




Annual Review 2022



Title Block

Name of operation	Mt Owen Glendell Operations
Name of operator	Mt Owen, Ravensworth East and Glendell Mines
Development consent/ project approval	MGO Mining Operations Plan (Mt Owen, Glendell and Ravensworth East), DA SSD-5850 (Mt Owen and Ravensworth East) and DA 80/952 (Glendell).
Name of holder of development consent/ project approval	Mt Owen Pty Limited
Mining lease and exploration lease #	Mt Owen & Rav East – CCL715, CL383, ML1355, ML1415, ML1419, ML1453, ML1475, ML1561, ML1608, ML1629, ML1673, ML1694, ML1741, ML1802, MLA512, MLA513, EL6254, EL5824, A268, A423, A429, AL08 Glendell – ML1629, ML1673
Name of holder of mining lease	Mt Owen Pty Limited
Mining lease and Exploration Lease #	Glendell – CL358, MPL343, ML1410, ML1476, EL6594, EL8184
Name of holder of mining lease	Glendell Tenements Pty Ltd
Water licence #	Refer list provided in Table 31
Name of holder of water licences	Mt Owen Pty Limited
MOP/ RMP start date	July 2022
MOP/ RMP end date	July 2025
Annual Review start date	01/01/2022
Annual review end date	31/12/2022
<p>I, Sebastien Moreno, certify that this audit report is a true and accurate record of the compliance status of Mt Owen Glendell Operations for the period 01/01/2022 to 31/12/2022 and that I am authorised to make this statement on behalf of Mt Owen Glendell Operations.</p> <p><i>Note.</i></p> <p><i>a) The Annual Review is an 'environmental audit' for the purposes of section 122B (2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, \$1 million and for an individual, \$250,000.</i></p> <p><i>b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or \$22,000, or both).</i></p>	
Name of authorised reporting officer	Sebastien Moreno
Title of authorised reporting officer	Environment and Community Manager
Signature of authorised reporting officer	
Date	31/05/2023

Contents

List of Tables	3
List of Figures.....	4
1. Executive Summary and Statement of Compliance.....	6
1.1 Executive Summary.....	6
1.1.1 Air Quality:.....	6
1.1.2 Water.....	6
1.1.3 Biodiversity.....	7
1.1.4 Noise.....	7
1.1.5 Blasting.....	7
1.1.6 Heritage.....	7
1.1.7 Rehabilitation	7
1.1.8 Community Complaints and Consultation	7
1.1.9 Demolition Works	8
1.2 Statement of Compliance	8
1.3 Statutory Requirements.....	10
2. Introduction	13
2.1 MGO.....	13
2.2 MTO.....	13
2.3 Mount Owen Continued Operations (MOCO)	13
2.4 Glendell	14
2.5 Ravensworth East.....	14
2.6 Mine Contacts	17
3. Approvals and Licences.....	18
3.1 Project approvals	23
3.1.1 MOCO.....	23
3.1.2 Glendell Continued Operations Project (GCOP).....	23
4. Operations Summary.....	24
4.1 Mining Operations	24
4.2 Other Operations	25
4.2.1 Train and Conveyor Movements.....	25
4.2.2 Waste and Other Hazardous Material Management.....	26
4.2.3 Land Ownership	27
4.2.4 Exploration	27
4.2.5 Next Reporting Period.....	27
5. Actions Required from Previous Annual Review	28
6. Environmental Performance	28

6.1	Operational Noise	28
6.1.1	Attended Noise Monitoring Program.....	29
6.1.2	Noise monitoring Performance	29
6.1.3	Continuous Improvement	32
6.2	Blasting.....	33
6.2.1	Blast Management and Monitoring	33
6.2.2	Blast Performance	33
6.3	Air Quality	37
6.3.1	Air Quality Management and Monitoring.....	37
6.3.2	Meteorological Conditions.....	41
6.3.3	Air Quality Performance.....	42
6.3.4	Continuous Improvements.....	48
6.3.5	Greenhouse Gas	48
6.4	Biodiversity and Land Management	49
6.4.1	Biodiversity Offset Areas (BOAs).....	50
6.4.2	Revegetation works – Habitat augmentation	55
6.4.3	Rehabilitation Woodland Offset	57
6.4.4	Flora Monitoring	57
6.4.5	Fauna Monitoring.....	68
6.4.6	Comparison to BOMP Performance Indicators and Completion Criteria	72
6.4.7	Biodiversity Offset Areas Management	75
6.5	Heritage.....	81
6.5.1	Aboriginal Heritage	81
6.5.2	European Heritage	81
6.6	Demolition Works	82
7.	Water Management	83
7.1	Water Balance	83
7.2	Hunter River Salinity Trading Scheme (HRSTS)	84
7.3	Surface Water	84
7.3.1	Surface Water Monitoring Program and Triggers.....	84
7.3.2	Stream Stability and Condition Monitoring	93
7.3.3	Erosion and Sediment Control	100
7.4	Groundwater	100
7.4.1	Groundwater Monitoring Program and Triggers	100
7.4.2	Groundwater Monitoring Performance	102
7.4.3	Groundwater Take	106
7.4.4	Continuous Improvement	106
8.	Rehabilitation.....	107
8.1	Glendell	107
8.2	MTO.....	107
8.3	Rehabilitation Monitoring.....	108

8.4	Results	112
8.4.1	Long-term Monitoring	112
8.4.2	Corridors/Shelter Belts	112
8.5	Rehabilitation Activities for the next Reporting Period	119
9.	Community	120
9.1	Community Engagement and Activities 2022	120
9.2	Community Contributions	121
9.3	Summary of MGO Community Complaints	122
9.4	Complaint Trends and Actions	122
10.	Incidents and Non-Compliances	123
11.	Independent Environmental audit	124
12.	Activities to Improve Environmental Management in 2023	124

List of Tables

Table 1: Summary of ROM and Product Coal	6
Table 2: MGO Statement of Compliance 2022	8
Table 3: Compliance Status Key	9
Table 4: MGO Non-Compliance 2022	9
Table 5: Statutory Requirements	10
Table 6: MGO Contact Details	17
Table 7: MGO Approvals and Licences	18
Table 8: MGO Production Summary	24
Table 9: MGO Train and Conveyor Movements	26
Table 10: MGO Recycled Materials (2021 and 2022)	26
Table 11: MGO Waste Tyre Burial (2021 and 2022)	27
Table 12 Land Ownership	27
Table 13: Summary of MTOs 2022 Environmental Noise Level (dB(A)) Contribution (LAeq, 15min) ..	31
Table 14: Summary of MTOs 2022 Environmental Noise Level (dB(A)) Contribution (LA1, 1min) – Night	31
Table 15: Summary of Glendells 2022 Environmental Noise Level (dB(A)) Contribution (LAeq, 15min) – Night	32
Table 16: Summary of Glendells 2022 Environmental Noise Level (dB(A)) Contribution (LA1, 1min) – Night	32
Table 17: MGO Blasting Hours and Frequencies for 2022	35
Table 18: MGO Blasting Criteria and Performance for 2022	35
Table 19: Summary of PM10 concentration from MGO monitors in 2022	44
Table 20: Summary of PM _{2.5} Concentrations from MGO Monitors in 2022	44
Table 21: Summary of TSP Concentrations from MGO Monitors in 2022	45
Table 22: Summary of Deposited Dust Levels from MGO Monitors in 2022	47
Table 23: Comparison between EIS Predictions and Air Quality Measurements in 2022	47
Table 24: Greenhouse Gas Emissions at MGO during the 2021/22 Financial Year	49
Table 25: Biodiversity Offset Areas (as per Biodiversity Offset Strategy)	53
Table 26: Conservation Agreement Monitoring Locations 2022	57

Table 27 Conservation Area Biodiversity Management Summary 2022	59
Table 28: Biodiversity Offset Area Monitoring Locations 2022	61
Table 29: Biodiversity Offset Area Management Summary 2022	63
Table 30: Threatened Species Observed at MGO 1996-2022.....	71
Table 31: 2022 Biodiversity Performance Indicators and completion Criteria.....	72
Table 32: MGO Weed Works Completed in Biodiversity Offsets 2022	78
Table 33: Wild Dog and Fox Biodiversity Offset Baiting Program – 2022 Results	80
Table 34: Wild Dog and Fox Buffer Land Baiting Program – 2022 Results	80
Table 35: MGO Water Balance for 2022	83
Table 36: Surface Water Quality Triggers	87
Table 37: Summary of Surface Water Monitoring Results 2022	87
Table 38: Bowmans Creek surface water monitoring.....	89
Table 39: Bettys Creek surface water monitor.	89
Table 40: Main Creek surface water monitoring	91
Table 41: Swamp Creek surface water monitoring.....	92
Table 42: CSIRO Ephemeral Stream Assessment Stability Classifications	93
Table 43: Summary of Indicator, Functions and Components Assessed in the RARC Index	94
Table 44: Summary RARC Classification System	95
Table 45: Bowmans Creek Stream Stability & Condition Assessment 2022	95
Table 46: York's Creek Stream Stability & Condition Assessment 2022	95
Table 47: Main Creek Stream Stability & Condition Assessment 2022	96
Table 48: Bettys Creek Stream Stability and Condition Assessment 2022	96
Table 49: Betty's Creek Diversion Stream Stability & Conditions Assessment 2022	96
Table 50: Swamp Creek Natural Waterway and Diversion Stability & Condition Assessment 2022....	97
Table 51: Groundwater Performance Criteria	100
Table 52: Summary of Groundwater Bore above Trigger Level.....	103
Table 53: Summary of Groundwater Bore above Trigger Level Main Creek Alluvium	105
Table 54: MGO Rehabilitation Summary.	107
Table 55: Rehabilitation Performance Categories.....	108
Table 56: 2022 Rehabilitation Monitoring Scope of Works.....	109
Table 57: 2022 Rehabilitation Progress Summary – Open Grassland Rehabilitation LTM Block.	112
Table 58: 2022 Rehabilitation Progress Summary – Open Woodland (CHGBW) LTM Blocks	113
Table 59: Community Engagement Activities for 2022	120
Table 60: MGO Community Contributions 2022	121
Table 61: Non-Compliance Reported in 2022.....	123

List of Figures

Figure 1: Mt Owen/Glendell Operations Overview and Disturbance as of 31 December 2022.....	15
Figure 2: MGO Overview – Regional Context	16
Figure 3: MGO Project boundaries and mining tenements	22
Figure 4 MGO Noise Monitoring locations	30
Figure 5: MGO Blasting Monitoring Locations.....	34
Figure 6: MGO Air Quality Monitoring locations	40
Figure 7 : 2022 Annual Wind Roses for MGO Weather Station.....	42
Figure 8: MGO Biodiversity Offset Areas	51
Figure 9: MGO MGO Biodiversity Offset Areas - Detail	52
Figure 10: Photo Monitoring locations for Conservation Areas	67

Figure 11 Opportunistic photos of fauna identified at MGO in 2022.....	70
Figure 12: Total number of Nest Boxes Installed at MGO	76
Figure 13: African Olive control	78
Figure 14: Before and after treatment of African Olive.....	78
Figure 15: Images captured on motion cameras in Offset Areas during 2022	80
Figure 16: Hebden Public School Remains.....	82
Figure 17: Ravensworth Public School Managed Ruin.....	82
Figure 18: Regional Rainfall Data (Bowmans Creek BoM Station (061270))	84
Figure 19: MGO Surface Water Monitoring Locations	86
Figure 20: Stream Stability and Condition Monitoring Locations.....	99
Figure 21: MGO Groundwater Extraction and Monitoring Bores.....	101
Figure 22: 2022 Monitoring Locations – Rehabilitation Blacks and Monitoring Sites.....	111
Figure 23: Summary of Rehabilitation Performance for 2022 Monitoring.....	118
Figure 24: Comparison of Complaints Received at Mt Owen and Glendell from 2014 to 2022	123

1. Executive Summary and Statement of Compliance

1.1 Executive Summary

This Annual Review ('the report') is for the period of 01 January 2022 to 31 December 2022. It is required under:

- Schedule 5, Condition 5, of Development Approval SSD-5850 (Mount Owen (MTO) and Ravensworth East open cuts)
- Schedule 5, Condition 5, of Development Approval 80/952 (Glendell open cut).

The report has been prepared in accordance with the *NSW Department of Planning and Environment Annual Review Guideline*, dated October 2015. Mt Owen Glendell Operations (MGO) produced a total of 11.92 million tonnes (Mt) of run of mine (ROM) coal during the reporting period. In 2022, product coal totalled 7.25Mt (see *Table 1*).

A total of 808 trains were loaded during the reporting period, with 6.54 Mt of product coal railed from site.

Table 1: Summary of ROM and Product Coal

Site	2022 ROM Coal (Mt)	ROM Consent Limit (Mt)	2022 Saleable Coal (Mt)
Mt Owen (MTO)	7.4	10	3.93
Glendell	2.53	4.5	1.54
Ravensworth East	1.99	4	1.78
Total	11.92	17*	7.25

*Up to 17 million tonnes of ROM Coal allowed to be processed via CHPP in a calendar year, as per SSD-5850.

1.1.1 Air Quality:

Measurements of Particulate Matter less than 10 microns (μm) and less than 2.5 μm (PM_{10} and $\text{PM}_{2.5}$ respectively), Total Suspended Particulates (TSP) and deposited dust were compared to the short and long-term impact assessment criteria from the MTO and Glendell respective development consents (SSD-5850 and DA 80/952). Monitoring completed during 2022 determined that MGO was in compliance with its development consent criteria in terms of air quality impacts.

Predictions of air quality impacts made in the latest environmental assessment of the approved operation were compared to the measurement results. The comparisons showed that modelled PM_{10} , TSP and deposited dust levels for MGO were generally greater than the 2022 monitoring results.

1.1.2 Water

MGO monitor groundwater levels and quality for over 78 groundwater monitoring bores as per the MGO Groundwater Monitoring and management Plan (GWMMP). Some bore monitoring results recorded a drawdown during 2022. Review of water quality results and comparison to trigger levels for Electrical Conductivity (EC) and pH identified some results were above trigger levels in 2022 but, they were generally either in line with historical trends or correlated with rainfall events.

1.1.3 Biodiversity

MGO completed its third round of monitoring on its Conservation Agreements (CAs) Offsets with overall good composite value scored throughout the offsets, the report also provided some recommendations

In addition, comprehensive fauna and flora monitoring surveys were conducted at MGO offsets in 2022, identifying the improved ecological state following the past year of constant, above average rainfall. In 2022, 11 threatened species were sighted, including 5 bird species, 3 non-flying mammals and 3 microbat species. A total of 26 threatened species have been detected at MGO since the commencement of fauna monitoring.

1.1.4 Noise

The noise monitoring program for MGO incorporates both continuous noise monitors and attended noise monitoring. The applicable noise criteria and the predicted noise levels are the same for each of the monitoring locations, and therefore the comparison with the criteria also demonstrates a comparison with the predicted noise levels. Results do not appear to indicate that there are any trends within the data.

1.1.5 Blasting

A total of 170 blasts occurred at MGO in 2022, compared to 187 blasts in 2021. There were 40 blasts at Glendell, 41 blasts at Ravensworth East and 89 blasts at MTO. There were no non-compliances with the Blast Management Plan (BMP) during 2022.

1.1.6 Heritage

In 2022 MGO, continued the monitoring of Aboriginal heritage sites, in conjunction with Registered Aboriginal Parties (RAPs) and a qualified archaeologist. Monitoring of Aboriginal heritages sites occurred quarterly, and artefacts were found to be well preserved. No artefacts were salvaged and there were no environmental incidents relating to Aboriginal heritage in 2022.

During the reporting period, MGO conducted quarterly monitoring and ongoing maintenance of European heritage sites. MGO continued to care for Ravensworth Homestead and actively managed the Hebden and Ravensworth Public School ruin sites.

1.1.7 Rehabilitation

Progressive rehabilitation continued across MGO during 2022, generally in line with the Rehabilitation Management Plan (RMP) and Forward Program. In 2022, MTO mine completed 23.32ha of rehabilitation (open woodland) that aligns with geomorphic landform design. Glendell mine prepared and seeded a total of 8.1 ha of rehabilitation (open Grassland). Rehabilitation across MGO was generally stable and no critical erosion features were identified.

1.1.8 Community Complaints and Consultation

During 2022, four community complaints were recorded at MTO mine. The complaints were related to noise, air quality, and vibration. Glendell mine received one community complaint, which related to noise. All complaints were addressed promptly, with MGO contacting the complainants who had requested it.

Two Community Consultive Committee (CCC) meetings and two community gatherings were held in 2022.

1.1.9 Demolition Works

No demolition works were undertaken onsite at MGO during 2022.

1.2 Statement of Compliance

During the reporting period, MTO and Glendell sites functioned under their respective development consent and Environment Protection Licence (EPL), together with Mining Leases (MLs) and secondary approvals, such as management plans and water licences.

MGO holds over 100 approvals, which contain more than 2,000 conditions. *Table 2* summarises the state of compliance against the site's major approvals during 2022. Non-compliances are listed in *Table 4* and detailed in later sections of this report, with a definition of risk levels for each provided in *Table 3*.

Table 2: MGO Statement of Compliance 2022

Relevant Approvals	Compliance
Mining Operations Plan (Mt Owen, Glendell and Ravensworth East)/ replaced by the Rehabilitation Management Plan (RMP)/ Forward program (FP) in July 2022	Yes
DA SSD-5850 (Mt Owen / Ravensworth East)	No
DA 80/952 (Glendell)	No
EPL 4460 *	Yes
EPL 12840 **	Yes
CCL 715	Yes
CL 358	Yes
CL 382	Yes
CL 383	Yes
ML 1355	Yes
ML 1419	Yes
ML 1453	Yes
ML 1561	Yes
ML 1475	Yes
ML 1608	Yes
ML 1410	Yes
ML 1415	Yes
ML 1476	Yes
ML 1802	Yes
ML 1694	Yes
ML 1629	Yes
ML 1741	Yes
ML 1794	Yes
MPL 343	Yes
EL5824	Yes
EL6594	Yes

Relevant Approvals	Compliance
EL8184	Yes
EL8916	Yes
Water Licences	Yes

* In reference to Condition 25, Schedule 3 of SSD5850

** In reference to Condition 23, Schedule 3 of DA80/952

Table 3: Compliance Status Key

Risk Level	Colour Code	Description
High	Non-Compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence.
Medium	Non-Compliant	Non-compliance with: <ul style="list-style-type: none"> potential for serious environmental consequences, but is unlikely to occur; or potential for moderate environmental consequences, but is likely to occur
Low	Non-Compliant	Non-compliance with: <ul style="list-style-type: none"> potential for moderate environmental consequences, but is unlikely to occur; or potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-Compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later that required under approval conditions).

Table 4: MGO Non-Compliance 2022

Relevant Approval	Condition #	Condition Description	2022 Compliance Status	Comment	Annual Review Sections
SSD-5850	Schedule 3 Conditions 27 and 29	The Applicant must implement the Biodiversity Offset Strategy described in the EIS. The Applicant must make suitable arrangements for the long-term protection of the areas identified in Table 9, to the satisfaction of the Secretary (SSD5850).	Non-Compliant	On 31 August 2022, Mt Owen Glendell Operations (MGO) requested from the Department an extension of time to comply with these conditions and that, in considering this request, the Department requested that MGO consult further with the Credit Supply Taskforce (CST) on the proposed timeframe for securing the relevant biodiversity offset areas (BOA). Since MGO has been liaising with CST to progress BOAs, Biodiversity credits and Biodiversity Stewardship Agreements applications. For example, in consultation with MGO, CST inspected Belford and Bulga Offsets in November and December 2022. MGO continues to liaise with CST to progress Esparanga Offset application.	6.4.1
DA 80/952	Schedule 3 Condition 36A	Within 6 month of approval of Modification 4, or other timeframe agreed by the Secretary, the Applicant must retire the biodiversity credits specified in Table 12.			

1.3 Statutory Requirements

Table 5: Statutory Requirements

Approval	Condition	Relevant Section of Document
<p>Development Consents SSD-5850 (Mt Owen and Ravensworth) and 80/952 (Glendell)</p> <p><i>Schedule 5, Condition 5</i></p>	<p>By the end of March each year, or as otherwise agreed with the Secretary, the Applicant must submit a report to the Department reviewing the environmental performance of the development to the satisfaction of the Secretary. This review must:</p> <p>(a) describe the development (including any rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year;</p> <p>(b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, which includes a comparison of these results against the:</p> <ul style="list-style-type: none"> • relevant statutory requirements, limits or performance measures/criteria; • monitoring results of previous years; and • relevant predictions in the documents listed in condition 2(a) of Schedule 2 or 3; <p>(c) identify any non-compliance or incident over the past year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;</p> <p>(d) identify any trends in the monitoring data over the life of the development;</p> <p>(e) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and</p> <p>(f) describe what measures will be implemented over the next year to improve the environmental performance of the development.</p>	<p>(a) 4, 6, 7, 8 (b) 6, 7, 8, 9 (c) 1, 10 (d) Various (e) Various (f) Various</p>
<p>Development Consent 80/952 (Glendell)</p> <p><i>Schedule 4, Condition 7</i></p>	<p>Continuous Improvement</p> <p>7. The Applicant must:</p> <p>(a) implement all reasonable and feasible best practice noise mitigation measures;</p> <p>(b) investigate ways to reduce the noise generated by the development, including maximum noise levels which may result in sleep disturbance; and</p> <p>(c) report on these investigations and the implementation and effectiveness of these measures in the Annual Review.</p>	<p>(a) 6 (b) 6 (c) 6</p>
<p>Development Consent 80/952 (Glendell)</p> <p><i>Schedule 4, Condition 46</i></p>	<p>Monitoring of Coal Transport</p> <p>46. The Applicant must keep records of the amount of coal transported from the site each year, and include these records in the Annual Review.</p>	<p>4.2.1 and Appendix B</p>
<p>Development Consent 80/952 (Glendell)</p> <p><i>Schedule 4, Condition 52</i></p>	<p>The Applicant must</p> <p>...</p> <p>(e) report on waste management and minimisation in the Annual Review,</p> <p>...</p>	<p>(e) 4.2.2</p>
<p>Development Consent SSD-5850 (Mt Owen and Ravensworth)</p>	<p>The Applicant must</p> <p>...</p>	<p>(d) 4.2.2</p>

Approval	Condition	Relevant Section of Document
Schedule 3, Condition 41	(d) monitor and report on the effectiveness of the waste minimisation and management measures in the annual review referred to in condition 5 of Schedule 5.	
Development Consent SSD-5850 (Mt Owen and Ravensworth) Schedule 3, Condition 26	Water Management Plan The Applicant must ... (vii) a protocol to report on the measures, monitoring results and performance criteria identified above, in the annual review referred to in condition 5 of Schedule 5.	(vii) 7
Development Consent SSD-5850 (Mt Owen and Ravensworth) Schedule 3, Condition 18	Air Quality Operating Conditions The Applicant must: ... (h) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this consent, and report on this in the annual review referred to in condition 5 of Schedule 5.	(h) 6.3 and Appendix F
Development Consent SSD-5850 (Mt Owen and Ravensworth) Schedule 3, Condition 31	Biodiversity Management Plan The Applicant must ... report on the effectiveness of the above measures against the periodic performance and completion criteria, as part of the annual review referred to in condition 5 of Schedule 5	6.4
Development Consent SSD-5850 (Mt Owen and Ravensworth) Schedule 3, Condition 45	Rehabilitation Management Plan The Applicant must ... include a program to monitor, independently audit and report on the effectiveness of the measures in paragraph (h) above, and progress against the detailed performance and completion criteria in paragraph (g) above (at a minimum these reporting requirements must be included as part of the annual review referred to in condition 5 of Schedule 5)	8
Exploration Licence EL8184 Conditions 043 and 044	043. The licence holder must submit an Environmental Management Report to the Department in the following circumstances: a) where the licence holder is seeking to renew this exploration licence, an Environmental Management Report must accompany an exploration licence renewal application; or b) where the licence holder is seeking to cancel or part cancel this exploration licence, an Environmental Management Report must accompany an exploration licence cancellation application; c) where the licence holder is not seeking to renew or cancel this exploration licence, and Environmental Management Report must be submitted prior to the expiry of this exploration licence. 044. The report must be prepared in accordance with any Director-General's requirements for environmental and rehabilitation reporting on exploration licences and include information on all disturbance resulting from prospecting operations and rehabilitation carried out within the exploration licence area. The report must be prepared to the satisfaction of the Director-General.	043. Entire document 044. Entire document
Mining Tenement CCL0715	004. The lease holder must lodge Environmental Management Reports (EMR) with the Director-General annually or at dates otherwise directed by the Director-General.	004. Entire document 005

Approval	Condition	Relevant Section of Document
<p>Schedule 00 Conditions 004 and 005</p>	<p>005. The EMR must:</p> <ul style="list-style-type: none"> a) report against compliance with the MOP; b) report on progress in respect of rehabilitation completion criteria; c) report on the extent of compliance with regulatory requirements; and d) have regard to any relevant guidelines adopted by the Director-General. 	<ul style="list-style-type: none"> a) 8 b) 8 c) Entire document d) Entire document
<p>Mining Tenement CL0358 Schedule 00 Condition 004</p>	<p>The lease holder must lodge Environmental Management Reports (EMR) with the Director-General annually or at dates otherwise directed by the Director-General.</p> <p>The EMR must:</p> <ul style="list-style-type: none"> i) report against compliance with the MOP; ii) report on progress in respect of rehabilitation completion criteria; iii) report on the extent of compliance with regulatory requirements; and iv) have regard to any relevant guidelines adopted by the Director-General. 	<ul style="list-style-type: none"> i) 8 ii) 8 iii) Entire document iv) Entire document
<p>Mining Tenements ML1410, ML1415, ML1453, ML1475, ML1476, ML1561 Schedule 00 Conditions 003.01 and 003.02</p>	<p>003.01. Within 12 months of the commencement of mining operations and thereafter annually or, at such other times as may be allowed by the Director-General, the lease holder must lodge an Annual Environmental Management Report (AEMR) with the Director-General.</p> <p>003.02. The AEMR must be prepared in accordance with the Director-General's guidelines current at the time of reporting and contain a review and forecast of performance for the preceding and ensuing twelve months in terms of:-</p> <ul style="list-style-type: none"> a) the accepted Mining Operations Plan; b) development consent requirements and conditions; c) Environment Protection Authority and Department of Land and Water Conservation licences and approvals; d) any other statutory environmental requirements; e) details of any variations to environmental approvals applicable to the lease area. and f) where relevant, progress towards final rehabilitation objectives. 	<ul style="list-style-type: none"> 003.01 Entire document 003.02 a) 8 b) Various c) Various d) Various e) 4.2 f) 8
<p>Mining Tenements ML1608 and ML1629 Schedule 00 Conditions 04 and 05</p>	<p>04. The lease holder must lodge Environmental Management Reports (EMR) with The Director-General annually or at dates otherwise directed by the Director-General.</p> <p>05. The EMR must: - report against compliance with the MOP; - report on progress in respect of rehabilitation completion criteria; - report on the extent of compliance with regulatory requirements; and - have regard to any relevant guidelines adopted by the Director-General.</p>	<ul style="list-style-type: none"> 04. Entire document 05. 8, 18, Entire document
<p>Mining Tenements ML1694 and MP0343 Schedule 00 Condition 04</p>	<p>The lease holder must lodge Environmental Management Reports (EMR) with the Director-General annually or at dates otherwise directed by the Director-General.</p> <p>The EMR must:</p> <ul style="list-style-type: none"> (i) report against compliance with the MOP; (ii) report on progress in respect of rehabilitation completion criteria; (iii) report on the extent of compliance with regulatory requirements; and (iv) have regard to any relevant guidelines adopted by the Director-General. 	<ul style="list-style-type: none"> i) 8 ii) 18 iii) Entire document iv) Entire document

2. Introduction

MGO comprises of:

- MTO Open Cut Mine, including the MGO Coal Handling and Preparation Plant (CHPP)
- Glendell Open Cut Mine (Glendell)
- Ravensworth East Open Cut Mine (Ravensworth East)

(refer to *Figure 1* and *Figure 2*).

This report is prepared for the reporting period 01 January 2022 to 31 December 2022. The report has been prepared in accordance with the *NSW Department of Planning, Industry and Environment (DPE) Annual Review Guideline*, dated October 2015. It covers the reporting requirements of:

- SSD-5850
- DA 80/952
- Associated approvals, mining and exploration leases, and environmental management plans.

2.1 MGO

MGO is located on Hebden Road at Ravensworth, approximately 20 km north-west of Singleton, NSW. MGO is owned and managed by Mt Owen Pty Limited (MTO), which is a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore). MTO was operated by Thiess Proprietary (Pty) Limited (Ltd) (Thiess) until 31st December 2022.

2.2 MTO

Mining operations at MTO began in 1993 under the management of Hunter Valley Coal Corporation Pty Limited (HVCC). Xstrata (now Glencore) acquired MTO in 2003. MTO was granted DA 14-01-2004 in December 2004, which was supported by the *MTO Environmental Impact Statement (EIS)* (Umwelt, 2003).

A modification to DA 14-1-2004 was approved in December 2010. This allowed for the construction and operation of a rail facility on the MTO rail loop. Further modification was approved in 2014 to increase the CHPP to 17 Million tonnes per annum (Mtpa) run-of-mine (ROM) coal equivalent from MTO, Glendell and Ravensworth East.

In January 2018 an application was made to DP&E to surrender DA 14-01-2004 as it is replaced by SSD-5850. Approval to surrender DA 14-01-2004 was received from DP&E on 29 May 2018.

2.3 Mount Owen Continued Operations (MOCO)

MOCO, the continued operation of both MTO and Ravensworth East, was granted SSD-5850 in November 2016. The approval was supported by the MOCO EIS, (Umwelt, 2015).

A modification to SSD-5850 was approved in August 2017 to allow for the inclusion of the Greater Ravensworth Area Water Sharing Scheme (GRAWTS), and the construction of a water pipeline from Integra Underground Mine to MGO.

A second modification to SSD-5850 was approved September 2019 to allow an increased disturbance area and extend mining operations to 31 December 2037. A third modification to SSD-5850 was

approved January 2020 which was an administrative modification in which a land parcel was included within the Schedule of Land. Modifications 5 and 6 were approved in January and June 2021.

2.4 Glendell

Glendell was granted DA 80/952 in May 1993.

The DA was modified in 1997 to enable the extraction of coal from an undeveloped coal reserve, totalling 3.6 Mtpa of ROM coal. The modification allowed for the construction of a CHPP and the MTO rail loop, and for Glendell to be integrated into the MTO Complex (now referred to as MGO). A further modification of the DA 80/952 was undertaken in February 2008. This was to allow for mining operations to continue until the end of June 2024, and to permit extraction of up to 4.5 Mt of ROM coal annually. Modification 3 of DA 80/952 was approved in late 2016. The modification permits the relocation of a section of the 132 kilovolt (kV) powerlines, to allow for the continuation of mining in the Barrett Pit.

A fourth modification to DA80/952 was approved in March 2020 which is an extension to the approved Barrett pit shell to access additional ROM coal and to install a western haul road under the existing approval.

2.5 Ravensworth East

Ravensworth East was acquired in 1997 by Peabody Resources Ltd. In March 2000, DA 52-03-99 was granted. This was to enable production of up to 4 Mtpa. This allowed mining operations to commence in August 2000 and continue for up to 21 years.

Enx Resources (now Glencore) purchased Ravensworth Operations Pty Ltd in March 2002. The operation included the Ravensworth East and Narama mines. A mining operations plan (MOP) was granted in December 2002, which allowed for the transport and processing of coal from Ravensworth East to the MTO CHPP. Modification to the DA in 2005 allowed the integration of Ravensworth East with MTO.

In 2016, Modification 6 to the DA was approved. This allowed an integrated **tailings management strategy** between Liddell Operations, Ravensworth Operations and the MOC.

In January 2018 an application was made to DPE to surrender DA 52-03-99 as Ravensworth East has been included in SSD-5850. Approval to surrender DA 52-03-99 was received from DPE on 29 May 2018.

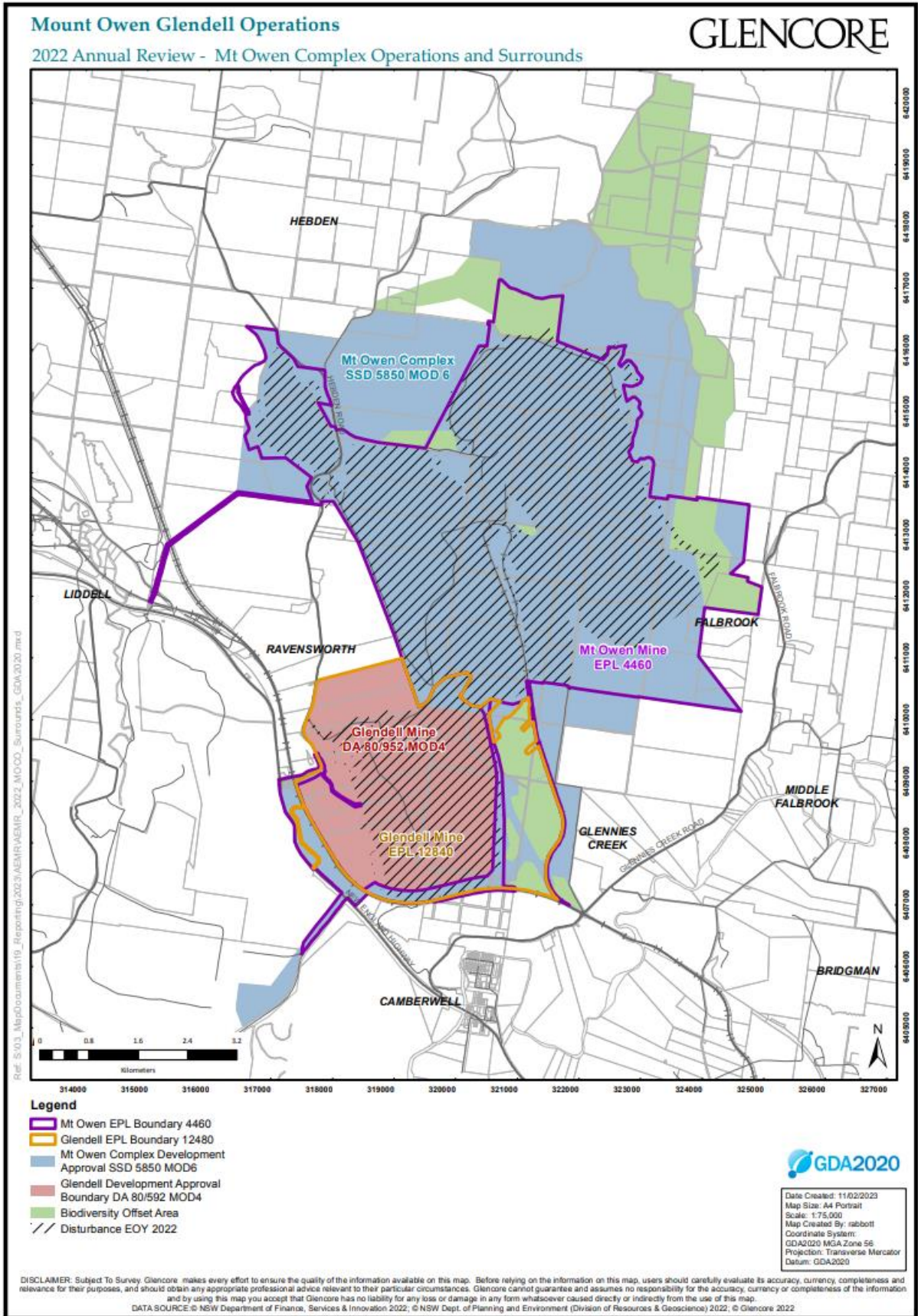


Figure 1: Mt Owen/Glendell Operations Overview and Disturbance as of 31 December 2022

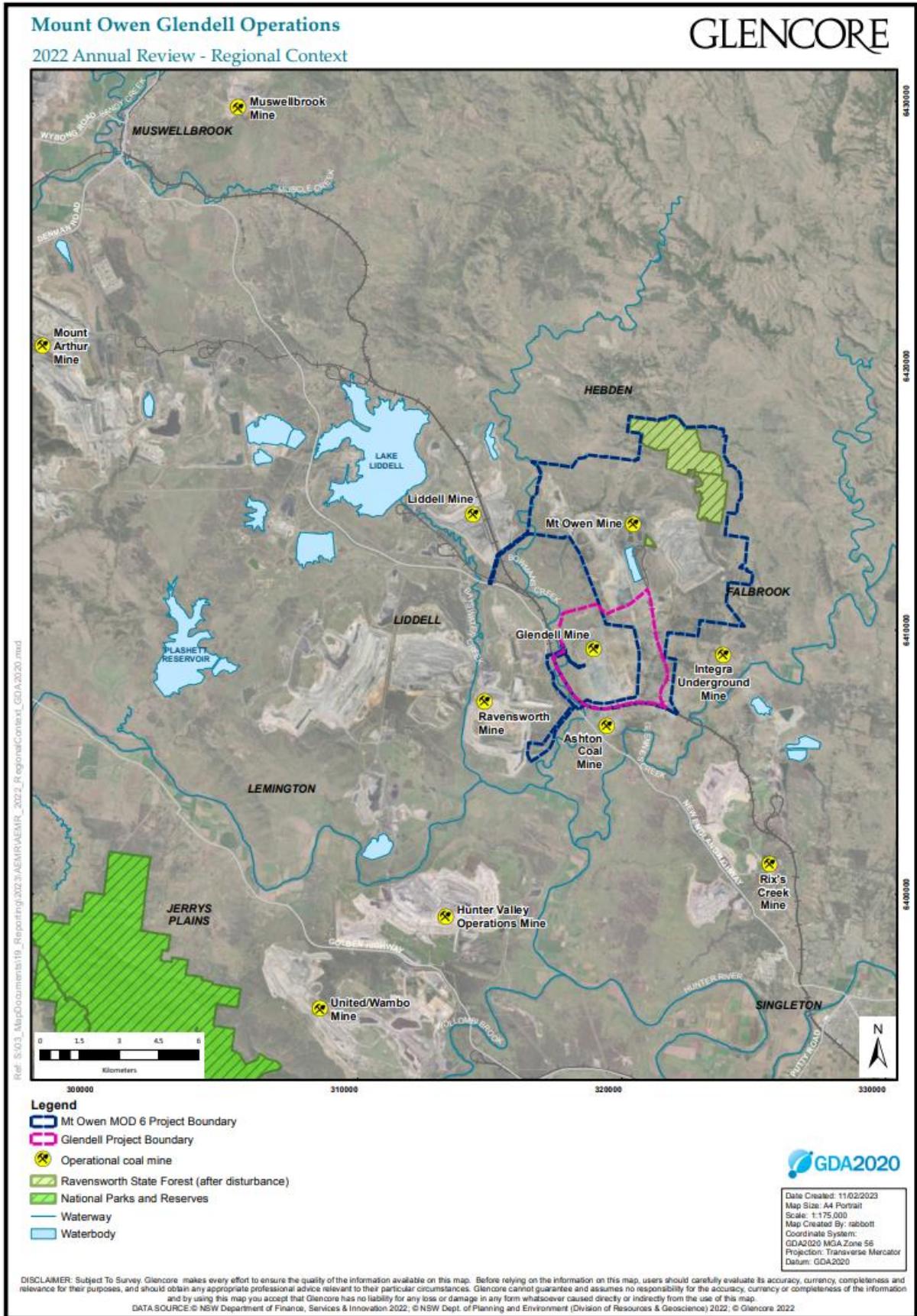


Figure 2: MGO Overview – Regional Context

2.6 Mine Contacts

Mine contacts for MGO are provided in *Table 6* below.

Table 6: MGO Contact Details

Name	Position Held	Contact Details	
Mount Owen/ Glendell Operations Management			
Christopher Gerard	Operations Manager	02 6520 2693	
Mount Owen / Glendell Operations Environment and Community			
Sebastien Moreno	Environment and Community Manager	02 6520 2693	
General Contact Details			
Mt Owen / Glendell Operations		Street Address: Postal Address: Phone: 24-hour Community Hotline: 24-hour Blasting Hotline: Website:	158 Hebden Road Ravensworth NSW 2330 PO Box 320, Singleton NSW 2330 02 6570 0850 1800 730 883 1800 319 566 www.mtowencomplex.com.au

3. Approvals and Licences

MGO operates under a number of approvals and licences which are summarised in *Table 7*. MGO project boundaries and mining tenements are illustrated in *Figure 3*.

Table 7: MGO Approvals and Licences

Approval Number	Approval Description	Date Granted	Expiry Date
FWP0001021	Mt Owen Complex Forward Program	1/07/2022	30/06/2025
SSD-5850 (Mt Owen and Ravensworth East)	Development Consent SSD-5850	03/11/2016	31/12/2037
DA 80/952	Development Consent 80/952	01/03/2020	30/06/2024
EPBC 2013/6978	Environment Protection and Biodiversity Conservation (EPBC) Act approval 2013/6978	19/01/2017	31/12/2037
WA 20WA210940	Water Supply Works	01/08/2009	31/07/2029
WA 20WA211430	Water Approval (Water Supply Works) – Swamp Creek Lower Diversion	01/05/2008	31/07/2022*
WA 20WA211425	Water Supply Works – Swamp Creek Middle Diversion	01/08/2009	31/07/2022*
WA 20WA211429	Water Supply Works – Yorks Creek Diversion	16/05/2007	15/05/2023
WA 20WA212660	Water Approval (Water Supply Works) – Bettys Creek Lower Diversion	11/02/2013	07/02/2023
WA 20WA212187	Water Supply Works – Bettys Creek Upper and Middle Diversion	01/08/2009	17/10/2032
ML 1355	Mining Lease	30/06/2014	23/07/2036
ML 1476	Mining lease	23/11/2000	23/11/2024
ML 1419	Mining Lease	02/02/2015	12/11/2033
ML 1415	Mining lease	07/08/1997	04/07/2042
ML 1561	Mining Lease	16/02/2005	16/02/2026
ML 1608	Mining Lease	18/12/2007	19/12/2028
ML 1794	Mining Lease	16/07/2019	31/12/2031
ML 1802	Mining Lease	30/03/2020	30/03/2041
ML 1475	Mining lease	24/11/200	23/11/2042
CL 383	Coal Lease	26/06/2014	12/11/2033

Approval Number	Approval Description	Date Granted	Expiry Date
CL 358	Coal Lease	26/03/1990	27/03/2032
Auth 268	Exploration Authorisation	13/09/2017	25/08/2025
EL5824	Exploration Licence	14/11/2016	Perpetuity
EL8916	Exploration Licence	02/12/2019	05/12/2028
EL6594	Exploration licence	07/07/2006	06/07/2025
EL8184	Exploration licence	14/10/2013	14/10/2018
Section 126 (Stages 1 and 2)	Emplacement Approval	7/11/1996	N/A
Section 126 (Stages 3 and 4)	Emplacement Approval	23/12/2003	N/A
EPL 4460	Environment Protection Licence 4460 (Mt Owen and Ravensworth East)	29/08/2019	29/08/2024 (Review Date)
WAL7823	Water Licence (Domestic and Stock)	17/05/2010	Perpetuity
WAL7826	Water Licence (Domestic and Stock)		Perpetuity
WAL754	Water Licence (Domestic and Stock)	01/07/2004	Perpetuity
WAL7817	Water Licence (Domestic and Stock)	17/10/2011	Perpetuity
WAL13324	Water Licence (Domestic and Stock)	20/08/2019	Perpetuity
WAL11084	Water Licence (Domestic and Stock)	01/07/2004	30/06/2027
WAL7814	Water Licence (High Security)	15/03/2011	Perpetuity
WAL41542	Water Licence (General Security)		Perpetuity
WAL41540	Water Licence (General Security)		Perpetuity
20BL168116	Groundwater Licence – Monitoring Bore	15/06/2001	Perpetuity
20BL169332	Groundwater Licence – Monitoring Bore	24/08/2004	Perpetuity
20BL169333	Groundwater Licence – Monitoring Bore	24/08/2004	Perpetuity
20BL169334	Groundwater Licence – Monitoring Bore	24/08/2004	Perpetuity
20BL169335	Groundwater Licence – Monitoring Bore	24/08/2004	Perpetuity
20BL169336	Groundwater Licence – Monitoring Bore	24/08/2004	Perpetuity
20BL171536	Groundwater Licence – Monitoring Bore	03/10/2007	Perpetuity
20BL171538	Groundwater Licence – Monitoring Bore	03/10/2007	Perpetuity
20BL171539	Groundwater Licence – Monitoring Bore	03/10/2007	Perpetuity

Approval Number	Approval Description	Date Granted	Expiry Date
20BL171540	Groundwater Licence – Monitoring Bore	03/10/2007	Perpetuity
20BL171541	Groundwater Licence – Monitoring Bore	03/10/2007	Perpetuity
20BL171544	Groundwater Licence – Monitoring Bore	03/10/2007	Perpetuity
20BL171546	Groundwater Licence – Monitoring Bore	03/10/2007	Perpetuity
20BL171542	Groundwater Licence – Monitoring Bore	03/10/2007	Perpetuity
20BL171534	Groundwater Licence – Monitoring Bore	03/10/2007	Perpetuity
20BL171707	Groundwater Licence – Monitoring Bore	17/08/2007	Perpetuity
20BL171543	Groundwater Licence – Monitoring Bore	03/10/2007	Perpetuity
20BL171545	Groundwater Licence – Monitoring Bore	03/10/2007	Perpetuity
20BL169544	Saline Water Excavation Bore	24/02/2005	Perpetuity
DA 80/952	Development Approval 80/952	01/12/2016	30/06/2024
WA 20WA201228	Water Approval (Water Supply Works)	01/07/2004	30/06/2027
WA 20WA201868	Water Approval (Water Supply Works)	01/07/2004	05/01/2028
WA 20WA215076	Water Approval (Water Supply Works)	01/07/2016	Perpetuity
WA 20WA201499	Water Approval (Water Supply Works)	01/06/2004	30/06/2027
WA 20WA201677	Water Supply Works	01/07/2004	28/06/2028
WA 20WA200727	Water Supply Works	01/07/2004	08/10/2028
MPL 343	Mining Purposes Lease	16/06/1996	04/01/2026
ML 1629	Mining Lease	08/03/2009	09/03/2030
ML 1673	Mining Lease	04/11/2016	11/11/2033
ML 1741	Mining Lease	11/03/2020	11/11/2033
ML 1453	Mining Lease	08/05/2001	04/07/2020 (Renewal Pending)
ML 1694	Mining Lease	21/10/2013	22/10/2034
ML 1410	Mining Lease	15/05/1997	04/07/2020 (Renewal Pending)
EPL 12840	Environment Protection Licence 12840	11/11/2019	11/11/2024 (Review Date)
WAL704	Water Licence (High Security)	02/05/2008	Perpetuity

Approval Number	Approval Description	Date Granted	Expiry Date
WAL1118	Water Licence (High Security)	02/05/2008	Perpetuity
WAL9521	Water Licence (High Security)	22/05/2008	Perpetuity
WAL612	Water Licence (General Security)	02/05/2008	06/02/2029
WAL637	Water Licence (General Security)	02/05/2008	Perpetuity
WAL613	Water Licence (General Security)	01/07/2004	Perpetuity
WAL705	Water Licence (General Security)	02/05/2008	Perpetuity
WAL1119	Water Licence (General Security)	02/05/2008	Perpetuity
WAL1215	Water Licence (General Security)	02/05/2008	Perpetuity
WAL1420	Water Licence (Supplementary Water)	02/05/2008	Perpetuity
WAL706	Water Licence (Domestic and Stock)	23/03/2005	Perpetuity
WAL1218	Water Licence (Domestic and Stock)	31/03/2005	Perpetuity
WAL41521	Water Licence (General Security)		Perpetuity
WAL13750	Water Licence (General Security)	20/10/2006	19/10/2026
WAL41526	Water Licence (General Security)	01/07/2016	30/06/2029
WAL18000	Water Licence (General Security)	20/08/2019	Perpetuity
WAL18310	Water Licence (Unregulated)	16/05/2014	Perpetuity
20CA200608	Water Licence (Water Supply Works and Water Use)	01/07/2004	30/06/2027
20CA200382	Water Licence (Water Supply Works and Water Use)	01/07/2004	06/02/2029
20CA200445	Water Licence (Water Supply Works and Water Use)	01/07/2004	30/06/2027
20CA201623	Water Licence (Water Supply Works and Water Use)	01/07/2004	30/06/2027
20BL171535	Groundwater Licence – Monitoring Bore	03/10/2007	Perpetuity
20BL171547	Groundwater Licence – Monitoring Bore	03/10/2007	Perpetuity

**Extension application submitted in 2022*

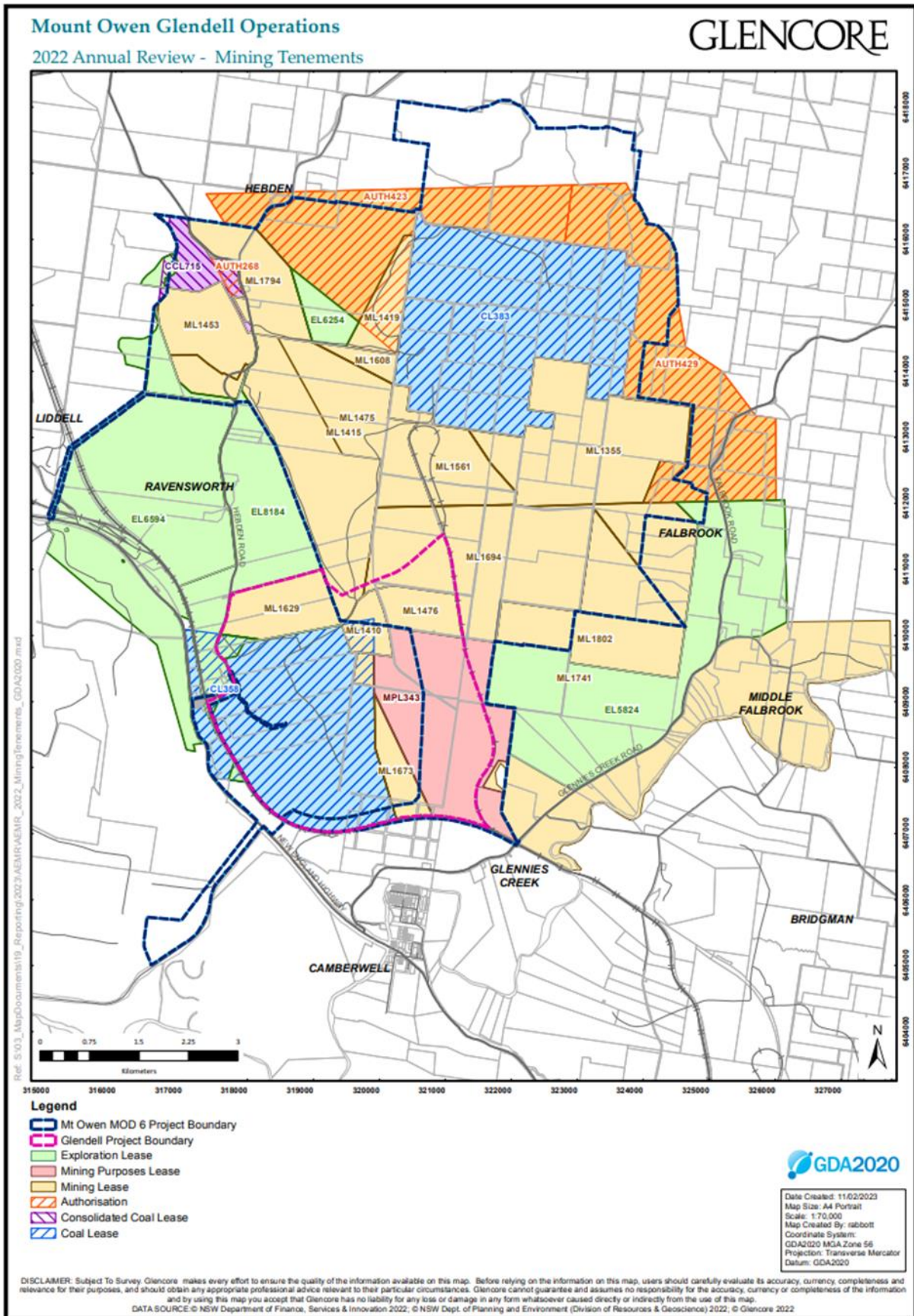


Figure 3: MGO Project boundaries and mining tenements

3.1 Project approvals

3.1.1 MOCO

MOCO received approval in November 2016, under SSD-5850. The approval combined the existing development consents for MTO and Ravensworth East, extending the operation until 2031.

In August 2017, MGO modified SSD-5850 ('Mod 1') to allow for the construction of a mine water pipeline from Integra Underground Mine to MGO. In September 2019, Modification 2 (Mod 2) to SSD-5850 was approved. This allows the additional mining of 35 Mt of ROM coal and extends the life of mine to 31 December 2037. During January 2020, Modification 3 (Mod 3), an administrative modification, was approved by DPE for the inclusion of one land parcel within the 'Schedule of Land'. Modification 5 (Mod 5) was approved by DPE in January 2021. This allowed the modification of Condition 27 of Schedule 3 of SSD-5850 to remove the requirement to establish the TSR Offset site as a biodiversity offset and instead nominate the number of biodiversity credits required to be retired in accordance with the Biodiversity Conservation Act 2016. Modification 6 (Mod 6) was approved in June 2021. Mod 6 allows for the construction of a water transfer pipeline between MGO and Ravensworth under the existing GRAWTS. Mod 6 also approved the installation of a new asset registration at the WRD, and amendment of the SSD-5850 Project Boundary.

3.1.2 Glendell Continued Operations Project (GCOP)

Under the GCOP proposal (SSD-9349), Glencore sought approval to extend the open cut mining operations at Glendell, north from the existing Barrett Pit. The GCOP proposal would have extracted an additional 140 Mt of ROM coal, down to the Hebden coal seam and extend the period of mining operations at Glendell to approximately 2044.

During 2018, a Preliminary Environmental Assessment (PEA) for the project was prepared and submitted to DPE. The Secretary's Environmental Assessment Requirements (SEARs) were received by Glencore in July 2018. A development application, accompanied by a detailed EIS, was submitted to DPE during 2019. DPE placed the EIS on public exhibition from 11 December 2019 until 14 February 2020. 359 submissions were received during public exhibition, including 16 from Government agencies, 16 from Special Interest Groups and 327 from community members. Of the 327 community submissions received 200 were supportive of GCOP, 117 objected and 10 provided comment.

The Response to Submissions (RTS) report for GCOP was submitted to DPE in two parts during May and October 2020. A separate response to the Federal Government's Independent Expert Scientific Committee (IESC) was submitted in August 2020. During the end of 2020 and throughout the reporting period, Glencore continued to respond to Government departments and complete further consultation with the Heritage Council and Singleton Council regarding the proposed Ravensworth Homestead relocation options.

The IPC rejected GCOP on 28th of October 2022.

4. Operations Summary

4.1 Mining Operations

In 2022, MGO produced a total of 11.92 Mt of ROM coal, consisting of:

- 7.4 Mt ROM coal from MTO
- 2.53 Mt for Ravensworth East Mine
- 1.99 Mt ROM Coal from Glendell Mine.

The annual ROM coal extraction limits for MGO are:

- 10 Mtpa for MTO
- 4 Mtpa for Ravensworth East Mine
- 4.5 Mtpa for Glendell Mine.

Details of the amount of ROM coal mined from each area and the total amount of product coal mined at MGO is provided in *Table 8*.

In 2022, approximately 237 people were employed by Glencore at Glendell mine and 56 at MTO. More than 300 people were employed by the contracting company (Thiess) at MTO mine.

Table 8: MGO Production Summary

Material	Approved limit (specify source)	2022 Reporting Period (Forecast)	2022 Reporting Period (Actual)	2023 Reporting Period (Forecast*)
MTO				
Prime Overburden (Million bank cubic metres (Mbcm))	-	39,590,947	36,098,967	38,126,362
ROM Coal Mined (Mt)	10 (Development Consent)	8,045,230	7,396,268	7,534,955
Saleable Product (Mt)	-	4,785,268	3,930,080	4,341,603
ROM Coal Fed (Mt)	-	8,452,230	7,022,325	7,534,955
Glendell				
Prime Overburden (Mbcm)	-	10,227,206	9,455,639	0
ROM mined (Mt)	4.5 (Development Consent)	2,583,576	2,526,259	0
Saleable Product (Mt)	-	1,718,303	1,541,414	0
ROM Coal Fed (Mt)	-	2,583,576	2,534,261	0
Ravensworth East				

Material	Approved limit (specify source)	2022 Reporting Period (Forecast)	2022 Reporting Period (Actual)	2023 Reporting Period (Forecast*)
Prime Overburden (Mbcm)	-	8,526,743	6,447,072	2,802,909
ROM mined (Mt)	4 (Development Consent)	2,519,802	1,995,464	2,331,747
Saleable Product (Mt)	-	1,451,261	1,179,092	1,462,702
ROM Coal Fed (Mt)	-	2,519,802	2,118,850	2,331,992
CHPP				
ROM Coal Fed (Mt)	17 (Development Consent)	13,555,608	11,675,436	9,866,947
Coarse Waste Reject (Mt)	-			
Total MGO Saleable Product (Mt)	-	7,954,832	6,650,586	5,804,305
Fine Waste Reject (Mt)	-			

*Forecast may change for 2023

4.2 Other Operations

4.2.1 Train and Conveyor Movements

Table 9 summarises the train and conveyor movements undertaken at the MGO during 2022. Daily train movements are provided in Appendix B.

ROM coal from MGO is transported for processing at the CHPP. Product coal is conveyed to the product coal stockpile where it is stored according to coal quality and loaded onto trains for transport to Newcastle Port. During the reporting period, 6.54 Mt of product coal from MGO was loaded onto 808 trains (Appendix B, Table 9) and railed from site. This included:

- 3.93 Mt from MTO
- 2.719 Mt from Glendell and Ravensworth East.

Approximately 600,000 tonne (t) product stockpile is located at the CHPP. The stockpile currently has five product types:

- Semi-soft
- High Ash Thermal
- Mid Ash Thermal
- Low Ash Thermal (<0.6% sulphur)
- Low Ash Thermal (>0.6% sulphur).

Table 9: MGO Train and Conveyor Movements

Train Movements	Total
Annual Average Daily Train Movements	2.21
Total Train Movements 2022	808
Annual Average Daily Train Tonnage	17,935
Annual Average Monthly Train Tonnage	545,542.3 Tonnes Per Month
Total Product Coal Loaded from CHPP	6.54 million Tonnes
Average Train Loading Time	121 minutes
Average Load Rate (Tonnes per hour)	4,155.90 Tonnes Per Hour
CHPP Compliance Limit	up to 17 Mt ROM coal per year

Note: Product coal can be stockpiled when not required, hence the product coal sales total will differ from product coal railed to port total.

4.2.2 Waste and Other Hazardous Material Management

Recycling and disposal of waste at MGO focuses on the correct handling, storage, segregation and reuse of materials. MGO recycles waste wherever possible, to reduce the amount of waste destined for landfill.

During the reporting period approximately 1,578.62 t of material was recycled at Glendell and Ravensworth East, this is slightly more than in 2021 (1,437 t). There was more scrap steel recycled in 2021 compared to 2022 (by approximately 14.9 t).

At MTO approximately 1,243 tonnes were recycled in 2022. This volume is less than in 2021 (2,048 t).

Waste oil, scrap steel, timber, paper and cardboard, oil filters and batteries were the major waste streams recycled during 2022 as outlined in Table 10: MGO Recycled Materials (2021 and 2022) Table 10.

Table 10: MGO Recycled Materials (2021 and 2022)

Waste Stream	MTO and CHPP		Glendell and Ravensworth East	
	2021	2022	2021	2022
Paper and Cardboard (t)	22.8 (CHPP: 1.9)	14.468 (CHPP: 1.2)	11.4	8.44
Waste Oil (Hazardous) (t)	673 (CHPP: 1.0)	508 (CHPP: 1.5)	558.5	520
Grease (t)	13.8	6.42	0.0	0.86
Oil filters (t)	34.3	24.045	24.7	26.75
Batteries (Hazardous) (t)	21.4	21.91	10.9	6.7
Scrap Steel (t)	550.8 (CHPP: 248.7)	199.3 (CHPP: 12.78)	188.9	174
Timber (t)	123.6 (CHPP: 36.2)	55.98	13.0	9.18

**co-mingled recycling at MTO includes paper and cardboard, and also glass, aluminium, and plastic.*

MGO disposes of waste heavy vehicle tyres through deep burial in overburden dumps, the location of all tyres is tracked by using spatial data. During 2022, 104 tyres were buried at Glendell and 335 at MTO as compared to 275 tyres at Glendell and 218 at MTO in 2021 (see *Table 11*).

Table 11: MGO Waste Tyre Burial (2021 and 2022)

Waste Stream	MTO		Glendell and Ravensworth East	
	2021	2022	2021	2022
Waste Heavy vehicle Tyres	218	335	275	104

Bulk fuel facilities at the MGO are bunded and designed to hold at least 110 % of the largest fuel storage tank. This is as per *Australian Standard (AS) 1940-2017 – The Storage and Handling of Flammable and Combustible Liquids*. Emergency measures and safeguards are in place in the event of a spill. There is low potential for off-site contamination once fuel is received on-site.

Monthly housekeeping inspections are undertaken across MGO, to monitor implementation of best practices.

4.2.3 Land Ownership

MGO landholdings total over 9,000 hectares. The landholdings cover the immediate and surrounding areas of the MGO, excluding the Ravensworth State Forest (RSF), which is situated north-east of MTO. The RSF consists of approximately 880 ha and is owned by the Forestry Corporation of NSW. Land not actively used for mining purposes is either rehabilitated or managed for either grazing or biodiversity offsets.

During 2022, one property (64.5 ha) was acquired by MGO from private landowners located in Middle Falbrook. Total land ownership for MGO is summarised in *Table 12*.

Table 12 Land Ownership

Operation	Land Owned (ha)	Land Leased (ha)
MTO	6,809.1	331*
Glendell	2,733.1	15.3
Total	9,447.7	346.9

** Incorporates the leased crown roads associated with offset properties.*

4.2.4 Exploration

No exploration activities were conducted during the 2022 reporting period.

4.2.5 Next Reporting Period

During the 2023 reporting period, it is projected that the following activities will occur at MGO:

4.2.5.1 MTO:

- Mining and dumping will continue in a south-easterly direction
- Progressive rehabilitation will consist of woodland areas
- Progressive rehabilitation will continue in accordance with the most recent Rehabilitation Management Plan and Forward Program.
- Pending favourable weather conditions capping and rehabilitation will continue to progress at North Void.

4.2.5.2 Glendell:

- Mining ceased at Glendell mine in Q4 2022.
- Glencore will evaluate options to continue mining at Glendell coal operation
- Progressive rehabilitation will continue in accordance with the most recent Rehabilitation Management Plan and Forward Program.

4.2.5.3 Ravensworth East:

- Mining within the Bayswater North Pit will continue within the existing pit shell.
- Progressive rehabilitation will continue in accordance with the most recent Rehabilitation Management Plan and Forward Program.

5. Actions Required from Previous Annual Review

The 2021 Annual Review for MGO was submitted to DPE on 31 March 2022 in accordance with Schedule 5 Condition 5 of SSD-5850 (as modified) and Schedule 5 Condition 5 of DA 80/952.

A revision of the annual review was submitted on the 22 July 2022. DPE acknowledged their satisfaction of the 2021 revised Annual Review on 29 July 2022 and did not identify additional actions to be completed.

No formal notification has been received by the NSW-Resources Regulator at the submission date of this report. The Annual Review 2021 is published on the company's website.

6. Environmental Performance

6.1 Operational Noise

MGO has a range of management strategies in place to limit the generation of noise and noise associated impacts. During 2022, the following activities were undertaken:

1. Monthly attended noise monitoring in accordance with the program described in the approved Noise Management Plan (NMP).

2. Continued use of directional real-time noise units integrated to MGO Noise Monitoring Network.
3. Maintenance of the real-time noise monitoring network.
4. Ongoing measurement of machine sound power levels to monitor equipment performance and assess the requirement for installation of noise attenuation equipment.
5. Continue to use weather forecast summary report to identify periods of potential adverse weather that could affect the propagation of noise.
6. Ongoing MGO employee education on noise management.
7. Development and implementation of MGO-specific noise training packages delivered to key site personnel.

6.1.1 Attended Noise Monitoring Program

The noise monitoring program includes both continuous noise monitors and attended noise monitoring. It is designed to measure the contribution that MTO, Ravensworth East and Glendell Mines make to the environmental noise levels in the region surrounding MGO.

Compliance with the development consents and regulatory requirements is determined from routine attended noise monitoring. Real-time noise monitors provide supporting information to the compliance assessment process when high noise levels are recorded during the attended noise monitoring program.

Both attended and real-time noise monitoring locations are detailed in Figure 4 and *Appendix C*, Table 3. Continuous and attended locations were selected as being representative of the nearest and/or most affected residences to the east, south and south-east of MGO. Monitoring locations are reviewed and where necessary, revised over the life of operations.

6.1.2 Noise monitoring Performance

Attended noise monitoring was undertaken monthly during the night-time periods in accordance with the approved NMP. Additional monitoring of day and evening periods occurred seasonally at MTO in accordance with EPL 4460 during the reporting period.

Results of the 2022 attended noise monitoring program are summarised in *Table 13* and *Table 14*, for MTO and *Table 15* and *Table 16*, for Glendell. During the attended noise monitoring, there was no non-compliance incidents recorded, monitoring location as shown in *Figure 4*.

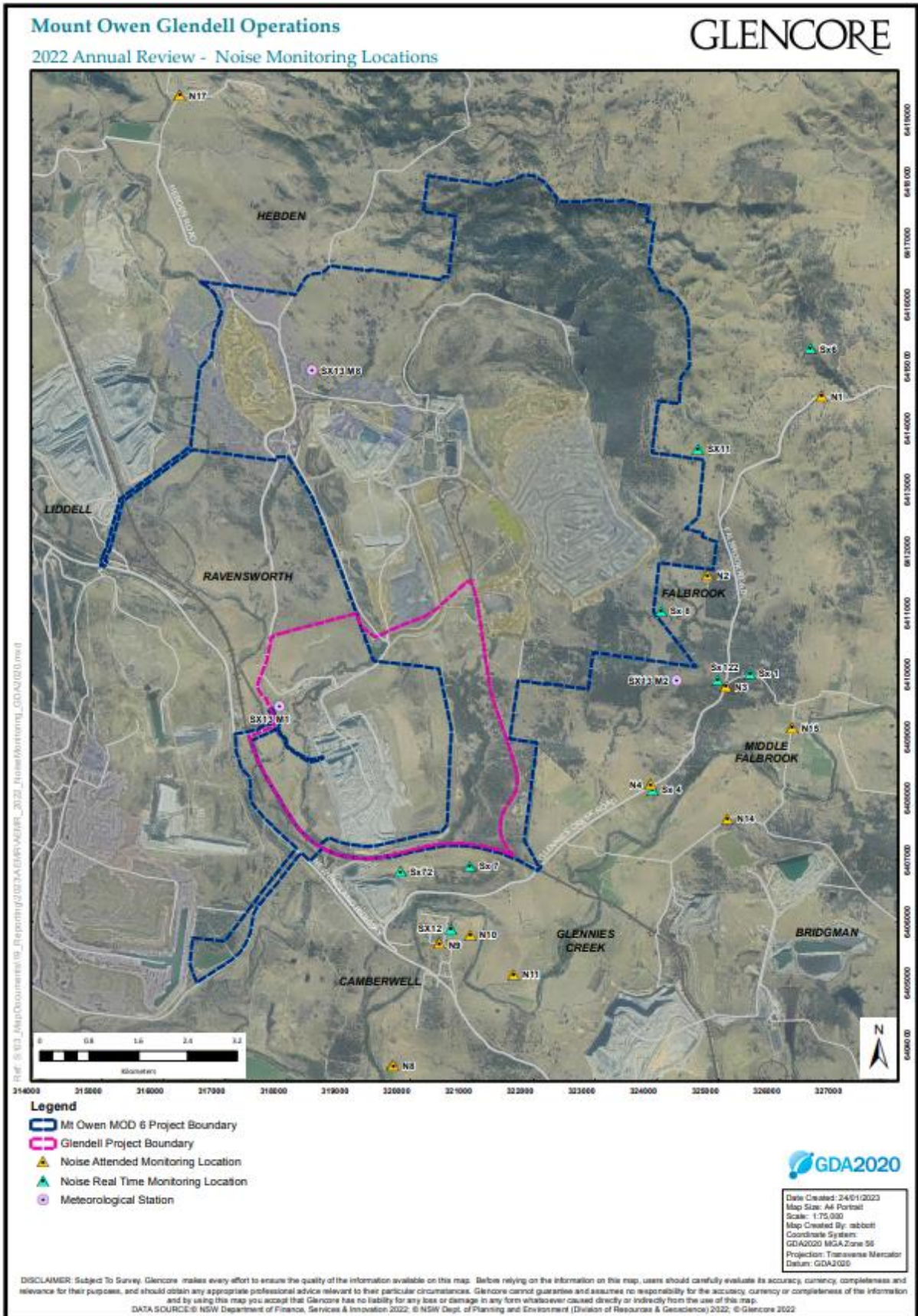


Figure 4 MGO Noise Monitoring locations

Night time monitoring results are displayed in *Appendix C*. Detailed seasonal noise reports are also available on the Glencore website at <https://www.glencore.com.au/>. The results presented in *Appendix C* and in the seasonal reports do not appear to indicate any trends in the data.

Generally, the applicable noise criteria and the predicted noise levels are the same for each of the monitoring locations and therefore the comparison with the criteria also demonstrates a comparison with predicted noise levels in the relevant MGO approvals.

Table 13: Summary of MTOs 2022 Environmental Noise Level (dB(A)) Contribution (LAeq, 15min)

Monitoring Location	Monitoring Period	Criteria	Jan 2022	Feb 2022	March 2022	April 2022	May 2022	June 2022	July 2022	Aug 2022	Sep 2022	Oct 2022	Nov 2022	Dec 2022
N1	Day	35	IA	N/A	N/A	IA	N/A	N/A	31	N/A	N/A	IA	N/A	N/A
	Evening	35	IA	N/A	N/A	IA	N/A	N/A	34	N/A	N/A	<25	N/A	N/A
	Night	45	<25	25	<25	<25	<30	<30	IA	<30	IA	IA	<25	IA
N3	Day	35	IA	N/A	N/A	IA	N/A	N/A	<40	N/A	N/A	<25	N/A	N/A
	Evening	45	IA	N/A	N/A	IA	N/A	N/A	<35	N/A	N/A	<30	N/A	N/A
	Night	45	IA	N/A	N/A	IA	N/A	N/A	<35	N/A	N/A	<30	N/A	N/A
N4	Night	42	IA	<35	<35	IA	<35	37	IA	40	IA	IA	<35	IA
N10	Night	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
N11	Night	35	<25	<30	IA	IA	IA	IA	<30	IA	IA	<30	<30	<25

Notes:

¹ There is no noise criteria for this monitoring location.

² Day and evening monitoring is only required once every quarter and was not required for this monthly monitoring round.

³ Re-measure undertaken following an initial exceedance at N3 as per the NMP

IA = Inaudible.

Table 14: Summary of MTOs 2022 Environmental Noise Level (dB(A)) Contribution (LA1, 1min) – Night

Monitoring Location	Criteria	Jan 2022	Feb 2022	March 2022	April 2022	May 2022	June 2022	July 2022	Aug 2022	Sep 2022	Oct 2022	Nov 2022	Dec 2022
N1	45	<30	36	<25	<25	42	31	IA	<30	IA	IA	<25	IA
N2 ¹	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N3	45	<30	36	<25	<25	42	31	IA	<30	IA	IA	<25	IA
N4	52	IA	40	<35	IA	<35	47	IA	45	IA	IA	41	IA
N10	45	IA	<35	<35	IA	<35	44	IA	<35	<35	<30	IA	IA
N17	45	<30	<30	IA	IA	IA	IA	<35	IA	IA	<30	<30	<30

Note:

¹ There is no noise criteria for this monitoring location.

² Re-measure undertaken following an initial exceedance at N3 as per the NMP

IA = Inaudible.

Table 15: Summary of Glendells 2022 Environmental Noise Level (dB(A)) Contribution (LAeq, 15min) – Night

Monitoring Location	Monitoring Period	Criteria	Jan 2022	Feb 2022	March 2022	April 2022	May 2022	June 2022	July 2022	Aug 2022	Sep 2022	Oct 2022	Nov 2022	Dec 2022
N1 ¹	Night	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
N2 ¹	Night	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
N3	Night	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
N4	Night	38	IA	IA	IA	IA	<35	IA	IA	IA	IA	IA	IA	IA
N8	Night	35	IA	<30	<30	IA	<30	<35	IA	IA	IA	IA	IA	IA
N9	Night	42	IA	<35	<30	IA	<37	40	<35	<35	<35	<30	<30	<30
N10	Night	40	IA	<35	<35	IA	<35	36	IA	<35	<35	<30	IA	IA
N11	Night	38	IA	<35	<35	IA	<35	38	IA	<37	IA	IA	<35	IA

Notes: 1 IA indicates that Glendell Mine was not audible at the location this month.

Table 16: Summary of Glendells 2022 Environmental Noise Level (dB(A)) Contribution (LA1, 1min) – Night

Monitoring Location	Monitoring Period	Criteria	Jan 2022	Feb 2022	March 2022	April 2022	May 2022	June 2022	July 2022	Aug 2022	Sep 2022	Oct 2022	Nov 2022	Dec 2022
N1 ¹	Night	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
N2 ¹	Night	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
N3	Night	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
N4	Night	45	IA	IA	IA	IA	<35	IA	IA	IA	IA	IA	IA	IA
N8	Night	45	IA	<30	<30	IA	<30	<35	IA	IA	IA	IA	IA	IA
N9	Night	45	IA	<35	<35	IA	<40	45	<40	<35	<35	<30	42	<30
N10	Night	45	IA	<35	<35	IA	<35	44	IA	<35	<35	<30	IA	IA
N11	Night	45	IA	<35	<35	IA	<35	45	IA	<40	IA	IA	<35	IA

Notes: 1 IA indicates that Glendell Mine was not audible at the location this month.

6.1.3 Continuous Improvement

As a part of the ongoing commitment to the management of noise impacts from MGO, a range of continuous improvement activities have been undertaken during 2022, including telemetry upgrade

Improvement activities to be undertaken in 2023 include:

- Continuous assessment and improvement of the real-time monitoring network and management alarms
- Addition of a new noise monitor in the middle Fallbrook community area.

6.2 Blasting

6.2.1 Blast Management and Monitoring

MGO blast management practices are managed in accordance with the MGO BMP. Blast monitoring locations are shown in *Figure 5*.

6.2.2 Blast Performance

MGO's performance for 2022 against the approved criteria for blasting is summarised in *Table 17*.

All blasts were fired within approved blasting hours no blasts were fired at MTO between 7am and 9am (Monday to Saturday inclusive).

One (1) blast was fired at Ravensworth East between 7am and 9am (Monday to Saturday inclusive) during 2022 in accordance with relevant condition of consent.

All blasting results from MGO are available on the website at:

<https://www.glencore.com.au/operations-and-projects/coal/current-operations/mt-owen-glendell-open-cut>.

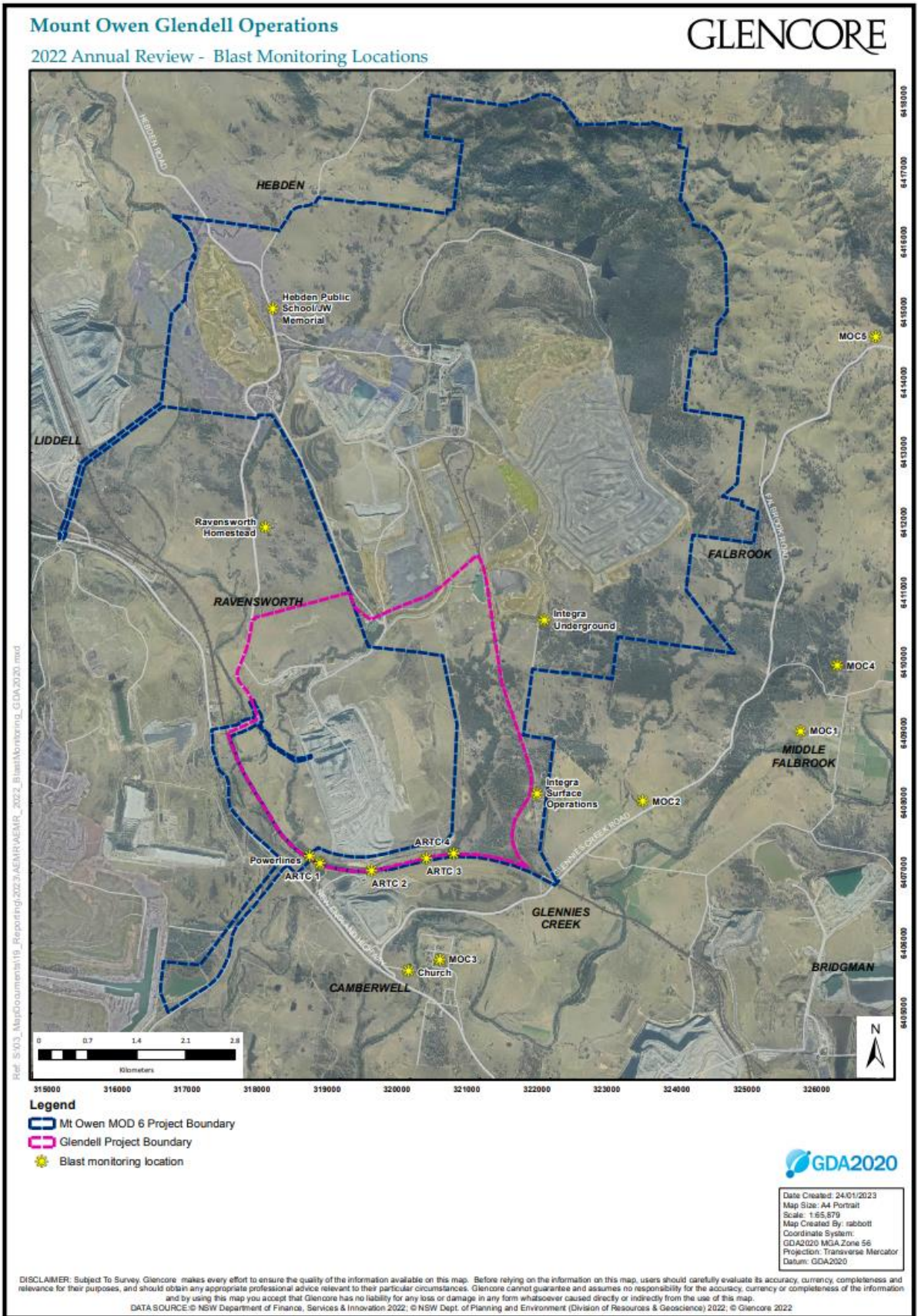


Figure 5: MGO Blasting Monitoring Locations

Table 17: MGO Blasting Hours and Frequencies for 2022

Approval	Operation	Compliant?	Approved Blasting Hours	Approved Blast Frequencies ¹		Actual Blast Frequencies (2022)		
				Maximum number of blasts per day	Average number of blasts per week	Total number of blasts recorded	Maximum number of blasts per day	Average number of blasts per week
DA 80/952	Glendell	Yes	9am – 5pm Monday to Saturday (EST) 9am – 6pm Monday to Saturday (DST)	2	5 ³	70	2	1.3 ⁵
SSD-5840	Ravensworth East	Yes	9am – 5pm Monday to Saturday ²	2	5 ⁴	31	2	0.6 ⁵
SSD-5850	MTO	Yes		2	8 ⁴	86	2	1.7 ⁵

1. Does not apply to blasts that generate ground vibration of 0.5mm/s or less at any residence on privately-owned land, or to blast misfires required to ensure the safety of the mine, its workers or the general public.

2. With the exception of an allowable maximum of 12 blasts in a calendar year which may be undertaken between 7am and 9am (Monday to Saturday inclusive).

3. Averaged over a 12-month period

4. Averaged over a calendar year

5. Averaged over the 2022 calendar year i.e., 1 Jan 2022 – 31 Dec 2022

EST – Eastern Standard Time

DST – Daylight Savings Time

Table 18: MGO Blasting Criteria and Performance for 2022

Location	Operation	Approval Criteria			Environmental Performance	Key Trends	Implemented/ Proposed Management Actions
		Airblast Over Pressure (dB(Lin Peak))	Ground Vibration (mm/s)	Allowable Exceedance			
Residents on Privately-Owned Land	MTO	120	10	0%	Compliant	Nil	Nil
	Ravensworth East Glendell	115	5	5% of the total number of blasts over a period of 12 months	Compliant		
Ravensworth Homestead	Ravensworth East	126	5	0%	Compliant	Nil	Nil

Location	Operation	Approval Criteria			Environmental Performance	Key Trends	Implemented/ Proposed Management Actions
		Airblast Over Pressure (dB(Lin Peak))	Ground Vibration (mm/s)	Allowable Exceedance			
Chain of Ponds Inn	MTO	133	10	0%	Compliant	Nil	Nil
Kangory (Dulwich) Homestead	MTO	126	5	0%	Compliant	Nil	Nil
Former Hebden Public School	MTO	n/a	16	0%	Compliant	Nil	Nil
John Winter Memorial	MTO	n/a	250	0%	Compliant	Nil	Nil
St Clements Church	Glendell	120	5	0%	Compliant	Nil	Nil
	Glendell	115	2	5% of the total number of blasts over a period of 12 months	Compliant	Nil	Nil
Main Northern Railway Culverts and Bridges	Glendell	120	25	Negotiated Agreement	Compliant	Nil	Nil
Powerlines	Glendell	n/a	25	Negotiated Agreement	Compliant	Nil	Nil
Integra Underground Surface	MTO	n/a	25 or 100	0%	Compliant	Nil	Nil
Integra Underground Workings	MTO	n/a	10 or 250	0%	Compliant	Nil	Nil

6.2.2.1 MTO

Overpressure and vibration compliance results for MTO are detailed in *Appendix D*.

There were 89 blasts fired at MTO during the reporting period, averaging less than 2 blasts fired per week. There were no non-compliances relating to blasting at MTO during the reporting period.

6.2.2.2 Glendell

Overpressure and vibration compliance results for Glendell are detailed in *Appendix D*.

There was a total of 40 blasts fired at Glendell during the reporting period averaging less than 1 blasts fired per week. There was no non-compliance relating to blasting at Glendell during the reporting period.

6.2.2.3 Ravensworth East

Overpressure and vibration compliance results for Ravensworth East are detailed in *Appendix D*.

There was a total of 41 blasts fired at Ravensworth East during the reporting period averaging less than 1 blast fired per week. There was no non-compliance relating to blasting at Ravensworth East during the report period.

MGO will continue to operate and managed blasting activities in accordance with the approved management plan and best practices.

6.3 Air Quality

6.3.1 *Air Quality Management and Monitoring*

Air quality is managed in accordance with the approved MGO Air Quality and Greenhouse Gas Management Plan (AQGHGMP). Monitoring locations are shown in

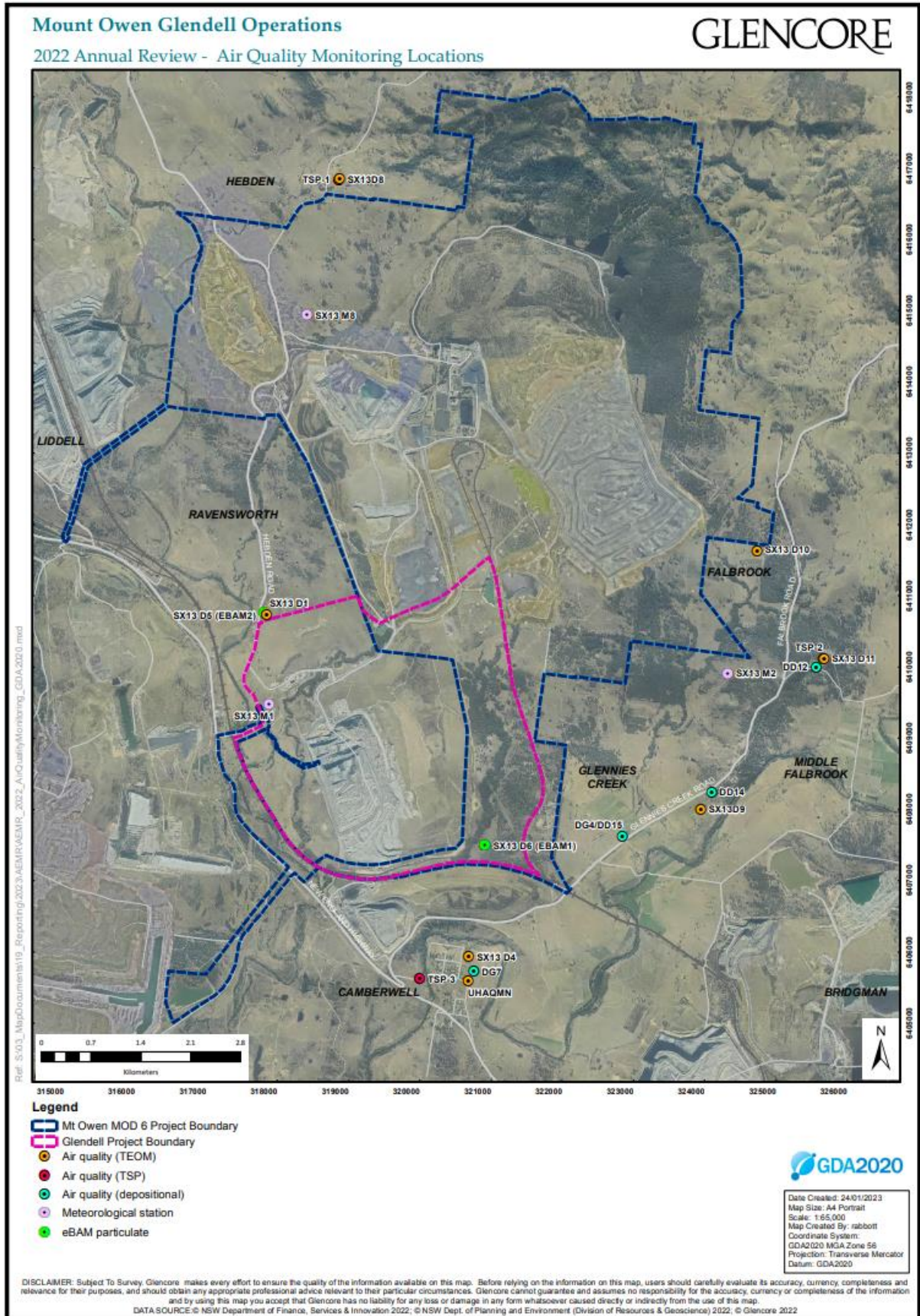


Figure 6. Results of air quality monitoring are presented in Appendix E.

Air quality conditions can be characterised by various substances and by various measurement techniques. Airborne particulate matter is typically the key air quality issue for open cut mining and the monitoring in the vicinity of MGO includes the measurement of:

- Particulate matter PM₁₀
- Particulate matter PM_{2.5}
- Particulate matter TSP
- Dust deposition.

Appendix E, Table 14 – 19 and Table 20 – 24 of this report present the monitoring results for 2022 and for recent years. It should be noted that the measurement data represents the contributions from all sources that have at some stage been upwind of each monitor. In the case of PM₁₀, the background concentration may contain emissions from many sources such as from mining activities, construction works, bushfires and 'burning off', industry, vehicles, roads, wind-blown dust from nearby and remote areas, fragments of pollens, moulds etc.

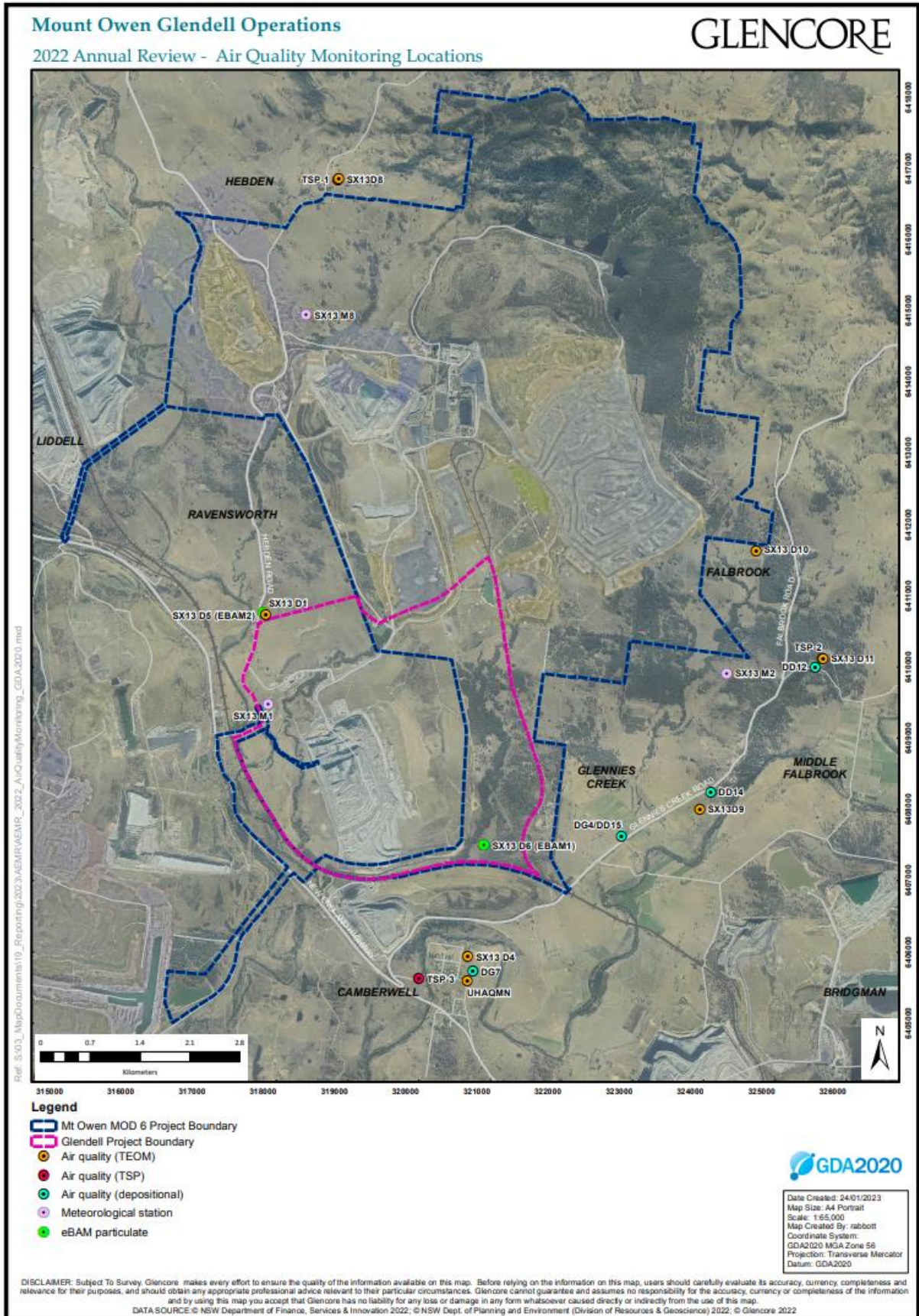


Figure 6: MGO Air Quality Monitoring locations

6.3.2 *Meteorological Conditions*

Meteorological monitoring is undertaken at MGO in accordance with SSD-5850 and DA 80/952 at the locations shown in *Figure 7*. MGO operates a continuous meteorological monitoring network which includes three weather stations:

- Sx13 M1
- Sx13 M2
- Sx13 M8

located to the west and south-east of the active mining areas.

The wind-roses in *Figure 7 : 2022 Annual Wind Roses for MGO Weather Stations* show the frequency of wind speeds and wind directions during the reporting period, based on hourly records for the three MGO weather stations. The circular format of the wind rose shows the direction from which the wind blew and the length of each "spoke" around the circle shows how often the wind blew from that direction. The different colours of each spoke provide details on the speed of the wind from each direction.

Rainfall data for Singleton Army Base (the closest Bureau of Meteorology monitoring station), recorded a total of 857mm in 2022, however is missing data for the months of April, May, June and July. The total of 857mm is still well above the long-term annual average rainfall of 689.8mm for that site confirming that 2022 was much wetter than average.

Approximately 1,129mm of rainfall was recorded at MGO at Sx13 M1 during the reporting period. In the previous reporting period, approximately 1,196mm of rainfall was recorded at that location, confirming that 2022 was just as wet as the previous year.



Figure 7 : 2022 Annual Wind Roses for MGO Weather Station

6.3.3 Air Quality Performance

6.3.3.1 Overview

As noted in the development consents DA 80/952 and SSD-5850, determination of compliance against MGO air quality impact assessment criteria are to exclude “...extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed to by the Secretary”. The DPE did not record any extraordinary events during the reporting period.

6.3.3.2 Particulate Matter PM10

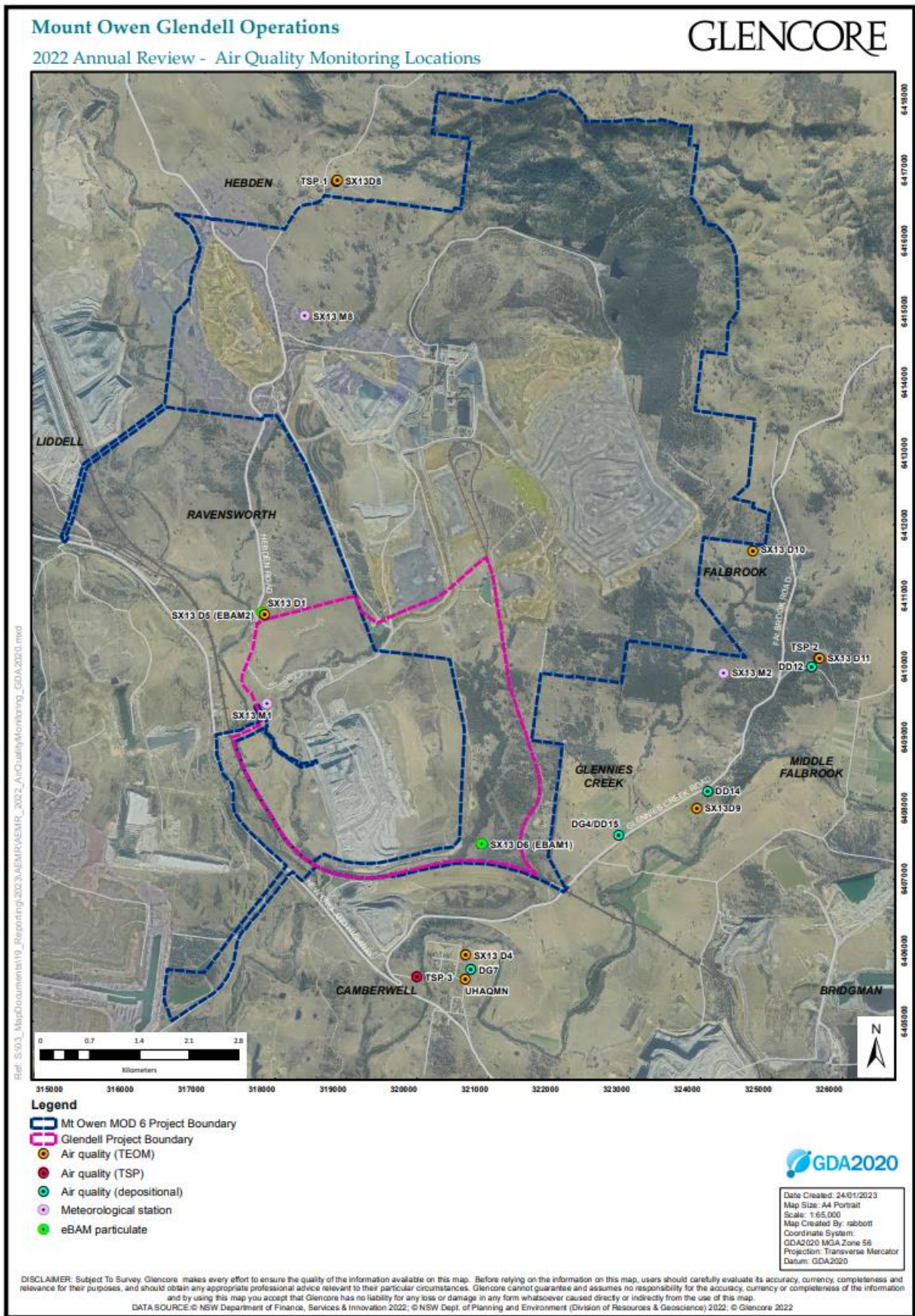


Figure 6 shows the location of monitors which are used to measure PM₁₀ concentrations. The

concentrations are measured by a variety of instruments including Tapered Element Oscillating Microbalance (TEOM) and High Volume Air Samplers (HVAS).

Table 19 summarises the measured PM₁₀ concentrations recorded at MGO during the reporting period. The data in Table 19 show that the PM₁₀ concentrations at all five monitors were below the 24-hour and annual average criteria. Consequently, the monitoring demonstrates compliance with DA 80/952 and SSD-5850 PM₁₀ criteria. Appendix E provides a more detailed analysis of the monitoring data, including a description of the method used to determine contributions from the direction of MGO.

Table 19: Summary of PM10 concentration from MGO monitors in 2022

Statistic	SX13 D1	SX13 D4	SX13 D8	SX13 D9	SX13 D11	Criterion	Environmental Performance this Reporting Period	Implemented/ Proposed Management Actions
Maximum 24-hour average in µg/m³								
Measurement (all data)	39.7	38.1	51.8	32.3	35.8	NA	NA	NA
Calculated contribution from direction of MGO	14.2	18.2	11.6	22.8	22.7	50 (SSD-5850) 50 (DA 80/952)	50 (Both Consents)	N/A
Annual average in µg/m³								
Measurement (all data)	16.3	15.4	14.6	13.2	10.2	25 (SSD-5850) 30 (DA 80/952)	25 (SSD-5850) 30 (DA 80/952)	Continuation of existing management and mitigation measures
Calculated contribution from direction of MGO	3.6	1.8	0.4	3.2	2.3	NA	NA	NA

6.3.3.3 Particulate Matter PM_{2.5}

Figure 6 shows the location of monitors which are used to measure PM_{2.5} concentrations.

Table 20 summarises the measured PM_{2.5} concentrations. The contribution from the direction of MGO could not be determined as monitoring to carry out an upwind-downwind calculation was not available. However, the data in

Table 20 shows that the PM_{2.5} concentrations were below the 24-hour and annual average criteria. Consequently, 2022 monitoring demonstrates compliance with SSD-5850 in terms of PM_{2.5} emissions. Appendix E provides a more detailed analysis of the monitoring data.

Table 20: Summary of PM_{2.5} Concentrations from MGO Monitors in 2022

Statistic	SX13 D8	SX13 D11	Criterion	Implemented/ Proposed Management Actions
Maximum 24-hour average in µg/m³				

Statistic	SX13 D8	SX13 D11	Criterion	Implemented/ Proposed Management Actions
Measurement (all data)	36.3	15.8	NA	Continuation of existing management and mitigation measures
Measurement (without extraordinary events)	36.3	15.8	NA	Continuation of existing management and mitigation measures
Calculated contribution from direction of MGO (without extraordinary events)	6.8	5.4	25 (SSD-5850)	Continuation of existing management and mitigation measures
Annual average in $\mu\text{g}/\text{m}^3$				
Measurement (all data)	6.8	4.6	NA	Continuation of existing management and mitigation measures
Measurement (without extraordinary events)	6.8	4.6	8 (SSD-5850)	Continuation of existing management and mitigation measures
Calculated contribution from direction of MGO (without extraordinary events)	0.3	0.7	NA	Continuation of existing management and mitigation measures

6.3.3.4 Particulate Matter TSP

TSP concentrations have been measured at three locations, TSP 1, TSP 2 and TSP 3, by HVAS. *Figure 6* shows the location of the monitoring sites. It should be noted that TSP 1 and TSP 2 are on mine owned land. *Table 21* shows the measured annual average TSP concentrations from each monitor for data collected in 2022.

The data shows that the TSP concentrations at TSP 1, TSP 2 and TSP 3 were below the $90 \mu\text{g}/\text{m}^3$ annual average criteria. Consequently, the monitoring demonstrates compliance with the development consents in terms of TSP emissions.

Table 21: Summary of TSP Concentrations from MGO Monitors in 2022

Statistic	TSP 1	TSP 2	TSP 3	Criterion SSD-5850 & DA80/932	Environmental Performance this Reporting Period	Implemented/ Proposed Management Actions
Annual average in $\mu\text{g}/\text{m}^3$	29	40	39	90	Compliant	Continuation of existing management and mitigation measures

6.3.3.5 Depositional Dust

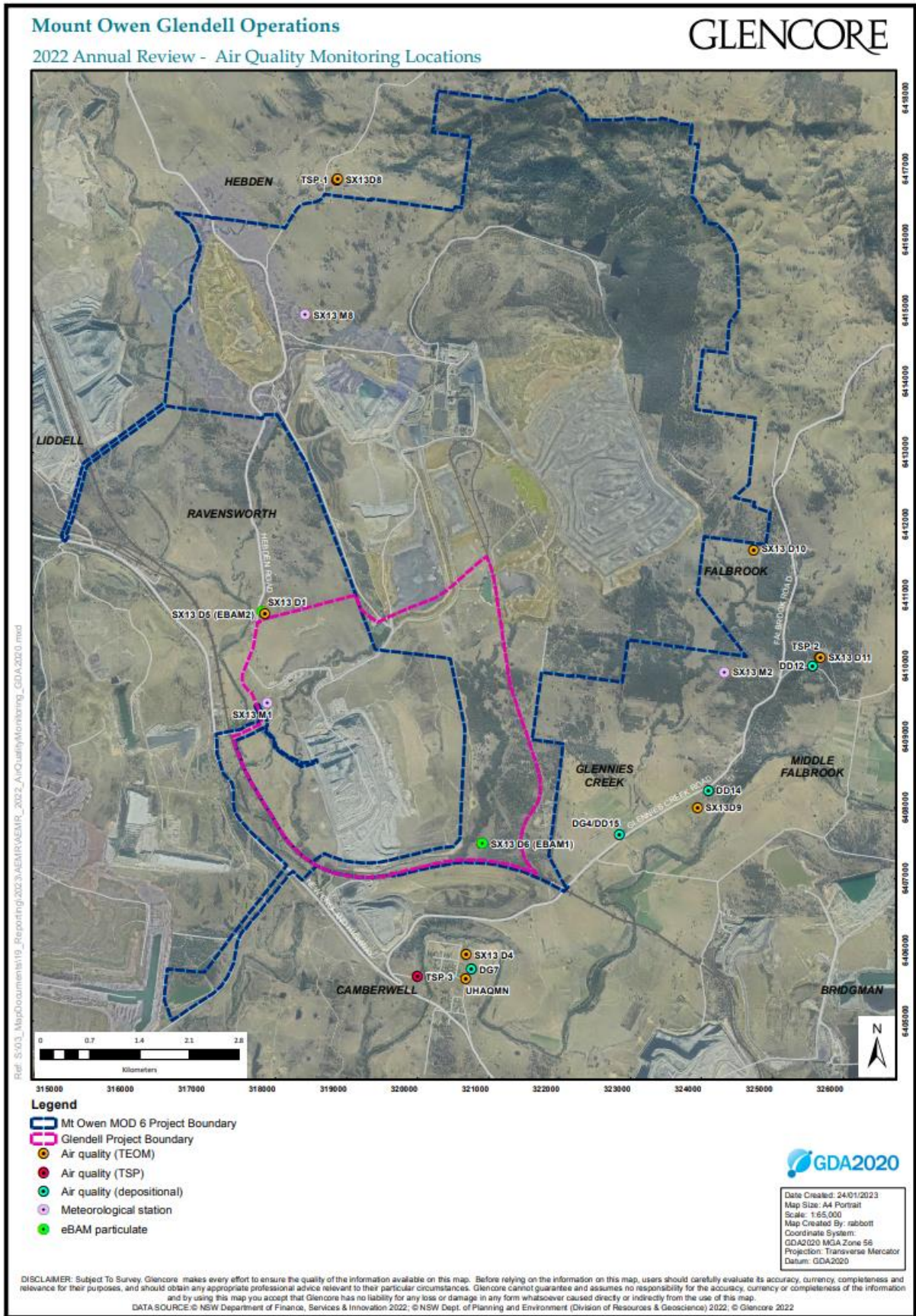


Figure 6 shows the location of the four depositional dust monitoring sites. Table 22 shows the

measured annual average deposited dust levels from each monitor during 2022. The annual averages presented in *Table 22* excluded monthly results marked as contaminated by the monitoring contractor. The deposited dust levels recorded during the reporting period were below 4 g/m²/month at all monitoring sites (refer *Table 22*). The calculations also show that the MGO did not exceed the “incremental impact” criteria from the development consents (i.e. 2 g/m²/month increase on the previous year).

Table 22: Summary of Deposited Dust Levels from MGO Monitors in 2022

Statistic	DD12	DD14	DD15/DG4	DG7	Criterion (SSD-5850 & Da80/932)	Implemented/Proposed Management Action
Annual average in g/m²/month						
Annual average	1.7	1.0	1.6	1.3	4	Continuation of existing management and mitigation measures
Estimated MGO contribution to annual average	0.7	0.4	0.7	0.3	2	Continuation of existing management and mitigation measures

6.3.3.6 EIS Predictions

The measured annual average PM₁₀, TSP and deposited dust levels have been compared to the predictions made in the latest environmental assessment of the approved operation, that is, the Statement of Environmental Effects (SEE) for MOCO Modification 2 (Umwelt, 2018). The SEE air quality predictions for Year 2 (approximately 2020) were used for the comparison, as the most representative of current MGO operations.

Table 23 shows the comparisons, which confirm that SEE predictions were:

- Between 1.4 and 2.5 times higher than the measured results for annual average PM₁₀ concentrations, depending on the location
- Between 1.9 and 2.6 times higher than the measured results for annual average TSP concentrations, depending on the location
- Between 1.5 lower and 3 times higher than the measured annual average deposited dust levels, depending on the location.

The comparisons confirm that air quality impacts from MGO in 2022 were less than the EIS predictions. The results are also generally within the factor-of-two accuracy that has been recognised for comparisons against these types of models (US EPA, 2005).

Table 23: Comparison between EIS Predictions and Air Quality Measurements in 2022.

Location	Prediction (MTO Continued operation Mod 2 for Year 2)	Measurement (2022 excluding extraordinary events)
Annual average PM10 in µg/m³		
SX13 D1	41	16

SX13 D4	35	15
SX13 D8	21	15
SX13 D9	30	13
SX13 D11	25	10
Annual average TSP in $\mu\text{g}/\text{m}^3$		
TSP 1	74	29
TSP 2	76	40
TSP 3	79	39
Annual average deposited dust in $\text{g}/\text{m}^2/\text{month}$		
DD12	3.1	1.7
DD14	3.0	1.0
DD15/DG4	3.0	1.6
DG7	3.1	1.3

Further information on the air quality data can be found in the independent air quality report, prepared by a suitably qualified air quality specialist, in *Appendix E*.

6.3.4 Continuous Improvements

As a part of the ongoing commitment to the management of dust impacts from MGO, a range of activities have been undertaken during 2022 that fall within the continuous improvement program. The most important being:

- Upgrade a TEOM 1400 to a newer model (e.g. TEOM 1405)
- Improved enclosures installed to prevent external environments from affecting the unit.

6.3.5 Greenhouse Gas

6.3.5.1 Reported greenhouse gas emissions

MGO reports greenhouse gas emissions (GHG) in accordance with National Energy and Greenhouse Gases (NGER) legislation. Each financial year, MGO is required to submit to the federal government the emissions from their NGERs registered facility. Also, because MGO emits over 100kt of CO₂e- each year, MGO is registered as a 'Safeguard' facility and therefore also had a Safeguard baseline. Emissions above the baseline for that year need to be offset by retiring Australian Carbon Credit Units (ACCUs). The NGERs reporting year is based on a financial year, not a calendar year such as this Annual Review. In order to prevent incompatible public reporting, the values in this report also cover a financial year. The following table contains the Scope 1 (direct emissions from the mining activities during the year), and Scope 2 emissions (electricity consumption by the mine during the year).

Table 24: Greenhouse Gas Emissions at MGO during the 2021/22 Financial Year

Emission Source	MTO Continued Operations EIS (Umwelt, 2015) and MOCO MOD2 (Umwelt, 2018) predictions (t CO ₂ -e/ year)	Glendell EIS (Umwelt, 2007) predictions (tCO ₂ -e/ year)	Total Predictions for MTO/ Glendell Operation (t CO ₂ -e/ year)	Actual MTO / Glendell Operation (t CO ₂ -e/ year)
Scope 1 Emissions	472,000	150,501	622,501	264,736
Scope 2 Emissions	72,000	1,193	73,193	43,199
Total Emissions	544,000	151,694	695,694	307,935

6.3.5.2 The expected average MGO

Table 24 compares average annual predictions of tCO₂-e extracted from the original Environmental Impact Statements (EIS) for Mt Owen and Glendell and the actual emissions reported by MGO in the last report (2021-2022). Actual annual emissions are well under predictions values.

6.3.5.3 Steps taken to improve energy efficiency and reduce GHG emissions

MGO is a part of the wider coal assets held by Glencore across Australia. Glencore Coal Assets Australia (GCAA) are themselves a part of the global Glencore mining portfolio. In line with the ambitions of the 1.5°C scenarios set out by the Intergovernmental Panel on Climate Change (IPCC), Glencore target a short-term reduction of 15% by 2026 and a medium-term 50% reduction of our total (Scope 1, 2 and 3) emissions by 2035 on 2019 levels. Post 2035, Glencore’s ambition is to achieve, with a supportive policy environment, net zero total emissions by 2050.

Glencore incorporates energy costs and our carbon footprint into our annual planning process. Commodity departments, such as Glencore Coal Assets Australia, are required to provide energy and GHG emissions forecasts for each asset over the forward planning period and provide details of emissions reduction projects.

In the case of MGO this includes involvement with GCAA when considering available GHG abatement technology and mine planning to optimise efficiency (which usually translates into reduced fuel consumption).

6.4 Biodiversity and Land Management

The Biodiversity Offset Management Plan (BOMP) at MGO forms part of the MGO Environmental Management Strategy (EMS). The BOMP is used to describe the controls and monitoring implemented for the management of flora and fauna. The objectives for land management at MGO are based on land management principles, including:

- Erosion prevention
- Pasture diversity
- Weed and feral animal control.

Natural regeneration is promoted where practical to enhance biodiversity and landscape amenity.

6.4.1 Biodiversity Offset Areas (BOAs)

MGO was required to secure several Biodiversity Offset Areas (BOAs) in accordance with conditions of SSD-5850 and DA 80/952. In 2018, five CAs were gazetted in consultation with the NSW Environment, Energy and Science Group (then Office of Environment and Heritage (OEH)) and the Biodiversity Conservation Trust (BCT). These CAs were implemented for the following:

1. Bettys Creek (Enex Foydell) Conservation Area
2. Bettys Creek (Glendell) Conservation Area
3. Mount Owen Offsets Conservation Area, represented by a cluster of four smaller offset areas, being;
 - North-East Offset;
 - Forest East Offset;
 - South-East Offset;
 - South-East Corridor Offset
4. Southern Remnant Conservation Area
5. North-West Offset Conservation Area

MGO is in the process of long-term securing the remaining BOAs through Biodiversity Stewardship Agreements (BSAs) under the BioBanking Biodiversity and Offset Scheme, therefore, BOAs are currently managed under the BOMP, and those include the following properties:

- Cross Creek Offset Site.
- Stringybark Habitat Corridor Offset Site.
- Esparanga Offset Site.
- Mitchell Hills Offset Site.

Details of the MGO CAs and BOAs are provided in *Table 25* with their location shown in Figures 8 and 9.

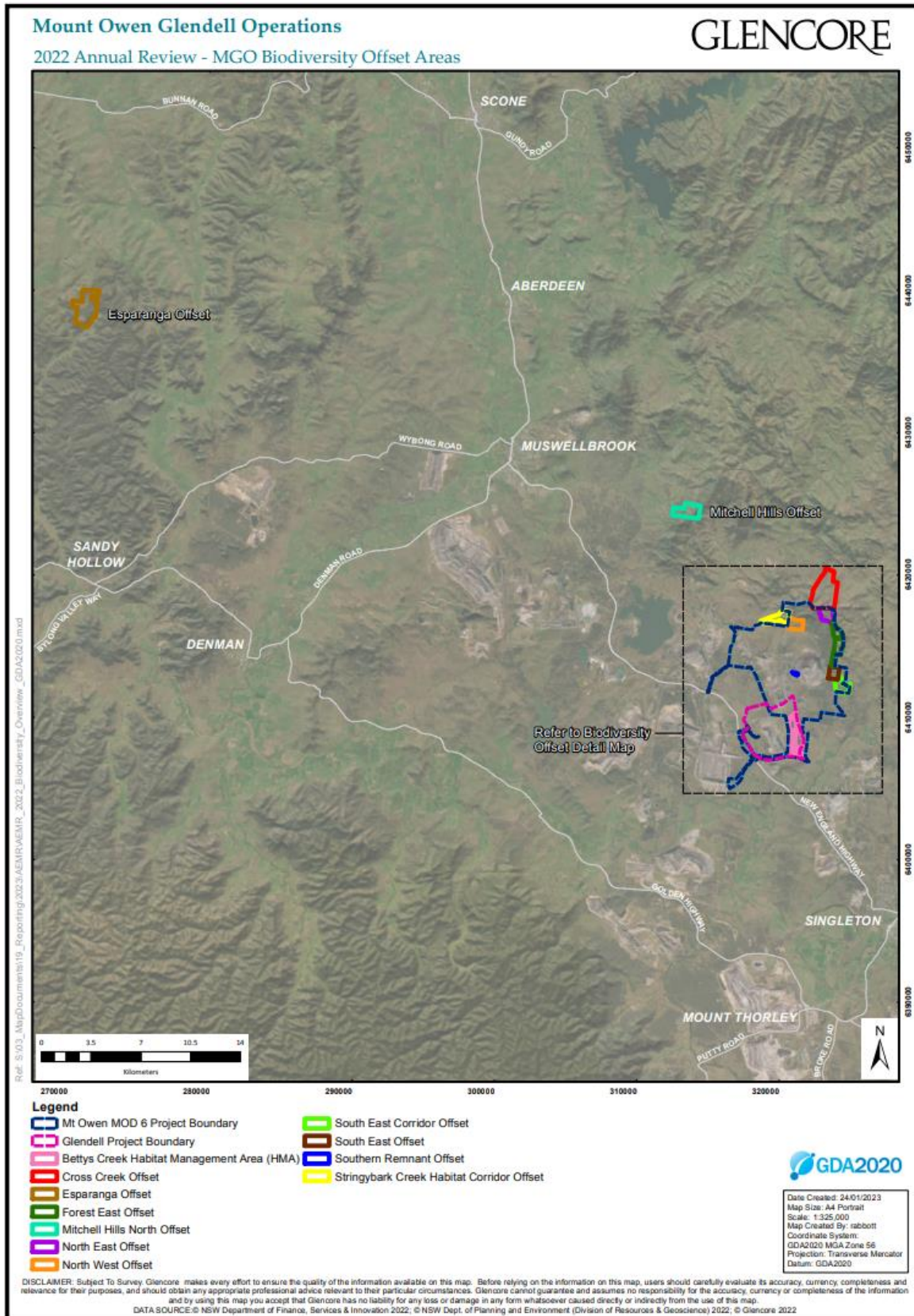


Figure 8: MGO Biodiversity Offset Areas

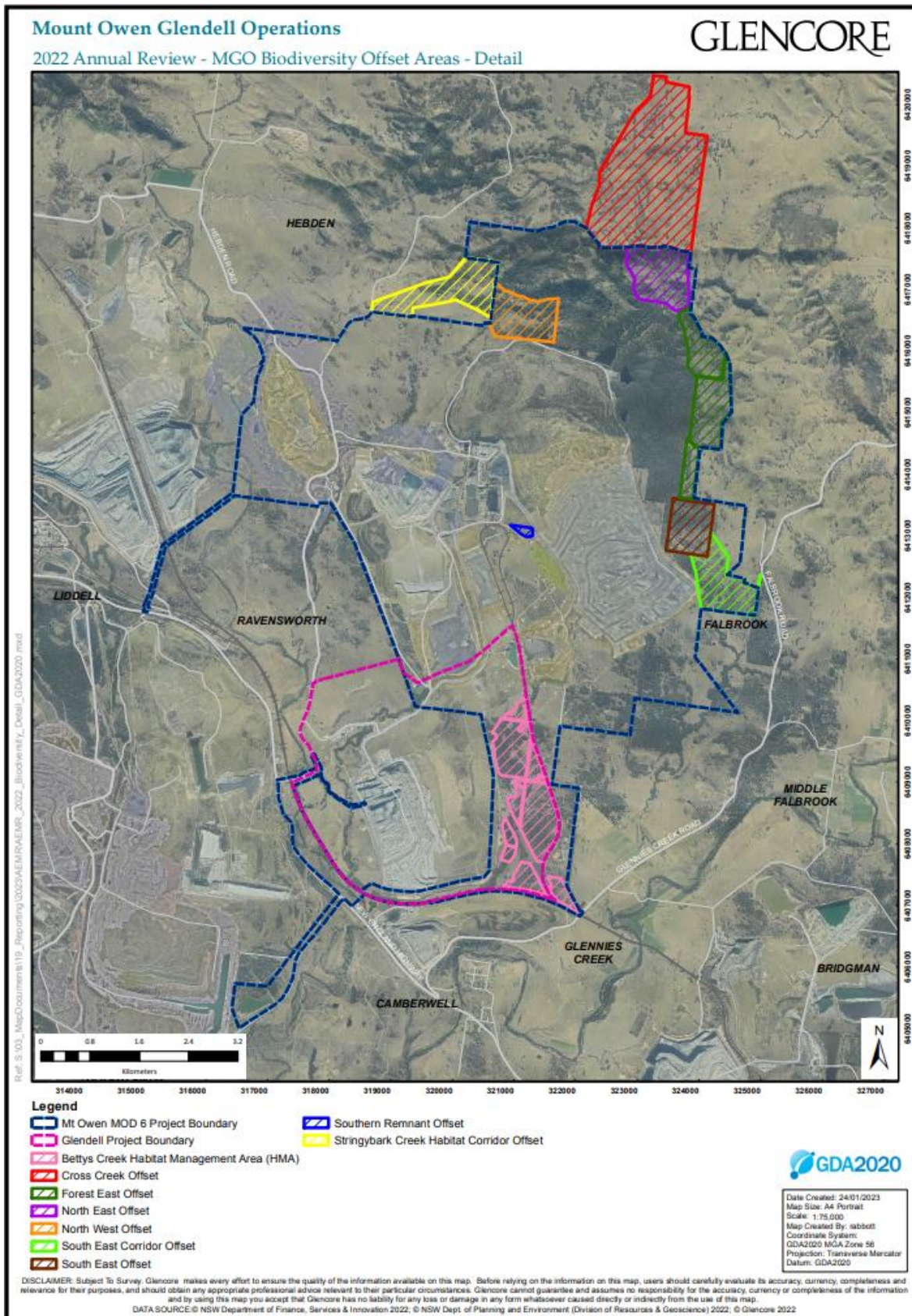


Figure 9: MGO Biodiversity Offset Areas - Detail

Table 25: Biodiversity Offset Areas (as per Biodiversity Offset Strategy)

Offset Area	Plant Community Type	Size (ha)
DA 80/952		
Bettys Creek Habitat Management Area (HMA) incorporating*: - Bettys Creek (Enex Foydell) - Bettys Creek (Glendell)	1691 – Narrow-leaved Ironbark – Grey Box Grassy Woodland of the Central and Upper Hunter	174.0
	1692 - Bull Oak Grassy Woodland of the Central Hunter Valley	
	1731 - Swamp Oak – Weeping Grass Grassy Riparian Forest of the Hunter Valley	
	Derived Native Grassland	
DA SSD-5850		
Northwest Offset*	1602 - Spotted Gum - Narrow-leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter	71.4
	1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest (1213 Decommissioned and merged with 1590)	
	Derived Native Grassland	
Northeast Offset*	1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest (1213 Decommissioned and merged with 1590)	83.6
	1614 - Grey Gum - Grey Myrtle - Narrow-leaved Stringybark - Rusty Fig open forest on ranges of the Upper Hunter	
	Derived Native Grassland	
Southeast Offset*	1602 - Spotted Gum - Narrow-leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter (Including planted variant)	58.3
	Derived Native Grassland	
Southeast Corridor Offset*	1602 - Spotted Gum - Narrow-leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter (Including planted variant)	74.1
	Derived Native Grassland	
	1731 - Swamp Oak – Weeping Grass Grassy Riparian Forest of the Hunter Valley	
Forest East Offset*	1602 - Spotted Gum - Narrow-leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter (Including planted variant)	110.9
	Derived Native Grassland	
	1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest (1213 Decommissioned and merged with 1590)	

Offset Area	Plant Community Type	Size (ha)
Southern Remnant Offset*	1602 - Spotted Gum - Narrow-leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter (Including planted variant)	4.0
Cross Creek Offset Site	1602 - Spotted Gum - Narrow-leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter (Including planted variant)	367.0
	Derived Native Grassland	
Stringybark Habitat Corridor Offset Site	1602 - Spotted Gum - Narrow-leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter (Including planted variant)	97.5
	1598 Forest Red Gum grassy open forest on floodplains of the lower Hunter	
	Dry Rainforest	
	1731 - Swamp Oak – Weeping Grass Grassy Riparian Forest of the Hunter Valley	
	Derived Native Grassland	
	African Olive Infestation	
Esparanga Offset Site	618 White Box x Grey Box - Red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley	303.0
	281 Rough-Barked Apple - Red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	
	618 White Box x Grey Box - Red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley (Shrubby variant)	
	1607 Blakelys Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter	
	1654 Narrow-leaved Ironbark - Grey Gum shrubby open forest on sandstone ranges of the upper Hunter Valley	
	Derived Native Grassland	
Mitchell Hills North Offset Site	1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest (1213 Decommissioned and merged with 1590)	143.7
	1543 Rusty Fig - Native Quince - Native Olive dry rainforest of the Central Hunter Valley	
	624 Large-fruited Grey Gum - Narrow-leaved Stringybark open forest on sheltered sandstone hillslopes in the Scone region of the upper Hunter Valley	
	Derived Native Grassland	
Rehabilitation Woodland	1602 - Spotted Gum - Narrow-leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter	518.0

* CA's gazetted in consultation with the Biodiversity and Conservation Division (BCD) of DPE and the Biodiversity Conservation Trust (BCT) and as administered by the Minister administering the Biodiversity Conservation Act 2016 (BC Act).

By September 2022, MGO had to implement the Biodiversity Offset Strategy (*Table 25* above) in accordance with Schedule 3, Conditions 27 & 29 of SSD-5850 and retire biodiversity credits in accordance with Schedule 3, Condition 36A of DA80/952. In August 2022, MGO requested an extension of time to maintain compliance with those conditions as there were significant delays to finalise the purchase of a crown road (at Esparanga) from Crown Lands and to retire the required biodiversity credits.

A new division within the Department (the Credit Supply Task Force (CST)) was created mid-2022, to simplify BSAs applications processes.

The Department asked MGO to liaise with CST and agree a new timeframe to meet consents obligations relating to BSAs and credit retirement. To date CST have not agreed on a new timeframe and therefore Department has not been able to approve an extension of time yet. However, MGO has been working with CST to progress the Esparanga Offset application.

In 2022, Mitchell Hills, Cross Creek and Springybark BSAs were finally signed by Glencore and BCT representatives. Those BSAs are now awaiting execution from CST.

6.4.2 *Revegetation works – Habitat augmentation*

Due to the heavy rainfall experienced in 2022, Esparanga could not be accessed by the qualified ecologist during this period.

With ongoing favourable growth conditions in 2022, ground coverage by vegetation observed during this monitoring event was generally high (both for native species and exotic species) in comparison to their baseline events. Exotic species coverage remains higher across the board in revegetation and regeneration areas compared to areas of remnant vegetation, however overall condition of each respective CA and BOA has improved compared to baseline as summarised below:

- Bettys Creek (Enex Foydell) CA
 - Approximately 6 ha of planting activities were undertaken in 2022, and these were observed as being moderately successful.
- Bettys Creek (Glendell) CA
 - No substantial natural recruitment was observed in the grassland areas of this Conservation Area, however canopy species recruitment is strong within areas of remnant vegetation and areas directly fringing remnant riparian areas was evident, particularly in small canopy gaps.
 - Supplementary planting in grassland areas was undertaken in 2022. The progress of this planted vegetation throughout the grassland varied with most trees and shrubs establishing well and having grown substantially since 2021. Only a minor extent of individuals were observed to be dying off.
- Mount Owen Offsets CA
 - Habitat value has seen the greatest important in areas where revegetation work has been undertaken in the Forest East Offset Area, which has substantially improved the connectivity, perching and foraging value of this Conservation Area.
- Southern Remnant Offset
 - This Conservation Area remains largely unchanged since baseline, however some in-filling of canopy gaps through natural recruitment is occurring.
- Northwest Offset
 - Scattered natural regeneration of canopy and scrub species is occurring in grasslands directly fringing woodland habitats throughout.

- Revegetation works previously completed in the south-west and south-east have been largely successful, substantially increasing the extent of woodland habitats available to native fauna.
- Cross Creek BOA
 - Native floristic diversity was generally good across remnant areas of Cross Creek. Weeds were typically low, however where encountered, typically comprised.
 - Areas proposed for regeneration are recruiting well throughout, however no formerly unconnected remnant fragments have become connected as a result of regeneration.
- Stringybark Creek BOA
 - Previously undertaken revegetation works are recruiting and developing well.
 - Abundant natural regeneration was observed, particularly in low lying areas and drainage lines.
- Mitchell Hills BOA
 - In good overall condition.
 - Regeneration was commonly encountered, particularly at the fringing grassland/woodland ecotone, this was identified in both the shrub layer (*Acacia* spp.) as well as in Eucalypt saplings.

6.4.3 Rehabilitation Woodland Offset

MGO is required to identify 518 ha of mine rehabilitation to commit as a BOA within five years of commencement of operations. This area is to be restored to Central Hunter Ironbark – Spotted Gum – Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions EEC under the BC Act. The long-term conservation of this offset will be determined in accordance with Condition 29, Schedule 3 of SSD-5850 (MOD2).

Details of the rehabilitation to be undertaken in the Rehabilitation Woodland Offset Area are included in the RMP as well as the Rehabilitation Strategy. Due to the rehabilitation not yet being complete MGO requested an extension of time to the DPE that was granted until 6 February 2023.

6.4.4 Flora Monitoring

6.4.4.1 Conservation Areas Monitoring Methods

As specified within Annexure D of the CAs, annual monitoring of each Conservation Area is required. Monitoring methods during 2022 were consistent with Annexure D of each CA and included:

- Photo monitoring for comparison to baseline photos taken between 2015 and 2017 (undertaken at the exact location and from the exact bearings as baseline photos)
- Quadrat monitoring, to compare data to benchmark data provided in Annexure D, Table 26 of each CA.
- Walkthrough assessment of opportunistic sightings, including:
 - Fire events or impacts of fire management
 - Weeds (including compilation of list of exotic species and recording new weed infestations including location and extent)
 - Pest animals (species and location must be recorded, including evidence of pest animals such as burrows, scats or disturbance)
 - Visitor impact and vehicle access (including evidence of any recent usage, and the presence of any new access trails or tracks)
 - Rubbish dumping
 - Natural regeneration of previously disturbed areas
 - Sightings of threatened species.

All monitoring works were undertaken by qualified ecologists at the locations required in Annexure D, Table 1 of each CA (reproduced in *Table 26*). Photo monitoring locations are shown in *Figure 10*.

Table 26: Conservation Agreement Monitoring Locations 2022

Site Name	Plant Community Type	Monitoring Type
Bettys Creek (Enex Foydell) CA*		
P07	Derived Native Grassland (proposed for 1692 - Bull Oak Grassy Woodland of the Central Hunter Valley)	Photo & Quadrat
P08	1691 - Narrow-leaved Ironbark – Grey Box Grassy Woodland of the Central and Upper Hunter	Photo & Quadrat

Mt Owen Glendell Operations

2022 Annual Review

Site Name	Plant Community Type	Monitoring Type
P09	1731 - Swamp Oak – Weeping Grass Grassy Riparian Forest of the Hunter Valley	Photo & Quadrat
GHMA05	1691 - Narrow-leaved Ironbark – Grey Box Grassy Woodland of the Central and Upper Hunter	Photo & Quadrat
GHMA08	Derived Native Grassland (proposed for 1691 - Narrow-leaved Ironbark – Grey Box Grassy Woodland of the Central and Upper Hunter)	Photo & Quadrat
GHMA09	1691 - Narrow-leaved Ironbark – Grey Box Grassy Woodland of the Central and Upper Hunter	Photo & Quadrat
GHMA11	Derived Native Grassland (proposed for 1691 - Narrow-leaved Ironbark – Grey Box Grassy Woodland of the Central and Upper Hunter)	Photo & Quadrat
GHMA13	Derived Native Grassland (proposed for 1692 - Bull Oak Grassy Woodland of the Central Hunter Valley)	Photo & Quadrat
Bettys Creek (Glendell) CA*		
BCCA-A	Derived Native Grassland (proposed for 1692 - Bull Oak Grassy Woodland of the Central Hunter Valley)	Photo & Quadrat [^]
Mount Owen Offsets CA*		
P01	1731 - Swamp Oak – Weeping Grass Grassy Riparian Forest of the Hunter Valley	Photo & Quadrat
P02	Derived Native Grassland (Proposed for Plant Community Type (PCT) 1602 - Spotted Gum - Narrow-leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter)	Photo & Quadrat
P05	1602 - Spotted Gum - Narrow-leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter	Photo & Quadrat
Photo 3	1614 - Grey Gum - Grey Myrtle - Narrow-leaved Stringybark - Rusty Fig open forest on ranges of the Upper Hunter	Photo & Quadrat [^]
Photo 4	1602 - Spotted Gum - Narrow-leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter	Photo & Quadrat [^]
Southern Remnant CA		
Photo 6	1602 - Spotted Gum - Narrow-leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter	Photo & Quadrat [^]
Northwest Offset CA		
P06	1602 - Spotted Gum - Narrow-leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter	Photo & Quadrat
Photo 5	Derived Native Grassland (Proposed for PCT 1602 - Spotted Gum - Narrow-leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter)	Photo & Quadrat [^]

* The CA naming conventions differ slightly from the BOAs (due to ownership/cadastral issues) in the following ways: Bettys Creek HMA is split into the Bettys Creek (Enex Foydell) and Bettys Creek (Glendell) CAs (see **Table 27**); and

Northeast Offset, Southeast Offset, Southeast Corridor and Forest East Offset are amalgamated into the collective Mount Owen Offsets CA.

^ Additional quadrat monitoring sites were established at previously photo monitoring sites to track vegetation change over time and allow comparisons against benchmarks

6.4.4.2 Flora Monitoring Results

Table 27 summarises biodiversity management performance in the Conservation Areas for 2022 and includes recommendations for 2023.

Table 27 Conservation Area Biodiversity Management Summary 2022

Conservation Area	2022 Management Actions	Key Trends	Recommendations for 2023
Bettys Creek (Enex Foydell) CA	Primary weed control Vertebrate pest control Erosion control Waste removal Annual reporting	<p>From 2021 there was a general continued positive trajectory of vegetation condition across the Conservation Area in 2022. This has been assisted by favourable weather conditions and is particularly evident in growth of regenerating trees as well as a dense groundcover throughout</p> <p>Exotic cover remains higher in areas of previous grassland when compared to remnant vegetation, particularly in areas which have been subject to revegetation works (with scalping allowing for rapid colonisation of opportunistic species).</p> <p>Natural recruitment remains strong throughout this community, with young trees growing well (including planted areas).</p>	Continue primary weed control
Bettys Creek (Glendell) CA	Fauna Habitat Augmentation Primary weed control Vertebrate pest control Waste removal Annual reporting	<p>Since baseline and 2021, this site remains on a positive trajectory. Along Bettys Creek, an increasingly dense and wide corridor of swamp oak (<i>Casuarina glauca</i>) persists. This vegetation has shown resilience considering the recent drought. In these areas the midstorey is sparse and where present comprises mostly regenerating canopy species. Although not observed in 2022, it is likely that ongoing suppression of sharp rush (<i>Juncus acutus</i>) in the riparian zone may be necessary in future.</p>	Continue primary weed control
Mount Owen Offsets CA	Seed collection Primary weed control Vertebrate pest control	<p>Natural recruitment, assisted by revegetation continues to occur in this CA, with the gradual in-filling of gaps in the canopy observable in comparative aerial imagery. This is particularly</p>	Continue primary and follow up weed control.

Conservation Area	2022 Management Actions	Key Trends	Recommendations for 2023
	Annual reporting	<p>evident in the far south, and central areas of this CA.</p> <p>Natural recruitment remains limited in the far north, with exception of grassland immediately fringing remnant vegetation habitats.</p> <p>Exotic coverage remains much higher in areas of former grassland when compared to remnant vegetation, particularly in areas which have been subject to revegetation works (with scalping allowing for rapid colonisation of opportunistic species).</p>	Investigate seeding options in the north-most grassland.
North West Offset CA	Primary weed control Vertebrate pest control Annual reporting	<p>the remnant areas of this PCT were initially in good condition. Management works have been undertaken targeting this species with some success, however, follow up treatment is required due to the favourable weather conditions which have permitted this species to flourish. Lantana (<i>Lantana camara</i>) is additionally becoming increasingly problematic.</p> <p>Areas of revegetation and regeneration have shown moderate success; however, it may be several years before the ultimate success of this revegetation can be determined. Areas of revegetation are observable in comparison aerial imagery. Although the condition of revegetation areas has substantially improved, it will likely be some time before their parameters are at similar levels to target remnant or benchmark vegetation.</p>	Continue primary weed control
Southern Remnant Offset CA	Primary weed control Annual reporting	<p>The condition of vegetation within the Southern Remnant CA remains generally consistent with previous monitoring, however, is slowly, steadily improving. A relatively dense canopy is present consisting grey box (<i>Eucalyptus moluccana</i>), red ironbark (<i>Eucalyptus fibrosa</i>) and spotted gum (<i>Corymbia maculata</i>). The sparse midstorey consists of bullock (<i>Allocasuarina luehmannii</i>) and regenerating grey box (<i>Eucalyptus moluccana</i>). Groundcover is dominated by grasses including barbed</p>	Continue primary weed control

Conservation Area	2022 Management Actions	Key Trends	Recommendations for 2023
		<p>wire grass (<i>Cymbopogon refractus</i>), threeawn speargrass (<i>Aristida vagans</i>) and tall chloris (<i>Chloris ventricosa</i>), as well as sparse fan wattle (<i>Acacia amblygona</i>) and has notably improved since 2021.</p> <p>Exotic vegetation has a cover of between 10 - 15% per cent (being lower in the central areas subject to less edge effects). Narrow-leaved cotton bush (<i>Gomphocarpus fruticosus</i>) and galenia (<i>Galenia pubescens</i>) were recorded in high densities near the access road. Presence of sharp rush (<i>Juncus acutus</i>) has improved within drainage lines.</p> <p>Natural recruitment continues to occur in this CA, with the gradual in-filling of gaps in the canopy observable in comparative monitoring.</p>	

6.4.4.3 Biodiversity Offset Areas

In 2022, flora monitoring was conducted within MGO BOAs (see *Table 28* and 29). Flora monitoring in the BOAs is conducted seasonally, every two to three years in accordance with the MGO BOMP. BOA flora monitoring was last conducted in 2019. 2022 was the fourth monitoring event to occur in the BOAs, with baseline monitoring taking place in 2017.

Table 28: Biodiversity Offset Area Monitoring Locations 2022

Site Name	Plant Community Type	Monitoring Type
Cross Creek BOA		
CC1	1602 - Spotted Gum - Narrow - leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter	Flora
CC2	1602 - Spotted Gum - Narrow - leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter	Flora
CC3	Derived Native Grassland 1602 - Spotted Gum - Narrow - leaved Ironbark Shrub - Grass Open Forest of the Central and Lower Hunter	Flora
Esparanga BOA		
EBB1	281 Rough-Barked Apple - Red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Flora

Site Name	Plant Community Type	Monitoring Type
E1	1607 Blakelys Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter	Flora
E2	281 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Flora
E3	618 White Box x Grey Box - Red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley	Flora
E5	618 White Box x Grey Box - Red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley	Flora
E6	1602 Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter Valley	Flora
E8	1654 Narrow-leaved Ironbark - Grey Gum shrubby open forest on sandstone ranges of the upper Hunter Valley	Flora
E9	1654 Narrow-leaved Ironbark - Grey Gum shrubby open forest on sandstone ranges of the upper Hunter Valley	Flora
E10	618 White Box x Grey Box - Red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley	Flora
Mitchell Hills BOA		
MH1	1213 Decommissioned. PCT 1213 merged with 1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	Flora
MH2	1213 Decommissioned. PCT 1213 merged with 1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	Flora
MH3	1213 Decommissioned. PCT 1213 merged with 1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	Flora
MH4	1543 Rusty Fig - Native Quince - Native Olive dry rainforest of the Central Hunter Valley	Flora
MH5	624 Large-fruited Grey Gum - Narrow-leaved Stringybark open forest on sheltered sandstone hillslopes in the Scone region of the upper Hunter Valley	Flora
Stringybark Creek BOA		
S1	1598 Forest Red Gum grassy open forest on floodplains of the lower Hunter	Flora
S2	1602 Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter	Flora
S3	1602 Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter	Flora
S4	1602 Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter	Flora

Site Name	Plant Community Type	Monitoring Type
S5	1614 Grey Gum - Grey Myrtle - Narrow-leaved Stringybark - Rusty Fig open forest on ranges of the Upper Hunter	Flora
S6	1731 Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley	Flora

Table 29 summarises biodiversity management performance in the BOAs for 2022 and includes recommendations for 2023.

Table 29: Biodiversity Offset Area Management Summary 2022

BOA	2022 Management Actions	Key Trends	Recommendations for 2023
Cross Creek	<p>Primary weed control</p> <p>Vertebrate pest management</p> <p>Annual reporting</p>	<p>Due to ongoing wet and unsafe conditions Cross Creek Offset was not accessible in the Spring inspection program. Information from the March 2022 inspections stand</p>	<p>Continue primary weed control</p> <p>Vertebrate pest control</p> <p>Habitat augmentation</p>
Stringybark Creek	<p>Seed collection</p> <p>Primary weed control</p> <p>Direct seeding</p> <p>Vertebrate pest management</p> <p>Annual reporting</p> <p>Development of burn plans and regime</p>	<p>General recovery of groundcover vegetation – very little exposed bare ground.</p> <p>Previously controlled areas of African olive (<i>Olea europaea subsp. cuspidata</i>) infestation are returning to former levels and follow-up treatment is required.</p> <p>Observed introduced species diversity and cover fluctuate more in areas of revegetation when compared to remnant areas, indicating that these areas are more resilient.</p> <p>Remnant vegetation at PCT 1602 is generally stable and considered resilient to change.</p> <p>While the overall value of derived native grasslands has improved, they lack natural recruitment of canopy species and require improvement in order to meet target vegetation.</p> <p>Overall floristic value of remnant sites S5 (PCT 1614) and S6 (PCT 1731) are on a negative trajectory. This appears primarily a result of: increased coverage of High Threat Weeds and defoliation that has yet to fully recover following drought conditions.</p> <p>Whilst individual areas of remnant vegetation have slightly increased in size, no areas of vegetation that were</p>	<p>Continue primary and follow up weed control</p> <p>Investigate additional seeding options</p> <p>Vertebrate pest control</p> <p>Habitat augmentation</p>

BOA	2022 Management Actions	Key Trends	Recommendations for 2023
		<p>formerly unconnected have become connected as a result of revegetation or natural recruitment.</p>	
Esparanga	<p>Primary weed control Vertebrate pest management Annual reporting</p>	<p>Due to ongoing wet and unsafe conditions Esparanga Offset was not accessible in the Spring inspection program. Information from the March 2022 inspections stand</p>	<p>Continue primary weed control Vertebrate pest control Habitat augmentation</p>
Mitchell Hills	<p>Primary weed control Vertebrate pest management Annual reporting</p>	<p>Due to ongoing wet and unsafe conditions Mitchell Offset was not accessible in the Spring inspection program. Information from the March 2022 inspections stand</p>	<p>Continue primary weed control Vertebrate pest control Habitat augmentation</p>
Bettys Creek (Enex Foydell) CA	<p>Primary weed control Vertebrate pest control Waste removal Annual reporting</p>	<p>From 2021 there was a general continued positive trajectory of vegetation condition across the Conservation Area in 2022. This has been assisted by favourable weather conditions and is particularly evident in growth of regenerating trees as well as a dense groundcover throughout</p> <p>Exotic cover remains higher in areas of previous grassland when compared to remnant vegetation, particularly in areas which have been subject to revegetation works (with scalping allowing for rapid colonisation of opportunistic species).</p> <p>Natural recruitment remains strong throughout this community, with young trees growing well (including planted areas).</p>	<p>Continue primary weed control</p>
Bettys Creek (Glendell) CA	<p>Seed collection Primary weed control Vertebrate pest control Waste removal Annual reporting</p>	<p>Since baseline and 2021, this site remains on a positive trajectory. Along Bettys Creek, an increasingly dense and wide corridor of swamp oak (<i>Casuarina glauca</i>) persists. This vegetation has shown resilience considering the recent drought. In these areas the midstorey is sparse and where present comprises mostly regenerating canopy species. Although not observed in 2022, it is likely that ongoing suppression of sharp rush (<i>Juncus acutus</i>) in the riparian zone may be necessary in future.</p>	<p>Continued primary weed control</p>

BOA	2022 Management Actions	Key Trends	Recommendations for 2023
<p>Mount Owen Offsets CA</p>	<p>Primary weed control</p> <p>Vertebrate pest control</p> <p>Annual reporting</p>	<p>Natural recruitment, assisted by revegetation continues to occur in this CA, with the gradual in-filling of gaps in the canopy observable in comparative aerial imagery. This is particularly evident in the far south, and central areas of this CA.</p> <p>Natural recruitment remains limited in the far north, with exception of grassland immediately fringing remnant vegetation habitats.</p> <p>Exotic coverage remains much higher in areas of former grassland when compared to remnant vegetation, particularly in areas which have been subject to revegetation works (with scalping allowing for rapid colonisation of opportunistic species).</p>	<p>Continue primary and follow up weed control.</p> <p>Investigate direct seeding options in the north-most grassland.</p>
<p>North West Offset CA</p>	<p>Primary weed control</p> <p>Vertebrate pest control</p> <p>Annual reporting</p>	<p>The remnant areas of this PCT were initially in good condition. Management works have been undertaken targeting this species with some success, however, follow up treatment is required due to the favourable weather conditions which have permitted this species to flourish. Lantana (<i>Lantana camara</i>) is additionally becoming increasingly problematic.</p> <p>Areas of revegetation and regeneration have shown moderate success; however, it may be several years before the ultimate success of this revegetation can be determined. Areas of revegetation are observable in comparison aerial imagery. Although the condition of revegetation areas has substantially improved, it will likely be some time before their parameters are at similar levels to target remnant or benchmark vegetation.</p>	<p>Continue primary weed control</p>
<p>Southern Remnant Offset CA</p>	<p>Primary weed control</p> <p>Annual reporting</p>	<p>The condition of vegetation within the Southern Remnant CA remains generally consistent with previous monitoring, however, is slowly, steadily improving. A relatively dense canopy is present consisting grey box (<i>Eucalyptus moluccana</i>), red ironbark</p>	<p>Continue primary weed control</p>

BOA	2022 Management Actions	Key Trends	Recommendations for 2023
		<p>(<i>Eucalyptus fibrosa</i>) and spotted gum (<i>Corymbia maculata</i>). The sparse midstorey consists of bullock (<i>Allocasuarina luehmannii</i>) and regenerating grey box (<i>Eucalyptus moluccana</i>). Groundcover is dominated by grasses including barbed wire grass (<i>Cymbopogon refractus</i>), threeawn speargrass (<i>Aristida vagans</i>) and tall chloris (<i>Chloris ventricosa</i>), as well as sparse fan wattle (<i>Acacia amblygona</i>) and has notably improved since 2021.</p> <p>Exotic vegetation has a cover of between 10 - 15% per cent (being lower in the central areas subject to less edge effects). Narrow-leaved cotton bush (<i>Gomphocarpus fruticosus</i>) and galenia (<i>Galenia pubescens</i>) were recorded in high densities near the access road. Presence of sharp rush (<i>Juncus acutus</i>) has improved within drainage lines.</p> <p>Natural recruitment continues to occur in this CA, with the gradual in-filling of gaps in the canopy observable in comparative monitoring.</p>	

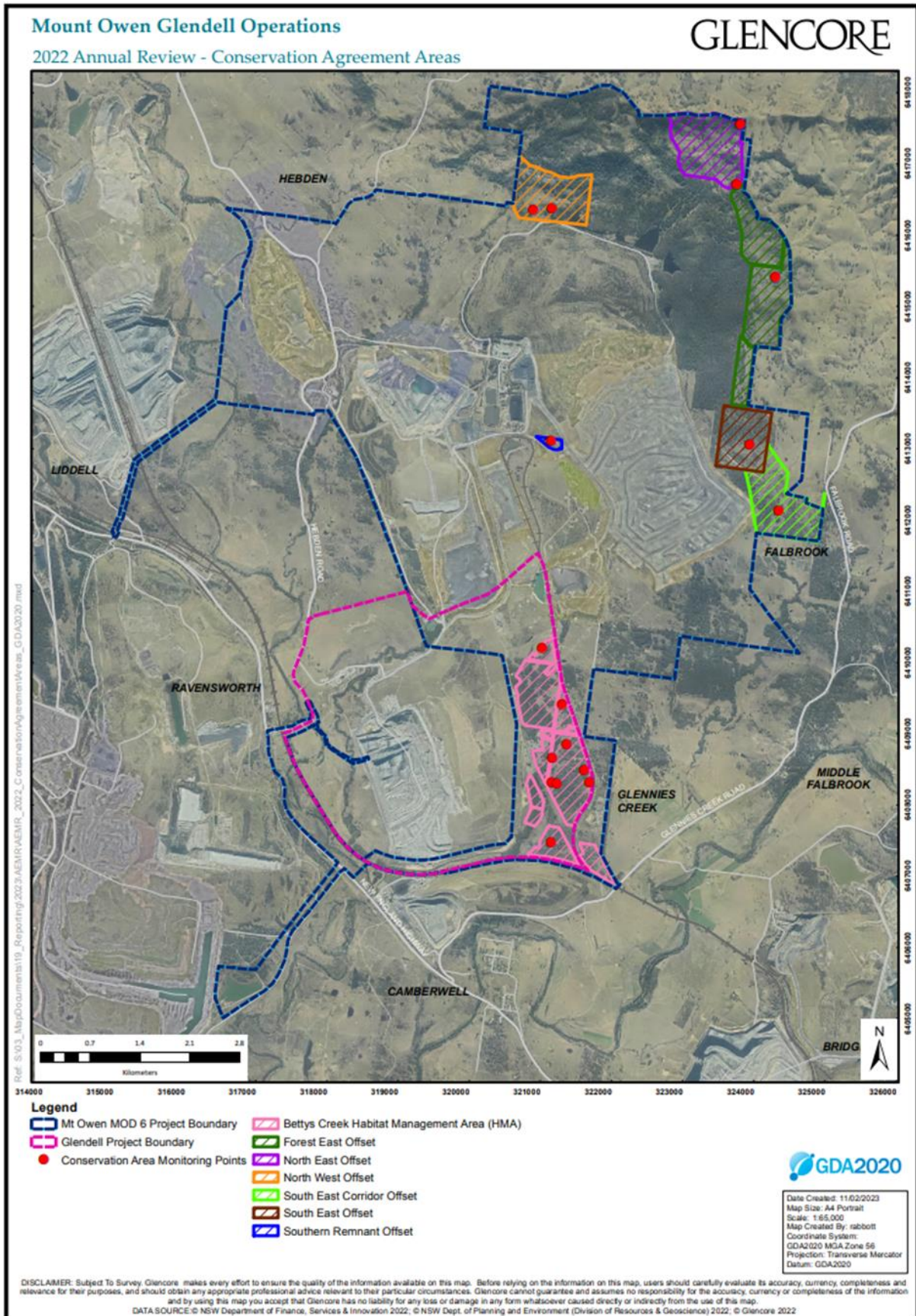


Figure 10: Photo Monitoring locations for Conservation Areas

6.4.5 Fauna Monitoring

6.4.5.1 Fauna Monitoring Methods

Fauna monitoring methods undertaken used at MGO fauna monitoring sites and within the BOAs in 2022 consists included the following methods:

- Diurnal woodland bird surveys
- Targeted winter bird surveys
- Microbat echolocation call surveys
- Diurnal herpetofauna surveys
- Call playback surveys
- Remote camera surveys.

6.4.5.2 Fauna Monitoring Results (MGO Sites)

Climatic conditions experienced in 2022 significantly disrupted the fauna monitoring program, due to extended flooding of the mid- to upper Hunter Valley in early February, and continued rainfall throughout the remainder of the monitoring period. Access to two offsets, Mitchell Hills and Esparanga, was significantly impacted such that neither offset could be accessed to undertake surveys in 2022. For Esparanga, the year 2022 is the second consecutive year that no fauna monitoring was conducted.

In 2022, no new bird species was added to the cumulative total of 172 bird species at MGO and Offsets. A total of 71 bird species were recorded in 2022, of which 47 were detected by census surveys, and the remaining 23 species observed or heard opportunistically. Analysis of the bird species diversity indices recorded above average scores for three sites, North East Offset, Habitat Management Area and Stringybark Creek Offset.

Field cameras deployed for mammals in 2022 revealed the presence of both native and introduced pest species. Native species detected include Short-beaked Echidna, Spotted-tail Quoll and Squirrel Glider, two species of macropods, Common Brushtail Possum and a bandicoot species. Introduced species include Dog, Cat, Fox, Brown Hare, Fallow Deer and Pig. The feral Pig was observed at several locations, and diggings were widespread and abundant throughout nearly all the monitoring sites. The extended rainfall and very moist soil conditions have likely caused a large increase in Pig numbers in 2021 and 2022.

Nest boxes revealed the presence of two threatened species, the Brush-tailed Phascogale and Squirrel Glider. The Squirrel Glider utilises nest boxes across a large area of MGO, with many boxes containing their characteristic leaf nest. 41 New nest boxes were installed at three (3) locations in MGO and Offsets in 2022. Nest boxes were installed in Glendell Habitat Management Area (20 boxes), North West Offset (10 boxes) and SE Corridor Offset (11 boxes). In 2022 the Gould's Wattled Bat and the Chocolate wattle bat were the most common species utilising bat roost boxes, Echolocation call recordings detected 11 species of microbats in 2022.

In 2022, 11 threatened species were recorded, including 5 bird species, 3 non-flying mammals and 3 microbat species. A total of 26 threatened species have been detected at MGO since the commencement of fauna monitoring. For several threatened species, their occurrence at the MGO is

irregular, being present during favourable environmental conditions and absent outside of those periods. No evidence of the nationally endangered Swift Parrot was recorded at MGO in 2022.

Flowering of eucalypts mistletoe was considered to be relatively low in 2022, which may have influenced the absence of the Swift Parrot. Previously, this species has been periodically recorded at MGO, including the years 2005, 2007 and 2014. During 2022, flowering events were fairly limited at the time of the monitoring surveys. However, for several tree species, namely Spotted Gum and Narrow-leaved Ironbark, flowering was noted sporadically up to November 2022. Both species typically flower in late Autumn / winter. The absence of abundant nectar and pollen possibly limited nectivorous bird species such as Swift Parrot, Musk and Little Lorikeet, and Rainbow Lorikeet. All were notable in their absence from MGO and Offsets during 2022.

6.4.5.3 Fauna Monitoring Results (MGO BOAs)

Fauna Monitoring Results Summary

Overall, the fauna monitoring for MGO undertaken over the period 1996 – 2022 has recorded a total of:

- 71 native and 2 introduced bird species
- 19 native and 5 introduced mammal species
- 52 reptiles
- 10 amphibian species.

In the 2022 monitoring period, a total of 71 bird species, 8 native terrestrial and arboreal mammals, 11 microbat species, 5 introduced terrestrial mammals, 5 reptile and 10 amphibian species were recorded (see *Figure 11*).

Cumulative Threatened Fauna Results

MGO carries out seasonal fauna monitoring across site rehabilitation areas and onsite BOAs. This includes monitoring of birds, reptiles, mammals, and frogs. *Table 30* lists the threatened species observed since 1996 at MGO.



A: Brush-tailed Phascogale in Nest Box, MTO Rehabilitation

B: Lace Monitor on old fence post, MGO



C: Australian Owlet-nightjar

Figure 11 Opportunistic photos of fauna identified at MGO in 2022

Table 30: Threatened Species Observed at MGO 1996-2022

Table ES1. Threatened Fauna Species recorded at MGO, 1996 to 2022.																													
Common Name	EPBC	BC	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Swift Parrot	CE	CE										√		√							√								
Green & Golden Bell Frog	E	E	√	√		√						?																	
White-bellied Sea Eagle						√	√		√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Little Eagle		√	√	√		√		√																					
Little Lorikeet		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√			√	√	√		√	√		
Powerful Owl		√									√	√	√	√															
Masked Owl		√		√		√		√	√	√	√	√	√		√	√				√	√					√			
Brown Treecreeper		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√
Speckled Warbler		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Black-chinned Honeyeater		√	√	√						√	√																		
Scarlet Robin		√		√														√											
Flame Robin		√				√	√																						
Hooded Robin		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√	√		√							
Grey-crowned Babbler		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Varied Sittella		√		√	√	√	√		√	√	√	√	√	√	√											√	√		
Dusky Woodswallow		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√					√	√
Diamond Firetail		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√									
Spotted-tail Quoll	√	√					√	√	√	√	√		√	√	√	√	√	√	√	√	√					√	√	√	√
Brush-tailed Phascogale		√																				√	√		√	√	√	√	
Koala		√	?																										
Squirrel Glider		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√	√	√	√	√
New Holland Mouse	√									√	√	√	√	√								√							
Grey-headed Flying-fox	√	E		√			√				√		√	√			√					√				√	√		
Yellow-bellied Sheath-tail Bat		√												√		?	√		√	√									
Eastern Coastal Freetailed-		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√		√	√	
Large-eared Pied Bat	√	√				?		?					?		?						√	√							
Eastern Bentwing-bat		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√		√	√
Little Bentwing-bat		√						?							?	√											√	√	
Large-footed Myotis		√				√		√				√		√	?	?					√								
Greater Broad-nosed Bat		√					√	√	√		√				?	?	√			√	√								

E = Endangered ; V = Vulnerable; v* Unconfirmed sighting

6.4.6 Comparison to BOMP Performance Indicators and Completion Criteria

The Biodiversity Offset Management Plan details short term performance indicators for the 2022 reporting period. Performance against these indicators and completion criteria are listed in *Table 31*.

Table 31: 2022 Biodiversity Performance Indicators and completion Criteria

Short Term Performance Indicators (Year 6 2022)	Status	Comments
General		
Pre-clearance surveys and tree-felling supervision is undertaken in accordance with procedure. Outcomes of pre-clearing process are recorded and recommendations are implemented.	Complete	Pre-clearance surveys completed in 2022
Suitable habitat features identified during the pre-clearing process are salvaged. Salvaged features are stockpiled appropriately for later use.	Complete	Habitat features salvage for later use in 2022
Salvaged resources and nest boxes are re-instated into surrounding areas with low levels of habitat features. Inspected, maintained, and replaced if required.	Complete	Salvaged resources and habitat features installed in 2022
Progressive installation and monitoring of habitat features and nest boxes.	Complete	Nest boxes installed and monitored in 2022
River oak trees are planted at a 10:1 ratio for the tailings management infrastructure and the realignment of the transmission line.	Complete	An additional 2,000 River Oak trees were planted in 2021
New England Tree Screen - Tree screen assessed for health, density and condition during Annual Walkover Inspections.	Not complete	Not completed in 2022
East-West Corridor Management Area - Passive regeneration is evident by the presence of dominant canopy species saplings.	Continue to Monitor	Monitoring of East-West Corridor not conducted in 2022
Delineation and signage of disturbance footprints is undertaken. Gates are locked and in good structural condition.	Complete	Gates locked and signs in position
Weed management actions are undertaken for noxious weed species if present within 6 months of disturbance works.	Complete	Extensive weed control conducted in 2022
Pest animal actions are undertaken for targeted pest species within 6 months of identification and reporting.	Complete	Targeted pest control activities conducted in 2022
Fire breaks and access roads are maintained. Strategic grazing or controlled burning in consultation with RFS is investigated if required following identification of high fuel loads.	Complete	Track maintenance conducted where possible considering weather and safety. Strategic Burn Plans established for four BOAs
Seeds are collected, stored, handled and propagated according to Florabank Guidelines.	Complete	Ongoing in 2022

Data is collected and reported from seed propagation programs (including seed germination success rates).	Partially Compliant	Seed propagation data is collected and reported but does not include seed germination success rates
Seeding and planting of tubestock and habitat feature emplacement is ongoing.	Complete	Ongoing in 2022
Seeding and planting of tubestock and habitat feature emplacement is ongoing, as well as any other required measures for erosion and bank stability	Complete	Habitat features installed in Bettys Creek Riparian Zone and River Oak trees planted in Bowmans Creek Riparian Zone.
Proposed activities at MGO (such as revegetation and regeneration) are undertaken in accordance with the ACHMP and legislation.	Complete	Works completed in accordance with ACHMP and legislation
Annual monitoring program completed as per BOMP	Complete	All required monitoring completed in 2022
GDE monitoring program undertaken	Not complete	Monitoring not completed in 2022
Specific BOMPS training package is included in the Site Familiarisation and Generic Surface Induction.	Complete	Included in site familiarisation
AR completed as required annually.	Complete	Completed for 2022
Conservation Bond remains in place and is revised if necessary.	Complete	Conservation Bond remained in place in 2022
Salvaged features are reinstated into BOAs with low levels of habitat features.	Complete	Salvaged resources installed in BOAs in 2022
Progressive installation of nest boxes in the BOAs. Nest boxes inspected, maintained and replaced, if required.	Complete	Nest boxes installed and monitored in 2022
Progressive installation and monitoring of nest boxes.	Complete	Nest boxes installed and monitored in 2022
Weed management actions are undertaken for weed species if present as per annual plan targeting identified high risk infestation.	Complete	Targeted weed control activities conducted in 2022
Pest animal actions are undertaken for targeted pest species as per annual plan targeting identified high risk population.	Complete	Targeted pest control activities conducted in 2022
Grazing excluded from BOAs (unless required for strategic weed or fuel load management)	Partially Compliant	Inspections identified some minor livestock activity during 2022
Inspect and maintain fencing and signage.	Complete	Inspections and fence maintenance conducted in 2022
Fire breaks and access roads are maintained. Strategic grazing or controlled burning in consultation with RFS is investigated if required following identification of high fuel loads	Complete	Track maintenance conducted where possible considering weather and safety.

		Strategic Burn Plans established for four BOAs
Proposed activities at the BOAs (such as revegetation and regeneration) are undertaken in accordance with the ACHMP and legislation.	Complete	Works completed in accordance with ACHMP and legislation
Location of Rehabilitation Woodland Offset Area investigated or determined.	Complete	Investigation completed to determine location
Annual monitoring program completed	Complete	All required monitoring completed in 2022
AR completed as required annually	Complete	Completed for 2022
Weed control works are completed, as required.		weed control activities conducted in 2022
Seeds are collected, stored, handled and propagated according to Florabank Guidelines.	Complete	Ongoing in 2022
Monitoring indicates that planted or regenerating canopy, mid storey and/or ground cover species are healthy and established.	Complete	Monitoring complete Some areas still require establishment
Revegetation/ regeneration works undertaken.	Complete	Works undertaken in 2022
Fauna monitoring undertaken to provide comparable data.	Complete	Fauna monitoring completed in 2022
Cross Creek Offset Area		
Ongoing passive and active regeneration (direct seeding or tubestock) using characteristic species, as required.	Complete	Passive and active (seeding) regeneration undertaken in Cross Creek in 2022
Stringybark Creek Habitat Corridor		
Ongoing passive and active regeneration (direct seeding or tubestock) using characteristic species, as required.	Complete	Passive regeneration ongoing in 2022
Salvaged features are placed into BOA as denning habitat.	Not complete	No Salvaged features placed in Stringybark Creek Habitat Corridor in 2022
African Olive Management - Monitoring of effectiveness of initial control measures. Further control to be undertaken if required.	Complete	Monitoring shows further control still required
Esparanga Offset Area		
Passive regeneration continues	Complete	Ongoing in 2022
Mitchell Hills Offset Area		
Flora monitoring undertaken	Complete	Flora monitoring undertaken in 2022

Southeast Corridor Offset		
Further supplementary planting of canopy and shrub species if monitoring shows planting failure.	Complete	Direct seeding undertaken to supplement regeneration in 2022
Bettys Creek Habitat Management Area		
Ongoing active regeneration (direct seeding or tubestock) using characteristic species, as required.	Complete	Direct seeding undertaken in 2022

6.4.7 Biodiversity Offset Areas Management

6.4.7.1 Habitat Augmentation

A total of 41 additional nest box structures were installed across MGO in 2022 (*Figure 12*). This included 19 Glider Boxes, 2 Duck Boxes, 7 Large Parrot/Possum Boxes, 6 Microbat Boxes, 2 Small Parrot Boxes, 3 Quoll Box and 1 Owl Box.

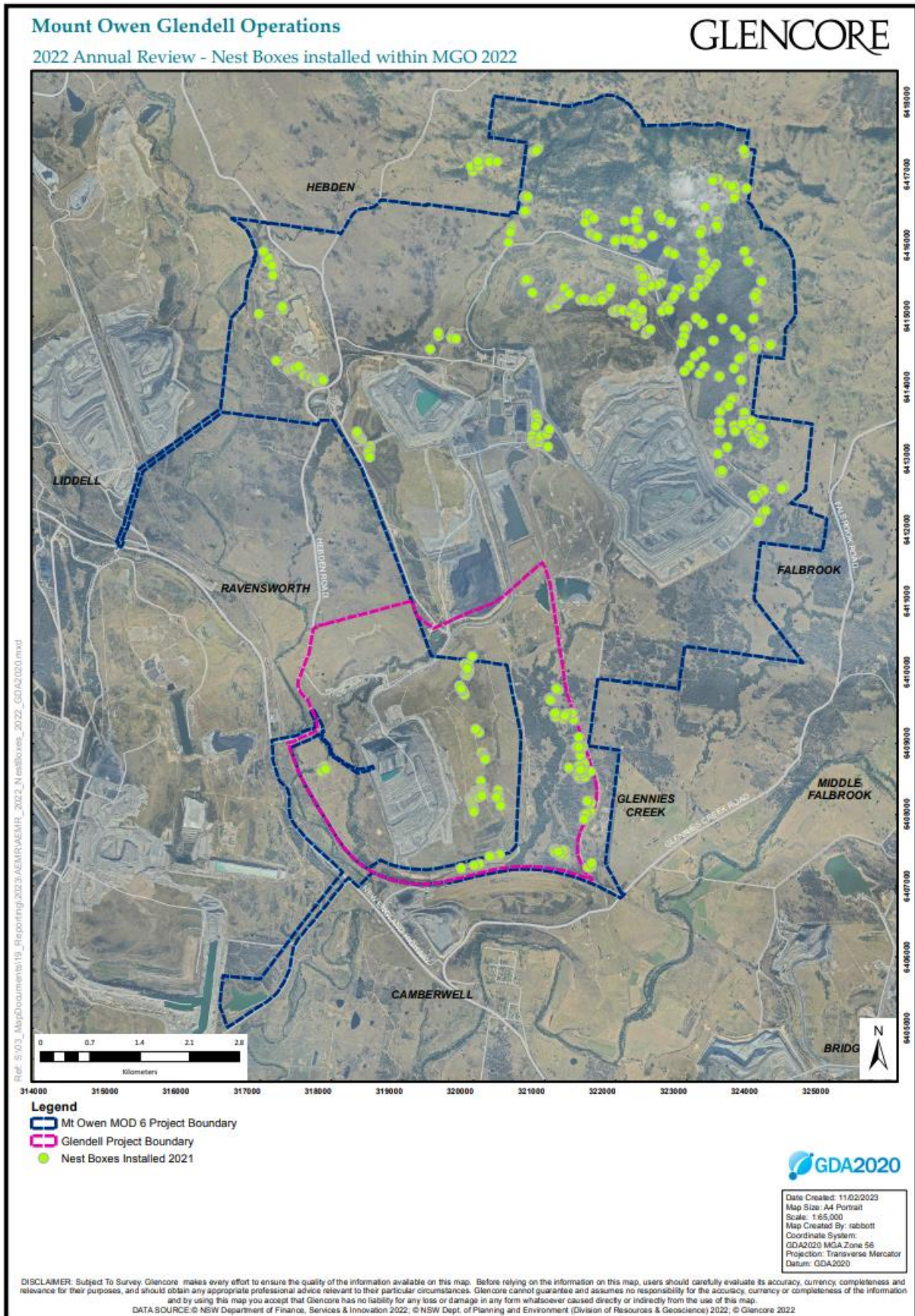


Figure 12: Total number of Nest Boxes Installed at MGO

6.4.7.2 Weed Management

A Weed Action Plan was developed to identify all targeted weed control activities at the MGO. The plan was implemented during the reporting period, continuing the active programs of control that have been implemented since 1996. During 2022, weeds targeted in MGO rehabilitation included:

- Galenia
- Lantana
- Coolatai Grass
- Prickly Pear
- Acacia Saligna.

Weeds were also treated across the MGO buffer land and BOAs, targeting species including (but not limited to):

- African Boxthorn - *Lycium ferocissimum*
- African Olive - *Olea europaea subsp. Cuspidate*
- African Lovegrass - *E. curvula*
- Acacia Saligna
- Bathurst Burr - *Xanthium spinosum*
- Blackberry - *Rubus fruticosus* species aggregate
- Coolatai Grass - *Hyparrhenia hirta*
- Cotton Bush – *Gomphocarpus fruticosus*
- Inkweed - *Phytolacca octandra* L.
- Lantana - *Lantana camara*
- Pampass Grass – *Cortaderia spp.*
- Prickly Pear - *Opuntia spp.*
- Saffron Thistle – *Carthamus lanatus*
- Scotch Thistle - *Onopordum acanthium*
- Tiger Pear - *Opuntia aurantiaca*
- Spear Thistle - *Cirsium vulgare*.

A summary of weed management works undertaken in MGO BOAs during the reporting period is included in *Table 32*. During 2022, successful campaigns were carried out on abundant high threat weeds African Olive and Coolatai grass within MGO's BOAs. Before and after images can be viewed below in *Figure 13* and *Figure 14*.



Figure 13: African Olive control



Figure 14: Before and after treatment of African Olive

Table 32: MGO Weed Works Completed in Biodiversity Offsets 2022

Offset Area	Weed Control Applied to Area	Weeds Targeted
Northwest Offset	Woody, herbaceous	<ul style="list-style-type: none"> • Cut and paint targeting African Olive Lantana • High volume spray application targeting Coolatai grass and St John's Wart. • Slashing and follow up spray of Coolatai grass • Low volume spray targeting Coolatai grass
Southeast Offset	Woody	<ul style="list-style-type: none"> • Cut and paint targeting African Olive • Cut and paint targeting Lantana • Hand removal targeting Lantana seeding • Cut and paint targeting Boxthorn and Golden Wreath Wattle
Forest East Offset	Woody, Herbaceous	<ul style="list-style-type: none"> • Scrape and paint targeting Inkweed • Cut and paint targeting Lantana and Arsenic Bush

Offset Area	Weed Control Applied to Area	Weeds Targeted
Southeast Corridor Offset	Herbaceous	<ul style="list-style-type: none"> Low volume spray application of African Love grass and Coolatai grass
Southern Remnant Offset	Herbaceous	<ul style="list-style-type: none"> Low volume spray application of Prickly Pear, Coolatai grass, Red Natal, Galenia, Juncus grass and Guinea grass
Stringybark Offset	Woody, herbaceous	<ul style="list-style-type: none"> Cut and paint targeting African Olive, peppercorn tree, Blue Jacaranda and Lantana High volume spray application targeting Coolatai grass. Low volume spray application targeting Juncus grass
Bettys Creek Habitat Management Area (HMA)	Woody, herbaceous	<ul style="list-style-type: none"> High volume spray application targeting Coolatai grass and African Lovegrass. Low volume spray application of Prickly Pear, African Love grass, Moth Weed and Inkweed, Juncus grass and Coolatai grass Cut and paint application targeting African Olive, Lantana, Peppercorn Tree, Silky Oak and Blue Jacaranda Scrape and Paint targeting Moth Vine, Inkweed and Green Cestrum Hand weeding targeting Prickly Pear
Cross Creek	Herbaceous	<ul style="list-style-type: none"> Low volume spray targeting St John's Wort

6.4.7.3 Pest Control

A Vertebrate Pest Monitoring Program (VPMP) was implemented across MGO BOAs during the 2022 report period, utilising a range of temporary and permanently installed motion detection cameras. The VPMP detected a range of pests, including deer, wild dogs, pigs, foxes and humans (as a result of unauthorised access).

6.4.7.4 Offset Pest Control

A targeted wild dog and fox baiting program was conducted across MGO offsets during the report period. The program consisted of a seasonal '1080' baiting program undertaken in Spring (October) across on-site BOAs.

Trained personnel placed '1080' poison baits across all areas. Results of the 2022 offset baiting program are summarised in *Table 33*, and photos in *Figure 15*.

6.4.7.5 Buffer Land Pest Control

During 2022, 18 baits were taken by non-target species, including 2 goannas, 1 Crows and 15 miscellaneous. The poison is not lethal to goannas. Goannas tend to be problematic in the warmer months when they are more active and, as such, baiting in summer is not recommended. Of the baits taken by goannas, all were taken during the spring program. Trapping was not conducted at all for the duration of 2022 due to high rainfall (see **30** and photos in *Figure 15*).

Table 33: Wild Dog and Fox Biodiversity Offset Baiting Program – 2022 Results

Program	Number of bait locations	Total number of baits made available to targeted species	Number of baits taken by targeted species	Targeted species success rate
1080 Baiting Program				
Autumn	17	51	7	13%
Spring	27	81	25	31%

Table 34: Wild Dog and Fox Buffer Land Baiting Program – 2022 Results

Program	Number of locations	Total number of baits made available to targeted species	Number of targeted species culled	Targeted species success rate
1080 Baiting Program				
Autumn	27	216	60	28%
Spring	26	216	48	22%



Figure 15: Images captured on motion cameras in Offset Areas during 2022

6.5 Heritage

6.5.1 Aboriginal Heritage

MGO implements an Aboriginal Cultural Heritage Management Plan (ACHMP). The ACHMP provides strategies for the management of remaining registered Aboriginal sites. It also provides for the management of the Bettys Creek, Swamp Creek, Yorks Creek and Bowmans Creek areas that fall outside the approved MGO disturbance boundaries. These areas retain Aboriginal heritage and archaeological values that require management, despite being salvaged.

MGO utilises ground disturbance permits (GDPs) to prevent damage to known valid Aboriginal sites. Alternatively, a due diligence assessment is conducted, and any necessary controls implemented. This is completed prior to authorisation of ground disturbance work.

6.5.1.1 2022 Monitoring Program

Quarterly monitoring of Aboriginal heritage sites across MGO continued in 2022, in conjunction with RAPs and a qualified archaeologist (see *Figure 16* and *Figure 17*). This monitoring includes:

- Site condition monitoring - previously recorded sites are inspected to evaluate the condition of the site
- Management recommendations may be made to improve the condition of a site, should it be required.

MGO monitored quadrants 1,2, 3 and 4 during 2022 with over 69 artefact sites visited. Artefacts were found to be well-preserved with minor management recommendations such as improved signage required.

6.5.1.2 Salvages During 2022

No artefacts were salvaged at MGO during 2022.

6.5.2 European Heritage

MGO manages European heritage through the implementation of the Historic Heritage Management Plan (HHMP). MGO demonstrates a varied historical pattern of European habitation. Prior European land use in the area has included a range of activities, from dairying to mixed farming, cropping, and mining.

MGO has committed to continual historical heritage management initiatives. These include:

- Implementing a quarterly monitoring program for European heritage sites
- Ongoing maintenance of sites.

Monitoring during the reporting period found that sites are well-preserved with minimal management recommendations required, such as the Hebden and Ravensworth Public School managed ruin sites pictured in *Figure 16* and *Figure 17*.



Figure 16: Hebden Public School Remains.



Figure 17: Ravensworth Public School Managed Ruin

6.6 Demolition Works

No demolition works were undertaken on-site during the reporting period.

7. Water Management

7.1 Water Balance

MGO operates a water management system designed to ensure efficient operation of the site through the control of water inflow and the ready provision for onsite demands. *Appendix F*, Figure 1 details the water flow path throughout the complex. In average to dry rainfall periods, MGO is predicted to operate with a water deficit in absence of water imports from either the GRAWTS or from licensed surface water allocations.

Table 35: MGO Water Balance for 2022

Aspect	Volume (ML) for 2021	Volume (ML) for 2022
INFLOWS		
Runoff	8,949	9,942.50
Glennies Creek Extraction	411	191.33
Transfers from other sites	1,070	437.89
Tailings Bleed Water to West Pit ¹	5,577	2,500.37
CHPP Feed ROM Moisture	740	700.53
Groundwater Inflow	1,383	420.00
Total	18,130	14,192.62
OUTFLOWS		
Evaporation	2,414	1,345.20
Exported to Other Sites	7,853	5,361.99
Entrainment ²	2,157	1,476.60
Dust Suppression	1,369	596.74
Off-site Discharge	-	-
Total	13,793	8,780.53
BALANCE		
Inflow-outflow	4,337	5,412.09

1. Tailings bleed from Ravensworth and Liddell tailings
2. Includes water entrained in tailings, product coal and coarse rejects

7.2 Hunter River Salinity Trading Scheme (HRSTS)

MGO has a total of 5 credits as a non-discharging participant of the scheme. MGO has no licensed discharge point. MGO transfers excess water to other sites as part of the GRAWTS. Other sites able to discharge are limited by the HRSTS. MTO credits would be transferred to the relevant discharge site if discharge was to occur.

7.3 Surface Water

Over the last several years MGO has received highly variable rainfall. In the years prior to 2021, MGO experienced lower than average rainfall resulting in long periods of no flow conditions within MGO's creek systems. For both 2021 and 2022 above average rainfall was received, resulting in an increase in flow rates at most surface water monitoring sites. Samples collected in the 2022 reporting period were collected under variable flow conditions. MGO was unable to obtain water samples from Swamp Creek (SC3) during the reporting period due to low water levels and dry conditions (*Table 41*).

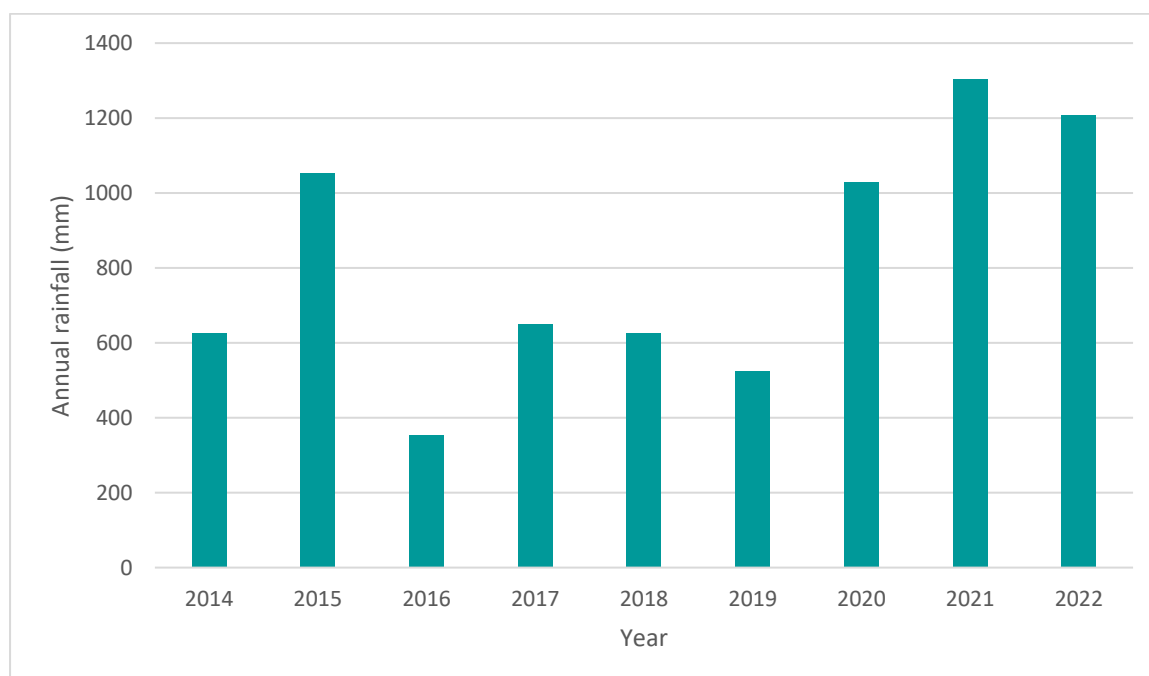


Figure 18: Regional Rainfall Data (Bowmans Creek BoM Station (061270))

7.3.1 Surface Water Monitoring Program and Triggers

7.3.1.1 Surface Water Monitoring Performance

MGO monitors surface water quality at 19 creek locations surrounding the site (*Figure 19*). These include:

- Bowmans Creek (5 sites: BMC1-BMC5)
- York's Creek (3 sites: YC1-YC3)
- Swamp Creek (4 sites: SC1-SC4)
- Betty's Creek (4 sites: BC1-BC4)
- Main Creek (3 sites: MC1-MC3).

Sites are monitored for pH, EC and TSS. Results are recorded in the site Environmental Monitoring Database (EMD). Results are assessed against baseline trigger levels outlined in the MGO Surface Water Monitoring and Management Plan (SWMMP) (

Table 36).

A summary of 2022 surface water monitoring results is presented in (*Table 37*), with a copy all monitoring results included in *Appendix F*. A comparison of 2022 data against historical data for the last five years is also provided in *Appendix F*.

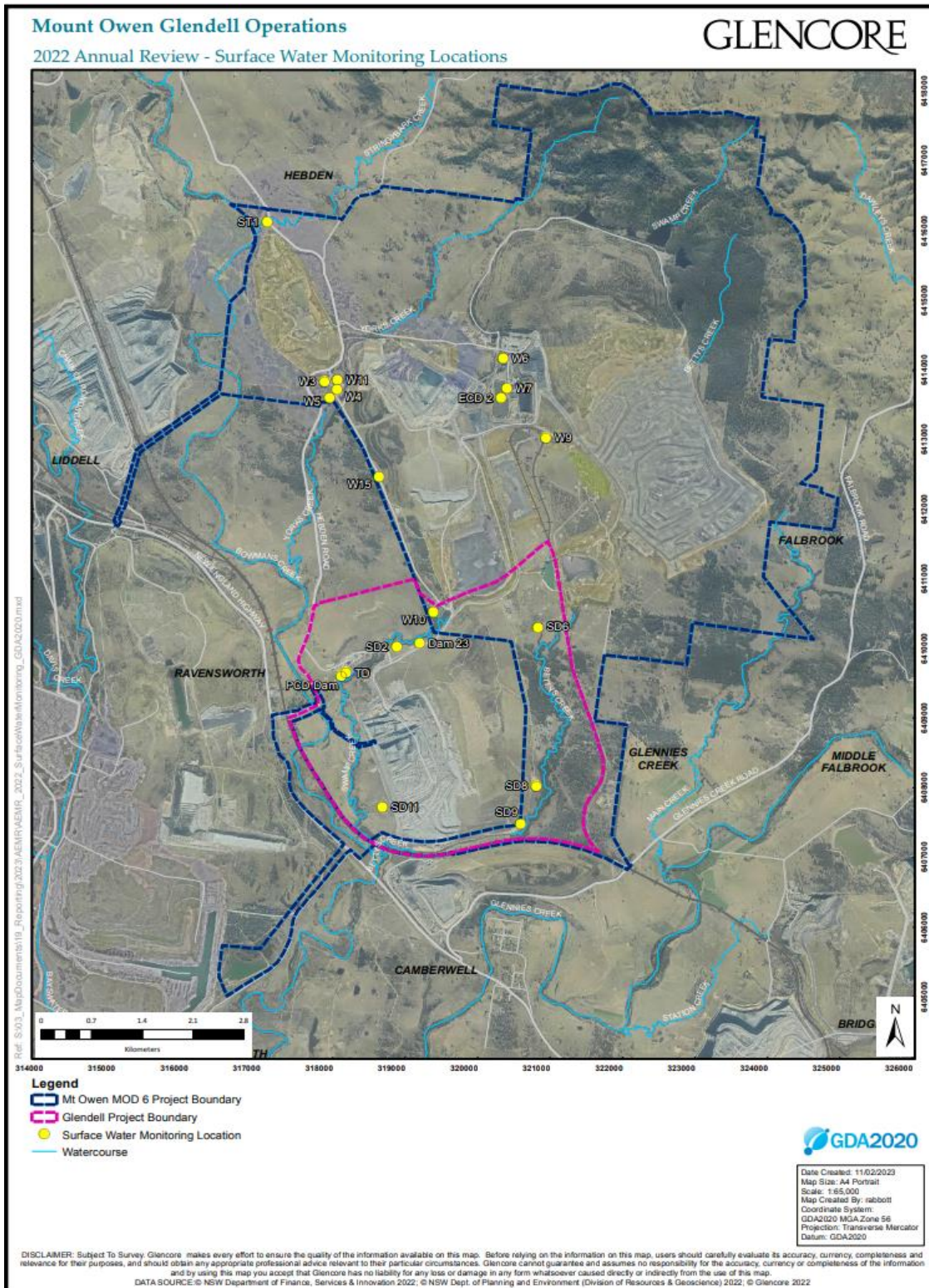


Figure 19: MGO Surface Water Monitoring Locations

Table 36: Surface Water Quality Triggers

Water Quality Variable	Bowmans Creek	York's Creek	Swamp Creek	Bettys Creek	Main Creek
pH	7.5 – 8.1	7.0 – 7.9	7.1 – 8.6	7.1 – 8.3	7.1 – 8.4
EC (µS/cm) ¹	1,288 - 2,430	5,286 - 8,852	824 - 8,824	1,882 - 6,680	1,191 – 5,440
TSS (mg/L) ¹	Oct-26	20 - 33	21 - 35	16 - 52	10 - 140

¹ 80th percentile range for EC and TSS. Sites have specific triggers as per MGO's approved SWMMP. MGO has defined 80th percentile trigger values for EC and TSS, and 20th percentile (acidic) and 80th percentile (alkaline) triggers for pH. Triggers are specific to each individual creek monitoring site. These values are based on historical datasets for each site. The Specific triggers are contained within MGO's approved SWMMP.

Table 37: Summary of Surface Water Monitoring Results 2022

Site	pH (units)			EC (µS/cm)			TSS (mg/L)			Comment	Scheduled monitoring events	Actual sampling events
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg		Monthly	%
Betty's Creek												
BC1	7.36	8.13	7.83	672	1910	1192	<5	1590	151	No sample collected in February due to being dry	12	92%
BC2	7.09	8.03	7.55	170	623	312	<5	60	215	No sample collected in May due to being dry		92%
BC3	7.56	8.69	8.315	594	8140	4402	<5	65	15.8	Samples collected under no flow conditions		100%
BC4	7.56	8.65	8.15	781	6430	3614	<5	32	13.33	Samples collected under no flow conditions		
Bowmans Creek												
BMC1	7.66	8.15	7.96	534	834	699	<5	14	5.54	Samples collected under steady flow conditions	12	100%
BMC2	7.34	8.09	7.89	534	874	703	<5	18	5.3			
BMC3	7.88	8.15	7.99	540	872	706	<5	18	4.79	February sample collected under no flow conditions		
BMC4	7.59	8.01	7.83	526	900	731	<5	22	8.75	Samples collected under steady flow conditions		
BMC5	7.79	8.01	7.89	595	928	762	<5	18	9.04			
Glennies Creek												
GC2/W4	7.55	7.95	7.77	277	564	394	<5	25	9.5	Samples collected under slow flow conditions	12	100%

GC3	7.42	7.99	7.72	277	547	392	<5	58	14.86	Unsafe access to collect Feb sample		92%
Main Creek												
MC1	7.03	8.25	7.55	473	7060	2301	<5	33	1400	No sample collected in December due to being dry	12	92%
MC2	7.19	7.9	7.63	438	3570	1331	<5	27	812	No sample collected in February or December due to being dry		83%
MC3	7.2	7.75	7.49	416	2370	1077	<5	24	10.41	Samples collected under No flow conditions		100%
Swamp Creek												
SC1	7.27	9.18	7.77	190	319	262	<5	59	15.166	Samples collected under No flow conditions	12	100%
SC2	7.08	9.12	7.67	180	292	222	<5	77	17.54			100%
SC3	-	-	-	-	-	-	-	-	-	DRY	0%	
SC4	6.82	7.26	7.06	328	648	469	<5	1750	266	DRY except samples collected Jan, Mar, April, July and November	58%	
York's Creek												
YC1	7.32	7.68	7.49	295	3880	1512	<5	26	7.875	Unsafe access to collect January, March and May sample	12	75%
YC2	7.41	7.87	7.61	443	2070	890	<5	17	6.68	No water sample was collected in December due to low water levels	12	92%
YC3	7.42	8.22	7.79	610	8530	2763	<5	13	5.19	Too Dry to sample in February	12	92%

7.3.1.2 Bowmans Creek (BMC)

Monitoring data collected for Bowmans Creek in 2022 generally aligned with baseline conditions (refer to *Appendix F*). Results above the SWMMP trigger levels for Bowmans Creek are outlined in *Table 38*. All the results were within the historical range (highest and lowest measurements) recorded throughout the entire monitoring period. The sites that triggered SWMMP criteria in 2022 were internally reviewed in accordance with the 2020 Surface Water and Groundwater Response Plan (SWGWRP).

Table 38: Bowmans Creek surface water monitoring

Sample Site	Date	Analyte	Result (2022)	Trigger Level	Historical Range (pre 2022)	Comments	Flow
BMC1	14/01/2022	pH	7.89	<7.7 - >8.1	6.75 - 8.2	Result within the historical range and also within the ANZECC Guidelines criteria (6.5 – 8.0 pH)	Samples collected under slow flow conditions
BMC1	17/02/2022	pH	7.86	<7.7 - >8.1	6.75 - 8.2	Result within the historical range and also within the ANZECC Guidelines criteria (6.5 – 8.0 pH)	Samples collected under still flow conditions
BMC1	17/02/2022	TSS	12	10	1 - 1,620	TSS results were recorded below the historical maximum and below the ANZECC Guidelines criteria (50 mg/L) for lowland rivers.	Samples collected under still flow conditions
BMC3	18/06/2022	pH	8.15	<7.8 - >8.1	7.2-8.4	Results within historical range	Samples collected under still flow conditions
BMC4	17/02/2022	TSS	21	17	1-201	TSS results were recorded below the historical maximum and below the ANZECC Guidelines criteria (50 mg/L) for lowland rivers.	Samples collected under still flow conditions

7.3.1.3 Betty's Creek (BC)

Bettys Creek exhibited variable flow conditions during 2022. Monitoring at all sites was only possible in select months due to water levels being too low to sample and dry conditions. Monitoring data for Betty's Creek is included in *Appendix F*. 2022 monitoring results for Bettys Creek sites above the SWMMP trigger levels (see *Table 39*) were internally reviewed in accordance with the SWGWRP and confirmed that results were within historical range and within Australian and New Zealand Environment Conservation Council (ANZECC) Guidelines criteria.

Table 39: Bettys Creek surface water monitor.

Sample Site	Date	Analyte	Result (2022)	Trigger Level	Historical Range (pre 2022)	Comments	Flow
BC1	18/06/2022	pH	7.86	<7.1 - >7.6	5.0 - 8.4	pH results were within the respective historical ranges as well as within the general range of ANZECC Guidelines criteria (6.5 – 8.0 pH) for lowland rivers.	All results were measured in still, trickling, or steady bodies of water.
BC1	20/07/2022	pH	7.82			pH result was outside of the ANZECC Guidelines criteria (6.5 – 8.0 pH) for lowland rivers, however was within the historical range of results obtained for the monitoring location.	
BC1	21/09/2022	pH	8.03				

Mt Owen Glendell Operations

2022 Annual Review

BC1	24/10/2022	pH	7.8			pH results were within the respective historical ranges as well as within the general range of ANZECC Guidelines criteria (6.5 – 8.0 pH) for lowland rivers.		
BC1	29/11/2022	pH	8.07			pH result was within the historical range of results obtained for the monitoring location and was slightly outside of the ANZECC Guidelines criteria (6.5 – 8.0 pH) for lowland rivers		
BC1	28/12/2022	pH	8.13			pH result was within the historical range of results obtained for the monitoring location and was slightly outside of the ANZECC Guidelines criteria (6.5 – 8.0 pH) for lowland rivers		
BC3	14/01/2022	EC	5,380	2,686	4-7,090	Result within the historical range	Samples collected under still/stagnant conditions	
BC3	17/02/2022	EC	5,250					
BC3	17/03/2022	EC	5,580					
BC3	14/04/2022	EC	5,890				Sample collected under slow flow conditions	
BC3	18/05/2022	EC	4,850				Samples collected under slow flow conditions	
BC3	18/06/2022	EC	4,880				All results were measured in still, trickling, or steady bodies of water.	
BC3	20/07/2022	EC	5,300					
BC3	17/02/2022	pH	8.69	<7.1 - >7.9	5.0 - 8.4	A consecutive new pH maximum was recorded at BC3. All other values were recorded below the historical maximums for each site/parameter and within the general range of ANZECC Guidelines criteria (6.5 – 8.0 pH) for lowland rivers.	Samples collected under still/stagnant conditions	
BC3	17/03/2022	pH	8.52					
BC3	14/04/2022	pH	8.61				pH results were recorded within the respective historic ranges as well as within the general range of ANZECC Guidelines criteria (6.5 – 8.0 pH) for lowland rivers.	Samples collected under slow flow conditions
BC3	18/05/2022	pH	8.5					All results were measured in still, trickling, or steady bodies of water.
BC3	18/06/2022	pH	8.45					
BC3	20/07/2022	pH	8.66					
BC4	17/02/2022	pH	7.89	<7.1 - >7.8	6.4 - 8.3	Result within the historical range, circum-neutral and within the ANZECC Guidelines criteria (6.5 – 8.0 pH))	Samples collected under still/stagnant conditions	

BC4	17/03/2022	pH	8.49			The BC4 pH result recorded a new historical maximum.	
BC4	14/04/2022	pH	8.41			The BC4 pH result was also below the historical maximum recorded in March 2022	
BC4	18/05/2022	pH	8.49			The BC4 pH result was equal to the maximum recorded in March 2022	
BC4	18/06/2022	pH	8.64			The BC4 pH result set a new historical maximum record.	
BC4	20/07/2022	pH	8.655			The BC4 pH result set a new historical maximum record, previously set in June 2022.	All results were measured in still, trickling, or steady bodies of water.
BC4	17/02/2022	EC	2,720	2,176	178-7,390	Result within the historical range	Samples collected under still/stagnant conditions
BC4	17/03/2022	EC	5,320				
BC4	14/04/2022	EC	5,420				
BC4	18/05/2022	EC	6,430				
BC4	18/06/2022	EC	6,280				
BC4	20/07/2022	EC	5,290				All results were measured in still, trickling, or steady bodies of water.

7.3.1.4 Main Creek (MC)

Main Creek exhibited variable flow conditions during 2022. Samples from Main Creek sample site MC1 and MC3 were all collected under no flow conditions. All the results at this location during the monitoring period can be seen in *Table 40*. Those results outside the historical range were reviewed by an external consultant and compared to ANZECC Guidelines. Monitoring data for Main Creek is included in *Appendix F*.

Table 40: Main Creek surface water monitoring

Sample Site	Date	Analyte	Result (2022)	Trigger Level	Historical Range (pre 2022)	Comments	Flow
MC1	17/03/2022	pH	7.03	<7.1 - >7.6	6.3 - 8.0	Result within the historical range, circum- neutral and within the ANZECC Guidelines criteria (6.5 – 8.0 pH)	Samples collected under still/stagnant conditions
MC1	24/06/2022	EC	3,470	1,191	1,191-5,440	Result within the historical range.	Samples collected under still/stagnant conditions
MC1	20/07/2022		5,900	1,191			
MC3	14/01/2022	pH	7.2	<7.3 - >7.6	6.9 - 7.9	Result within the historical range, circum- neutral and within the ANZECC Guidelines criteria (6.5 – 8.0 pH)	Samples collected under still/stagnant conditions

MC3	17/02/2022		7.75				
MC3	17/03/2022		7.27				
MC3	17/02/2022	TSS	16	10	2-38	TSS results were recorded below the historical maximum and below the ANZECC Guidelines criteria (50 mg/L) for lowland rivers.	Samples collected under still/stagnant conditions
MC3	29/11/2022		16				
MC3	18/12/2022		12				

7.3.1.5 Swamp Creek (SC)

Swamp Creek sample site SC3 was unable to be sampled during the 2022 reporting period due to low water levels and dry conditions. The results above the SWMMP trigger levels at Swamp Creek during the reporting period are detailed in *Table 41*. Those results were reviewed in accordance with the SWGWRP. These reviews confirmed there was no compliance issues because and confirmed that results were within historical range and within ANZECC Guidelines criteria. Monitoring data for Swamp Creek is included in *Appendix F*.

Table 41: Swamp Creek surface water monitoring

Sample Site	Date	Analyte	Result (2022)	Trigger Level	Historical Range (pre 2022)	Comments	Flow
SC1	14/01/2022	pH	7.44	<7.7 - >8.6	6.4 - 10.1	Result within the historical range, circum- neutral and within the ANZECC Guidelines criteria (6.5 – 8.0 pH)	Samples collected under no flow conditions
	18/05/2022		7.4				
	18/06/2022		7.6				
	20/07/2022		7.27				
SC2	14/01/2022	pH	7.14	<7.4 - >8.2	6.6 - 9.7	Result within the historical range, circum- neutral and within the ANZECC Guidelines criteria (6.5 – 8.0 pH)	Samples collected under no flow conditions
	17/02/2022		7.46				
	17/02/2022		7.08				
	14/04/2022		7.15				
	18/05/2022		7.35				

7.3.2 Stream Stability and Condition Monitoring

7.3.2.1 Location

Annual channel stability assessment is also carried out across both existing creeks and creek diversions at the site. MGO monitors channel stability at 43 locations (*Figure 20*). These include:

- Reference waterway sites
 - Bowmans Creek (2 sites: BMC1-BMC2)
 - Yorks Creek (3 sites: YC1-YC3)
- Main Creek (2 sites: MC1-MC2), Swamp Creek (4 sites: SC1-SC4)
- Bettys Creek (2 sites: BC1-BC2)
- Bettys Creek Diversion (25 sites: UBD1-UBD6, MBD1-MBD6 and LBD1-LBD13)
- Swamp Creek Diversion (3 sites: SC1A-SC1C).

7.3.2.2 Methodology

Channel stability is assessed using the CSIRO Ephemeral Stream Assessment (2011) (*Table 42* and *Table 43*) and the Rapid Appraisal of Riparian Condition (RARC) (Jansen et al., 2005) methodologies and scoring system (refer to *Table 44*).

Table 42: CSIRO Ephemeral Stream Assessment Stability Classifications

Activity Rating (%)	Classification	Discussion of Classification
> 80	Very Stable	Drainage line is very stable and likely to be in original form. It is able to withstand all flow velocities that have previously occurred in this area and only minimal monitoring is required, predominantly after high flow events, to ensure condition does not deteriorate.
70-80	Stable	Drainage line is stable. It is important to assess this zone in relation to the other classifications and define whether this zone is moving from potentially stabilising to a more stable form, or if it is deteriorating from a very stable form. The nature of this relationship will identify the type of monitoring required.
60-69	Potentially Stabilising	Drainage line is potentially stabilising. Ongoing monitoring is required while rehabilitation works are not needed in the immediate future.
50-59	Active	Drainage line is actively eroding and remedial actions are required. It is important to classify if erosion is caused primarily by upstream flows, lateral flows or unstable wall materials so that appropriate rehabilitation can be carried out.
<50	Very Active	Drainage line is very actively eroding and immediate remedial actions are required. It is important to classify if erosion is caused primarily by upstream flows, lateral flows or unstable wall materials so that appropriate rehabilitation can be carried out.

Table 43: Summary of Indicator, Functions and Components Assessed in the RARC Index

Functions of the riparian zone at different levels of organisation	Components of the riparian ecosystem that perform those functions	Indicators of the functions used in the RARC
Physical		
Reduction of erosion of banks	Roots, groundcover	Vegetation cover*
Sediment trapping	Roots, fallen logs, ground cover	Canopy cover, fallen log, ground cover vegetation, leaf litter cover
Controlling stream, Microclimate/discharge/water temperatures	Riparian Forest	Canopy Cover
Filtering of nutrients from upslope	Vegetation, leaf litter	Ground cover vegetation, leaf litter cover
Community		
Provision of organic matter to aquatic food chains	Vegetation	Vegetation cover*, leaf litter cover
Retention of plant propagules	Fallen logs, leaf litter	Fallen logs, litter cover
Maintenance of plant diversity	Regeneration of dominant species, presence of important species, dominance of natives versus exotics	Native canopy and shrub regeneration, grazing damage to regeneration, reeds, native vegetation cover*
Provision of habitat for aquatic and terrestrial fauna	Fallen logs, leaf litter, standing dead trees/hollows, riparian forest, habitat complexity	Fallen logs, leaf litter cover, standing dead trees, hollows, vegetation cover*, number of vegetation layers
Landscape		
Provision of biological connections in the landscape	Riparian forest (cover, width, connectedness)	Vegetation cover*, width of riparian vegetation, longitudinal continuity of riparian vegetation, proximity to another habitat
Provision of biological connections in the landscape	Riparian forest (cover, width, connectedness)	Vegetation cover*, width of riparian vegetation, longitudinal continuity of riparian vegetation, proximity to another habitat

Table 44: Summary RARC Classification System

RARC Total Score	Classification
40-50	Excellent
35-39	Good
30-34	Average
25-29	Poor
< 25	Very Poor

7.3.2.3 Reference Sites

Bowmans Creek

Bowmans Creek was assessed for stream stability and condition at two locations and results are presented in *Table 45*. In 2022, the stream trajectory has remained static at both monitoring points. There has also been no overall change in stream condition classification. The stream condition classification for Bowmans Creek has remained 'Very Poor' since 2014 and is generally a reflection of past land use and management.

Table 45: Bowmans Creek Stream Stability & Condition Assessment 2022

Monitoring Point	Stream Stability (CSIRO)		Stream Condition (RARC)	
	2022	Trajectory	2022	Trend 2014-2022
Bowmans Creek 1 (BMC1)	63% (Potentially Stabilising)	Static	Very Poor	Stable
Bowmans Creek 2 (BMC2)	72% (Stable)	Static	Very Poor	Stable

York's Creek

York's Creek was assessed for stream stability and stream condition at three locations and results are included in *Table 46*. Stream stability has remained on a static trajectory and potentially stabilising since 2017. The stream condition of monitoring site YC1 continues improve since 2014. However, monitoring sites YC2 and YC3 are classified as 'Stable' and 'Very Poor' stream condition. Fireweed (*Senecio madagascariensis*) is reported to be present at all three monitoring sites.

Table 46: York's Creek Stream Stability & Condition Assessment 2022

Monitoring Point	Stream Stability (CSIRO)		Stream Condition (RARC)	
	2022	Trajectory	2022	Trend 2014-2022
York's Creek 1 (YC1)	56% (Active)	Static	Average	Improved
York's Creek 2 (YC2)	69% (Potentially Stabilising)	Static	Very Poor	Declined
York's Creek 3 (YC3)	63% (Potentially Stabilising)	Static	Very Poor	Stable

Main Creek

Main Creek was assessed for stream stability and stream health at two locations, with results included in *Table 47*. Stream stability for both sites has remained static since 2018. One site (MC1) progressed from 'Active' to 'Potentially stabilising' between 2017-2018, however the other site (MC2) has been

classified as ‘Active’ since 2014. Stream condition has remained constant, and generally classified as ‘Very Poor’. Main Creek has been cleared in the past prior to mining activities and has minimal riparian vegetation. This is the main reason for the low health score.

Table 47: Main Creek Stream Stability & Condition Assessment 2022

Monitoring Point	Stream Stability (CSIRO)		Stream Condition (RARC)	
	2022	Trajectory	2022	Trend 2014-2022
Main Creek 1 (MC1)	63% (Potentially Stabilising)	Static	Very Poor	Stable
Main Creek 2 (MC2)	59% (Active)	Static	Very Poor	Stable

Bettys Creek

Bettys Creek natural waterway was assessed for stream stability and condition at two locations. Results are included in Table 48. Stream condition at BC1 declined in the assessment conducted in November 2022 which is likely to have been a results of high rainfall events.

Table 48: Bettys Creek Stream Stability and Condition Assessment 2022

Monitoring Point	Stream Stability (CSIRO)		Stream Condition (RARC)	
	2022	Trajectory	2022	Trend 2014-2022
BC1	66% (Potentially Stabilising)	Static	Very Poor	Declined
BCD2	75% (Stable)	Static	Average	Improved

7.3.2.4 Creek Diversions

Creek diversions onsite undergo biannual monitoring of stream stability and condition assessments, targeted at identifying areas requiring maintenance such as erosion and weed control. Annual stream stability and condition assessments follow the same methodology as that carried out for local creek reference sites (Ephemeral Stream Assessment and RARC) and results can be compared to existing creek lines to assess the performance of diversions.

Bettys Creek Diversion

Stream stability trajectory across Bettys Creek diversion monitoring sites remains static, with stability ranging between 63%- 81% among and between the Upper, Middle and Lower groupings (refer to Table 49 and Figure 20: Stream Stability and Condition Monitoring Locations).

Table 49: Betty's Creek Diversion Stream Stability & Conditions Assessment 2022

Creek Diversion	Monitoring Point	Stream Stability (CSIRO)		Stream Condition (RARC)	
		2022	Trajectory	2022	Trend 2014-2022
Upper Betty's Diversion	UBD1	63% (Potentially Stabilising)	Static	Very Poor	Stable
	UBD2	63% (Stable)	Static	Poor	Improved
	UBD3	66% (Potentially Stabilising)	Static	Poor	Improved
	UBD4	69% (Potentially Stabilising)	Static	Poor	Improved
	UBD5	66% (Potentially Stabilising)	Static	Very Poor	Stable
	UBD6	75% (Stable)	Static	Very Poor	Stable
	MBD1	81% (Very Stable)	Static	Poor	Stable

Creek Diversion	Monitoring Point	Stream Stability (CSIRO)		Stream Condition (RARC)	
		2022	Trajectory	2022	Trend 2014-2022
Middle Bettys Diversion	MBD2	69% (Potentially Stabilising)	Static	Very Poor	Decline
	MBD3	66% (Potentially Stabilising)	Static	Poor	Stable
	MBD4	66% (Potentially Stabilising)	Static	Very Poor	Stable
	MBD5	81% (Very Stable)	Static	Very Poor	Stable
	MBD6	69% (Potentially Stabilising)	Static	Very Poor	Stable
Lower Bettys Diversion	LBD1	66% (Potentially Stabilising)	Static	Poor	Improved
	LBD2	66% (Potentially Stabilising)	Static	Poor	Improved
	LBD3	69% (Potentially Stabilising)	Static	Average	Improved
	LBD4	75% (Stable)	Static	Very Poor	Stable
	LBD5	69% (Potentially Stabilising)	Static	Very Poor	Stable
	LBD6	75% (Stable)	Static	Very Poor	Stable
	LBD7	75% (Stable)	Static	Very Poor	Stable
	LBD8	75% (Stable)	Static	Very Poor	Stable
	LBD9	69% (Potentially Stabilising)	Static	Very Poor	Stable
	LBD10	72% (Stable)	Static	Poor	Decline
	LBD11	72% (Stable)	Static	Average	Improved
	LBD12	72% (Stable)	Static	Good	Improved
	LBD13	72% (Stable)	Static	Good	Improved

Swamp Creek

Swamp Creek was assessed for stream stability and condition at four natural waterway locations and three diversion locations (refer to *Figure 20*). Stream stability remained relatively consistent across all sites. Comparison to previous monitoring shows that stream condition at the upstream natural waterway site SC1 has declined and classified as 'Very Poor', whilst diversion site SC1B and downstream site SC2 have improved. Like other creeks in the area, the low health scores are a result of past land use and management where cattle were not excluded from riparian areas. Results are included in *Table 50*. Fencing inspections are completed bi-annually to ensure cattle are excluded from these areas.

Table 50: Swamp Creek Natural Waterway and Diversion Stability & Condition Assessment 2022

Monitoring Point	Stream Stability (CSIRO)		Stream Condition (RARC)	
	2022	Trajectory	2022	Trend 2014-2022
Swamp Creek 1 (SC1) Natural upstream	66% (Potentially Stabilising)	Static	Very Poor	Declined
Swamp Creek 1A (SC1A) Diversion	66% (Potentially Stabilising)	Static	Very Poor	Stable
Swamp Creek 1B (SC1B) Diversion	78% (Stable)	Static	Poor	Improved
Swamp Creek 1C (SC1C) Diversion	78% (Stable)	Static	Very Poor	Stable
Swamp Creek 2 (SC2) Natural downstream	63% (Potentially Stabilising)	Static	Very Poor	Stable

Mt Owen Glendell Operations

2022 Annual Review

Monitoring Point	Stream Stability (CSIRO)		Stream Condition (RARC)	
	2022	Trajectory	2022	Trend 2014-2022
Swamp Creek 3 (SC3) Natural downstream	63% (Potentially Stabilising)	Static	Very Poor	Stable
Swamp Creek 4 (SC4) Natural downstream	66% (Potentially Stabilising)	Static	Very Poor	Stable

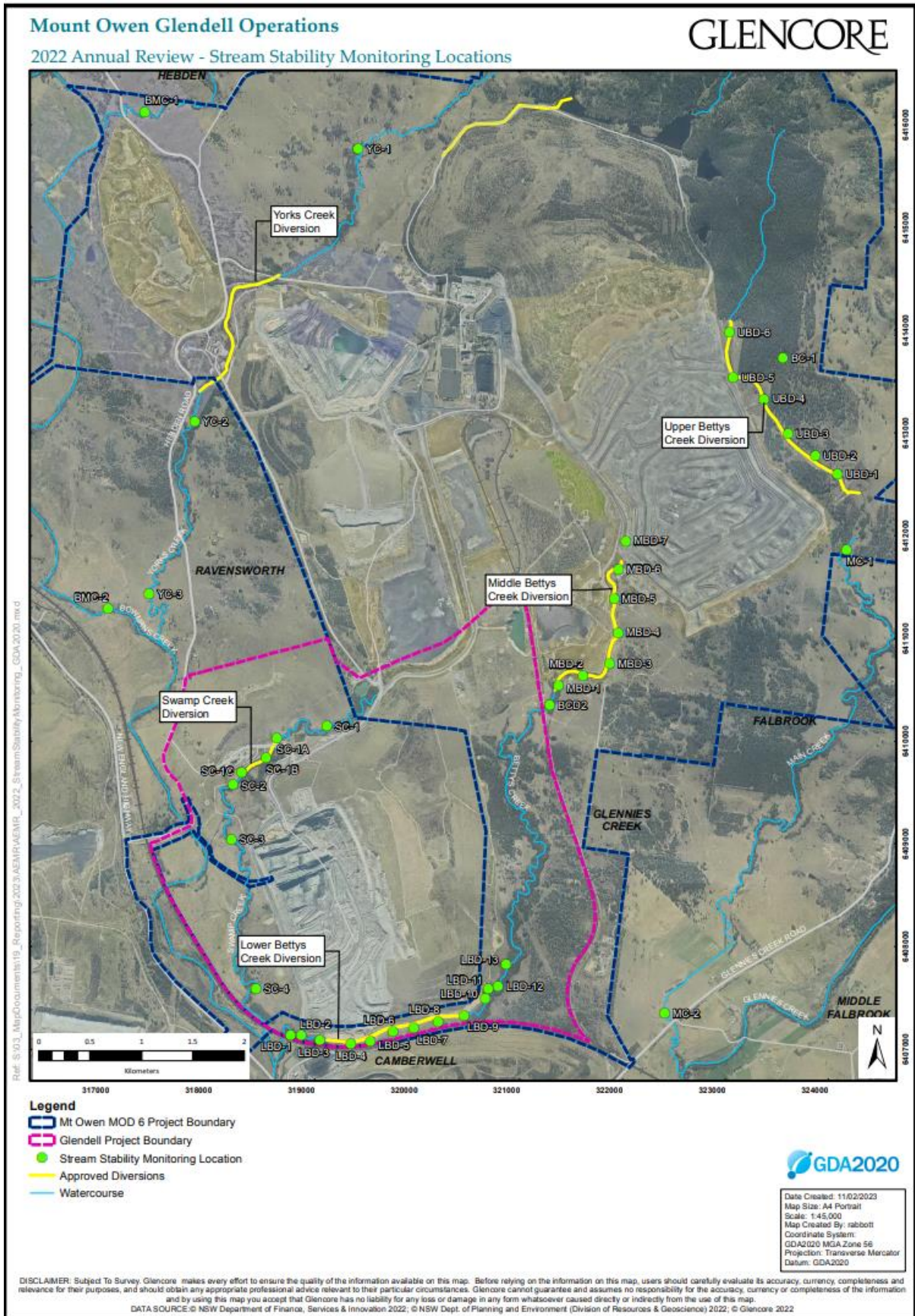


Figure 20: Stream Stability and Condition Monitoring Locations

7.3.3 Erosion and Sediment Control

MGO engages an erosion and sediment controls specialist to conduct quarterly inspections. These inspections aim to identify issues that require maintenance, and where possible these issues are scheduled for rectification prior to the next inspection.

7.4 Groundwater

7.4.1 Groundwater Monitoring Program and Triggers

Groundwater monitoring is undertaken in accordance with the approved MGO Groundwater Management and Monitoring Plan (GWMMP) and includes recording of depth to water (to calculate drawdown), pH and Electrical Conductivity (EC). Groundwater performance criteria is provided in *Table 51*.

Table 51: Groundwater Performance Criteria

Aspect	Performance Measures	Performance Indicator/Trigger
Alluvial aquifers	Groundwater levels (depth to water)	Drawdown greater than historical average plus 1 standard deviation.
	Groundwater quality (pH and EC)	pH or EC outside of 80th percentile of historical data for specific bore locations. Groundwater quality concentrations outside of trigger value for at least one parameter for 2 or more consecutive (quarterly) monitoring rounds.
Hardrock aquifers	Groundwater levels (depth to water)	Drawdown greater than historical average plus 1 standard deviation.
	Groundwater quality (pH and EC)	pH or EC outside of 80th percentile of historical data for specific bore locations. Groundwater quality concentrations outside of trigger value for at least one parameter for 2 or more consecutive (quarterly) monitoring rounds.
Groundwater inflows to mining pits	Calculated inflows to mining pits	Groundwater inflow to mining pits is >10% higher than predicted for three consecutive months. Groundwater inflows exceed WAL limits.
Seepage/leachate	Presence of seepage/leachate from water storages	Visual inspections of water storages (as per the MGO Erosion and Sediment Control Plan) shows seepage zones and reporting water balance indicates seepage is greater than negligible (i.e: >5% of inflows to water storages).
	Seepage/leachate from emplacement areas	Visual inspections of water storages (as per the MGO Erosion and Sediment Control Plan) indicates seepage areas and confirms location of drainage pathways outside of water management system.
	Seepage/leachate from backfilled voids	No increasing trends in water quality parameters in monitoring bores surrounding backfilled voids. An increasing trend would be indicated by 4 consecutive water quality readings showing continual increases in analyte concentrations.

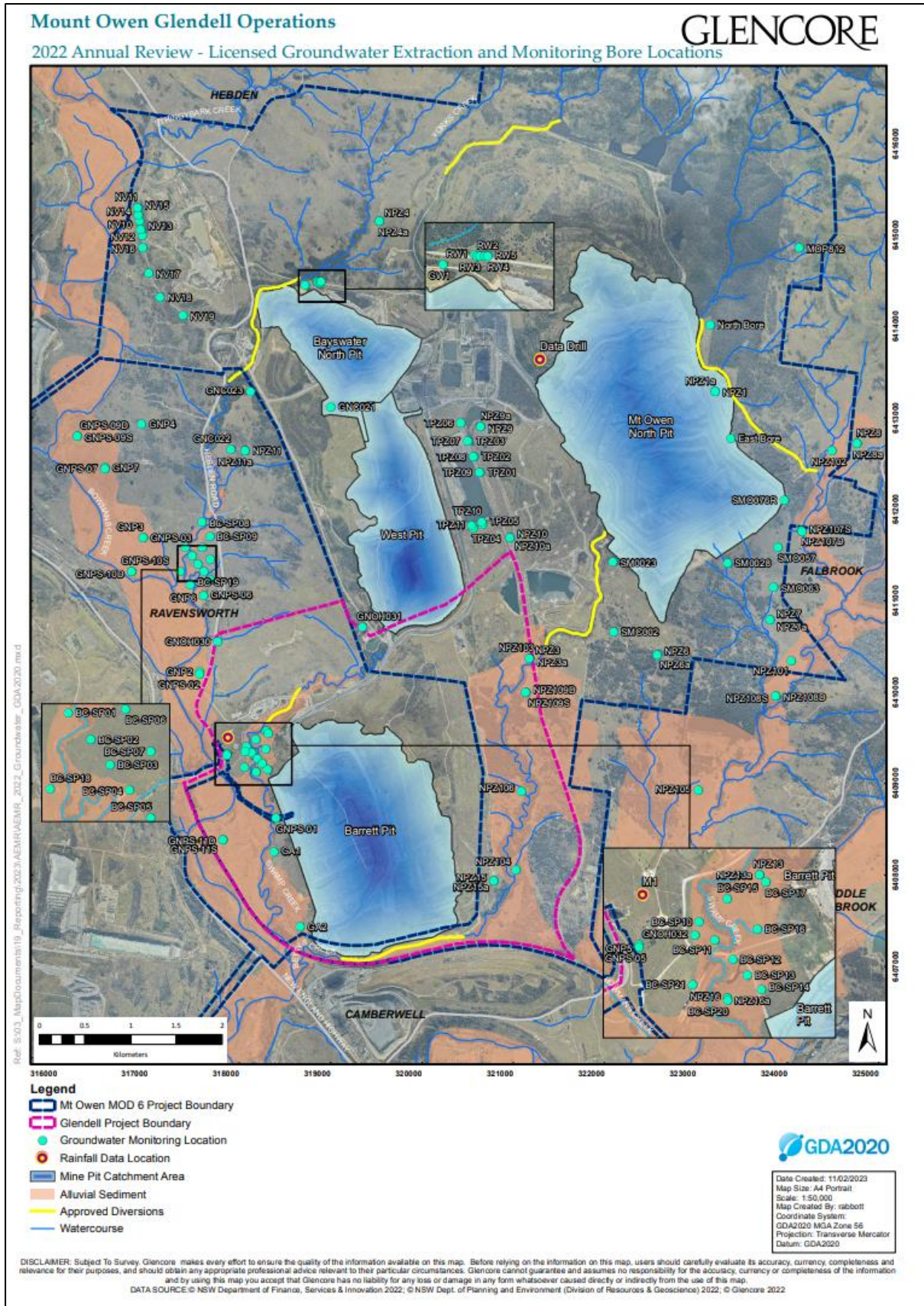


Figure 21: MGO Groundwater Extraction and Monitoring Bores

7.4.2 Groundwater Monitoring Performance

MGO experienced above average rainfall during most of 2022. The greatest monthly rainfall (> 50 mm) was recorded in February to April, July and September to November of 2022. During the reporting period streamflow was also observed within Bowmans Creek/Foy Brook and Glennies Creek, with significant flow events in March and November 2022. The above-average rainfall and streamflow for the reporting period would have resulted in recharge to the alluvium and Permian coal measures where they occur at outcrop, as well as within backfilled MGO mining areas.

A third party water expert was engaged to review annual groundwater monitoring results for 2022. In accordance with Surface and groundwater Response Plan, some sites will require further investigation for:

7.4.2.1 Water Level:

Bores NPZ104, BC-SP01, BC-SP06, BC-SP07, BC-SP09, BC-SP10, BC-SP13, BC-SP17, BC-SP18, BC-SP19, GNPS-03, GNPS-05, GNPS-07, NPZ107S, NPZ105, NPZ1, NPZ6, NPZ9, NPZ11, NPZ15, NPZ1A, NPZ7A, NPZ8A, NPZ7, NPZ16, NPZ107D, NPZ13, NPZ11A, NPZ6A, NPZ4A, NPZ13A, NPZ4A, NPZ6, NPZ16A.

7.4.2.2 Electrical Conductivity:

Bores NPZ107S, NPZ101, NPZ108S, NPZ1, NPZ8, NV10A, NPZ13a, NPZ3a, RW3, TPZ_05, TPZ_07 AND NV17B

7.4.2.3 pH:

Bores NPZ1a, NPZ108D, TPZ_06, NV10A, BC-SP22, RW4, RW5, NV11A, NV11B, NV12A, NV14A, NV14B, NV15A, NV16A, NV16B and TPZ_04 .

A summary of the findings from the investigations of those results are included below:

7.4.2.4 Alluvial bores:

No issues for water level were recorded for bores BC-SP22, GNP09S, GNP10S, GNP11S, GNPS02 and GNPS-06.

7.4.2.5 Permian Coal Measures:

Five of the shallow overburden bores recorded a water level above trigger (NPZ1, NPZ6, NPZ9, NPZ11, and NPZ15). Bore NPZ1 Also recorded an EC above trigger.

A summary of the groundwater bore monitoring parameters that recorded results above respective GWMMP trigger levels is provided in

Table 52.

A copy of all the monitoring results for individual groundwater monitoring locations is included in *Appendix F*, along with a summary of the 2022 results for all bores.

Table 52: Summary of Groundwater Bore above Trigger Level

Site ID	Investigation Criteria Triggered?			
	Drawdown	pH	EC	
			12,800 µS/cm trigger	>1,000 µS/cm change
Yorks Creek Alluvium				
BC-SP01	✓ (Q1, Q2, Q4)	x	x	x
BC-SP06	✓ (Q1, Q2)	x	x	x
BC-SP07	✓ (Q1, Q2)	x	x	x
BC-SP09	✓ (Q1, Q2)	x	x	x
NPZ4	✓ (Q1, Q2)	x	x	x
NPZ11	✓ (Q1, Q2, Q3, Q4)	x	x	x
Bowmans Creek Alluvium				
BC-SP18	Dry			
BC-SP19	Dry			
BC-SP22	x	✓ (Q2, Q3, Q4)	x	x
GNPS-03	Insufficient water to sample			
GNPS-05	Insufficient water to sample			
GNPS-07	Insufficient water to sample			
Swamp Creek Alluvium				
BC-SP10	✓ (Q1, Q2, Q3, Q4)	x	x	x
BC-SP14	✓ (Q1, Q2, Q3, Q4)	x	x	x
BC-SP17	Insufficient water to sample			

Investigation Criteria Triggered?				
Site ID	Drawdown	pH	EC	
			12,800 $\mu\text{S}/\text{cm}$ trigger	>1,000 $\mu\text{S}/\text{cm}$ change
Bettys Creek Alluvium				
NPZ104	✓ (Q1, Q2, Q4)	x	x	x
Hardrock aquifer				
NPZ16a	Insufficient water to sample			
NPZ7	✓ (Q1, Q2, Q4)	x	x	x
NPZ8	x	x	✓ (Q1, Q2, Q3, Q4)	✓ (Q1, Q2, Q3, Q4)
NPZ13a	✓ (Q1, Q2, Q3, Q4)	x	✓ (Q1, Q2, Q3, Q4)	x
NPZ6	✓ (Q1, Q2, Q3, Q4)	Insufficient water to sample		
NPZ6a	✓ (Q1, Q2, Q3, Q4)	Insufficient water to sample		
NPZ9	✓ (Q1)	x	x	x
NPZ15	✓ (Q1, Q2, Q4)	x	x	x
NPZ1	✓ (Q1, Q2, Q3, Q4)	x	✓ (Q2, Q3, Q4)	✓ (Q2, Q3, Q4)
NPZ104	✓ (Q1, Q2, Q4)	x	x	x
NPZ1a	✓ (Q1, Q2, Q3, Q4)	✓ (Q3, Q4)	x	x
NPZ3a	x	x	✓ (Q3, Q4)	x
NPZ4a	Insufficient water to sample			

Investigation Criteria Triggered?				
Site ID	Drawdown	pH	EC	
			12,800 $\mu\text{S}/\text{cm}$ trigger	>1,000 $\mu\text{S}/\text{cm}$ change
NPZ7a	✓ (Q1, Q2, Q4)	x	x	x
NPZ8a	✓ (Q1, Q2, Q4)	x	x	x
NPZ13a	✓ (Q1, Q2, Q3, Q4)	x	✓ (Q2, Q4)	✓ (Q4)
NPZ11a	✓ (Q3, Q4)	x	✓ (Q3, Q4)	x
NPZ16	✓ (Q1, Q2, Q3, Q4)	x	x	x
NPZ107D	✓ (Q1, Q2)	x	x	x
NPZ108D	x	x	✓ (Q1, Q2, Q3)	x

Table 53: Summary of Groundwater Bore above Trigger Level Main Creek Alluvium

Investigation Criteria Triggered?				
Site ID	Drawdown	pH	EC	
			7,710 $\mu\text{S}/\text{cm}$ trigger	>1,000 $\mu\text{S}/\text{cm}$ change
Main Creek Alluvium				
NPZ101	x	x	✓ (Q1, Q2, Q3)	x
NPZ105	Insufficient water to sample			
NPZ107S	✓ (Q1, Q2)	x	✓ (Q1, Q2, Q4)	✓ (Q1, Q2, Q4)
NPZ108S	x	x	✓ (Q1, Q2, Q3,Q4)	✓ (Q1, Q2,Q3,Q4)

7.4.3 Groundwater Take

The approved site activities include the direct interception of groundwater from the Permian coal measures, as well as direct and indirect interception of groundwater from alluvium. The alluvium falls under the Hunter Unregulated and Alluvial Water Source Water Sharing Plan, while groundwater in the Permian coal measures is under the North Coast Fractured and Porous Rock Groundwater Source. Mining was active within MTO North Pit and Glendell Barrett Pit.

Drawdown in the Permian coal measures is observed. Over the reporting period, the local area also experienced above average rainfall that had the potential to influence inflows to active mining areas.

7.4.4 Continuous Improvement

In 2022, site conducted a review of the Groundwater Monitoring network. The findings of this survey will assist the site to target areas that require improvement.

8. Rehabilitation

During the reporting period MGO submitted one amendment to the titled Mt. Owen Glendell Operations Mining Operations Plan Amendment C Report No. 630.301641 for the period January to 30 June 2024 Plan to Resources Regulator for approval. The revised MOP (will be referred to as RMP henceforth) included updated text and plans to reflect current, mining operations and rehabilitation. In 2022, rehabilitation at MGO was carried out generally in accordance with:

- MGO MOP/ Rehabilitation Management Plan
- MGO Biodiversity and Offset Strategy
- MGO Rehabilitation Strategy

Rehabilitation is designed to achieve a stable final landform compatible with the surrounding environment and to meet the landform commitments presented in the Rehabilitation Management Plan – Forward Program as well as the Rehabilitation Strategy.

Table 54 provides a summary of rehabilitation activities at MGO for 2021 and 2022 and the rehabilitation forecast to be undertaken in 2023. All values presented are in hectares.

Table 54: MGO Rehabilitation Summary.

Mine Area Type	Previous Reporting Period (2021)	This Reporting Period – Actual (2022)	Next Reporting Period – Forecast (2023)*
Total Mine Footprint	3,053.1	3,067.3	3077.3
Total Active Disturbance	1,511.48	1,525.68	1,604.2
Land being prepared for rehabilitation	0	0	0
Land under active rehabilitation	1,634.3	1,665.72	1,752

* This forecast may change to align with the most recent RMP-Forward program.

8.1 Glendell

GLD completed 8.1 ha of rehabilitation during 2022 all of which was open woodland areas. In woodland areas, GLD continued to use a species mix which incorporates several shrub and understorey species, characteristic of the Central Hunter Ironbark-Spotted Gum-Grey Box Forest. GLD including improvements to the rehabilitation process, deep ripping directly prior to seeding. This change in the rehabilitation process provides a rougher surface finish improving infiltration, limiting surface runoff, and therefore reducing any potential erosion issues.

8.2 MTO

MTO rehabilitated 23.32 ha of open forest rehabilitation. Rehabilitation methodology remains largely unchanged at MTO with past success an indicator that processes are suitable for the conditions. Focus is placed on the use of direct place topsoil from pre-strip areas and the majority of 2022 rehabilitation was able to utilise this resource. The rest of the area was rehabilitated using subsoil with the addition of gypsum to counter any soil dispersion. Natural landform design continued to be incorporated into the rehabilitation process during 2022, with ha completed on the North Pit rehabilitation area.

8.3 Rehabilitation Monitoring

The objective of rehabilitation monitoring is to assess the progression of rehabilitation areas towards relevant criteria and commitments and to facilitate continuous improvements in rehabilitation practices.

Commencing in 2020, GCAA implemented across its NSW operations common templates for rehabilitation monitoring, performance indicators and completion criteria. This standardised approach adopts monitoring according based on the establishment age of the rehabilitation areas. These are defined by two distinct groups known as Initial Establishment Monitoring (IEM) and Long-Term Monitoring (LTM).

Initial Establishment Monitoring focuses on rehabilitation which is 1 to 3 years of age since establishment. Monitoring of these areas evaluates native species germination success, landform stability and early identification of problematic weeds.

Long Term Monitoring focuses of rehabilitation which is 4 years or greater in age since establishment and evaluates and tracks progress towards completion criteria using detailed scientific monitoring methods.

The 2022 monitoring program included a combination of:

- High resolution imagery – identification of mapping areas of recalcitrant bare ground >1,000m² in size;
- Walkover inspection – high level assessment of rehabilitation condition and ground-truthing the findings of remote sensing; and
- Long term monitoring – plot/transect based monitoring collecting scientific data and trends on vegetation community establishment.

The 2022 monitoring campaign included the assessment of 59 rehabilitation blocks covering a cumulative area of ~375.5 ha, comprising of 12 IEM blocks and 8 LTM blocks for areas being returned to Open Grassland, Corridors/Shelter Belts and Open Woodland/ Forest. In addition, one native reference site was also monitoring in 2022 under the GCAA reference site sharing program. The monitoring program is designed to assess all rehabilitation block areas at least once every three years. As this monitoring methodology was introduced in 2022 data presented here presents the current trends for the blocks monitored, over the next several years all blocks will be monitored under this methodology which will then allow for more direct comparison of trends over time. *Table 55* rehabilitation performance categories are based on field assessments, observations and criteria to determine the status of rehabilitation. *Table 56* provides details of the rehabilitation blocks monitored in 2022 and *Figure 22* shows the locations.

Performance against key rehabilitation metrics was assessed for each rehabilitation polygon. A summary of this data is presented in *Table 56*. Each polygon is assigned one of four performance rankings as per the criteria below.

Table 55: Rehabilitation Performance Categories.

Category	Criteria
Rework	<ul style="list-style-type: none"> • Does not meet completion criteria.

Category	Criteria
	<ul style="list-style-type: none"> Extensive rework required that would not typically form part of a rehabilitation maintenance program; e.g. slopes do not comply with approval requirements, large bare areas >0.1ha, very severe and widespread erosion, etc. TARP condition red
Maintenance	<ul style="list-style-type: none"> Does not meet completion criteria. Routine rehabilitation maintenance works required (e.g. weed control, infill seeding/plantings, repair of minor erosion, fertiliser application). TARP Condition Amber
Monitor	<ul style="list-style-type: none"> Trajecting towards completion criteria but does not meet all criteria. No intervention required other than ongoing routine land management, but continued monitoring required (e.g. ecologically young areas, variable results). TARP Condition Green.
Acceptable	<ul style="list-style-type: none"> Rehabilitation objectives and completion criteria are generally met and the area is ready for sign off by regulators. Routine management and monitoring should be continued to maintain status until relinquishment process is sought. TARP Condition Green.

Table 56: 2022 Rehabilitation Monitoring Scope of Works.

Type	Mine Site	Mining Area	Block Code	Domain	Area (ha)	Sites	2022 Performance Condition Status
IEM	Rav East	Bayswater North	RAV-GBIW-2020-1	2020	4.6	2	Maintenance
IEM	Rav East	Bayswater North	RAV-GBIW-2020-2	2020	5.4	2	Maintenance
IEM	MTO	North Pit	MTO-SGIGBF-2020	2020	14.9	3	Maintenance
IEM	Rav East	Bayswater North	RAV-GBIW-2019	2019	12.9	3	Maintenance
IEM	MTO	North Pit	MTO-SGIGBF-2019	2019	27.8	4	Maintenance
LTM	Rav East	Bayswater North	RAV-GBIW-2017-2	2017	4.4	2	Maintenance
LTM	MTO	WOOP Dump	WOOP-GBIW-2015	2015	15.9	3	Maintenance
LTM	MTO	WOOP Dump	WOOP-GBIW-2013	2013	28.2	4	Maintenance
LTM	MTO	North Pit	MTO-SGIGBF-B6	2014-2018	11.5	3	Maintenance
LTM	MTO	North Pit	MTO-SGIGBF-B7	1998-2009	65.7	7	Maintenance

Mt Owen Glendell Operations

2022 Annual Review

Type	Mine Site	Mining Area	Block Code	Domain	Area (ha)	Sites	2022 Performance Condition Status
IEM	Glendell	Barrett Pit	BAR-NSNV-2021	2021	27.9	0	Maintenance
IEM	Glendell	Barrett Pit	BAR-NSNV-2020	2020	11.3	3	Maintenance
IEM	Glendell	Barrett Pit	BAR-NSNV-2019	2019	33.7	4	Maintenance
IEM	Rav East	North Void	NV-NSNV-2019	2019	22.0	4	Maintenance
IEM	Rav East	Bayswater North	RAV-PAS-2020	2020	37.7	IEM	Maintenance
IEM	Rav East	North Void	NV-PAS-2020	2020	3.8	IEM	Maintenance
IEM	Glendell	Barrett Pit	BAR-PAS-2019	2019	2.4	IEM	Monitor
LTM	Rav East	North Void	NV-PAS-2016	2016	5.5	LTM	Acceptable
LTM	Glendell	Barrett Pit	BAR-PAS-B2	2009-2015	40.0	LTM	Maintenance
LTM	MGO	South-East Offset	n/a	n/a	n/a	LTM	
Total					375.5	47	

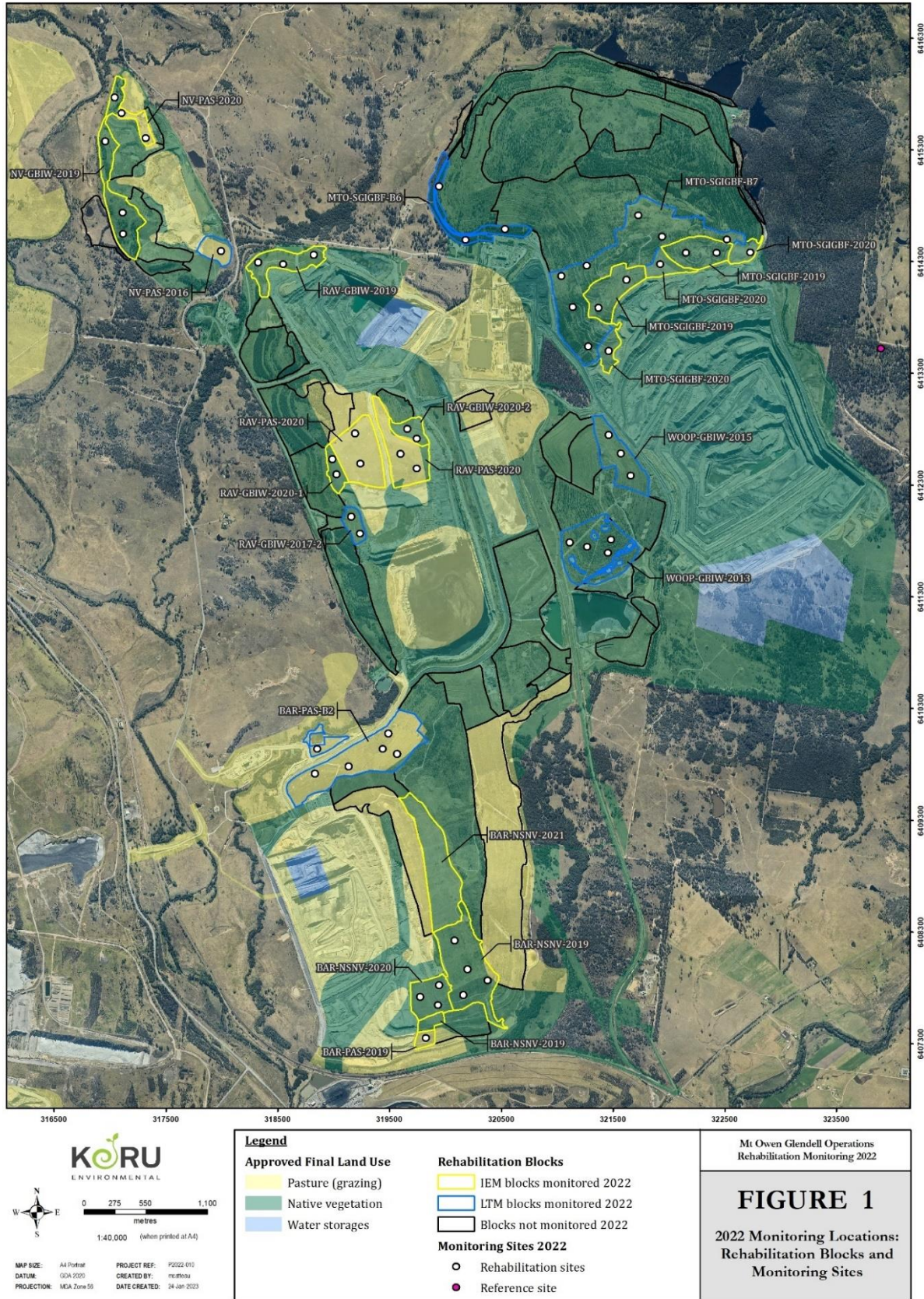


Figure 22: 2022 Monitoring Locations – Rehabilitation Blocks and Monitoring Sites

8.4 Results

8.4.1 Long-term Monitoring

Based on the observations and results from the 2022 walkover inspection and transect-based monitoring an assessment of rehabilitation progress against the relevant MOP (including TARP) and Rehabilitation Strategy criteria is provided in *Table 57* for the LTM Open Grassland block. BAR-PAS-B2.

Table 57: 2022 Rehabilitation Progress Summary – Open Grassland Rehabilitation LTM Block.

Monitoring Block	NV-PAS-2016		BAR-PAS-B2	
	Compliant	TARP	Compliant	TARP
Slopes generally <14 degrees (Glendell)	Yes	Acceptable	Yes	Acceptable
No drainage issues threatening to cause rehabilitation failure	Yes	Acceptable	Yes	Acceptable
Land capability classification criteria met	Yes	Acceptable	Yes	Acceptable
No large bare patches indicating poor soil/spoil quality	Yes	Acceptable	Yes	Acceptable
No evidence of spontaneous combustion	Yes	Acceptable	Yes	Acceptable
No gully or tunnel erosion features, or rill erosion >200mm deep	Yes	Acceptable	Yes	Acceptable
Protective ground cover is at least 80%	Yes	Acceptable	Yes	Acceptable
Weed presence does not present a risk to the intended land use	No	Acceptable	No	Maintenance
Pasture establishment is in good health and provides adequate cover	Yes	Acceptable	Yes	Acceptable
>75% of herbage cover provided by grasses and legumes suitable for grazing	Yes	Acceptable	No	Maintenance
Pasture production is comparable to similarly managed pastures	Yes	Acceptable	Yes	Acceptable

8.4.2 Corridors/Shelter Belts

Blocks of Corridors/Shelter Belts rehabilitation at the LTM stage were not monitored during the 2022 monitoring campaign.

Targeted Native Vegetation

- RAV-GBIW-2017-2
- WOOP-GBIW-2015

- WOOP-GBIW-2013
- MTO-SGIGBF-B6
- MTO-SGIGBF-B7

Results of natural regeneration across both sites highlighted an overall good potential for the established communities to be self-sustainable.

Based on observations and results from the 2022 walkover inspection and transect-based monitoring an assessment of rehabilitation progress against the relevant criteria in the RMP and Rehabilitation Strategy (and associated TARP triggers is presented in *Table 58*.

Table 58: 2022 Rehabilitation Progress Summary – Open Woodland (CHGBW) LTM Blocks

Monitoring Block / Rehabilitation Strategy Criteria	RAV-GBIW-2017-2		WOOP-GBIW-2015		WOOP-GBIW-2013	
	Compliant	TARP	Compliant	TARP	Compliant	TARP
Slopes generally <10 degrees (MTO/Rav East)	Yes	Acceptable	Yes	Acceptable	Yes	Acceptable
Overburden emplacements include informal undulations	No	n/a	Yes	n/a	No	n/a
Artificial habitat features incorporated in the landform at suitable densities	no	n/a	no	n/a	no	n/a
Landforms are free draining to local watercourses	Yes	Acceptable	Yes	Acceptable	Yes	Acceptable
No evidence of slumping or uncontrolled erosion causing a safety issue	Yes	Acceptable	Yes	Acceptable	Yes	Acceptable
No drainage issues threatening to cause potential rehabilitation failure	Yes	Acceptable	Yes	Maintenance	Yes	Acceptable
No gully or tunnel erosion features, or rill erosion >200mm deep	Yes	Acceptable	Yes	Acceptable	Yes	Acceptable

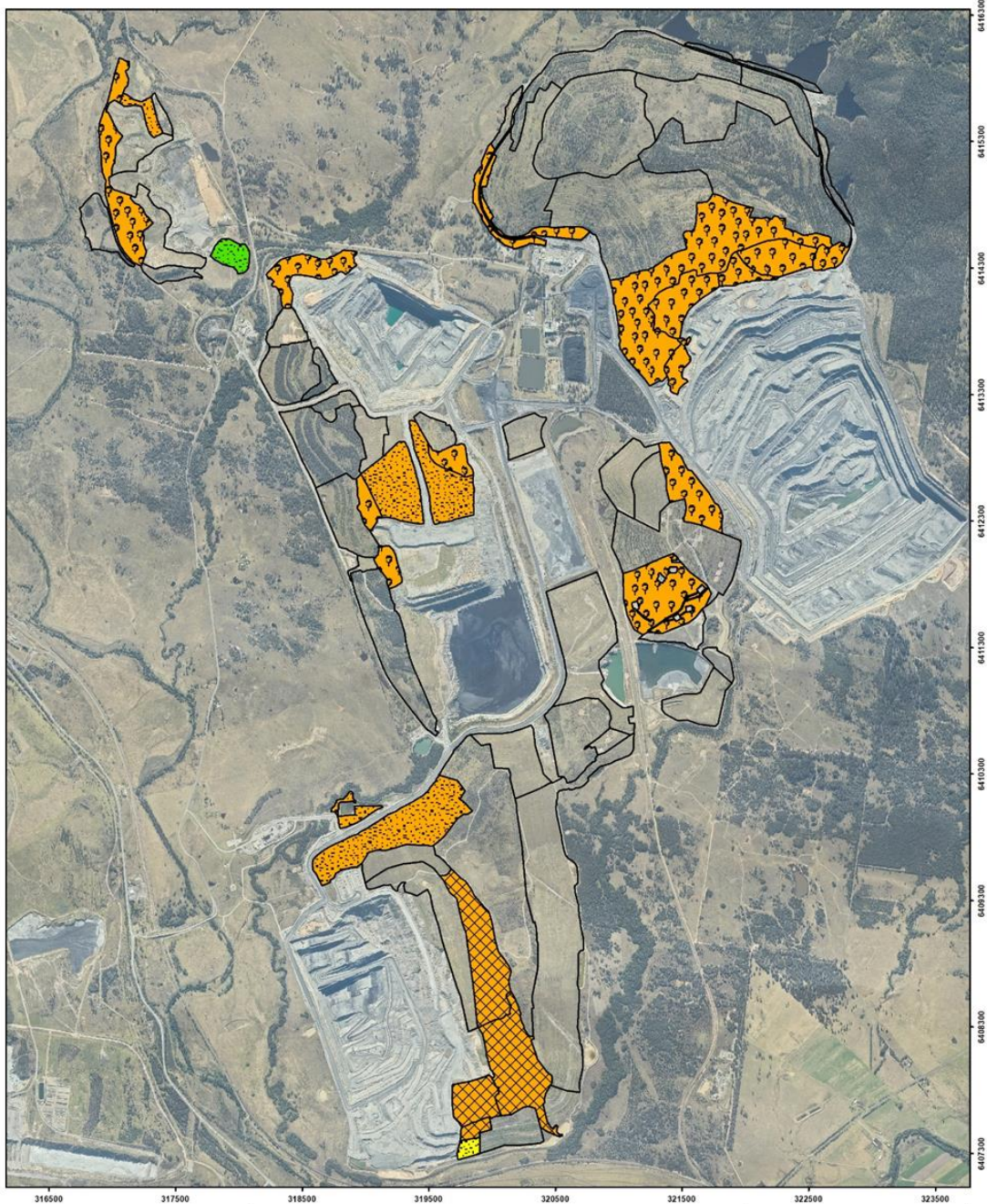
Monitoring Block	RAV-GBIW-2017-2		WOOP-GBIW-2015		WOOP-GBIW-2013	
No large bare patches (>400 m ²) indicating poor soil/spoil quality	Yes	Acceptable	Yes	Acceptable	Yes	Acceptable
No evidence of spontaneous combustion	Yes	Acceptable	Yes	Acceptable	Yes	Acceptable
Soil pH in the range of reference sites	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed
The rehabilitation surface is a suitable growing medium (as evidenced by vegetation establishment)	Yes	Acceptable	Yes	Acceptable	Yes	Acceptable
Protective ground cover is at least 70%	Yes	Acceptable	Yes	Acceptable	Yes	Acceptable
Cover of priority weeds is within range of reference sites	No	Rework	No	Rework		Rework
No significant weed infestations within the Blocks	No	Rework	No	Rework	No	Rework
Evidence of nutrient cycling processes (litter cover) within benchmarks	Yes	Acceptable	Yes	Acceptable	Yes	Acceptable
Native tree diversity >75% of reference sites or published community benchmarks	Yes	Acceptable	Yes	Acceptable	Yes	Acceptable
Native shrub diversity >75% of reference sites or published	Yes	Acceptable	Yes	Acceptable	No	Rework

Monitoring Block	RAV-GBIW-2017-2		WOOP-GBIW-2015		WOOP-GBIW-2013	
community benchmarks						
Native ground cover diversity >75% of reference sites or published community benchmarks	No	Rework	No	Rework	No	Rework
≥50% of native trees are representative of target community	Yes	Acceptable	Yes	Acceptable	Yes	Acceptable
Tree FPC characteristic or trending towards target community	No	n/a	No	n/a	Trending	n/a
Shrub FPC characteristic or trending towards target community	Yes	n/a	Yes	n/a	No	n/a
Ground cover FPC characteristic or trending towards target community	Yes	n/a	Yes	n/a	Yes	n/a
>75 percent of trees are healthy and growing	Yes	n/a	Yes	n/a	Yes	n/a
Evidence of flowering, seeds for trees and shrubs	No	n/a	Yes	n/a	Yes	n/a
At least one second-generation seedling present per plot	No	n/a	Yes	n/a	Yes	n/a
Rehabilitation provides a range of structural features (e.g. trees, shrubs, ground cover, litter layer, etc.)	No	Rework	Partially	Maintenance	Partially	Maintenance

Monitoring Block	MTO-SGIGBF-B6		MTO-SGIGBF-B7	
	Compliant	TARP	Compliant	TARP
Slopes generally <10 degrees (MTO/Rav East)	Yes	Acceptable	Yes	Acceptable
Overburden emplacements include informal undulations	No	n/a	Yes	n/a
Artificial habitat features incorporated in the landform at suitable densities	Yes	Acceptable	Yes	Acceptable
Landforms are free draining to local watercourses	Yes	Acceptable	Yes	Acceptable
No evidence of slumping or uncontrolled erosion causing a safety issue	Yes	Acceptable	Yes	Acceptable
No drainage issues threatening to cause potential rehabilitation failure	Yes	Acceptable	Yes	Acceptable
No gully or tunnel erosion features, or rill erosion >200mm deep	Yes	Acceptable	No	Maintenance
No large bare patches (>400 m ²) indicating poor soil/spoil quality	Yes	Acceptable	Yes	Acceptable
No evidence of spontaneous combustion	Yes	Acceptable	Yes	Acceptable
Soil pH in the range of reference sites	Not Assessed	Not Assessed	Not Assessed	Not Assessed
The rehabilitation surface is a suitable growing medium (as evidenced by vegetation establishment)	Yes	Acceptable	Yes	Acceptable
Protective ground cover is at least 70%	Yes	Acceptable	Yes	Acceptable

Monitoring Block	MTO-SGIGBF-B6		MTO-SGIGBF-B7	
Cover of priority weeds is within range of reference sites	No	Rework	Yes	Acceptable
No significant weed infestations within the Blocks	No	Rework	No	Maintenance
Evidence of nutrient cycling processes (litter cover) within benchmarks	Yes	Acceptable	Yes	Acceptable
Native tree diversity >75% of reference sites or published community benchmarks	Yes	Acceptable	Yes	Acceptable
Native shrub diversity >75% of reference sites or published community benchmarks	Yes	Acceptable	Yes	Acceptable
Native ground cover diversity >75% of reference sites or published community benchmarks	Yes	Acceptable	No	Maintenance
≥50% of native trees are representative of target community	Yes	Acceptable	Yes	Acceptable
Tree FPC characteristic or trending towards target community	Yes	n/a	Trending	n/a
Shrub FPC characteristic or trending towards target community	Yes	n/a	Yes	n/a
Ground cover FPC characteristic or trending towards target community	Yes	n/a	Yes	n/a
>75 percent of trees are healthy and growing	Yes	n/a	Yes	n/a
Evidence of flowering, seeds for trees and shrubs	Yes	n/a	Yes	n/a
At least one second-generation seedling present per plot	Yes	n/a	Yes	n/a

Monitoring Block	MTO-SGIGBF-B6		MTO-SGIGBF-B7	
Rehabilitation provides a range of structural features (e.g. trees, shrubs, ground cover, litter layer, etc.)	Yes	Acceptable	Yes	Acceptable



KORU
ENVIRONMENTAL

MAP SIZE: A4 Portrait
DATUM: GDA 2020
PROJECTION: MCA Zone 58

PROJECT REF: P5022-010
CREATED BY: mc@koru
DATE CREATED: 24 Jan 2023

0 262.5 525 1,050 metres
1:37,703 (when printed at A4)

Legend

Approved Final Land Use

- Grazing pasture
- Non-specific native vegetation
- Targeted native vegetation

Overall Performance Status 2022

- Acceptable
- Monitor
- Maintenance
- Blocks not monitored 2022

Mt Owen Glendell Operations
Rehabilitation Monitoring 2022

FIGURE 3
2022 Overall
Performance
Condition Summary

Figure 23: Summary of Rehabilitation Performance for 2022 Monitoring

In areas currently showing an unsatisfactory performance in 2022, it was identified that the key issues and factors impeding the successful establishment of stable and self-sustaining vegetation communities include:

- erosion
- weed incursion
- Habitat corridors

Rehabilitation across MGO was generally stable and no critical erosion features were identified. One block located in North Void requires rework to remediate gully erosion.

Weed incursion has been identified as the main issue for rehabilitation impacts at MGO. The main species of concern at the time of the 2022 monitoring included Galenia (*G. pubescens*), Golden Wreath Wattle (*A. saligna*) and exotic grasses. The management of these species is ongoing using a targeted approach based on annual monitoring recommendations.

The results from the 2022 monitoring also identified the requirement in some areas for increases and decreases in existing stem densities. Species composition and assemblages characteristic of target communities were variable between and among some sites.

The management of these requirements is also ongoing and targeted based on the outcomes of annual monitoring recommendations so that improvement trends can be monitored overtime.

While there are only a few localised issues with rehabilitation performance identified across the site (which in most cases could be successfully controlled/ treated in the next reporting period), established rehabilitation at MGO generally showed good performance in 2022 following improved rainfall conditions compared to the drought conditions of the previous several years. Going forward, the continued monitoring of rehabilitation performance will allow MGO to build a robust database of relevant and scientific data. This dataset will allow an accurate and reliable assessment of rehabilitation performance to be made against regulatory requirements and assist in presenting a strong case for successful land relinquishment in the future.

8.5 Rehabilitation Activities for the next Reporting Period

Rehabilitation at MGO is undertaken progressively over the life of the mine, with overburden emplacements and backfilled pits shaped and rehabilitated once dumping is complete. Approximately 1,752 ha of disturbed land has been rehabilitated at MGO.

Ongoing rehabilitation activities at MGO will continue. A new forward program is to be submitted to the NSW Resources Regulator in Q1 2023. MGO's rehabilitation target for 2023 will align with the rehabilitation targets detailed in the Forward Program 2023.

9. Community

9.1 Community Engagement and Activities 2022

During the reporting period, informal discussions continued with local landowners, regulatory authorities and other stakeholders on the status of operational activities within MGO.

MGO implemented the community engagement program, consisting of:

- One-on-one meetings with:
 - community neighbours
 - regulators
 - non-governmental organisations
- Distribution of Community Newsletters
- Community Consultative Committee (CCC) meetings.
- Informal community gatherings
- Topics of discussion included:
 - Progress of development applications
 - Progress of MOP / RMP
 - Current operational environmental performance
 - Environmental monitoring results
 - Rehabilitation progress.
 - Pest and weed control
 - Aboriginal and Cultural heritage matters.

Details of community engagement activities undertaken at MGO during 2022 are outlined in *Table 59*.

Table 59: Community Engagement Activities for 2022

Date	Community Group	Community Activity	Topics Covered
12 May 2022	CCC	Community Consultative Committee Meeting	General overview of MGO operations, environmental performance, approvals update, exploration activities update and Integra Mine update.
31 March 2022	Hebden hall Community	Coffee and a Chat	General overview of MGO operations and environmental performance.
31 May 2022	Middle Falbrook Community	Coffee and a Chat	General overview of MGO operations and environmental performance.

Date	Community Group	Community Activity	Topics Covered
11 November 2022	CCC	Community Consultative Committee Meeting	General overview of MGO operations, environmental performance, approvals update, exploration activities update and Integra Mine update.

MGO organised community coffee events at Hebden Hall and Middle Falbrook for the residents of the Goorangoola, Falbrook, and Hebden areas, as well as the CCC representatives. These events provided an opportunity to discuss topics such as environmental performance, rehabilitation, projects and approvals.

9.2 Community Contributions

Table 60 summarises the community contributions made by MGO during 2022.

Table 60: MGO Community Contributions 2022

Organisation	Reason for Contribution	Amount
Singleton PCYC	Friday Afternoon Fun	\$5,250
Singleton Neighbourhood Centre Inc	Acrylic Art Course	\$2,400
Mt Pleasant Public-School P&C Association	Communication booster	\$2,000
Singleton Neighbourhood Centre Inc	All about You Course	\$1,565
Mt Pleasant Public-School P&C Association	Intensive Swimming Program	\$2,750
NSW State Emergency Service Singleton Unit	Battery tools	\$3,900
Business Singleton	International Woman Day Luncheon	\$5,000
Samaritans Foundation Diocese of Newcastle	Samaritans Christmas Lunch - Singleton	\$3,085.00
Singleton Fire Station	Singleton Lolly Run	\$2,000
Singleton Family	Support Scheme	\$4,343
Whittingham Public Hall	Fridges	\$4,579
Rural Fire Brigade (Glennies Ck, Darlington)	Marquee's	\$5,620.45
Darlington RFS	Workshop improvement	\$3,450
Total		~\$46,000

9.3 Summary of MGO Community Complaints

MTO received 4 community complaints during 2022:

- One for Noise
- Two for Air quality
- One for Blasting Vibrations

Glendell Mine received a total of 1 community complaints during 2022 for noise.

MGO responded and investigated to all complaints received during 2022. All complaints are contained within the Community Complaints Register which is available on the Glencore website: <https://www.glencore.com.au/>.

Further information can be found in *Appendix H*.

9.4 Complaint Trends and Actions

In 2022 MTO received 4 community complaint, compared to 1 received in 2021 and Glendell mine received one community complaints in 2022, a decrease from 2021 (see *Figure 24*).

Each complaint is investigated individually for compliance.

During 2022, noise and air quality related complaints made up the majority. However, complaints often aligned with unsuitable meteorological conditions such as temperature inversions. Temperature inversions are monitored across MGO daily to reduce these impacts. Furthermore, MGO operates a real time noise monitoring system (with alarms) to assist mining Supervisors in adjusting operations, which ultimately reduces noise during periods of increased risk.

Air Quality across MGO is continually monitored through a system of meteorological predictions, modelling and reactive alarming systems. As operations progress, these systems are reviewed and revised to ensure air quality is appropriately managed.

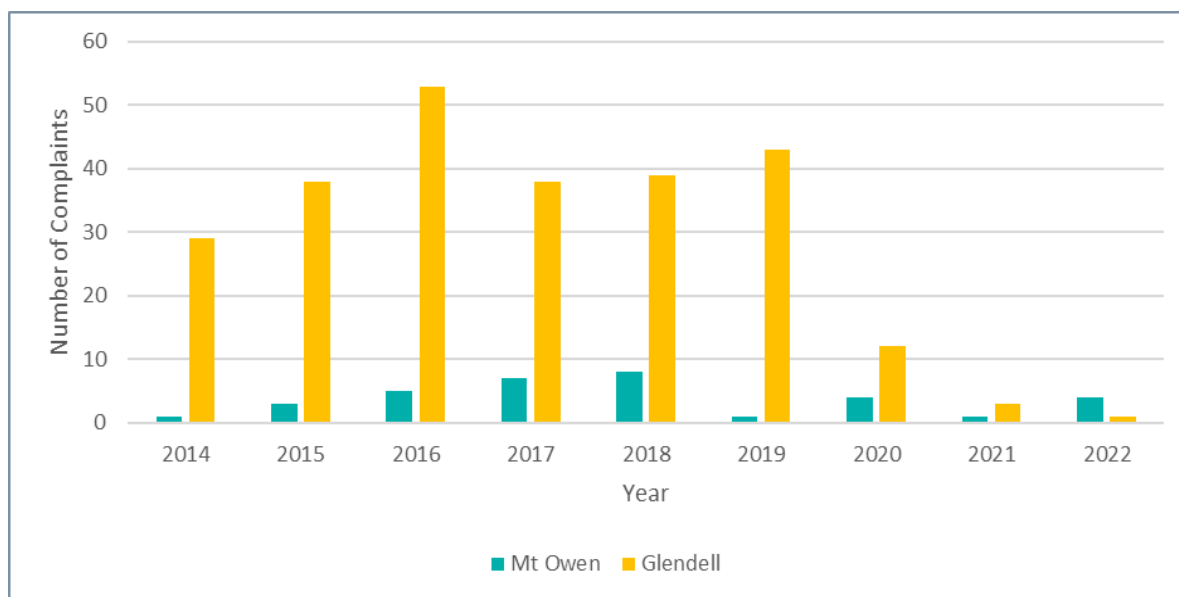


Figure 24: Comparison of Complaints Received at MTO and Glendell from 2014 to 2022

10. Incidents and Non-Compliances

MGO reported two (1) non-compliance during 2022, as detailed in *Table 61*.

Table 61: Non-Compliance Reported in 2022

Agency	Approval	Description	Follow up/ Action taken
DPE	Schedule 3 Conditions 27 and 29 of SSD-5850 and Schedule 3 Condition 36A of DA 80/952	MGO did not secure Biodiversity offsets and credits by the due date: The Applicant must implement the Biodiversity Offset Strategy described in the EIS, The Applicant must make suitable arrangements for the long-term protection of the areas identified in Table 9, to the satisfaction of the Secretary (SSD5850). These arrangements must be implemented by: (a) the end of June 2018, unless the Secretary agrees otherwise, for all on-site and off-site offsets excluding the Rehabilitation Woodland offset area (DA80/932)	On 31 August 2022, Mt Owen Glendell Operations (MGO) requested from the department an extension of time to comply with these conditions and that, in considering this request, the department requested that MGO consult further with the Credit Supply Taskforce (CST) on the proposed timeframe for securing the relevant properties. Since MGO has been liaising with CST to progress BOAs and BSAs applications. For example, CST inspected Belford and Bulga Offsets in November and December 2022. MGO is liaising with CST to progress Esparanga Offset.

11. Independent Environmental audit

An independent environmental audit (IEA) is required for MGO every three years and was conducted by Jacobs during December 2020. The audit covered the period 31 October 2017 to 2 December 2020, and consisted of a desktop review of documentation, interviews with key MGO personnel, and a field inspection.

The IEA was conducted generally in accordance with the State Significant Developments Independent Audit Guideline, October 2015 (DPE), ISO 14001:2015 Environmental management systems and ISO 19011:2018 Guidelines for auditing management systems and was submitted to DPE in February 2021.

The audit identified seven non-compliance recommendations. All seven issues were classified as administrative in nature and no 'high-risk' non-compliances were identified.

All actions relating to the audit recommendations are now complete.

The 2020 IEA report and MGO response to audit recommendations are located on the MGO website:

<https://www.mtowencomplex.com.au/en/Pages/home.aspx>.

12. Activities to Improve Environmental Management in 2023

Further investigations into MGO's groundwater network to ascertain what bores are relevant, what bores may need to be removed, and the addition of bores to better monitor groundwater.

GLENCORE