (d) to provide for the protection and conservation of heritage; and
- (e) to promote a co-operative approach to the protection and management of the environment involving governments, the community, land-holders and indigenous peoples; and
- (f) to assist in the co-operative implementation of Australia's international environmental responsibilities; and
- (g) to recognise the role of indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity; and
- (h) to promote the use of indigenous peoples' knowledge of biodiversity with the involvement of, and in co-operation with, the owners of the knowledge.

3A Principles of Ecologically Sustainable Development

The following principles are *principles of ecologically sustainable development*.

- (a) Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations.
- (b) If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
- (c) The principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
- (d) The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.
- (e) Improved valuation, pricing and incentive mechanisms should be promoted.

Attachment B – Matters that must be addressed by draft public environment report and environmental impact statement

(Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000)

1 General information

1.01 The background of the action including:

- (a) the title of the action;
- (b) the full name and postal address of the designated proponent;
- (c) a clear outline of the objective of the action;
- (d) the location of the action;
- (e) the background to the development of the action;
- (f) how the action relates to any other actions (of which the proponent should reasonably be aware) that have been, or are being, taken or that have been approved in the region affected by the action;
- (g) the current status of the action;
- (h) the consequences of not proceeding with the action.

2 Description

2.01 A description of the action, including:

- (a) all the components of the action;
- (b) the precise location of any works to be undertaken, structures to be built or elements of the action that may have relevant impacts;
- (c) how the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts;
- (d) relevant impacts of the action;
- (e) proposed safeguards and mitigation measures to deal with relevant impacts of the action;
- (f) any other requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed action;
- (g) to the extent reasonably practicable, any feasible alternatives to the action, including:
 - i. if relevant, the alternative of taking no action;
 - ii. a comparative description of the impacts of each alternative on the matters protected by the controlling provisions for the action;
 - iii. sufficient detail to make clear why any alternative is preferred to another;
- (h) any consultation about the action, including:

- i. any consultation that has already taken place;
- ii. proposed consultation about relevant impacts of the action;
- iii. if there has been consultation about the proposed action — any documented response to, or result of, the consultation;
- iv. identification of affected parties, including a statement mentioning any communities that may be affected and describing their views.

3 Relevant impacts

3.01 Information given under paragraph 2.01(d) must include

- (a) a description of the relevant impacts of the action;
- (b) a detailed assessment of the nature and extent of the likely short term and long term relevant impacts;
- (c) a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible;
- (d) analysis of the significance of the relevant impacts;
- (e) any technical data and other information used or needed to make a detailed assessment of the relevant impacts.

4 Proposed safeguards and mitigation measures

4.01 Information given under paragraph 2.01(e) must include:

- (a) a description, and an assessment of the expected or predicted effectiveness of, the mitigation measures;
- (b) any statutory or policy basis for the mitigation measures;
- (c) the cost of the mitigation measures;
- (d) an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing;
- (e) the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program;
- (f) a consolidated list of mitigation measures proposed to be undertaken to prevent, minimise or compensate for the relevant impacts of the action, including mitigation measures proposed to be taken by State governments, local governments or the proponent.

5 Other Approvals and Conditions

5.01 Information given under paragraph 2.01(f) must include:

- (a) details of any local or State government planning scheme, or plan or policy under any local or State government planning system that deals with the proposed action, including:

- i. what environmental assessment of the proposed action has been, or is being carried out under the scheme, plan or policy;
 - ii. how the scheme provides for the prevention, minimisation and management of any relevant impacts;
- (b) a description of any approval that has been obtained from a State, Territory or Commonwealth agency or authority (other than an approval under the Act), including any conditions that apply to the action;
- (c) a statement identifying any additional approval that is required;
- (d) a description of the monitoring, enforcement and review procedures that apply, or are proposed to apply, to the action.

6 Environmental record of person proposing to take the action

6.01 Details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:

- (a) the person proposing to take the action; and
- (b) for an action for which a person has applied for a permit, the person making the application.

6.02 If the person proposing to take the action is a corporation — details of the corporation's environmental policy and planning framework.

7 Information sources

7.01 For information given the PER/EIS must state:

- (a) the source of the information; and
- (b) how recent the information is; and
- (c) how the reliability of the information was tested; and
- (d) what uncertainties (if any) are in the information.

Appendix B – Cross Reference to TOR

CROSS REFERENCE TO THE TERMS OF REFERENCE FOR THE PREPARATION OF AN EIS

Terms of Reference	Cross Reference
Development and Operation	
Site Layout Maps	
Location and dimensions of proposal components, identifying existing infrastructure, pit lakes, landforms, roads/tracks; and new areas of disturbance, infrastructure, stockpiles, drainage and underground workings.	Section 3.3, 4.1, 4.5 and 4.6
The proposal layout overlain with environmental values of the site such as the location of occupied adits, waterbodies/waterways.	Section 3.3 and 4
The current land tenure and owner(s) of the land of which the Proposal area covers.	Section 3.2, 3.3 and 4.2
Alternatives	
<ul style="list-style-type: none"> Alternative portal locations considered and associated alternative pit lake dewatering and water balance options. Alternatives to restricting access to OK and Prospect adits during operation. 	Section 4.10
<ul style="list-style-type: none"> Extent of investigations into the alternative proposal with regard to assessment of impacts on environmental values. Why the preferred alternative was selected. 	Section 4.10
Mine Development	
Timeframes and seasonal considerations, for pit dewatering, water treatment and construction of portal access.	Section 4, 4.1, 4.6, 4.8, 8.2.1 and 8.5...
Mine Operation	
Methods and timeframes for underground mine development.	Section 4, 4.1, 4.3, 4.7 and 4.8
Method, timeframe and expected volumes for dewatering and water treatment.	Section 4, 4.1, 4.6, 4.8, 8.2.1, 8.5, 12.3.1, Appendix H and Appendix I
Volume of ore and waste rock to be mined annually.	Section 4.1, 4.8 and 4.9.2
Material characterisation (waste rock and ore), classification and expected volumes of each material type (e.g. non-acid-forming, potentially acid-forming).	Section 4.9.2

Terms of Reference	Cross Reference
Timeframes and staging of progressive rehabilitation activities proposed during mine operation.	Section 4.4 and 4.6.1
Ore Processing	
Explanation of the processing method – clarification of consistency with previously authorised activities and description of any variances.	Section 4.2, 4.5.4 and 4.9.3
Volumes and chemical composition of tailings and proposed disposal timeframe and method.	Section 4.1, 4.2, 4.6, 4.9.3 and 8.1
Water Use	
<p>A water balance (including schematic) and water account for the proposal, based on the Minerals Council of Australia Water Accounting Framework (MCA 2014), incorporating:</p> <ul style="list-style-type: none"> • Predicted water demand for all phases of the proposal. • Proposed water supply sources, available volumes and yields (including details of any peak periods and seasonal variations). • Water volumes and timing for transfer of dewater to water tanks and Crosscourse pit lake, during mine development and operations. • Water volume anticipated to remain, if any, in Prospect pit lake during dewatering actions. • Confirmation that Crosscourse pit can accommodate tailings and dewatering from Prospect pit. • Management of process waters. 	Sections 4.6 and 8
<p>An overview of treatment methodology, including:</p> <ul style="list-style-type: none"> • Discharge water quality (including targets in accordance with ANZG (2018) or otherwise). • Location of the discharge point/s. • Schedule for the discharge if discharge is proposed. 	Section 8.1.6, 8.5, 12.3.1
Discussion on water quality and levels of pit lakes and dams affected by the proposal for the short term (e.g. at closure) and long-term (post-closure) up to at least the time of predicted equilibrium/stability, or 1,000 years (whichever occurs first), based on hydrogeological modelling, material characterisation, and other modelling (e.g. contaminant transport modelling).	Section 8.1, 8.4, 12.3, 13.2.3 and 13.3.2.
Rehabilitation and Closure	
Closure Objectives	
Proposal-specific closure objectives and an explanation of how they are consistent with leading practice guidance.	Section 5.1.3 and 9.4

Terms of Reference	Cross Reference
How proposal-specific closure objectives will be met and over what timeframes.	Section 8.4, 9.1, 9.4 and 9.5
Details of how monitoring results will assist in assessing compliance with the mine closure objectives.	Section 9.1
Protection of Ghost bat habitat throughout mine closure and post closure	Section 9.4 and 11.4
Discussion on stakeholder expectations and an outline of methods for reaching agreement with stakeholders on closure objectives.	Section 6.1, 9.3 and 9.5
Description of any improvements to overall environmental condition of the mine site post underground mining.	Section 9.1, 11.4
Assessment of the cumulative impacts of the proposal on the interactions between previous activities and impacts, and the new proposal.	Sections 10.1.5, 11.3, 12.3, 13.3 and 14.3
General Plans	
Intended closure timeframes.	Section 4.4 and 9.1
Expected post closure monitoring and management arrangements.	Section 9.1
Indicative volumes, sources and characterisation of materials required for rehabilitation and closure (e.g. fill, cover materials).	Section 4.1, 9.1.1 to 9.1.8 and 9.2
Predicted post-closure water balance.	Section 8.4
Key Components (Open Pits/Lakes, Tailings, Surface Waste Rock, Site Drainage & Access Portal and Underground Mine)	
Outline of all rehabilitation and closure options that have been or are being considered, and where uncertainties remain, outline a process that will be used to decide which closure options will be adopted.	Section 9.1 and 9.2
Evaluation and comparison of the likely environmental outcomes and the costs, benefits and residual environmental and social risks of the rehabilitation and closure alternatives considered. Information on the methods, assumptions and limitations used in any calculations of cost, time and materials required for rehabilitation options.	Section 9.1, 9.3 and 13.3
Demonstration that the selected closure option delivers post-closure environmental outcomes with respect to the principles of ecologically sustainable development.	Section 9
Explanation of how closure options contribute to meeting the overall closure objectives.	Section 9

Terms of Reference	Cross Reference
A conceptual site model including landforms and final structures that are designed to divert, capture, retain and/or treat surface runoff from the site.	Section 4.6, 4.6.1, 8.1.1, 8.1.5, 8.1.7, 8.4 and Appendix I
Future use and/or access requirements, particularly the access portal	Section 9.1.1 – 9.1.4 and 9.4
An assessment of the resulting pit lakes in accordance with Appendix H of the Western Australian Guidelines for Preparing Mine Closure Plans (DMP & EPA 2015), including density driven exchange between pit lake water and surrounding groundwater.	Section 8.2 and 13.3
Risks to Successful Rehabilitation and Closure	
Description of matters that could influence unanticipated or early care and maintenance and/or closure of the mine, how this may affect rehabilitation objectives, and the contingency and mitigation measures to be implemented.	Section 9.3 and 9.5
Terrestrial Flora and Fauna	
Environmental Values	
Location of Ghost bats using the proposal area, include: <ul style="list-style-type: none"> • Geographic extent of the regional population. • Geographic location of known and/or predicted colonies. • Characteristics of all known and likely natural and man-made roosts in the proposal area (provide depth and structure at a minimum for OK, Lady Alice, Union North and Prospect adits). 	Section 11.2.2, 11.2.3 and Appendix G
Ghost bat use (including seasonal use) of natural and man-made roosts within: <ul style="list-style-type: none"> • The proposal area. • The region (including, but not limited to, known connections with colonies at Springhill and Kohinoor adit). 	Section 11.2.2, 11.2.3 and Appendix G
Significance of adits to: <ul style="list-style-type: none"> • Ghost bat colonies in the proposal area region. • The regional population of Ghost bats. 	Section 11.2.2, 11.2.3, 11.3.3 and Appendix G
Discussion of Ghost bat movements and roosting activity within a regional context, with regard to individuals that are transient or remain within the proposal area, and consideration of:	Section 11.2.2, 11.2.3, 11.3.3, 11.4 and Appendix G

Terms of Reference	Cross Reference
<ul style="list-style-type: none"> • Past and current distribution. • Recent exploration drilling program. • Recent seasonal movements. • Regional significance of roosting sites. • Existing and required genetic information. 	
Potential Impacts and Risks	
Susceptibility of Ghost bats to low level vibration and limits below what is considered for human comfort levels and provide the justification and rationale for limits (from suitably qualified ecologists (chiropterologist) in consultation with acoustic engineers).	Section 11.3.4 and Appendix G
Damage to roost sites through internal collapse or entrance blockages.	Section 11.3.2 and Appendix G
Evidence to demonstrate the consequence and likelihood of potential impacts to individuals, local colony(s) and the regional population of Ghost bats as a result of temporary exclusion of Ghost bats from occupied adits, considering this effect over time as well as single events.	Section 10.1.6, 11.3.3 and Appendix G
Impact arising from Ghost bats (individual, colony, regional population) relocating to suboptimal roosts on nights following noise or vibration disturbance with potential for increased mortality.	Section 11.3.3, 11.3.4 and Appendix G
Impacts at each level of individual, colony(s) and the regional population resulting from Ghost bats leaving closed adits.	Section 11.3.3 and Appendix G
<p>The capacity of known roost structures on-site (Union North and Lady Alice adits) and off-site (Kohinoor adit and Springhill workings) to accommodate bats excluded during proposed adit closure, consider:</p> <ul style="list-style-type: none"> • Potential for significant impact to Ghost bats and other obligate cave dwelling bats in currently occupied roosts. • Mortality through suboptimal roosting and daytime abandonment of roosts. • Capacity and likelihood for migration to, and use of, alternate roosts. 	Section 11.3.3 and Appendix G
Consequence of potential impacts on local colony(s) and the regional population resulting from the total loss of Ghost bats from affected adits.	Section 11.6 and Appendix G
Robust justification to support claims that impacts considered would not be significant due to the implementation of avoidance measures or no impact pathway.	Section 11.3 and 11.6

Terms of Reference	Cross Reference
Statement for whether any relevant impacts are likely to be unknown, unpredictable or irreversible.	Section 11.5 and 11.6
Assessment of impacts that identifies relevant short term and long-term impact pathways and the full extent of any consequences.	Section 11.3, 11.6 and Appendix G
Detailed assessment of any likely impacts that the proposed action may facilitate on the Ghost bat at the local, regional, state and national scale in accordance with the EPBC Act. Including consideration of the precautionary principle.	Section 11.3.5 and Appendix G
Mitigation and Management	
Identification of options to avoid exclusion of Ghost bats from adits (e.g. active relocation, artificial roost sites, no mining) and provide clear and comparative assessment of the environmental consequences, viability, risk, cost and benefits of each alternative at various time scales.	Section 11.4 and Appendix 1 of Appendix G
Minimising adit collapse or blockage and daytime Ghost bat movements from vibration.	Section 11.4 and Appendix 1 of Appendix G
Mitigation and management responses, for all phases of the proposal, to avoid, minimise, mitigate or restore, impacts on Ghost bats and other obligate cave dwelling bats.	Section 11.4 and Appendix 1 of Appendix G
List of mitigation measures proposed to prevent, minimise or mitigate the relevant impacts of the proposal, including those proposed to be taken by Territory and local governments or the proponent.	Section 11.4 and Appendix 1 of Appendix G
Discussion of how the proposal is consistent with Threat Abatement Plans and Recovery Plans and how it has had regard to Conservation Advices in accordance with the EPBC Act and other statutory or policy basis for mitigation measures.	Section 11.4 and Appendix 1 of Appendix G
Provide an updated Ghost Bat Action Plan incorporating all relevant information identified herein.	Appendix 1 of Appendix G
Monitoring and Reporting	
Survey design, including timeframe of monitoring required, to measure the effect on Ghost bat individuals and colonies (in proposal area) and population (in region) if temporary exclusion of Ghosts bats from adit closure is undertaken.	Section 11.4, 11.5.1 and Appendix G
<p>Monitoring plan to identify impacts on Ghost bats and other obligate cave dwelling bats, including:</p> <ul style="list-style-type: none"> ● Appropriate and targeted monitoring to identify whether mitigation measures are successful during mining. ● Clear triggers for when changes to activity (including stop work)/monitoring are required. ● Clear actions required before activity resumes. ● Clear trigger for when activity may resume. 	Section 11.4, 11.5.1 and Appendix G

Terms of Reference	Cross Reference
<ul style="list-style-type: none"> Clear feedback of monitoring data to inform management actions. 	
Expected post closure monitoring and management arrangements.	Section 11.4 and Appendix 1 of Appendix G
Names of endorsing or approving agencies for mitigation measures, monitoring program and action plan.	Appendix 3 of Appendix G
Details of consultation undertaken, including: <ul style="list-style-type: none"> The names and qualifications of appropriate experts consulted and/or engaged to design survey and monitoring plans (including Flora and Fauna – DENR). The names and qualifications of third party reviewers. Details of the scope of consultation or review any documented responses to, or result of, the consultation. 	Appendix 3 of Appendix G
Residual Impact	
Assessment of the significance of any residual impact or risk of the proposal to local colonies and the regional Ghost bat population should bat mortality occur.	Section 11.6 and Appendix G
Details of a proposed offset package to be implemented to compensate for the residual significant impact of the proposal and an analysis of how the offset meets the requirements of the Department of the Environment and Energy EPBC Act Offsets Policy (DSEWPC, 2012).	Section 11.3.5, 11.4 and Appendix G
Separate EPBC Conclusion	
Overall conclusion as to the environmental acceptability of the proposal on Ghost bats, including: <ul style="list-style-type: none"> Discussion on the consideration with the requirements of the EPBC Act, including the objects of the EPBC Act, the principles of ecologically sustainable development and the precautionary principle. Reasons justifying undertaking the proposal in the manner proposed, including the acceptability of the avoidance and mitigation measures. Discussion of residual impacts and any offsets and compensatory measures proposed or required for significant residual impacts on Ghost bats, and the relative degree of compensation and acceptability. 	Section 11.3.5 and Appendix G
Hydrological Processes	Cross Reference
Environmental Values	

Terms of Reference	Cross Reference
Characterisation of the current hydrological regime of the proposal area and receiving waterways, in particular McKinlay River, which may be impacted by the proposal.	Section 7.5, 12.2 and Appendix H
<p>Long term monitoring data that describes the surface water hydrology:</p> <ul style="list-style-type: none"> ● Major and minor rivers, drainage lines and wetlands (permanent and ephemeral). ● Surface water flow directions and rates, based on field data and modelled data. ● Water reservoirs (natural and artificial). 	Section 12.2 and Appendix H
<p>Long term monitoring data that describes groundwater aquifers and hydrological properties:</p> <ul style="list-style-type: none"> ● Depth to aquifers, including temporal variation. ● Groundwater contours and flow direction, volumes and yields. ● Hydrological connectivity (considering seasonal variation) between groundwater aquifers, existing pits, dams and the Pine Creek bore field (town water supply) of the proposal area and zone of influence. ● Surface connections via springs or recharge zones. ● Beneficial uses, specifically groundwater extraction. 	Section 12.2 and Appendix H
Potential Impacts and Risks	
Potential impacts and risks to hydrological processes from the proposal that relate to the effects of dewatering the Prospect pit and underground mine.	Sections 12.3.2 and 12.3.7
Current status of groundwater processes and how the proposal may alter the hydrological regime of the proposal area, surrounding pit lakes, dams and receiving waters (including groundwater extraction for stock watering and base flows in the Mary River catchment area).	Sections 12.2, 12.3, 12.6 and Appendix H
Discussion of the potential for impact on Pine Creek bore field.	Section 12.3.4
Demonstration that there will be no impact on Pine Creek town water supply.	Section 12.3.2 and Appendix H
<p>Quantification of the groundwater drawdown during operations and post-mining/closure, indicating:</p> <ul style="list-style-type: none"> ● Peak drawdown. ● Predicted post-closure recovery of groundwater levels upon stabilisation and in extreme rain events. ● Time required for full recovery. ● Predicted groundwater level contours at the time of peak drawdown and at the end of the proposal. 	Section 12.3.2 and Appendix H

Terms of Reference	Cross Reference
Quantification of the altered surface water flow pathways, volumes and timing (seasonality) that arise from mine dewatering for each phase of the proposal including post-closure.	Section 4.6, 8.1, 8.2, 9.1.3, 9.1.4, 12.3.3, 13.2 and Appendix H
Consideration and discussion surrounding the discharge to the environment (ground or surface, on-site or off-site, intended or unintended) from the pit lakes, post-closure, based on a predicted water balance of the final pit lakes.	Section 4.6, 8.1.6, 8.5, 12.2, 12.3.2, 12.3.3, 13.3.1, 14.2 and 14.3.2.
A justification for impacts considered not significant due to identification of avoidance measures or no impact pathway (providing for the full extent of consequence where an impact pathway exists).	Section 10.6.1, 12.3
Mitigation and Management	
<p>Application of the mitigation hierarchy on the following:</p> <ul style="list-style-type: none"> • The extent of the depressurisation zone and its effect during dewatering of the underground mine. • The extent of groundwater drawdown, on surface and groundwater flows as well as on other water bodies within and adjacent to the proposal, from dewatering the Prospect pit and underground mine. • Impact on beneficial uses of groundwater. 	Section 12.4 and 12.5
Monitoring and Reporting	
<p>Detailed water monitoring program for all phases of the proposal (including post-closure) for the proposal which includes:</p> <ul style="list-style-type: none"> • Groundwater levels and flows (rate and direction) to address potential drawdown effects. • Surface water volumes and flow rates. 	Section 12.5
Residual Impact	
Assessment of the significance of any residual impact or risk of the proposal on hydrological processes.	Section 12.6
Inland Water Environmental Quality	
Environmental Values	
Characterisation of the environmental values associated with the quality of surface water and groundwater and how they relate to the proposal's location in the headwaters of the McKinlay River.	Section 13.2

Terms of Reference	Cross Reference
<p>Baseline information to describe environmental values and declared beneficial uses both within and surrounding receiving waters downstream of the proposal (including a map), including:</p> <ul style="list-style-type: none"> • Description of permanent pools of water on the McKinlay River. • Existing users of surface and/or groundwater resources. 	Section 13.1 and 13.2.
<p>Description of baseline water quality, including a comparison with relevant water quality guidelines (e.g. ANZG 2018), and incorporating any additional parameters of relevance to the proposal area, of:</p> <ul style="list-style-type: none"> • Receiving waters (surface and groundwater), including the McKinlay River and control sites. • All pit lakes and dams affected by the proposal, including equivalent data for Lady Alice pit lake, Union North pit lake, Dam A and Dam C. • Groundwater at all pit lakes and dams within the surrounding area of influence. 	Section 13.2.1 to 13.2.3 and Appendix I
<p>Discussion of water quality data (provide dates and comparison against longer term, providing for dry and wet season scenarios).</p>	Section 13.2.3, 13.2.4 and Appendix I
<p>Analysis and quantification of any historic impacts to water quality.</p>	Sections 13.2 and 13.3
Potential Impacts and Risks	
<p>Quantification of potential impacts on groundwater from Acid and Metalliferous Drainage (AMD) and saline drainage from surface waste rock storage and the ability of the waste rock classification system to identify waste rock that may produce AMD, saline drainage and all contaminants of concern.</p>	Section 13.3 and Appendix I
<p>Quantification of expected pit water quality during and post mining accounting for the permanent surface storage of waste rock used as the bench in the Prospect pit.</p>	Section 13.2, 13.3 and Appendix I
<p>Quantification of passive discharge or seepage from:</p> <ul style="list-style-type: none"> • Surface waste rock storage. • Exposure of historic mining material through dewatering Prospect pit and/or lowering water levels in other pit lakes and dams. 	Section 4.9.2, 8.1.5, 8.4.2, 9.4, 13.2.3, 13.3 and Appendix I
<p>Discussion of changes to water quality from the following:</p> <ul style="list-style-type: none"> • The release of water from the proposal sites through unintended loss of control/containment or intended discharge. • New impacts from increased output of the existing processing plant. 	Section 13.3, 14.3.3, Appendix H and Appendix I

Terms of Reference	Cross Reference
<ul style="list-style-type: none"> Immediate and long term water quality impacts across all water bodies affected by the proposal. 	
<p>Predictions associated with water quality and contaminants of concern between connected mine pit lakes and existing dams with consideration of:</p> <ul style="list-style-type: none"> Recharge of the Prospect pit and underground mine due to connection with Dam A via Lady Alice and Union North pit lakes. Lowering of adjacent pit lake and dam levels due to connectivity with the Prospect pit and underground mine, and any potential for non-benign waste rock present in the walls and floor to be exposed thus oxidise and produce acid, saline and/or metalliferous drainage. 	<p>Section 10.2.1, 13.2, 13.3, 14.3.2, Appendix F and Appendix I</p>
<p>Conceptual site models describing sources of potential contaminants, mechanisms for their release, transport pathways, receptors, and fate of any potentially contaminated waters from the proposal for the following:</p> <ul style="list-style-type: none"> Development/any dewatering of existing pits/storages. During mining/processing, including any dewatering. To the point equilibrium is reached. 	<p>Section 13.1, 13.2 and Appendix I</p>
Mitigation and Management	
<p>Draft Water Management Plan identifying the mitigation and management actions that will be provided.</p>	<p>Section 4.6, 8, 12.4 and 12.5</p>
<p>The approach to avoid or minimise (treat) uncontrolled discharges and/or migration of poor-quality mine affected water requiring discharge, and a predicted schedule for the discharge.</p>	<p>Section 8.2, 8.5.4, 12.4 and Appendix I</p>
<p>The proposed water management measures to:</p> <ul style="list-style-type: none"> Avoid cumulative impact from poor water quality. Provide storage flexibility during operations. Allow closure objectives to be met. 	<p>Section 4.6, 8, 12.4, 12.5 and Appendix I</p>
<p>Demonstration that mine closure strategies will be implemented to avoid impacts to values dependent on good water quality, both during operation and into the long-term following closure (giving reference to Mine Closure Plan).</p>	<p>Sections 8.5 and 9.1</p>
Monitoring and Reporting	
<p>Discussion and monitoring plan for pit lakes for all phases (including post closure).</p>	<p>Sections 8.1.3, 8.1.4, 8.4 and 13.5</p>

Terms of Reference	Cross Reference
Discussion and monitoring plan for groundwater in the vicinity of the proposal (including post closure).	Section 13.2.4, 13.4 and Appendix I
Discussion and monitoring plan for surface water in the vicinity of the proposal and downstream (including post closure).	Section 13.2.3, 13.4 and Appendix I
Residual Impact	
Assessment of the significance of any residual impact or risk of the proposal on inland water environmental quality.	Section 10.6.1 and 13.3
Aquatic Ecosystems	
Environmental Values	
Description of the aquatic ecosystems, including any permanent pools in the McKinlay River, in the area where hydrological processes and inland water environmental quality may be impacted by the proposal.	Sections 14.1 -14.2.2 and Appendix J
Description of the regional distribution, abundance or extent of aquatic ecosystems of McKinlay River and comparable control areas.	Sections 14.2 and Appendix J
Potential Impacts and Risks	
Quantification and discussion of impacts for all phases, in comparison to baseline data, in the distribution, abundance or health of aquatic ecosystems and their constituent taxa due to changes to hydrological processes (including reduction or increase in surface and/or groundwater flows or ephemeral pools).	Sections 14.3 and Appendix J
Mitigation and Management	
Identification of the mitigation and management actions that will be provided to ensure that all potential impacts identified above to the aquatic ecosystems of McKinlay River, in accordance with the mitigation hierarchy.	Section 14.4 and Appendix J
Monitoring and Reporting	
Monitoring plan for water availability (quantity and quality) for any aquatic ecosystems.	Section 14.5 and Appendix J
Monitoring plan for the distribution, abundance and/or health of aquatic ecosystems and constituent taxa, as applicable.	Section 14.5.1 and Appendix J
Residual Impact	
Assessment of the significance of any residual impact or risk of the proposal on aquatic ecosystems.	Section 14.6 and Appendix J

Appendix C – EIS Authors

EIS AUTHORS

TABLE 15-1 EIS STUDY TEAM

Project Input	Key Staff and Qualification		Company
EIS Preparation			
Author	Nicole Conroy, BAppSc(Hons)		GHD Pty Ltd
Author	Dong (Sam) Yang, B.Env.Eng. CPESC (8425) MAusimm (323988)		Kirkland Lake Gold Ltd
Author	Bhavika Laxman, BEnvMan (Hons)		GHD Pty Ltd
Author	James Hill, BSc.		GHD Pty Ltd
Author	Jaime Marr, BEnvSc.		Kirkland Lake Gold Ltd
Author	Tyler Tinkler, BE(Civil) BE(Env)(Hons)		GHD Pty Ltd
Author	Heather North, BEnvSc, BSc(Hons)		GHD Pty Ltd
Author	Karen Yale, MSc. BSc.		GHD Pty Ltd
Peer Review	Dr Stuart Winchester, PhD, MBA, MSc, BSc, GradDipAppSc		GHD Pty Ltd
Appendices			
Geochemical Characterisation of Waste Rock and Ore (Appendix F)	Author	Dr Warwick Stewart, PhD, BSc(Hons) Dr Russell Schumann, PhD, BSc(Hons)	Environmental Geochemistry International Pty Ltd
	Peer Review	John Jeffery, PhD, BAgSci (Hons)	Environmental Geochemistry International Pty Ltd
Ghost Bat Technical Report (Appendix G)	Author	Paul Barden, MSc (Environmental Management)	Ecological Management Services Pty Ltd
	Author	Dr Kyle Armstrong, BSc (Hons) PhD (Zoology)	Specialised Zoological
	Author	Nicola Hanrahan, Bsc (Hons), PhD Candidate	Nicola Hanrahan Consulting Services

Project Input	Key Staff and Qualification		Company
	Author	Emer McGowan, BSc (Hons)	Kirkland Lake Gold Ltd
	Peer Review	Dr Bruce Thomson, PhD, BAppSc	Ecology by Design
	Peer Review	Sue Churchill, MSc	Independent Researcher
Blasting Noise and Vibration Modelling (Appendix 1 of Appendix G)	Author	Marco Velasco, MSc (Audio and Acoustics)	GHD Pty Ltd
Groundwater Study (Appendix H)	Author	Dr Lee Evans, PhD BAppSci (Hons)	GHD Pty Ltd
	Peer Review	Antony Volcich, B.Sc (Env), M.Sc (Research), G.Cert (Eng)	GHD Pty Ltd
Geochemical Water Quality Modelling (Appendix I)	Author	Dr Katrina David PhD (Hydrology) Dr David Faulkner, BSc(Hons), PhD Dr Russell Schumann, PhD, BSc(Hons)	Environmental Geochemistry International Pty Ltd
	Peer Review	Dr John Jeffery, PhD, BAgSci (Hons)	Environmental Geochemistry International Pty Ltd
Aquatic Ecosystems Characterisation Report (Appendix J)	Author	Tara Steele, BSc BA MEnv	Aquatic Ecology Services
	Peer Review	Gary Bennison, BSc (Hons)	ECOScience Australia
	Peer Review	Nicole Conroy, BAppSc (Hons)	GHD Pty Ltd

Appendix D – Spatial Coordinates of Project Footprint and Site
Technical Studies

COORDINATES

Spatial data to define the Union Reefs Project Area features and site technical studies are included in Table 15-2. Shape files including the extent of the project area and associated technical study areas have been attached to this draft EIS.

TABLE 15-2 SPATIAL COORDINATES OF UNION REEFS PROJECT AREA FOOTPRINT AND SITE TECHNICAL STUDIES

Feature	Description	Zone	Easting	Northing
Terrestrial Flora and Fauna				
Roost	OK Adit entrance portal	52L	801427	8482730
Roost	Union North Adit entrance portal	52L	801156	8483393
Record of bat in flight	Unnamed shaft entrance portal	52L	801368	8483485
Record of bat in flight	Lady Alice Adit entrance portal	52L	801310	8483401
Feeding sight	Railway culvert	52L	800520	8480465
Feeding sight	Railway culvert	52L	799434	8483753
Feeding site	Prospect Adit entrance portal	52L	801373	8482766
Roost	OK Adit roost estimated position	52L	801444	8482734
Roost	Union North Adit roost estimated position	52L	801209	8483424
Aquatic Ecosystems				
MRDRY01	Dry conditions	52L	802631	8478018
MRDRY02	Dry conditions	52L	802362	8478148
MRDRY03	Dry conditions	52L	802149	8478487
MRDRY04	Dry conditions	52L	801012	8480267
MRDRY05	Dry conditions	52L	799963	8482256
MRDRY06	Dry conditions	52L	799726	8482346

Feature	Description	Zone	Easting	Northing
MRDRY07	Dry conditions	52L	799188	8482642
MRDRY08	Dry conditions	52L	799017	8482818
MRDRY09	Dry conditions	52L	799031	8483082
MRDRY10	Dry conditions	52L	798586	8483015
MRDRY11	Dry conditions	52L	798785	8483345
MRDRY12	Dry conditions	52L	798754	8483469
MRDRY13	Dry conditions	52L	798295	8486946
MRDRY14	Dry conditions	52L	798632	8487030
MRDRY15	Dry conditions	52L	798894	8487228
MRDRY16	Dry conditions	52L	798346	8487618
MRDRY17	Dry conditions	52L	798219	8487889
MRDRY18	Dry conditions	52L	797885	8488951
MRDRY19	Dry conditions	52L	798308	8489023
MRWET01	Wet conditions	52L	802289	8478411
MRWET02	Wet conditions	52L	800952	8480697
MRWET03	Wet conditions	52L	801041	8480918
MRWET04	Wet conditions	52L	800987	8480952
MRWET05	Wet conditions	52L	800314	8481671
MRWET06	Wet conditions	52L	800382	8481956
MRWET07	Wet conditions	52L	800254	8482134
MRWET08	Wet conditions	52L	800159	8482318
MRWET09	Wet conditions	52L	799918	8482100

Feature	Description	Zone	Easting	Northing
MRWET10	Wet conditions	52L	799641	8482480
MRWET11	Wet conditions	52L	799393	8482581
MRWET12	Wet conditions	52L	798890	8483116
MRWET13	Wet conditions	52L	798295	8486946
MRWET14	Wet conditions	52L	798632	8487030
MRWET15	Wet conditions	52L	798894	8487228
MRWET16	Wet conditions	52L	798346	8487618
MRWEIR	Located at constructed concrete weir	52L	800788	8481493
MRBILL01	Billabong	52L	800933	8480922
MRBILL02	Billabong	52L	800214	8482438
Inland Water Quality				
URNDD0055	Diamond Drill, depth analysed 18 m to 81 m	52L	801432	8482924
URNDD0061	Diamond Drill, depth analysed 1 m to 77 m	52L	801453	8482882
URNDD0100	Diamond Drill, depth analysed 46 m to 290 m	52L	801494	8482874
URNDD0105	Diamond Drill, depth analysed 44 m to 285 m	52L	801511	8482851
Site Infrastructure				
Dam A	Used for dust suppression, receives overflow water from Dam C	52L	800955	8484312
Dam B	Downstream of ROM, Fuel Bay, Workshop, and South of West WRD	52L	800721	8482225
Dam C	Used for milling operations	52L	801664	8483908
Union Reefs Plant Spill Pond	Spill contingency containment	52L	801273	8481793
Union Reefs Decant Pond	Receives runoff from rehabilitated tailings dam	52L	801517	8480317
URRD	Tailings Slurry	52L	801237	8481780

Feature	Description	Zone	Easting	Northing
Crosscourse Pit	Tailings storage facility	52L	801709	8482528
Union North Pit	Open Pit	52L	801097	8483524
Lady Alice Pit	Open Pit	52L	801482	8483202
Prospect Pit North	Proposed Underground Mine	52L	801311	8482957
Prospect Pit South	Open Pit	52L	801397	8482711
Union South Pit	Open Pit	52L	802113	8481293
Ping Que Pit	Open Pit	52L	802223	8481375
Big Tree Pit	Open Pit	52L	802301	8481205
Millars Pit	Open Pit	52L	802424	8480961
Temple Pit	Open Pit	52L	802230	8481007
Laydown Area	Laydown for recyclable material	52L	800893	8483149
Landfill	Waste refuse disposal	52L	801020	8483090
Fuel Bay	Fuel bowser and storage tank	52L	801279	8482352
Storage Area	Storage area	52L	801385	8482569
Truck Workshop	Workshop	52L	801072	8482469
Run of Mine	Storage of ore for processing	52L	801259	8482084
Processing/ offices/ workshop compound	Mill, office complex, workshops	52L	801189	8481826
Orica Compound	Disused Orica Compound	52L	801502	8480435
North WRD	Waste Rock Dump	52L	800786	8483662
East WRD	Waste Rock Dump	52L	802429	8482173
West WRD	Waste Rock Dump	52L	800707	8482872

Feature	Description	Zone	Easting	Northing
Proposed Prospect Pit Infrastructure				
Prospect Pit Portal	Portal to Prospect decline	52L	801366	8482816
Raise 1	Underground raise	52L	801397	8482821
Raise 2	Underground raise	52L	801400	8482815
Tanks/ Power/ compressor	Service to underground	52L	801402	8482808
Exhaust Fan	Ventilation to underground	52L	801547	8482744
Magazine	Storage for underground explosives	52L	800741	8483172
Workshop	Truck workshop	52L	801072	8482469
Fuel Bay	Fuel bowser and storage tank	52L	801279	8482352
Run of Mine	Storage of ore for processing	52L	801259	8482084
Alternative Portal				
Alternate Lady Alice Portal	Alternate portal location	52L	801492	8483041
Box Cut	Box Cut	52L	801828	8483041
Magazine	Storage of underground explosives	52L	800741	8483172
Workshop	Truck workshop	52L	801072	8482469
Fuel Bay	Fuel Bowser and storage tank	52L	801279	8482352
Run of Mine	Storage of ore for processing	52L	801259	8482084
Alternate Haul Road	Alternate haul road to Lady Alice Pit	52L	801430	8483279
Water Monitoring Sites				
Dam A	Water Dam A	52L	800955	8484312
Dam B	Water Dam B	52L	800721	8482225
Dam C	Water Dam C	52L	801664	8483908

Feature	Description	Zone	Easting	Northing
URCP	Crosscourse Pit, Tailings Storage Facility	52L	801709	8482528
URDP	Union Reefs Decant Pond	52L	801577	8480357
URPSP	Secondary containment pond, downstream of mill	52L	801262	8481799
URRD	Tailings slurry	52L	801237	8481780
URST4A	Wetland outflow for West WRD	52L	800170	8482440
URST5B	Wetland outflow for East WRD	52L	802795	8481120
URST3	Dam B outflow	52L	800406	8482263
URSW01	Wellington Creek downstream of Water Dams	52L	799599	8486456
URSW03	McKinlay weir downstream decant pond and East WRD	52L	800630	8481393
URSW04	McKinlay River downstream of West WRD	52L	799983	8482290
URSW05	Esmeralda creek downstream of East WRD	52L	802211	8479142
URSW08	McKinlay River downstream Compliance Point	52L	798708	8488780
URSW09	McKinlay River upstream of all MLN1109 activities Control Point	52L	802034	8478932
URSW10	McKinlay River downstream of West Waste Rock Dump and Decant Pond (On lease boundary)	52L	799061	8483038
URSW11	Upstream of URSW09 Control Point	52L	802205	8478291
Prospect Pit N	Prospect Pit North	52L	801335	8482849
Prospect Pit S	Prospect Pit South	52L	801382	8482725
URDB1	Capped and rehabilitated TSF seepage monitoring bore	52L	801950	8480027
URDB2	Capped and rehabilitated TSF seepage monitoring bore	52L	801954	8480007
URDB3	Capped and rehabilitated TSF seepage monitoring bore	52L	801801	8480006
URDB4	Capped and rehabilitated TSF seepage monitoring bore	52L	801804	8479985

Feature	Description	Zone	Easting	Northing
URDB5	Capped and rehabilitated TSF seepage monitoring bore	52L	801700	8479992
URDB6	Capped and rehabilitated TSF seepage monitoring bore	52L	801703	8479968
URDB7	North of Lady Alice Pit monitoring bore	52L	801279	8483590
URDB9	Union North monitoring bore	52L	801077	8483779
URMB25	North of Crosscourse Pit historical monitoring bore	52L	801477	8482578
URMB26	East of Crosscourse Pit historical monitoring bore	52L	802131	8482107

Appendix E – Commitments

COMMITMENTS

A table listing commitments made by the proponent in relation to managing potential environmental impacts of the proposal are presented in Table 15-3.

TABLE 15-3 PROJECT COMMITMENTS

Environmental Factors	Commitment	Timeframe
Environmental Performance	NTMO is committed to compliance with statutory and other requirements, implementing an effective Environment and Social Responsibility Management System (ESRMS), continuous improvement and minimising environmental and social impacts.	LOM
	NTMO has recently entered into a Memorandum Of Understanding with Charles Darwin University to provide funding over three years to a post-doctoral research program for Ghost bat conservation.	3 years
	No roads in the public road network will be opened or closed as a result of construction or operations for the project.	LOM
	A URPA Mining Management Plan amendment will be submitted to DPIR to incorporate the Union Reefs North Underground Mine.	Prior to operations
	Permits will be sought in relation to the proposed Ghost bat management strategy actions under The <i>Territory Parks and Wildlife Conservation Act 1978</i> (TPWC Act) which protects Northern Territory parks and reserves, animals and plants (including wildlife and protected wildlife).	Prior to operations
	General and hazardous wastes will be removed from site by a licensed contractor. Pursuant to Section 14 of the <i>Waste Management and Pollution Control Act 1998 Act</i> appropriate pollution incident notification procedures will be put in place.	LOM
Terrestrial flora and fauna	Characterise the internal dimensions of the OK adit and Union North adit, and the position of Ghost bat roost areas within. [Research to support minimisation].	Wet season 2019
	Create several artificial roosting habitats in the URPA, for both contingencies and additional capacity, and evaluate their success. [Both mitigation/ minimisation and offset].	Wet season 2019
	Re-open and rehabilitate the Lady Alice adit so that it is suitable for Ghost bat occupancy. [Mitigation/ minimisation and offset].	Wet season 2019

Environmental Factors	Commitment	Timeframe
	Manage the Union North adit during the period of mining to exclude visitation from mining personnel. [Mitigation/minimisation].	LOM
	Implement management measures at the Koohinoor adit, Pine Creek, to protect the Ghost bat roost. [Mitigation/minimisation].	LOM
	Continue monitoring of Ghost bat presence, activity levels and colony size at Union North adit, potentially Lady Alice adit, new artificial roost habitats, and other key regional sites (Pine Creek; Spring Hill; any newly discovered caves of significance surrounding the URPA). [Mitigation/minimisation].	LOM
	Provide a portion of the new mine for Ghost bat occupancy once mining has been completed and evaluate its success. [Rehabilitation or offset	End of mining
	Conduct field surveys for Ghost bat diurnal roosts in natural caves in the hills surrounding the URPA. [Research to support minimisation].	Dry season 2020
	Investigate the connectedness of Ghost bat colonies in the region using an advanced genetic method based on genome-scale DNA sequencing. [Research to support minimisation].	LOM
	Provide support for further academic research, including coordinating the development of a Recovery Plan, which is required under the EPBC Act 1999, but has not yet been developed. [Research to support overall management].	LOM
Mine Water Management	NTMO will apply for a waste discharge licence separate to this draft EIS	Prior to discharging any treated waste water
	NTMO will continue to undertake sampling and treatment studies over the next six months to confirm the most appropriate water treatment regime for waste water	6 months
	Proposed discharge water volumes will be based on discharge water quality, River flows and ecotoxicology. Ecotoxicology assessment will be undertaken prior to discharge to characterise the acute toxicity of the discharge water which will assist in the calibration of the discharge coefficient.	Prior to discharging any treated waste water

Environmental Factors	Commitment	Timeframe
Mine closure	<p>NTMO will redevelop the URPA Mine Closure Plan (MCP) 2015 in accordance with the Western Australian Guidelines for Preparing Mine Closure Plans.</p> <p>NTMO will work with the DPIR to agree on a realistic submission date for the redeveloped URPA MCP.</p>	TBD
	NTMO will continue with progressive rehabilitation and/or rehabilitation trials to inform closure design.	LOM
	Rehabilitation will achieve a stable and functioning landform that is consistent with the surrounding landscapes and other environmental values and will remove potential for long term, post closure impacts on downstream water quality, beneficial uses and environmental values.	EOM
	The underground mine will have no access for public access post-closure. No security fencing or signage is required. Stock fencing will be put in place around the pit bund to keep cattle off the bund surface, particularly during the early growth years immediately post-closure.	EOM
	All surface infrastructure associated with the underground mine will be decommissioned, removed and the areas rehabilitated.	During closure
Hydrological process	A Water Management Plan will be completed prior to mining.	Prior to mining
	<p>In addition to monitoring all existing locations for surface water level and groundwater level, NTMO commits to drilling and monitoring of 11 additional groundwater monitoring bores. Loggers will be fitted to all new bores, and water level readings recorded hourly. Given the short duration of the underground mine, analysis of these levels and reporting on them will occur at:</p> <p>Commencement of mining</p> <p>3 months into mining</p> <p>6 months into mining</p>	LOM and post mining

Environmental Factors	Commitment	Timeframe
	<p>1 year into mining</p> <p>2 years into mining</p> <p>1 year post mining</p> <p>5 years post mining</p> <p>This reporting will include the water levels of all pits and the flow rates of all water pumped on site. Where results exceed anticipated rates, groundwater drawdown or visible evidence of impact is observed, the groundwater modelling will be re-assessed.</p> <p>Monitoring bores will be installed downgradient of the Dam B and Crosscourse pit to monitor the changes in water chemistry along the groundwater flowpath towards the River over time</p> <p>Groundwater monitoring down gradient of the underground mine void will help detect any potential contamination and provide early warning for any unexpected changes.</p> <p>All surface water and groundwater sites will be monitored for groundwater quality on a quarterly basis during mining and this frequency reviewed at the end of mining. Groundwater quality will be reported on an annual basis during mining, with this frequency reviewed at the end of mining.</p> <p>All water levels and quality will be documented in or appended to annual updates to the Water Abstraction Management Plan.</p>	
Inland water	The management of potentially contaminated water from the underground mine and from the temporary waste rock dump in Prospect pit south will be by disposal into the Crosscourse pit during mine development and operation.	LOM
	The disposal of waste rock into the underground void will be managed such that PAF material is maintained saturated long term. This will begin at mine closure when mine dewatering is stopped and as the groundwater level starts recovering, with some potential for sulphide oxidation from void and backfill until these materials are completely inundated.	EOM

Environmental Factors	Commitment	Timeframe
	<p>Water quality monitoring will be undertaken quarterly for major ions, field parameters and heavy metals (As, Cu, Ni, Pb, Zn, Fe). The sampling frequency will be quarterly during the two years of operation reducing to yearly during post-mining period. Water quality data will be:</p> <p>Compared to ANZG (2018) guidelines for the slightly disturbed ecosystems.</p> <p>Compared to long terms site specific guidelines that need to be developed.</p> <p>Reviewed annually by a qualified hydrogeochemist, and if no statistically significant changes are observed after two years, the monitoring frequency can be reduced.</p>	LOM
Aquatic ecosystems	Ongoing monitoring will be undertaken to track the extent of groundwater drawdown, and the impact on surface and groundwater flows, and any corresponding impact on the aquatic ecosystems during the life of the mine and the recovery period. The monitoring plan will be a component of the URPA site water management plan.	LOM and recovery period
	The water management plan will include the development of trigger values for groundwater drawdown. High frequency monitoring of groundwater levels between URPA and the River will also occur. The installation of a flow gauge on the upper McKinlay River will assist in interpreting the results of annual biological monitoring, as taxa adapted to intermittent waterways are highly influenced by wet season flow conditions.	LOM
	Late dry season aquatic ecosystem monitoring , i.e. macroinvertebrate and fish sampling via deployment of ‘artificial substrates’ at permanent surface water sites will be implemented in addition to the continuation of the current, annual, early dry season macroinvertebrate monitoring program using NT AusRivAS protocols.	LOM and recovery period
	Deployment of remote fauna cameras as a follow-up survey for an extended period, i.e. three months, will be undertaken in the early dry season 2020	Pre mining
	A baseline condition monitoring program will be implemented prior to the start of mining to add to baseline data used to measure the impact (if any) at permanent pools as a result of drawdown. The use of methods for bio-condition assessment (Appendix J) will allow for repeat monitoring to take place	Pre mining