Northparkes Mines

A century of mining together

2022 Annual Review

Ripping as dust mitigation undertaken on Rosedale TSF

CMOC | Northparkes

Document Details	
Name of Operation	CMOC-Northparkes Mines
Name of Operator	CMOC Mining Pty Ltd operating as CMOC Mining Services Pty Ltd
Development Consent/Project Approval Number	DC11_0060, as modified
Name of holder of development consent/Project Approval	CMOC Mining Pty Ltd
Mining Leases	ML1247, ML1367, ML1641, ML1743
Name of holder of mining lease	CMOC Mining Pty Ltd
Water Licence #	Refer to Table 4 Summary of Licences
Name of holder of water licence	CMOC Mining Pty Ltd
MOP/RMP Commencement Date	n/a
MOP/RMP Completion Date	n/a
Annual Review Commencement Date	1st January 2022
Annual Review Completion Date	31st December 2022
I, Jianjun Tian, certify that this audit report is a true and accurate record of the compliance status of CMOC-Northparkes Mines for the period 1st January 2022 to 31st December 2022 and that I am authorised to make this statement on behalf of CMOC Mining Pty Ltd.	
Name of authorised reporting officer	Jianjun Tian
Title of authorised reporting officer	Managing Director
Signature of authorised reporting officer	
Date	30 March [redacted] 2023

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1. STATEMENT OF COMPLIANCE

In accordance with the *Post-approval requirements for State significant mining developments – Annual Review Guideline* (NSW Government, 2015) a statement of compliance has been prepared to document the status of compliance with Development Consent 11_0060 (as modified), mining leases and other relevant approvals at the end of the 2022 reporting period. Table 1 shows each statutory approval and where a non-compliance was identified during the reporting period.

Table 1 Statement of Compliance

Were all conditions of the relevant approvals complied with?	
PA 11_0060	Yes
ML 1247	Yes
ML 1367	Yes
ML 1641	Yes
ML 1743	Yes
EPL 4784	Yes
EPBC 2013/6788	Yes
WAL9995, WAL8241, WAL7866, WAL34955, WAL32138, WAL32120, WAL32004, WAL31969, WAL31963, WAL31930, WAL31863, WAL31850, WAL21471, WAL21466, WAL1698, WAL13108, WAL10082	Yes

2. INTRODUCTION

2.1 Mine Contacts

Table 2 CMOC-Northparkes Mines Contacts

Position	Contact Name	Contact Number
Northparkes Hotline	Stacey Kelly	02 6861 3000
Mill Control (24 Hrs)	-	02 6861 3167
Access Control	-	02 6861 3211
Environment and Farm Superintendent	Chris Higgins	02 6861 3265
People, Safety and Environment Manager	Stacey Kelly	02 6861 3495

2.2 Mine Operation Introduction and History

2.2.1 Location, History and Process Overview

CMOC-Northparkes Mines (Northparkes) is a copper-gold mine located 27 kilometres north-west of the town of Parkes in central west New South Wales, Australia (Figure 1). The Northparkes business continues to run under a joint venture arrangement with 80% interest with China Molybdenum Pty Ltd and the remaining 20 percent share owned by the Sumitomo Group.

The majority of Northparkes employees reside in the Parkes Shire, which has a population of approximately 15,000 residents. Parkes Shire is a diverse municipality centred in the town of Parkes. The largest industry is the retail industry, closely followed by the agricultural industry.

North Mining Limited originally received development consent for Northparkes operations in 1992, 15 years after the first onsite resource discovery. This approval was based on open cut mining of E22 and E27 and underground mining of E26 within the 'Mining Reserve' of 64.1 million tonnes (Mt).

Underground block cave mining commenced at Northparkes in October 1993 with the construction of the E26 underground block cave mine through the granting of development consent DA504/90. Northparkes commissioned its second block cave mine, E26 Lift 2 in 2004. In 2008, North Mining Limited commissioned an extension to the second block cave mine, E26 Lift 2 North (E26 Lift 2N). Mining operations at Northparkes focus on the extraction of a range of ore bodies based on a set of target mineral concentration limits.

Open cut mining commenced with the E27 pit in December 1993 and the E22 pit in January 1994. The gold-enriched oxide ore was processed through a separate carbon-in-pulp (CIP) gold circuit, including the use of cyanide for gold extraction, prior to the construction of the copper-gold sulphide processing circuits in 1995. Ore was then stockpiled for blending with E26 underground material. Open cut mining at Northparkes operated on a campaign basis determined by economic and environmental viability. Open cut mining ceased in October 2010 with the completion of the E22 open cut campaign. The CIP processing plant has been decommissioned from site, with cyanide no longer used in process circuits on site.

In February 2007, the NSW Minister for Planning granted PA06_0026 under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act). This approval provided for the ongoing operation of the previously approved mining operations and facilities and the extension of underground block cave mining into the E48 ore body. This project was known as the E48 Project. After approval in 2007, North Mining Limited commenced construction of E48 Lift 1, its third major block cave mine. Initial production of E48 Lift 1 began in 2010 and forms part of the approved underground mining operations in conjunction with E26 Lift 2 and E26 Lift 2N.

In October 2009, approval was granted for two modifications to PA06_0026 under Section 75W of the EP&A Act. Section 75W modification 1 (Mod 1) provided for the construction of the Estcourt Tailings Storage Facility (TSF), a mine and mill upgrade to increase processing up to 8.5Mtpa and extension of mine life until 2025. Section 75W modification two (Mod 2) provided for the development of a 1200m^2 warehouse within the approved mine infrastructure area.

In 2012 North Mining Limited was granted approval for development of a block cave knowledge centre under Part 4 of the EP&A Act (DA 11092) from Parkes Shire Council (PSC).

In 2013, CMOC Mining Pty Ltd acquired Northparkes.

In July 2014, Project Approval was granted for PA11_0600 under section 75J of the EP&A Act for the Northparkes Extension Project (the Project). This approval PA11_0060 surrendered the Project Approval PA06_0026 and DA11092 in accordance with section 104A of the EP&A Act.

In 2019, Project Approval 11_0060 was gazetted as a State Significant Development (SSD) under section 4 of the EP&A Act and is now referred to as Development Consent 11_0060.

A copy of the 2022 Northparkes Value Chain is provided as Figure 2. The value chain is a high-level model used to describe the process by which Northparkes receive raw materials, add value to the raw materials through various processes to create a finished product, and then sell that end product to customers. Northparkes conducts annual value-chain analysis by looking at every production step required to create a product and identifying ways to increase the efficiency of the chain. The overall goal is to deliver maximum value for the least possible total cost and impact, while creating a competitive advantage. Surface infrastructure and operation layout is shown in Figure 3.

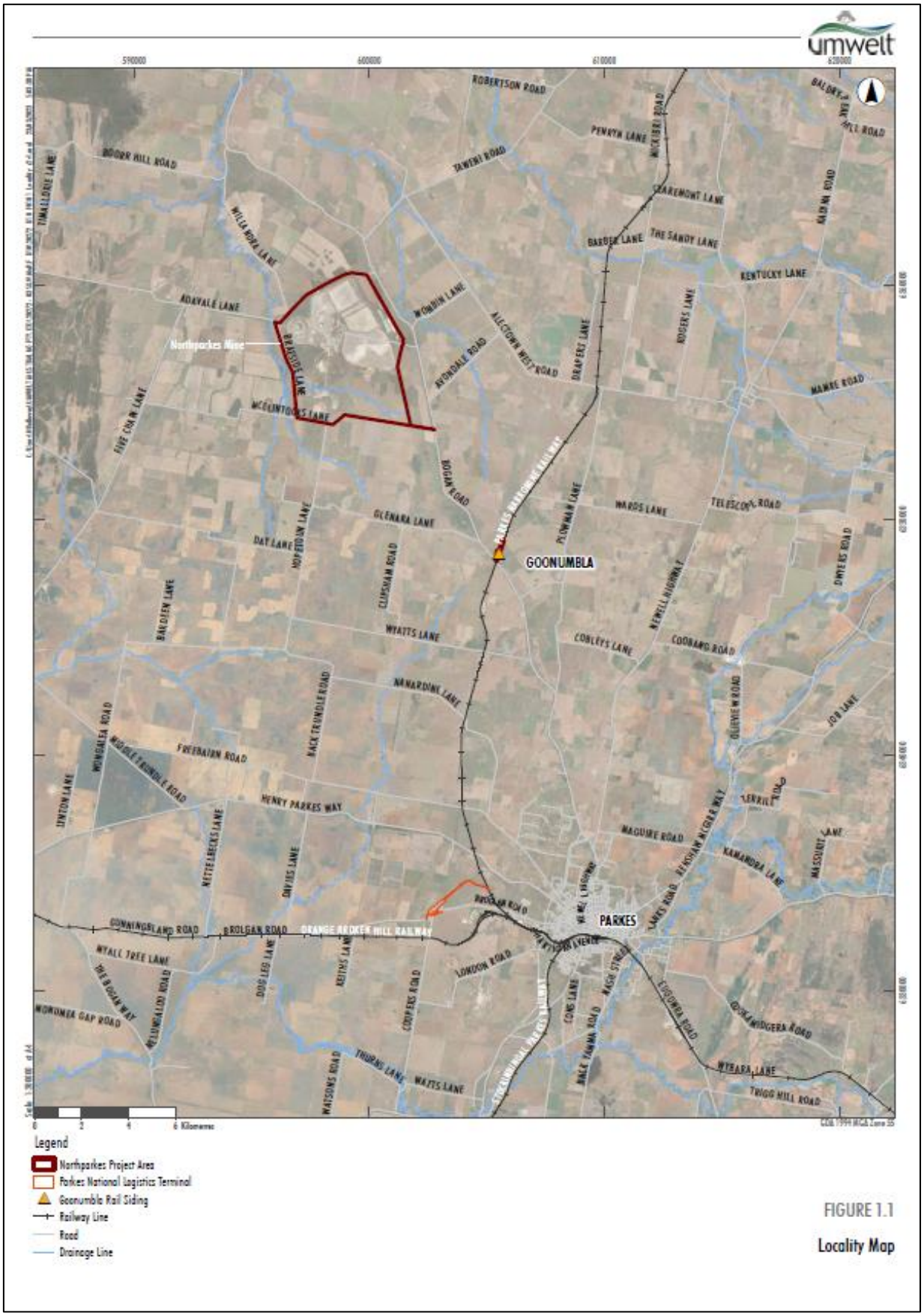


Figure 1 Project Locality Plan

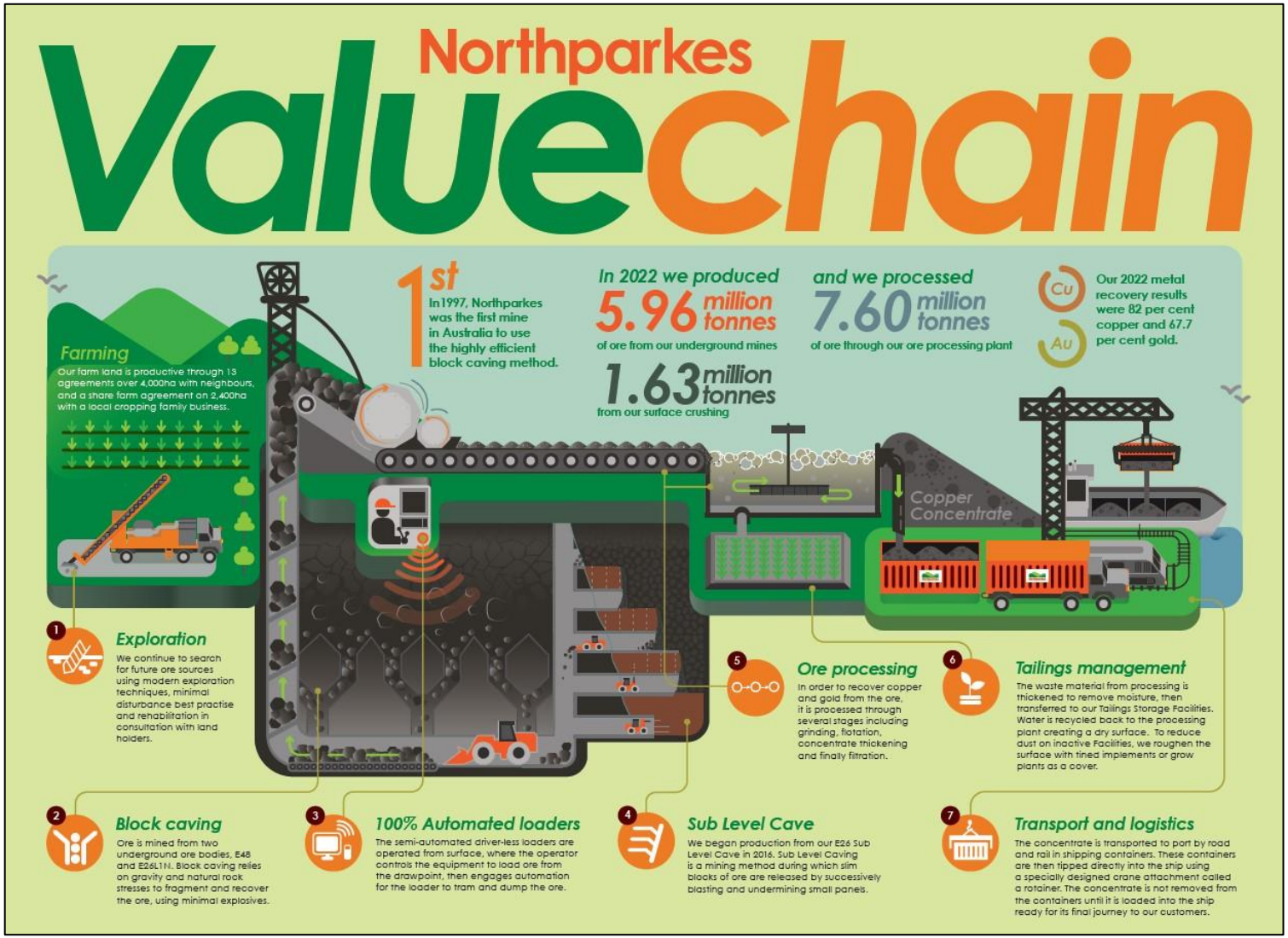


Figure 2 Northparkes 2022 Value Chain

2.2.2 Site Layout and Infrastructure

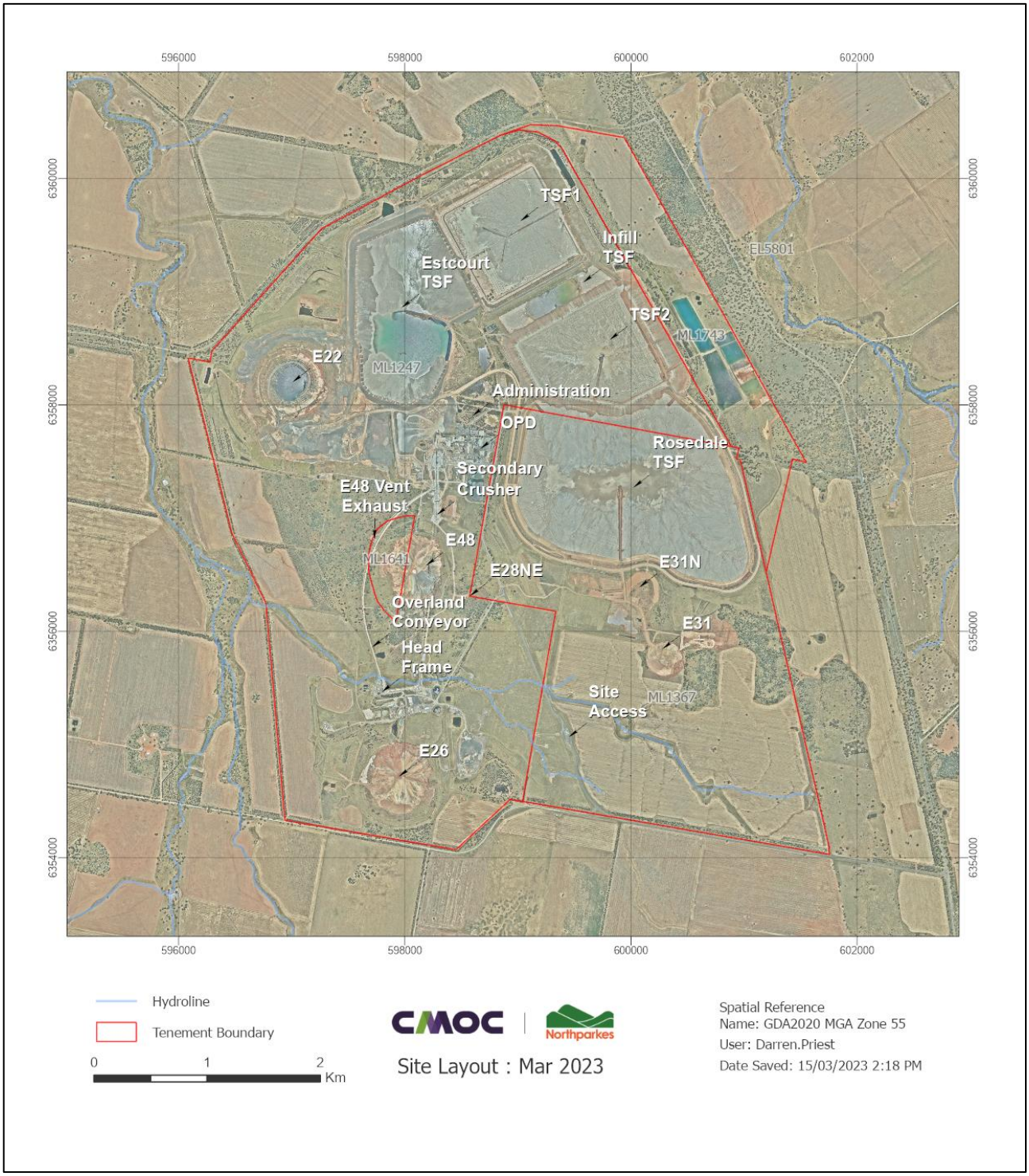


Figure 3 Surface Infrastructure and Operational Layout

The major components of the Northparkes onsite infrastructure and approved future operations includes:

- Continuation of approved underground block cave mining in the E48 and E26 ore bodies, and associated underground infrastructure
- Development of underground block caving in the E22 resource beneath the E22 open cut void
- Campaign open cut mining through development of five open cut resources including:
  - development of four small open cut pits E31, E31N, E28, E28NE
  - E26 open cut which is located in an area of previous underground block cave subsidence (existing vertical extent of subsidence void is approximately 200 metres)
- Ongoing TSF disposal and raises including:
  - continuation of tailings disposal to TSF1, TSF2, Infill TSF and Estcourt TSF to an approved height of 28 metres
  - provision for additional raises on Rosedale TSF to provide for an increased height up to approximately 28 metres above ground surface
  - the extension of the Infill TSF west to adjoin the Estcourt TSF
- Development of new waste dumps (overburden emplacement areas) for the management of open cut waste rock. Waste rock from open cut mining areas can be utilised in the development of TSF raises such as Rosedale TSF
- Continuation of approved ore processing infrastructure up to 8.5 Mtpa capacity, and road haulage of copper concentrate to local rail sidings
- Continued use of existing site infrastructure including administration buildings, workshop, internal access roads and service infrastructure
- Continued use of surface mining infrastructure including ventilation shafts, hoisting shaft and ore conveyors
- Continuation of existing approved water supply and management processes
- Continuation of approved mining operations until end of 2032 and
- Rehabilitation and closure of the mine site will be carried out after the end of the operational life of the Project in accordance with relevant approvals.

2.3 Scope

This Annual Review provides a summary of actual operational and environmental management activities undertaken at Northparkes during the reporting period and provides a review against planned works, as described in the Rehabilitation Management Plan (RMP), and predicted impacts documented in the Northparkes Mines Step Change Project Environmental Assessment (EA) (Umwelt, 2013). The Annual Review also covers community relations and addresses mine development and rehabilitation undertaken during the reporting period.

The report has been prepared to satisfy the conditions of the Development Consent 11_0060 (DC11_0060) (in particular Schedule 6, Condition 4) and Mining Leases (ML) 1247, 1367, 1641, 1743. Key requirements of these approvals are described in Table 3.

The report has been prepared generally in accordance with the NSW Governments "*Annual Review Guideline*" October 2015 where practicable, as well as the relevant Northparkes reporting framework.

Northparkes recognises and respects the importance of stakeholders and considers positive relationships important to aid in continual improvement of its environmental management practice. This report is therefore provided to the following stakeholders:

- Department of Planning, Industry and Environment (DPE)
- Resource Regulator, Department of Regional NSW
- Forestry Corporation of NSW
- NSW Environment Protection Agency (EPA)
- Biodiversity Conservation Trust (BCT)
- Peak Hill Local Aboriginal Land Council (PHLALC)
- Wiradjuri Council of Elders (WCE)
- Parkes Shire Council (PSC)
- Forbes Shire Council (FSC)
- Northparkes Community Consultative Committee and
- General public (available at http://www.northparkes.com/).

2.4 Annual Review Requirements

Table 3 Annual Review Requirements

Licence Approval or Guideline	Section Reference	Requirement	Reference in this Report
Development Consent 11_0060	Schedule 6, Condition 4	By the end of March each year, or as otherwise agreed by the Secretary, the Proponent shall review the Environmental performance of the project to the satisfaction of the Secretary. This review must: (a) describe the development that was carried out in the previous calendar year, and the development that is proposed to be carried out over the next year	Whole document
		(b) include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, which includes a comparison of these results against the • the relevant statutory requirements, limits or performance measures/criteria • the monitoring results of previous years and • the relevant predictions in the EA	Section 4 Section 6 Section 7 Section 8
		(c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance	Section 1 Section 11
		(d) identify any trends in the monitoring data over the life of the project	Section 4 Section 6 Section 7 Section 8
		(e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies and	Section 4 Section 6 Section 7 Section 8
		(f) describe what measures will be implemented over the next year to improve the environmental performance of the project.	Section 12
	Schedule 3, Condition 38	The Proponent shall: (a) implement all reasonable and feasible measures to minimise the waste (including waste rock) generated by the project) (b) ensure that the waste generated by the project is appropriately stored, handled and disposed of and (c) monitor and report on effectiveness of the waste minimisation and management measures in the Annual Review	Section 4

ML 1247 ML 1367 ML 1641 ML1742	Condition 3 (f)	The lease holder must prepare a Rehabilitation Report to the satisfaction of the Minister. The report must: i. provide a detailed review of the progress of rehabilitation against the performance measures and criteria established in the approved MOP ii. be submitted annually on the grant anniversary date (or at such times as agreed by the Minister) and iii. be prepared in accordance with any relevant annual reporting guidelines published on the Department's website.	Whole document

3. APPROVALS

3.1 Approvals, Leases and Licences

Table 4 summarises the key mining leases and approvals currently held by Northparkes which are relevant to the operations.

Table 4 Summary of Licences

Approval	Description	Issue Date
Project Approvals		
DC11_0060	Project Approval – Step Change Project (Mine Extension)	16/07/2014
DC11_0060 Mod 1	Modification to include Sub Level Cave Mining	16/05/2015
DC11_0060 Mod 2	Correct error in project boundary	31/03/2016
DC11_0060 Mod 3	Development and operation of E26 Lift 1 North	22/08/2017
DC11_0060 Mod 4	Changes to Ore Processing Infrastructure	06/09/2018
DC11_0060 Mod 5	Temporary road haulage route and new secondary crusher	30/09/2019
DC11_0060 Mod 6	Amendments to Operational Activities	06/06/2022
DC11_0060 Mod 7	Underground Portal and TSF buttressing	Withdrawn
DC11_0060 Mod 8	Product haulage arrangements	22/12/2022
DC11_0060 Mod 9	E22 Portal Geotechnical Drilling	In Progress
DC11_0060 Mod 10	E31 Waste Rock Emplacements and Cyclone Tailings	In Progress
SSD	Rocklands TSF and E44	In Progress
Commonwealth Approvals		
EPBC 2013/6788	EPBC Approval	13/02/2014
Council Approvals		
	PSC Approval for Road Train Access on Bogan Road	19/11/1999
Mining Leases		
ML 1247	Mining Lease (1629.6 Ha)	27/11/1991
ML 1367	Mining Lease (826.2 Ha)	21/03/1995
ML 1641	Mining Lease (24.4 Ha)	25/03/2010
ML 1743	Mining Lease (193.3 Ha)	01/09/2016
Exploration Leases		
EL 5800	Exploration Lease (12,130Ha)	08/01/2001
EL 5801	Exploration Lease (49,550 Ha)	08/01/2001
EL 5323	Exploration Lease (21,840 Ha)	18/07/1997
EL 8377	Exploration Lease (25,950 Ha)	12/06/2015
Environmental Protection Licences		
EPL 4784	Environmental Protection Licence	30/05/2001

Current variation	s.58 Licence variation to permit import of material and five year periodic review.	14/12/2022
Dangerous Good and Explosives		
NDG029083	Acknowledgement of Notification of Hazardous Chemicals on Premises	19/08/2019
XSTR200036	Licence to Store Explosives	24/09/2019
XMNF200011	Licence to Manufacture Explosives	28/07/2019
5060895	Radiation Management Licence	10/11/2020
Heavy Vehicle Authorisation		
133827V6	Road Train Operation Permit	12/09/2020
Water Licences		
WAL43208	Water Access Licence - High Security	01/07/2020
WAL43207	Water Access Licence - General Security	01/07/2020
WAL34955	Water Access Entitlement	04/10/2012
WAL32138	Water Access Entitlement	14/09/2012
WAL32120	Water Access Entitlement	14/09/2012
WAL32004	Water Access Entitlement	14/09/2012
WAL31969	Water Access Entitlement	14/09/2012
WAL31963	Water Access Entitlement	14/09/2012
WAL31930	Water Access Entitlement	14/09/2012
WAL31863	Water Access Entitlement	14/09/2012
WAL31850	Water Access Entitlement	14/09/2012
Forestry Occupation Permits		
847	Limestone State Forest Occupation Permit	14/01/2022
Annual Rehabilitation Report		
	2022 ARR	31/03/2023

3.2 Amendments during the Reporting Period

3.2.1 Development Consent

Development Consent 11_0060 (the Consent) was granted on 16 July 2014, and has since undergone seven modifications.

During 2022, the modifications lodged for assessment under the Environmental Planning and Assessment Act 1979 (EP&A Act) were modification 6 (MOD 6) and modification 8 (MOD 8). Both applications were assessed and granted approval for the amendment to operational activities and altered haulage arrangements for copper concentrate, respectively. Changes to operations associated with MOD 6 include:

- construction and use of a new underground portal access (including associated drive, conveyor and other ancillary infrastructure) for E22 underground mining operations
- TSF2 embankment buttressing (including associated amendments to the approved disturbance area)
- changes to TSF construction within the approved disturbance footprint associated with increased safety requirements for TSFs since first approved
- minor changes to the E31 and E31N open cut pits to reflect updated geological data and improved resource recovery, including:
    - minor adjustments to disturbance areas for the approved pits and associated infrastructure (roads, safety bunds, water management etc)

- minor increases to maximum approved mining depths

- establishment of temporary waste rock stockpile areas for the E31 and E31N pits to avoid unnecessary material re-handling in the future due to the proposed Rocklands TSF
- additional detail regarding the approved methods and locations of rehabilitation material (soils and vegetation)
- establishment of additional clay and filter material borrow pits for TSF construction and lifts
- relocation of the Contractor area facilities (e.g. site offices, crib huts and a workshop) which would also service the E31 and E31N mining operations
- relocation of the main water supply pipeline and Rosedale (TSF3) tailings pipeline
- clarification regarding approved disturbance boundaries and the location of ancillary infrastructure within the E31 Precinct.

Vegetation disturbance associated with the Mod 6 will be undertaken in stages, comprising:

- Stage 1: E31 Precinct and TSF2 embankment buttressing works
- Stage 2: E22 Portal direct disturbance required for the establishment of the portal
- Stage 3: E22 Portal additional disturbance that may be required subject to detailed design.

MOD 8 granted alternative transport and port loading arrangements during periods in which the Goonumbla Rail Siding is unavailable due to constraints on the rail network outside of Northparkes' control. A summary of the changes to concentrate haulage is provided below.

- permanent copper concentrate haulage arrangements to permit up to 16 return movements, and not exceeding 50 return movements per month, to the Parkes National Logistics Terminal (PNLT)
- with the agreement of DPE, Northparkes may transport up to 32 laden trucks per day (64 return movements) to the PNLT, with no limit on monthly movements
- with the agreement of DPE, Northparkes may transport copper concentrate to an alternative rail loading and unloading facility, restricted to 12 laden trucks per 24-hour period.
- Extension to the onsite copper concentrate storage area

3.2.2 Environmental Protection Licence

An Annual Return for the reporting period was submitted to the EPA on 28 July 2022 in accordance with requirements under Environment Protection Licence (EPL) 4784 Condition R1.5.

On 12 October 2022, Northparkes requested that Environment Protection Licence 4784 conditions of approval be varied to permit the receival and processing of a small quantity of ore from another mining company. During the process of approving the importation of ore, Northparkes utilised the opportunity to undertake a five-year review of the licence, subsequently amending and acquiring several new conditions at approval on 14 December 2022. Specific details of the licence variation are available in Notice 1624407, on the EPA's public register.

4. OPERATIONS SUMMARY

4.1 Production Statistics

A summary of production figures for 2022 calendar year is provided in Table 5 below. Also shown are the previous and predicted production figures for the 2021 and 2023 reporting period, respectively.

Table 5 Production and waste rock summary

Material	Approved Limit	Previous Reporting Period	Current Reporting Period	Next Reporting Period (forecast)
Underground Ore Mined to ROM (Mt)	>5.0	5.37	5.96	5.10
Surface Ore Mined to ROM (Mt)		-	0.02	1.51
Stockpiled Opencut Ore to ROM (Mt)	N/A	1.40	1.64	1.24
Ore Processed (Mt)	8.5	6.84	7.60	7.82
Waste Rock/Overburden (t)	N/A	10,374	894,872*	1,547,476
Fine Reject (tailings) (Mt)	N/A	6.74	7.49	7.68
Saleable Product (t)	N/A	107,789	117,830	139,352

*a significant portion of the waste rock generated during the period was consumed as part of Rosedale Stage 3 construction.

Mining operations within the 2022 reporting period remained below the limits specified in the Consent. Other conditions relevant to operating conditions are addressed throughout the report.

4.2 Mining and Processing

4.2.1 Open cut

Open-pit mining operations re-commenced at Northparkes in late 2022, following a period of only underground mining for more than ten years. Resumption of open-pit mining is providing waste concurrently for the continuing construction of the adjacent Rosedale Tailings Storage Facility. Approximately 375,000 m^3 of waste was removed from the E31 open-pit and 16,000 tonnes hauled to Run Of Mine (ROM).

Whilst there was no significant ore mining undertaken within the year, the approved production plan has scheduled more than 7.5 million tonnes of ore to be mined from the two small open-pits over their two year lifespan.

Preparation is underway to also commence open-pit mining at the nearby E31N project. With E31N similar in size to E31, the two pits combined will see more than 14 million tonnes of material mined as either waste or ore.

As part of surface mining recommencing, drill and blast activities were undertaken during the period. Northparkes pro-actively monitors aspects of blasting such as overpressure and vibration to ensure impacts on our neighbours are minimised. All blasts during the period were below the criteria detailed in the Consent.

4.2.2 Underground Operations

Underground mining activities are currently undertaken in the E48 and E26 ore bodies. The E26 L1N mine and the E48 ore bodies are operated as block caves as the primary method of resource extraction. Block Caving is an underground hard rock mining method that involves undermining an ore body, allowing it to progressively collapse under its own weight (see Figure 4 Block Cave Mining Method). The E26 SLC mine is a sublevel caving operation involving construction of the sub level horizon followed by retreat drill and blast of that horizon, with the material above allowed to freely cave to fill the opened voids.

The E26 SLC project commenced construction in April 2015 and went into production in 2016. The mine design aimed to extract a remnant wedge of high-grade material adjacent to the E26 Lift 2 Block Cave. The operations at E26 SLC had ceased in 2021, having completed production from the first four levels at approximately 20m vertical spacing. The remaining two levels were deferred due to less favourable economics. The development of the remaining levels commenced in 2023 with 25m vertical spacings. Production is planned from the remaining levels from 2023 until early 2026.

The construction of E48 block cave mine was completed in 2010, with the first ore extracted from E48 Lift 1 block cave mine and is currently in production. Automation (remote and autonomous operation of underground load, haul and dump machinery) continued in the reporting period to maintain full automation of underground mine loaders in E48. E26 L1N operations began with loaders operating manually, with automated operations under consideration for 2023 implementation.

In 2022, Northparkes increased production from E26 L1N ahead of plan to the full production rate due to favourable monitoring results in quarter four.

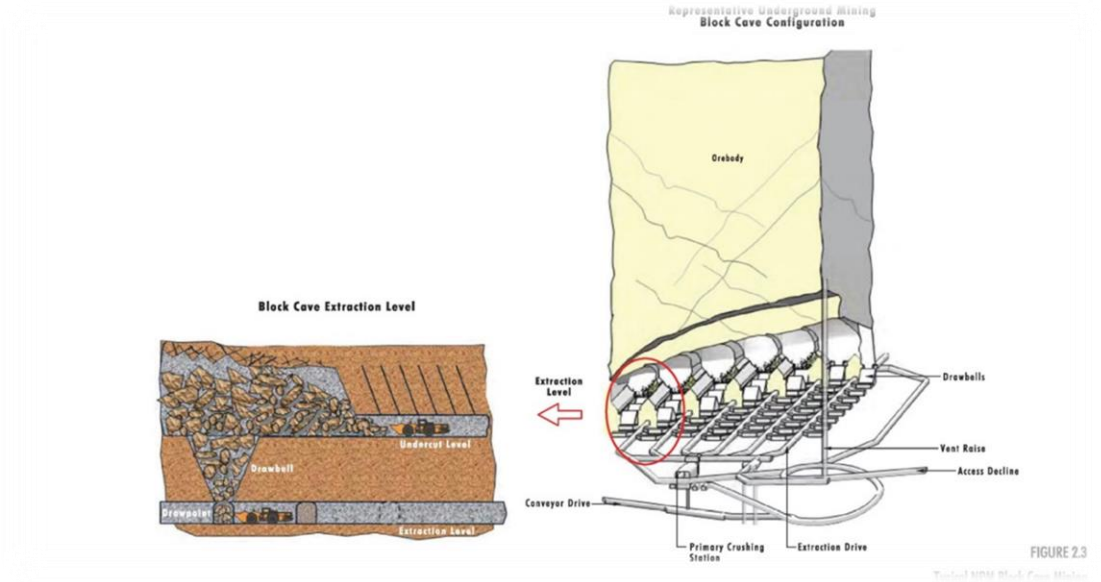


Figure 4 Block Cave Mining Method

4.2.3 Waste Rock

A total of 294 tonnes of waste rock from underground development was placed on E26 waste rock emplacement during the reporting period.

The underground waste was from the E26 L1N Block Cave Development Project and consisted mostly of rock contaminated by ground support (steel mesh and shotcrete) and concrete that could not be effectively separated out. All this waste material was trucked to the surface and separated to extract contaminating material.

4.3 Exploration and Resource Utilisation

Exploration and evaluation programs continued across ML1247 and ML1367 during the reporting period as shown in Figure 5 Exploration and Evaluation Drilling Activities Mining Leases 2022.

No exploration activities were undertaken on ML1641 or ML1743 during the year. No non-compliances have been noted within the mining leases related to exploration or evaluation activities.

A total of 49 drill holes for 13,608.5m were completed for exploration and evaluation purposes during the reporting period. The drilling program comprised 20 underground diamond holes for a total of 5687.7m, and 29 surface diamond drill holes totalling 7,920.8m of core and percussion drilling. Northparkes is committed to identifying and evaluating new ore bodies with the intention of extending mine life.

Mining lease evaluation in 2022 involved the following works:

- A targeted surface diamond drill programs to test conceptual targets at White Rock prospect, Major Tom prospect and follow-up of the historic intersection in GD540;
- Testing of the eastern margin of the deep GRP314 resource zone to confirm the extents of the potential subsidence zone resulting from future extraction of that resource;
- Sterilisation drilling over the footprint of the proposed Rocklands Tailings Facility to ensure no economic mineralisation would be impacted;
- Infill testing of the E28 resource area to confirm the existing resource estimate;
- Drilling of additional monitoring holes to support extraction of the E26Lift1 North Block Cave;
- Underground drilling to define the margins of the E26MJH mineralisation (>0.4% Cu shell), particularly on the eastern and southern margins, which were not well defined by existing drilling; and,
- Underground drilling in the E26 CLJ and E48 Bodkin zones to confirm and evaluate conceptual mineralisation.

In addition to new drilling, assaying was completed on four historic holes from the upper southern margin of the E48 Block Cave where a volume for remnant mineralisation remains to be extracted.

Non-drilling activities during 2022 included:

- the creation of two revised Block Models which were completed for the E26 and E31 deposit areas (re-blocking only),
- results were received for the multi-element re-assaying of 2780 historic diamond and RC pulps from the E48 deposit located on ML1247,
- results and interpretations were received for the trial of Deep Ground Penetrating Radar as on exploration tool in the porphyry environment and sampling of the older tailings storages (TSF1 and TSF2) as part of the MEG Critical Minerals and Mine Wastes program.
- Studies and assessments for potential future development and mining of mineralisation were undertaken for E31/E31Nth Project (open pit mining), E28NE Project (open pit mining) and E22 project (block cave mining)

Exploration and evaluation activities will continue in the next reporting period with the major focus of these activities being completion of drilling to evaluate the E28 Resource area, geotechnical evaluation drilling to support the E22 Block Cave Project, along with further underground diamond drill testing of conceptual underground resource zones.

The proposed exploration comprises 8,130m of drilling (5,750m diamond drilling and 2,380m reverse circulation drilling) and will be focussed in five programs testing known and postulated mineralisation, being:

- Completion of the infill drilling for the E28 resource area south of the E48 subsidence zone with a program of RC +/- diamond drillholes.
- Geotechnical drilling to support the E22 Feasibility Studies and engineering design works for areas including:
    - E22 conveyor portal
    - E22 ventilation and hoisting shaft locations

- E22 crusher chamber location
- Sampling of historic tailings in the deeper levels of TSF1
- Follow-up underground infill drilling for the E26 CLJ Zone at the E26 Lift 2 level.
- Follow-up underground infill drilling for the E48 Bodkin Zone at the E48 Lift 1 level.

In addition, trials of geophysical techniques to aid target selection for potential porphyry deposits including Induced Polarisation, Magneto-Telluric, active Seismic Reflection and Deep Ground Penetrating Radar (DGPR) surveys are planned.

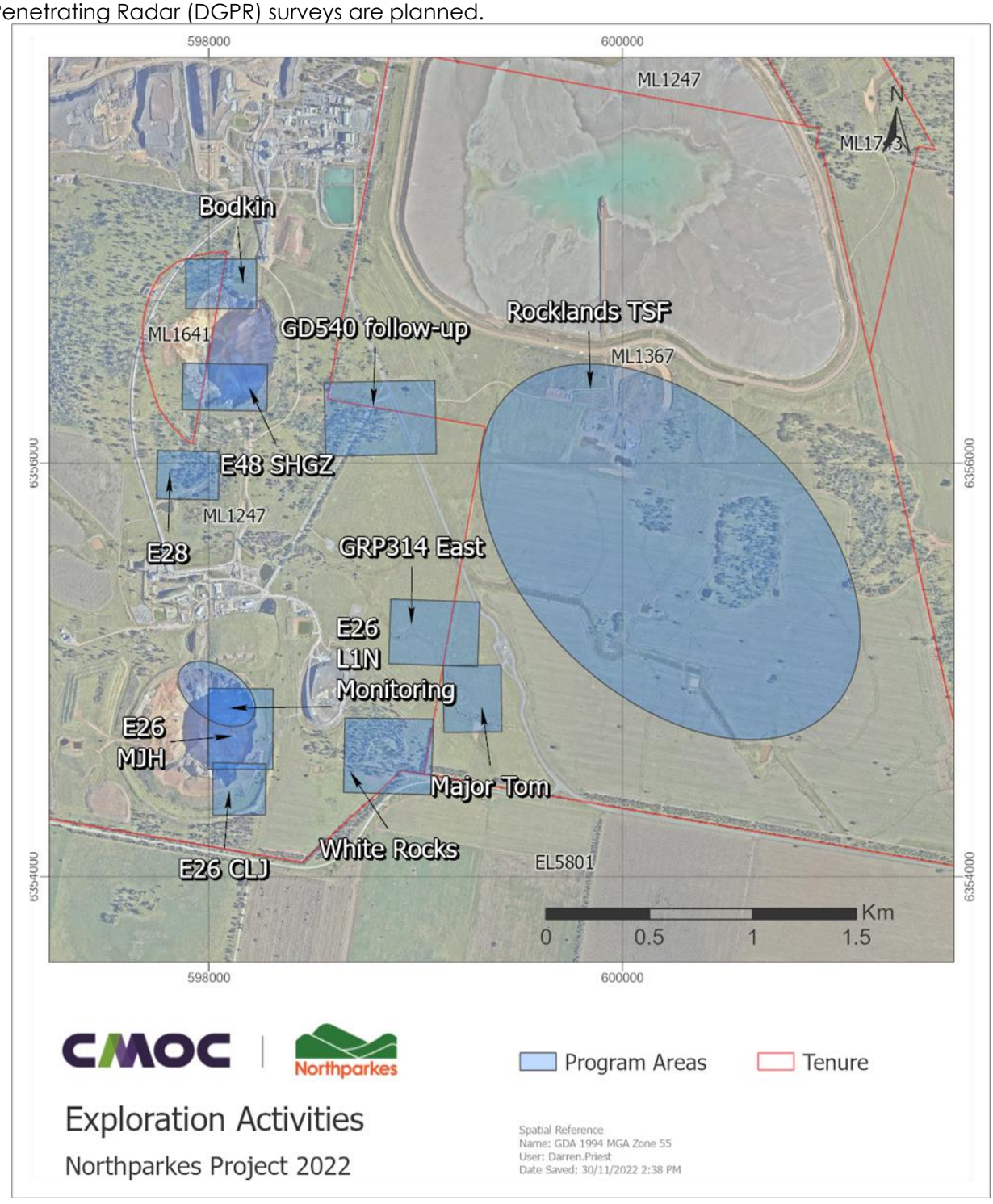


Figure 5 Exploration and Evaluation Drilling Activities on Mining Leases - 2022

4.4 Ore processing

In 2022, a total of 7.60 Mt of sulphide ore was processed from the underground ore bodies and existing surface stockpiles (5.96 Mt underground and 1.64 Mt stockpiled ore). Copper-gold concentrate production totalled 117,798 tonnes (dry) and this product was predominantly sold to customers in China and Japan. Production for the past five years is presented in Table 6.

Ore processing includes several defined stages that include crushing, grinding, flotation and dewatering. Ore is sourced from either underground mines or surface stockpiles, where it is first primary crushed, followed by passing through a secondary & tertiary crushing circuit before being stockpiled into two separate stockpiles. From the stockpiles, material is fed to the grinding circuit, compromising of two parallel modules (Mod 1 and Mod 2), each incorporating a Semi Autogenous Grinding (SAG) mill, oversize pebble crushing, two stages of ball milling, flotation (rougher-scavenger with cleaning stage) and thickeners for concentrate and tails streams.

Air and agitation to produce bubbles in combination with a suite of regents, to enable attachment of particles (minerals) are captured and recovered in the flotation process to produce a sulphide-rich concentrate containing Copper and Gold bearing minerals. After flotation, the concentrate is first thickened through thickeners and filtered through ceramic disc filters to produce a low moisture concentrate ready for loading and transportation to the port.

The tailings component is pumped from the final flotation stage to a tails thickener for dewatering followed by additional pumping to the tailing's storage facilities.

Commissioning of the new secondary and tertiary crushing facility was completed in 2021 allowing the concentrator to achieve a nominal throughput rate of 7.6Mtpa.

Table 6 Ore Processing Production

Year	Ore Milled (Mt)	Production Copper Concentrate (t)
2018	6.48	125,438
2019	6.42	120,832
2020	6.49	107,541
2021	6.84	107,798
2022	7.60	117,830

4.5 Tailings

In the reporting period, 7.48 million tonnes of tailings were deposited into Estcourt Stage 3 TSF. A summary of the tailing's distribution and TSF capacity consumed during the reporting period is provided in Table 7 below.

Table 7 Distribution and Capacity Consumed of Tailings Storage Facilities

Tailings Storage Facility	Distribution (%)	Capacity Consumed (Mt)
TSF1	0	0
TSF2	0	0
TSF Infill	0	0
Estcourt Stage 3	100	7.48
Rosedale Stage 2	0	0

A total of 134 Mt of tailings has been deposited at Northparkes operations to date. All tailings have been deposited within TSF1, TSF2, Estcourt, Rosedale TSF and the Infill TSF located approximately 2km from the processing plant. The tailings are sub-aerially deposited into the active TSF from the external embankments (excluding TSF1 central discharge) and tailings and supernatant water runoff are contained and directed to the internal central decant towers.

All TSFs at Northparkes have been designed by an Engineer of Record to provide:

- Safe and permanent containment of all tailing's solids
- The recovery of free water for reuse within the processing plant
- Containment of all water under extreme rainfall conditions
- Maximised structural strength through the deposited tailings and
- Containment of all chemical residues.

Northparkes control measures for the management of tailings during construction and operation are implemented as per the Tailings Storage Facility Operation, Maintenance and Surveillance (OMS) Manual and the Emergency Management Tailings Storage Facility Procedure.

The site tailings strategy is regularly reviewed, with the most optimal disposal strategy utilised. The current tailings deposition strategy involves alternating deposition between the Estcourt TSF and Rosedale TSF. Further deposition into Infill extension and TSF1 is planned for 2024.

Remediation of TSF2 in the methodology of unloading the embankments progressed through to November. The project was paused due to extreme wet conditions at the base of the eastern embankment and rescheduled for commencement in February 2023. Stability in TSF2 was achieved in 2022 with the Factor of Safety reaching the ANCOLD 2019 guidelines.

Dust mitigation strategies will continue to be investigated and implemented across the business, with possibilities such as vegetation covers on TSF2 and ripping any dust susceptible areas of TSFs considered. Ripping the surface of TSF1 and Rosedale proved successful in limiting dust lift off towards year end.

5. ACTIONS REQUIRED FROM 2021 ANNUAL REVIEW

Each year, Northparkes aims to host an Annual Review meeting for the relevant stakeholders, where the Annual Review for the previous reporting period is discussed. The purpose of this meeting is to document any actions required as an outcome of the previous Annual Review, including any actions that have been undertaken and when those actions were complete.

No actions were raised from the submission of the 2021 Annual Review.

6. ENVIRONMENTAL MANAGEMENT AND PERFORMANCE

6.1 Environmental Management System

Northparkes has developed and implemented a Health, Safety and Environment Management System (HSEMS). The environmental related system components are compliant with ISO14001.

The Environment Management System (EMS) at Northparkes provides the strategic framework for environmental management. The EMS:

- Outlines all relevant statutory leases, licences and approvals that apply to the Northparkes operations
- Details key plans, procedures, management plans and other documents that will be implemented to ensure compliance with all relevant leases, licences and approvals

- Describes the key processes that will be implemented to:
  - Communicate with community and government stakeholders
  - Manage community complaints
  - Resolve disputes and
  - Respond to non-compliance incidents and emergencies.
- Outlines Northparkes monitoring, reporting and auditing requirements
- Outlines relevant roles, responsibilities and accountabilities relevant to environment management for all Northparkes employees and contractors.

During the reporting period, Northparkes maintained the EMS to the ISO14001:2015 standard. Northparkes also maintained its Level 1 risk rating under the EPA's risk based licencing scheme, the highest possible standard.

Northparkes has developed a suite of environmental management plans to guide environmental management at Northparkes. The plans have been developed in accordance with the EMS, the Consent and other statutory requirements. The revision status of approved key environmental management plans, as required by Schedule 6, Condition 3 of the Consent, is summarised in Table 8.

Table 8 Key Environmental Management Plans

Management Plan	Status
Biodiversity Offset Management Plan	Revision 7.02 - Revised August 2022
Water Management Plan Surface Water Management Plan Groundwater Management Plan	Revision 13.01 – Revised October 2022 Revision 7.01 – Revised October 2022 Revision 7.01 – Revised October 2022
Pollution Incident Response Management Plan (PIRMP)	Revision 11.02 - Revised March 2022
Air Quality Management Plan	Revision 21.0 – Revised June 2022
Noise Management Plan	Revision 17.01 - Revised July 2021 (under review)
Environmental Management Strategy	Revision 15.01 - Revised July 2021 (under review)
Blast Management Plan	Revision 9.0 - Revised August 2022
Cultural Heritage Management Plan	Revision 9.03 - Revised September 2022
Rehabilitation Management Plan	Revision 1.01 - 31 July 2021
Traffic Management Plan	Revision 2.0– Revised August 2022

The PIRMP listed in Table 8 applies to all activities that have the potential to generate pollution incidents. These include, but are not limited to, water discharge events, and hazardous spills resulting in land or water contamination and fire hazards.

The PIRMP was not implemented throughout the reporting period, however it was tested in December 2022, and revised accordingly.

6.2 Meteorology

The Consent (Schedule 3, Condition 18) requires a permanent meteorological station to be installed and maintained for the life of the Project. As such, a meteorological monitoring station (MET) has been established to continuously measure and record wind speed, wind direction, temperature, solar radiation and rainfall at Northparkes.

The MET station provides real-time data to Northparkes employees and contractors. Meteorological data is used for assessing compliance, dust and noise management, and for investigative and reporting requirements. The parameters recorded by the MET monitoring station and the method are outlined in Table 9.

Table 9 MET Monitoring Parameters

Parameter	Units	Frequency	Averaging period
Temperature at 2m	°C	Continuous	15 minute
Temperature at 10m	°C	Continuous	15 minute
Wind direction at 10m	°	Continuous	15 minute
Relative Humidity	%	Continuous	15 minute
Rainfall	mm/hr.	Continuous	1 hour
Solar radiation	W/m2	Continuous	15 minute

6.2.1 Temperature

Maximum, minimum and average temperatures are calculated daily from the 15 min intervals.

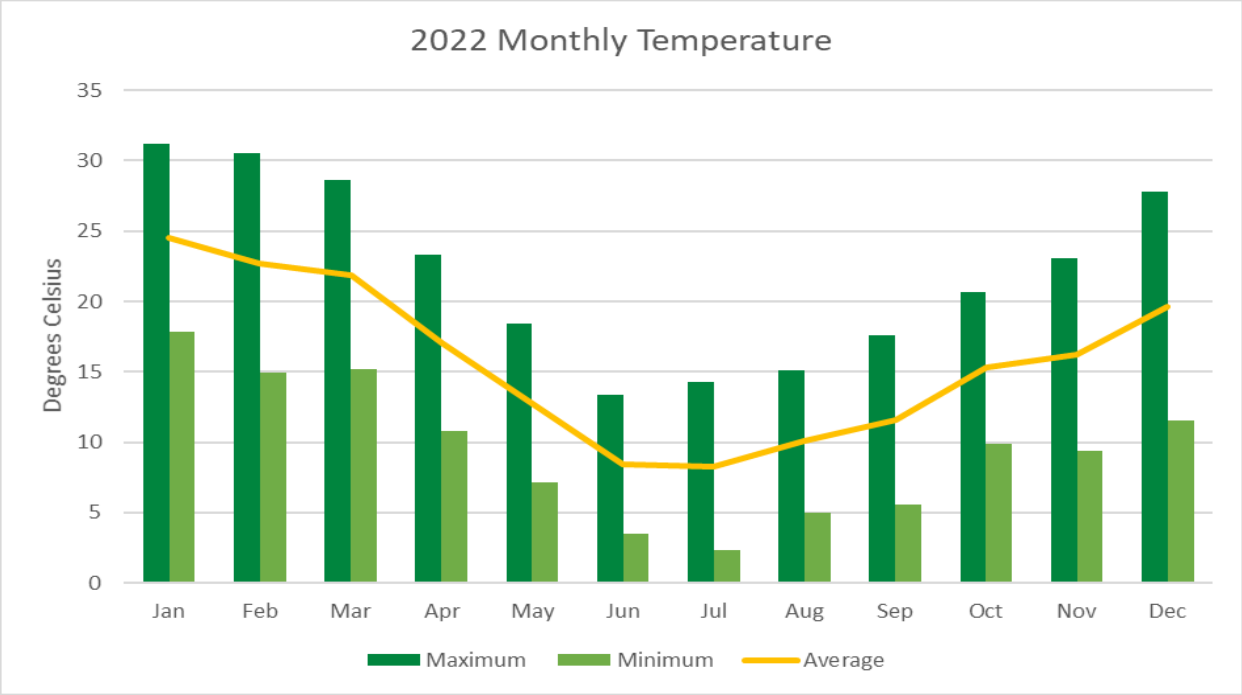


Figure 6 shows average monthly temperature records for the reporting period (10m MET recordings). Compared to the long-term historical data, average maximum and minimum temperatures were largely lower during the period, averaging -1.2°C across all months. The average maximum for November and average minimum for December were significantly lower than the long-term average, -4.5°C and -4.3°C respectively.

Table 10 Temperature averages for 2022 reporting period

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Maximum Temp	31.2	30.5	28.6	23.3	18.4	13.4	14.3	15.1	17.6	20.7	23.1	27.8
Variance from long-term data	-1.2	-1.1	0.1	-0.3	-0.2	-1.5	0.3	-0.7	-1.8	-2.9	-4.5	-2.8
Average Minimum Temp	17.8	14.9	15.2	10.8	7.1	3.5	2.3	5.0	5.6	9.9	9.4	11.5
Variance from long-term data	0.1	-2.6	0.4	0.2	0.0	-1.4	-1.4	0.6	-1.1	0.1	-3.6	-4.3

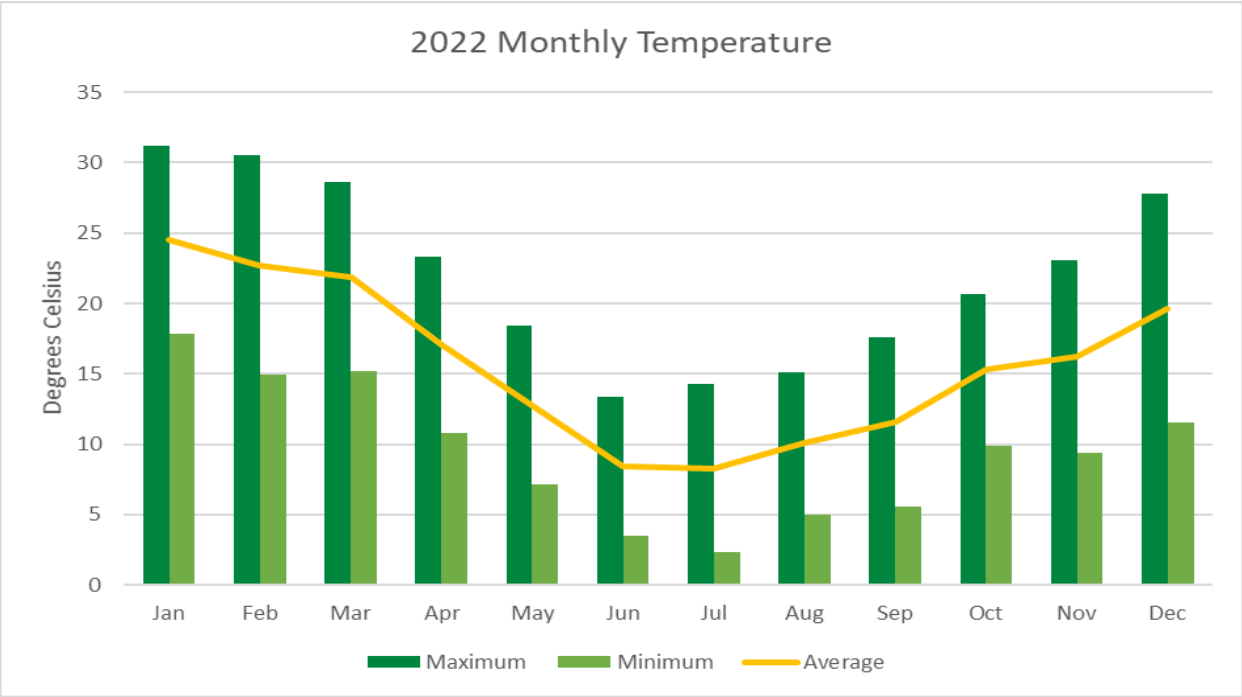


Figure 6 Monthly temperature averages for period

6.2.2 Rainfall

The total onsite rainfall recorded at the MET monitoring station for the period was 1,008.4mm. The rainfall received during the reporting period was 421.2mm above the long-term average for the region (587.2mm). A comparison of 2022 rainfall to long-term averages for Parkes is shown in Figure 7 below.

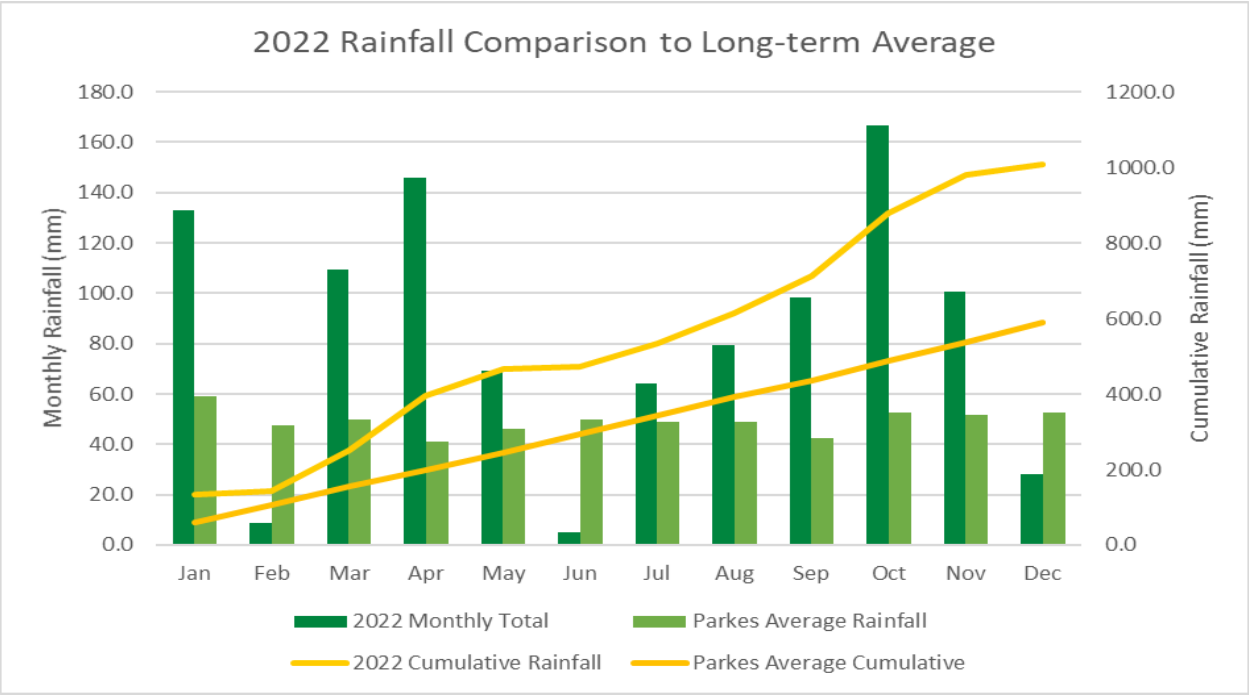


Figure 7 Comparison of 2022 rainfall to long term average for Parkes.

6.2.3 Wind

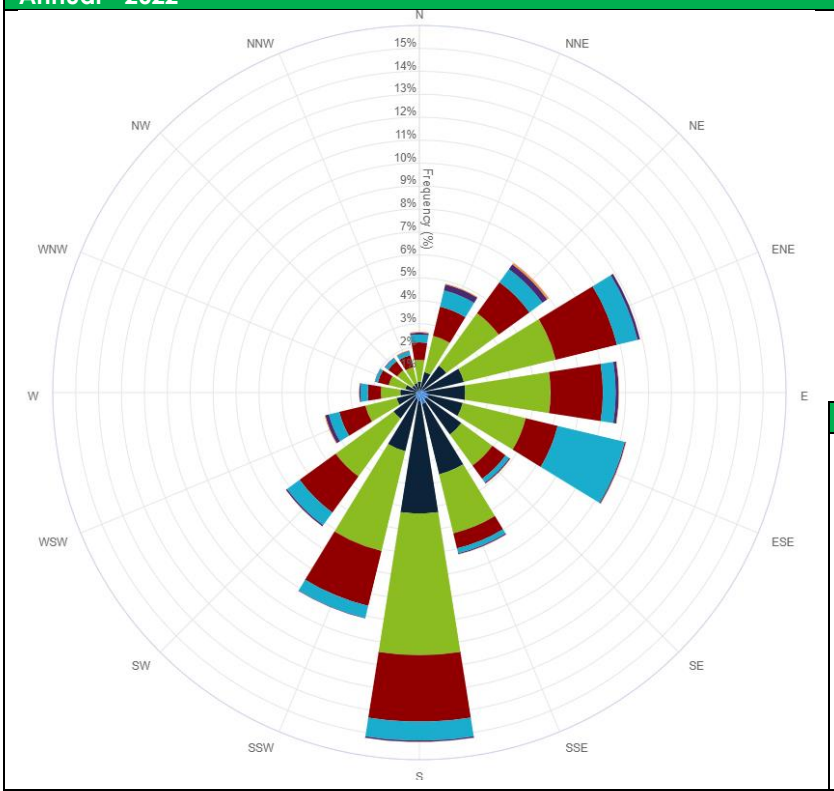
Wind speed and direction are important parameters for the preparation of blasting activities, investigating noise and dust events, and assessing cumulative impacts as a result of other operations in the region. Wind data for the 2022 reporting period are presented in Table 11 and the wind roses provided in Figure 8. Wind speed values are displayed as metres per second.

Table 11 Monthly wind direction percentages for 2022

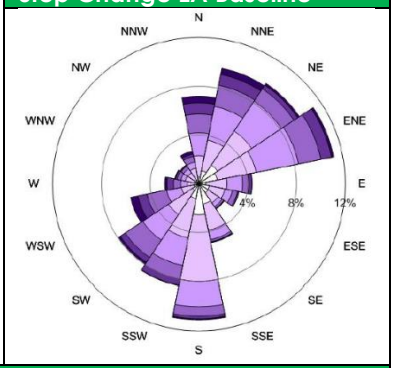
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	%
N (337.6° - 22.5°)	8	7	3	2	2	3	5	11	5	7	10	12	**6**
NE (22.6° - 67.5°)	26	15	10	5	5	11	9	21	17	16	20	23	**15**
E (67.6° - 112.5°)	26	24	20	31	23	10	10	11	11	28	10	14	**18**
SE (112.6° - 157.5°)	14	16	14	20	16	9	9	5	7	8	5	9	**11**
S (157.6° - 202.5°)	16	19	42	31	35	26	48	21	27	18	13	13	**25**
SW (202.6° - 247.5°)	4	12	7	6	13	31	15	16	19	10	24	17	**15**
W (247.6° - 292.5°)	3	4	2	3	4	6	2	7	8	10	14	6	**6**
NW (292.6° - 337.5°)	3	3	2	2	2	4	2	8	6	3	4	6	**4**

Analysis of data reveals that prevailing winds during the 2022 reporting period were largely in line with that recorded for the Step Change Environmental Assessment (EA), Umwelt 2013. Prevailing winds for the period were typically received from the south, south south-west or east north-east. Average wind speeds were generally consistent through the year recording 3.14m/s in H1 and 3.42m/s in H2.

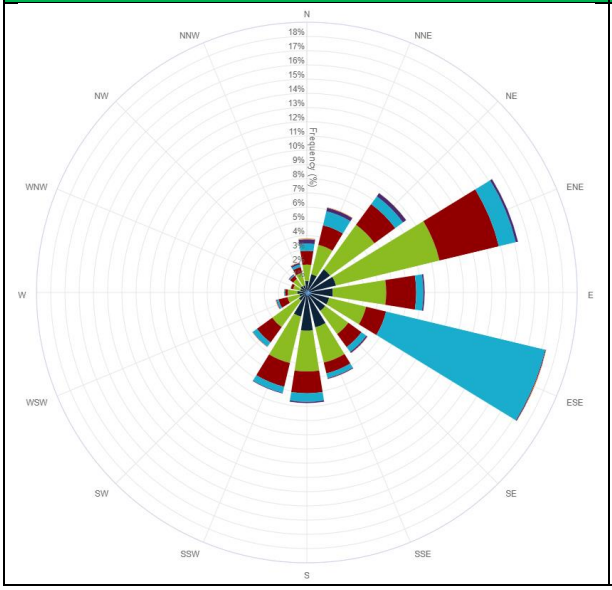
Annual - 2022



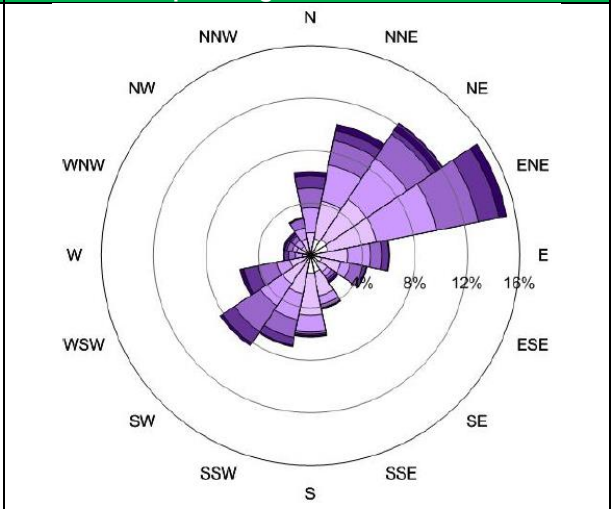
Step Change EA Baseline



Summer - 2022



Summer - Step Change EA Baseline



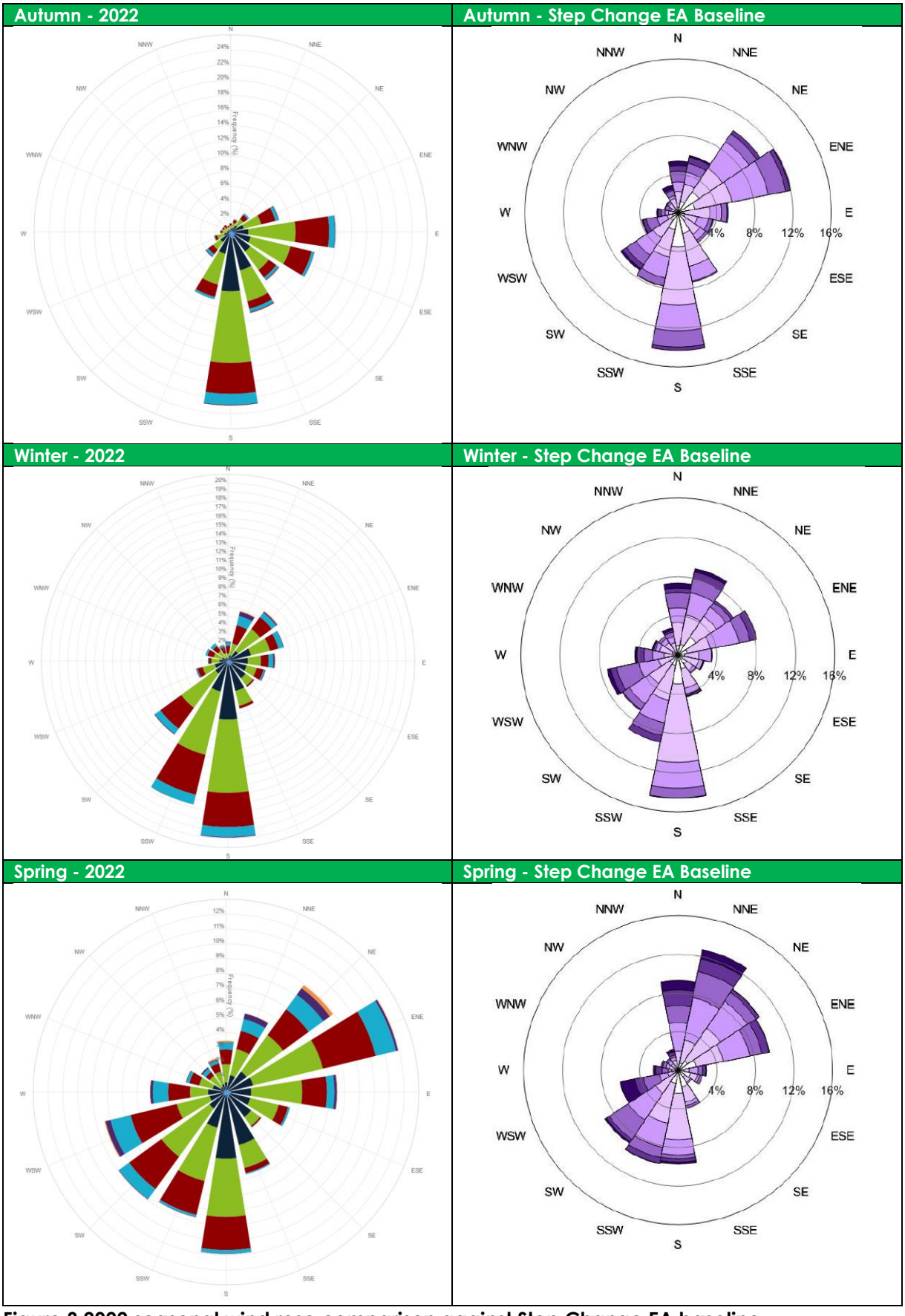


Figure 8 2022 seasonal wind rose comparison against Step Change EA baseline

6.2.4 Meteorology Improvements and Initiatives

Building on the work completed during the 2019 reporting period, CMOC continued to implement and refine the environmental database at Northparkes. This included ongoing utilisation of real-time meteorological data and weather forecasting to guide the implementation of reactive and proactive mitigation measures. A weekly weather assessment is undertaken to evaluate the potential risk for fugitive dust generation, with mitigative measures implemented where required.

6.3 Air Quality

6.3.1 Air Quality Management

Air quality management is undertaken in accordance with the approved Air Quality Management Plan (AQMP). The AQMP outlines mitigation measures, required monitoring and provides clear definitions of the roles and responsibilities related to air quality and greenhouse gas management.

Through implementation of the AQMP, Northparkes executes a range of mitigation measures for air quality that have proven to be effective at managing dust impacts, demonstrated by maintaining compliance. These mitigation measures will continue to be implemented throughout 2023. During the 2022 reporting period, mitigation measures included, but were not limited to, the following:

- Major works scheduled to undergo a risk assessment prior to commencing work
- Environmental inductions and training to ensure workforce awareness
- Purchase of equipment that meets relevant air emission standards
- Maintaining plant and machinery in good working order
- Maintaining haul roads in good condition
- Regular contact with local residents to notify of extraordinary weather events
- Weekly internal weather assessment and forecast predicting risk and controls
- Sealing high traffic roads, where possible
- Ripping of exposed areas, including TSF's
- Use of water carts on construction haul roads
- Scheduling of work with attention paid to adverse weather conditions and modifications made to the work program where necessary
- Implementation of best management practice to minimise the construction, operational and road air quality impacts of the operations
- A program of permanent air quality monitoring, including real-time, of site operations to determine whether the operations are complying with the criteria set out in the Consent.

Northparkes implements a comprehensive dust monitoring program to measure concentrations of particulate matter in the vicinity of the operations. During the 2022 period, Northparkes were granted approval to remove monitoring of depositional dust and total suspended particulates (TSP), and introduce $PM_{2.5}$ to the real-time monitoring network. A figure showing the current location of each air quality monitoring site is provided in Appendix 1.

PM_{10} measures the concentration of particulate matter less than 10 microns in diameter, utilising real-time Beta-Attenuation Monitoring (BAM). $PM_{2.5}$ data will be derived via a calculation based on recorded PM_{10} data. The calculation shall use the ratio of PM_{10} to $PM_{2.5}$ as recorded at the NSW DPE's Merriwa monitoring station (considered to be the most similar climatic conditions to Northparkes). The ratio is 1 (PM_{10}) : 0.35 ($PM_{2.5}$). Results from monitoring are discussed in Section 6.3.2.

Table 12 Air Quality Monitoring Sites

Site ID	Type	Units	Frequency
Milpose	PM10 (BAM) and PM2.5 (calculated)	µg/m3	Continuously
Hubberstone	PM10 (BAM) and PM2.5 (calculated)	µg/m3	Continuously
Hillview	PM10 (BAM) and PM2.5 (calculated)	µg/m3	Continuously

6.3.2 Air Quality Performance

All dust samples are collected by trained staff and analysed by NATA certified laboratories. This work is carried out in accordance with relevant statutory and industry code standards. Monitoring equipment is maintained in accordance with manufacturer's specifications.

During the reporting period dust lift-off from the TSFs was managed through the implementation of a variety of different strategies. These strategies included the:

- deposition of wet tailings on Estcourt TSF
- strategic ripping of TSF1 and Rosedale surfaces.

Native saltbush groundcover species have started to colonise across the TSF2 beach. These species are from planted tubestock, broadcasted seeds and natural germination, with succession occurring over the past few years, now providing generous ground cover to prevent the occurrence of tailings dust generation.

PM_{10}

PM10 monitoring results for the 'Hubberstone'(Figure 10 and Figure 11), 'Milpose' (Figure 12 and Figure 13)and 'Hillview' (Figure 14 and Figure 15) monitoring locations, for the reporting period are displayed below. The criteria for exceedances (as nominated in the Consent) is >30 µg/m^3 for the annual average and >50 µg/m^3 for a 24-hour monitoring period.

Monitoring results for the three locations were under the air quality criteria stated in the Consent, with all outliers removed. During the reporting period, there was one 24hr period at Hillview that recorded elevated particulate matter above the criteria stated in the Consent. This reading was internally investigated and found to be caused by a power surge at the monitoring location, resulting in an instrument malfunction. All other missing data is due to power supply issues, instrumentation error and periods corresponding the commissioning of new equipment.

During the month of November, airborne particulates were noted to be generated from Rosedale TSF and TSF1 during high wind events. Ripping of the tailings surface was instigated and provided immediate mitigation that effectively managed dust generation. Ripping is scheduled on a regular basis to ensure that facilities have minimal surface area that is likely to incur dust lift off. Figure 9 below shows ripping undertaken on the Rosedale TSF.

Figure 9 Ripping undertaken on Rosedale TSF for dust control

The annual average PM10 levels recorded at all monitoring locations are well below the predicted concentrations of the Step Change EA (~20 µg/m^3) and the Consent criteria, shown in Table 13 Annual average PM10 and PM2.5 results compared to predicted concentrations and the Consent criteria below.

Table 13 Annual average PM10 and PM2.5 results compared to predicted concentrations and the Consent criteria

Site ID	Annual Average PM_{10} (Outliers Omitted)	Predicted Air Quality (Step Change EA)	Development Consent 11_0060 Criteria
Milpose	9.1 µg/m3	23 µg/m3	25 µg/m3
Hubberstone	8.1 µg/m3	21 µg/m3	25 µg/m3
Hillview	7.0 µg/m3	Not modelled	25 µg/m3
Site ID	**Annual Average $PM_{2.5}$ (Outliers Omitted)**	**Predicted Air Quality (Step Change EA)**	**Development Consent 11_0060 Criteria**
Milpose	3.2 µg/m3	Not modelled	8 µg/m3
Hubberstone	2.8 µg/m3	Not modelled	8 µg/m3
Hillview	2.5 µg/m3	Not modelled	8 µg/m3

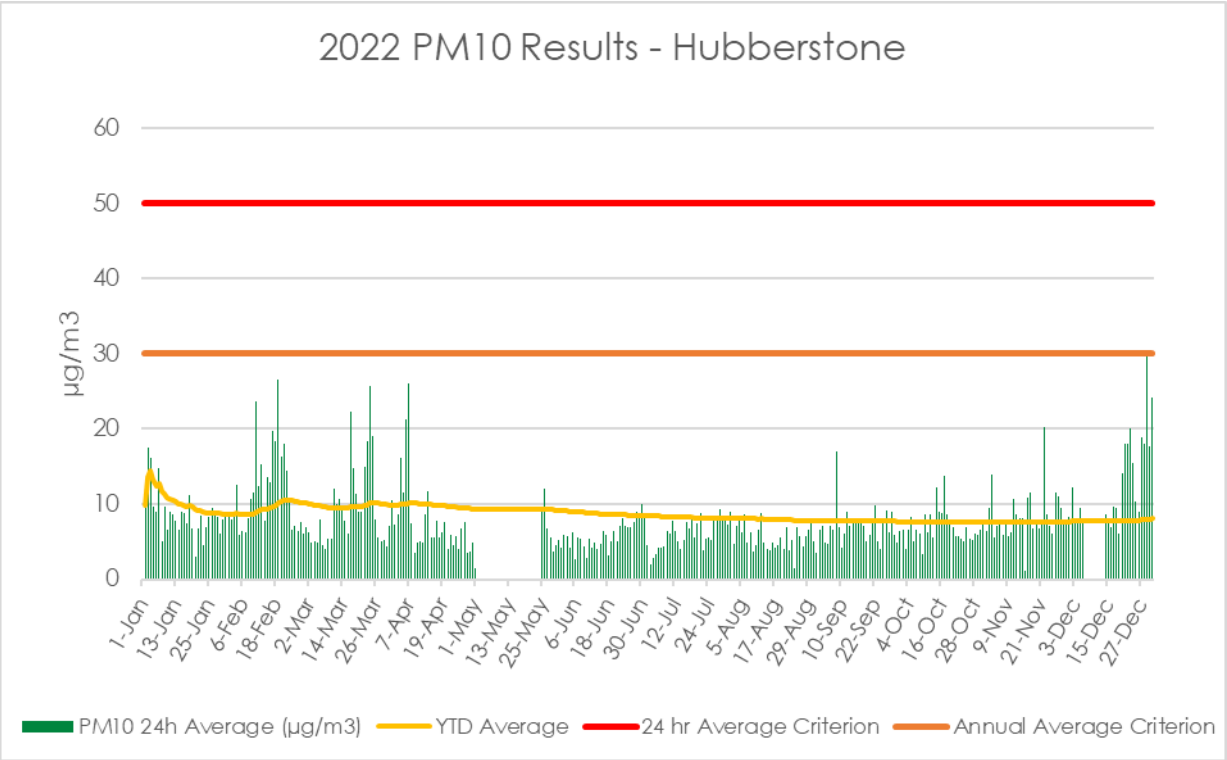


Figure 10 PM10 Monitoring results – Hubberstone

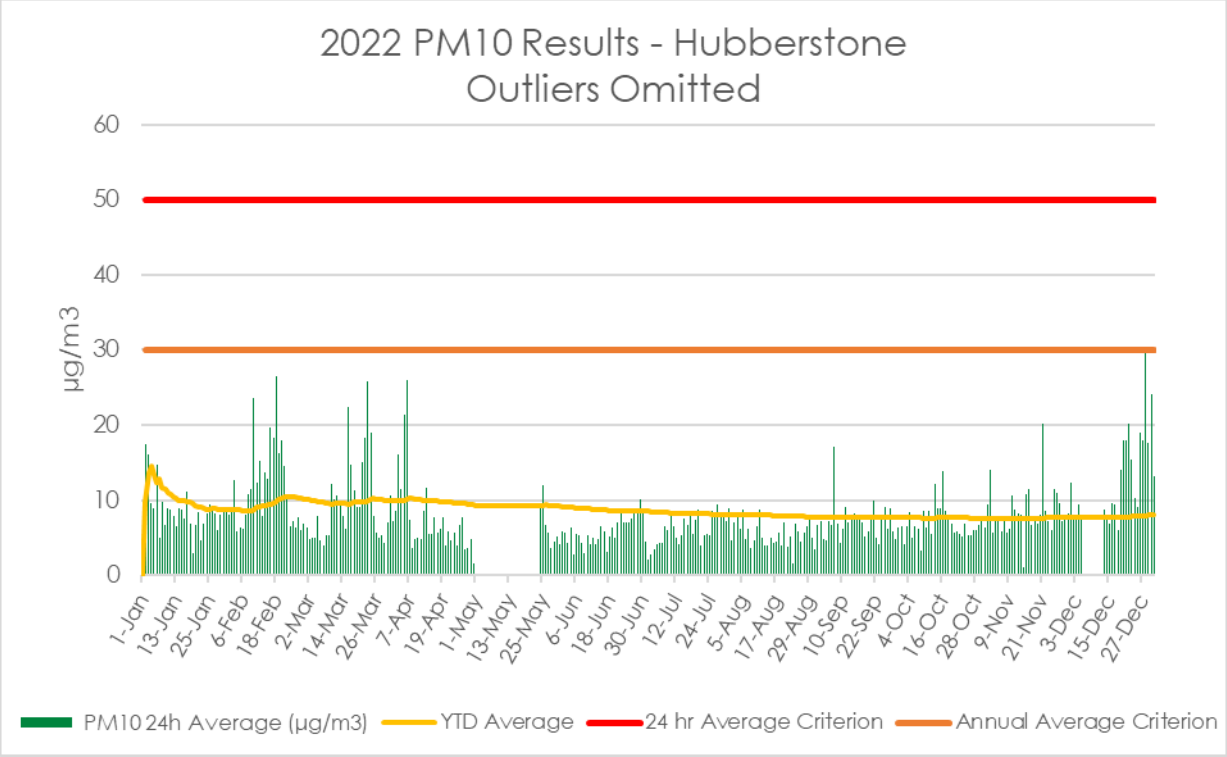


Figure 11 PM10 Monitoring results with outliers omitted - Hubberstone

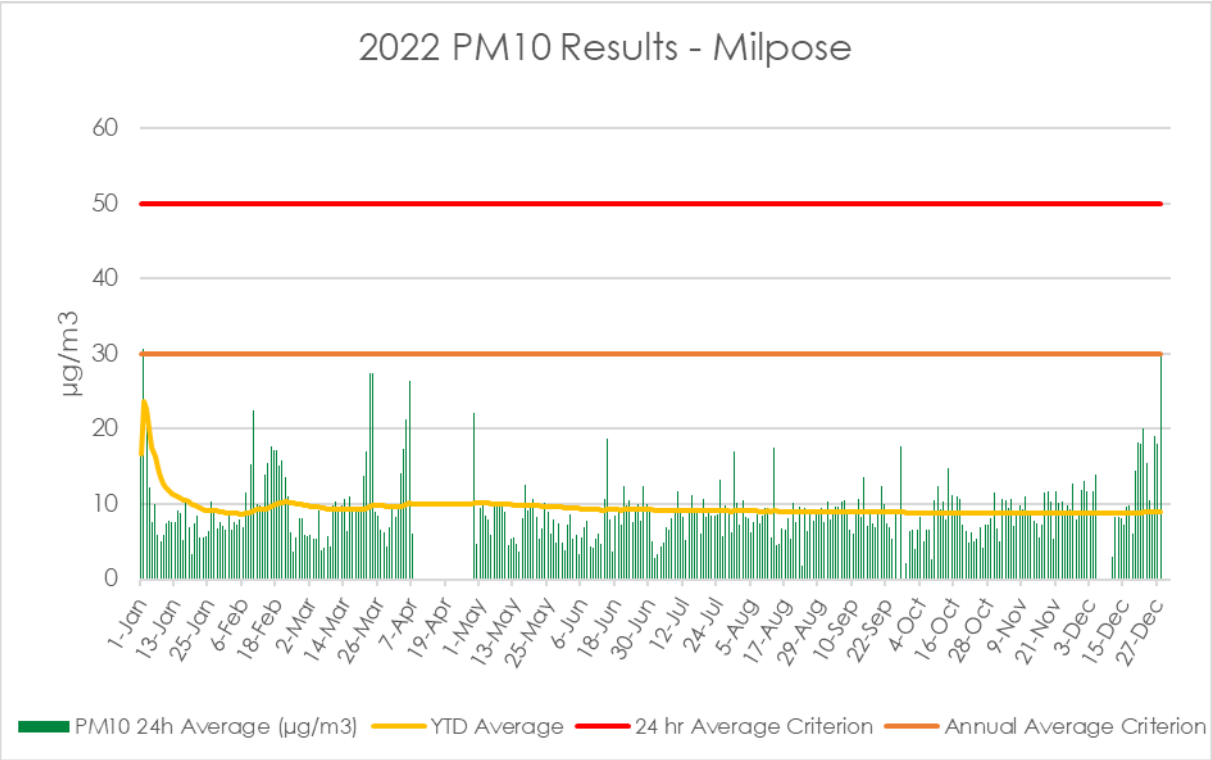


Figure 12 PM10 Monitoring Results – Milpose

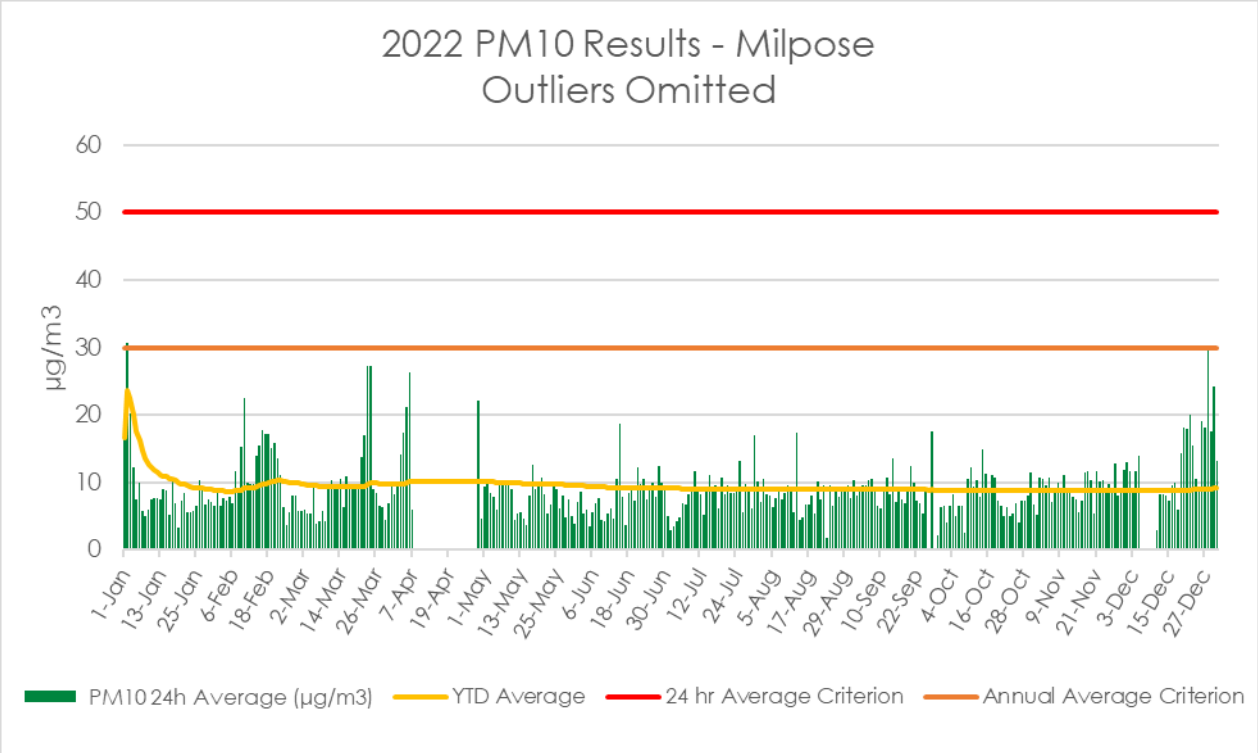


Figure 13 PM10 Monitoring results with outliers omitted – Milpose

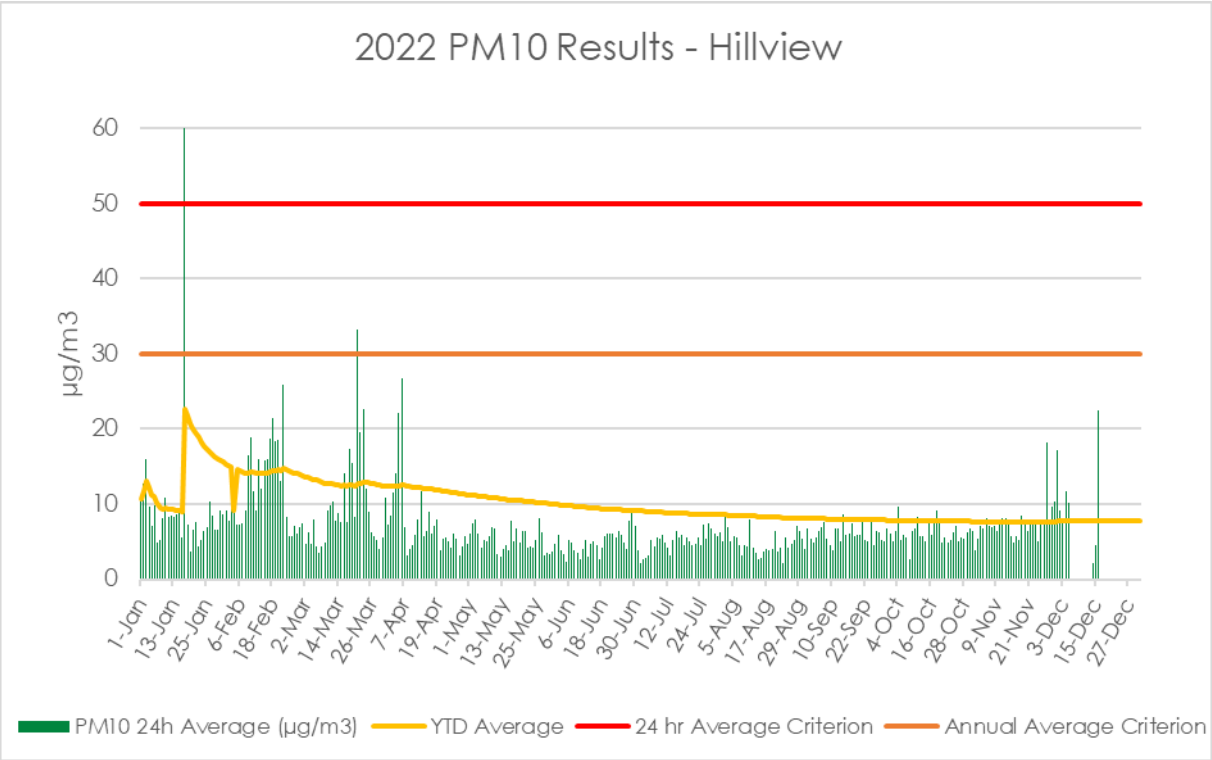


Figure 14 PM10 Monitoring Results – Hillview

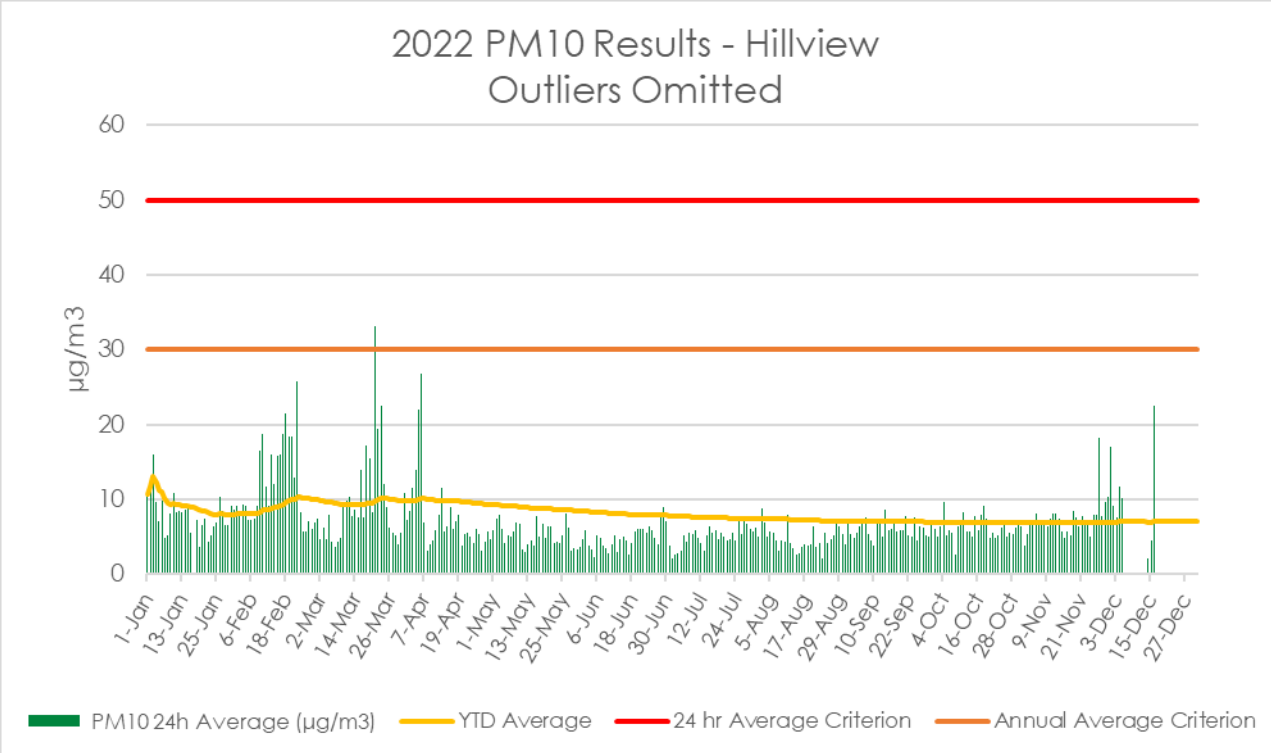


Figure 15 PM10 Monitoring results with outliers omitted – Hillview

Total Suspended Particulates (TSP)

TSP monitoring results for the 'Hubberstone' (Figure 16), 'Milpose' (Figure 17) and 'Hillview' (Figure 18) monitoring locations for the reporting period are displayed below. There were zero recorded elevated results during the period and annual average TSP dust levels recorded at all monitoring locations are well below the Consent criteria (90 µg/m³) and predicted concentrations within the Step Change EA (~50 µg/m³), shown in Table 14 below.

The missing data prior to November for Hubberstone, Milpose and Hillview in Figure 16, Figure 17 and Figure 18, respectively, were the result of power supply issues to the monitoring unit.

As part of the approved Modification 6 to the Development Consent, Northparkes removed TSP monitoring from the air quality network in November of 2022.

Table 14 Annual average TSP results compared against predicted concentrations and development consent criteria

Site ID	Annual Average – 2022 (Outliers Omitted)	Predicted Air Quality (Step Change EA)	Development Consent 11_0060 Criteria
Hubberstone	14.8 µg/m3	52 µg/m3	90 µg/m3
Milpose	18.8 µg/m3	53 µg/m3	90 µg/m3
Hillview	14.7 µg/m3	Not modelled	90 µg/m3

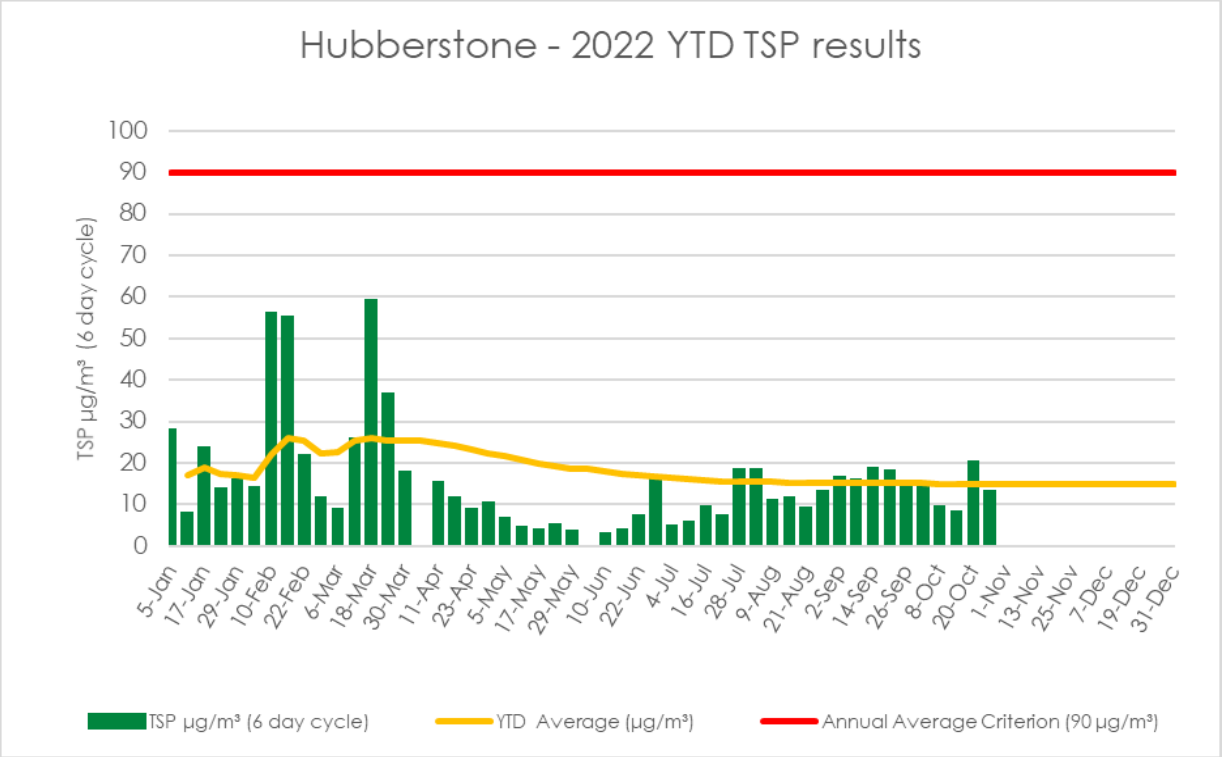


Figure 16 TSP Results for Hubberstone

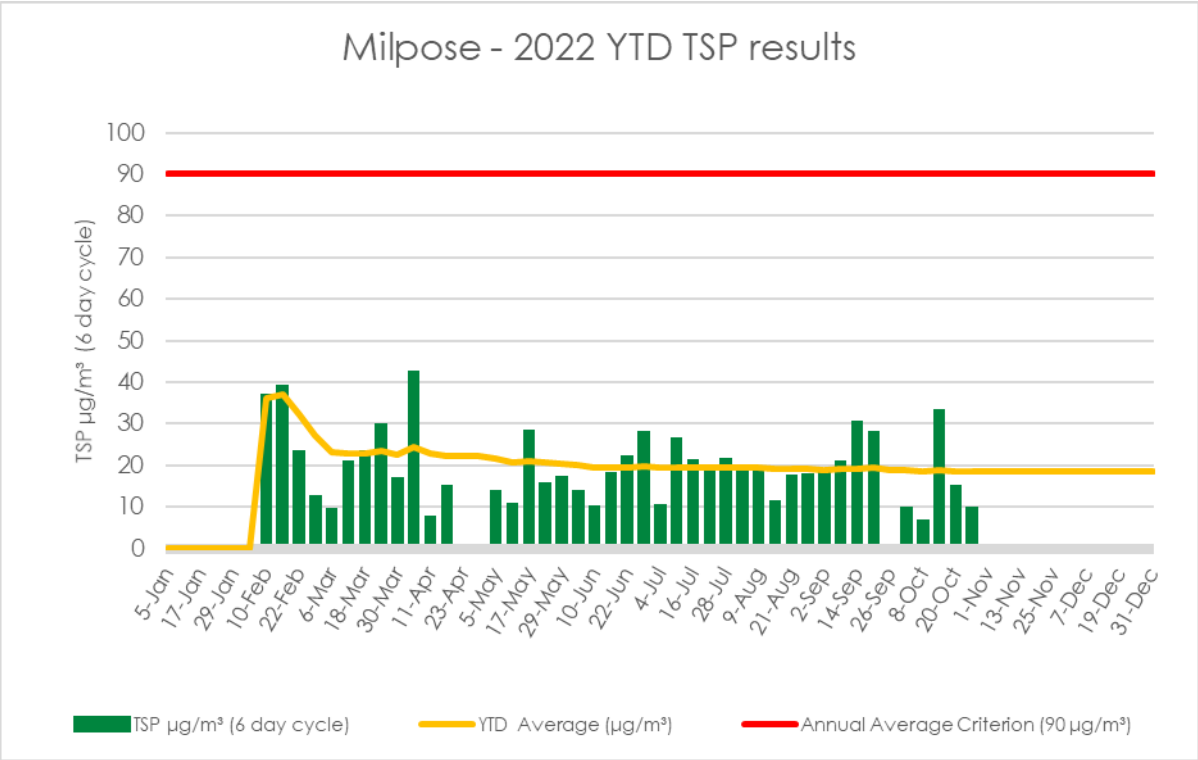


Figure 17 TSP Results for Milpose

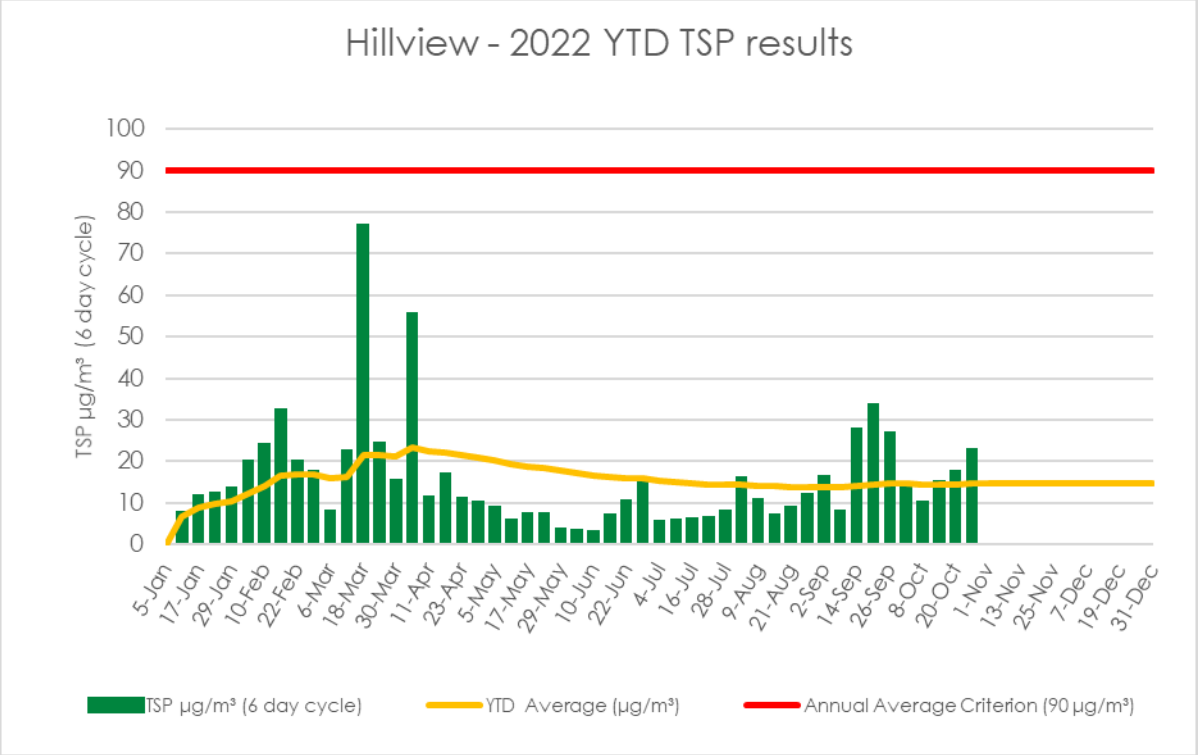


Figure 18 TSP Results for Hillview

Depositional Dust

Depositional dust samples were analysed by a NATA accredited laboratory to determine sample contamination by naturally occurring impurities. Figure 19 presents the annual average results following laboratory analysis of all eleven dust gauges. The results indicate that all reportable depositional dust gauges remained below the annual average criterion of 4.0 g/m2 /month for the 2021 period.

As part of the approved Modification 6 to the Development Consent, Northparkes removed depositional dust monitoring from the air quality network in November of 2022.

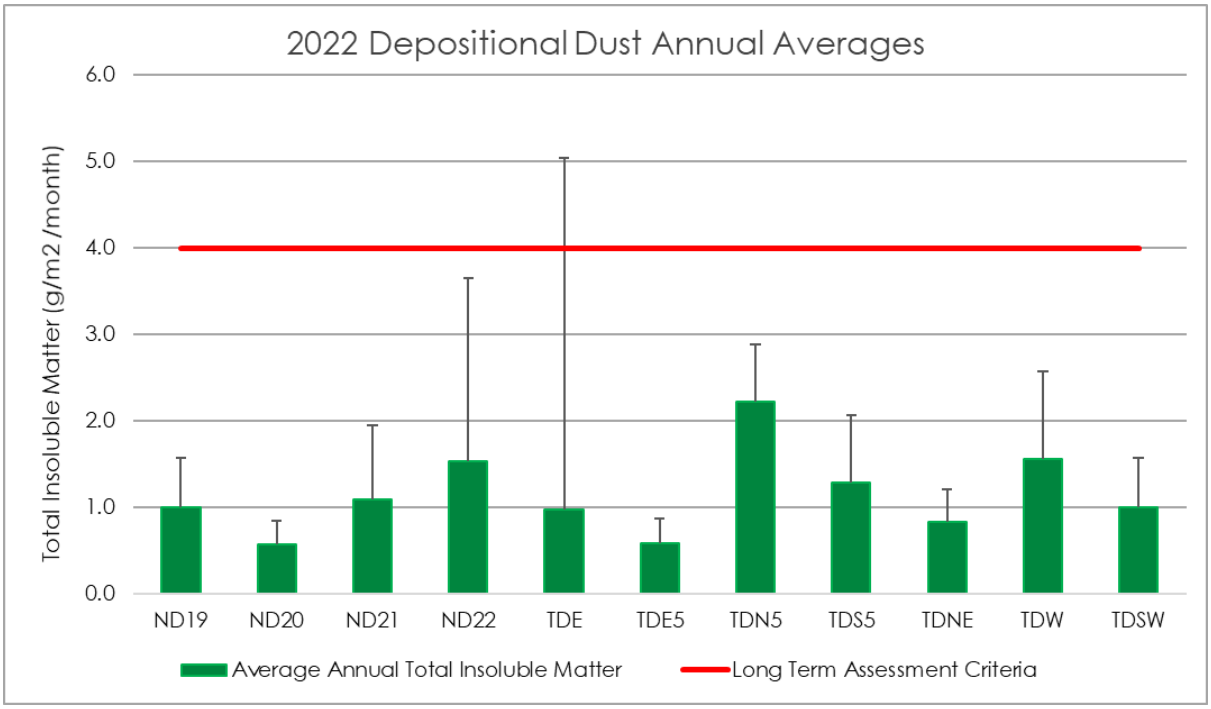


Figure 19 Depositional Dust Annual Averages

Table 15 Annual average TSP results compared against predicted concentrations and development consent criteria

Site ID	Annual Average – 2022 (Outliers Omitted)	Predicted Air Quality (Step Change EA)	Development Consent 11_0060 Criteria
ND19 (Hubberstone)	1.0 g/m2/month	2.8 g/m2/month	4.0 g/m2/month
ND20 (Avondale)	0.6 g/m2/month	2.9 g/m2/month	4.0 g/m2/month
ND21 (Lone Pine)	1.1 g/m2/month	2.8 g/m2/month	4.0 g/m2/month
ND22 (Milpose)	2.8 g/m2/month	2.9 g/m2/month	4.0 g/m2/month
TDE	2.9 g/m2/month	n/a	n/a
TDE5	0.6 g/m2/month	n/a	n/a
TDN5	2.2 g/m2/month	n/a	n/a
TDS5	1.3 g/m2/month	n/a	n/a
TDNE	0.8 g/m2/month	n/a	n/a
TDW	1.6 g/m2/month	n/a	n/a
TDSW	1.0 g/m2/month	n/a	n/a

Depositional dust systems are often subject to contamination by naturally occurring impurities such as bird droppings, insects and vegetation or regularly impacted by local extraneous sources (such as farming activities, local dirt roads or large dust storms following lengthy drought periods). On five separate occasions over the reporting period, samples were deemed contaminated and removed from the data as outliers. Each reportable elevated result exceeding internal trigger levels is subject to an investigation. These investigations determined that all high readings were the result of localised agricultural activities (sowing, harvesting and livestock management).

All dust gauge results, with outliers removed, remain well below the predicted concentrations in the Step Change EA and criteria of the Consent, shown in Table 15 above. Between 2013 and 2015, the rolling annual average of all gauges was on an upward trend. During 2015, the trend stabilised and then began trending downwards during 2016. Depositional dust levels during the 2018 and 2019 periods reported upward trends as a result of increasing drought conditions. During January and February of 2020, drought conditions were still heavily impacting recorded dust levels before widespread rainfall prompted results to return to that in line of long-term historical data. Results continued to trend downwards from 2021 as above average rainfall maintained significant quantities of groundcover and soil moisture.

6.3.3 Air Quality Improvements and Initiatives

Although Northparkes will not be continuing with monitoring for depositional dust in 2023, we will look to employ several additional strategies for air quality impacts, these include:

- Investigating alternate sowing opportunities on inactive tailings facilities to provide ground cover and to reduce risk of dust lift off
- Rip the tailings surface areas where there is actual or predicted dust risk due to wind and
- Alternate tailings material deposition between the active TSFs, reducing dust risk.

6.4 Noise

6.4.1 Noise Management

Operational noise is managed in accordance with the approved Noise Management Plan (NMP). The NMP covers all operational activities with the potential to generate noise at Northparkes. It details specific noise management and mitigation measures, outlines monitoring and reporting requirements and provides clear definition of the roles and responsibilities for noise management.

Control measures for the management of noise during construction, operation and decommissioning are essential in minimising noise impacts. The three main strategies used to identify reasonable and feasible noise control/mitigation strategies are:

- Controlling noise at the source
- Controlling the transmission of noise and
- Controlling noise at the receiver.

Noise control measures at Northparkes are designed to comply with the Consent and the requirements of the *NSW Noise Policy for Industry (2017)*.

Operational control measures include:

- Major scheduled works undergo a risk assessment prior to commencing work
- Environmental inductions and training to ensure workforce awareness
- Purchase of equipment that meets relevant noise emission standards
- Maintaining plant and machinery in good working order
- Maintaining haul roads in good condition
- Operating equipment in a manner that will minimise noise emissions

- Regular contact with local residents
- Modifications to surface ventilation fans
- Scheduling of work with attention paid to adverse weather conditions, particularly at night, and modifications made to the work program where necessary
- Implementation of best management practice to minimise the construction, operational and road noise of the operations
- A program of regular noise monitoring of site operations to determine whether the operations are complying with the criteria set out in the Consent. This monitoring will be undertaken as attended and real-time noise monitoring at surrounding receivers over the life of the mine
- Additional targeted noise monitoring during construction activities, and whilst open cut mining operations occur during winter night-time operations if required. This targeted monitoring program will include the use of real time monitoring and be undertaken to identify situations when meteorological conditions have the potential to exacerbate noise impact on neighbouring receivers. Appropriate noise mitigation measures will be implemented as required, and
- Northparkes has a private agreement in place with the owners of 'Avondale' for the property to not be included in the monitoring program while it remains unoccupied.

6.4.2 Noise Performance

Northparkes undertakes a noise monitoring program at five locations on privately owned properties outside the mining leases. The program consists of operator-attended monitoring at five of the nearest occupied residences, 'Hubberstone', 'Milpose', 'Lone Pine', 'Hillview' and 'Adavale', and unattended real-time monitoring at four of these locations, excluding Adavale (see Appendix 1).

Noise measurements are undertaken in accordance with the requirements of the Consent, *AS 1055*, and the *NSW Noise Policy for Industry, 2017*. Northparkes engaged acoustic specialists to undertake attended noise monitoring on a quarterly basis at locations defined in the NMP to adequately assess the noise impacts related to Northparkes operations. All acoustic instrumentation is designed to comply with the requirements of *AS 1259.2* and carries current NATA or manufacturer calibration certificates.

Temperature inversions, when they occur, have the ability to increase noise levels by focusing sound waves. Temperature inversions occur predominantly at night during the winter months but can also occur as a result of low cloud cover. They are generally determined based on the occurrence of atmospheric stability classes, with moderate and strong inversions corresponding to atmospheric stability categories F and G respectively.

A total of 188 fifteen-minute LAeq attended noise surveys were undertaken during the reporting period. Of which, 180 (96%) were during favourable meteorological conditions, as stipulated in the Consent. The surveys undertaken during unfavourable meteorological conditions were excluded from assessment. The reason for this being that the assessment was undertaken during stability class of F or G. These are shown in Table 16 below.

Unattended noise monitoring was conducted continuously over the year at each monitoring location. This data was used to assess background ambient noise levels and do not have an applicable exceedance criterion.

A summary of the attended noise monitoring results is provided in Table 16. This includes all quarterly monitoring conducted in 2022.

Table 16 Summary of Attended Noise Monitoring Results

Location		Day	Evening	Night	
		L_{Aeq}(15min)	L_{Aeq}(15min)	L_{Aeq}(15min)	L_{A1}(1min)
	Criteria dB (A)	**35**	**35**	**35**	**45**
Hubberstone	8-10 Feb	^	*^	*^	<40
	3-4 May	^	^	*^	<40
	26-27 Jul	<30	~<30	<35	<40
	22-23 Nov	32	*~<35	32	<45
Predicted Noise Impact (EA)		19	32		n/a
Lone Pine	8-10 Feb	^	^	*^	<40
	3-4 May	^	^	*^	<40
	26-27 Jul	^	^	^	<40
	22-23 Nov	^	^	^	<40
Predicted Noise Impact (EA)		17	31		n/a
Milpose	8-10 Feb	<35	^	*^	<40
	3-4 May	^	~30	<30	<40
	26-27 Jul	^	^	^	<40
	22-23 Nov	^	^	^	<40
Predicted Noise Impact (EA)		19	19		n/a
Hillview	8-10 Feb	^	^	<25	<40
	3-4 May	^	30	*31	<45
	26-27 Jul	^	^	~<30	<40
	22-23 Nov	~<30	^	~<30	<40
Predicted Noise Impact (EA)		20	20		n/a
Adavale	8-10 Feb	27	~<25	~<25	<40
	3-4 May	^	~<30	~<30	<40
	26-27 Jul	^	^	^	<40
	22-23 Nov	^	^	^	<40
Predicted Noise Impact (EA)		21	34		n/a

Note: Measurements represent total mine contribution by excluding impact noise from extraneous sources such as wind noise and fauna. As LA^1 results are not adjustable, this measurement is not representative of noise produced by the mine and should be disregarded. Results indicating a * have been recorded during a stability class of F or G and are not a true representation of the mine noise contribution.
^ Northparkes Inaudible.
~ Northparkes Slightly Audible
≠ Not measurable
Predicted evening / night impact levels selected based on most significant impact of the two scenarios in the MOD 4 noise assessment.

Noise levels assessed as part of the monitoring program were within all operational noise criteria. They were also within the noise levels predicted in the Modification 4 Expansion Noise Assessment (Umwelt, 2018), and did not exceed the sleep disturbance limit at night despite the frequency and impact of temperature inversion conditions. During most attended monitoring surveys at all locations, operators noted that Northparkes operations were inaudible or only slightly audible. Monitoring events noting noise contributions from the project, and were above the predicted impact levels in the EA, are explained below:

- Hubberstone Q4 (32dB LAeq) – it was noted that the site was barely, to just audible, throughout all measurements, noting the main contribution to a water pump near the boundary of the mining lease. Pumping activities are periodic although there was a significant increase during 2022 as a result of above average rainfall conditions.
- Hillview Q2 (30dB LAeq) – the general mine processing hum was noted during the evening period, ranging from just audible to audible. Light winds from the northwest during stability class E likely concentrated the noise from the operation during this period, recording a measurement above that predicted in the EA.
- Adavale Q1 (27dB LAeq) – throughout the day measurements, the E48 ventilation fan was noted to range from barely audible to audible. The general mine hum was also noted to be barely audible throughout all measurements. The mine noise was inaudible during the three following assessments in 2022.

Northparkes was successful in achieving the long-term intrusive noise goals during the 2022 reporting period.

All attended monitoring reports for the reporting period are available on the Northparkes webpage at: http://www.northparkes.com/news/#publications

6.4.3 Noise Improvements and Initiatives

Northparkes will continue to implement the operational controls in the approved NMP including its quarterly attended noise monitoring program to remain compliant with the approved limits.

Northparkes has begun conversations with the immediate neighbours to inform and discuss 24-hour open pit mining that will commence in 2023. Suitable controls will be investigated and implemented as far as practical and feasible.

To identify periods of increased noise risk during surface mining, Northparkes will investigate a predictive service to forecast times when specific activities are likely to have increased impact on the surrounding community. Specific controls will be implemented during these periods to maintain our compliance with the noise criteria.

6.5 Blasting

6.5.1 Blasting Management

Northparkes operates an effective blast monitoring program to ensure that vibration and overpressure impacts are minimise at neighbouring residences and private infrastructure that surrounds the mine. Blast management is undertaken in accordance with the approved Blast Management Plan (BMP) and outline the mitigation measures, required monitoring, and provides clear definitions of the roles and responsibilities related to managing impacts of surface blasting. The vibration monitors have also assisted to demonstrate that underground draw bell blasting is within the Consent criteria.

Implementation of the BMP executes a range of mitigative measures to minimise annoyance in accordance with the conditions of the Consent. Blast operations also have specific management requirements regarding:

- Blast hours
- Frequency of blasts
- Road closures
- Fly rock removal and road maintenance
- Property inspections
- Reporting of exceedances and complaints

6.5.2 Blasting Performance

During the reporting period, Northparkes completed nine surface blasts at the E31 open pit. All events were successfully recorded at all monitoring locations and vibration impacts were well below the criteria detailed in the Consent. Overpressure results are also below the criteria in the Consent, though are heavily impacted by weather, most commonly wind and rain. Table 17 and Figure 20 below detail the vibration and overpressure results from each of the blast events.

Table 17 Vibration results for surface blasting of E31 pit

Location and Date	Adavale	Hillview	Hubberstone	Milpose
95% of Blasts Criteria (mm/s)	**5**	**5**	**5**	**5**
E31 - 25 Aug 22	0.02	0.07	0.05	0.02
E31 - 15 Sep 22	0.05	0.08	0.06	0.03
E31 - 29 Sep 22	0.03	0.07	0.05	0.03
E31 - 13 Oct 22	0.04	0.09	0.05	0.03
E31 - 27 Oct 22	0.05	0.07	0.06	0.03
E31 - 10 Nov 22	0.05	0.06	0.06	0.03
E31 - 24 Nov 22	0.04	0.06	0.04	0.03
E31 - 08 Dec 22	0.05	0.06	0.04	0.03
E31 - 15 Dec 22	0.03	0.06	0.03	0.03

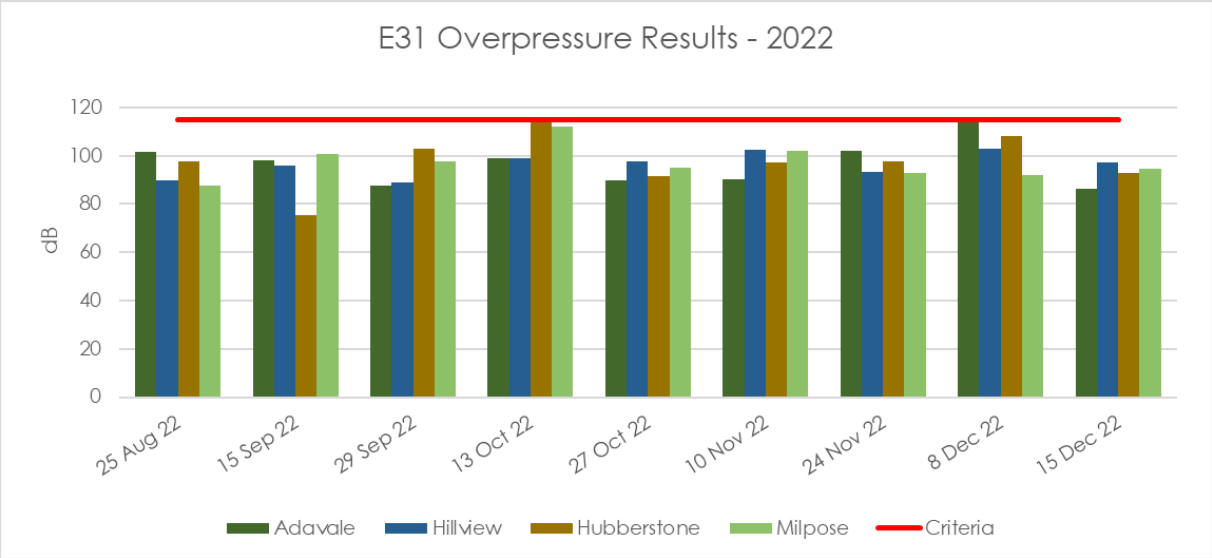


Figure 20 Overpressure results for surface blasting of E31 pit

All underground blasting activities remain well within the impact limits detailed in the Consent.

6.5.3 Blasting Improvements and Initiatives

Northparkes will continue to refine its blast management program during 2023 and look for any possible opportunities to further minimise the potential impact to surrounding residences.

6.6 Biodiversity and Ecology

6.6.1 *Biodiversity and Ecology Management*

Biodiversity impacts are managed in accordance with the approved Biodiversity Offset Management Plan (BOMP) and Vegetation Management Plan (VMP), collectively known as the Offset Management Documents (OMD). The OMD provides a framework for managing biodiversity values within the project boundary, Biodiversity Offset Areas (BOAs), and wider locality.

The OMD guides the implementation of offsetting commitments and manages potential risks to biodiversity as a result of operations at Northparkes. Specifically, the OMD aims to:

- Describe the measures (short, medium and long-term) to be implemented to manage remnant vegetation and habitat within the Project boundary and BOAs, including detailed performance and completion criteria
- Describes enhancement practices and procedures to be undertaken in accordance with commitments stipulated in the Voluntary Conservation Agreements (VCA) and BOMP
- Describe the practical management strategies to be implemented to:
    - manage impacts on flora and fauna
    - maximising salvage and beneficial use of resources in areas to be impacted for habitat enhancement
    - rehabilitate creeks, drainage lines and disturbed areas and
    - control weeds and pests.
- Ensure compliance with all legislative requirements, statutory approvals/licences and corporate responsibilities of Northparkes
- Describe biodiversity monitoring and reporting requirements and
- Provide details of the parties responsible for monitoring, reviewing, and implementing the OMD.

No impacts outside those predicted in the EA have occurred during the reporting period indicating the management strategies specified by the OMD implemented across the site are adequate to address potential impacts.

Northparkes has implemented a range of biodiversity monitoring activities since the commencement of operations, in addition to those studies completed for the EA.

Implementation of Kokoda VCA

During the reporting period, Northparkes continued to implement the active regeneration planting which was initiated in 2020. A total of 18,000 tubestock were installed in the previous two years, requiring a large-effort survey to determine survivorship and compliance with the conditions of the VCA. All 18,000 plants were surveyed and an overall survivorship of 81.72% was determined. The largest negative impact on plants across all cells was waterlogging and site inundation. Many inundated plants showed symptoms of hypoxia, yellowed, stunted and drooping leaves. Heavy fungal infestation was observed on some *Eucalyptus spp* individuals and a majority of *Brachychiton populneus*. The revegetation survey results indicate the Kokoda offset is seeing a high rate of successful plant establishment as well as displaying a vigorous natural regeneration from the existing seedbank and the resilient remnant bush. Figure 21 below shows the survivorship percentage for each of the planting cells.

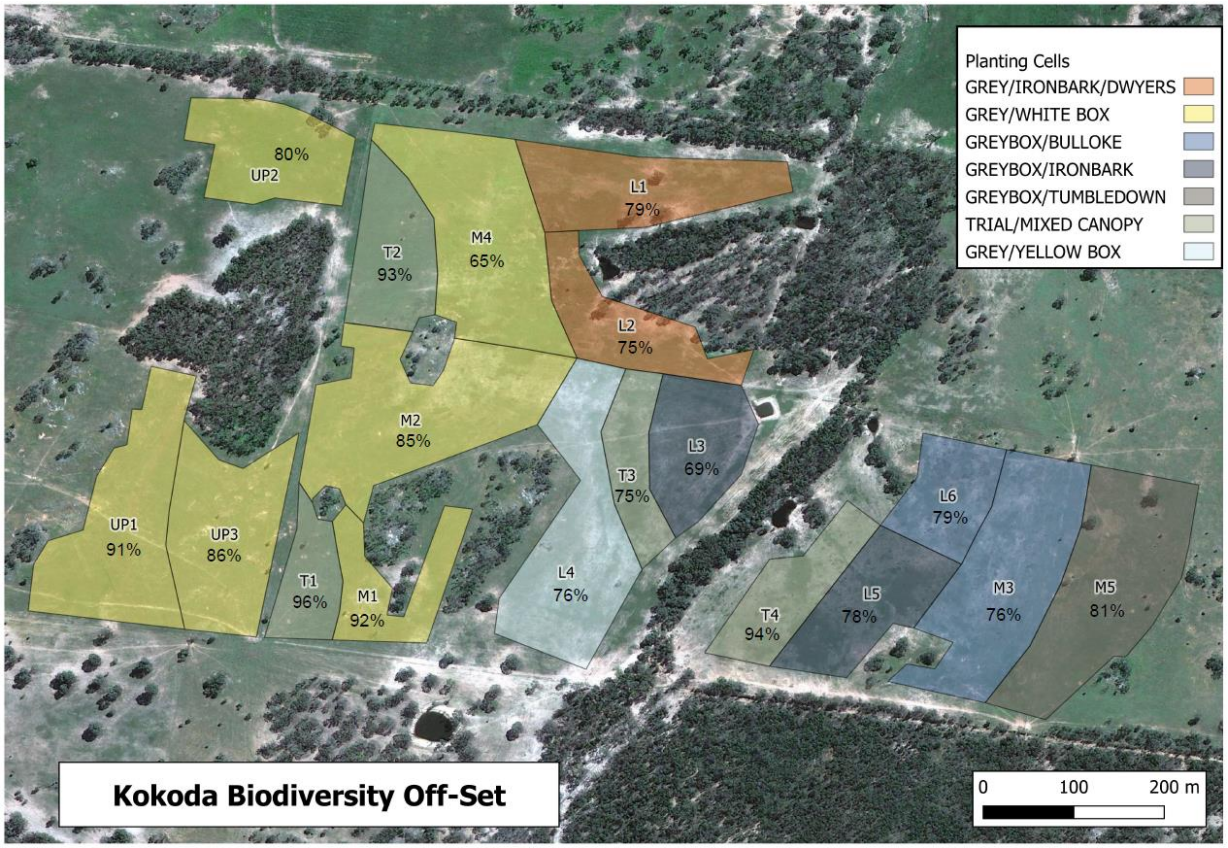


Figure 21 Survivorship of Kokoda planting cells

6.6.2 Biodiversity and Ecology Performance Monitoring

During the reporting period Northparkes engaged external consultants to undertake rehabilitation monitoring at Kokoda Biodiversity Offset. This program is guided by clearly defined, repeatable and consistent methodologies for monitoring changes in various aspects of ecosystem function, succession and long-term sustainability. The adopted monitoring methodology is a standard and simple procedure that can be easily replicated over any vegetation community or revegetation area. It includes a combination of Landscape Function Analysis (LFA) and flora diversity. For more details on rehabilitation monitoring undertaken in 2022, refer to the 2022 Kokoda Offset Monitoring Report, available via the Northparkes website at http://www.northparkes.com/news/#publications

Kokoda Ecological Monitoring

A range of ecological field surveys were undertaken across Kokoda in 2022. These included:

- Floristic data using plot-based surveys
- Landscape Function Analysis (LFA) monitoring
- Targeted bird surveys in winter and spring
- Monitoring of kangaroo numbers
- Biometric vegetation surveys and
- Qualitative biannual inspections for weeds, pests and maintenance.

Floristic Data Using Plot-Based Surveys

A total of seventeen 20 x 20 metre permanent flora sampling sites (plots) were assessed at Kokoda in 2022. The location of survey sites was selected to represent the different vegetation communities mapped by Umwelt in 2013 and were marked for ease of relocating for subsequent monitoring surveys (using a handheld global positioning system (GPS) and star pickets). Photographs were also taken at each site to help monitor changes over time.

During surveys, total floristic diversity was recorded in systematic increments within the monitoring plots, beginning at the start of the LFA vegetation transect in the 1 x 1 m sub-plot. Total shrub counts were made within the shaded 10 x 20 m subplots and mature tree counts and condition variables were made within the entire 20 x 20 m quadrat.

Floristic plot-based survey at Kokoda in 2022 recorded 198 plant species, comprised of 59 non-native (exotic) species and 139 native species. No threatened flora species were detected in the flora plots during field surveys. Refer to the 2022 Kokoda Offset Monitoring Report for full information and data.

A range of Key Performance Indicators (KPI's) were quantified by data obtained from replicated reference sites which were representative of the Grey Box Woodland CEEC and Dwyer's Red Gum woodland. All ecological performance indicators are quantified by range values measured from these reference sites which form both *upper* and *lower* KPI targets. The same ecological performance indicators are also measured in the revegetation/rehabilitation sites and these should equal or exceed these values, or at least demonstrate an increasing trend.

Table 18 below indicates the performance of the woodland revegetation monitoring sites against the proposed Primary Completion Performance Indicators. The selection of criteria has been presented in order of rehabilitation phases according to the ESG3 MOP guidelines. The range values of the ecological performance targets are amended annually. Revegetation sites meeting or exceeding the range values of their representative community type have been identified with a coloured box and have therefore been deemed to meet these primary completion performance targets this year. Hashed coloured boxes indicate they may be outside of the reference target ranges, but within acceptable agricultural limits.

The reference sites at Kokoda are typically degraded and of low quality which subsequently have provided low performance targets. In the Grey Box woodlands, there was limited abundance and diversity of the grassy understorey and there were limited shrubs. Subsequently the revegetation activities proposed should include a range of species known to occur within these communities and not just restricted to those occurring within the existing reference sites.

Landscape Function Analysis Monitoring

Landscape Function Analysis (LFA) monitoring was also undertaken at the seventeen permanent plots. LFA is a methodology used to assess key indicators of ecosystem function including landscape organisation and soil surface condition as measure of how well the landscape retains and uses vital resources. The indicators used quantify the utilisation of the vital landscape resources of water, topsoil, organic matter and perennial vegetation in space and time. Soil sampling was also undertaken at the plots.

Table 18 Performance of the Grey Box, Ironbark and Dwyers Red Gum woodland revegetation sites against primary completion performance indicators in 2022

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measurement (*desirable)	DReveg 1	DReveg 2	DReveg 3	DWoodLQ	GBReveg 1	GBReveg 2	GBReveg 3	GBReveg 4	GBReveg 5	WBWood 1	IronWood 1
Performance indicators are quantified by the range of values obtained from replicated reference sites					2022										
Phase 2: Landform establishment and stability	**Landform slope, gradient**	Landform suitable for final land use and generally compatible with surrounding topography	Slope	< Degrees (18°)	4	3	4	3	5	4	3	4	3	3	4
	Active erosion	Areas of active erosion are limited	No. Rills/Gullies	No.	0	0	0	0	0	0	0	0	0	0	0
Phase 3: Growth medium development	**Soil chemical, physical properties and amelioration**	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH (*5.6 - 7.3)	5.7	5.4	6.0	5.5	6.4	5.5	6.2	5.7	6.0	6.5	5.2
			Organic Matter	% (*>4.5)	2.9	2.8	3.5	5.7	2.6	4.4	3.8	3.1	3.3	4.8	4.6
			Phosphorous	ppm (*50)	3.6	4.6	3.9	7.9	3.6	3.9	4.6	1.6	3.6	4.9	2.6
Phase 4: Ecosystem & Land use Establishment	**Landscape Function Analysis (LFA): Landform stability and organisation**	Landform is stable and performing as it was designed to do	LFA Stability	%	74.0	76.6	76.5	70.3	75.5	74.5	74.9	76.0	75.5	72.5	71.0
			LFA Landscape organisation	%	100	96	100	100	100	100	100	99	100	100	100
	Vegetation diversity		Diversity of shrubs and juvenile trees	species/area	2	7	1	3	1	0	6	6	1	9	9

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measurement (*desirable)	DReveg 1	DReveg 2	DReveg 3	DWoodLQ	GBReveg 1	GBReveg 2	GBReveg 3	GBReveg 4	GBReveg 5	WBWood 1	IronWood 1
		Vegetation contains a diversity of species comparable to that of the local remnant vegetation		% endemic	100	100	100	100	100	0	100	100	100	100	100
			Exotic species richness	<No./area	15	17	26	23	24	15	21	19	24	23	5
	Shrubs and juvenile tree (<5cm dbh) density	Vegetation contains a density of shrubs and juvenile trees (<5cm dbh) comparable to the local remnant vegetation	Total density of endemic shrubs and/or juvenile trees	No./area	6	11	1	23	1	0	12	7	4	23	112
	Ecosystem composition	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Trees	No./area	1	1	1	2	1	0	2	3	1	4	5
			Shrubs	No./area	1	8	0	2	0	0	4	3	0	6	5
			Herbs	No./area	19	34	33	39	32	27	27	28	32	49	25
Phase 5: Ecosystem & Land use Sustainability	**Landscape Function Analysis (LFA): Landform function and ecological performance**	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	%	45.6	34.5	51.5	56.1	48.2	42.9	47.9	44.8	47.1	53.2	49.6

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measurement (*desirable)	DReveg 1	DReveg 2	DReveg 3	DWoodLQ	GBReveg 1	GBReveg 2	GBReveg 3	GBReveg 4	GBReveg 5	WBWood 1	IronWood 1
			LFA Nutrient recycling	%	46.2	37.8	50.1	55.5	48.7	45.1	47.9	44.0	47.4	52	48.5
	Protective ground cover	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Perennial plant cover (< 0.5m)	%	20	26	7	9.5	32	6.5	18	17.5	22	38	13
			Total Ground Cover	%	91	91	100	99	100	98.5	98.5	98	100	99	98
	Native ground cover abundance	Native ground cover abundance is comparable to that of the local remnant vegetation	Percent ground cover provided by native vegetation <0.5m tall	%	50.5	57.6	47.4	47.8	27	41.9	49.1	35.4	53.7	68.7	87.2
	Ecosystem growth and natural recruitment	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local remnant vegetation	shrubs and juvenile trees 0 - 0.5m in height	No./area	4	5	0	11	0	0	2	1	2	12	50
			shrubs and juvenile trees 1.5 - 2m in height	No./area	0	0	0	0	0	0	1	1	0	0	5

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measurement (*desirable)	DReveg 1	DReveg 2	DReveg 3	DWoodLQ	GBReveg 1	GBReveg 2	GBReveg 3	GBReveg 4	GBReveg 5	WBWood 1	IronWood 1
	Ecosystem structure	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	% cover	2	0	0	0	0	0	0	0	0	0	0
			Foliage cover >6m	% cover	0	0	0	20	0	0	0	0	0	43	12.5
	Tree diversity	Vegetation contains a diversity of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree diversity	%	100	0	0	100	0	0	0	0	0	100	100
	Tree and mature shrub (>5cm dbh) density	Vegetation contains a density of maturing tree and shrubs (>5cm dbh) species comparable to the local remnant vegetation	Total tree and mature shrub density	No./area	9	0	0	9	0	0	0	0	0	7	27
	Ecosystem health	The vegetation is in a condition comparable to that of the local remnant vegetation.	Live trees	% population	100	0	0	100	0	0	0	0	0	87.5	73
			Healthy trees	% population	100	0	0	0	0	0	0	0	0	12.5	0
			Flowers/fruit: Trees	% population	11	0	0	78	0	0	0	0	0	12.5	11

Targeted Bird Surveys

Targeted bird surveys were carried out at Kokoda in winter and spring 2022. Bird surveys were conducted at six sites across two days in winter and eleven sites across two days in spring. Surveys consisted of a two-hectare area search for 20 minutes in suitable habitat within Kokoda on each day.

All bird surveys undertaken at Kokoda in 2022 were undertaken by a suitably qualified ecologist. Winter bird surveys targeted the Regent Honeyeater and Swift Parrot, and spring bird surveys targeted the Superb Parrot and eastern subspecies of the Grey-crowned Babbler. During targeted bird surveys, all birds seen (using binoculars) or heard (using diagnostic calls) were recorded. Targeted bird surveys were undertaken twice at each survey site each time in the early morning when birds are most active and vocal to maximise detectability. Any opportunistic bird species identified during surveys were also recorded.

During targeted bird surveys, a total of 57 bird species were recorded during winter and a total of 61 bird species during spring. Four of those species were identified as threatened and/or migratory under the *Biodiversity Conservation Act 2016* and *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). These include:

- Superb parrot (Polytelis swainsonii) (EPBC: V/ BC: V)
- Grey-crowned babbler (eastern sub-species) (Pomatostomus temporalis) (BC-V)
- Brown Treecreeper (Climacteris picumnus victoriae) (BC-V)
- Speckled Warbler (Chthonicola sagittata) (BC-V)

Threatened species records appear consistent with previous years records. Overall, species diversity appears stable over the past few years. Species diversity was generally consistent between 2017 and 2020 prior to the drought with a slight increase in diversity between 2021 and 2022 due to increased rainfall. The grey-crowned babbler (centre) is a sedentary species therefore, these records are likely to indicate that populations of this species occur within Kokoda. However, the superb parrot (left) is a nomadic species and likely to only use the site for foraging during eucalypt flowering.

Figure 22 Superb Parrot, Grey-crowned babbler (eastern sub-species) & Speckled Warbler

Biometric Vegetation Surveys

Biometric vegetation surveys were undertaken at the Kokoda Biodiversity Offset Site in 2022 between the 17th and 29th of October to support Northparkes Voluntary Conservation Agreement (VCA). Results were found to be generally consistent with previous monitoring years. An increase in annual weeds was observed as a result of widespread rain during the reporting period. The VCA for Kokoda was submitted in 2017, as per the Northparkes project approvals and was signed by Northparkes and the Office of Environment and Heritage (OEH) Executives in February 2018.

Opportunistic Flora and Fauna Monitoring

Prior to the erection of the exclusion fence, a number of trial cameras were set up across Kokoda to opportunistically observe the range of potential feral animal species. The cameras were then again set up after the completion of the fencing to assess what species required ongoing management. Table 19 details the current presence of feral animal species from the trail cameras. Although the presence of cats have not been captured post fencing, it is possible they exist within offset area, but are yet to be photographed. Programs for the management of these feral pest species, mainly pigs and rabbits, will continue to be investigated during 2023.

Table 19 Presence of feral pest species

Feral Animal Species	Prior to Exclusion Fencing	Post Exclusion Fencing	2022
Rabbits	Yes	Yes	Yes
Cats	Yes	No	No
Dogs	No	No	No
Foxes	Yes	Yes	No
Pigs	Yes	Yes	Yes
Goats	Yes	No	No

Pine Donkey Orchid Population Monitoring

Field inspections of the two populations of the Pine Donkey Orchid (*Diuris tricolour*) (PDO) found within the Northparkes mining lease were carried out during October, which targeted emerging and effloresced plants to coincide with the species flowering period. The density of PDO individuals recorded at the two populations have varied significantly over the years, with the seasonal conditions, ground cover abundance, ease of identification and survey timing having a significant impact on the orchid populations. With above average rainfall again received in 2022, record numbers of individuals were recorded at both Adavale and Limestone sites, observing 780 and 1,491 respectively.

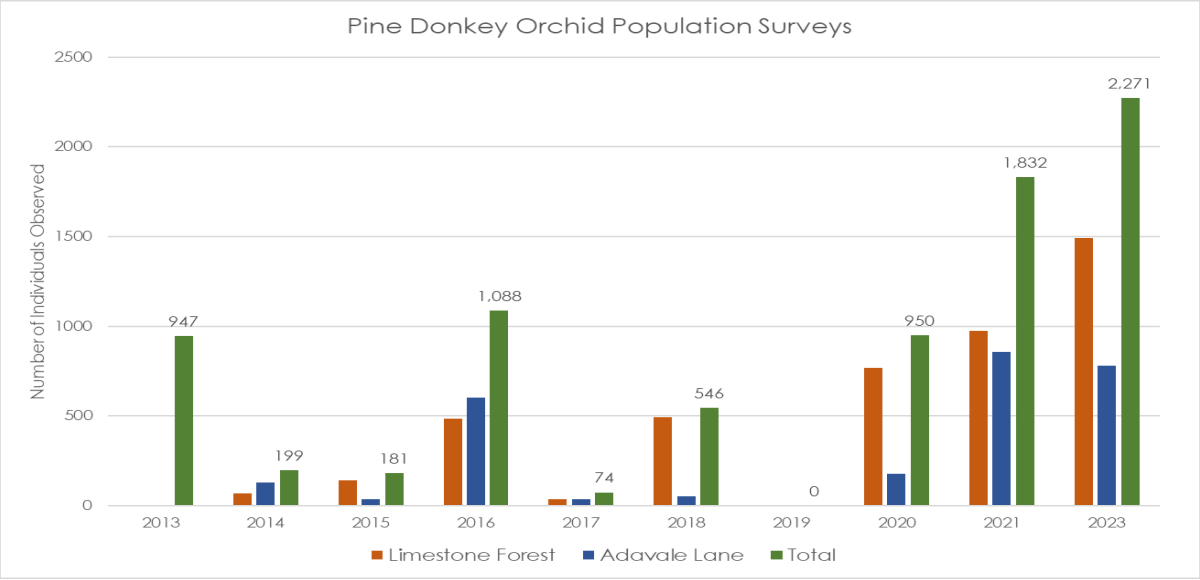


Figure 23 Number of Pine Donkey Orchids observed during surveys

Figure 24 Pine Donkey Orchid (*Diurus tricolour*)

6.6.3 *Land Category Mapping*

Category 1 and Category 2 land was mapped out within the Consent area in accordance with the *Local Lands Services Act 2013*. The mapping relied on aerial images to determine those areas that qualified as Category 1 due to being disturbed prior to 1990.

The assessment also clarified that those areas that were disturbed prior to 1990, however had since been planted with mid and overstorey vegetation by Northparkes, were still considered Category 1 as the plantings were not done so under any regulatory requirement.

The mapping of Category 1 and Category 2 will inform current and ongoing biodiversity assessments however ground truthing will occur to confirm the status.

6.6.4 *Biodiversity and Ecology Improvements and Initiatives*

Northparkes has implemented a comprehensive biodiversity management and monitoring program, which will continue through the next reporting period to consistently track and inform Northparkes' performance in meeting biodiversity objectives.

Under the direction of the Biodiversity Conservation Trust (BCT), Northparkes are to develop a thinning plan for the Callitris regeneration at the Estcourt Offset.

Additional fencing maintenance will also be investigated to reduce pest and feral species accessing farming and biodiversity properties.

6.7 Waste

6.7.1 *Waste Management*

The Consent, specifically Schedule 3 Condition 38, requires the following in regards to waste:

- Implement all reasonable and feasible measures to minimise waste generated by the Project
- Ensure waste generated by the Project is appropriately stored, handled and disposed of and
- Monitor and report on the effectiveness of waste minimisation and management measures in the Annual Review.

Northparkes Waste Management Plan covers aspects of waste management peripheral to mining activities, i.e. does not include production waste, such as coarse or fine reject. The Waste Management Plan was prepared in accordance with the objectives of the *Waste Avoidance and Resource Recovery Act 2007* and is based on the waste management hierarchy of avoid, reduce, reuse, recycle and dispose.

Waste management measures employed on site include:

- General waste from operations is disposed at an appropriate licensed waste management facility
- Recyclable wastes are collected for recycling at an appropriate facility
- Contaminated soil is collected and transported to the on-site bioremediation area for treatment and eventual on-site disposal
- Scrap metal materials are separated onsite and collected by a recycling contractor for off-site recycling
- All waste oils and greases are segregated and stored appropriately until collection by a licensed waste contractor for appropriate offsite recycling/disposal
- Waste chemicals (including solvents) are segregated, stored appropriately and transported offsite by a licensed waste contractor for appropriate disposal
- Contaminated areas are bunded and water is reused within the process water circuit and
- Clean water surface water/runoff is diverted around mine facilities (where feasible).

6.7.2 Waste Performance

Northparkes tracks operational waste disposal for all key waste streams. All waste streams are stored in appropriate containers prior to disposal at licenced facilities.

Operational waste collection statistics for the 2022 reporting period is summarised in Table 20.

Table 20 Summary of Waste Disposal

Waste Stream	Tonnes
Hazardous recycled: empty drums oil filters oily water waste grease waste oil dust suppressant/resin/glue and fluorescent tubes.	153.1
Hazardous disposal: hydraulic hose medical/sanitary waste oily rags and used absorbent	16.6
Non-Hazardous recycled: empty drums	51.9
Non-Hazardous disposal: mixed solid waste	367.2
Recycled metal	1,652
TOTAL	**2,240.8**

Northparkes and its contractors have continued to implement the waste management hierarchy. Wherever possible, waste materials are re-used on site in preference to direct disposal. Recycling of materials is also undertaken where possible to minimise waste. An example of reuse is the integration of an oil water separator at the wash bay, which minimises waste water and returns water to the water management system for re-use.

Northparkes contracts a third-party waste service to manage its waste from the premises. This has been successful as specialised waste streams can be more thoroughly investigated for opportunities and improvements.

Site induction packages include waste awareness and Northparkes has included waste best practice in employee and contractor HSE sessions. Environmental inspections were undertaken by Northparkes throughout the reporting period with observations and non-conformances communicated as necessary to relevant contractors.

6.7.3 Bioremediation Area

The bioremediation area was maintained and monitored during the reporting period, as listed in Table 21. Successful management of this bioremediation area has allowed for onsite treatment of contaminated material and subsequently reduced the need to transfer contaminated waste material offsite. The bioremediation area was active during the 2022 reporting period (refer to Table 21).

The materials retained in the bioremediation area were aerated as the bioremediation agent was applied. The material was tested in the 2021 reporting period for any residual hydrocarbons. The results of the sampling demonstrated that the material has been remediated and is suitable for onsite disposal. Once the bioremediation area is empty, the fresh material from the western surge dam cell will be transported to the bay and treated during the next reporting period.

Table 21 Summary of Bioremediation Activities

Initiated	Origin of Material	Description	Completion
2016	-	Construction of bioremediation area	2016
2016	Surge Dam 2	The treatment of approximately 15,000m^3 of material from the western surge dam with Micro-Blaze formulation	2017
2019	Surge Dam 1	The treatment of approximately 21,000m^3 of material from the eastern surge dam with Micro-Blaze formulation	2023
2023	Surge Dam 2	Treatment of approximately 20,000m^3 of material from the western surge dam will be completed in 2023	Not yet commenced

6.7.4 Waste Improvements and Initiatives

Consistent with the implementation of the waste management hierarchy, Northparkes and its waste contractor continue to look for ways to re-use waste materials onsite in preference to direct disposal.

6.8 Cultural Heritage

6.8.1 Cultural Heritage Management

The management, including identification, assessment and monitoring, of cultural heritage at Northparkes is undertaken in accordance with the Cultural Heritage Management Plan (CHMP).

The CHMP prescribes:

- The policies and practices for the preservation of sites during construction and operations
- Other facets of cultural heritage practices and conservation measures including salvage of sites as required and the practice of due diligence inspections
- Management of unanticipated Aboriginal objects and
- Other relevant cultural heritage considerations including consultation with the Aboriginal community.

Northparkes utilises a Site Disturbance Permit (SDP) approval system to manage the protection of heritage sites on the mining lease. This approval process applies to activities planned in undisturbed areas or previously rehabilitated areas. The area to be disturbed is compared to the Aboriginal cultural heritage sensitivity zones to determine the need for additional survey work or salvage work prior to starting the project.

6.8.2 Cultural Heritage Initiatives and Programs

In accordance with the CHMP, the Wiradjuri Executive Committee (WEC) met on a regular basis throughout the reporting period, with meetings held in February, June and September. The WEC is a consultation forum to enable appropriate review of the aboriginal heritage management practices at Northparkes and identify potential improvement opportunities from the community.

In the reporting period, there were no due diligence surveys undertaken across Northparkes holdings.

Works and initiatives undertaken by the WEC in the reporting period included:

- Feedback on selection of Northparkes Indigenous Scholarship recipients and encouragement of Indigenous employment.
- Review of the planned modifications to the operations and therefore regulatory approvals
- Input into the rehabilitation planning process
- Planning to develop a cultural heritage training program for Northparkes leaders
- Work plans relating to education, community engagement, business development and employment and training
- Improve community engagement through volunteer opportunities and
- Undertake a review of the working Agreement between Northparkes and the WEC.

7. WATER MANAGEMENT

Water management at Northparkes is undertaken in accordance with approved management plans, prepared generally in accordance with the Consent. The Water Management Plan (WMP) acts as the overarching document to govern water management at Northparkes. Approved subordinate plans supporting the WMP include:

- Surface Water Management Plan (SWMP)
- Groundwater Management Plan (GWMP) and
- Site Water Balance (SWB) report.

7.1 Surface Water

7.1.1 Surface Water Management

Surface water is managed in accordance with the SWMP and associated water management plans which conform to the Consent, licenses and other regulatory requirements of Northparkes.

The primary objectives of water management at Northparkes is to manage dirty and contaminated catchment runoff, divert clean water around operational areas of the mine and to collect and store water for use on site to minimise the dependence on external water supplies. A critical component of the water management system is to maintain zero discharge of contaminated water into the surrounding environment.

The water management strategy includes the separation of clean, dirty and contaminated water, categorised as follows:

- **Clean water** includes surface runoff from areas not affected by mining operations and includes runoff from undisturbed areas and rehabilitated areas and water supplied by external sources. The clean water system includes diversion drains and farm dams (FD) surrounding the active mining areas in order to capture and divert clean water away from areas disturbed by mining operations.
- **Dirty water** includes sediment-laden runoff from disturbed areas, including rehabilitated waste rock stockpile areas, TSF embankments and surface infrastructure areas that are not associated with mineralized ore. Runoff from these areas is collected in sediment ponds (SP) to allow sediment to fall out of suspension.
- **Contaminated water** includes water associated with mining, ore processing and tailings storage. Any potentially contaminated water is managed within retention ponds (RP), the Caloola Dams, E22 pit, surge dams and the process water dam to avoid discharge into surrounding watercourses and to maximise water reuse.

In accordance with the Consent, Northparkes maintains a Surface Water Balance (SWB) for effective management of water resources. The SWB details water use, water demand and water management, as well as the sources and security of water supply, including contingency for future reporting periods.

The following subsections describe surface water monitoring and environmental performance.

Surface Water Monitoring Program

Water quality monitoring is undertaken at Northparkes specifically within the three defined water management systems mentioned above.

Th table below lists each monitoring location and their corresponding water management system.

Table 22 Surface Water Quality Monitoring Location Catchments

Clean water management system	Dirty water management system	Contaminated water management system
Upstream WC4. WC6, WC7, WC13, W14 **Downstream** WC1, WC2, WC3, WC5, WC11 WC12, WC15, WC16 **Farm Dams** FD04, FD05, FD06, FD07, FD11, FD12, FD16, FD18, FD25, FD26, FD27	SP03, SP10, SP15, SP33	RP01, RP02, RP03, RP04, RP05, RP06, RP07, RP08, RP09, RP12 RP13, RP15, RP16, RP19, RP20, RP21, RP22, RP23, RP24, RP25, RP26, RP27, RP28, RP32, Process Water Dam, Surge Dam 1 and 2, Caloola Storages

The monitoring locations of watercourses and surface water storages are provided in Appendix 2. Table 23 identifies the specific analytical suites undertaken for each of the different water management systems.

The monitoring of watercourse stability is required to manage the potential impact on the watercourse as a result to changes in the watercourses hydraulic operation. As part of the water quality monitoring of watercourses, visual assessments are conducted to determine any visible instabilities. Records are made, including comments regarding bed and bank condition. Photographs may also be taken to provide a record on the status of the watercourse.

Table 23 Surface water monitoring program

Monitoring Locations	Frequency	Analytical Suite
Watercourses (clean water systems)	Quarterly	pH, EC, TSS, TDS, Cu, Na, K, Ca, Mg, Cl, SO_4, HCO_3, CO_3
Farm Dams (clean water systems)	Quarterly	pH, EC, TSS, TDS, Cu, NA, K, Ca, Mg, Cl, SO_4, HCO_3, CO_3
Sediment Ponds (dirty water management system)	Quarterly	pH, EC, TSS, TDS, Cu, NA, K, Ca, Mg, Cl, SO_4, HCO_3, CO_3
Retention Ponds and Process water system (contaminated water management system)	Quarterly	pH, EC, Cu
	Annual	pH, EC, TSS, TDS, Na, K, Ca, Mg, Cl, SO_4, HCO_3, CO_3, Al, As, Ba, Be, Cd, Co, Cu, Cr, Mo, Mn, Ni, Pb, Se, Th, U, Zn

Table 24 Watercourse stability monitoring program

Location	Frequency	Assessment Requirements
WC01, WC02, WC03, WC04, WC05, WC06, WC07, WC11, WC12, WC13, WC14, WC15, WC16	Quarterly, additional sampling following heavy rainfall events.	Visual assessment of channel form, presence of instabilities in watercourse banks or in crossing structure (bridge/culvert).

Northparkes uses a handheld multi-parameter water quality probe (pH, EC, temperature). All water quality samples requiring lab analysis are collected by a suitably qualified employee and sent to a NATA accredited laboratory for processing.

The existing monitoring program is subject to periodic review and as such will evolve with the continual development of Northparkes water management system.

Surface Water Quality Criteria

Surface water quality criteria use a two-stage water quality trigger system based on the statistical analysis of the existing available water quality data. Current water management plan Stage 1 and Stage 2 trigger values as well as livestock water quality guidelines were taken into consideration when developing and updating the site water quality trigger levels. The current trigger levels for surface water quality sites are detailed in Appendix C of the approved WMP.

7.1.2 Surface Water Performance

There were no non-compliances related to surface water management recorded during the reporting period. All storages show trends that are generally within historical ranges of all parameters. All quarterly monitoring events were carried out successfully and within the scheduled period.

Surface Water Quality

Samples were able to be taken at all locations during the monitoring period. Widespread rain through the remainder of the year enabled routine sampling to be undertaken. Due to the nature of the ephemeral streams, water courses were not also flowing or had insufficient water at time of sampling throughout the monitoring period. WC02, WC03, WC11, WC14 were sampled for most of the monitoring events although were not able to have all samples collected during the period. FD12 was also dry for most of the period.

Watercourses

Watercourses recorded results in line with long-term data. Electrical conductivity and dissolved copper did not fluctuate although pH decreased slightly across all locations. All results were below internal trigger values. WC02 recorded an electrical conductivity reading above the trigger level in Q4 and will be subject to close monitoring in the next reporting period.

Farm Dams

Farm dam results for all parameters remained in line with historical data with the exception of FD18 recording elevated electrical conductivity. Three of the four sampling events recorded values slightly above the internal trigger values. This location will be monitored closely for change during the next reporting period.

Retention Ponds

Process water monitoring locations (retention ponds) fluctuated throughout the year although still remain within long-term historical data across pH, electrical conductivity and dissolved copper. RP20 was the only location to record an elevated reading above the internal trigger values during the reporting period. The electrical conductivity at this location returned to be in-line with the long-term historic data for the remaining sampling events.

Sediment Ponds

Sediment pond locations recorded pH, electrical conductivity and dissolved copper results in line with long-term historical data and well below the internal trigger values.

Northparkes will continue to monitor and assess local water courses to ensure there are no detrimental mine related impacts to the local environment.

The monitoring results were predominantly in line with or below historical data and representative of the regional freshwater quality characteristics. The monitoring results are available in Appendix 2.

7.1.3 Surface Water Improvements and Initiatives

During the reporting period, Northparkes maintained its compliance with all water criteria detailed in the Consent. Above average rainfall conditions received across the operation put increased pressure on the water management system and pumping infrastructure. Small improvements were achieved to maximise efficiencies and water recover during flood and heavy rainfall events.

Within the next reporting period there will be several initiatives regarding water management. Northparkes will work to streamline monitoring requirements and refine the site water model to reflect current and future operations.

7.2 Groundwater

7.2.1 Groundwater Management

Groundwater is managed in accordance with the approved GWMP. The GWMP provides a framework defining how Northparkes will assess, manage and mitigate impacts to the groundwater system. This particularly focuses on impacts to the shallow alluvial aquifer as a result of mining activities such as dewatering the open pit void and underground operations. The GWMP specifies impact assessment criteria and trigger levels to identify groundwater level and quality changes, and outlines Northparkes monitoring and reporting requirements for groundwater management.

Groundwater Monitoring Program

Northparkes groundwater monitoring program aims to identify any changes to the natural groundwater system as a result of mining operations and ensure compliance with the Consent. It focuses on potential impacts to environmental assets and groundwater users in the area surrounding Northparkes.

The monitoring program undertaken during the reporting period included:

- Quarterly monitoring of groundwater levels and
- Quarterly laboratory groundwater quality analysis.

During the reporting period the active groundwater monitoring network comprised 42 monitoring bores located across different geographical areas, including 12 surrounding the tailing storage facilities, 14 surrounding the open cut voids, 11 associated with the underground operations and five regional bores on neighbouring properties. Monitoring details for these bores are listed in Table 25 and Table 26 and their respective locations are shown in Appendix 2.

Table 25 Groundwater Monitoring networks

TSF Bores	Opencut Bores	Underground Bores	Regional
MB01, MB02, MB03, MB05, MB06B, W26, W27, W28, W29, W30, W31, W32	MB10, MB11, MB12, MB13, MB14, MB16, W14, W19, W20, W21, W22, W23, W24, W25	MB17, MB18, MB19, MB20, P101, P102, P103, P104, P139, P145, P149	Far Hilliers, Moss, Wright, Long Paddock, South Hilliers

Table 26 Groundwater monitoring program

Monitoring Locations	Frequency	Analytical Suite
TSF Bores, Open cut Bores, Underground Bores, Regional Bores	Quarterly	Water level, pH, EC, total dissolved solids, hydroxide alkalinity, carbonate alkalinity, bicarbonate alkalinity, total alkalinity, sulphate, chloride, calcium, magnesium, sodium, potassium, aluminium, antimony, arsenic, beryllium, barium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, zinc, nitrate, strontium, thallium, thorium, uranium, iron and mercury.

Groundwater Quality Criteria

Northparkes engaged an independent consultant to conduct a review of trigger levels for groundwater levels and quality. The review was conducted to assist in providing more relevant trigger levels for the groundwater monitoring network. The trigger levels were developed to assist in identifying and appropriately managing potential groundwater impacts based on historical monitoring data available from the groundwater monitoring network. Northparkes has developed groundwater levels and quality criteria for each bore where there is sufficient data available.

Each bore has been set with Stage 1 and 2 trigger levels which correspond to Appendix D of the WMP. Applying individual trigger levels to bores provides Northparkes with a more accurate and representative range of the groundwater levels and quality of the bores. This enables more accurate interpretation of the monitoring data with respects to the Northparkes operation. The trigger values were independently reviewed in 2020 with no changes made. No further changes were made in 2022. The trigger values for water level and quality for the groundwater monitoring sites are detailed in Appendix D of the WMP.

7.2.2 Groundwater Performance

There were no non-compliances related to groundwater management recorded during the reporting period. All bores show trends that are generally within historical ranges of all parameters. Quarterly monitoring events were carried out successfully and within the scheduled period. The TSF2 exclusion zone has been removed and monitoring of W14, W22, W23, W26, and W27 has resumed. However, MB16 has collapsed and is not able to be monitored.

Groundwater Quality

TSF Bores

The groundwater monitoring results were predominantly in-line with historical long-term data. The electrical conductivity of all bores remained in line with the previous reporting period and long-term averages. Electrical conductivity was recorded above the internal trigger levels at MB01 and MB03 during the period, though remain consistent with levels previously reported. Copper was also noted to be elevated at MB03 during multiple sampling events.

Open Cut Bores

Open cut monitoring bore MB11 was not sampled during the reporting period and hasn't been sampled since Q2 2016 due to it being dry. Likewise, foreign material at water level is preventing MB12 from being sampled (last sampled Q1 2018).

Electrical conductivity was recorded above the internal trigger values at several locations (MB13, MB14, W19, and W21) during the reporting period. All readings are largely in line with historic data with the exception of W21 that is displaying upwards trending results. Elevated copper results were also recorded at W22, W23 and W25 during Q2 and Q3. Results have since returned to levels below the internal trigger levels.

Underground Bores

All underground bores are generally in line with historical data and below internal trigger values. Several elevated readings above the internal trigger values were recorded during the period. Elevated copper levels at MB17, and increased electrical conductivity at MB19 and P139 were recorded during Q2 and Q3 respectively. All results have returned below the trigger levels and in line with long term historic data.

Regional Bores

Regional ground water quality remained similar to the previous reporting period and in-line with the long-term averages. Groundwater pH, copper concentration and electrical conductivity at each regional bore were generally consistent with previous monitoring periods. Copper was slightly elevated at Moss during Q1, and electrical conductivity was also above the internal trigger level at Wright in Q3. Both locations have returned below the trigger levels following the fluctuation.

The groundwater monitoring results were predominantly in-line with historical long-term average data, and consistent with the EA predictions. The monitoring results are presented in Appendix 2.

Groundwater Levels

Quarterly monitoring of groundwater levels are undertaken by suitably qualified Northparkes personnel in accordance with the approved GWMP. Throughout 2022, and over the last 10 years, groundwater levels have displayed a consistent upward trend at all monitoring bores, the cause of which is continuing to be investigated. Changes in rainfall over the past decade may also have effects on local water quality variability. Groundwater levels remained below internal trigger values set in the WMP.

7.2.3 Improvements and Initiatives

During the next reporting periods, Northparkes will also be commissioning a third party to analyse any long-term trending of the captured water data, and identify any concerns with impacts to groundwater quality and quantity. Suitable action plans will be developed accordingly.

7.3 Water Balance

Northparkes has implemented a water model to capture water inputs, outputs and throughputs. The GoldSim model is used to incorporate the latest production data and future demands.

Results of the model are incorporated in internal management decisions and are communicated internally to the leadership team on an annual basis.

In reviewing the mine water balance for the reporting period, the following is of note:

- A total rainfall of 1008mm was recorded at the onsite weather station during the reporting period. The rainfall received during the reporting period was 421mm above the long-term average for the region (587 mm),

- The volume of freshwater imported to site was less than previous reporting periods (2,998 in 2020 and 2,684 in 2021) as a result of increased rainfall. All water imported to site was from groundwater and surface water licence allocations owned by Northparkes or through a commercial arrangement with Parkes Shire Council, as shown in Table 29,
- Total water usage was slightly less than the previous reporting period (6,688 ML)
- Recycled water use increased slightly during the reporting period due to increased available stocks

Details of Northparkes water balance for the reporting period are outlined in the table below.

Table 27 Reporting period water balance

Water Balance	Total (ML)
Total Water Input from external sources	2,025
Recycled onsite water	4,563
Water Use	**6,588**

7.3.1 Surface Water Storage

Water is essential in the processing of ore through the concentrator to produce copper concentrate. Effective water management is therefore crucial to the long-term success of Northparkes operations. A summary of the major water storage volumes at the beginning of the five most recent reporting periods are provided in Table 28.

Table 28 Major Water Storages

Major Storage Volumes (ML)	01/01/2019	01/01/2020	01/01/2021	01/01/2022	01/01/2023
Caloola North	118	0	326	425	500
Caloola South	124	0	427	504	570
E22 Void	1,464	533	575	917	2,858
Process Water Dam (PWD)	172	132	180	190	166
RP09	50	10	60	60	50
Other Infrastructure	-	-	-	200	440
TOTAL	1,928	675	1,538	2,296	4,584

Water storage levels of all active sediment ponds, retention ponds and process water dams are monitored and recorded periodically. This allows for effective management of stored supplies in terms of consumption, avoidance of potential discharges and infrastructure planning.

Onsite water storages are heavily dictated by surface water inflows. Fluctuating rainfall adds further emphasis on the need to conserve, protect and recycle water resources. Northparkes continually look to optimise water use and investigate opportunities to operate more efficiently to manage water impact responsibly.

7.4 Water Supply

Northparkes sources water from numerous locations including imported water from various licences (see Table 4 Summary of LicencesTable 4 Summary of Licences

). Water recycled from the on-site ore processing facility and tailings dam reclamation system is collected through existing on-site infrastructure.

Effective water management is crucial to the long-term success of Northparkes operations as it is essential in the processing of ore through the concentrator to produce copper concentrate. The water management system aims to efficiently and economically collect, store and re-use water onsite to minimise external water supply inputs and supplement supply during periods of high consumption.

In accordance with its licences and the Consent, Northparkes:

- accesses groundwater from the Lachlan Alluvial Water Sources
- holds water entitlements for surface water extraction from the Lachlan River.
- can trade additional water to make up shortfalls or sell any excess water in a reporting period
- uses existing water entitlements to supplement demand.

The water supplied by Northparkes licenses for mining activities during the 2022 water reporting period is detailed in Table 29.

Table 29 Northparkes 2020/2021 Mine Water Entitlements and Use

Water Licence	Water sharing plan, source and management zone	Licenced Volume (ML)	Passive take/ inflows	Active Pumping	Total
WAL43208	Lachlan River Water Sharing Plan Lachlan River Regulated River Water Source (High Security)	1305	0	No	757.57
WAL43207	Lachlan River Water Sharing Plan Lachlan River Regulated River Water Source (General Security)	3463	0	No	0
WAL34955	Lachlan River, Water Sharing Plan NSW Murray Darling Basin Fractured Rock Groundwater Sources	232	<10	No	<10
WAL32138	Lachlan River, Water Sharing Plan Lachlan Unregulated and Alluvial Water Sources	1110	0	No	0
WAL32120		1050	0	Yes	151.14
WAL32004		1600	0	Yes	319.77
WAL31969		1728	0	No	0
WAL31963		700	0	No	0
WAL31930		600	0	No	0
WAL31863		534	0	No	0
WAL31850		500	0	No	0

Core water demand during the 2022 reporting period was for ore processing. Small quantities of water were also required for dust suppression, vehicle wash down and potable water uses. Table 30 outlines future estimated water volumes as described in the EA (Umwelt, 2013). Water demand predictions were initially provided in the EA and have remained unchanged through subsequent project modifications.

Table 30 Predicted Water Demand

Water Source	Current Approved Operations (ML)
External	4,350
Recycled	2,091
Surface Water Runoff	523
Groundwater	290
Total	7,254

8. REHABILITATION

Northparkes owns and manages approximately 10,500 ha of land within and surrounding the mine leases. This area supports a range of land uses including mining, exploration, crop production and habitat re-establishment.

Rehabilitation activities incorporate the entire landholding in order to enhance the regional landscape and native habitat values. The Rehabilitation Strategy is described in Sections 2.0 and 3.0 of Appendix 4 of the EA. The State and Federal approvals require rehabilitation to be consistent with the Rehabilitation Strategy (i.e. Schedule 3, Condition 39 of DC11_0060).

The Rehabilitation Management Plan (RMP) was prepared to guide the ongoing management of the sites progressive rehabilitation as to ensure that it is integrated with the surrounding Northparkes owned land and is managed with a view to enhancing the regional landscape and native habitats.

8.1 Post Mining Land Use

Northparkes is committed to developing a stable landform that is capable of supporting sustainable ecosystems and enables sustainable land use after the completion of mining operations at Northparkes.

The agreed final land use as stated in the MOD6 Consent includes the following:

- Agricultural land use
- Native vegetation and
- Restricted land use.

8.2 Landform Establishment

8.2.1 TSF1 Final Landform

During 2019, discharge of tailings using the central discharge method was undertaken to assist the final formation of TSF1. This method creates a self-draining final landform that assists with closure of the facility. The central discharge requires the discharge of tailings in thin layers to enable drying. As such, the tailings discharge will continue to occur over several years.

Deposition of tailings on TSF1 is on hold until the studies into increased height (Section 8.2.3Mine Contacts) or consolidation (Section 8.2.4) of TSFs is completed.

8.2.2 TSF2 East Embankment Buttress

The Eastern embankment of TSF2 is the only embankment that won't be covered by deposition into adjacent tailings facilities. Within 2021 and 2022 all of the TSF2 embankments were reshaped to improve the safety factor to current guidelines. The embankments were reshaped by pushing material from the upper section down to the lower section.

The East embankment of TSF2 was primarily reshaped in 2022, with some further landform establishment required in early 2023. The growth medium will be applied in 2023 once the landform is established.

8.2.3 Increased TSF Height Investigations

Investigations are planned for 2023 and 2024 to increase the heights of the current TSFs. Increased heights of TSFs reduces the need for new facilities and therefore reduces impacts. If the TSFs are increased in height, the final landforms will be modified.

8.2.4 Consolidated Northern TSF Investigations

With the construction of Infill TSF extension planned to start in 2023, deposition is likely to start in 2024. With the potential for increasing throughput rates, larger TSFs may be required. Instead of creating new TSFs in the future, the consolidation of TSF1, TSF2, Estcourt and Infill TSFs is being investigated. To deposit into a consolidated northern TSF, the final approved height will need be raised and the final landform altered.

8.2.5 Mining Void Tailings Investigations

In 2023 the filling of E31 and E31 open cut voids with tailings will be investigated. The primary focus for this study will be the groundwater investigations and modelling. The E31 and E31N in-pit tailings is essential for the future Rocklands TSF. Filling voids with tailings is a desired final landform as it reduces ongoing safety risks are reduces the requirement for creating further tailings facilities.

8.2.6 Tailings Construction Materials

To reduce ongoing final landform risks, Northparkes intends to use as much waste rock for TSF construction during operations. During the 2022 reporting period small scale trials of using cyclones to separate course and fine tailings particles were started. The intent is to use the course tailings particles as the construction material for the upstream, on beach, portion of the future lifts. As part of this investigation it is planned to assess the impact of final waste rock landforms and tailings landforms.

8.3 Growth Medium Development

Growth medium will be placed on the eastern embankment of TSF2 during the next reporting period. This material was sourced from the cover that was on the east embankment prior to it being reshaped. Additional volume was also sourced from the E31 mining area as part of the overburden stripping process.

8.4 Ecosystem Development and Establishment

8.4.1 E22 Waste Rock Batter

A small area on the western batter of the rehabilitated E22 waste rock emplacement had erosion repairs carried out in 2021. The area was reshaped, with erosion gutters and benches removed to create a consistent gradient (Figure 25). Growth medium was sourced immediately below the area from a rehabilitation stockpile that was against the Sediment Pond 3 embankment.

During 2022 a range of vegetation species established creating the early succession of the ecosystem. As expected, the percentage of common introduced vegetation species were higher than the adjacent undisturbed areas. The species composition will continue to be monitored by Northparkes staff.

Figure 25 E22 waste rock batter rehabilitation repairs from 2020 to 2023

8.5 Research and Rehabilitation Trials

8.5.1 TSF1 Trial Plots

Four trial plots of 20m x 20m have been within the southwest corner of TSF1, separated from active deposition, since 2008. Each plot has different levels and layers of cover over the tailings.

Table 31 TSF1 capping trial design specifications

Design	Plot A	Plot B	Plot C	Plot D
	No specific cover	Shallow cover	Shallow cover with capillary break	Standard cover
Topsoil [m]	0.1	0.1	0.1	0.1
Waste rock [m]	--	0.4	0.4	0.9
Capillary break [m]	--	--	0.3	--
Total trial depth [m]	0.1	0.5	0.8	1

Modelling of the water balance for various cover design scenarios showed that for the climatic conditions of Northparkes, the contribution of vegetation to extract moisture from the cover could greatly improve the performance (i.e. reduces the risk of deep drainage). The maximum depth from which upward water flow caused by evaporation has been derived from modelling is approximately 1.8 to 2m. This depth would ensure avoidance of surface salt accumulation. In case of shortcomings of topsoil or other fine textured material, upward flow from a saline subsurface layer can be interrupted by a capillary break layer, consisting of coarse competent rock, which would allow a reduction of the cover thickness.

Drone photos have been taken of the trial plots from 2019 onwards. These records assist to monitor the differences between groundcover percentage and indicate species diversity between each plot across the reporting years (Figure 26). Plot A continued to maintain the highest percentage of groundcover and higher contribution to cover from perennial grasses.

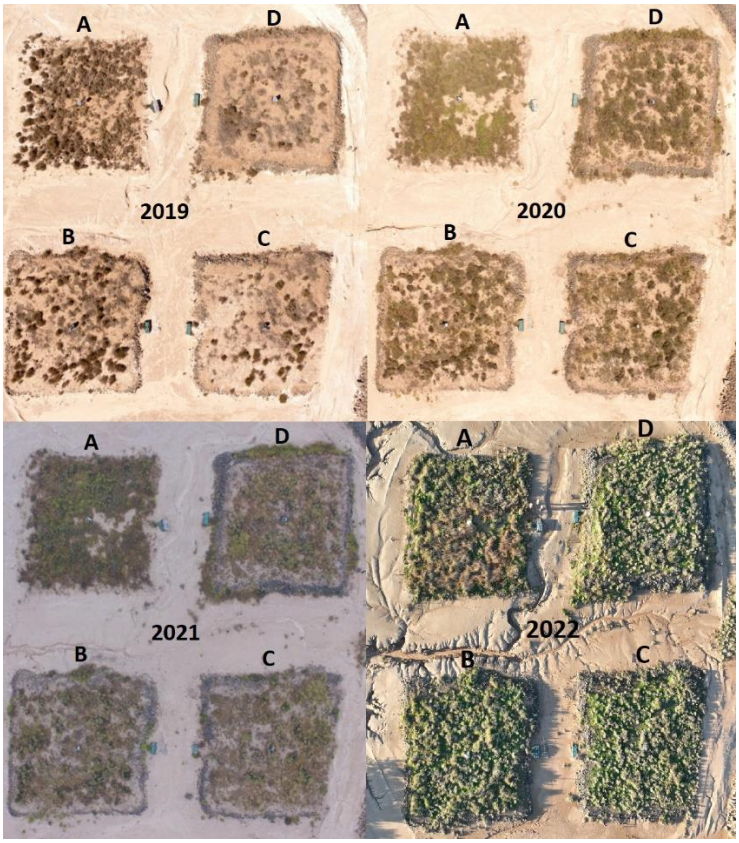


Figure 26 TSF1 trial plot groundcover comparison from 2019 to 2022

8.5.2 TSF2 Direct Revegetation

Since 2015, a range of projects have been carried out on the existing TSFs to reduce potential dust lift off. The establishment of vegetation directly onto tailings has not only proven to be an effective dust control strategy but has demonstrated vegetation establishment directly within the saline tailings surface is possible.

Local native salt bush and blue bush species have colonised TSF2 and continue to provide ongoing dust management. The ongoing success of native vegetation species to establish directly in the TSF2 tailings has initiated a multi-year study into the potential for the tailings material to be used as a growth medium for long term rehabilitation.

During July 2022 a range of studies were carried out on TSF2. Trenches were dug with a shovel and trowel comparing different tailings characteristics. Federation University assessed the hydraulic conductivity and ore volume of the tailings comparing vegetated to bare areas (Figure 27). Results from the assessment concluded that the vegetated areas have an increased pore volume and hydraulic conductivity. The improvement may have been influenced by ripping some five or more years ago.

Microbial assessments were also taken from vegetated and bare areas at varying depths and the data will be assessed in the following reporting period.

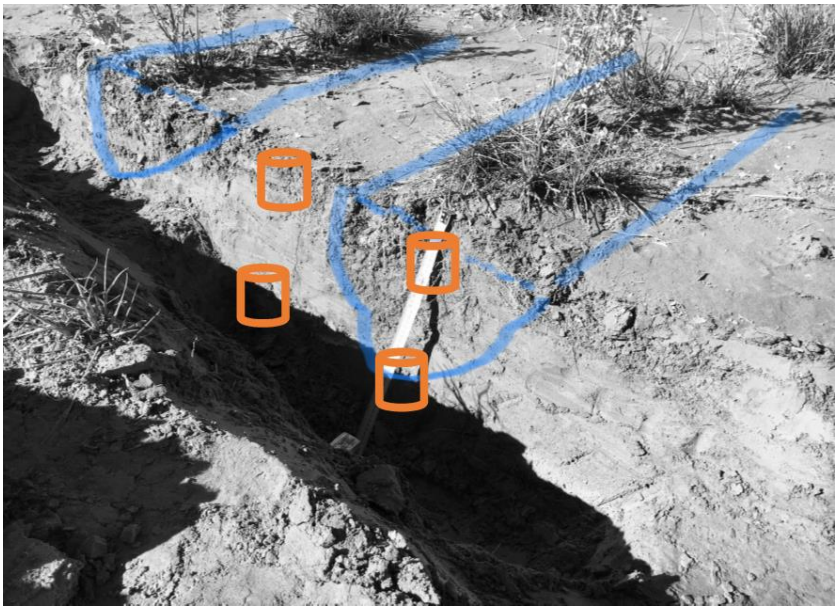


Figure 27 Hydraulic properties samples from Tall Wheat Grass rip lines and the in between bare areas

Some of other general conclusions from the July work were:

- There were distinct bare and vegetated areas
- Fibrous roots had established as fan like structures between the deposited tailings layers
- Visible roots were present even in the bare patches
- Established salt or blue bush species had significant visible roots below 700mm into the tailings profile
- Application of nitro humus or chicken manure increased surface biomass significantly.

Figure 28 Visible influence on vegetation due to a strip of chicken manure

Figure 29 Yanga Bush (*Maireana brevifolia*) roots visible 700mm into tailings

8.6 Rehabilitation Status

The areas rehabilitated to date include the E26 Oxide Dump, E26 Lift 1 Mullock Dump and waste rock dumps surrounding the E22 pit. None of these rehabilitated areas have been signed-off as final by regulators.

In 2009, DnA Environmental established a total of 19 monitoring sites which included four mixed woodland and three native grassland reference sites. These monitoring sites are assessed on a three-year basis, with the latest monitoring being carried out in the 2020 reporting period.

All reference sites have been subjected to some prior form of disturbance, in particular clearing, logging and grazing and some sites were likely to be older regrowth. Exotic annual grasses and a range of other agricultural weeds such were also common.

The 12 rehabilitation monitoring sites were a combination of mixed native woodland and grasslands communities which occurred on various waste emplacements (E22, E26, E27) and on the sides of TSF1 and TSF2. Some sites were also established in revegetation areas located around the farming properties (Kundibah, Beechmore and Altona) as well in the Limestone Forest Offset (LFO) area. Separate monitoring reports have been prepared to record ecological changes occurring in the Estcourt and Kokoda Offset Areas. The monitoring sites were chosen based on their final land use/vegetation community type and year of establishment and were considered to be representative of the rehabilitation area as a whole.

The detail within Table 32 aligns with the details within the Annual Rehabilitation Report submitted through the portal.

There are no current or foreseeable issues that may affect the ability to successfully rehabilitate the site. Table 32 and Figure 30 provides the status of disturbance and rehabilitation as per '*Table 8*' of the guidelines.

Table 32 Rehabilitation Status

Mine Area Type	2021 Reporting Period (Actual)	2022 Reporting Period (Actual)	2022 Reporting Period (forecast)
Total Mine Footprint	1,145	1,303	1,160
Total active disturbance	876	1,224	873
Land being prepared for rehabilitation	102	137	131
Land under active rehabilitation	163	179	156
Completed Rehabilitation	0	0	0

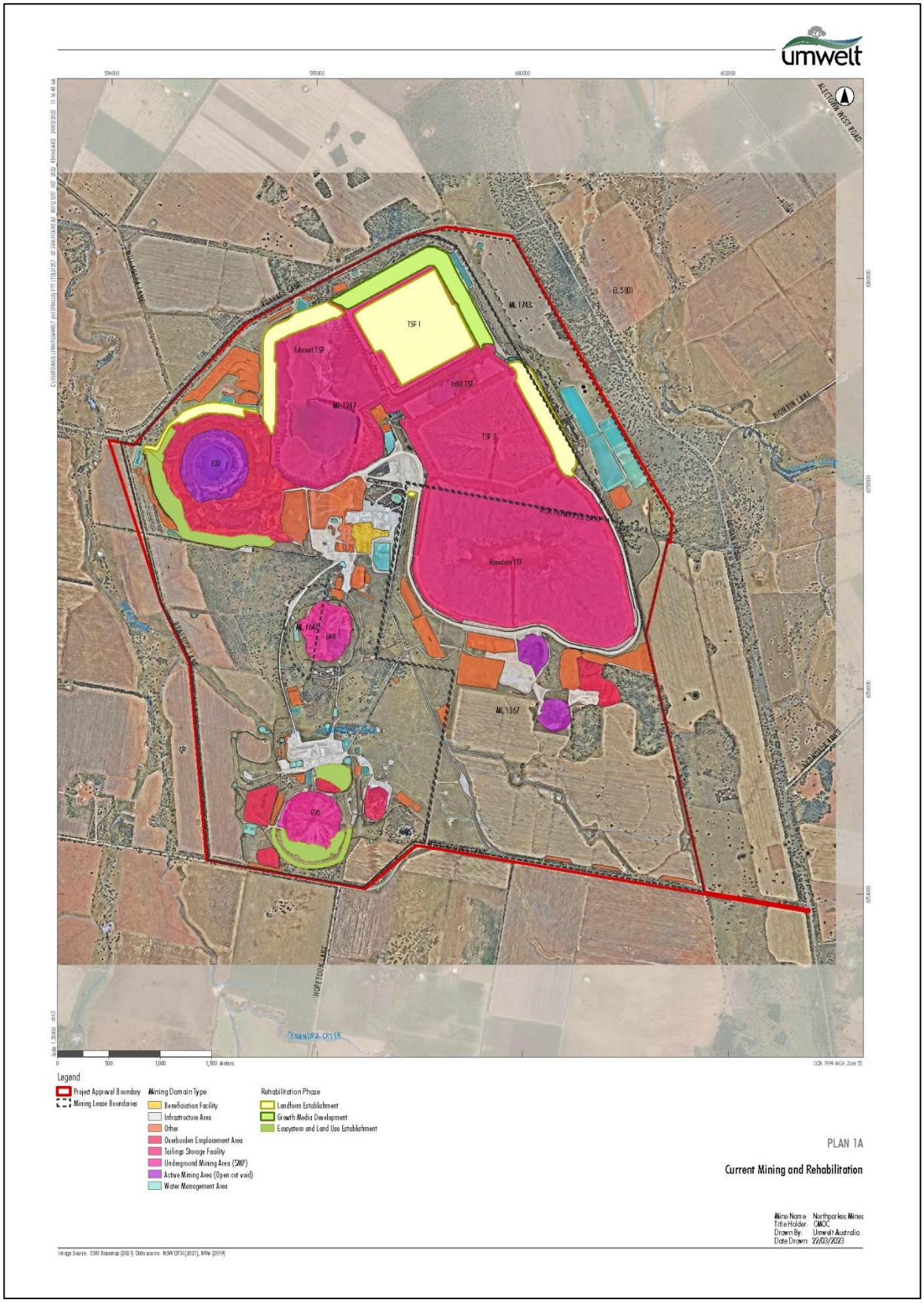


Figure 30 Rehabilitation status at the end of the reporting period

8.7 Rehabilitation Actions for the next Reporting Period

As per the commitments within the current MOP period, the following rehabilitation activities will be carried out:

- The ongoing monitoring of the established tailings cover trial plots on TSF1 will continue, which is detailed within Section 8.5.1
- Continued research into the vegetation established directly into the tailings, which is detailed within Section 8.5.2
- Application of growth medium to the eastern embankment of TSF2 will occur during the next reporting period and
- Research into various opportunities to modify the final tailings landforms will continue.

9. COMMUNITY RELATIONS

9.1 Reporting Period Summary

The Northparkes Stakeholder Communications Management Plan (the Plan) guides Northparkes relationship with the community in which it is licensed to operate. The Plan aims to address the various and, at times, diverse needs of Northparkes stakeholders, employees, community and government. During 2022 Northparkes:

- Expanded stakeholder relationships
- Implemented new community engagement opportunities, worked closely with the community and proactively participated in community initiatives
- Invested in the future of the community through community contributions, strategic partnerships, and scholarship programs and
- Recognises the importance of positive relations with its community and takes this into account in the operation of its business and the decisions made.

9.2 Community Engagement

Northparkes engages directly and regularly with the local community to both understand community issues and to keep the community updated about activities relating to the operations at Northparkes.

The Northparkes Community Consultative Committee (CCC) was established in 2006. The CCC provides an open forum to discuss any issues relating to Northparkes and its impact on the local community. The CCC comprises an independent chairperson, several local council and community members and Northparkes personnel. Two meetings were held in the reporting period in March, and October 2022. The primary topics covered within the period related to the Modification 7 and 8, and the planned surface blasting at E31 zone in preparation for open pit mining. A range of considerations were raised, however no significant issues were raised during the meetings held with the CCC during the reporting period.

Northparkes hosts formal meetings open to neighbours twice a year and meets with many neighbours individually throughout the year. During 2022, we held formal meetings in March and October at Adavale Hall.

The Northparkes Facebook, Instagram and LinkedIn page were used actively as a two-way communication channel by both Northparkes and the community in 2022. The Northparkes Facebook Page has over 4,500 followers and LinkedIn has over 10,000 followers.

Additional engagement and communication with neighbours was undertaken on a scheduled and as required basis ahead of the commencement of surface blasting in the E31 zone. Neighbours received scheduled text messages at least 24 hours prior to the blast, and any updates if the schedule changed. The Northparkes website was also used to communicate blasting times and additional information to our community.

9.3 Contributions and Achievements

In line with its commitment to support a sustainable community, Northparkes has an investment program to manage financial support for local community events, committees and schools. This program encompasses a small number of carefully considered donations, the Northparkes Community Investment Program and the partnership programs. An independent sub-committee helps Northparkes make decisions regarding sponsorship requests from the local community, as part of the Northparkes Community Investment Program.

In 2022, Northparkes continued to provide financial assistance to local organisations that deliver benefits to the community investing in various sporting, educational, cultural, industry, environmental and agricultural programs.

The major initiatives in the reporting period included:

- Funding a Grants Officer Program in conjunction with Parkes Shire Council
- Funding for an Aboriginal project officer in conjunction with Parkes Shire Council
- A Sports Grant Program with the Parkes Shire Council
- Supporting education through the Parkes Life Education Program
- Supporting children's developmental health through the Sprouts Program and the Parkes Early Intervention
- Funding for the Frontline Services Ball in support of the Emergency Services
- Funding for community members impacted by the flood disaster in the local region

Figure 31 Members from community and sporting groups at the Community Investment Presentation

9.4 Complaints

9.4.1 Management of Complaints

Northparkes has a process for receiving, investigating, responding and reporting complaints received from community members. 24-hour external telephone lines are in place to allow the public to raise community concerns. These contact numbers are advertised on the website (www.northparkes.com).

Registered neighbours received via post an updated magnetised contact list including all relevant contact numbers of Northparkes personnel.

The website provides information about all aspects operations and has the capacity for the community to submit enquiries, concerns or complaints via e-mail direct to the Community and External Relations Advisor.

All complaints received across site are referred to the Community and External Relations Advisor, and are then responded to in a professional and timely manner. All complaints are recorded, with the outcomes of investigation findings and corrective actions communicated to the relevant personnel and reported in the Annual Review and the annual Northparkes Report.

Northparkes maintained its dust risk notification communication strategy in 2022. The Northparkes Environment Team distributes a weekly weather report, internally. If there is a high-risk dust day, the Community and External Relations Advisor sends an advance text message to any neighbour who may be affected. The message includes information about the expected high-risk day and any mitigating actions Northparkes plans to take, as well as the invitation to call the Community and External Relations Advisor if people have concerns or questions.

9.4.2 Registered Community Complaints

During the reporting period, one community complaint was received. The compliant related to dust and water concerns and was the first compliant in 3 years. The EPA visited Northparkes and investigated the complaints and found no non-compliances and stated that no further action will be taken.

Monthly summaries of complaints are made publicly available on the website at: http://www.northparkes.com/news/reports-and-policies#community-reports

A number of concerns were raised by Northparkes neighbours to employees which were addressed adequately, preventing the neighbours making formal complaints. The concerns have been discussed in:

- Section 6.4.3 Noise Improvements and Initiatives

9.5 Workforce Profile

Wherever possible, local personnel are employed by Northparkes and its contractors. The team consists of 385 staff, with majority locally based. Modified employee working arrangements increased the personnel residing in 'Other' localities from 12% to 15%. A breakdown of the local government areas where employees reside is presented in Table 33.

Table 33 Residential Locality of Northparkes Employees

Locality	Northparkes Employee Residency (%)
Parkes	65%
Forbes	12%
Dubbo	2%
Orange	3%
Peak Hill	3%

Other	15%

10. INDEPENDENT ENVIRONMENTAL AUDIT

As required by Schedule 6, Condition 9 and 10 of DC11_0060, Northparkes are required to undertake an independent environmental audit every three years. The last independent audit was carried out within the 2021 reporting period with all actions complete. The next independent audit is scheduled for 2024.

11. INCIDENTS AND NON-COMPLIANCES

11.1 Non-compliances during the reporting period

As stated within Section 1, there were no non-compliances recorded during the 2022 reporting period.

11.2 Summary Environmental Incidents

During 2022 there were eight internally reported events with an environmental component reported across different event types and event outcomes. The details of events, likely causes, actions to date and additional proposed measures were uploaded into the risk management system (known as RMSS) in accordance with reporting procedures. The separation between near misses and incidents is detailed within Table 34.

Table 34 Environmental Hazards and Incidents in 2022

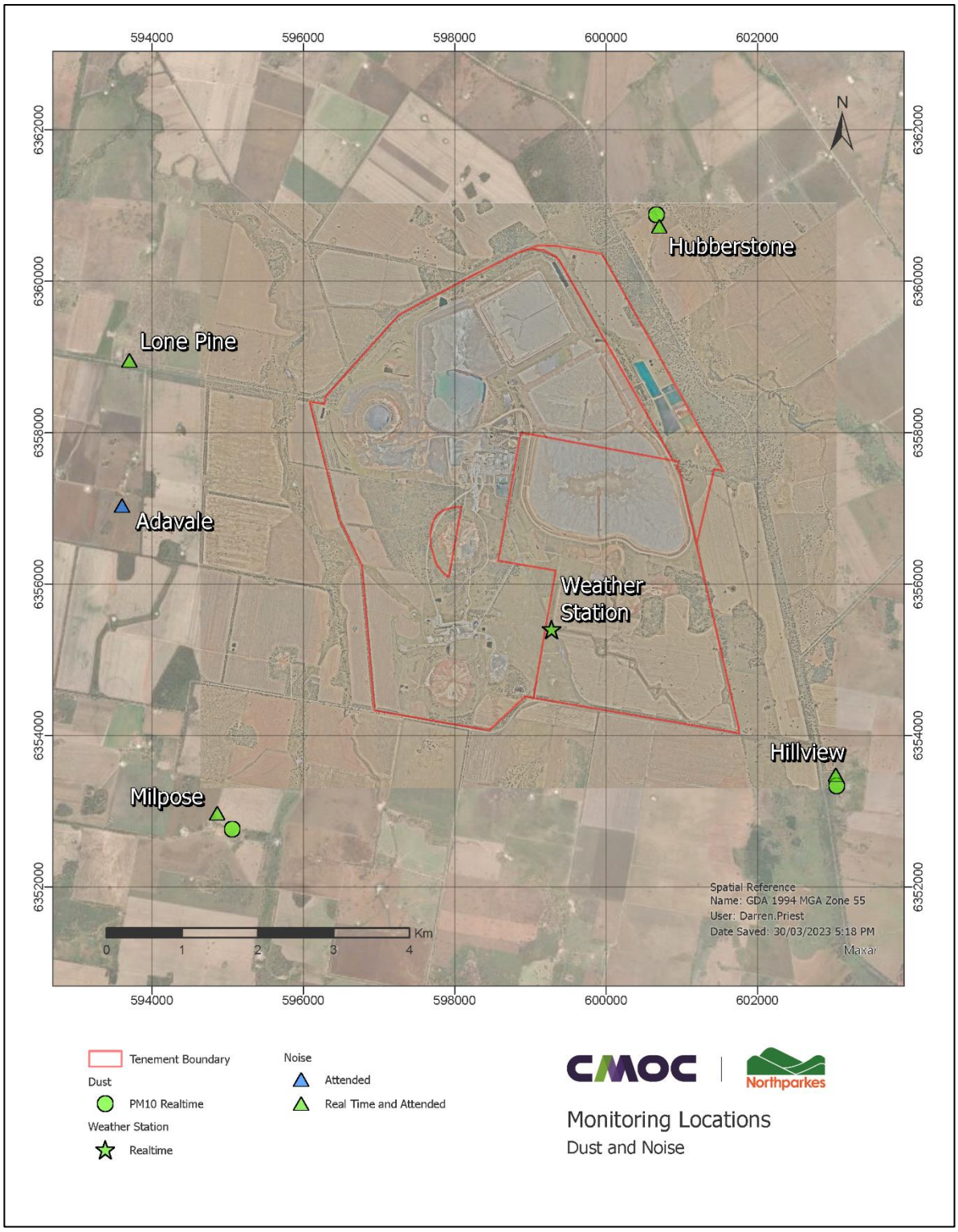
Event Type	Number
Damage/Report Only	2
Hazards	2
Incident Near Miss	2
Incident Actual	2
Total	**8**

12. ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Activities proposed for the next reporting period include:

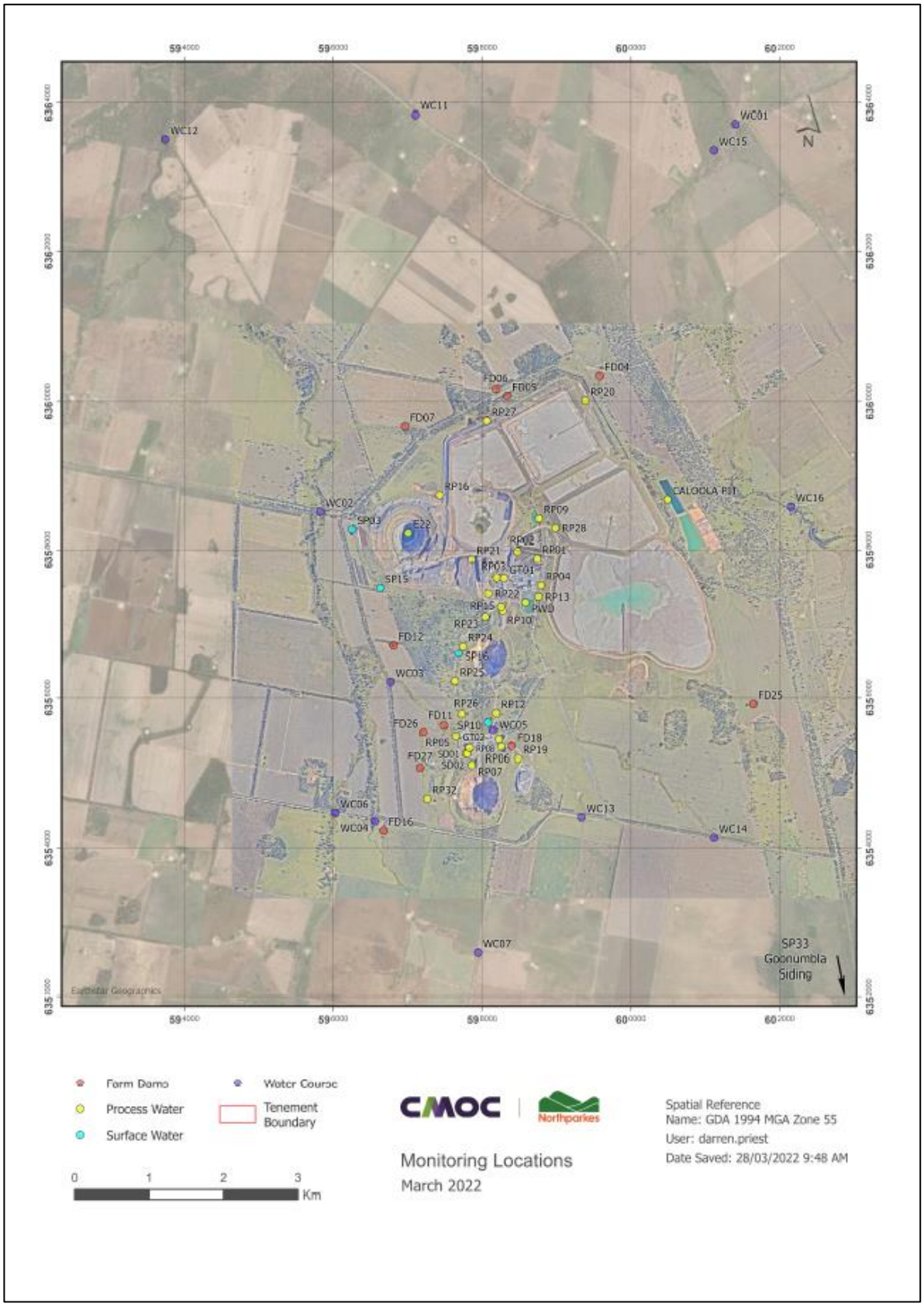
- Progress various modifications works and implement conditions post approval
- Investigate and implement noise mitigative techniques for surface mining activities
- Review the Wiradjuri Executive Committee Agreement will begin between Northparkes and local Traditional Owners
- Continue research aimed at improved long-term effectiveness of tailings closure covers

APPENDIX 1 DUST AND NOISE MONITORING LOCATIONS

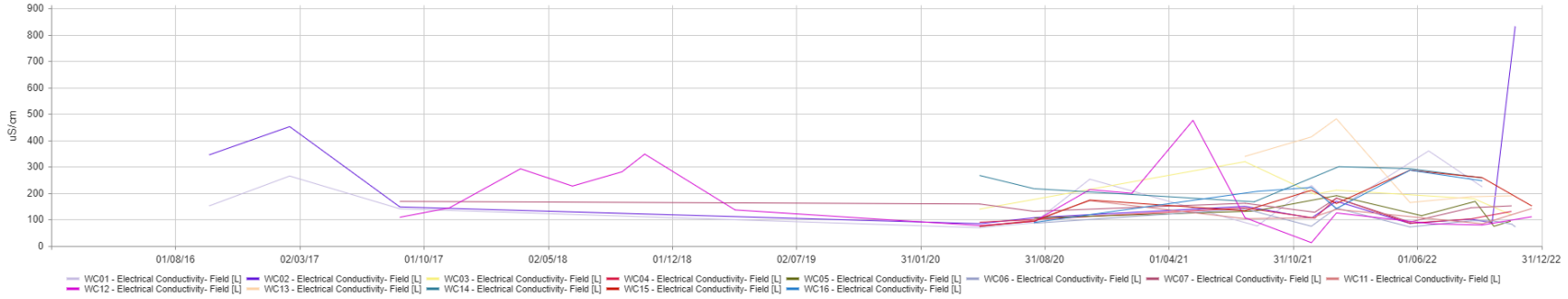


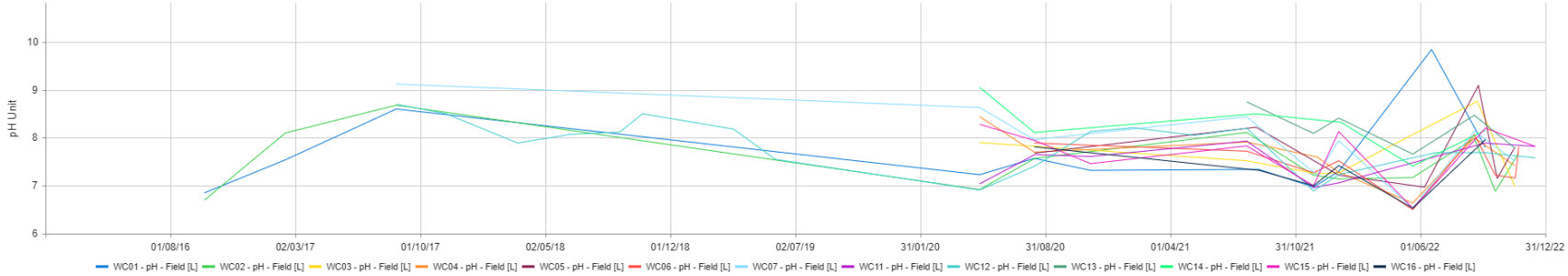
APPENDIX 2 WATER MONITORING

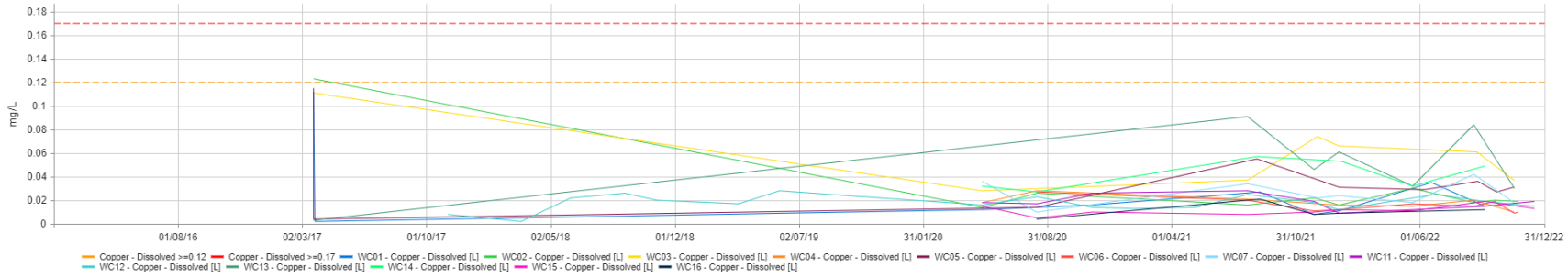
Surface water monitoring locations



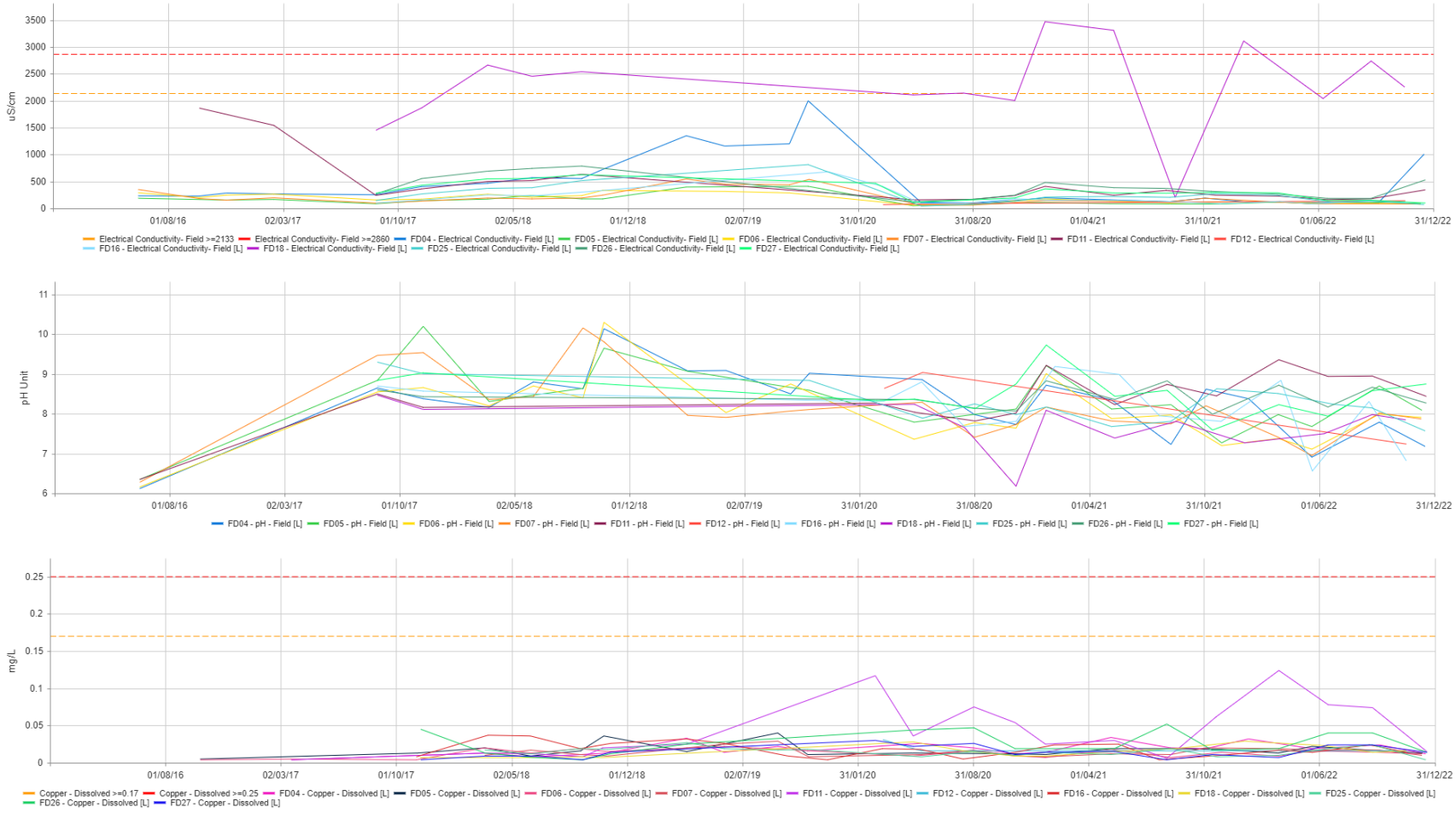
Surface water monitoring results – Water Course pH, electrical conductivity and copper



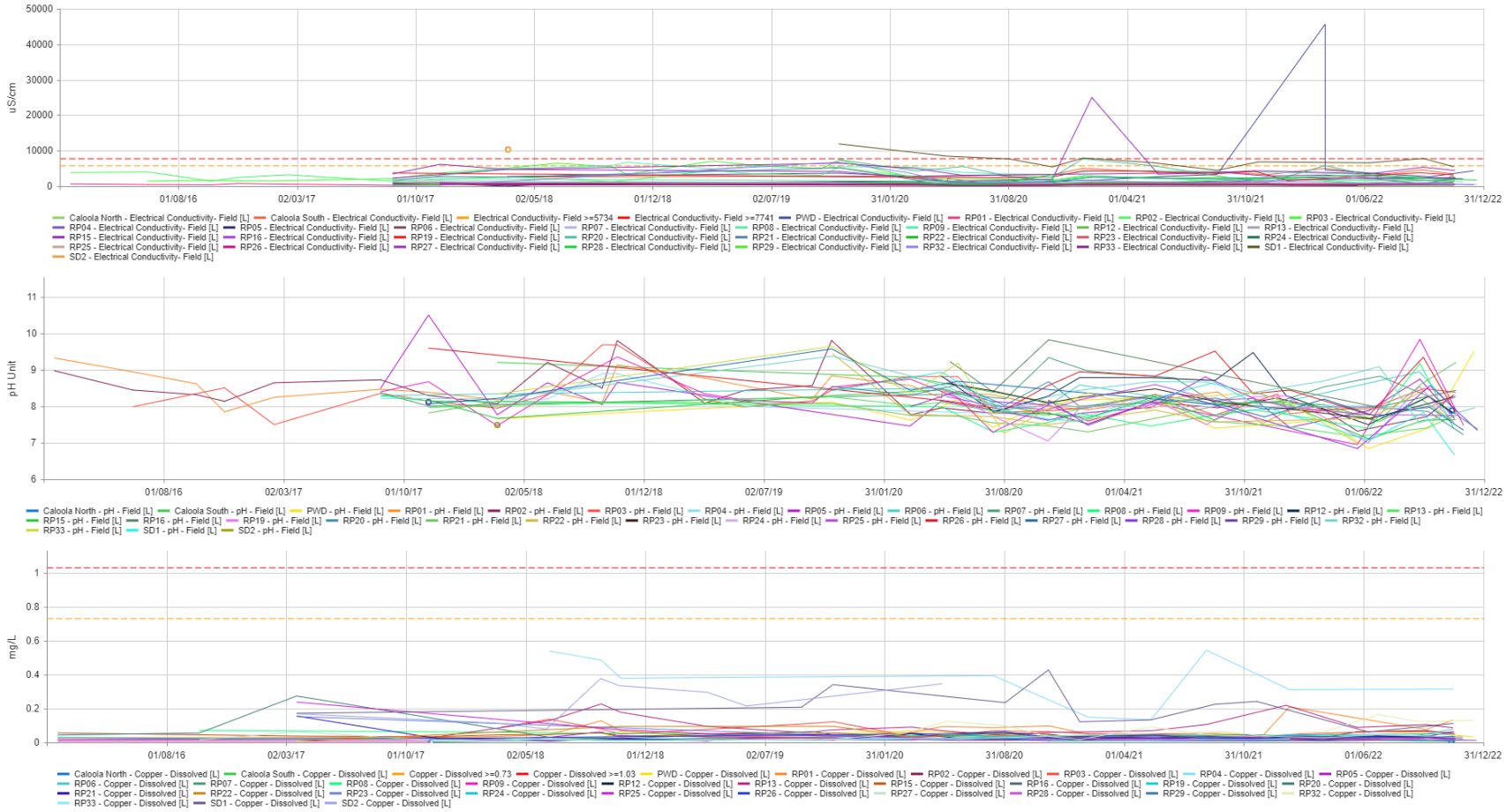




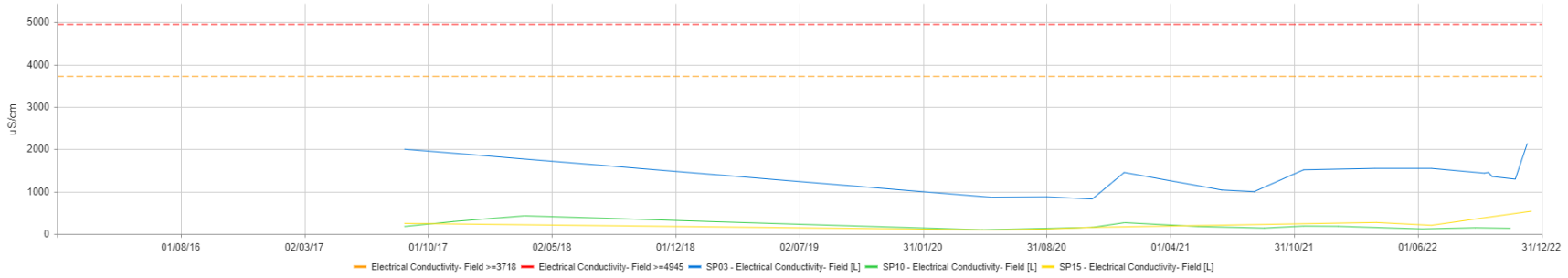
Surface water monitoring results – Farm dams pH, electrical conductivity and copper

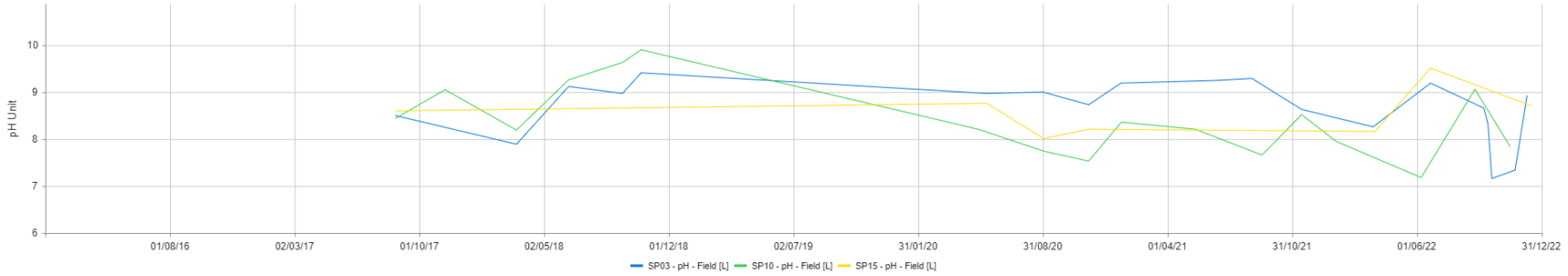


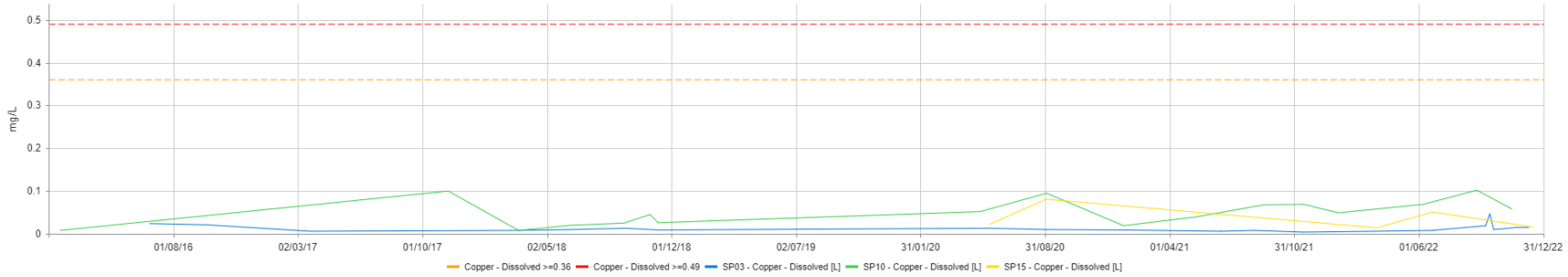
Surface water monitoring results – Retention ponds pH, electrical conductivity and copper



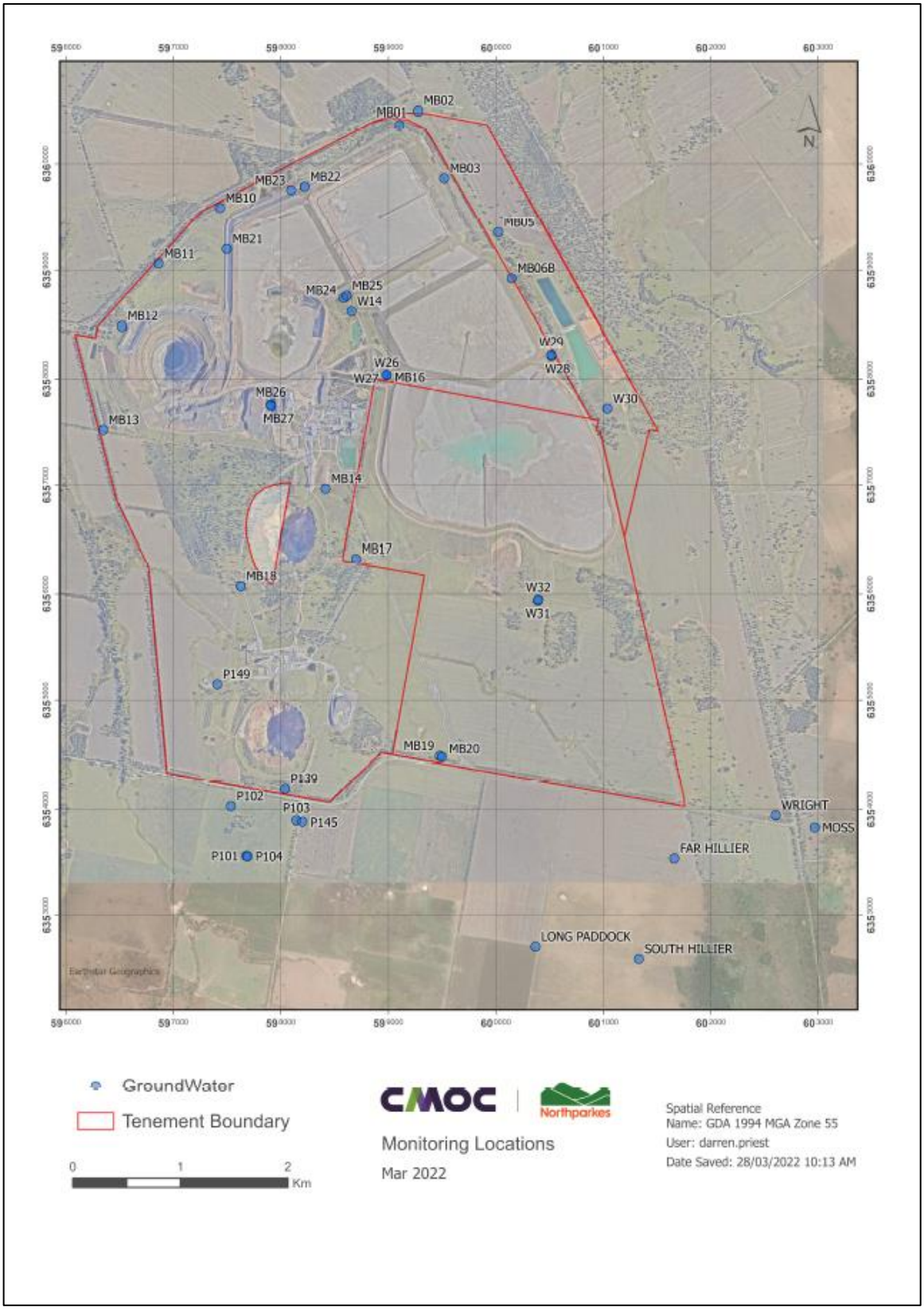
Surface water monitoring results – Sediment ponds pH, electrical conductivity and copper



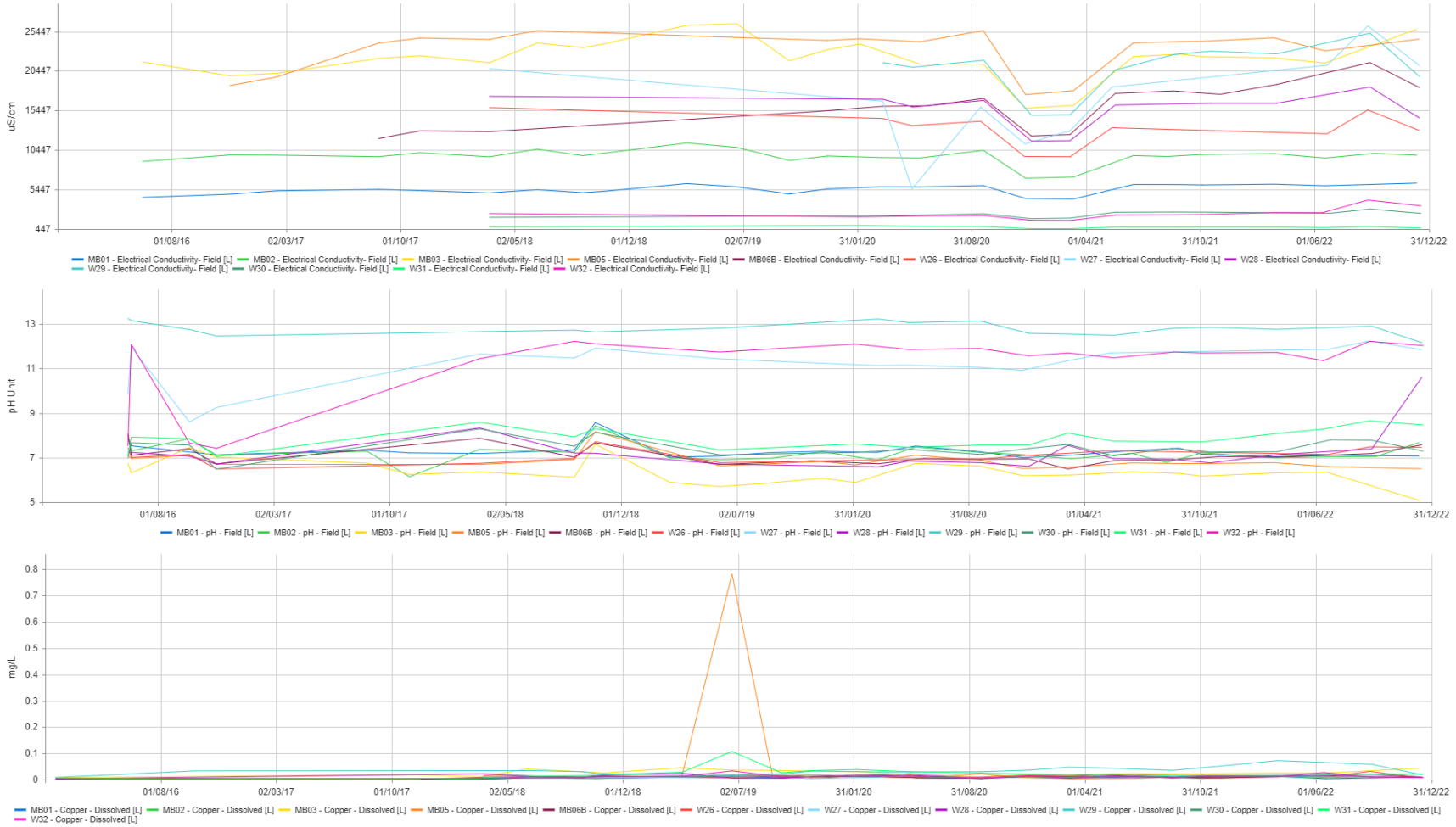




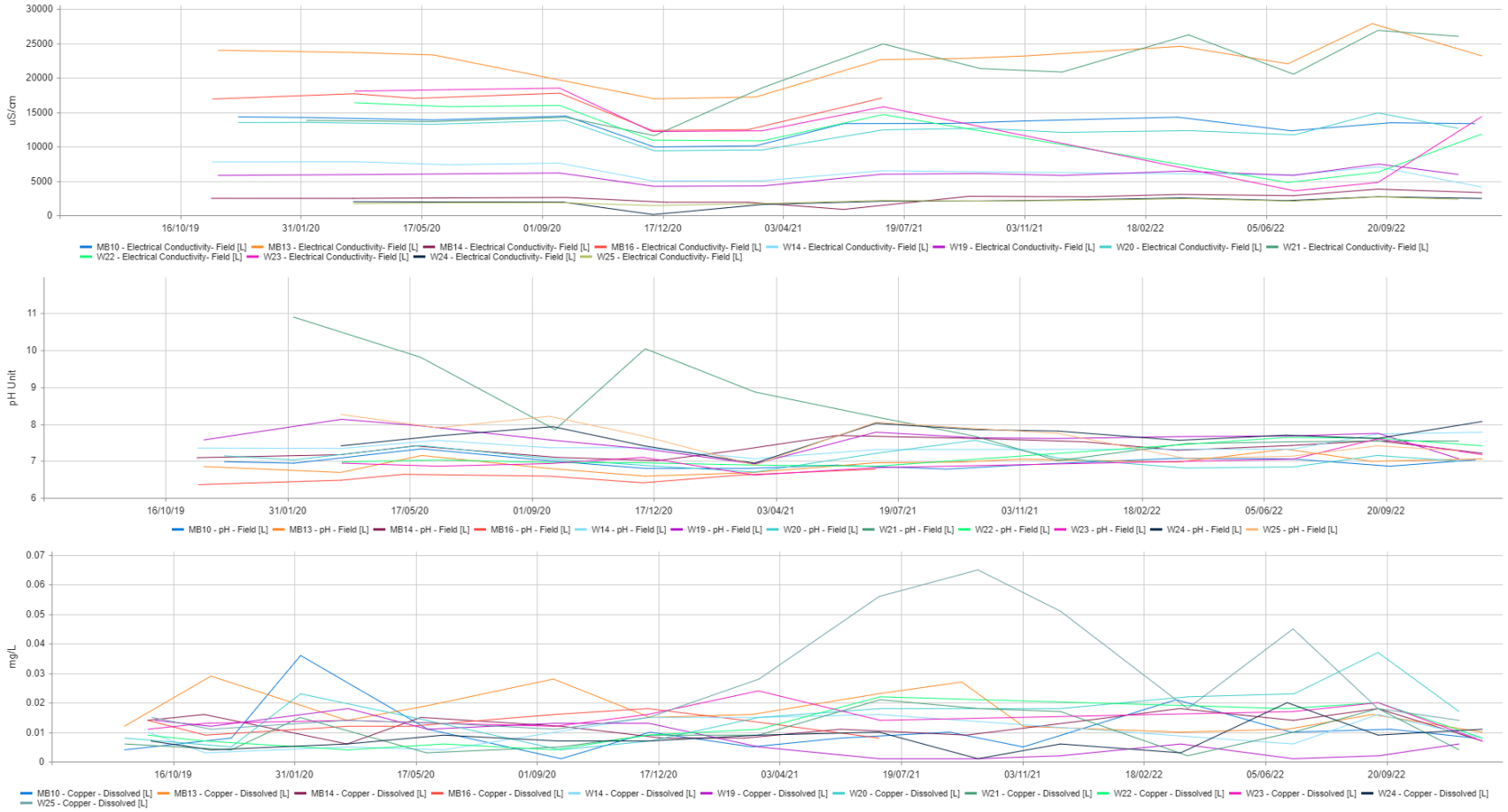
Ground water monitoring locations



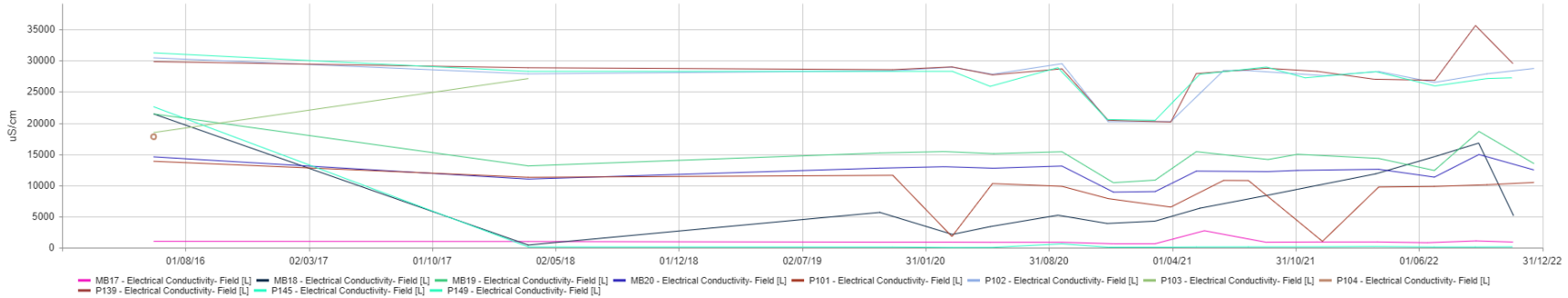
Ground water monitoring results – TSF bores pH, electrical conductivity and copper

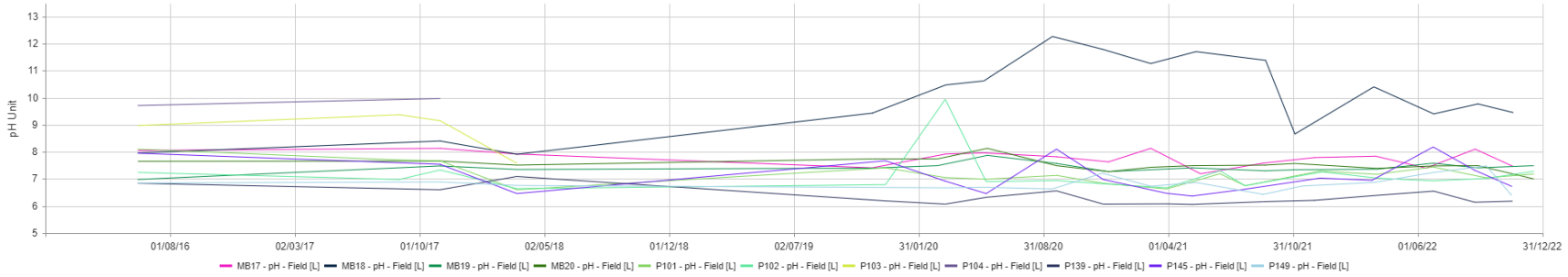


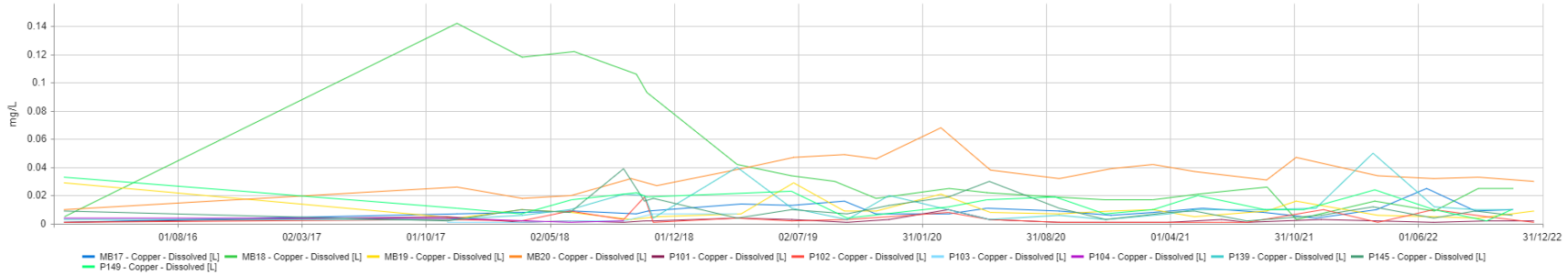
Ground water monitoring results – Opencut bores pH, electrical conductivity and copper



Ground water monitoring results – Underground bores pH, electrical conductivity and copper







Ground water monitoring results – Regional bores pH, electrical conductivity and copper