Mining Management Plan Exploration Activities

Northern Territory of Australia – *Mining Management Act*

It is recommended that the Mining Management Plan is completed in conjunction with the user guide, available on the Northern Territory Government website.

Section 1 – Project Details

Project Name Provide new or existing project name	Union Reefs Project Area (URPA)

Authorisation Number Insert existing authorisation number, where applicable	0961-01

Operator Name Use ASIC-ABR registered name (if a company), or name of the applicant	NT Mining Operations Pty Ltd (NTMO)

Location and Access Details Include brief description of the location, access details, and distance to nearest town or community	The URPA is located approximately 20 km north-west of the township of Pine Creek and 175 km south-east of Darwin (220 km by road). The URPA is accessed off the Stuart Highway along a restricted 8 km mine-access road (Ping Que road). The mining and exploration tenements and the Ping Que access road alignment from the Stuart Highway occupy land on Mary River West Station (Pastoral Lease 815).

Target Commodity Details Include target commodities (i.e. gold, copper etc)	Gold

Mining Activities Summarise the mining activities (exploration) to be the subject of the proposed Authorisation or Variation	Exploration programmes described in this application include activities in historically disturbed areas. Separate documents will be submitted to DPIR for each upcoming exploration activity. Presently, this application includes information on the “Union Reef Tailings” drilling programme. Drilling of the area included some geochemical assessment of the drill cores to determine potential gold grades of the tailings. Assessment of Dam walls have now been included in the programme for understanding geotechnical and geochemical material of the Dam structures.

Proposed Schedule Include start and finish dates of ground disturbing work	May 2021- September 2021

Mining Interest and Land Ownership

List the mining interests (titles), the title holder name/s, the title expiry date and the Property name/Land holder (e.g. pastoralist or Aboriginal land trust) for each title.

Title Number	Title Holder	Expiry Date	Property Name or Land Holder
MLN1109	NT Mining Operations Pty Ltd (NTMO)	31/12/2034	Mary River West PL815

Delete or add rows as required

Organisational Structure

Position Title	Name
VP Australia (Co-Lead)	John Landmark
Project Director	Mark Edwards
Manager Projects, Rehabilitation and Environment	Trevor Edwards
Senior Exploration Geologist	Meg Ellis
Lead Environmental Engineer	Sam Yang
Health, Safety, Training and Security Manager	Allan Sinclair

Delete or add rows for various position titles as required

Section 2 – Operator Self-Assessment of the Environmental Risk

The purpose of this self-assessment is to ensure Operators complete a project risk assessment of potential environmental impacts and are aware of other legislative obligations from various Agencies. As a result of this self-assessment, further information may be required in the form of a management plan to enable full assessment of the MMP. If you have any queries please contact a Mining Officer prior to submitting the MMP. Useful resources to assist with this self-assessment are provided in the User Guide.

Environmental considerations

ASSESSMENT ASPECT	YES or NO	ACTIONS REQUIRED (if answered YES)	APPENDED INFORMATION (Evidence of consultation with DENR and/or management plan)
Step 1: Are there any threatened flora and fauna species or habitats of significance that may occur in the proposed work area?	YES	Extensive monitoring of the Vulnerably listed ghost bat (*Macroderma gigas*) has been implemented after identifying small populations in adits located in the project area. Specialist consultants, Dr Kyle Armstrong and Paul Barden from EMS, have developed a monitoring program that captures background information which aims to monitor populations during and after exploration activities. Under the guidance of EMS Consultants and acknowledgment of DENR, since October 2018 NTMO have been conducting daily monitoring using video recorders, acoustic recorders, and photographic monitors. Ambient noise monitoring will also be undertaken during exploration activities.. NTMO will action the recommendations put forward by the actions illustrated in the Environmental Impact Statement for the Union Reefs (2020) during all exploration activities. This will ensure mitigation measures are in place to prevent impact from proposed exploration activities such as drill pad clearing and diamond and reverse circulation drilling. But as Drill distance and depth of holes should are not in areas of bat colonisation no impact should eb observed NR Maps was used as a tool to identify threatened species of flora within a 5km radius of MLN1109. *Acacia praetermissa* was listed as Vulnerable by State and Commonwealth protection acts. This species has not been identified at URPA and found more than 7.5 km from the nearest exploration area. Clearing and ground disturbance permits before any exploration activities will identify any flora species of significance.	Action Plan for Management Ghost Bat *Appendix 9*

ASSESSMENT ASPECT	YES or NO	ACTIONS REQUIRED (if answered YES)	APPENDED INFORMATION (Evidence of consultation with DENR and/or management plan)
Step 2: Are there any known declared weeds within the proposed work area?	YES	Weeds of National Significance, Class B and C weeds have been identified across the URPA. Flannel weed, gamba grass, hyptis, mission grass, Mossman river grass, rubber bush, sicklepod and spiny head side are declared weeds found at URPA. All weed management, monitoring and mapping for Union Reefs Project Area will be undertaken as per the objectives and targets listed in Section 4.13, page 55 of NTMOs Integrated Management System submitted with the 2019- 2020 MMP. Weed management will be undertaken with operation activities under Authorisation 0539-03 though also apply to exploration activities of this MMP. NTMO commits to apply objectives and targets made in Section 4.13 to all stages of exploration including pre and post drilling.	Weed Management Plan *Appendix.10*
Step 3: Will you be using water from bores or other sources for the operation?	YES	Water will be sourced from Dam C which is close the proposed drilling and has been the source of water for past drilling projects	

Environmental assessment and cultural considerations

ASSESSMENT ASPECT	YES or NO	MANAGEMENT REQUIREMENTS
Step 4: Is your project likely to have a significant impact on the environment?	NO	NTMO believe that to follow the Ghost Bat Monitoring Plan these activities will not have a significant impact on the environment.
Step 5: Are there Aboriginal sacred sites in the Project area?	YES	AAPA certificate C2009/267 has been issued for MLN1109 in accordance with Section 22 of the NT Aboriginal Sacred Sites Act 1989. The planned drilling activities are not within close proximity to any designated Restricted Work Areas.

ASSESSMENT ASPECT	YES or NO	MANAGEMENT REQUIREMENTS
Step 6: Are there archaeological and heritage sites in the Project area?	YES	Drilling at Union Reefs is around existing site infrastructure which has historically been heavily disturbed. No sites of significance are within the proposed area of works in the both the Dam areas and Tailings area. The Clearing and Ground Disturbance Permitting system, monitoring and mitigation measures are in place to ensure any potential impacts on cultural and heritage sites are avoided.

Section 3 – Amendments

As per Section 41(3) of the *Mining Management Act*, an MMP reviewed and amended under Section 41(1)(a) is to clearly identify amendments made.

Section	Amendment
N/A	N/A

Delete or add rows as required

Section 4 – Activities Proposed

Mining Interests (i.e. titles)	**MLN1109**
Number and type of proposed drill holes	2 x Diamond holes 7 x Sonic Drill Holes
Maximum depth of proposed holes (m)	15m
Number and size of drill pads to be cleared (Length: m x Width: m)	9 x Pads 10x20m
Total area of drill pads to be cleared (ha)	0.18ha
Is drilling likely to encounter groundwater? (Y, N, unsure)	unsure
Number of costeans (Length: m x Width: m x Depth: m)	5 x costeans 2x1x1m
Number of bulk sample pits	
Total bulk sample (tonnes) (Length: m x Width: m x Depth: m)	
Bulk sample pits approved under *Mineral Titles Act*? (Y or N)	
Length of line/track clearing (km: x Width: m)	0.77 x 3m track (reopen existing tracks)
Camp area to be cleared (ha)	
Camp Infrastructure (i.e. demountable, tents)	
Previous disturbance yet to be remediated on title (ha) if known	0.32ha
Other: sumps LxWxD metres	4 x sumps 4x3x1m
Total area disturbed proposed (ha)	0.42ha

Section 5 – Previous Disturbance (for existing Authorisations only)

Mining Interests (i.e. titles)	**MLN1109**	
Number/type of holes drilled	10 x CPT 7 x Sonic 2 x DDH	
Maximum depth of holes drilled (m)	30m	
Number of holes remediated (i.e. plugged/capped)	10 x CPT	Sonic/DDH capped for monitoring
Number and size of drill pads cleared (Length: m x Width: m)	3 @ 20x20m	
Total area of drill pads cleared (ha)	1200m2 .12	
Total area of drill pads remediated (ha)	1200m2 .12	
Was groundwater encountered? (Y or N)	YES	
Length of line/track cleared (Length: km x Width: m)	2.3km x 3m .69	
Length of line/track remediated (Length: km x Width: m)	1.24km x 3m .372	
Number of costeans excavated (L: m x W: m x D: m)	NIL	
Number of costeans remediated	NIL	
Total bulk sample pits excavated (Length: x Width: x Depth: m)	NIL	
Total bulk sample pits remediated	NIL	
Camp area/s cleared (ha)	NIL	
Camp area/s remediated (ha)	NIL	
Total area disturbed (ha)	0.81ha	
Total area remediated (ha)	0.49ha	

Section 6 – Environmental Management

By checking these boxes, you are agreeing to implement the following minimum environmental management standards on the project area. Where boxes have been left unchecked, justification is required.

6.1	✓	Blade-up approach for clearing will be used (i.e. no windrows, leave root stock and topsoil)
6.2	✓	Significant vegetation will be avoided during clearing (i.e. large trees, specimens providing habitat or food sources, riparian vegetation, and threatened species)
6.3	✓	Vegetation clearing during, and immediately after rainfall events, will be avoided
6.4	✓	Vegetation clearing will be kept to the minimum required to safely traverse vehicles and drill rigs along tracks and drill pads
6.5	✓	Where blade-up techniques cannot be employed, topsoil and vegetation will be stockpiled appropriately for remediation purposes
6.6	✓	All employees and contractors will be trained and inducted in relation to the management of environmental risks in the work area, including weeds, waterways, threatened species, soil erosion, sacred sites and heritage areas
6.7	✓	Sumps will be lined or tanks of appropriate size to contain water, sediment and drilling fluids encountered during drilling, will be used
6.8	✓	Sumps, drill holes, and fuel stores will be located away from environmentally significant areas and water courses
6.9	✓	Excavations (sumps, costeans and pits) will be appropriately ramped to allow fauna egress
6.10	✓	Drill holes will be securely capped immediately after drilling
6.11	✓	Vehicle hygiene measures will be employed to prevent the introduction and spread of invasive species and pathogens when mobilising vehicles and equipment from one location to another
6.12	✓	Hydrocarbon spills will be minimised using liners and drip trays under machinery, and appropriately sized spill-kits available in the event of a spill
6.13	✓	Hazardous substances (including hydrocarbons) will be stored and handled in accordance with relevant Australian Standards
6.14	✓	Hydrocarbons will be stored in lined and bunded areas
6.15	✓	Waste will be stored securely while on-site to minimise windblown rubbish and access by feral animals
6.16	✓	Waste will be removed off-site and disposed of at an appropriate waste management facility
6.17	✓	All environmental incidents will be reported to the Department in accordance with Section 29 of the *Mining Management Act.*

Justification and alternative management measures:

Section 7. A rehabilitation register has been drafted in 2020 to commence with a framework of rehabilitation and reporting. Drill holes will be temporarily plugged until revisited. Once drilling and use of tracks are complete, NTMO will remediate areas referring to the Department of Primary Industry and Resources *"Construction and Rehabilitation*

of Exploration Drill Sites" and *Clearing and Rehabilitation of Exploration Gridlines and Tracks"* as a guide. NTMOs current rehabilitation register has been attached as Appendix 7.

Section 7 – Remediation and Closure

By checking these boxes, you are agreeing to implement the following minimum remediation standards on the project area. Where boxes have been left unchecked, justification is required.

7.1	✓	Drill holes plugged below ground level at a minimum depth of 0.4 metres and soil mounded to prevent subsidence, within 6 months of completion of drilling
7.2	✓	Drill samples/spoil returned down drill holes, buried in sumps, or removed from site
7.3	✓	All drill hole and access markers including flagging tape, wooden markers and star pickets will be removed from site
7.4	✓	Re-contouring of cut and fill drill pads will be consistent with the surrounding terrain
7.5	✓	Ripping/scarifying of drill pads, and compacted areas along the contour (on sloping ground) and cross-ripping (zig-zag) along tracks
7.6	✓	Tracks will be remediated, including pushing in all windrows
7.7	✓	Appropriate erosion and sediment controls will be installed where erosion is evident or likely to occur
7.8	✓	All tracks will be remediated unless otherwise agreed in writing by the land holder or appropriate third party
7.9	✓	Access through watercourses will be removed and banks restored
7.10	✓	No erosion is occurring in disturbed areas, on tracks and in remediated areas
7.11	✓	All excavations backfilled within 6 months of completion of drilling
7.12	**N/A**	All water bores decommissioned unless otherwise agreed in writing by the land holder or appropriate third party. The bore must comply with the Minimum Construction Requirements for Water Bores in Australia and may require permits or licenses under the *Water Act*
7.13	✓	All rubbish and infrastructure will be removed from site
7.14	✓	Replacement of topsoil and vegetation
7.15	✓	Contaminated soils (e.g. hydrocarbon or hazardous chemicals) will be remediated or removed from site
7.16	✓	Monitoring will be undertaken following the wet season or a significant rainfall event

Justification and alternative management measures:

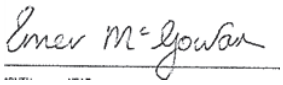
7.1 Monitoring Bores to be installed for continued monitoring where holes have been drilled into the wall of the Dams and Tailings structures.
Drill holes that will not be installed with monitoring bores will be remediated to minimum remediation standards.
7.6 Some access tracks will need to be left open in order to gain access to monitor the bores that are installed.
7.12 No water bores are being commissioned or used during drilling activities.

Section 8 – Required Attachments

8.1	✓	Security Calculation Spreadsheet
8.2	✓	Nomination of Operator Form
8.3	✓	Spreadsheet with coordinates of proposed drill holes or polygons of target areas
8.4	✓	Google Earth KML/shape files/track logs of proposed tracks and camp sites
8.5	✓	A map of the work area(s) showing: 1. title boundaries and title numbers 2. current and proposed drill holes, or polygons of target areas 3. current and proposed tracks 4. remediated areas 5. camp sites 6. sacred/heritage sites 7. environmental constraints
8.6	✓	Remediation Register (for existing Authorisations)
8.7	✓	Photographs of remediation work
8.8	✗	Radiation Management Plan (if applicable)

Section 9 – Declaration

The Mining Management Plan must be endorsed by a senior representative of the company who has the appropriate level of authority to do so.

	Author	Reviewed by	Approved by
Date	07/04/2021	04-May-2021 | 7:13 AM AEST	04-May-2021 | 1:23 PM ACST
Name	Emer McGowan	Trevor Edwards	Mark Edwards
Signature		DocuSigned by: Trevor Edwards 04F00D0CD9E546A...	DocuSigned by: D429AC961F4A498...

I ……Mr Mark Edwards……..…,Project Director - NT Mining Ops, declare that I have the authority to make the commitments contained in this mining management plan on behalf of the company. To the best of my knowledge the information contained in this plan is true and correct and commit to undertake the works in accordance with the agreed minimum standards and all relevant Northern Territory and Commonwealth Government legislation.

SIGNATURE: …… DocuSigned by: D429AC961F4A498... **……..**

04-May-2021 | 1:23 PM ACST

DATE: ……

Mining Management Plan Exploration Activities

Appendix 1 (updated)

URPA Exploration Security Calculation

DEPARTMENT OF PRIMARY INDUSTRY AND RESOURCES

https://nt.gov.au/minerals

AF7-014		last review: September 2012

M & E Security Calculation Tool
Exploration Operations

Kirkland Lake Gold

Security Calculation Summary

Details			
Contact Name	Mark Edwards	**Authorisation #**	0961-01
Project	Union Reef Project Area	**Date**	28-Apr-21
MMP	URPA Tailing Dam Drilling		

Calculation Trigger			
New Authorisation	**MMP Renewal/amendment**	**Audit Finding**	**Client Request**
	✠		

Domains	Calculated Cost
Site Infrastructure	$0.00
Exploration	$2,090.00
Post Closure Management	$0.00
Sub-Total - All Domains	$2,090.00
CONTINGENCY @15%	$313.50
TOTAL COST	$2,403.50
10% Discount	$240
Amended amount	$2,163
1% levy	$22

Mining Management Plan Exploration Activities

DISTURBANCE AREA INVENTORY			
Whole of site summary	**Total Area (ha)**	**Progressively rehabilitated area**	**Remaining area**
Lease surface area			
Disturbed operational area			
Disturbance type			
Camp and other infrastructure			
Drill pads and sumps	0.28		
Costeans/pits			
Tracks/gridlines	0.24		
Other (specify)			
TOTAL	**0.52**		

Mining Management Plan Exploration Activities

Domain 1: Infrastructure

Management Area	Technique	Unit of Measure (UOM)	Range per UOM ($)	Cost per UOM ($)	Estimated Quantity	Sub Total ($)	Technique Notes
Infrastructure	Remove temporary buildings and associated equipment	m^2	70-90	75.00		0.00	Enter the total area of small buildings and caravans. Range can be lowered for larger quantities.
	Remove concrete pads and footings	m^2	10-30	15.00		0.00	Enter the total area of concrete pads, concrete bunds, etc. Range can be adjusted depending on thickness (e.g. $10/m2 for <300mm thick, $30/m2 for >300mm thick).
	Remove above ground tanks	@	200.00	200.00		0.00	Enter number of tanks.
	Excavate and remediate contaminated soil	m^3	30-55	55.00		0.00	Enter quantity of hydrocarbon contaminated soil required to be excavated and remediated on site
	Waste disposal offsite	@	650	650.00		0.00	Enter number of bin loads. Cost includes removal of potentially-contaminating waste (e.g. waste oil, contaminated soil, etc.) and materials from laydown area by a contractor with a skip bin.
	Fill in landfill	m^3	2.00-3.00	3.00		0.00	Enter quantity of fill material required. Range can be lowered for larger quantities.
	Pump septic tank, disconnect and infill/cave-in tank	item	400-1000	1000.00		0.00	Enter number of septic tanks. Range can be lowered for multiple tanks.
	Bore closure	@	2000-3300	2000.00		0.00	Enter number of bores. Cost includes sealing and rehabilitation. Range can be adjusted based on the number of bores.
	Infill dams	m^3	2.00-5.00	5.00		0.00	Enter quantity of material to be excavated. Cost includes backfilling to natural surface level. Range can be lowered for larger quantities.
						0.00	
Revegetation Activities - all infrastructure areas	pushing windrows, final trim and deep rip infrastructure areas	ha	250-1000	1000.00		0.00	Enter all areas disturbed by infrastructure as above and including laydown, core and sample storage, parking areas, etc. Range can be adjusted based on the soil type and quantity of ripping required. See assumptions and considerations tab
	Respread topsoil	m^2	0.25-0.55	0.55		0.00	Enter size of area where topsoil is required. Range can be lowered for large quantities.
	Revegetation by direct seeding	ha	1200-2000	2000.00		0.00	Enter size of relevant area. Apply for substantial areas where topsoil resources poor and where reasonable seed dispersal from nearby areas unlikely. Range can be adjusted based on sensitivity/significance and
	Fertiliser application	ha	150-750	750.00			include a single application of fertiliser during the initial seeding program
						0.00	
DOMAIN 1 TOTAL						$0.00	

NORTHERN TERRITORY GOVERNMENT

Mining Management Plan Exploration Activities

Domain 7: Exploration

Management Area	Technique	Unit of Measure (UOM)	Range per UOM ($)	Cost per UOM ($)	Estimated Quantity	Sub Total ($)	Technique Notes
Drillholes, Pads, sumps, costeans	Cap drillholes below ground	@	80-275	150.00	9.00	1350.00	Enter number of holes. Cost includes cutting collar, inserting plug and backfilling. Range can be adjusted based on number of holes (more holes is less expensive).Assume using, concrete or plastic cone plugs or bridge (no 'occy' plugs)
	Grout with concrete	@	1250	1250.00	0.00	0.00	Enter number of holes that will require grouting (e.g. likely to encounter multiple or confined aquifers). Exclude these from above row for capping.
	Empty and remove plastic sample bags	hole	25-235	235.00	0.00	0.00	Enter number of holes where plastic bags are used. Cost is to return cuttings to hole and remove plastic bags to a waste disposal facility. Cost is in addition to capping. Range can be adjusted based on the number of anticipated bags and holes.
	Rip/scarify drill pads	ha	240-900	900.00	0.18	162.00	Enter total area of drill pads. Cost is for minor ripping/scarifying of pads to depth of 0.3m in flat/gentle terrain. Includes sump infilling. Range can be adjusted based on the soil type and number of drill pads.
	Reshape and rip drill pads	@	320-2500	500.00	0.00	0.00	Enter number of drill pads where cut and fill is required in steep terrain. Cost includes excavator/dozer to return pad to slope and establish erosion control. Includes sump infilling. Exclude these pads in above row for ripping/scarifying pads.
	Infill costeans	m^3	2.00-3.00	3.00	0.00	0.00	Enter quantity of material required to backfill costean and trenches. This assumes material does not have to be carted.
	Infill bulk sample pits and dams	m^3	2.00-8.00	2.00	0.00	0.00	Enter quantity of material excavated from pit. Range can be adjusted depending on depth of pit and if battering of walls required for appropriate slope.
	Scaling, battering for stabilisation	m^2	1.21-3.00	3.00	0.00	0.00	If borrow pits or bulk sampling pits are excavated and not backfilled and require battering of walls. This includes the area requiring reshaping for stabilisation and preparation for revegetation
	Contouring for erosion control	ha	700-1540	1500.00	0.00	0.00	Enter size of area where minor pushing required to construct water management structures, such as contour banks and diversion drains in steep terrain. Range can be adjusted depending on the scale of works required.
	Revegetation by direct seeding	ha	1200-2000	1500.00	0.18	270.00	Enter size of relevant area. Apply when disturbance is intense (e.g. resource definition drilling, if most of area cleared for drill pads). Range can be adjusted based on sensitivity/significance and diversity of vegetation.
	Fertiliser application	ha	150-750	750.00	0.00	0.00	include a single application of fertiliser during the initial seeding program
						1782.00	
Tracks and Gridlines	Ripping/scarifying minor tracks and gridlines	km	120-500	400.00	0.77	308.00	Enter length. Range can be adjusted depending on width of track, soil type, grading vs raised blade, quantity (see considerations tab). Cost assumes no windrows and no erosion control measures required in flat terrain.
	Ripping major tracks and roads	km	550-1000	1000.00		0.00	Enter length. Range can be adjusted depending on width of track and soil type (see considerations tab). Cost includes pushing windrows and establishing erosion control measures in undulating and steep terrain.
	Removal of gridpegs	item	1500	1500.00		0.00	includes removal offsite of all grid pegs in exploration area
	Topsoil replacement	m^2	0.25-0.55	0.55	0.00	0.00	Enter size of area where topsoil replacement is required. Range can be lowered for large quantities. Assumes approx 10cm of topsoil being replaced over the area.
	Revegetation by direct seeding	ha	1200-2000	2000.00		0.00	Enter size of relevant area. Range can be adjusted based on sensitivity/significance and diversity of vegetation.
	Fertiliser application	ha	150-750	750.00	0.00	0.00	include a single application of fertiliser during the initial seeding program
						308.00	
	DOMAIN 7 TOTAL					$2,090.00	

NORTHERN TERRITORY GOVERNMENT

Mining Management Plan Exploration Activities

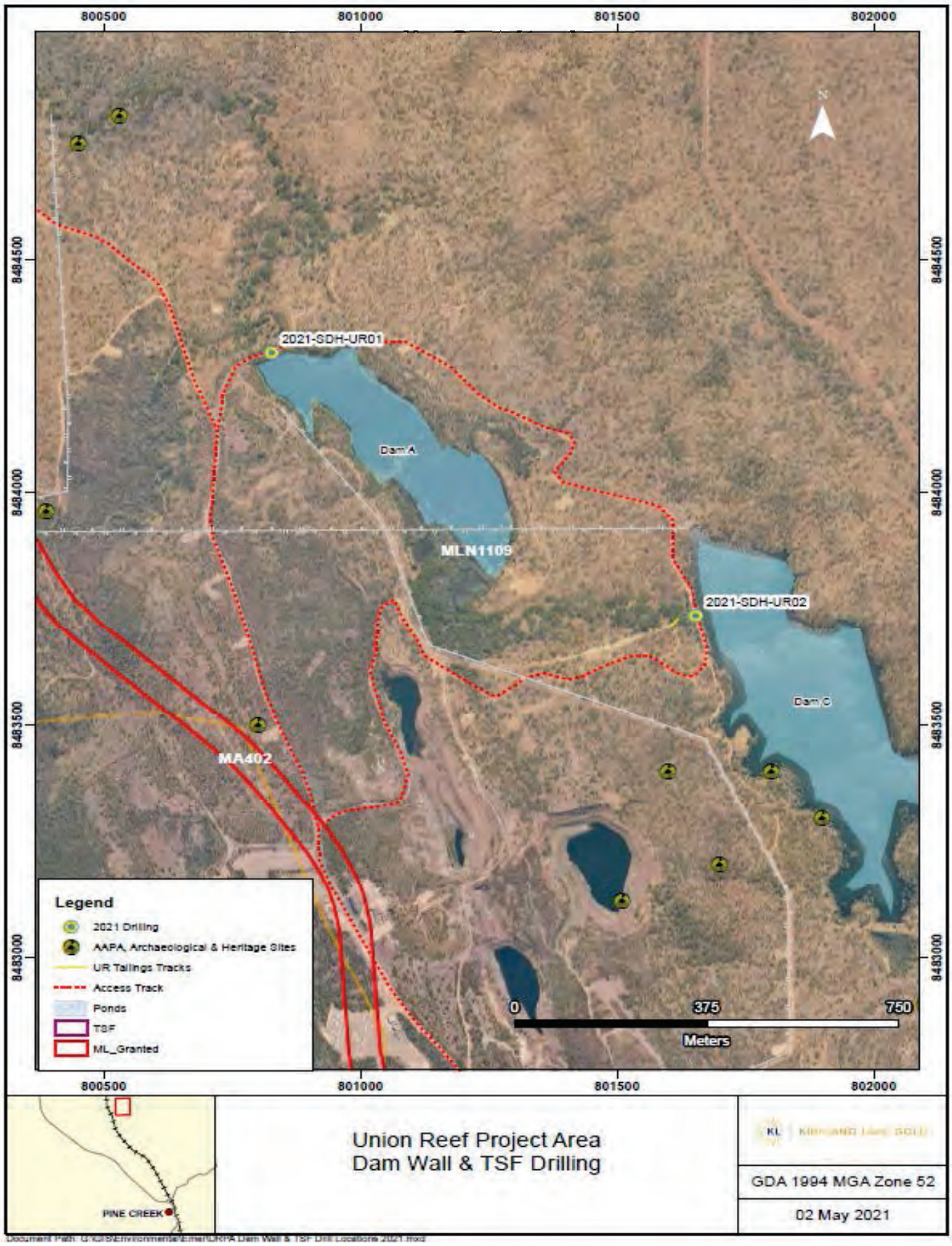
Closure Management

Management Area	Technique	Unit of Measure (UOM)	Range per UOM ($)	Cost per UOM ($)	Estimated Quantity	Sub Total ($)	Technique Notes
Closure	Mobilisation/demobilisation	km	10.00-15.00	15.00		0.00	This reflects a contractor bringing equipment to the site to undertake rehabilitation. Enter distance from nearest large centre, unless another location is stipulated and supported by the operator. Cost based on 1 piece of machinery required for earthw orks. Range can be adjusted depending on size of machinery required.
	Project management	month	1,600	1600.00		0.00	Enter proportion/number of year/s required to coordinate rehabilitation activities. Costs includes tender preparation, financial reporting, procurement, contractor management, etc. Time frame assumed is minimum 1 month and may be substantially more, depending upon the size and complexity of the project.
	Monitoring and w eed management	ha	200 - 250	250.00	0.00	0.00	Entry automated form 'Key Information' tab. Includes total area and assumes 1 year post closure. Range can be adjusted based on level of w eed infestation.
	Revegetation maintenance, monitoring & assessment	ha	1200-2000	1200.00	0.00	0.00	Enter 20% of the size of the relevant area (assumes a 20% failure rate of revegetation). Apply for signficant cleared areas (e.g. large camps). Range can be adjusted based on the sensitivity and significance of vegetation.
	Earthw ork maintenance	ha	1,100	1100.00		0.00	Enter 20% of the size of disturbed erosion-prone areas (assumes 20% erosion rate). Apply for tracks/gridlines, drill pads and other clearing in erosion-prone areas (e.g. hilly areas, creek crossings, erosion-prone soils).
						0.00	
POST CLOSURE TOTAL						0.00	

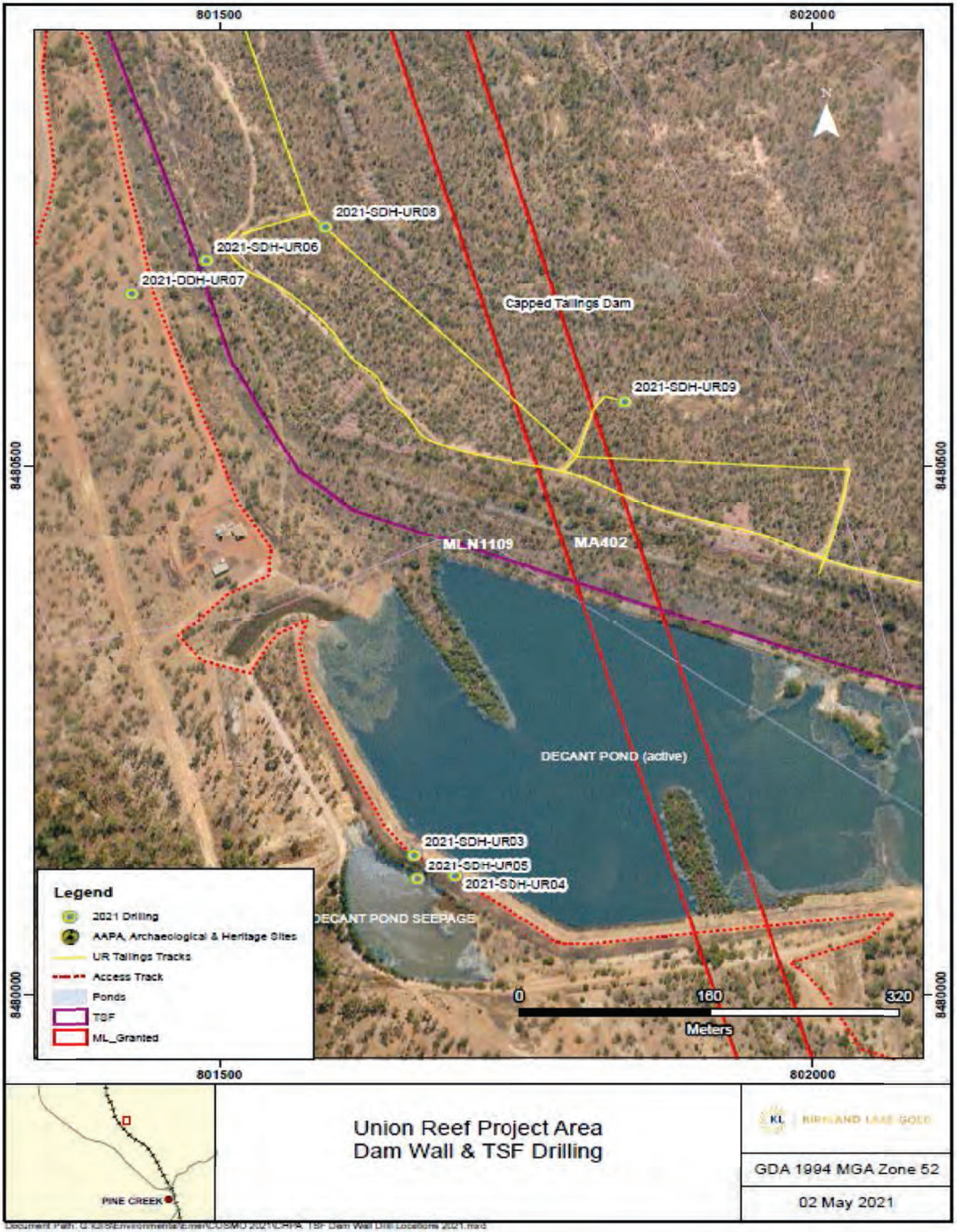
Appendix 2

Nomination of Operator

Mining Management Plan Exploration Activities



Mining Management Plan Exploration Activities



Appendix 5

Drill Hole Coordinates

NAME	TYPE	EASTING	NORTHING	AREA	LEASE
2021-SDH-UR01	Borehole – Sonic	800826.3	8484301	UR DAM A	MLN1109
2021-SDH-UR02	Borehole - Sonic	801653.5	8483735	UR DAM C	MLN1109
2021-SDH-UR06	Borehole - Sonic	801488.6	8480695	UR TSF	MLN1109
2021-DDH-UR07	Borehole – Diamond	801425.7	8480664	UR TSF	MLN1109
2021-SDH-UR09	Borehole – Sonic	801841.9	8480562	UR TSF	MLN1109
2021-SDH-UR08	Borehole - Sonic	801589	8480726	UR TSF	MLN1109
2021-SDH-UR03	Borehole – Sonic	801663.8	8480132	UR DECANT	MLN1109
2021-SDH-UR04	Borehole – Sonic	801698	8480111	UR DECANT	MLN1109
2021-SDH-UR05	Borehole – Sonic	801666.8	8480109	UR DECANT	MLN1109

Appendix 6

AAPA Certification

Mining Management Plan Exploration Activities

Appendix 7

Rehabilitation Register

Year			Drill Holes (No.)				Pads (No.)				Sumps (No.)				Drill Line/ Access Track (km)				
Reporting period	Tenement	MMP Reference	Planned	Drilled	Rehabed	Remaining Rehab	Planned	Cleared	Rehabed	Remaining Rehab	Planned	Cleared	Rehabed	Remaining Rehab	Planned	Cleared	Rehabed	Remaining Rehab	Comments
2011/2012	MLN1109	2011	106	83	83	0	106	75	75	0	80	48	48	0	4.00	4.00	2.00	2.00	All Drill Site Rehabilitation Complete
2012/2013	MLN1109	2012	89	56	56	0	54	38	38	0	108	76	76	0	2.00	2.00	0.50	1.50	All Drill Site Rehabilitation Complete
2013/2014	MLN1109	2013	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	No Drilling Undertaken
2014/2015	MLN1109	2014	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	No Drilling Undertaken
2015/2016	ML27999	2015	81	81	81	0	75	67	67	0	6	8	8	0	4.20	2.37	1.25	1.12	All Drill Holes and Sumps Rehabilitation Complete. Final Pad Rehabilitation completed in 2020
2016/2017	MLN1109	2016	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	No Drilling Undertaken
2017/2018	MLN1109	2017	2	2	2	0	2	2	2	0	6	6	6	0	0.00	0.00	0.00	0.00	All Drill Site Rehabilitation Complete
2018/2019	MLN1109	2018	109	95	95	0	94	43	43	0	0	0	0	0	1.86	0.65	0.00	0.65	Rehabilitated in 2020
2019/2020	MLN1109	2019	161	61	61	0	153	39	39	0	21	16	16	0	0.80	0.73	0.00	0.73	Rehabilitated in 2020
2020/2021	MLN1109	2020	24	16	16	0	20	22	22	0	0	0	0	0	0.70	0.00	1.31	-1.31	Rehabilitated in 2020
Total	All	2011-2020	572	394	394	0	504	286	286	0	221	154	154	0	13.56	9.75	5.06	4.69	

NORTHERN TERRITORY GOVERNMENT

Appendix 8

Photos of Rehabilitation Work

Drill ID	**2020-DDH-UR04**
Coordinates **GDA 94 / MGA Zone 52**	**E: 801760, N: 8480040**
Works completed	This DDH was drilled, and a monitoring bore was installed to monitor the geochemistry of the wall. Earth works were carried out to return the ground level/slope to as near original condition as possible. All over burden that was excavated from the site was re spread over the area loosely to promote water infiltration and revegetation. Any pre-existing vegetation was re-spread over the site to assist with regrowth. A new track was developed from a pre-existing track along the access track to access the drill pad location. The new access track was ripped to loosen the topsoil and promote revegetation. And track was rehabilitated to allow better drainage.
Before	 Photo taken 9/07/2020. Pink flag indicates drill hole location.

After	 Photo taken 13/01/2021. Monitoring bores installed but pad rehabbed.

Appendix 9:

Action Plan for Management Ghost Bats

Appendix 10:

URPA Weed Management Plan

ABORIGINAL AREAS PROTECTION AUTHORITY

GPO BOX 1890
DARWIN NT 0801
TELEPHONE: 08 8981 4700
FACSIMILE: 08 8981 4169
EMAIL: enquiries.aapa@nt.gov.au

File: D89/199; 90/307 ***In reply please quote: 68667***

Crocodile Gold Australia Pty Ltd
PO Box 346
PALMERSTON NT 0831

Attention: GRANT DAVEY

RE: RE-ISSUE OF AUTHORITY CERTIFICATE C2008/022 FOR UNION REEFS MINE SITE

I refer to your application for Authority Certificate received on the 18th August 2009 for the above location.

Accordingly, under the powers delegated to me under Section 19 of the *Northern Territory Aboriginal Sacred Sites Act 1989* I am pleased to issue the attached Authority Certificate.

Please read carefully the conditions outlined in the Certificate. In particular, you should note that it has been issued for an indefinite period of time, providing that the works covered by the Certificate start within the period stipulated in condition 3.

You should also note that the Authority has issued you with two identical copies of digitised maps attached. One copy should be retained with your original Certificate. The second is supplied for use by contractors to avoid unnecessary photocopying of a colour coded document.

Please note that the cost of this Authority Certificate will be **$50** and an invoice will be issued to you by the Department of Business and Employment [DBE). The terms and conditions of the invoice will require you to make payment within 30 days of receipt.

If you have any further queries regarding this Authority Certificate please contact Gareth Lewis on 8982 4227.

Yours faithfully

DR BEN SCAMBARY
Chief Executive Officer

8 October 2009

ABORIGINAL AREAS PROTECTION AUTHORITY
AUTHORITY CERTIFICATE

Issued in accordance with Section 22 of the Northern Territory Aboriginal Sacred Sites Act 1989

REFERENCE: D89/199; 90/307 (Doc: 68667) C2009/267
(Supersedes C2008/022)

APPLICANT: Crocodile Gold Australia Pty Ltd
PO Box 346
PALMERSTON NT 0831

SUBJECT LAND: Re-issue of C2008/022 for Mining Lease 1109, Union Reefs mine site, as shown on the map which is annexure 'A' hereto.

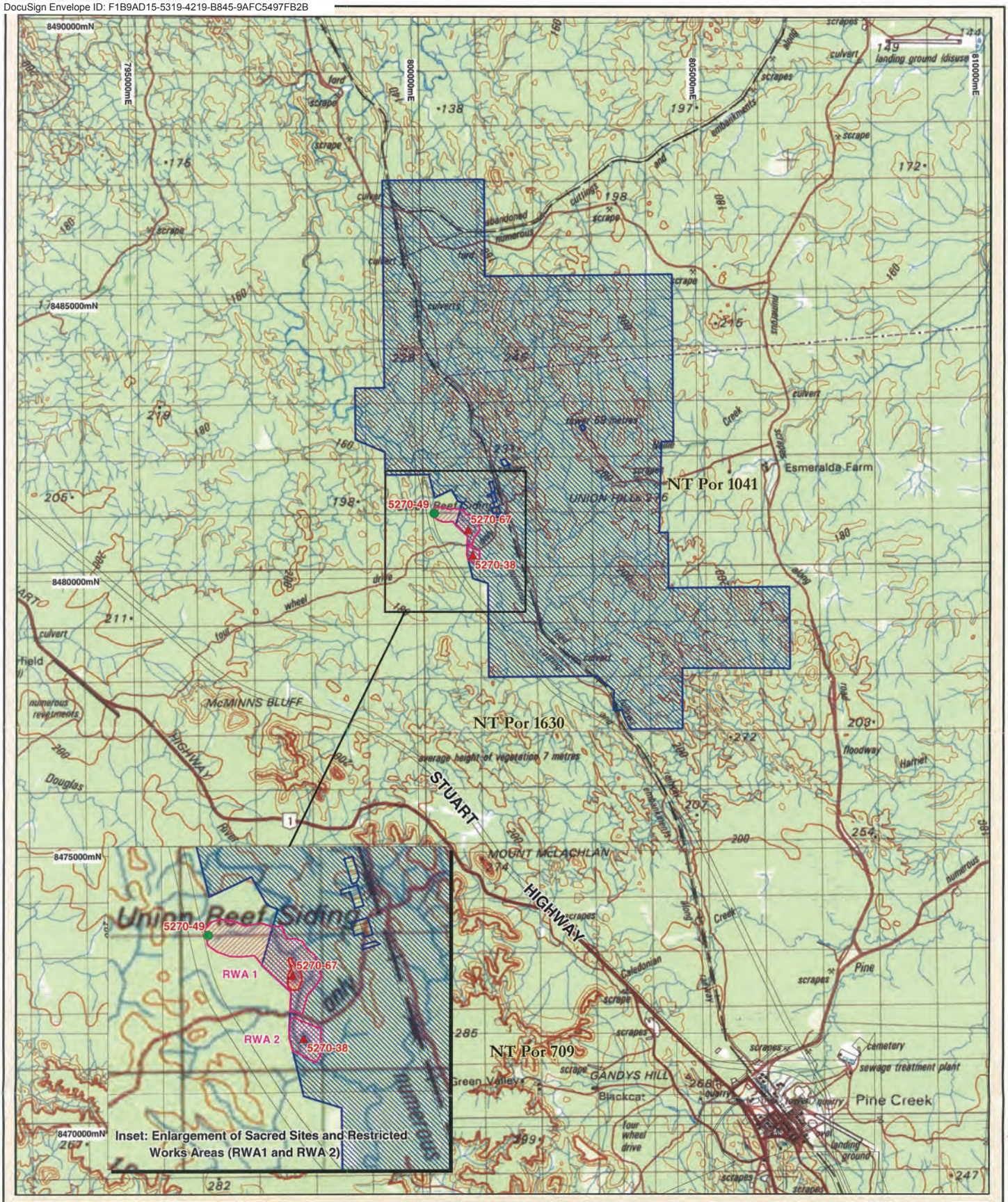
PROPOSED WORK OR USE: Mining of ore, construction and use of access roads, mineral exploration including drilling costeaning, bulk metallurgical test work, surface geochemical sampling, geophysical surveys, geological mapping and reconnaissance.

CONDITIONS:

1. The applicant shall ensure that the conditions of this Certificate are included in any subsequent contract or tender documents for the works or use described herein.
2. The applicant shall ensure any agent, contractor or employee is aware of the conditions of this Certificate and the obligations of all persons (who enter on, or carry out works or use land on which there is a sacred site) under Part IV of the *Northern Territory Aboriginal Sacred Sites Act 1989*.
3. This Certificate shall lapse and be null and void if the works in question or the proposed use is not commenced within 24 months of this Certificate.
4. The applicant shall ensure any agent, contractor or employee is aware of the content of section 40(1) of the *Northern Territory Aboriginal Sacred Sites Act 1989* which provides that this Certificate does not negate the need for consent, approval or permission for the subject works or use of the land which may be required under another statute.
5. Ground disturbing or water extraction activities are not permitted within Restricted Works Area 1 (RWA 1), associated with Sacred Sites 5270-49 and 5270-67, as marked on the attached map.
6. Ground disturbing or water extraction activities are not permitted within Restricted Works Area 2 (RWA 2), associated with Sacred Site 5270-38, as marked on the attached map.

The COMMON SEAL of the
ABORIGINAL AREAS PROTECTION AUTHORITY
was hereto affixed on the 8 day
of October 2009

DR BEN SCAMBARY
Chief Executive Officer



Prepared and produced by Aboriginal Areas Protection Authority (AAPA), Darwin, Northern Territory of Australia. 04/02/2008

Topographic Base Mapping Copyright © Geoscience Australia. All rights reserved.

This map forms part of a Certificate issued by the Authority under section 22 of the *Northern Territory Aboriginal Sacred Sites Act 1989*. No reliance should be put on the accuracy of the information on the map except as it relates to the land the subject of the Certificate and the fact that sites are not shown in other areas shall not be taken as a definitive indication of the existence or lack of existence of sites.

MLN1109
Mining and Minesite Construction

ANNEXURE "A" MAP FORMING PART OF

AUTHORITY CERTIFICATE C2009/267

ISSUED TO: Crocodile Gold Australia Pty Ltd

AUTHORISED COPY: NUMBER 1 OF 5

CHECKED BY: SJ DATE 06/10/2009

S JURKIJEVIC - SENIOR LAND INFORMATION OFFICER

J2009/0636

SCALE 1 : 60 000

0 1200 2400

metres

Projection: MGA Zone 52
Horizontal Datum: GDA94

KEY

- Subject Land
- Extent of Registered Sacred Site
- Restricted Works Area
- Recorded Site Centroid
- Registered Site Centroid

NT Mining Operations Pty Ltd
Union Reefs North Underground Mine

Ghost Bat Management Plan

KL | KIRKLAND LAKE GOLD

DECLARATION OF ACCURACY

I, Sally Horsnell, declare that all the information and documentation supporting this Ghost Bat Management Plan is true and correct. I am authorised to bind the Northern Territory Mining Operations Pty Ltd to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration. In making this declaration, I am aware that Sections 490 and 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (the EPBC Act) make it an offence in certain circumstances to knowingly provide false or misleading information or documents.

This document details the strategies proposed for managing the Ghost bat colony that, at times, utilise roosting habitat within the Union Reefs project area north of Pine Creek, Northern Territory.

Signed: _____

Full Name: Sally Horsnell

Position: Environmental Manager

Organisation: Northern Territory Mining Operations Pty Ltd (ABN: 65 36 525 990)

EPBC Number: XXXX

Date: _____

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FIGURES

APPENDICES

1 INTRODUCTION

1.1 Project Description

Northern Territory Mining Operations Pty Ltd (NTMO) propose to develop the Union Reefs North Underground Mine (the project) at the Union Reefs Project Area (URPA), a highly modified brownfield mine site that has been subject historically to gold mining. The URPA is located approximately 20 km northwest of the township of Pine Creek and 175 km southeast of Darwin. Authorised activities at the URPA include ore processing and tailings storage.

The Union Reefs underground mine will be accessed via a portal and decline developed from within the existing Prospect pit. Prospect pit is divided into two sections, north and south, each of which has a pit lake. Both pits will be dewatered completely prior to portal construction. The Prospect pit (south) will be used to store waste rock that will then be returned underground and used as backfill during mining operations. Ore will be trucked directly to the existing Run of Mine pad, and then fed into the existing processing plant crusher using the existing infrastructure and equipment. Tailings will be deposited in the existing Crosscourse pit tailings storage facility.

The key features and infrastructure referred to in this Ghost Bat Management Plan (GBMP) are listed below. This includes four underground horizontal tunnels (adits) that are used as diurnal roosts by the Ghost bat *Macroderma gigas* (listed as Vulnerable under the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999*). The characteristics of these adits and pits and their surrounding environments are described in detail in the Union Reefs North Underground Mine Draft Environmental Impact Statement (EIS) 2019.

- Prospect pit containing Prospect adit and OK adit
- Union North pit containing Union North adit
- Lady Alice adit, east of the Union North pit
- Artificial roosts to be constructed

1.2 Purpose and Objectives

The purpose of the GBMP is to provide the details of appropriate controls that will be implemented to protect Ghost bats at the URPA. This Environmental Management Plan (EMP) forms part of the NTMO Integrated Management System, to minimise the likelihood of potential impacts of the mining activities on Ghost bats. This GBMP has been developed from the Ghost Bat Action Plan (GBAP) that was included as part of the EIS, which provides the high-level strategy for protecting, managing and researching the Ghost bat within URPA, and at regionally important stronghold colonies present in other underground mines to the north (Spring Hill) and south (Pine Creek). This EMP will be treated as a dynamic document, to be revised and/or amended as required, to accurately reflect changing on-ground conditions and Ghost bat management measures.

Through implementing this EMP, NTMO aims to meet the following objectives:

1. Gather more information on the movements of Ghost bats that inhabit the URPA
2. Manage disturbance to Ghost bats and their habitat from mining and related activities
3. Avoid and control adverse impacts to Ghost bats
4. Promote awareness amongst mine staff of the need to protect threatened species

A key objective in this EMP is the management of a colony of Ghost bats that are known to use the Union North adit and OK adit on a regular (though not continuous) basis. This EMP describes the threats, mitigation measures and management strategies for Ghost bats known to occupy the URPA.

NTMO aim to be recognised as a leader nationally in efforts to manage, conserve and support research on the threatened Ghost bat.

2 LEGAL AND OTHER REQUIREMENTS

2.1 EPBC Conditions of Approval

Any activity that will have, or is likely to have a significant impact on a matter of national environmental significance requires Commonwealth Government approval under the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act). This includes nationally threatened animal and plant species and ecological communities. The EPBC Act approval condition requirements the project will address will be detailed in Table 2-1 below once issued.

TABLE 2-1 CONDITIONS OF APPROVAL

Ref.	Condition Number	Condition Requirement	Document Reference	Demonstration of How This Plan Addresses Condition Requirements
1	tbc			
2	tbc			
3	tbc			

2.2 Other Legal Requirements

Legal requirements applicable to this Ghost Bat Management Plan include:

- *Environmental Assessment Act 1982* – Administered by the Northern Territory Environmental Protection Agency (NT EPA). This Act is yet to be superseded by the *Environmental Protection Act 2019.*
- *Bushfires Management Act 2016* – Requires the prevention and control of bushfires including fire breaks, fire management plans and permits for lighting fires (Permit to Burn).
- *Mining Management Act 2001* – Mining Management Plans (MMPs) require technical studies, data and management plans based on the risk assessment of proposed activities.
- *Territory Parks and Wildlife Conservation Act 1976* – Lists plants and animals that are protected in the NT and requires management plans for impacts on protected species. Permits may be required to undertake studies for approvals or to remove or relocate problem animals during development or operations (Permit to Take or Interfere with Wildlife and/or Permit to Undertake Scientific Research).
- *Weeds Management Act 2001* – Duties of land owners to manage and prevent the spread of weeds into and out of the NT in accordance with a Weed Management Plan.

2.3 Guidelines

Guidelines applicable to this Ghost Bat Management Plan include:

- An Action Plan for the management of Ghost bats in the Union Reefs project area (Armstrong, Barden and Hanrahan, 2020)
- Environmental Management Plan Guidelines (Commonwealth of Australia, 2014)
- Conservation Advice, *Macroderma gigas* (Ghost bat), established under the EPBC Act (Threatened Species Scientific Committee, 2016)

2.4 Integrated Management System

NTMO manages significant environmental and social aspects of its operations through a series of EMPs, which are included in the NTMO Integrated Management System. The EMPs applicable to this GBMP are:

- Environmental Emergency Response Plan
- Dust Management Plan
- Fire Management Plan
- Flora and Fauna Management Plan

2.4.1 THE GHOST BAT ACTION PLAN

This Management Plan should also be read in conjunction with the Ghost Bat Action Plan (GBAP). The GBAP is a plan with a wider application than the URPA and encompasses actions to manage the wider regional population of Ghost bats and provide direction for scientific research for conservation of the species. The following table provides a summary of actions from the GBAP that are referred to in this document.

TABLE 2-2 ACTION PLAN FOR THE MANAGEMENT OF GHOST BATS IN THE URPA – SUMMARY OF ACTIONS

Action	Description	Objective
Action 1	Exclude the Ghost bat from the OK and Prospect adits based on a carefully planned protocol.	Protect Ghost bats from disturbances associated with mining-related activity in the Prospect pit.
Action 2	Characterise the internal dimensions of OK, Lady Alice and Union North adits.	Provide confirmation that the Ghost bat has continued suitable alternative diurnal roost habitat (contingency roosts) within the Union Reefs project area and further afield.
Action 3	Create artificial habitats (contingency roosts) for the Ghost bats in the Union Reefs project area, for both contingencies and redundancy.	Encourage and protect the persistence of the Ghost bat in the Union Reefs project area during the period of mining, and the period that the OK adit is temporarily closed to Ghost bats, and provide contingencies for roosting in the area if the Union North adit becomes unsuitable temporarily. Contribute to the long-term persistence of the Ghost bat in the Union Reefs project area. (Actions 3, 4, 8)
Action 4	Re-open and rehabilitate the Lady Alice adit so that it is suitable for Ghost bat occupancy.	Encourage and protect the persistence of the Ghost bat in the Union Reefs project area during the period of mining, and the period that the OK adit is temporarily closed to Ghost bats, and provide contingencies for roosting in the area if the Union North adit becomes unsuitable temporarily. Contribute to the long-term persistence of the Ghost bat in the Union Reefs project area. (Actions 3, 4, 8)

Action	Description	Objective
Action 5	Manage the Union North adit during the period of mining to avoid direct impact from mining personnel (also discussed in Table 8-2).	Encourage and protect the persistence of the Ghost bat in the Union Reefs project area during the period of mining, and the period that the OK adit is temporarily closed to Ghost bats, and provide contingencies for roosting in the area if the Union North adit becomes unsuitable temporarily.
Action 6	Implement management and protection measures to increase the security of the Pine Creek roost.	Contribute to the long-term persistence of the Ghost bat in the region by helping to protect stronghold colonies at Pine Creek and Spring Hill. (Actions 6, 7)
Action 7	Conduct a programme of continuous monitoring of Ghost bat presence, activity levels and colony size at all known (Union North adit) and potential (Lady Alice adit and newly created artificial roosts) within the project area.	Provide confirmation that the Ghost bat has continued suitable alternative diurnal roost habitat (contingency roosts) within the Union Reefs project area and further afield. Contribute to the long-term persistence of the Ghost bat in the region by helping to protect stronghold colonies at Pine Creek and Spring Hill. (Actions 6, 7)
Action 8	Provide a portion of the new mine for Ghost bat occupancy once mining has been completed.	Contribute to the long-term persistence of the Ghost bat in the Union Reefs project area.
Action 9	Conduct field surveys for Ghost bat diurnal roosts in natural caves in the hills surrounding the Union Reefs project area.	Provide confirmation that the Ghost bat has continued suitable alternative diurnal roost habitat (contingency roosts) within the Union Reefs project area and further afield.
Action 10	Investigate the connectedness of Ghost bat colonies in the region using an advanced genetic method based on genome-scale DNA sequencing.	Confirm that Ghost bats maintain connectedness amongst colonies in the population, thus demonstrating the capacity for Ghost bats to move from the Union Reefs project area to other colonies, including stronghold colonies.
Action 11	Provide support for further academic research on the ecology of the Ghost bat.	Seek further understanding of the Ghost bat distribution, numbers and movements in the region to inform their conservation and management.

2.5 Standard Operation Procedures

NTMO Standard Operating Procedures (SOPs) applicable to the Ghost Bat Management Plan include:

- NTMO ES – SOP011 Fauna Monitoring
- NTMO ES – SOP031 Incident and Complaint Notification and Reporting
- NTMO ES – SOP032 Pest and Vector Management
- NTMO ES – SOP033 Fauna Injury and Death Management
- NTMO ES – SOP034 Feral Animal Management

3 ROLES AND RESPONSIBILITIES

The roles relevant for conducting management strategies in this GBMP are listed below. The timing and responsibilities of each relevant position are documented throughout Section 8 of this GBMP.

Internal Roles

- KLG Environmental Officer
- KLG Senior Environmental Officer
- KLG Environment Manager
- KLG Safety Officer
- KLG Operations Manager

External Roles

- Charles Darwin University Post-Doctoral Research Fellow
- Ghost Bat Specialist Consultants

4 Environmental Training

All NTMO personnel and external parties (including contractors and consultants) entering the URPA to conduct work activities will undergo a compulsory site induction before commencing works. This includes a Safety and Environment Induction, which includes (but is not limited to):

- Identifying the key points of environmental value on the URPA, including Ghost bats, their conservation status, ecology, sensitivities and key threats.
- Requirements of the GBMP, including environmental incident response procedures, site environmental controls, such as the restricted access areas of the URPA, and the consequences of not meeting their environmental responsibilities.
- Awareness training so that all personnel are made aware of their environmental responsibilities under the GBMP in relation to implementing mitigation measures, reporting environmental incidents and complaints, and implementing corrective actions.

Records of all training conducted will be maintained and include:

- The person receiving the training
- The date the training was received
- The name of the person conducting the training
- A summary of the training

5 EMERGENCY CONTACTS AND PROCEDURES

Incorporated into the Integrated Management System, NTMO has developed an Environmental Emergency Response Plan (Appendix 9.1 of the URPA MMP) to provide a framework for the safe response and management of environmental emergencies. Emergency responses to environmental issues are integrated within NTMO emergency response procedures. In the event of an environmental emergency, the following key personnel must be contacted.

TABLE 5-1 EMERGENCY CONTACTS

Emergency	Contact	Details
Medical emergency	**Emergency Services**	**Ph:** 000 or 112
Environmental emergency	**Sally Horsnell** Environment and Community Manager	**Ph:** 08 8982 4415 **Mob:** 0436 643 620 **Email:** SHorsnell@klgold.com.au
Ghost bat related query, sighting, injury or fatality	**Emer McGowan** Environmental Office (Ghost Bats)	**Ph:** **Mob:** **Email:** EMcgowan@klgold.com.au

6 SPECIES INFORMATION

The Ghost bat has a history of decline across its broad distribution, and now exists as a fragmented group of geographically isolated populations across northern Australia. The Daly River regional Ghost bat population is thought to comprise between 8.1 % and 12.5 % of the national Ghost bat population.

Part of this regional population is a colony of up to 50 individuals at different times of the year, that is confirmed to roost during the day in either the OK adit (in the Prospect pit) or the Union North adit (in the Union North pit) within the URPA. Diurnal roosting also occurs at times in the Prospect adit (in the Prospect pit). These diurnal roosts are within the remnants of the lower parts of historical workings that are found extending back from the walls of two open-cut mine pits. The adits are small, with tunnels being around c. 1.5 m high by 1.5 m wide, and are part of the goldfield that was worked mostly between c. 1880 and 1910. The open-cut mine pits are the result of contemporary mining activity in the past three decades. Monitoring indicates that Ghost bats switch between adits within the URPA, or move completely out of the area to roost elsewhere at different times. Table 6-1 summarises information about the Ghost bat.

TABLE 6-1 SPECIES INFORMATION FOR THE GHOST BAT

Common / Scientific Name	Ghost bat / *Macroderma gigas*
Conservation Status	• 'Vulnerable' under the Commonwealth EPBC Act 1999 • 'Near Threatened' under the Territory Parks and Wildlife Conservation Act
Description	The Ghost bat is the largest microchiropteran bat in Australia, with females being larger than males and weighing up to 170 g. They have a head and body length of 10 to 13 cm, a forearm length of 10 to 11 cm and a wingspan of up to 60 cm. It is Australia's only carnivorous bat. The fur is light to dark grey above and paler below. It has long ears which are joined together, large eyes, a simple nose leaf and no tail (TSSC, 2019).  **FIGURE 6-1 GHOST BAT / *MACRODERMA GIGAS*** **GHOST BAT / *MACRODERMA GIGAS***

Habitat	Ghost bats roost in deep limestone or sandstone caves, shallow sandstone caves with domed ceilings or in historical mine sites, i.e. disused mine adits (see images of this habitat below). The types of subterranean structures that provide diurnal roosts and support the larger colonies of Ghost bats and function as breeding sites are generally deep, with warm, humid microclimates.   **FIGURE 6-2 HABITAT**
Feeding	Diet consists of small mammals (including other bats), birds, reptiles, frogs, and usually a considerable proportion of large insects, and it varies regionally and depending on seasonal availability. Ghost bats forage either by ambushing passing prey in the air or on the ground. Most prey is taken to a feeding perch in trees, rock overhangs, or cave entrances to be consumed.
Life Cycle	Females breed at an age of two to three years and give birth to a single young, and occasionally twins. Birthing occurs over the period of a month commencing in August in the Top End. Young can be shifted to other warm caves as summer progresses. Juvenile bats commence flying at seven weeks, with all young capable of flight by the end of January.
Key Threats	Key threats are detailed in Section 7 of this GBMP. Of primary significance, Ghost bats are highly sensitive to disturbance at the entrance of and inside their roosts during the day. Noise, light and the presence of people and vehicles near daytime roost sites may result in Ghost bats leaving their roost. If Ghost bats are disturbed during the day and fly out of the roost, they risk predation by raptorial birds, and/or death from exposure to unfavourable outside ambient conditions.

7 Potential Risks and Impacts

The components of the project that pose potential risks and impacts to Ghost bats have been identified and are detailed in Table 7-1 below. The impact pathways have provided a basis for evaluation and justification of the proposed controls and management measures to modify the risk. The risk assessment methodology and risk rating system is as per Section 10 of the Draft EIS.

TABLE 7-1 PROJECT ACTIVITIES, RISKS AND POTENTIAL IMPACTS ON GHOST BATS

Project Activity	Mining Phase	Potential Impact	Potential Consequence	Residual Risk Rating
Closure of OK adit and Prospect adit prior to mine construction	Development / construction	All Ghost bats disperse out of the URPA after closure of the OK adit, relocating to caves and other structures, or to alternative sites such as Pine Creek and Spring Hill.	• Reproductive success may be lowered when bats are forced to move elsewhere. • Habitat loss – temporary removal of one of two Ghost bat diurnal roost sites in the Union Reefs project area and possible breeding site. This also represents a loss of redundancy in the event that one remaining roost becomes unsuitable or is disturbed.	***Medium***
Closure of OK and Prospect adits prior to mine construction	Development / construction	Ghost bats are unable to find alternative roosts with suitable conditions.	• Loss of up to 30 individuals from the URPA (population potentially represents 2.6 % of the upper estimated regional Ghost bat population or approx. 1.5 % of the Top End population).	***Medium***

Project Activity	Mining Phase	Potential Impact	Potential Consequence	Residual Risk Rating
Mining personnel in the vicinity of roosting sites	All mining phases	Disturbance to roosting habitat.	• Roost is not returned to after dusk exodus, and bats may need to travel further in one night to reach an alternative site, which may or may not contain a suitable roosting and/or breeding microclimate. • Some or all bats exit into the daylight exposing them to predation by raptorial birds, and exposure to unfavourable outside ambient conditions causing mortality of some or all bats comprising the URPA colony. • Total colony loss would constitute 2.6 % of the Daly River regional population, or approx. 1.5 % of the Top End population Reduced reproductive success due to disturbance during breeding cycle.	***Medium***
Wet season flooding	All mining phases	Union North adit microclimate is changed due to being flooded and may become a sub-optimal roost.	• Potential habitat loss: Bats are forced to aggregate in fewer roost sites or find an alternative site, which may or may not contain a suitable roosting and/or breeding microclimate. • Occurs at a critical part of the breeding cycle that causes an interruption to breeding activity and lowered reproductive output.	***Medium***
Vibration and ground borne noise emissions from mining activities	Operations / production	Disturbance to roosting habitat.	• Roost is not returned to after dusk exodus and bats may need to travel further in one night to reach an alternative site, which may or may not contain a suitable roosting and/or breeding microclimate. • Some or all bats exit into the daylight exposing them to predation by raptorial birds, and exposure to unfavourable outside ambient conditions causing mortality of some or all bats within the URPA colony. • Total loss would constitute 2.6 % of the Daly River regional population, or approx. 1.5 % of the Top End population. • Reduced reproductive success due to disturbance during breeding cycle.	***Medium***

Project Activity	Mining Phase	Potential Impact	Potential Consequence	Residual Risk Rating
Vibration and ground borne noise emissions from mining activities	Operations / production	Damage to roost sites from vibration (adit collapse / blockage) during the day.	• Mortality of some or all Ghost bats. Total colony loss would constitute 2.6 % of the Daly River regional population, or approx. 1.5 % of the Top End population.	***Medium***
	Operations / production	Damage to roost sites (adit collapse / blockage) during the night.	• Potential habitat loss: Roosting habitat is rendered unsuitable, roost is not re-occupied at dawn and bats may need to reach an alternative site, which may or may not contain a suitable roosting and/or breeding microclimate.	***Low***
Dust generating mining activities, e.g. haul road, blasting, waste rock deposit, etc.	All mining phases (particularly operation phase)	Dust may reduce the suitability of roosting habitat, e.g. dust enters adits.	• Potential roost habitat modification. Bats are forced to find an alternative site, which may or may not contain a suitable roosting and/or breeding microclimate. • Potentially coinciding with breeding cycle and reducing reproductive success.	***Low***
	All mining phases (particularly operation phase)	Dust reduces the suitability of foraging habitat, e.g. dust emissions and deposition in surrounding woodland.	• Reduced foraging success, forcing bats to travel longer distances to forage each night, which may or may not result in adequate feeding success. • Potentially coinciding with breeding cycle and reducing reproductive success. • Potential foraging habitat modification. May result in URPA colony relocating to alternate habitat outside of the URPA.	***Low***
Fencing	All mining phases	Ghost bats may become entangled in fencing in and around the URPA.	• Mortality of some or all Ghost bats. Total loss would constitute 2.6 % of the Pine Creek regional population, or approx. 1.5 % of the Top End population.	***Low***

Project Activity	Mining Phase	Potential Impact	Potential Consequence	Residual Risk Rating
Lighting	All mining phases	Artificial light from the mine may reduce the suitability of foraging and roosting habitat.	• Potential habitat modification. Bats are forced to find an alternative site, which may or may not contain a suitable roosting and/or breeding microclimate. • Reduced foraging success, forcing bats to travel longer distances to forage each night, which may or may not result in adequate feeding success. • Potentially coinciding with breeding cycle and reducing reproductive success.	***Low***
Use of vehicles and machinery within the URPA	All mining phases	Collision.	• Mortality of some or all Ghost bats. Total colony loss would constitute 2.7 % of the Pine Creek regional population, or approx. 1.5 % of the Top End population.	***Low***
Fire management activities	All mining phases	Burning activities reduce the suitability of foraging and/or roosting habitat.	• Potential habitat modification. Bats are forced to find an alternative site, which may or may not contain a suitable roosting and/or breeding microclimate. • Reduced foraging success, forcing bats to travel longer distances to forage each night, which may or may not result in adequate feeding success. • Potentially coinciding with breeding cycle and reducing reproductive success.	***Low***

8 Environmental Management Measures

The tables below represent each potential risk to Ghost bats or their habitat identified in Table 7-1 of this GBMP.

This Section describes the commitments of NTMO, pertaining to each of these risks, for the following:

- Objectives and targets
- Management strategies and associated actions from the action plan (GBAP; Armstrong et al. 2020)(Appendix A)
- Performance indicators, listing triggers where relevant
- Monitoring
- Reporting
- Corrective actions
- Timing of each aspect of the management strategy
- Roles and responsibilities

8.1 Closure of OK and Prospect Adit

TABLE 8-1 MANAGEMENT OF RISKS FROM CLOSURE OF OK AND PROSPECT ADIT

Closure of OK and Prospect Adits Prior to Mine Construction	Description	Responsibility	Timing
Objectives	Protect Ghost bats from disturbances associated with mining-related activity in the Prospect pit, and reduce the likelihood of mortality of individual Ghost bats due to closure of the adits in Prospect pit.		
Management Strategies / Actions	Exclude the Ghost bat from the OK adit and Prospect adit based on a carefully planned protocol. This protocol is detailed in the GBAP Action 1. Closure to take place: • When Ghost bats are observed to be absent. • After a survey of adits is complete. • After the contingency roosts have been established and opened (two artificial roosts; Lady Alice adit; Action 3, 4). • After the cave occupancy surveys have been initiated (Action 9).	NTMO Environmental Officers and Ghost Bat Specialist Consultants, Contractors and the CDU Research Team	Pre-construction

Closure of OK and Prospect Adits Prior to Mine Construction	Description	Responsibility	Timing
Monitoring	A monitoring program related to this objective will be conducted at several adits as per Action 7, as follows: • **OK adit and Prospect adit** – 24-hour acoustic monitoring and thermal video monitoring nightly one week before and after the exclusion protocol has been implemented. • **Union North adit and Lady Alice adit** – 24-hour acoustic monitoring and thermal video for two consecutive nights every two weeks for duration of the project. • **Kohinoor adit at Pine Creek, Spring Hill adits and natural caves surrounding URPA (dependent on discovery)** – 24-hour acoustic monitoring nightly and thermal video for two consecutive nights every two months for duration of the project.	**Deploying equipment:** KLG Environment Officer **Maintaining monitoring equipment and collating data:** Ghost Bat Specialist Consultants	Prior to closure; during and after closure
Reporting	A report will be produced to document the process and will detail the following: • Protocol for adit closure and observations made during the exclusion. • Monitoring results at each adit and artificial roost detailing activity levels and colony counts. • Summary of information from dataloggers (noise, vibration, temperature, relative humidity) at the Union North adit, Lady Alice adit, artificial roosts. The report can be assessed for the suitability of its release to the public domain once the information has been compiled.	**Data analysis and reporting:** Ghost Bat Specialist Consultants	Report submitted one month after the exclusion
Performance Indicators	No bat carcasses of any bat species are found outside the sealed portals to the OK adit or Prospect adit for 14 days after the permanent barricades have been established. Changes in the level of usage of the Union North adit, Lady Alice adit, artificial roosts, or any other regional site used by Ghost bats does not provide meaningful interpretation for the exclusion. Responses to exclusion (other than the presence of bat carcasses outside the adit entrances) cannot be separated from those occurring because of natural processes.		
Corrective Actions	If a carcass of any bat species is found at the sealed portal of the OK adit or Prospect adit, then the illumination designed to discourage the presence of bats will be re-evaluated and improved. Thermal video recordings and acoustic recordings will be made for seven nights after the Exclusion, unless bat carcasses are observed, in which case thermal video monitoring will be extended another seven nights.	As above	As above

8.2 Disturbance from Unauthorised Visitation

TABLE 8-2 MANAGEMENT OF RISKS FROM MINING ACTIVITY

Unauthorised Visitation in the Vicinity of Roosting Sites	Description	Responsibility	Timing
Objectives	Encourage and protect the persistence of the Ghost bat in the Union Reefs project area during the period of mining, and the period that the OK adit is temporarily closed to Ghost bats by excluding visitation or disturbance of alternative roost sites (particularly Union North adit) from personnel, equipment and/or machinery.		
Management Strategies / Actions	Action 5 from the GBAP (Armstrong et al. 2019) details the management requirements of the Union North adit to exclude visitation and disturbance from mining personnel and equipment / machinery from Union North pit. Each adit within the URPA (Union North, Lady Alice and artificial roosts) will have designated exclusion zones: • Vehicles and other machinery prohibited in the Union North pit and above the extent of the underground structure. • Heavy machinery (not including light vehicles) prohibited within 135 m of the adit entrance (consistent with buffer zones established for the drilling program; Armstrong and Barden, 2019). • All mining and contractor personnel are prohibited from approaching or entering roost sites. Exceptions to this include approved activities and personnel under the GBAP, including (but not limited to) placement / retrieval of monitoring equipment (Action 7), and adit characterisation (Action 2). Exclusion zones will be made apparent with adequate signage. Mine personnel will be made aware of the threat of disturbance on Ghost bats through the inclusion of information in a compulsory 'Safety and Environment' induction on the presence and value of Ghost bats on-site, the restrictions in place including camera surveillance, and the consequences for non-compliance to these exclusion zone requirements.	**Adhering to exclusion zones:** All mining and contractors personnel **Maintaining integrity of exclusion zones:** KLG Environmental Officer **Safety and Environment Inductions:** KLG Safety Officer	Enacted during all mining phases

Unauthorised Visitation in the Vicinity of Roosting Sites	Description	Responsibility	Timing
Monitoring	Surveillance to allow enforcement of these restrictions will be implemented using wildlife camera traps placed at the Ghost bat roosts. The units will face out from the entrance, or another point where they are deemed to be effective for identifying people. They will be reviewed every two weeks, coinciding with the thermal camera deployments.	**Deploying, maintaining and data analysis:** KLG Environmental officer	Continuously throughout all mine phases CCTV footage reviewed every two weeks
Reporting	Any breach of these exclusion zones will be reported immediately to the KLG Environmental Officer who will lodge an incident report, to include in the quarterly and annual reporting requirements.	**Enforcing requirements and incident reporting:** KLG Environmental Officer	Quarterly and annual reports
Performance Indicators	No Ghost bats exiting their diurnal roosts into the open (daylight) as the result of a disturbance from personnel or equipment at the entrance of or within any of the adits within the URPA. An indicator of performance is no reported incidents.		
Corrective Actions	Incident reporting will be used in corrective actions that allow compliance with the management actions listed in this plan to be achieved. Non-conformance will be reported and addressed to prevent reoccurrence.	N/A	As required

8.3 Wet Season Flooding

TABLE 8-3 MANAGEMENT OF RISKS FROM WET SEASON FLOODING

Wet Season Flooding	Description	Responsibility	Timing
Objectives	To maintain the suitability of the Union North adit for Ghost bat roosting during and following rainfall events.		
Management Strategies / Actions	The source of the water that accumulates in the Union North adit is unknown; however, there is a straightforward solution to maintaining low water levels, and therefore the long-term (i.e. wet season) suitability of the Union North adit for Ghost bats. If an accumulation of water (defined as a complete inundation of the adit floor; not pooled or puddled) is visible from the portal, the water will be pumped out of Union North adit using the following non-invasive protocol: 1 Observations to date do not suggest that water is entering the adit from the entrance, rather the level increases from a source inside the adit. However, if a future observation suggests that some contribution to the water level originates from water running in via the entrance, a bund of dirt will be applied and maintained using hand tools. 2 A pump will be installed permanently a minimum distance of 40 metres from the entrance to Union North adit, with a noise-reducing shroud included. The chosen pump will be a model that emits relatively low noise, and consideration will be given to smaller models that may need to pump for longer but emit less noise. The pump will be located out of direct line of sight of the adit entrance, to reduce noise transmission further. The pump intake pipe will be installed permanently in the Union North adit, which will extend as far as the debris pile c. 60 metres from the entrance. The intake pipe will be installed at night when bats are absent, in the same way that occasional inspections of the adit have been undertaken previously. 3 The adit will be inspected from the portal on a weekly basis, and after heavy rainfall events, to determine internal water levels. Note that both the length of the tunnel and the pile of debris in the middle of the adit prevent torchlight reaching areas where the bats roost, so no disturbance from regular inspections of water level is likely. 4 If water is observed to have accumulated in the base of the adit from the portal, the pump will be turned on. Operation of the pump will be conducted at night only to reduce disturbance. The pump will be turned on no sooner than two hours after sunset, to give enough time for bats to vacate the structure.	KLG Environment Officer	When required during large rainfall events

Wet Season Flooding	Description	Responsibility	Timing
	5 Water from the adit will be pumped into the adjacent lower lever pit lake to the north of Union North adit. 6 Pumping will cease when water levels have reduced to the point that inundation is no longer visible. 7 Inspections of water level will be continued on a daily basis for three days after the last pumping event, and then return to the standard inspection regime once pumping has not been required for three days.		
Performance Indicators / Triggers	No trigger or performance indicator based on the activity of Ghost bats will be implemented, given that we cannot separate the effects of changing roost conditions from natural patterns of Ghost bat movement or roost usage; and also that the practical limitations of the acoustic monitoring do not allow for an immediate assessment of any possible response to flooding. If water inundation is observed in the Union North adit from the entrance (the trigger), it will be pumped after the next sunset. Water inundation is defined as complete inundation the adit floor visible from the entrance; not pooled or puddled. It should be noted that if any inundation is visible from the entrance, then the rear of the adit is likely to be flooded to a greater depth. It should also be noted that it is not possible to estimate the water depth at any point of the adit tunnel from a casual inspection from the entrance, but given that water depth is known to increase with distance from the entrance, any inundation visible from the entrance will indicate the need to pump to reduce water levels in the area where bats roost. The performance indicator will be a complete reduction in the water level observed in the adit from the entrance. Small pools or puddles remaining after pumping in depressions of the floor do not count as water inundation.	KLG Environment Officer to monitor large rainfall events and rainfall data Ghost Bat Specialist Consultants to analyse Ghost bat movement data for correlations with rainfall events	When required during large rainfall events; weekly throughout the wet season (November to April inclusive)
Monitoring	Water levels will be inspected weekly across the wet season, with increased frequency during and following large rainfall events.	KLG Environment Officer to monitor rainfall data	When required during large rainfall events
Reporting	Any inundation of the adit, and the details of subsequent pumping will be included in the regular bat activity monitoring reports that are prepared as part of Action 7 in the Ghost Bat Action Plan.	KLG Environment Officer to pass on information to	Reporting in regular bat activity

Wet Season Flooding	Description	Responsibility	Timing
		Ghost Bat Specialist Consultants; to include information in regular bat activity monitoring reports	monitoring reports as scheduled in Action 7 of the Ghost Bat Action Plan
Corrective Actions	Management strategies listed above can be considered corrective action.	KLG Environment Officer to coordinate pumping	As the need for pumping of the adit arises

8.4 Vibration and Ground Borne Noise Emissions

TABLE 8-4 MANAGEMENT OF RISKS FROM VIBRATION EMISSIONS

Vibration and Ground Borne Noise Emissions from Mining Activities	Description	Responsibility	Timing
Objectives	Encourage and protect the persistence of the Ghost bat in the Union Reefs project area during the period of mining, and the period that the OK adit is temporarily closed to Ghost bats: 1 Vibration emissions recorded at all URPA roost sites to remain below 10 mm/sec. 2 Ground-borne noise emissions recorded at all URPA roost sites to remain below 75 dBZ. 3 No daylight exodus of Ghost bats from URPA roost sites as a result of noise and vibration disturbance from drilling and blasting in the Underground Mine.		
Management Strategies / Actions	• Alternative roost site locations (Union North adit, Lady Alice adit, artificial roosts) are all predicted to experience vibration emissions at a level that is not expected to disturb Ghost bats. The value of 10 mm/sec for vibration and 75 dBZ for ground-borne noise level (based on modelling conducted by Velasco 2019) are defined here as thresholds, and their exceedance will trigger a response. • A continuous program of monitoring will be conducted within URPA roost sites, which will allow mining activities to be correlated with the activity of Ghost bats). • The entrance portals to all URPA roosts will be examined for blockages or instability when acoustic, video and datalogger equipment is being maintained.	**Adit inspections and equipment deployment:** KLG Environment Officer	For the duration of mine operation / production phase
Monitoring	Noise and vibration dataloggers will be installed in the Union North adit, Lady Alice adit and all artificial roosts. Dataloggers will be installed that do not require regular human entry of adits, only an initial entry to place probes on a long cable into position at night when bats have left. The recording and controlling device will be placed at the entrance. Dataloggers will be downloaded when acoustic and video equipment is maintained, which is every two weeks.	**Deploying equipment:** KLG Environment Officer **Maintaining monitoring equipment and collating data:** Ghost Bat Specialist Consultants	Data review every two weeks for the duration of mine operation / production phase

Vibration and Ground Borne Noise Emissions from Mining Activities	Description	Responsibility	Timing
Reporting	Data from noise and vibration dataloggers will be included in quarterly and annual reports that document Ghost bat activity in URPA. Any values of noise and vibration above the thresholds would be identified and correlated with Ghost bat activity. This information is valuable to document, and consideration will be made of whether to release this to the public domain, given its potential cross-application to other projects.	**Data analysis and reporting:** Ghost Bat Specialist Consultants	Quarterly and annual reports
Performance Indicators / Triggers	Documentation of whether the threshold level of 10 mm/sec for vibration and 75 dBZ for ground-borne noise emissions have been exceeded. If these levels are exceeded, this will be correlated with the activity levels of Ghost bats to determine if there was an obvious, remarkable and unusual change. If there was, as determined by the Ghost Bat Specialist Consultants, then a modification to the blasting regime would be enacted as a minimisation action, as described above. No threshold levels for Ghost bat activity change are specified, given the difficulty of defining them, and disentangling their natural patterns of movement from changes related to mining activity (see GBAP Strategy of this Action Plan; Armstrong et al. 2019).		
Corrective Actions	The project has the capacity to adjust blasting pattern / timing / sequence / duration if the noise and vibration thresholds are exceeded. If noise and vibration levels exceed the thresholds stated above, then the following actions will be implemented: • Blasting will only be permitted to occur between 0500 and 0600, and between 1700 and 1800 each day, which correspond to times of the day when Ghost bats might be active inside the roost prior to leaving after dusk, or just after returning before dawn, and thus less likely to be disturbed compared with when they are resting. • Consideration of different blast conditions to reduce the magnitude of noise and vibration emissions. • Noise and vibration monitoring in URPA roosts to check whether the altered blasting regime results in noise and vibration levels decrease below the threshold levels.	KLG Operations Manager	When required

8.5 Dust Generating Mining Activities

TABLE 8-5 MANAGEMENT OF RISKS FROM DUST GENERATING MINING ACTIVITIES

Dust Generating Mining Activities	Description	Responsibility	Timing
Objectives	Prevent and avoid modification to roosting or potential foraging habitat due to dust emissions and deposition.		
Management Strategies / Actions	There is no information about levels of dust that would cause a significant impact to Ghost bats. To approach the issue of potential impacts of dust on Ghost bats, and limit levels of dust, we will rely on the regular procedures for dust suppression that are enacted during normal operation of mine sites. A dust monitoring program is already in place as part of operational management for the URPA and is detailed in the Dust Management Plan. An outline of the dust management strategies are as follows: • Water from the Plant Spill Pond is used for dust suppression around the processing plant and ROM areas. • Vehicle exclusion zones (as detailed in Table 8-2) to mitigate dust around Ghost bat roosting sites. • A dust monitoring program is implemented within the URPA (detailed below). • The haul and main access roads are sprayed continuously to reduce dust from traffic.	**Dust suppression around processing plant and roads:** KLG Operations Manager	During all mine phases
Monitoring	Dust monitoring is conducted for a minimum of three months in the dry season, and sampling is in accordance with the Dust Deposition Sampling Procedure. The program consists of two dust deposition gauges to capture various dust criteria measures from the main dust generating areas of the URPA on sensitive receptors (given the prevailing wind direction during the dry season).	**Deployment and maintenance of dust monitoring equipment:** KLG Environment Officer	For three months during the dry season
Reporting	Annual dust reporting of total loads and metals to DPIR and National Pollutant Inventory (NPI) to the federal regulator. Estimates of fugitive emissions of Particulate Matter 10.0 µm (PM_{10}) and Particulate Matter 2.5 µm ($PM_{2.5}$) are reported for the URPA.	**Data analysis and reporting:** KLG Environmental Officer	Reporting annually following dry season data collection

Dust Generating Mining Activities	Description	Responsibility	Timing
Performance Indicators / Triggers	Consistent results showing dust deposition levels below the internal trigger threshold will confirm whether monitoring can be decommissioned after sufficient data has been collected (i.e. 3 years) and a risk assessment has been completed. The criteria have been derived from subjective observations and investigation of dust levels and nuisance effects. NTMO compare dust deposition results to the New South Wales (NSW) Department of Environment and Conservation's *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*. The dust deposition criteria allow a mine to add a certain amount of dust to the atmosphere. A mine may increase deposited (background) dust levels by up to 2 g/m_2/month (annual average). However, the total deposited dust level should not exceed 4 g/m_2/month (annual average). Based on this, an internal dust deposition guideline value of 2 g/m_2/month plus the control level is applied as a guide only to determine the risk and effectiveness of dust management strategies.		
Corrective Actions	If guideline values are not met, management strategies will be reassessed and alternative and additional dust suppression options will be considered.	KLG Operations Manager	When required

8.6 Fencing

TABLE 8-6 MANAGEMENT OF RISKS FROM FENCING

Fencing	Description	Responsibility	Timing
Objectives	Prevent and avoid Ghost bat fatalities from barbed wire fence entanglement within the URPA.		
Management Strategies / Actions	When new fences are constructed or old fencing is replaced, plain wire only, and no barbed wire, will be used. All fencing near roost sites must not have any barbed wire. Where barbed wire is found near roost sites, it will be replaced as soon as practicably possible with plain wire. Where barbed wire is required to meet Australian Standards to restrict access of personnel for safety reasons, metal disks will be placed between the top two strands to make the fence more visible to bats in flight.	**Fence inspections:** KLG Environment Officer Fencing to be replaced by KLG nominated team member or fencing contractor	Inspections to be conducted during mine development / construction phase
Monitoring	N/A	N/A	N/A
Reporting	Any Ghost bat death from a fence entanglement will be documented in the fauna register and the fauna fatality register, which is reported monthly and quarterly to National and International KLG and shareholder and annually to DPIR. The observation of any entanglements will also be included in the regular quarterly and annual monitoring reports of Ghost bat activity and numbers (Action 7 of the GBAP).	KLG Environment Officer	As required
Performance Indicators / Triggers	No recorded Ghost bat injuries or fatalities from barbed wire fence entanglement within the URPA.		
Corrective Actions	Where barbed wire fence is found near URPA roost sites, it will be replaced as soon as practicably possible with plain wire. The need for the fence will also be reconsidered.	**Fence inspections:** KLG Environment Officer	During mine construction / development phase

8.7 Artificial Lighting

TABLE 8-7 MANAGEMENT OF RISKS FROM LIGHTING

Artificial Lighting	Description	Responsibility	Timing
Objectives	No addition of lights to areas near Ghost bat roosts in order to avoid associated disturbance.		
Management Strategies / Actions	No artificial lighting will be added within the restriction areas (as detailed in Table 8-2) for the Union North adit, Lady Alice adit and artificial roosts.	KLG will incorporate this clause into any infrastructure development approvals	Throughout all mine phases
Monitoring	N/A		
Reporting	N/A		
Performance Indicators / Triggers	N/A		
Corrective Actions	N/A		

8.8 Use of Vehicles and Machinery

TABLE 8-8 MANAGEMENT OF RISKS FROM THE USE OF VEHICLES AND MACHINERY

Use of Vehicles and Machinery	Description	Responsibility	Timing
Objectives	No recorded Ghost bat injuries or fatalities from vehicle collision within the URPA.		
Management Strategies / Actions	As described in Table 8-2, Action 5 of the GBAP will be implemented to reduce disturbance surrounding known Ghost bat roost sites through the definition of exclusion zones. The implementation of this management strategy will eliminate the risk of Ghost bat vehicle collision around roosting sites. The risk of collision in the greater URPA area is mitigated by a maximum site speed limit of 40 km/hr. This will reduce the likelihood of fauna collisions. The requirement to obey posted speed limits is included in safety and environment inductions for all mine personnel and contractors.	All mine personnel and people entering the URPA	At all times, during all mining phases
Performance Indicators / Triggers	No recorded Ghost bat injuries or fatalities from vehicle collision within the URPA.		
Monitoring	N/A	N/A	N/A
Reporting	Report any collisions on fauna register and fauna fatality register and/or to KLG environmental officer. Any incidences of speeding are reported in the INX incident reporting system. The observation of any collisions will also be included in the regular quarterly and annual monitoring reports of Ghost bat activity and numbers (Action 7 of the GBAP).	Incident logged by all site personnel and KLG safety department are responsible for reporting data into system	As required during all mining phases
Corrective Actions	If Ghost bat collisions are reported in areas not currently enforced with speed limits, they will be introduced to reduce the likelihood of similar future events.	KLG Environment Manager	As required during all mining phases

8.9 Fire Management Activities

TABLE 8-9 MANAGEMENT OF RISKS FROM FIRE MANAGEMENT ACTIVITIES

Fire Management Activities	Description	Responsibility	Timing
Objectives	No reduction in the quality of roosting and foraging habitat due to inappropriate fire management.		
Management Strategies / Actions	An existing Fire Management Plan is already in place at the URPA and can be found in the NTMO IMS and URPA MMP. Key management strategies applicable to this GBMP include: • Large fuel loads around sensitive receptors will be reduced through hazard reduction burning from the mid wet season to the end of wet season to reduce the likelihood of Ghost bat disturbance due to high intensity wild fire. • When conducting hazard reduction burning in woodland areas, low intensity mosaic-style burns will be implemented to avoid vegetation simplification and retain suitable foraging habitat for Ghost bats. • With the exception of the Union North adit, there is potential for fire to burn the area immediately around the entrance portal. At the Lady Alice adit and the artificial roosts, burns will be kept at least 20 metres from the entrance to avoid any stimulus for Ghost bats to fly into daylight.	**Monitoring of fire risk surrounding sensitive receptors:** KLG Environmental Officer **Fire management:** Emergency Response team and contractors	Mid to end of the wet season
Performance Indicators / Triggers	N/A	N/A	N/A
Monitoring	N/A	N/A	N/A
Reporting	Monitor and record the occurrences of controlled and wildfires.	KLG Environmental Officer	Annual reporting
Corrective Actions	N/A	N/A	N/A

9 GHOST BAT MANAGEMENT SCHEDULE

Table 9-1 below shows an indicative schedule for all Ghost bat actions and associated management strategies detailed in this GBMP, including monitoring duration and frequency. These are shown in relation to relevant major mining activities.

TABLE 9-1 GHOST BAT MANAGEMENT SCHEDULE

Activity	Start	End	Duration (days)	Frequency	Comments
Development / Construction Phase					
Monitoring – OK adit and Prospect adit (acoustic)	01/10/2018	Until adit closure	-	Continuous	
Monitoring – OK adit and Prospect adit (thermal video)	01/10/2018	Until adit closure	-	2 consecutive nights every 2 weeks	
Action 1 – Closure of OK adit and Prospect adit	Within the low/no occupancy opportunity window	Prior to mine production phase	Minimum 3	Once	
Action 4 – Re-open Lady Alice adit	01/12/2019	01/12/2020	1	Once	This action was completed in December 2019
Action 6 – Implement management at Kohinoor adit	01/05/2020	-	-	Continuous	
Action 5 – Manage disturbance to Union North	01/10/2018	-	-	Continuous	
Action 9 – Survey for unknown cave roost sites in areas surrounding URPA	01/05/2020	01/12/2021	1 day / survey	Several field surveys	
Ghost bat management Action 2 – Characterise OK adit and Union North adit	01/12/2019	01/12/2019	1	Once	This action was completed in December 2019
Action 3 – Construct artificial roosts	01/04/2020	Prior to commence-ment of Action 1	5	Once	At least 2 structures built
All Mine Phases					
Union North adit (acoustic monitoring)	01/10/2018	Until post closure	-	Continuous	
Union North adit (thermal video monitoring)	01/10/2018	Until post closure	-	2 consecutive nights every 2 weeks	

Activity	Start	End	Duration (days)	Frequency	Comments
Lady Alice adit (acoustic monitoring)	01/10/2018	Until post closure	-	Continuous	
Lady Alice adit (thermal video monitoring)	01/10/2018	Until post closure	-	2 consecutive nights every 2 weeks	
Kohinoor adit (acoustic monitoring)	01/05/2020	Until post closure	-	Continuous	
Kohinoor adit (thermal video monitoring)	01/05/2020	Until post closure	-	2 consecutive nights every 2 weeks	
Spring Hill roosts (acoustic monitoring)	01/01/2020	Until post closure	-	Continuous	
Spring Hill roosts (thermal video monitoring)	01/01/2020	Until post closure	-	2 consecutive nights every 2 weeks	
Natural caves surrounding URPA (acoustic monitoring)	Immediately following discovery	Until post closure			
Natural caves surrounding URPA (thermal video monitoring)	Immediately following discovery	Until post closure			
Artificial roosts (acoustic monitoring)	Immediately following construction	Until post closure	-	Continuous	
Artificial roosts (thermal video monitoring)	Immediately following construction	Until post closure	-	2 consecutive nights every 2 weeks	
Action 10 – Study of colony connectedness using genetic markers	01/03/2020	01/12/2021	-	Continuous	
Action 11 – Provide support for university research project on general ecology	01/03/2020	01/03/2023	Duration of program	Continuous	
Closure and Post Closure Phase					
Action 8 – Convert underground mine for Ghost bat habitat	01/05/2023	01/05/2023	1	Once	
Action 8 – Underground mine (acoustic monitoring)	01/05/2023	01/11/2023	186	Continuous for 6 months	

10 Audit and Review

This GBMP will be reviewed and/or updated annually, and more frequently as required, to make sure that it is current and addresses any changes, including:

- Information or discoveries occurring after the preparation of this GBMP
- Environmental incidents
- Site conditions or requirements
- Statutory requirements or community expectations
- Operational activities, technology or equipment
- Guidelines, policies or procedures

Review and update of this GBMP shall also be triggered where any project activities have potential for an environmental impact that is not sufficiently controlled through existing management practices. The review will assess whether the plan is achieving its objectives and the requirements of any relevant approval conditions. The review will be based largely around a checklist, environmental monitoring records, corrective actions and the results of any audits.

Review and update of this GBMP will provide for continuous improvement. Compliance auditing will primarily be the responsibility of the KLG Environmental Manager with any identified changes or deficiencies being promptly addressed and new revisions of the GBMP issued as necessary.

APPENDICES

Appendix A – Ghost Bat Action Plan

(The Ghost Bat Action Plan will be appended to this Ghost Bat Management Plan, but for the purposes of reporting, see Appendix 4 in the EIS Supplementary report)

An Action Plan for the management of Ghost Bats in the Union Reefs project area

Prepared for Kirkland Lake Gold Ltd

Version Final-2019-06-04

Specialised Zoological

EMS | ECOLOGICAL MANAGEMENT SERVICES ENVIRONMENTAL CONSULTANTS

Nicola Hanrahan Consulting Services

Version Final-2019-06-04

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Contents

Background

Kirkland Lake Gold Ltd (KLG) plan to further develop deposits of gold ore in the Union Reefs project area, north of Pine Creek, Northern Territory. The Ghost Bat *Macroderma gigas*, which is specially protected and listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, has been detected in this area, both in the past (NSR Environmental Consultants 1993), and on recent surveys (Armstrong and Barden 2018a—contains a summary of the biology of the species; Hanrahan and Armstrong 2019).

At present, Ghost Bats are known to use two main sites for diurnal roosting within the Union Reefs project area—'Union North adit' in the Union North pit; 'OK adit' in the Prospect pit. Their presence has been noted during most of the breeding cycle, but no direct observations associated with breeding have been made (since 1987; NSR Environmental Consultants 1993), mainly because the sensitivity of this species to disturbance precludes capture and direct observations. The confirmed diurnal roosts are within the remnants of the lower parts of underground adits that are found extending back from the walls of two open-cut mine pits.

The colony size has been counted as c. 11 individuals in the Union North adit in August 2018, and up to 26 individuals in the OK adit in February 2019 (Armstrong and Barden 2018a; Hanrahan and Armstrong 2019). Ghost Bats also appear to move regularly between these two structures, occurring in one or the other on most nights between October 2018 and the end of February 2019 (Hanrahan and Armstrong 2019).

Two other adits nearby (the 'Prospect adit' within 50 m of the OK adit; and the Lady Alice adit / Adit H within 300 m to the east of the Union North adit entrance portal) are now visited temporarily or at night only. In 1987, the Lady Alice adit / Adit H contained c. 200 Ghost Bats, including females in breeding condition (NSR Environmental Consultants 1993).

A drilling programme being conducted currently has taken into consideration the presence of Ghost Bats in the two adits, and activities have been modified to avoid drilling within close proximity (within 130 m) of roost site positions and entrances (Armstrong and Barden 2018b).

Monitoring during the drilling programme has shown that bats move regularly between the Union North adit and the OK adit, and that they have been present continuously at either one of these sites since August 2018 (Hanrahan and Armstrong 2019).

Approval has been sought from the Northern Territory Government and Commonwealth Government for the temporary closure of the entrances of both the OK adit and Prospect adit for approximately two years whilst a new underground drive is excavated and used for mining purposes in the immediate vicinity. The present management strategy sets out five actions that are designed to inform the management of Ghost Bats, and promote their local persistence, during the temporary closure of the OK adit.

The scope of the present management plan is primarily the Union Reefs project area, but given that Ghost Bats are also found c. 15 km to the north (underground workings in the Spring Hill active mining area) and c. 15 km south (abandoned Kohinoor adit at Pine Creek), and are presumably connected by dispersing individuals, the plan also outlines some proactive actions that consider parts of the population outside the immediate project area.

Specific questions for the management plan

The desire to conduct a manipulation of wildlife of conservation significance prompts a range of questions in the context of an overall goal to minimise the impact of mining-related activity on the species, and maintain their local persistence. These questions help formulate the goals and actions of the management plan.

1. Can the Ghost Bat be excluded from the OK adit without mortality being observed within the OK adit?

2. Will Ghost Bats continue to use the Union North adit, and thus persist in the project area, following the temporary closure of the OK adit?

3. When Ghost Bats are excluded from the OK adit, are there other alternative roosts (contingency roosts) nearby if for some reason they cannot use the Union North adit?

4. Is there evidence that individual Ghost Bats move between the Union Reefs project area and other colonies further afield?

5. Can we improve protections around colonies further afield already identified as key stronghold colonies under threat in the population, so that any unintended effects of mining-related activity in the Union Reefs project area do not significantly compound threats within the bat population.

Note that it is common in discussions of bat management and conservation for confusion around terms such as 'population', which can lead to ambiguity around whether goals have been achieved. Therefore, a short glossary is provided in **Appendix 1** to define the specific meaning of certain terms used in this management plan (highlighted in blue in this section, and the next section on *Specific goals of the management plan*).

Specific goals of the management plan

Specific goals are required so that the success of supported management actions can be assessed. The relevant Actions are listed against the goals for easier cross-reference.

1. Implement a cautious approach that excludes Ghost Bats from the OK adit in such a way that the risk of mortality from exposure to ambient conditions, suboptimal alternative roosts and diurnal raptorial predators is minimised. **[Action 1]**

2. Promote and monitor the ongoing presence of the Ghost Bat in the Union Reefs project area during mining activity by KLG through proactive management and regular non-invasive monitoring. **[Action 1]**

3. Provide evidence that Ghost Bats have alternative roost sites within the hilly landscape surrounding the project area, if an unforeseen circumstance prevents them from continuing to use the Union North adit. **[Action 2] [Action 3]**

4. Similarly, provide evidence that Ghost Bats can maintain connectedness amongst colonies in the population, thus demonstrating the capacity for Ghost Bats to move from Union Reefs project area to stronghold colonies, through evidence of movement via detection of gene flow. **[Action 4]**

5. Initiate a proactive programme that mixes opportunities for Ghost Bat conservation and the Pine Creek township community. **[Action 5]**

6. Contribute new knowledge of Northern Territory Ghost Bats for core questions specifically relevant to their management in the region. **[Actions 1–5]**

Action 1. Excluding the Ghost Bat from the OK adit and monitoring at Union North adit

The Ghost Bat will need to be excluded from the OK adit before it can be closed to their entry. This needs to be done in the least invasive way possible. It will occur when bats have shifted their attention to the Union North adit.

When there is acoustic evidence from bat detectors that Ghost Bats are not using the OK adit as a diurnal roost site, the entrance of the OK adit will be sealed at night (early in the morning before dawn) to prevent their access prior to dawn.

- The entrance portal will be monitored with bat detectors and video recorders from dusk to dawn on Night 1.
- On Night 1, bright light will be shone on the entrance from three hours after sunset until dawn to discourage any species of bat from re-entering the structure throughout the night. Introducing the bright light three hours after dusk will give all species of bats sufficient time to leave the structure naturally. The remaining time until dawn (with the entrance illuminated) will give bats sufficient time to find an alternative roost.
- The OK adit will be designated as 'probably empty' of Ghost Bats if the last detected call is more than one hour before the start of civil twilight in the morning.
- A temporary cloth barricade will be placed over the portal after dawn following Night 1.
- On Night 2, the blocked entrance will be monitored from sunset for three hours with bat detectors to ensure that no bats of any species are trapped within the structure. Bats remaining in the structure will be let out from behind the cloth barricade after sunset.
- Once it has been established that no bats remain in the structure, the cloth barricade will be checked for its integrity and then left.
- The following day after Night 2, the cloth will be replaced by a permanent barricade. Small gaps will be left for reptiles.

Monitoring by video (thermal and/or infrared) and acoustic (with AnaBat Swift bat detectors) recorders will continue at the Union North adit for the period that the OK adit is closed. Acoustic monitoring will be continuous to provide information on levels of bat activity. Video monitoring will be periodic (at least twice per month) to provide information on colony size. Reports will be produced at least quarterly.

Acoustic monitoring will also be extended to other species of bat that occupy the adits, but especially the more physiologically fragile species (Dusky Leaf-nosed Bat *Hipposideros ater*; Orange Diamond-faced Bat *Rhinonicteris aurantia*).

Monitoring will continue for six months after the OK adit is reopened to show that Ghost Bats were able to return. Video monitoring will occur at least three times in this period. This requirement may be modified based on plans for mining at this time.

Follow-up investigations of the depth and structure of the Union North adit will be necessary to provide evidence that this structure continues to be suitable for Ghost Bats, especially regarding whether parts become flooded at certain times of the year. This may involve the use of professional-grade remote-controlled inspection devices or the entry of personnel suitably trained and experienced for underground entry.

It is important that the patterns documented from acoustic and video recordings of Ghost Bat activity in the Union North adit can be correlated with mining-related activity on the site, and ideally with empirical data. One such measure will be the level of ground vibration at the adit during blasting, which will rely on the installation of a vibration datalogger at the entrance portal. Vibration data will be recorded continuously. Ambient noise measurements will also be taken on selected occasions at times of blasting.

Other management actions will involve the prevention of access by people to the Union North adit and its immediate surrounds through education/instruction during site and safety inductions, signage, and enforced consequences for unauthorised visitation of the site. Enforcement can be aided by hidden security cameras, if deemed necessary. Fencing and gating will not be used. However, blocking vehicular access to areas nearby will help to discourage unauthorised visitation of people generally.

No specific trigger level of activity or contingency plan at the Union North adit is specified, but continuing protection of the Union North adit will remain, and other investigations and proactive and adaptive management options will continue to ensure the Union North adit continues to be available as a diurnal roost for Ghost Bats.

⌦ Action 2. Investigating possibilities around the creation of alternative habitat nearby

With the temporary closure of the OK adit, the local occurrence of the Ghost Bat will have fewer opportunities for an alternative nearby roost if an unforeseen event causes them to vacate the Union North adit. This is important because bats are exposed to much greater risk of mortality from raptors and ambient conditions if they are forced to leave their roost during the day, or are disturbed to a degree that induces them to seek an alternative (possibly sub-optimal) diurnal roost between sunset and sunrise the night following the disturbance.

It would be ideal if the alternative diurnal roost is nearby, and also that Ghost Bats are already familiar with it and have been using it periodically. The disused adit within 200 metres of the Union North adit (waypoint 118 in Armstrong and Barden 2018a; probably the Lady Alice adit / Adit H) has been assessed as not being suitable currently to function as an alternative roost in case of contingencies. There is currently no other disused underground mine within the Union Reefs project area that is known to, or likely to, support a colony of Ghost Bats.

Action 3 details an assessment for natural roost caves that may function as 'contingency roosts'. Another option is to consider the feasibility of creating an artificial roost within the Union Reefs project area. Habitat creation has been considered as a useful mitigative option (it does not meet the definition of an environmental offset) in situations where the interests of mining coincide with the location of a bat roost site (e.g. Cramer et al. 2016).

A desktop review, and a feasibility and design study, will therefore be undertaken to investigate the construction of alternative artificial roosts as a possible mitigative action. As an example, steel road culverts might be placed in overburden dumps, with the design checked to ensure that it maintains a suitable microclimate for roosting.

⌦ Action 3. Seeking the presence of roost habitat in natural features nearby

Knowledge about the presence of natural roost sites in caves in the hills surrounding the project area will provide further evidence that Ghost Bats have a nearby roost option ('contingency roost') if an unforeseen event causes the exodus of Ghost Bats at the Union North adit during the period of mining. There are numerous mesa hills within a 15 km radius surrounding the Union Reefs project area that have not been searched for caves and Ghost Bat roost sites.

The various hill formations surrounding the Union Reefs project area can be examined in the first instance from freely-available satellite imagery and other coverages in a brief GIS study to prioritise areas for on-ground exploration. A 'groundtruthing' field survey will then be undertaken to check the targeted bluff areas of mesa hills for Ghost Bat roosts. The survey will also consider the possibility of other areas where historical workings are present, and these will be examined in a similar way to the survey of Barden and Armstrong (2018a)

The presence of Ghost Bats will be established from scat material accumulations at the entrance of caves, and bat detector and video recordings made at cave entrances. Caves will not be entered initially, given the likelihood of having bats exit into daylight (daytime entry of Ghost Bat roosts has been identified as a threatening process).

Caves may need to be entered eventually to collect scat material for genetic analysis (*see Action 4*). No caves will be entered until safety issues and the perspectives of Traditional Owners have been considered and permission granted from the landowners. Cave entry will only to be undertaken at night after bats have exited.

These caves will be monitored periodically and non-invasively during the time of closure of the OK adit, but with longer monitoring intervals than Union North, and depending on the ease of access to their location. An assessment of their inclusion into the monitoring programme can be made following their discovery.

If Ghost Bats do disappear from the Union North adit (for more than one week), greater attention will be given to determining whether Ghost Bats are present in natural caves ('contingency roosts') in the hilly areas surrounding the Union reefs project area.

Ghost Bats are known to enter large steel culverts beneath roads and railways at night to rest and consume captured prey (e.g. Armstrong and Barden 2018a). Culverts may also be used on occasions as diurnal roosts. Studies of Ghost Bat habitat usage can be extended to the examination of these feeding sites, which might assist with understanding foraging range and roost site connectedness. Extending the roost site exploration to include an examination of railway culverts between Pine Creek and Darwin could highlight the importance of culverts for Ghost Bat dispersal on a larger scale, and provide evidence of the connectedness of Ghost Bats within the central part of the Top End. Culverts would be examined in the late Dry season, noting presence of scats, prey remains, size, type and location of culverts.

Action 4. Investigating movements of individuals using two genetic methods

Two genetic methods can be used to show that Ghost Bats move amongst roosts in the Daly Basin and Pine Creek IBRA bioregions (at least between Pine Creek and the Union Reefs project area and surrounds), and thus are part of the same population.

The first method, a genome-scale high-throughput DNA sequencing method called 'DArTseq' (Diversity Arrays, Canberra; https://www.diversityarrays.com/), will be used to confirm that colonies of bats are part of the same gene pool, thus confirming contemporary movement among regional colonies. The method provides information about not only population connectedness, but relatedness of individuals and indices relevant to conservation such as genetic diversity and inbreeding coefficients. The priority will be to establish that bats in the Union Reefs project area and surrounding hills are part of the same gene pool as the bats at Pine Creek. Samples from Spring Hill will be also included if there is an opportunity to do so.

Usually such a genetic study requires the collection of samples from outside small focal areas of interest to help establish the extent of gene pools and population connectedness. This comparative framework is already available from prior studies across northern Australia conducted by Nicola Hanrahan and Kyle Armstrong, and the data will be made available.

The generation of markers costs around $40 per sample, but there is a requirement to use fresh tissue for this. Thus, Ghost Bats will need to be captured so that a non-lethal biopsy skin plug can be sampled from the wing membrane (a standard technique globally for bat studies; the hole closes within 4 weeks; Worthington Wilmer and Barratt 1996; Faure et al. 2009; Weaver et al. 2009). Ideally, capture will be made away from the roost, but nearby, using an acoustic lure next to a harp trap and mist net arrangement. This strategy is based on observations made in the PhD research programme conducted by Nicola Hanrahan.

The second genetic method will identify the movement of individual bats between roost sites from scat material. It uses a specially-designed derivative marker set developed from the DArTseq genetic markers. These derivative markers are being developed currently by the Western Australian Department of Biodiversity, Conservation and Attractions, using genetic data donated by Kyle Armstrong, and supported partially by the Oz Mammals Genomes project funded by Bioplatforms Australia (https://www.bioplatforms.com/oz-mammals/). The marker set will be applicable to Northern Territory Ghost Bats. This second method will only be used if the marker development is successful, if caves used by Ghost Bats are discovered in the hills surrounding the project area, and if fresh scats are found within the caves.

This second method will rely on identifying the same individuals in the Union North adit and any cave roosts that may be present in the hills surrounding the Union Reefs project area, and will therefore provide evidence that Ghost Bats have alternative roosts within the nightly flight range of the Union North adit, and that Ghost Bats are likely to actually use them.

A genetics-based bat movement study requires access to Ghost Bat roost sites inside caves and mines to collect scat material. Only subterranean structures considered to present a low risk to the safety of investigators will be entered.

Action 5. Minimising the impact of roost visitation at Kohinoor adit, Pine Creek

The largest known colony of Ghost Bats in Australia (and therefore globally) occurs within the Kohinoor adit on the outskirts of the township of Pine Creek. It is very likely that this site is within the nightly flight range of the Union Reefs project area, and genetic studies may support this (*Action 4*).

There is widespread knowledge of this site as 'a place to see Ghost Bats'. Information about the location of the mine is available readily in books and on the internet. This actively encourages people to enter the mine to see the bats, which is entirely undesirable for reasons of safety, liability and the conservation of threatened bats. Local townspeople are also known to enter the mine regularly.

Monitoring of Ghost Bat colony size at Pine Creek has been undertaken by Nicola Hanrahan as part of a PhD study since November 2015. The study has found that colony size fluctuates between 300–800 individuals depending on the time of year, with peak numbers counted during the mating season and after the parturition period. The study has confirmed that there is frequent human visitation to the colony. There is evidence from litter (including beer bottles and videos of the roost interior posted on the internet by wildlife tourists) that visitation brings disturbance to this colony.

There is potential to completely turn around the situation at the Kohinoor adit—by converting a very undesirable situation one into one that enhances simultaneously both the conservation of threatened species and provides for other positive outcomes for people in the town. This management plan outlines below some of the first steps that can be undertaken to ensure that this colony achieves better protection, and is therefore maintained as a potential refuge for any Ghost Bats that may arrive from the Union Reefs project area.

The first step will be to reduce access to the 'attraction'. Impediments to human visitation of the site will include the construction of a suitable fence further away from the entrance, signage warning of danger to entry of a collapsing structure, and natural screening to reduce the visibility of the adit portal from the road.

The second step will be to meet with the local Government to discuss ways that access to the colony can be reduced, that townspeople and visitors are effectively educated against visitation of the site, and also to discuss ways that proactive management at the site may actually contribute to the 'well-being' of the town. The inclusion of Traditional Owners in consultations will also be a valuable opportunity for collaboration.

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Appendix 1. Glossary

Adit—a horizontal tunnel extending underground from an entrance portal in a vertical or near-vertical rock face. The adit may link to other horizontal cross-cuts on either side, and to vertical shafts that extend below or above the horizontal tunnels.

Alternative roost, contingency roost—any underground structure, including underground mine workings, natural caves, or other equivalent structures, which can provide the conditions required for diurnal roosting by the Ghost Bat. The inference here is that they are predicted to occur outside the project area, and within the nightly flight range of a Ghost Bat, but remain to be found. Suboptimal alternative roosts are those structures that may be used randomly by Ghost Bats following a disturbance, but do not provide suitable conditions for longer term roosting.

Bat population—an interconnected set of colonies of Ghost Bats, in this case inferred to occupy an unknown number of roosts within the Daly Basin and Pine Creek IBRA bioregions. Gene flow occurs amongst members of the same population, but not currently with other population/s (it is not known if gene flow occurs with colonies further north and in other parts of the Northern Territory).

Colony—a set of individual Ghost Bats that occur in an underground diurnal roost at any one time. Based on previous genetic studies (Worthington Wilmer et al. 1994, 1999; K.N. Armstrong unpublished study in prep.), females do not move away or far from their natal roost, and males also show high fidelity to roosts but are more likely to disperse greater distances.

Further afield—the wider region that is occupied by the Ghost Bat population.

Local persistence/occurrence—presence within the Union Reefs project area.

Persist—present and detectable at one or more roost sites within the project area during the time of the defined activity (the closure of the OK adit and Prospect adit to bats) and for at least 6 months after it is re-opened.

Project area—all the area within tenements held by Kirkland Lake Gold Ltd and referred to as the Union Reefs project area.

Region—the Daly Basin and Pine Creek IBRA bioregions.

Roost—an area within an underground structure where Ghost Bats remain during daylight hours, and sometimes during the night.

Stronghold colonies—the large colonies at Spring Hill c. 15 km to the north of Union Reefs project area, and the large colony c. 15 km south in the Kohinoor mine adit adjacent to the township of Pine Creek. These colonies have been known for many years, and are also known to be subject to a range of threats.

Temporary closure—the period in which the OK adit is closed to bats while underground tunnels are excavated and used nearby, estimated at around two years.

KIRKLAND LAKE GOLD

ACN 136-525-990

WEED MANAGEMENT PLAN

FOR

UNION REEFS PROJECT AREA

[2020-2022]

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Table List

1. INTRODUCTION

This Weed Management Plan (WMP) is a strategic document that is an integral part of land management. It forms part of Northern Territory (NT) Mining Operation's (NTMO) Weed and Pest Environmental Management Plan in the Integrated Environmental Management System (IMS) for the Union Reefs Project Area (URPA) and is a working document. Weed management, mapping and treatment will be conducted under operation activities within compliance of the URPA MMP and Authorisation number 0529-03.

URPA is located approximately 215 km south of Darwin via the Stuart Highway to the Ping Que Road turnoff (mine access road), Latitude -13°.7' and Longitude 131°7' (GDA94). It is in an area that receives a mean annual rainfall of 1141mm (Pine Creek station 014933).

1.1 Objective

The objective of the URPA WMP, is to comply with the NT *Weeds Management Act 2001 (WMA), r*elevant statutory weed management plans, and the regional management plan. Overall the aim is to reduce the spread and introduction of weeds that have the potential to cause adverse impacts to native flora and fauna and reduce the risk of uncontrolled wildfire. Implementation of this WMP will:

- Specify the priority weeds for control;
- Provide direction for management of priority weeds;
- Control and prevent the introduction and spread of weeds;
- Provide suitable control methods to reduce populations and re-occurrence;
- Reduce wildfire risks and intensities;
- Protect areas of native vegetation by preventing the spread of weeds;
- Prevent habitat loss; and
- Monitor the distribution and abundance of weed species.

1.2 Legislation

NTMO employees and their contactors are obliged to comply with all relevant environmental legislation. The primary legislation that relates to weed management in the Northern Territory (NT) is the WMA.

NT Weeds Management Act (2001)

The WMA is administered by the NT Department of Environment and Natural Resources (DENR). The WMA declares undesirable species of plants as weeds, and requires these species to be controlled, eradicated or prevented from entering the NT depending on their classification. Classification is as follows:

- Class A declared plant: to be eradicated
- Class B declared plant: growth and spread to be controlled
- Class C declared plant: not to be introduced into the NT

(Note: Class A and B weeds are also Class C weeds)

The WMA specifies how weeds in each of the classes must be treated. Statutory weed management plans for specific weeds are endorsed under the WMA. The WMA stipulates general duties for the owner or occupier of land to take all reasonable measures to prevent land being infested with a declared weed, to prevent a declared weed spreading to other land, and to report to a Weed Management Officer, within 14 days of first becoming aware, when a declared weed that has not been previously known in an area is identified.

The general overriding interpretation of the WMA is that the management of declared weeds is the responsibility of the landholder, land manager and land user; therefore, NTMO has the responsibility for

declared weed management / control over the URPA. It also stipulates that landholders are not to allow the spread of declared weeds across their boundaries to adjoining landholdings.

The URPA Mineral Lease (ML) is located on Pastoral Land – Mary River West (PL 815) station – with land tenure such as the Alice Springs to Darwin railway line to the west of the URPA, Amadeus Basin to Darwin gas pipeline easement to the east, and a power line corridor intersecting through the URPA. Disturbed and frequently trafficked areas such as the railway line and roads can increase the spread of weeds. Each landholder is responsible for weed control within the respective areas.

Weeds of National Significance

Commonwealth, state and territory governments have agreed on the declaration of 32 Weeds of National Significance (WoNS), based on invasiveness, potential for spread and environmental, social and economic impacts. Land owners and land managers are responsible for the control and management of WoNS, and state and territory governments are responsible for the requisite legislation, regulation and administration. There has been one WoNs identified at URPA, Gamba grass (*Andropogon gayanus).*

NT Statutory Weed Management Plans

Once a plant species is declared as a weed under the WMA, the Minister can approve a statutory weed management plan, which identifies a strategic approach to managing the weed species in the NT. A statutory weed management plan establishes the objectives, management requirements and management actions to be achieved by land managers. NTMO will conduct land management practices in accordance with the weed management plans to ensure compliance with the requirements of the WMA. Currently, there are two statutory weed management plan relevant to URPA:

- *Weed Management Plan for* Gamba grass (*Andropogon gayanus)* (DENR 2018), and
- *Weed Management Plan for* Grader grass (*Themeda quadrivalvis)* (DENR 2016).

Regional Weed Management Plans

The *Darwin Regional Weed Management Plan (2015-2020)* ("the plan") was developed by the Department of Land Resource Management (DLRM) (currently known as DENR). The plan was developed by experts to support local weed management priorities, which includes identification of priority species, weeds considered significant threat species (but not declared under the WMA), alert species and priority landscape areas that require particular protection. URPA is located within the plan area, covering as far south as Pine Creek. Seven priority species were identified in the plan – Gamba grass (*Andropogon gayanus*), Bellyache bush (*Jatropha gossypiifolia*), Mimosa (*Mimosa pigra*), Olive hymenachne (*Hymenachne amplexicaulis*), Parkinsonia (*Parkinsonia aculeate*), Mission grass (*Pennisetum spp*.) and Grader grass (*Themeda quadrivalvis*). Three of these priority weeds are identified at URPA – Gamba grass, Mission grass and Grader grass.

An alert weed is a species not yet fully naturalised in the region, that has the potential to have a high level of impact to the region should it become established, and the likelihood of the species naturalising and spreading in the region is perceived to be high (DLRM, 2015). Alert weeds are deemed to be eradicable in the true sense of the term "eradication". Five alert species have been identified in the region – Pond apple (*Annona glabra*), Cabomba (*Cabomba spp*.), Rubber vine (*Cryptostegia grandiflora*), Water hyacinth (*Eichhornia crassipe*s) and Water mimosa (*Neptunia spp*.). These alert species will form part of NTMO awareness to ensure any alert weeds are identified and reported immediately.

Other Relevant Legislation

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Commonwealth)
- *Territory Parks and Wildlife Conservation Act 2014* (TPWC Act) (Northern Territory)
- *Fire and Emergency Act 2016* (and Regulations) (Northern Territory)
- *Bushfires Act 2016* (and Regulations) (Northern Territory)

1.3 Guidelines

NTMO follow guidelines and reference material as provided by the DENR and the Weeds Management Branch (WMB). Most relevant guidelines and reference material are outlined below.

NT Weed Management Handbook

The NT Government has developed the *NT Weed Management Handbook* (DENR 2018) to provide detailed information about weed control in the NT. It contains weed control tables for most problem weeds in the NT, which details herbicide recommendations and optimum treatment times – plus a range of other control methods if considered applicable.

Weed Reference Material

The following weed identification books, field guides and reference material are available;

- Northern Territory Weed Management Handbook 2018 (https://nt.gov.au/__data/assets/pdf_file/0004/233833/NT-Weedmanagement_handbook_2018.pdf)
- *Weeds of Northern Australia: A field guide* (Smith 2011)
- *Northern Territory Weed ID Deck* (NTG 2018) (https://denr.nt.gov.au/__data/assets/pdf_file/0012/257988/Weed-Deck_2018_LR.pdf*)*
- *NTG DENR Weed Notes (*https://denr.nt.gov.au/rangelands/publications2/weed-management-publications/weed-publications/weed-notes)
- Weed Data Collection – A Field Guide for Collecting Weed Data For the NT (DENR, 2009). (https://nt.gov.au/__data/assets/pdf_file/0009/233856/weed-data-collection-field-guide.pdf).
- Northern Territory Weed Data Collection Manual (DLRM, 2015). (https://nt.gov.au/__data/assets/pdf_file/0007/233854/nt-weed-data-collection-manual-section-1.pdf) & (https://nt.gov.au/__data/assets/pdf_file/0008/233855/nt-weed-data-collection-manual-section-2.pdf)

1.4 Key Stakeholders

Key stakeholders are important to engage and maintain a cross-boundary partnership for successful weed management. The key stakeholders at URPA include:

- Mary River West Station – Pastoralist
- Traditional Owners
- Genesee & Wyoming Australia (GWA) - Railway
- APA Group - Amadeus Gas pipeline
- Department of Infrastructure, Planning and Logistics (DIPL) - Public road reserves (Stuart Hwy frontage, Ping Que Road)
- DENR NT Weed Management Branch (WMB)

2. WEEDS IDENTIFIED AT URPA

2.1 Declared Weeds

Priority of weeds for control has been determined based on WoNs, declared status, regional priority, statutory weed management plans, environmental risk (such as changes to the fire regime and out-competing native species), and feasibility of control.

Previous weed surveys have been conducted across the URPA, the latest during 2018 (Refer to APPENDIX A – Weed Mapping 2018). **Error! Reference source not found.** below shows a summary of the declared weeds that have been identified at URPA. A total of 22 weed species (declared and non-declared) have been identified, with eight species being listed as declared. Grader grass was identified during the 2018 weed mapping survey undertaken, but not during the previous year's survey. This is likely due to different times of the year the weed mapping was undertaken (April 2018 compared with August 2017). Ideally, the weed surveys should be undertaken when the weed is actively growing and most identifiable i.e flowering/seeding.

All declared weeds will be targeted as a priority, however the weed of highest priority is Gamba grass because it is a WoNS and is listed as a key threatening process under the EPBC Act. Gamba grass has been recorded in the UPRA in small isolated patches. The weed management priority is outlined in Table 1 below.

TABLE 1 DECLARED WEEDS IDENTIFIED ON THE URPA

Declared Weed	Statutory Status	Level of Risk	Management
Gamba grass (*Andropogon gayanus)*	B and C, WoNS	High Priority & regional priority	Targeted program for eradication
Grader grass (*Themeda quadrivalvis*)	B and C	Regional priority	Targeted program for control
Perennial mission grass (*Cenchrus polystachios*)	B and C	Regional priority	
Mossman river grass (*Cenchrus echinatus)*	B and C	Priority	
Hyptis (*Hyptis suaveolens)*	B and C		
Sicklepod (*Senna obtusifolia)*	B and C		
Spinyhead sida (*Sida acuta)*	B and C		
Flannel weed (Sida cordifolia)	B and C		

2.2 Non-Declared Weeds

Non-declared weeds have no legislative control or management obligation and have been classified as low priority weeds for control at URPA. The following non-declared weeds have been identified at URPA:

- Rubber bush (*Calotropis procera)* – declared south of 16° 30’
- Annual mission grass *(Cenchrus pedicellatus)*
- Wild passionfruit (*Passiflora foetida*)
- Calopo (*Calopogonium mucunoides)*
- Chinese lantern (*Physalis angulate)*
- Gambia pea (*Crotalaria goreensis)*
- Panicle joint vetch (*Aeschynomene paniculata)*
- Purple top chloris (*Chloris barbata)*
- Red natal grass (*Melinis repens)*
- Rosella (*Hibiscus sabdariffa)*

- Stylos (*Stylosanthes sp.)*
- Centro *(Centrosema molle)*
- Hairy merremia *(Merremia aegyptia)*
- Coffee Senna *(Senna occidentalis).*

Of these non-declared weeds, Rubber bush, Annual mission grass and Wild passionfruit will be managed as part of a broad scale weed control program as they have become highly invasive within areas of URPA, pose a high fire risk, impact on rehabilitation areas and are highly likely to invade other areas if not controlled.

3. WEED MANAGEMENT

URPA (MLN 1109) is 3998 ha, with approximately 850 ha as the disturbance footprint. The remainder of the MLN is bushland.

Priority areas for management are:

- Outlier / isolated weed plants;
- Asset protection - infrastructure areas to reduce fire hazard;
- Areas frequently trafficked;
- Recently disturbed or future disturbance areas susceptible to invasion;
- Weed areas up-wind and up-stream of URPA to prevent dispersal; and
- Areas of heritage or cultural significance within the URPA.

Principles of effective weed management will focus on:

- Preventing introduction;
- Preventing or suppressing reproduction;
- Preventing spread through dispersal of propagules;
- Eradicating new / isolated outbreaks;
- Containment of established populations if eradication is not possible; and
- Education and awareness.

NTMO have contracted Territory Weed Management Pty Ltd (TWM) to undertake a three-year work program across the URPA. TWM are a well-established local business that specialise in Top End weed management and have excellent weed identification skills and expertise in weed control methods. TWM have a current professional ground spraying business licence (GSBL/0091) as required under the NT *Agricultural and Veterinary Chemicals (Control of Use) Act, 2004*. All staff of TWM are trained appropriately, hold current chemical handling and use certification, and current professional ground spray applicators licences.

A three-year work program (2019-2022) will be undertaken at URPA with a high priority on gamba grass with the intention to eradicate gamba grass. This is achievable at URPA given gamba grass is currently in manageable areas and the seed bank is viable for up to three years. Following the three-year plan, a thorough review of the plan, treatment successes and failures will be undertaken, weed surveys conducted and a revised plan developed for tender.

The Weed Management Plan for Gamba grass (*Andropogon gayanus*) (DENR 2018), prescribes the required actions by all land holders / users with regard to land zoning, size and use. URPA is located within the Class B zone – control and contain. Table 2 outlines the following legislative actions for mining and extractive industries on their EL and/or ML.

TABLE 2. MINING AND EXTRACTIVE INDUSTRIES REQUIREMENT FOR GAMBA GRASS CONTROL

Section	Legislative requirement for gamba grass	Responsibility / Action
7.1	Establish and maintain by chemical, mechanical or physical means, a gamba grass free buffer zone on all land parcels that are ≤ 200 hectares, that is a distance of 15 m in width around property/lease area boundaries, infrastructure, flammable materials and along tracks and roads, within one year of commencement of this plan.	N/A – (MNL1109 is 3998 ha)
7.2	Establish and maintain by chemical, mechanical or physical means, a gamba grass free buffer zone on all land parcels that are > 200 hectares, that is a distance of minimum 15 m in width along existing firebreaks, river corridors,	TWM

Section	Legislative requirement for gamba grass	Responsibility / Action
	infrastructure such as roads and tracks and fence lines, or other natural land formations to prevent spread into clean areas or into neighbouring land.	
7.3	Consult with adjoining land owners and the Weed Management Branch prior to applying for exploration and mining leases, licences and development of mines and associated roads and infrastructure. Utilise the Northern Territory Government's NR Maps website as a guide to identify possible weed locations in your proposed lease areas.	NTMO as applicable
7.4	Survey for and map weeds (including gamba grass) in areas proposed for exploration lines, extractive leases and associated infrastructure and road corridors. Submit weed survey and control data to the Weed Management Branch prior to exploration or construction commencing.	NTMO
7.5	Destroy gamba grass in areas scheduled for construction, extraction or exploration works prior to flowering. No earthworks to occur through seeding gamba grass.	TWM
7.6	Actively control, contain and reduce all gamba grass infestations by minimum 50% of infestation size within five years of commencement of this plan and demonstrably reduce infestations for the term of the lease (during the life of this plan).	TWM
7.7	Not move machinery or transport materials contaminated with gamba grass seed from site.	NTMO
7.8	Regularly inspect and destroy gamba grass on stockpiles, tracks, windrows and haul roads.	TWM
7.9	Design and implement a weed seed spread prevention program in accordance with the "Preventing Weed Spread Is Everybody's Business" document, including hygiene procedures. Include exclusion zones in heavily infested areas. Educate contractors and maintenance staff in gamba grass identification. Avoid exploration or grading through seeding gamba grass and collaborate with adjoining land owners. Align and plan in conjunction with owner/manager of underlying tenure.	NTMO (Section 3.7)

The Weed Management Plan for Grader grass (*Themeda quadrivalvis*) (DENR 2016), provides the required actions by all land holders / users with regard to land zoning, size and use. URPA is located within the Class B zone – control and contain. Table 3 outlines Grader grass legislative actions for mining and extractive industries on their EL and/or ML.

TABLE 3. MINING AND EXTRACTIVE INDUSTRIES REQUIREMENT FOR GRADER GRASS CONTROL

Clause	Legislative requirement for Grader grass	Responsibility / Action
1	Consult with land owners and the Weed Management Branch prior to applying for exploration and mining leases and development of mines and haul roads etc. Utilise the Northern Territory Government's NR Maps website	NTMO as applicable
2	Survey and map proposed exploration lines, extractive leases and associated infrastructure and road corridors to identify any grader grass infestations	NTMO
3	Control grader grass in areas scheduled for construction, extraction or exploration works prior to seeding and before works commence	TWM
4	Eradicate isolated plants and outbreaks	TWM
5	Actively contain established infestations	TWM
6	Do not transport contaminated materials	NTMO
7	Prevent or minimise seed production by controlling grader grass prior to seed set using appropriate control methods	NTMO
8	Regularly inspect and control grader grass (and other grassy weeds) on stockpiles and haul roads	NTMO / TWM

Clause	Legislative requirement for Grader grass	Responsibility / Action
9	Prioritise control of: • Outlying and isolated plants and infestations • Plants likely to contaminate vehicles, machinery and equipment • Infestations likely to spread into neighbouring properties	TWM
10	Design and implement a weed seed spread prevention program in accordance with the "*Preventing weed spread is everybody's business*" document, including hygiene procedures, which will ensure that no seed is moved and no new infestations establish as a result of accidental seed transfer or spread (refer section 7). Include exclusion zones in heavily infested areas, train contractors and maintenance staff in grader grass identification, avoid exploration or grading through seeding grader grass and collaborate with existing and adjoining landowners. Limit the risk of spread by moving towards large infestations and not through or away from these areas	NTMO
11	Submit survey and control data to the Weed Management Branch	NTMO
12	Monitor and evaluate the results of grader grass management. In order to evaluate success of your control program, keep a record of the methods used and management outcomes which is consistent with the example provided at Appendix A, and fine tune the program as required. Consider also recording weather conditions when treatment is applied	TWM / NTMO

3.1 Integrated Weed Management

NTMO propose to undertake an integrated approach to weed management that primarily involves fire and chemical control. NTMO have engaged Fire Stick and Associates Pty Ltd. (Fire Stick) to undertake a 3-year fire management program at URPA. This involves early wet-season and early cool dry season burning. The early wet season burns will assist to better gain access to areas of dense weed infestations and provide follow-up chemical application of regrowth following a burn. Fire Stick and TWM have been contracted for land management activities at NTMO sites to ensure sufficient time and resources are allocated to weed and fire management with appropriate skill and knowledge to implement the plans effectively.

3.2 Work Program

The work program is a three-year plan to meet the requirements of the *WMA* protecting assets, infrastructure and people from fire risk and controlling weed spread. Each year will include three rounds of herbicide application (maximum) and an additional fourth round in May for a continued Rubber bush control program. Rubber bush is a non-declared at URPA; however, given the invasiveness of the weed at URPA and impacts on rehabilitation areas, NTMO have conducted Rubber bush control for the past four years (2015 to 2018). The three-year plan is outlined below as detailed in TWM UPRA Weed Management Proposal (TWM, 2019). Isolated patches of Grader grass were identified during the 2018 weed mapping survey. Although not explicitly captured in TWM's three-year plan, TWM is aware of those infestations and Grader grass will be included as a priority target species for URPA. Moreover, many of the control and spread measures within this plan will have a negative impact on Grader grass.

YEAR 1. 2019-2020

1. Control Gamba grass and Perennial mission grasses to meet legislative requirement - 15 metre Gamba-free buffer zone along all tracks, existing firebreaks, river corridors, water bodies, fence lines and infrastructure.

2. Control declared weeds identified in Table 1 any other identified declared weeds identified at the URPA. Control the non-declared weeds (Rubber bush, Annual mission grass and Wild passionfruit) in accessible areas on an opportunistic basis whilst targeting the declared weeds.

3. Control all grass and brush vegetation to 3 metres either side of all pipelines.

4. Control vegetation on rock gabions, dam and settling pond walls as directed.

YEAR 2. 2020-2021

1. Extend Gamba and Perennial mission grasses buffer to 20 metres along all tracks, existing firebreaks, river corridors, water bodies, fence lines and infrastructure. Control isolated Gamba and Mission grass infestations up to 20 metres x 20 metres in area. Reduce area of large infestations. Ensure all new weed occurrences are controlled – keep clean areas clean.

2. Control declared weeds identified in Table 1 any other identified declared weeds identified at the URPA. Control the non-declared weeds (Rubber bush, Annual mission grass and Wild passionfruit) in accessible areas on an opportunistic basis whilst targeting the declared weeds.

3. Maintain control all grass and brush vegetation to 3 metres either side of all pipelines, extended if necessary.

4. Maintain control of vegetation on rock gabions, dam and settling pond walls as directed.

YEAR 3. 2021-2022

1. Extend Gamba and Mission grass buffer to 30 metres along all tracks, existing firebreaks, river corridors, water bodies, fence lines and infrastructure. Where practical, extend buffer to control to control all of infestation where infestation is a discrete stand-alone infestation. Control isolated Gamba and Mission grass infestations up to 20 metres x 20 metres in area. Continue to reduce area of large infestations. Ensure all new weed occurrences are controlled – keep clean areas clean.

2. Control declared weeds identified in Table 1 any other identified declared weeds identified at the URPA. Control the non-declared weeds (Rubber bush, Annual mission grass and Wild passionfruit) in accessible areas on an opportunistic basis whilst targeting the declared weeds.

3. Maintain control all grass and brush vegetation to 3 metres either side of all pipelines, extended if necessary.

4. Maintain control of vegetation on rock gabions, dam and settling pond walls as directed.

3.3 Timing

Timing of weed control is critical for effective treatment and prevent further spread. All chemical control on grasses will be undertaken during the wet season when the plant is actively growing and prior to seeding. This will occur from December through to April, rainfall dependent. Treatment of specific weeds will be in accordance with the NTG Weed Management Handbook, 2018.

3.4 Chemical Application

Herbicides used will be approved by the Australian Pesticides and Veterinary Medicines Authority (APVMA) and used as per the chemical label. Chemical application methods will mainly involve foliar application via hand gun, boom spray or (to a lesser extent) knapsack. Herbicides used will primarily include the list in Table 4. The rate will vary dependent on plant species to be controlled and herbicide formulations. The NTG Weed Management Handbook, 2018, will be referred to as required for weed species, herbicide use, rates and optimum treatment times and application methods.

TABLE 4. PROPOSED HERBICIDE USE

Chemical/Active Constituent	*Rate - example (per 100L water)	Uses	Application
Glyphosate	800 mL	Broad-spectrum herbicide	Foliar
Metsulfuron-Methyl	8 g	Selective herbicide (broad-leaf weeds and some annual grasses)	Foliar
Sulfomac	70 g	Residual herbicide for the control of broad leaf weeds and grasses. Use for fire breaks, pipelines and areas that may not be accessible later in the wet season.	Foliar
Activator	100 mL	Wetting agent - aid in plant uptake of herbicide	Foliar
300 g/L Triclopyr & 100 g/L Picloram (GrazonDS)	200 mL	Brushweed control and difficult to control broad leaf weeds	Foliar
Fluroxypyr 333 g/L (Starane)	300 mL	Broadleaf / woody weeds	Foliar
2,4-D amine	320 mL	Broadleaf weeds	Foliar
240 g/L Triclopyr & 120 g/L Picloram (Access)	1 L : 60 L (diesel)	Selective control woody and noxious weeds	Basal bark / cut stump

*Rate will be according to herbicide label, target species, application method and the State/Territory approved for use.

3.5 Data Recording

Herbicide application logs will be completed by TWM. Recorded information will include details of the date and time of application, vehicle/equipment, location, applicator, application method, herbicide, rate, amount used, target weeds and weather conditions (wind speed and direction, temperature, humidity). GPS track and point data will be used to track treatment areas.

3.6 Monitoring

Follow-up monitoring from each round of treatment will be undertaken (including a photo record of treatment) to determine treatment success. If the treatment has failed for whatever reason, the work program will be re-assessed and amended as required. NTMO environmental staff will conduct opportunistic treatment surveillance monitoring and EcOz will conduct ad-hoc site inspections two to four weeks following treatment rounds.

3.7 Reporting

Following each round of control, TWM will provide herbicide application records, GPS track and point data. At the end of each treatment season (June), TWM will supply a report that will include; treatment areas, weeds controlled, any identified new weed occurrences, issues and recommendations.

4. WEED SPREAD MITIGATION MEASURES

Prevention of weed introduction and spread is an integral part of successful weed management.

There are a number of environmental induced pathways that need to be considered as part of the weed control plan, namely wind dispersion of seeds, seed dispersion via waterways, weed spread by livestock and feral animals. In addition, human weed dispersal can occur via activities such as driving through bushland, vehicle hygiene, seeds attaching to clothing and equipment, and movement of weed contaminated soil. Weed spread prevention measures that will be implemented at URPA include the following:

- Weed hygiene;
- Education and awareness;
- Reporting “Alert” weeds;
- Site inspections;
- Controlling access;
- Importation of weed-free material;
- Rehabilitation with approved plants;
- Disposal of contaminated material;
- Weed and seed inspections of machinery and vehicles new to NTMOs project areas;
- Pest and feral animal control; and
- Control techniques.

4.1 Weed Hygiene

Vehicle, machinery and equipment cleaning and inspections will be undertaken to prevent weed seed spread. Vehicles need to be thoroughly checked and washed, including the undercarriage (free of mud), radiator grill and engine bay. All personnel working in areas with weeds present will inspect their clothing for weed seeds prior to leaving the location. This is particularly important where there is Mossman river grass present around the mill site. This burr easily attaches to clothing.

Machinery coming onto site must be deemed clean and weed seed free. The contractor must provide a weed seed clearance certificate and ad-hoc inspections conducted by the contractor manager. All vehicles and equipment will be frequently washed down at the on-site wash down facility as required and be washed at other project areas such as Cosmo Howley prior to driving to URPA particularly during seeding times. Vehicles should remain on established tracks and avoid off road travel and known areas of infestation.

Machinery used for clearing, slashing, earthworks, grading firebreaks will be cleaned before leaving and entering site or moving to cleaner area within the URPA. All machinery will work from clean areas towards areas of infestation to prevent spread where applicable.

4.2 Education and Awareness

Site inductions include a discussion on weeds, NTMO obligations and weed hygiene prevention measures. The site environmental department will be aware of any weed alerts from the NT WMB and share with the employees and contractors. Good communication, relationship and information sharing with key stakeholders such as Mary River West station will be actioned, and shared responsibilities of managing property boundaries undertaken.

4.3 Reporting “Alert” Weeds

Encouraging a culture of reporting weeds to the site environmental department. The site environmental officers will investigate the reports and notify the NT WMB if any “alert” weeds are detected, for assistance where required.

4.4 Site Inspections

Opportunistic site inspections will be conducted by the site Environmental officers for early detection, control and monitor treatment success. Weed mapping will be undertaken annually towards the end of the wet season whilst weeds are actively growing, easily identifiable and prior to early dry season fire management. Results will inform the subsequent year’s plan.

4.5 Controlling Access

Access is currently controlled at URPA through site access gates, fencing, and “no unauthorized access” signage. The mill operates around the clock and site personnel are always present to deter unauthorised personnel. Controlling access reduces the likelihood of inadvertent weed introduction.

4.6 Importation of Weed-Free Material

Any material brought to URPA (such as topsoil or mulch for rehabilitation) from an off-site area will need to be declared weed-free to prevent the introduction and spread of weeds.

4.7 Rehabilitation with Approved Plants

Only native plants will be sourced for rehabilitation activities. Ornamentals and invasive plants will not be brought to site.

4.8 Disposal of Contaminated Material

NTMO will not transport declared weed as per legislative requirement. Any weed seed or weed product will be disposed of with on-site burial. The NT WMB will be contacted for advice when required.

4.9 Pest and Feral Animal Control

Feral animals such as buffalo and pigs contribute to weed spread. If feral populations are abundant across URPA, NTMO will contact the Mary River West station owner to initiate a site-wide feral animal control program.

4.10 Weed Control Methods

Weed control methods such as prioritising outlier isolated plants and treating from the outside towards the infestation areas will be undertaken. Factoring in wind and water flow direction can also improve weed control measures.

4. ROLES AND RESPONSIBILITIES

Roles and responsibilities are set out in Table 5 below.

TABLE 5. WEED MANAGEMENT RESPONSIBILITY

Task	Responsibility
Planning and project management – oversee that work is undertaken in accordance with plans, manage contractors and report to NTMO. Undertake ad-hoc inspections.	EcOz Environmental Consultants
Weed Control Program – conduct weed control, data recording and reporting in accordance with legislative requirements.	Territory Weed Management
Site inspections, reviews and monitoring	NTMO Environmental department
Abide by NTMO procedures, plans and policies.	All employees and contractors
Report any non-compliance	All employees and contractors
Ensure all employees and contractors are provided with appropriate weed management related training, weed hygiene and awareness.	All employees and contractors

5. REVIEW

The URPA Weed management plan will be reviewed and updated as required, dependent on:

- Weed control outcomes and recommendations from each successive year of treatment;
- Weed mapping outcomes – introduction of a new declared weed and/or treatment failures;
- Changes in priority/high risk weeds;
- Legislative changes;
- Incidents relevant to weed management; and
- Significant ground disturbances within the URPA.

6. REFERENCES

Department of Land Resource Management (DLRM) (2014), Northern Territory Weed Management Handbook, Weed Management Branch DLRM, Palmerston. https://nt.gov.au/__data/assets/pdf_file/0004/233833/nt-weed-management-handbook.pdf.

Department of Land Resource Management (2015) *Darwin Regional Weed Management Plan 2015- 2020*. Northern Territory Government.

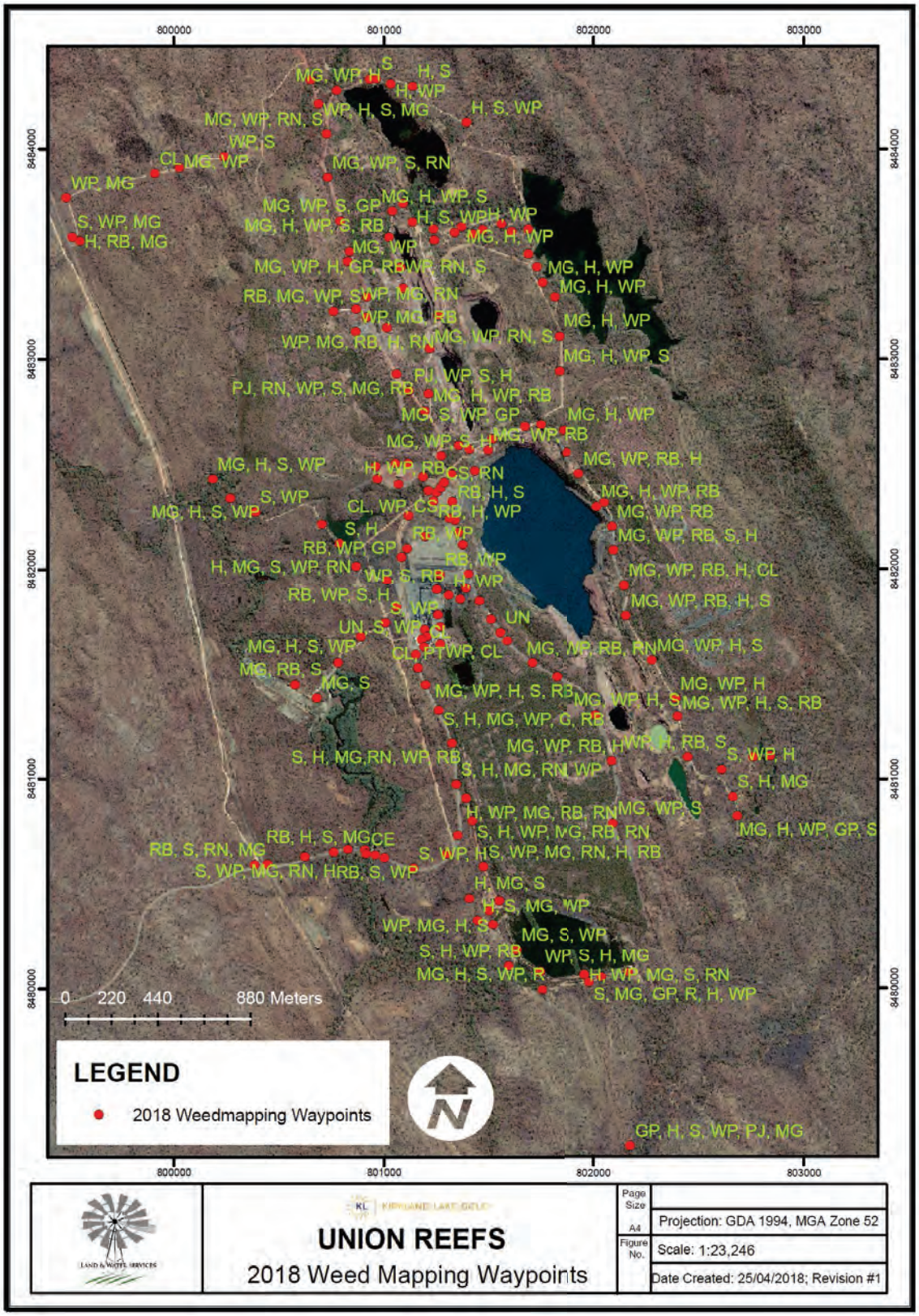
Department of Environment and Natural Resources (2018) *Weed Management Plan for* Gamba Grass (*Adropogon* gayanus). Northern Territory Government.

Department of Environment and Natural Resources (2018) *Weed Management Plan for* Gamba Grass (*Adropogon* gayanus). Northern Territory Government.

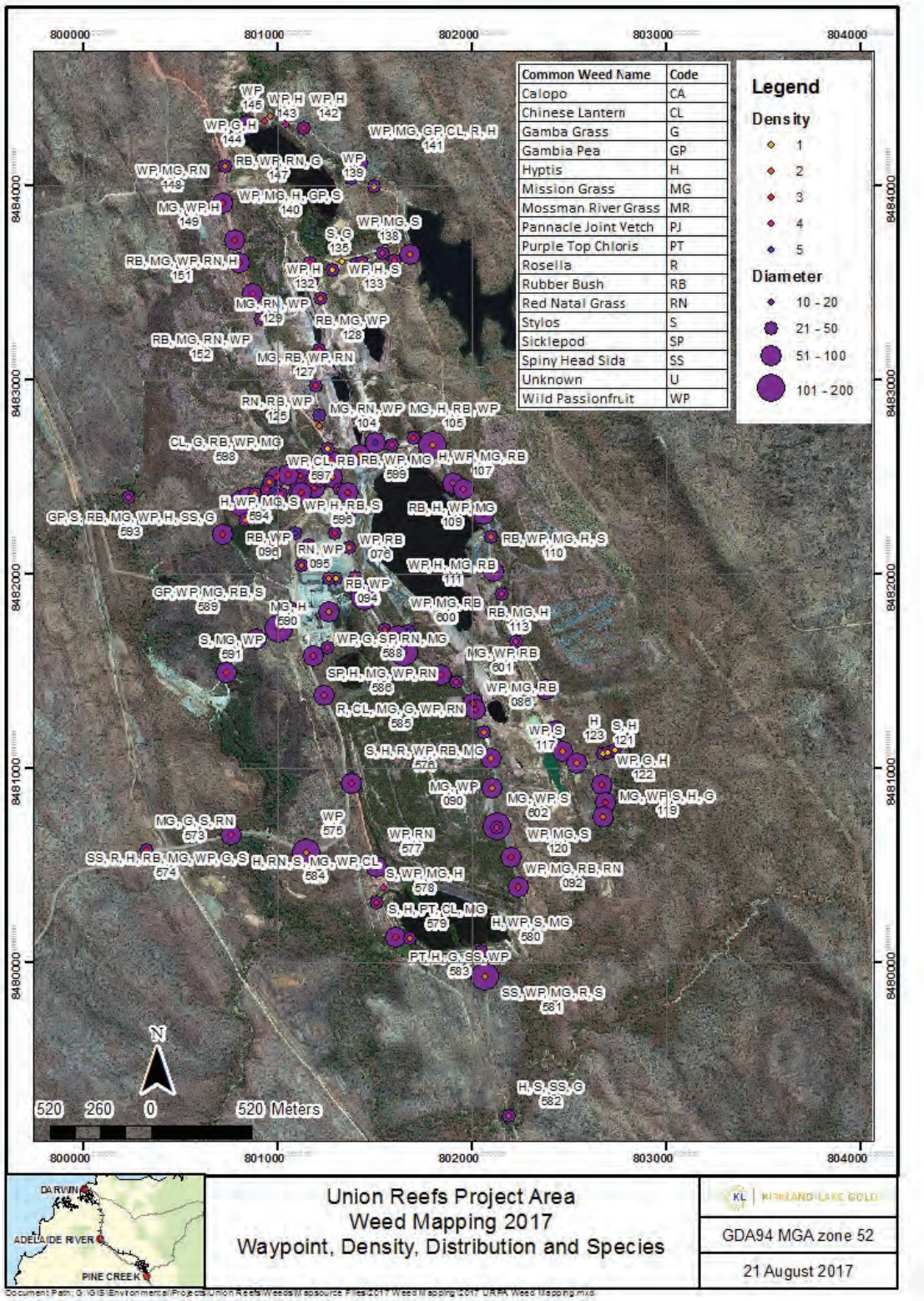
Smith, N. 2011. *Weeds of Northern Australia: A Field Guide*. Environment Centre Northern Territory.

Fuller, M. 2019. *Union Reefs Project Area Weed management plan*. Territory Weed Management, 2019.

APPENDIX A – WEED MAPPING 2018



APPENDIX B – WEED MAPPING 2017



KIRKLAND LAKE GOLD

Clearing/Ground Disturbance Permit

INSTRUCTIONS

This form is to be completed prior to work commencement, where vegetation clearing/ground disturbance is intended.

Clearing / Ground Disturbance can be defined as and not limited to the following:

1) Creation of tracks/access/drill pads/fire breaks
2) Tree lopping
3) Vegetation removal or relocation
4) Digging of pits/sumps

Works must be completed within the validity period/prior to the expiration date; otherwise, the issued permit will need to be reviewed and re-signed to ensure all information is still accurate.

Responsibilities:

- ☐ Section 1–3 – Disturbance Description – Applicant to complete
- ☐ Section 4 – Safety Considerations – Applicant to complete
- ☐ Section 5 – Utilities Information – Project & Maintenance Department to sign off
- ☐ Section 6 – Environmental & Archaeological considerations – Environmental Department to sign off
- ☐ Authorisation – Signed by Applicant, Environmental Department & Clearing Operator

Permit ID:

SECTION 1: General Information

If applicable;

Related Approved Permit(s)

Project Area

Location

Previously Disturbed Site? ☐ Yes ☐ No

Disturbance Dimensions

Estimated Area to be Disturbed

Expected Disturbance Date

Type of Disturbance ☐ Permanent ☐ Temporary

If temporary;

Expected Rehabilitation Date

SECTION 2: Purpose and Description

☐ Exploration ☐ Mining ☐ Pipeline

☐ Other (specify):

Description of Activities:

SECTION 3: Type of Surface Disturbance

☐ Auger Holes ☐ Excavation ☐ Trenching	**Excavation information:** Length/depth/width: _____ Utilities present (YES/NO): _____ _____		
☐ Topsoil stripping	Volume (approx..) (m^3):		
☐ Vegetation removal			
☐ Surface water flow alteration	☐ Yes	☐ No	*If yes, provide details here:*
☐ Regulatory approval required	☐ Yes	☐ No	Approval date:

SECTION 4: Safety Considerations

Aspect	**Addressed?**			**Details** *If yes, provide details and attach supporting documents* *If no, provide details why.*
	Yes	**No**	**N/A**	
Any other permits required? (e.g. Hot Work, working at heights)				
Has a JHA been completed?				
Have the job requirements been clearly explained?				
Specific safety instructions:				

SECTION 5: Utilities Information

Description (Internal and External)	Utilities in the area			Details *If yes, provide details and attach supporting documents* *If no, provide details why.*
	Yes	No	N/A	
Electrical				
Cable / Fibre optic				
Water / Tailings pipe lines				
Sewer				
Gas				

Maintenance Department Sign Off:

I have checked that the above information in Section 4 is true and correct at the time of signing.

Name	Department	Signature	Date

Surface Projects Sign Off:

I have checked that the above information in Section 4 is true and correct at the time of signing.

Name	Department	Signature	Date

SECTION 6: Environmental Considerations

Aspect	Addressed?			Details *If yes, provide details and attach supporting documents. If no, provide details why.*
	Yes	No	N/A	
Compulsory Area surveyed and marked out?				
Has Survey Plan / Drawing been developed with correct GPS coordinates and projection system?				
Surface water flow alteration required?				
Ground water management required?				
Heritage / Archaeology assessment completed?				
Significant Flora or habitat present?				
Topsoil to be stockpiled (topsoil stockpiles to be no higher than 2m)? Stockpile location?				

Date of Initial site inspection completed:

Site Description:

Revisions to initial application: ☐ Yes ☐ No

If yes; details:

Date of additional site inspection **Completed**

Findings:

Conditions:

Application Outcome ☐ Approved ☐ Rejected

Permit ID

Version

Permit Validity/Expiration Date

AUTHORISATION

Applicant:

This Permit is true and correct at the time of signing. Any further alterations will require a variation undertaken by the Environment Department.
If a later version of this Permit has been issued, it will be deemed as current and the superseded version will be no longer valid.

The final area of clearing has boundaries marked (with exceptions*)

I accept the conditions set out in this Permit and any breaches must be reported to the Environment Department immediately for rectification.

Name	Department	Signature	Date

Environment Department:

This Permit is true and correct at the time of signing. Applicant(s) have acknowledged and understood conditions set out on this Permit.

The final area of clearing has boundaries marked (with exceptions*)

Environmental Officer	Department	Signature	Date

Clearing Operator (if required):

I have read and understood this document and am informed of the works to be undertaken.

I accept the conditions set out in this Permit and any breaches must be reported to the Environment Department immediately for rectification.

Name	Department/Company	Signature	Date

* Exceptions apply where it is unable/physically unsafe to be done (e.g. lopping of tree branches).

PHOTOS (add more pages where required)

TO BE USED BY ENVIRONMENT DEPARTMENT IF VARIATION IS REQUESTED

Revision Number:

Reason for requesting revision (including date of request):

Date of site inspection completed:

Findings:

Conditions:

Revision Outcome	☐ Approved	☐ Rejected
Permit ID		
Version		
Permit Validity/Expiration Date		