

# METROPOLITAN COAL


## 2023 ANNUAL REVIEW



METROPOLITAN COAL

2023 ANNUAL REVIEW

Project No. MET-24-36  
Document No. 01225142

|   |   |
|---|---|
| <b>Name of Operation</b>  | Metropolitan Coal   |
| <b>Name of Operator</b>   | Peabody Energy Australia Pty Ltd  |
| <b>Project Approval</b>   | Project Approval 08_0149  |
| <b>Name of Holder of Project Approval</b>   | Metropolitan Collieries Pty Ltd   |
| <b>Mining Leases</b>  | Consolidated Coal Lease 703<br>Mining Lease 1610<br>Mining Lease 1702<br>Mining Purpose Lease 320<br>Coal Lease 379<br>Exploration Licence 9364 |
| <b>Name of Holder of Mining Leases</b>  | Metropolitan Collieries Pty Ltd   |
| <b>Water Licence</b>  | Water Access Licence – WAL25410<br>Bore Licence Certificate – 10BL603595  |
| <b>Name of Holder of Water Licence</b>  | Metropolitan Collieries Pty Ltd   |
| <b>Annual Review Start Date</b>   | 1 January 2023  |
| <b>Annual Review End Date</b>   | 31 December 2023  |
| <p>I, James Hannigan, certify that to the best of my knowledge and belief that this Annual Review is a true and accurate record of the compliance status of Metropolitan Coal for the period 1 January to 31 December 2023 and that I am authorised to make this statement on behalf of Peabody Energy Australia Pty Ltd.</p> |   |
| <b>Name of Authorised Reporting Officer</b>   | James Hannigan  |
| <b>Title of Authorised Reporting Officer</b>  | General Manager   |
| <b>Signature of Authorised Reporting Officer</b>  |   |
| <b>Date</b>   | Version 1: 28/03/2024<br>Version 2: 30/08/2024  |

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## 1 STATEMENT OF COMPLIANCE

The compliance status of the Metropolitan Coal Mine with its relevant approval conditions at the end of the review period (31 December 2023) is provided in Table 1.

**Table 1**  
**Statement of Compliance**

| Were all conditions of the relevant approval(s) complied with? |                        |
|--|------------------------|
| Project Approval 08_0149                                       | No, Refer to Table 2.  |
| Development Consent D90/832                                    | Yes                    |
| Consolidated Coal Lease 703                                    | Yes                    |
| Mining Lease 1610  | Yes                    |
| Mining Lease 1702  | Yes                    |
| Coal Lease 379   | Yes                    |
| Mining Purpose Lease 320                                       | Yes                    |
| Exploration Licence 9364                                       | Yes                    |
| Environment Protection Licence No. 767                         | No, Refer to Table 2*. |

Table 2 summarises the non-compliances with the approval conditions.

**Table 2**  
**Summary of Non-Compliances**

| Relevant Approval                      | Condition Number         | Condition Description  | Comment   | Report Section |
|--|--------------------------|--|---|----------------|
| Project Approval 08_0149               | Condition 1, Schedule 3  | Subsidence Impact Performance Measures (Table 1 of Project Approval) | Exceedance of the Eastern Tributary watercourse subsidence impact performance measure in relation to iron staining and pool flow/drainage behaviour downstream of the Longwall 26 maingate. | 6.2 and 13.1   |
| Environment Protection Licence No. 767 | Condition O2.1           | Pollution of waters  | The EPA is currently investigating whether there has been a non-compliance with EPL 767 associated with a landslip incident in August 2023,   | 13.2           |
| Project Approval 08_0149               | Condition 14, Schedule 4 | Discharges   | The EPA is currently investigating whether there has been a non-compliance with EPL 767 associated with a landslip incident in August 2023,   | 13.2           |

## 2 INTRODUCTION

The Metropolitan Colliery (Metropolitan Coal Mine) is owned and operated by Metropolitan Collieries Pty Ltd (Metropolitan Coal), which is a wholly owned subsidiary of Peabody Energy Australia Pty Ltd (Peabody), and is located adjacent to the township of Helensburgh and approximately 30 kilometres (km) north of Wollongong in New South Wales (NSW) (Figure 1). Metropolitan Coal is located within Consolidated Coal Lease (CCL) 703, Mining Lease (ML) 1610 and ML 1702. Metropolitan Coal is one of the earliest established and longest continually running coal mining operations in Australia, with a history dating back to the 1880s.

Metropolitan Coal was granted approval for the Metropolitan Coal Project (the Project) by the Minister for Planning under section 75J of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) on 22 June 2009. A copy of the Project Approval (08\_0149) is available on the Peabody website (<http://www.peabodyenergy.com>). The Project comprises the continuation, upgrade and extension of underground coal mining operations and surface facilities at Metropolitan Coal. The underground mining longwall layout is shown on Figure 1. The extent of the mine's surface facilities area is shown on Figure 2.

The surface facilities include administration buildings, workshops, bath houses, ablution facilities, haul roads, access roads, fuel and consumables storages, hardstand areas, a coal handling and preparation plant (CHPP), stockpiles (including run-of-mine [ROM] coal, product coal and coal reject stockpiles), underground coal reject emplacement plant and associated coal handling infrastructure (e.g. conveyors, transfer points and buffer bins).

Coal extracted from the underground mining operations is transferred by conveyor to the surface facilities area. ROM coal is crushed, screened and washed at the CHPP. The majority of product coal is transported by train to the Port Kembla Coal Terminal (PKCT) (in Wollongong) for domestic and overseas customers. CHPP coal reject material is transported by rail and truck to the PKCT, placed in unused workings, or transported to offsite locations for beneficial reuse.

The Environmental Management Structure of the Project is shown on Figure 3. It includes the Metropolitan Coal Environmental Management Strategy, developed to provide the strategic context for environmental management at Metropolitan Coal, and management plans and monitoring programs applicable to the underground mining area or mine's surface facilities area.

Metropolitan Coal submitted the Longwalls 308-310 Extraction Plan to the then Department of Planning and Environment (DPE) (now Department of Planning, Housing and Infrastructure [DPHI]) in February 2022. The Longwalls 308-310 Extraction Plan includes post-mining monitoring and management of potential subsidence impacts and environmental consequences, subject to the previously approved Metropolitan Coal Extraction Plans for Longwalls 20-22, 23-27, 301-303, 304 and 305-307. The DPE approved the Longwalls 308-310 Extraction Plan on 12 December 2022 and mining of Longwall 308 commenced on 12 December 2022. Under this Annual Review, environmental performance for the period 1 January 2023 to 31 December 2023 is reported against the Longwalls 308-310 Extraction Plan.

### 2.1 PURPOSE AND SCOPE

Metropolitan Coal's environmental reporting requirements include an Annual Review, which is to be prepared in accordance with Condition 3, Schedule 7 of the Project Approval, an Annual Environmental Management Report, to be prepared in accordance with CCL 703, and an Annual Rehabilitation Report, to be prepared in accordance with ML 1610, ML 1702, MPL 320 and Coal Lease (CL) 379.

The Metropolitan Coal 2023 Annual Review has been prepared to meet the above reporting requirements and to review the environmental performance of the Project during the review period (i.e. 1 January to 31 December 2023), consistent with the NSW Government (2015) *Annual Review Guideline for State Significant Mining Developments*.

## 2.2 MINE CONTACTS

Contact details for key Metropolitan Coal employees are provided below:

|   |  |   |
|---|--|---|
| James Hannigan<br>General Manager<br>Telephone: (02) 4294 7234<br>Email:<br>jhannigan@peabodyenergy.com | Jon Degotardi<br>Manager, Project Approvals<br>Telephone: (02) 4294 7233<br>Email:<br>jdegotardi@peabodyenergy.com | Stephen Love<br>Environment & Community<br>Superintendent<br>Telephone: (02) 4294 7384<br>Email:<br>slope@peabodyenergy.com |
|---|--|---|

The street and postal address for Metropolitan Coal is provided below:

### Street Address

Parkes Street  
HELENSBURGH NSW 2508

### Postal Address

PO Box 402  
HELENSBURGH NSW 2508

### 3 APPROVALS

Metropolitan Coal operates under a number of statutory approvals, leases and licences granted by the NSW Government as outlined in Table 3.

**Table 3**  
**Consent, Lease and Licence Details**

| Consent/Lease/Licence   | Authority          | Grant/Renewal | Expiry Date |
|---|--------------------|---------------|-------------|
| Project Approval 08_0149  | DPHI               | 22/6/2009     | 22/6/2032   |
| Project Approval 08_0149 – Mod 1  | DPHI               | 8/9/2010      | 22/6/2032   |
| Project Approval 08_0149 – Mod 2  | DPHI               | 2/7/2011      | 22/6/2032   |
| Project Approval 08_0149 – Mod 3  | DPHI               | 3/10/2013     | 22/6/2032   |
| Development Consent D90/832   | WCC                | 5/1/1995      | -           |
| Consolidated Coal Lease 703   | MEG                | 27/1/2024     | 26/1/2045   |
| Mining Lease 1610   | MEG                | 19/5/2014     | 18/12/2031  |
| Coal Lease 379  | MEG                | 14/11/2013*   | 4/10/2033   |
| Mining Purpose Lease 320  | MEG                | 16/6/2014     | 9/12/2035   |
| Mining Lease 1702   | MEG                | 13/10/2014    | 13/10/2035  |
| Exploration License 9364  | MEG                | 24/02/2022    | 24/02/2028  |
| Bore Licence Certificate 10BL603595   | NSW DCCEEW - Water | 25/1/2013     | 24/1/2028   |
| Camp Creek Weir Surface Water Certificate of Title  | NSW DCCEEW - Water | 28/11/2012    | -           |
| Environment Protection Licence (EPL) No. 767  | EPA                | 9/9/2002      | -           |
| Radiation Licence – Radiation Management Licence 5063985  | EPA                | 27/9/2023     | 27/9/2024   |
| Licence to Store Explosives and/or Security Sensitive Dangerous Substances – Licence XSTR200082 | SafeWork NSW       | 15/06/2017    | 15/06/2027  |

Note: MEG = NSW Division of Mining, Energy and Geoscience; EPA = NSW Environment Protection Authority; WCC = Wollongong City Council; NSW DCCEEW – Water = NSW Department of Climate Change, Energy, the Environment and Water - Water.

\* Date lease offer was signed.

## 4 OPERATIONS SUMMARY

### 4.1 MINING OPERATIONS

Prior to the review period, the extraction of Longwall 308 commenced on 12 December 2022 and was completed in July 2023. Longwall 309 commenced on 28 July 2023 and continued through the remainder of the review period (Figure 4).

The amount of waste rock/overburden, ROM coal, coal reject and product coal produced in the previous reporting period, current reporting period and forecast for the next reporting period is provided in Table 4.

**Table 4  
Production Summary**

| Material                        | Approval Limit                        | 2022 Reporting Period (Actual) | 2023 Reporting Period (Actual) | 2024 Reporting Period (Forecast) |
|---------------------------------|---------------------------------------|--------------------------------|--------------------------------|----------------------------------|
| Waste Rock/Overburden           | N/A                                   |                                |                                |                                  |
| ROM Coal                        | 3.2 Mt per calendar year <sup>1</sup> | 2,047,404 t                    | 2,527,376 t                    | 2,020,190 t                      |
| Coal Reject <sup>2</sup>        | N/A                                   | 366,575 t <sup>3</sup>         | 485,903 t <sup>4</sup>         | 465,471 t                        |
| Saleable Product <sup>2,5</sup> | 2.8 Mt per calendar year <sup>1</sup> | 1,699,843 t                    | 2,043,937 t                    | 1,537,623 t                      |

N/A = not applicable; Mt = million tonnes; t = tonnes.

<sup>1</sup> Condition 6, Schedule 2 of the Project Approval states:

*The Proponent shall not:*

- (a) *extract more than 3.2 million tonnes of ROM coal from the mining area in a calendar year, or*  
 (b) *transport more than 2.8 million tonnes of product coal from the site in a calendar year.*

<sup>2</sup> Coal rejects and saleable product out of the CHPP.

<sup>3</sup> Of the 366,575 t of coal reject produced in 2022 316,325 t was transported via rail to PKCT and 79,674 t was emplaced underground.

<sup>4</sup> Of the 485,903 t of coal reject produced in 2023 447,470 t was transported via rail to PKCT and 39,792 t was emplaced underground.

<sup>5</sup> Note, there is no Approval limit for saleable product itself. The only Approval limit relating to saleable product is the amount of product coal transported from the site in a calendar year. Note that the quantities presented in Table 4 reflect the saleable product produced by Metropolitan Coal and are therefore not consistent with the quantities dispatched from site that are reported on the Peabody website in the Truck and Rail Register.

### 4.2 OTHER OPERATIONS – METROPOLITAN COAL SURFACE FACILITIES AREA

In addition to the Project Approval limits detailed in Table 4, other relevant operational conditions are described in Table 5 and primarily relate to the Metropolitan Coal surface facilities area.

During the review period, Metropolitan Coal continued the coal reject backfill emplacement project.

**Table 5  
Other Relevant Operational Conditions**

| Operational Condition  |   | Operational Condition Met? | Comment  |
|--|---|----------------------------|--|
| Limits on Approval (Project Approval Conditions 5, 7 and 8, Schedule 2)      | <p>5. <i>The Proponent may undertake mining operations in the mining area for up to 23 years from the date of this approval.</i></p> <p><i>Note: Under this approval, the Proponent is required to rehabilitate the site and perform additional undertakings to the satisfaction of the Director-General. Consequently, this approval will continue to apply in all other respects other than the right to conduct mining operations until the site has been properly rehabilitated.</i></p>  | Yes                        | Metropolitan Coal was granted approval for the Project in June 2009.   |
|  | <p>7. <i>The Proponent shall not export any coal reject from the site after 2021 without the written approval of the Director-General.</i></p>  | Yes                        | -  |
|  | <p>8. <i>The Proponent shall not emplace coal reject on the surface of the site without the written approval of the Director-General.</i></p> <p><i>Note: This condition applies to the Camp Gully Emplacement Area, as well as to the rest of the surface of the site. It does not apply to the proposed additional coal reject stockpile shown in Appendix 4.</i></p>   | Yes                        | Metropolitan Coal has DPHI approval to emplace coal reject on the site when used for construction purposes (e.g. as engineered fill material). No construction activities requiring fill were undertaken and no coal reject was emplaced on the surface of the site during the review period.                      |
| Structural Adequacy (Project Approval Condition 9, Schedule 2)               | <ul style="list-style-type: none"> <li><i>The Proponent shall ensure that all new buildings and structures, and any alterations or additions to existing buildings and structure, are constructed in accordance with:</i> <ul style="list-style-type: none"> <li><i>(a) the relevant requirements of the BCA; and</i></li> <li><i>(b) any additional requirements of the MSB in areas where subsidence effects are likely to occur.</i></li> </ul> </li> </ul> <p><i>Notes:</i></p> <ul style="list-style-type: none"> <li><i>Under Part 4A of the EP&amp;A Act, the Proponent is required to obtain construction and occupation certificates for the proposed building works.</i></li> <li><i>Part 8 of the EP&amp;A Regulation sets out the requirements for the certification of the project.</i></li> </ul> | Yes                        | Metropolitan Coal did not undertake any construction activities during the review period.  |
| Demolition (Project Approval Condition 10, Schedule 2)                       | <ul style="list-style-type: none"> <li><i>The Proponent shall ensure that all demolition work is carried out in accordance with <u>Australian Standard AS 2601-2001: The Demolition of Structures</u>, or its latest version.</i></li> </ul>  | Yes                        | Metropolitan Coal did not undertake any demolition activities during the review period.  |
| Operation of Plant and Equipment (Project Approval Condition 11, Schedule 2) | <ul style="list-style-type: none"> <li><i>The Proponent shall ensure that all plant and equipment used at the site is:</i> <ul style="list-style-type: none"> <li><i>(a) maintained in a proper and efficient condition; and</i></li> <li><i>(b) operated in a proper and efficient manner.</i></li> </ul> </li> </ul>  | Yes                        | All plant and equipment in use at Metropolitan Coal is regularly serviced in accordance with the relevant Industry & Investment NSW Mining Design Guidelines to ensure plant and equipment is maintained in proper and efficient condition. All plant and equipment are operated in a proper and efficient manner. |

**Table 5  
Other Relevant Operational Conditions (Continued)**

| Operational Condition                                 |   | Operational Condition Met? | Comment  |
|---|---|----------------------------|--|
| Rail Noise (Project Approval Condition 4, Schedule 4) | 4. <i>The Proponent shall only use locomotives that are approved to operate on the NSW rail network in accordance with noise limits L6.1 to L6.4 in RailCorp's EPL (No. 12208) and ARTC's EPL (No. 3142) or a Pollution Control Approval issued under the former <u>Pollution Control Act 1970</u>.</i> | Yes                        | All locomotives used by Metropolitan Coal are approved to operate on the NSW rail network in accordance with the relevant noise limits.  |
| Blasting (Project Approval Condition 7, Schedule 4)   | <ul style="list-style-type: none"> <li><i>The Proponent shall not undertake blasting operations at the surface facilities area without the written approval of the Director-General.</i></li> </ul>   | Yes                        | <p>No blasting activities were carried out at the surface facilities area during the review period.</p> <p>Minor blasting underground is necessary at times when geological structures are encountered that cannot be excavated by the continuous miner or the longwall mining machine and when a section of the longwall roof falls ahead of the hydraulic supports of the longwall mining machine.</p> |

#### 4.3 OPERATIONAL ACTIVITIES IN THE NEXT REPORTING PERIOD

Longwall 309 commenced extraction on 28 July 2023 and is forecast to be completed in February 2024. The figures presented in this Annual Review show the approved Longwalls 308-310 Extraction Plan layout. In the next reporting period, Longwall 310 is anticipated to commence extraction in March 2024 (Figure 5).

The amount of waste rock/overburden, ROM coal, coal reject and product coal forecast for the next reporting period is provided in Table 4.

## 5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

A reconciliation of the actions required by relevant agencies, the previous Annual Review and actions taken in response by Metropolitan Coal during the reporting period are outlined in Table 6.

WaterNSW provided comments on the 2022 Annual Review in its letter dated 17 October 2023. Comments raised by WaterNSW related to potential water quality impacts on Woronora Reservoir, leakage from the Woronora Reservoir and height of fracturing.

WaterNSW's comments have been considered in this Annual Review where appropriate, as outlined in Table 6.

**Table 6**  
**Actions Required by Relevant Agencies and 2022 Annual Review**

| Action   | Requested by | Action Taken  | Section Reference           |
|--|--------------|---|-----------------------------|
| <i>Include a table that identifies actions required as an outcome of previous Annual Reviews</i>   | DPHI         | Table 6 has been included to identify actions required by relevant agencies, the previous Annual Review and actions taken in response by Metropolitan Coal during the reporting period.   | Section 5                   |
| <i>Include water taken in the previous 'water year' (1 July to 30 June) as per Table 7 of the Guideline</i>  | DPHI         | A summary of the water taken in the previous water year (1 July 2022 to 30 June 2023) has been included in Section 8 of the Annual Review.  | Section 8 and Table 13      |
| <i>Update the AR to include reporting on additional actions to improve the energy efficiency of the site in accordance with the Metropolitan Coal Air Quality and Greenhouse Gas Management plan dated December 2010 published on the company website.</i> | DPHI         | Greenhouse gas emissions reductions have been included in the relevant section in Section 7.2 of the Annual Review.   | Section 7.2 and Table 11    |
| <i>Update the AR to clarify the action/response to Level 3 trigger for amphibian monitoring in accordance with table 18 of the Metropolitan Coal Longwalls 308-310 Biodiversity Management Plan</i>  | DPHI         | Cenwest has undertaken further monitoring of the amphibian populations across sites 1-39 and has also undertaken threatened fauna species assessment at Swamp 20, Swamp 28 and sites on the Eastern Tributary and Waratah Rivulet (Cenwest, 2024). The assessment concludes that the Performance Measure continues to be met.<br><br>A copy of threatened fauna species assessment will be provided to DPHI. A copy of the 2024 amphibian monitoring report is in preparation and will be provided to DPHI upon finalisation. | Cenwest (2024)              |
| <i>Boreholes IDs for deep groundwater bores are checked and corrected for all inconsistencies between text, tables, figures, and maps. Please add inserts on the map where there are several boreholes next to each other.</i>                             | WaterNSW     | Groundwater bores IDs have been cross-checked throughout the Annual Review.   | Section 6.2.8 and Figure 10 |
| <i>Presentation of groundwater hydrographs should include lines showing sensor levels or figures of groundwater pressure to assess if reported groundwater levels are representing saturated conditions.</i>   | WaterNSW     | The sensor levels have been excluded as most bores have multiple sensors (e.g. up to 11 sensors) and the inclusion of the sensors levels would reduce the readability of the hydrographs. Notwithstanding, the sensor levels of each bore are included in Table 19 of the approved Longwalls 308-310 Water Management Plan.   | N/A                         |



**Table 6**  
**Actions Required by Relevant Agencies and 2022 Annual Review**

| Action   | Requested by       | Action Taken  | Section Reference      |
|--|--------------------|---|------------------------|
| <i>All special studies referenced in the AEMR are included in the package. WaterNSW is requesting a copy of Hydro Engineering &amp; Consulting Pty Ltd (2022b). "Metropolitan Coal Review of Recorded Streamflow – GS300078 Eastern Tributary". Letter 121152-82.L37 RevC to Metropolitan Coal, 1 November.</i>  | WaterNSW           | The Annual Review including all appendices is provided to DPHI. It provides a comprehensive summary of all monitoring data for the reporting period.<br><br>Metropolitan Coal will provide a copy of the Hydro Engineering and Consulting Pty Ltd (2022b) report to WaterNSW.   | N/A                    |
| <i>Visual observations of pool status and extent of iron staining in the Eastern Tributary (between the FSL and the LW26 maingate) and Waratah Rivulet (from pool P to the FSL) shall be documented and reported in the separate attachment.</i>   | WaterNSW           | Visual observation of iron staining is undertaken between the fully supply level of the Woronora Reservoir and the maingate of Longwall 23 and the Eastern Tributary between the fully supply level of the Woronora Reservoir and the maingate of Longwall 26 in accordance with the Longwalls 308-310 Water Management Plan. A summary of outcomes is included in Sections 6.2.1 and 6.8 of the Annual Review. | Sections 6.2.1 and 6.8 |
| <i>All figures showing the longwall layout include completed longwalls 1 to 18.</i>  | WaterNSW           | Mining of Longwalls 1-18 was completed in 2009. The focus of this Annual Review is on Longwalls 308 and 309, which are located more than 1.4 km from the Longwalls 1-18 domain.   | N/A                    |
| Continuation of stream remediation on the Eastern Tributary at Pools ETAH, ETAL and/or ETAK and downstream locations.  | 2022 Annual Review | Stream remediation activities continued during the review period. A summary of outcomes has been included in Section 6.4.3.2 of the Annual Review.  | Section 6.3.4.2        |
| In response to a level 2 exceedance of the Performance Indicator, " <i>The vegetation in upland swamps is not expected to experience changes significantly different to vegetation in control swamps</i> " at Swamps 20, 28, 40, 41, 48, 50 and 53, the commitment was made to continue close monitoring of trends in vegetation to assess the contribution of dry climatic conditions versus mine subsidence impacts.   | 2022 Annual Review | Vegetation monitoring of Swamps 20, 28, 40, 41, 48, 50 and 53 continued during the review period. A summary of outcomes has been included in Table 10 within the Annual Review.   | Table 10               |
| In response to a level 2 exceedance of the Performance Indicator, " <i>Surface cracking within upland swamps resulting from mine subsidence is not expected to result in measurable changes to swamp groundwater levels when compared to control swamps or seasonal variations in water levels experienced by upland swamps prior to mining</i> " at Swamps 25, 30, 35, 50 and 72, the frequency of data analysis will be increased to quarterly (until such a time that data analysis indicates a return to Level 1). | 2022 Annual Review | Quarterly data analysis was conducted throughout the review period. A summary of outcomes has been included in Table 10 within the Annual Review.   | Table 10               |

## 6 ENVIRONMENTAL PERFORMANCE – UNDERGROUND MINING AREA AND SURROUNDS

This section provides a summary of the key environmental monitoring results for subsidence, surface water, groundwater, biodiversity, land, heritage, built features and public safety in the underground mining area, an assessment of environmental performance and a description of the management measures implemented during the review period.

Each section indicates the relevant management plan or monitoring program where details of the underground mining management and monitoring are available. The Metropolitan Coal management plans/monitoring programs are available on the Peabody website (<http://www.peabodyenergy.com>).

The Longwalls 308-310 Extraction Plan includes post-mining monitoring and management of potential subsidence impacts and environmental consequences, subject to the previously approved Metropolitan Coal Extraction Plans for Longwalls 20-22, 23-27, 301-303, 304 and 305-307.

### 6.1 SUBSIDENCE MONITORING

The Metropolitan Coal Longwalls 308-310 Subsidence Monitoring Program was prepared to validate subsidence predictions and analyse the relationship between the subsidence effects and subsidence impacts of the Metropolitan Coal Longwalls 308-310 Extraction Plan in accordance with Condition 6(e), Schedule 3 of the Project Approval.

Subsidence movements are surveyed in three dimensions using a total station survey instrument, real time Global Navigation Satellite System and Light Detection and Ranging (LiDAR) units. The subsidence parameter monitoring locations are shown on Figure 6.

A review of the subsidence survey results and comparison between the predicted and observed subsidence movements for the review period has been conducted by Mine Subsidence Engineering Consultants Pty Ltd (MSEC). The report prepared by MSEC is provided in Appendix A. A summary of the key findings is provided below.

#### 6.1.1 Predicted and Observed Subsidence Movements

The reporting period included the continued extraction of Longwall 308 from chainage 1,863 metres (m) (void length 85 m) to completion and Longwall 309 from commencement to chainage 345 m (void length 1,465 m). The total length of extraction for Longwalls 308 and 309 during the 2023 reporting period was 3,384 m. Details of the observed and predicted subsidence movements at the subsidence monitoring locations (300 XL Line, Princes Highway Line, M1 Princes Motorway, Bridge 2 [Old Princes Highway Underpass], Cawley Road Overbridge, Eastern Tributary, Waratah Rivulet Cross Lines, and Ridge Top Survey Stations) are provided in Appendix A. The monitoring locations are shown on Figure 6.

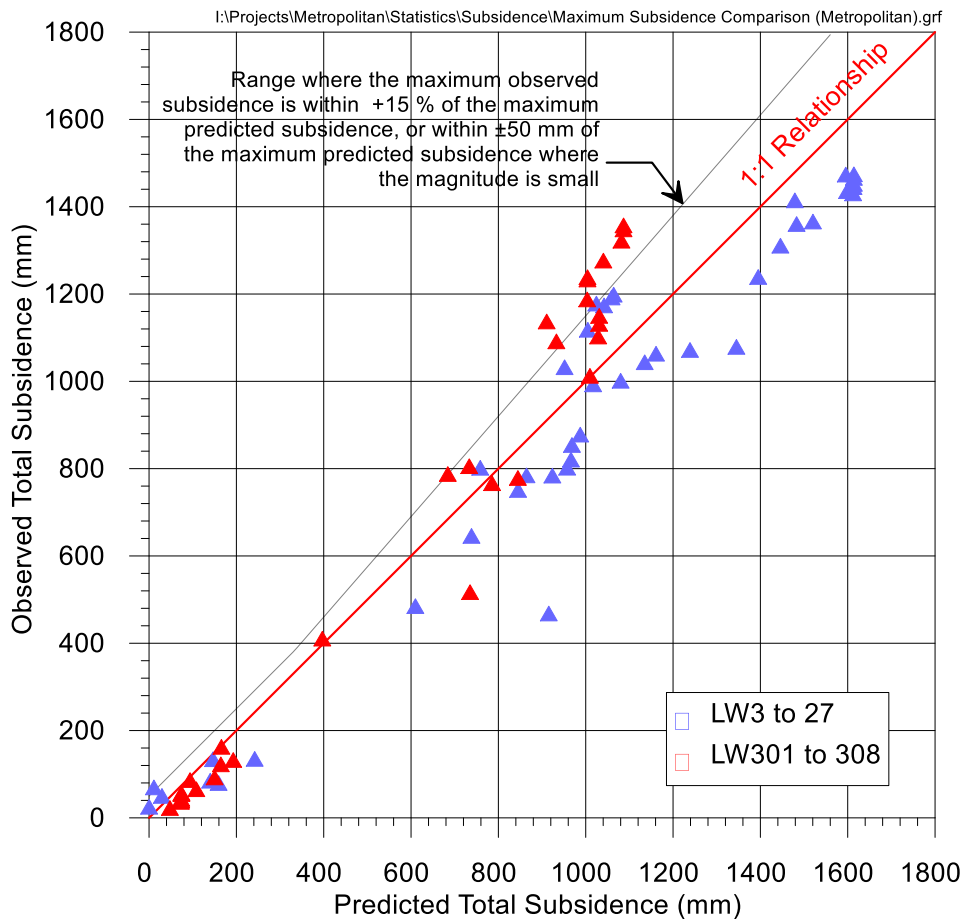
The observed subsidence profile shapes and subsidence parameters were generally similar to those predicted or within limits of accuracy of the predicted subsidence parameters. The maximum observed total conventional subsidence parameters above the extracted longwalls was greater than predicted, particularly at higher magnitudes of observed subsidence. Based on previous LiDAR surveys, and the survey monitoring lines, the location of greatest increase in observed subsidence is located at the area around the topographical high point above Longwalls 301 and 302 (Appendix A).

Metropolitan Coal used a Trigger Action Response Plan (TARP) designed to monitor valley closure movements on the Eastern Tributary. The Eastern Tributary Valley Closure TARP has been successfully implemented by Metropolitan Coal for Longwalls 303, 304 and 305.

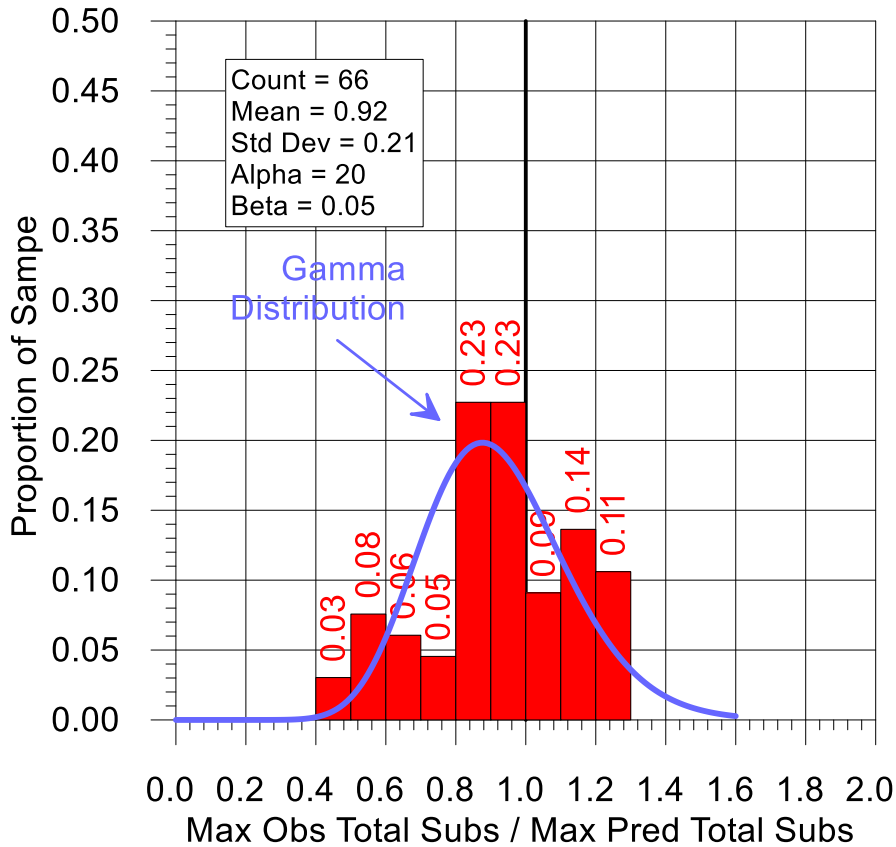
Condition 3, Schedule 3 of the Project Approval states:

3. *If the subsidence effects and subsidence impacts of the project exceed the relevant predictions by more than 15% at any time after mining has progressed beyond the halfway mark of Longwall 21, or if the profile of vertical displacement does not reflect predictions, then the Proponent shall use appropriate numerical modelling to supplement the subsequent predictions of subsidence effects and subsidence impacts for the project to the satisfaction of the Director-General.*

A comparison of the maximum observed and maximum predicted total conventional subsidence for the Project after each longwall for Longwalls 3 to 27 and Longwalls 301 to 308 is shown in Chart 1. The comparison of conventional subsidence effects excludes the valley cross lines which represent non-conventional subsidence movements.



**Chart 1 Comparison Between the Maximum Observed and Maximum Predicted Total Conventional Subsidence for Longwalls 3 to 27 and Longwalls 301 to 308 at Metropolitan Colliery**



**Chart 2 Histogram of Maximum Observed/Maximum Predicted Total Vertical Subsidence with Gamma Distribution**

An analysis of the maximum observed versus maximum predicted vertical subsidence was undertaken by MSEC (Appendix A). The mean of the maximum observed divided by the maximum predicted vertical subsidence for the project shown in Chart 2 is 0.92, indicating that, on average, observed subsidence is 8 percent (%) less than predicted for the project. Based on the results of survey data to date and comparison with predicted conventional subsidence parameters, the profiles of vertical displacement adequately reflect the predictions. The overall subsidence effects of the project do not exceed predictions by more than 15% (Appendix A).

## **6.2 WATER MANAGEMENT**

The Metropolitan Coal Longwalls 308-310 Water Management Plan was prepared to manage the potential environmental consequences of the Metropolitan Coal Longwalls 308-310 Extraction Plan on watercourses (including the Woronora Reservoir), aquifers, and catchment yield in accordance with Condition 6, Schedule 3 of the Project Approval.

The Longwalls 308-310 Water Management Plan includes post-mining monitoring and management of potential subsidence impacts and environmental consequences associated with Longwalls 20-22, Longwalls 23-27, Longwalls 301-303, Longwall 304 and Longwalls 305-307.

ATC Williams Pty Ltd (ATC Williams) (Appendices B1 and B2) and SLR Consulting Australia Pty Ltd (SLR) (Appendices C1 and C2) have reviewed the environmental performance of the Project in relation to surface water and groundwater in the underground mining area and surrounds for the reporting period.

The surface water, groundwater and meteorological monitoring locations are shown on Figures 7 to 12.

Sections 6.2.1 to 6.2.11 provide a summary of the surface water and groundwater assessments for the reporting period.

Section 6.8 provides a summary of the assessments against the water resource and watercourse subsidence impact performance indicators and measures for the reporting period.

### **6.2.1 Stream Features**

Visual inspections and photographic surveys of the Waratah Rivulet (from Pool P [downstream of Longwall 23] to the Woronora Reservoir's full supply level) and Eastern Tributary (from the full supply level of the Woronora Reservoir to the maingate of Longwall 26) were conducted within three months of the completion of Longwall 308.

The visual and photographic surveys conducted at the completion of each longwall provide a detailed photographic record of stream features. The visual and photographic surveys have recorded observations of mining impacts including surface cracking, iron staining, gas releases and water discoloration/opacity. A summary of the observations for the reporting period is provided for the Waratah Rivulet (Table 7) and Eastern Tributary (Table 8). The location of mapped pools on the Waratah Rivulet and Eastern Tributary are provided in Appendix D.

During the reporting period, weekly inspections have also been undertaken where gas releases occur, and monthly inspections have been undertaken of the Eastern Tributary between the full supply level of the Woronora Reservoir and the Longwall 26 maingate to document surface cracking and iron staining. The results of these inspections are included in Table 8.

**Table 7**  
**Monitoring of Stream Features – Waratah Rivulet Downstream of the Longwall 23 Maingate**

| Stream Feature                                 | Summary of Observations  |
|--|--|
| <b>Surface Cracking and Drainage Behaviour</b> | <p>Metropolitan Coal's visual inspections downstream of the Longwall 23 maingate on the Waratah Rivulet indicate no mine-induced surface cracking and no observed changes to the natural drainage behaviour of the pools.</p> <p>The performance indicator, <i>No change to the natural drainage behaviour of Pools P, Q, R, S, T, U, V and W</i>, was not exceeded during the reporting period.</p>   |
| <b>Surface Flow/ Pool Water Levels</b>         | <p>Water levels in pools on the Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir (i.e. in Pools P, Q, R, S, T, U, V and W) have been monitored using a continuous water level sensor and logger (Figure 7 and Appendix D).</p> <p>The recorded water levels in Pools P, T, U, V and W have remained at or above the pools' previously recorded minimums. The recorded water levels in Pools Q, R and S have remained above that required to maintain water over the downstream rock bar. The monitoring results for the reporting period are further discussed in Section 6.2.3 and Appendices B1 and B2.</p> <p>The performance indicators, <i>Analysis of water level data for Pools P, T, U, V and W indicates the water level is at or above the pool's previous minimum</i>, and <i>Analysis of water level data for Pools Q, R and S indicates the water levels are above that required to maintain water over the downstream rock bar</i>, were not exceeded during the reporting period.</p> |
| <b>Iron Staining/ Flocculent</b>               | <p>No change in iron staining was observed between Pools P to W on the Waratah Rivulet as a result of mining during the reporting period. Natural seeps and associated iron staining (as recorded by baseline mapping) continue to be recorded within this reach.</p> <p>The performance indicator, <i>Visual inspection of the Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir does not show significant changes in the extent or nature of iron staining that isn't also occurring in the Woronora River (control site)</i>, was not exceeded during the reporting period.</p>  |
| <b>Gas Releases</b>                            | <p>Gas releases continued to be observed and monitored on the Waratah Rivulet at Pool P (in January, and July to September 2023) and Pool U (in January 2023).</p> <p>No environmental effects resulting from the gas releases (such as riparian vegetation dieback or dead fish) have been observed.</p> <p>The performance indicator, <i>Gas releases in Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir have not increased beyond those observed up to the commencement of Longwall 301 extraction</i>, was not exceeded during the reporting period.</p>  |
| <b>Water Discoloration/ Opacity</b>            | <p>Pools along the Waratah Rivulet were generally observed to be clear, sometimes showing a green opacity.</p>   |

**Table 8**  
**Monitoring of Stream Features – Eastern Tributary Downstream of the Longwall 26 Maingate**

| Stream Feature                                 | Summary of Observations  |
|--|--|
| <b>Surface Cracking and Drainage Behaviour</b> | <p>Metropolitan Coal's visual inspections of Pools ETAS, ETAT and ETAU (and associated rock bars) indicate no mine-induced surface cracking has been observed at Pools ETAS and ETAT during the review period and no increase in the occurrence of cracking has been observed at Pool ETAU. There have been no observed changes to the natural drainage behaviour of Pools ETAS, ETAT or ETAU during the review period.</p> <p>The performance indicator, <i>No change to the natural drainage behaviour of Pools ETAS, ETAT and ETAU</i>, was not exceeded during the reporting period.</p>   |
| <b>Surface Flow/ Pool Water Levels</b>         | <p>As previously reported in the 2016 to 2022 Metropolitan Coal Annual Reviews, mine subsidence resulted in the diversion of flows or change to the natural drainage behaviour of Pools ETAG to ETAR between the full supply level of the Woronora Reservoir and the Longwall 26 maingate, (Figure 7 and Appendix D). As of December 2023, mining had not resulted in the diversion of flows or change to the natural drainage behaviour of Pools ETAS, ETAT and ETAU (Figure 7 and Appendix D).</p> <p>Water levels in Pool ETAU and in Pools ETAS/ETAT (since May 2018) have been monitored using a continuous water level sensor and logger (Figure 7 and Appendix D). The monitoring results are discussed in Section 6.2.3 and in Appendices B1 and B2 and indicate the natural drainage behaviour of Pools ETAS/ETAT and ETAU have not been impacted by mine subsidence.</p> <p>The performance indicator, <i>Analysis of water level data for Pool ETAS/ETAT and Pool ETAU indicates the water levels are above that required to maintain water over the downstream rock bar</i>, was not exceeded during the reporting period.</p> |
| <b>Iron Staining/ Flocculent</b>               | <p>As previously reported in the 2016 to 2022 Metropolitan Coal Annual Reviews, mine subsidence resulted in the exceedance of the Eastern Tributary performance measure in relation to iron staining (emphasis added): <i>Negligible environmental consequences over at least 70% of the stream length (that is no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining and minimal gas releases)</i>.</p> <p>During the reporting period, iron staining continued to be observed along the reach of the Eastern Tributary between the full supply level of the Woronora Reservoir and the Longwall 26 maingate, and was most evident in the reach from Pool ETAQ to Boulderfield ETAU.</p>   |
| <b>Gas Releases</b>                            | <p>No gas releases were observed on the Eastern Tributary during the reporting period. No environmental effects resulting from the gas releases (such as riparian vegetation dieback or dead fish) have been observed.</p> <p>The performance indicator, <i>Gas releases in Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26 have not increased beyond those observed up to the commencement of Longwall 301 extraction</i>, was not exceeded during the reporting period.</p>  |
| <b>Water Discoloration/ Opacity</b>            | <p>Orange in colour where iron staining occurred. Pools along the Eastern Tributary observed with a green opacity.</p>   |

Visual inspections and photographic surveys of the Eastern Tributary (from the Woronora Reservoir full supply level to the Longwall 26 maingate) will continue to be conducted monthly while Longwall 309 extraction is within 450 m of the stream. Visual inspections and photographic surveys will also be conducted along the Waratah Rivulet (from Pool P to the full supply level of the Woronora Reservoir) within three months of the completion of Longwall 309.

The results of the stream inspections (Tables 7 and 8) are consistent with the potential subsidence impacts described in the Metropolitan Coal Project Environmental Assessment (Project EA) (Helensburgh Coal Pty Ltd [HCPL], 2008), the Preferred Project Report (HCPL, 2009) and the Metropolitan Coal Water Management Plans, including cracking and dilation of bedrock which has resulted in the localised diversion of a portion of the surface flow through either:

- **diversion into subterranean flows**, where water travels via new mining induced fractures and opened natural joints in the bedrock into near-surface dilated strata beneath the bedrock, ultimately re-emerging at the surface downstream; or
- **leakage through rock bars**, where the rate of leakage from pools through rock bars to the downstream reaches of the stream is increased by new mining induced fractures.

The Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans indicated that the effects of underflow would be localised to the subsidence affected reaches of streams. Underflow has been observed to result in lower water levels in pools as they become hydraulically connected with the fracture network. During prolonged dry periods when flows recede to low levels, the number of instances where loss of flow continuity between pools occurs increases with a greater proportion of the flow being conveyed entirely in the subsurface fracture network.

The Preferred Project Report and Metropolitan Coal Water Management Plan indicated that valley closure values of greater than 200 mm were predicted at pools/rock bars on the Waratah Rivulet upstream of the maingate of Longwall 23, downstream to rock bar ETAL on the Eastern Tributary, and on Tributary B. The NSW Planning Assessment Commission's Report for the Metropolitan Coal Project (NSW Planning Assessment Commission, 2009) indicates the Panel considered 'negligible consequence' for a watercourse to mean, '*no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases*', and was assumed to be achieved in circumstances where predicted valley closure was less than 200 millimetres (mm).

Up until December 2016, the monitoring of water levels/drainage behaviour of pools on the Eastern Tributary between the maingate of Longwall 26 and the full supply level of the Woronora Reservoir was consistent with predictions. In the Longwalls 20-22 Extraction Plan Subsidence Assessment it was recognised that fracturing resulting in surface flow diversion could be observed at a site where the predicted total closure is less than 200 mm, although none had been observed to date. The report also noted that reference to the 200 mm predicted total closure value should be viewed as an indication of low probability (10%) of impact rather than certainty. In the Longwalls 23-27 Extraction Plan Subsidence Assessment, additional case studies were added to the pool impact model, including cases where loss of pool water levels had occurred at less than 200 mm predicted total closure. Similar to the previous database for Longwalls 20-22, the updated database showed that based on a maximum predicted total closure of 200 mm, the proportion of pools that experienced loss of pool water levels was around 10%.

In December 2016 and January 2017, a number of pools with predicted closure values of less than 200 mm experienced loss of pool water levels. This resulted in the exceedance of the negligible environmental consequences performance measure for the Eastern Tributary in relation to diversion of flows and drainage behaviour. The impacts are considered to be anomalous in that more than 15% of pools on the Eastern Tributary have experienced loss of pool water levels at predicted closure values of less than 200 mm. However, the combined data that is available to MSEC for the Southern Coalfield (including the Waratah Rivulet and Eastern Tributary results) indicates that less than 10% of all pools have experienced the diversion of flow at predicted closure values of less than 200 mm, consistent with previous assessments of potential pool impacts. On their own, the impacts for the Eastern Tributary are outside of the predictions of the empirical based model.

Metropolitan Coal's actions in relation to the Eastern Tributary Incident are described in Section 13.1. No additional pools downstream of the Longwall 26 maingate to those identified previously as being impacted (in terms of drainage behaviour) have been impacted during the review period.



The key potential subsidence impacts and environmental consequences in relation to bed gradients, scouring and stream alignment described in the Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans included:

- Potential changes in bed gradients could occur, however, were anticipated to be small relative to the existing grades.
- An increased potential for scouring of the stream bed and banks (at locations where the predicted tilts considerably increase the natural pre-mining stream gradients). The potential for scouring is greatest in stream sections with alluvial deposits. Since the streambed of the Waratah Rivulet and the Eastern Tributary is predominantly erosion-resistant Hawkesbury Sandstone, scouring was expected to be very low.
- Subsidence fracturing of bedrock has the potential to cause dislodgement of rock fragments during high flow events.
- The potential for changes to stream alignment as a result of mine subsidence effects was considered to be low.
- Minor stream bank erosion, where changes in channel gradients result in increases in flow energy. It would be expected that bank erosion would be relatively minor and comprise a slow retreat of the bank until a new dynamic equilibrium is reached.

The results of the stream inspections have generally been consistent with these predictions. On the Waratah Rivulet (in a section of the stream over Longwall 21) and Eastern Tributary (in a section of the stream over Longwalls 20 and 21) increased ponding from changes in bed gradients has previously resulted in the prolonged inundation of the adjacent riparian vegetation which has resulted in some vegetation dieback on a local scale as described in Section 6.3.3.

As described in the Southern Coalfield Panel Report (Department of Planning [DoP], 2008) and the NSW Planning Assessment Commission's Report for the Metropolitan Coal Project (NSW Planning Assessment Commission, 2009), under certain conditions the cracking of stream beds and underlying strata has the potential to result in changes in water quality, particularly ferruginous springs and/or development of iron bacterial mats. Experience at Metropolitan Coal prior to Project Approval indicated that areas of the substratum can be covered by iron flocculent material for several hundred metres downstream of mine subsidence fractures.

Metropolitan Coal has monitored the extent of iron staining through visual and photographic surveys and assessed the extent of iron staining against the subsidence impact performance measures as follows:

- *Negligible environmental consequences (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases) on the Waratah Rivulet between the full supply level of the Woronora Reservoir and the maingate of Longwall 23 (upstream of Pool P).*
- *Negligible environmental consequences over at least 70% of the stream length (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases) on the Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26.*

From January to December 2023, iron staining continued to be observed along the reach of the Eastern Tributary between the full supply level of the Woronora Reservoir and the Longwall 26 maingate, and was most evident in the reach from Pool ETAQ to Boulderfield ETAU.

Prior to approval of the Project in 2009, no gas releases had been observed along the Waratah Rivulet, Eastern Tributary or other tributaries over the Metropolitan Coal lease, either before or during mining. Notwithstanding, the Project EA, Preferred Project Report, and Metropolitan Coal Water Management Plans recognised there was the potential for gas releases to occur.

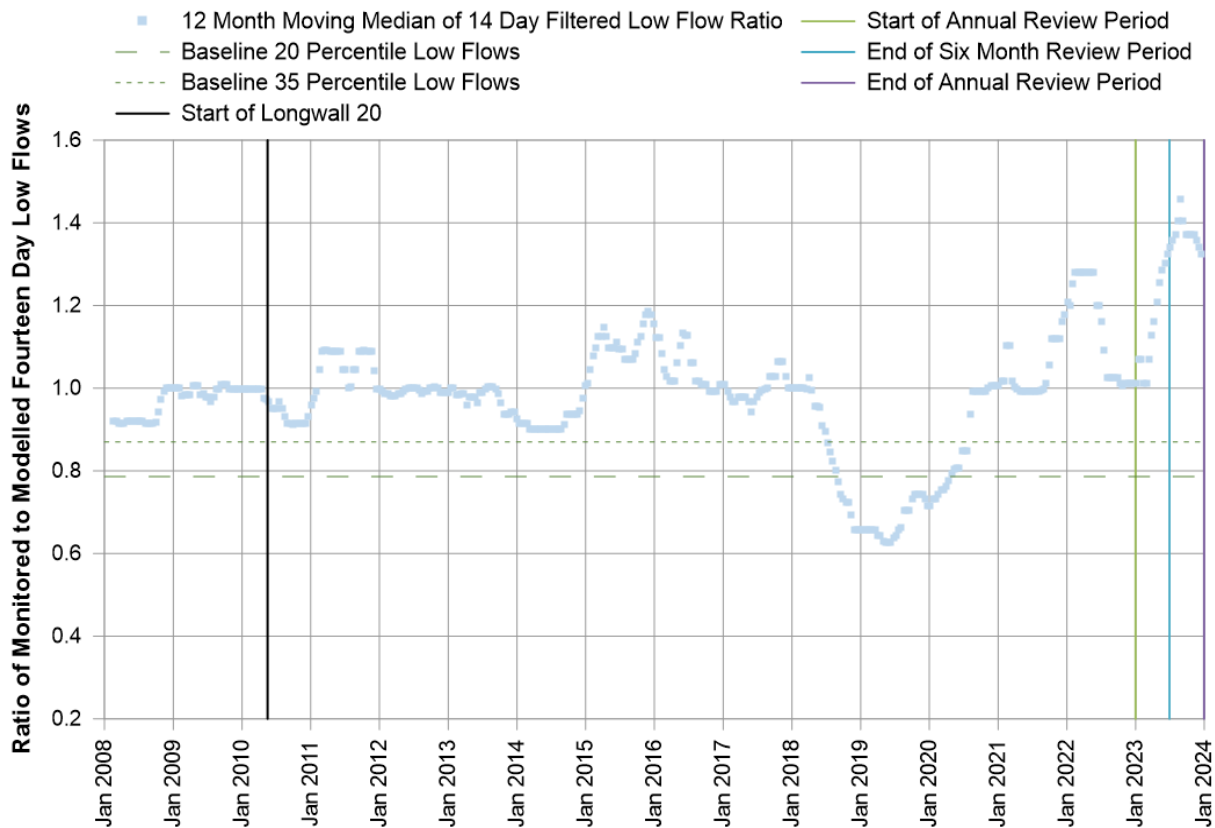
Monitoring of gas releases were undertaken during the reporting period in accordance with the Metropolitan Coal Longwalls 308-310 Water Management Plan. No gas releases observed on the Eastern Tributary or Waratah Rivulet exceeded the performance indicators.

**6.2.2 Surface Water Flow**

Waratah Rivulet stream flow data (GS 2132102; Figure 7) is analysed to assess whether a statistically significant reduction in the quantity of water entering Woronora Reservoir in the post-mine period relative to the pre-mine period has occurred, that has not also occurred in the control catchment(s).

The quantity of water entering the Woronora Reservoir is not considered to be significantly different post-mining compared to pre-mining if the median of the ratios (of 14 day sums of monitored flow) for the ‘sliding’ 12 month period does not fall below the 20<sup>th</sup> percentile of the baseline data.

Chart 3 shows a plot of the sliding 12 month median of the ratio of 14 day sums of monitored and modelled flow at Waratah Rivulet (GS 2132102) to 31 December 2023.



**Chart 3 One Year Sliding Median for the Ratios of the 14 Day Sums of Monitored and Modelled Flow Rates at Waratah Rivulet (GS 2132102)**

For the Project EA, a comprehensive analysis of stream flow data and data on the yield behaviour of Woronora Reservoir indicated that past mining at Metropolitan Coal had no discernible effect on the inflow to, or yield from, the reservoir. Surface water flow monitoring indicates there has been a negligible reduction in the quantity of water resources reaching the Woronora Reservoir during the reporting period.

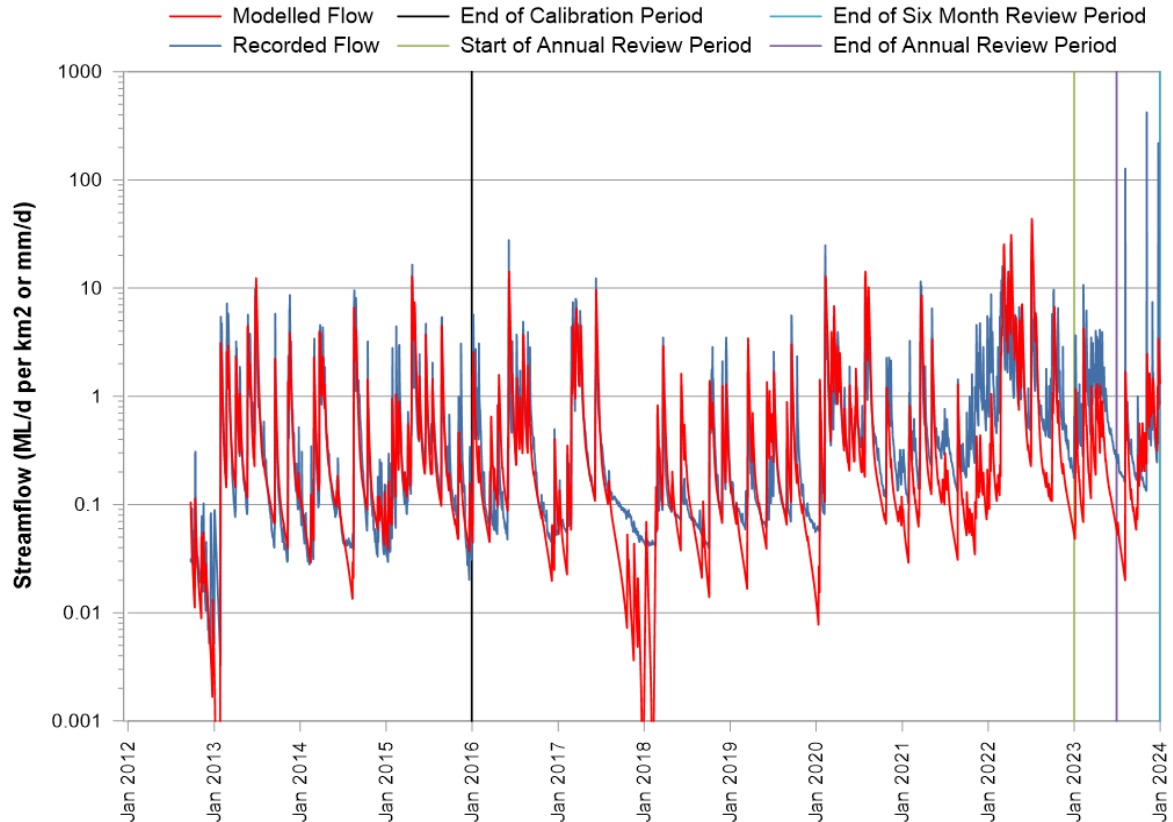
The results show that the moving 12 month median of the 14 day filtered low flow ratio remained above the 35<sup>th</sup> percentile for the duration of the reporting period. In accordance with the Metropolitan Coal Longwalls 308-310 Water Management Plan TARP, this equates to a Level 1 significance from 1 January to 31 December 2023.

As such, it is considered that the performance indicator relating to the quantity of water entering Woronora Reservoir from Waratah Rivulet has not been exceeded and an assessment against the performance measure is not required.

Chart 4 shows the flow monitoring data that is available since gauging station construction on the Eastern Tributary (GS 300078; Figure 7) in September 2012 compared to model predictions. The results for the reporting period indicate that flow has been continuous at the gauging station and that it has been generally consistent with, or above, model predictions (Chart 4). The 2021 Metropolitan Coal Surface Water Review (Hydro Engineering & Consulting [HEC], 2022) identified that the streamflow recorded at the gauging station has been increasingly higher than the model predictions from mid-2018. Key outcomes of the review of the recorded streamflow at GS 300078 are:

1. The most likely cause of the higher recorded data is the method by which recorded streamflow has been extrapolated above the capacity of the flow measuring flume. When the method is adjusted (using quadratic extrapolation of the flume rating curve), recorded streamflow data more closely matches recorded data.
2. A controlled hazard reduction burn was conducted within the Metropolitan Special Area and the catchment of GS 300078 on 29 April 2021. For a period of approximately 10 months following, the divergence between the hydrographs increases and this behaviour is considered related to the effects of the burn, which likely increased the rate of catchment runoff. However, this behaviour appears to have diminished since the onset of higher rainfall in approximately March 2023.
3. During periods of flow recession dating back to spring 2017, the modified streamflow record somewhat exceeds modelled flow. It is considered that this may be related to increased baseflow occurring due to subsidence-induced stream bed fracturing upstream of GS 300078 leading to flow diversion through the fracture network which increases flow routing.

This indicates that flows reaching the Woronora Reservoir have not been reduced by mining (Appendices B1 and B2).



**Chart 4 Monitored and Model Predicted Flows – Eastern Tributary Upstream of Woronora Reservoir**

### 6.2.3 Pool Water Levels

The water level in a number of pools on the Waratah Rivulet, Eastern Tributary, Tributary B and Woronora River (Figure 7) has been either manually monitored on a daily basis<sup>1</sup> or monitored using a continuous water level sensor and logger.

During the reporting period, all pools on the Waratah Rivulet (Pools A, B, C, E, F, G, G1, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V and W) remained above their cease to flow levels or historical minimums for the duration of the reporting period.

There were no exceedances of the performance indicator, *Analysis of water level data for Pools P, T, U, V and W indicates the water level is at or above the pool's previous minimum* from January to December 2023. Metropolitan Coal's visual inspections of Pools P, Q, R, S, T, U, V and W downstream of the maingate of Longwall 23 indicate no mine-induced surface cracking and no observed changes to the natural drainage behaviour of the pools (Metropolitan Coal, pers. comm). The visual inspection results equate to a Level 1 significance level.

<sup>1</sup> Specifically, Pools B, C, E, G, G1, H and I on Waratah Rivulet.

On the Eastern Tributary, water levels in Pools ETG, ETJ, ETM, ETU, ETW, ETAF, ETAG, ETAH, ETAI/ETAJ/ETAK<sup>2</sup>, ETAL, ETAM, ETAN, ETAO, ETAP, ETAQ, ETAR, ETAS/ETAT<sup>3</sup> and ETAU are monitored using a continuous water level sensor and logger (Figure 7).

Water levels in Pools ETAI/ETAJ/ETAK, ETAL, ETAM, ETAN, ETAO and ETAP on the Eastern Tributary declined below the sensor level (Charts 5 to 12). The water levels recorded at Pool ETAI/ETAJ/ETAK declined below the sensor levels in early January 2023. Pool ETAL declined below the sensor levels in early January 2023 and late October into early November 2023. Pool ETAM water levels declined below the sensor for periods during January, July, August and between September and November 2023. Data was unavailable for Pool ETAN from 3 January 2023 to 16 March 2023 due to loss of the water level sensor in a high flow event. However, Pool ETAN recorded water levels below the sensor for periods during January, July, August and between September, November and December. Pool ETAO recorded water levels below the sensor for periods during January, February, March, June to December 2023. The water level recorded at Pool ETAP declined below the sensor level for periods in January and February, July and August, September to November and for a brief period in December 2023. All other pools on the Eastern Tributary were consistent with historical behaviour, with recorded levels remaining above the cease to flow level or historical minimum for the duration of the review period (Appendices B1 to B2).

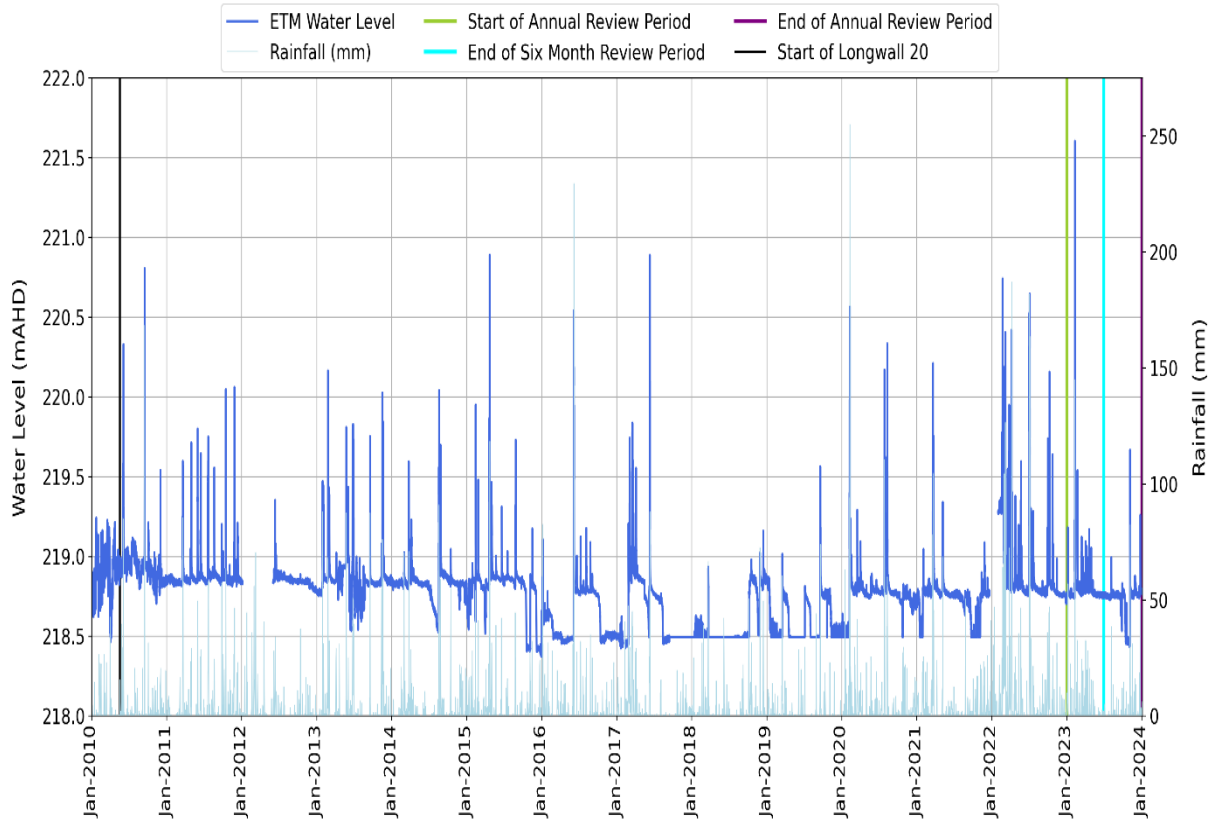
Consistent with historical behaviour, the water level at Pool RTP1 on Tributary B rose in response to significant rainfall periods and declined below the sensor level during periods of below average rainfall. Pool RTP1 was recorded as dry during all visual inspections for the review period. Pool RTP2 water level was consistent with historical behaviour for the duration of the review period, however, declined below the cease to flow for a brief period at the end of October and start of November 2023 (Appendices B1 and B2).

As described in Section 6.2.1, the Eastern Tributary pool water level monitoring results for the review period were consistent with the potential subsidence impacts and environmental consequences described in the Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans in that data that is available to MSEC for the Southern Coalfield (including the Waratah Rivulet and Eastern Tributary results) indicates that less than 10% of all pools have experienced the diversion of flow at predicted closure values of less than 200 mm, consistent with previous assessments of potential pool impacts. On their own, the impacts for the Eastern Tributary are outside of the predictions of the empirical based model.

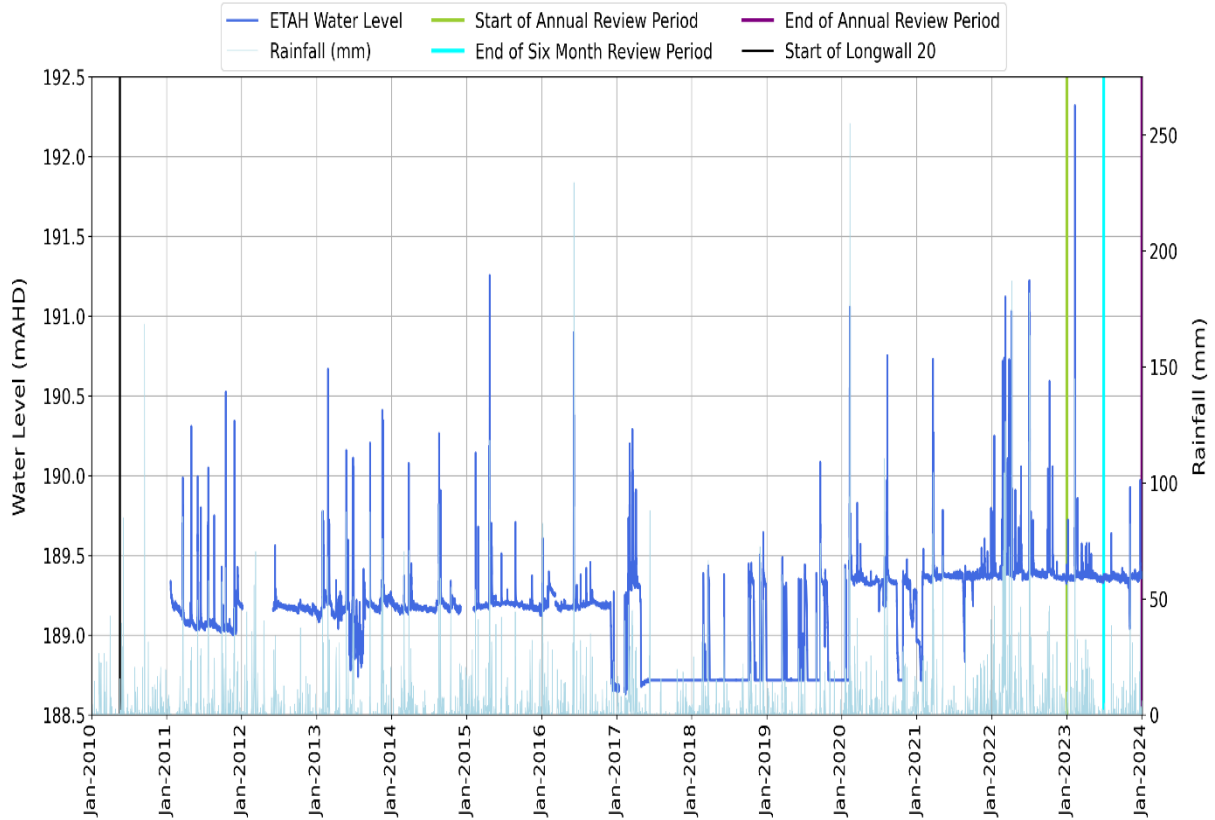
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<sup>2</sup> Only small rock bars separate Pools ETAI, ETAJ and ETAK, with the pools joining to become the one large pool as water levels rise. Pool ETAK is controlled by a more substantial rock bar. Readings from the water level sensor situated in Pool ETAI is considered to also be representative of the water level in Pools ETAJ and ETAK.

<sup>3</sup> Due to the nature of rock bar ETAS, Pool ETAS and Pool ETAT typically record the same level. A continuous water level sensor and logger was installed at Pool ETAT. Water level data for Pools ETAS/ETAT is available from 24 May 2018.



**Chart 5 Pool ETM**



**Chart 6 Pool ETAH**

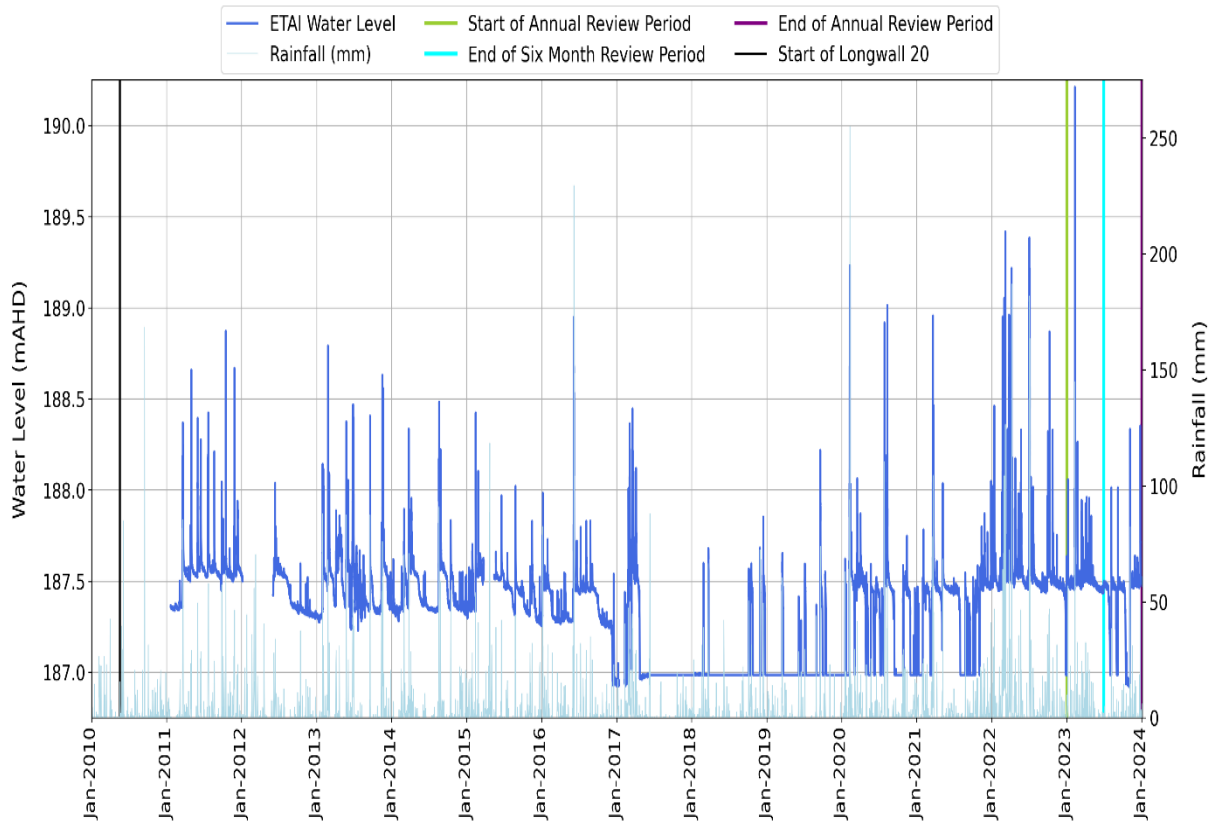


Chart 7 Pool ETAI

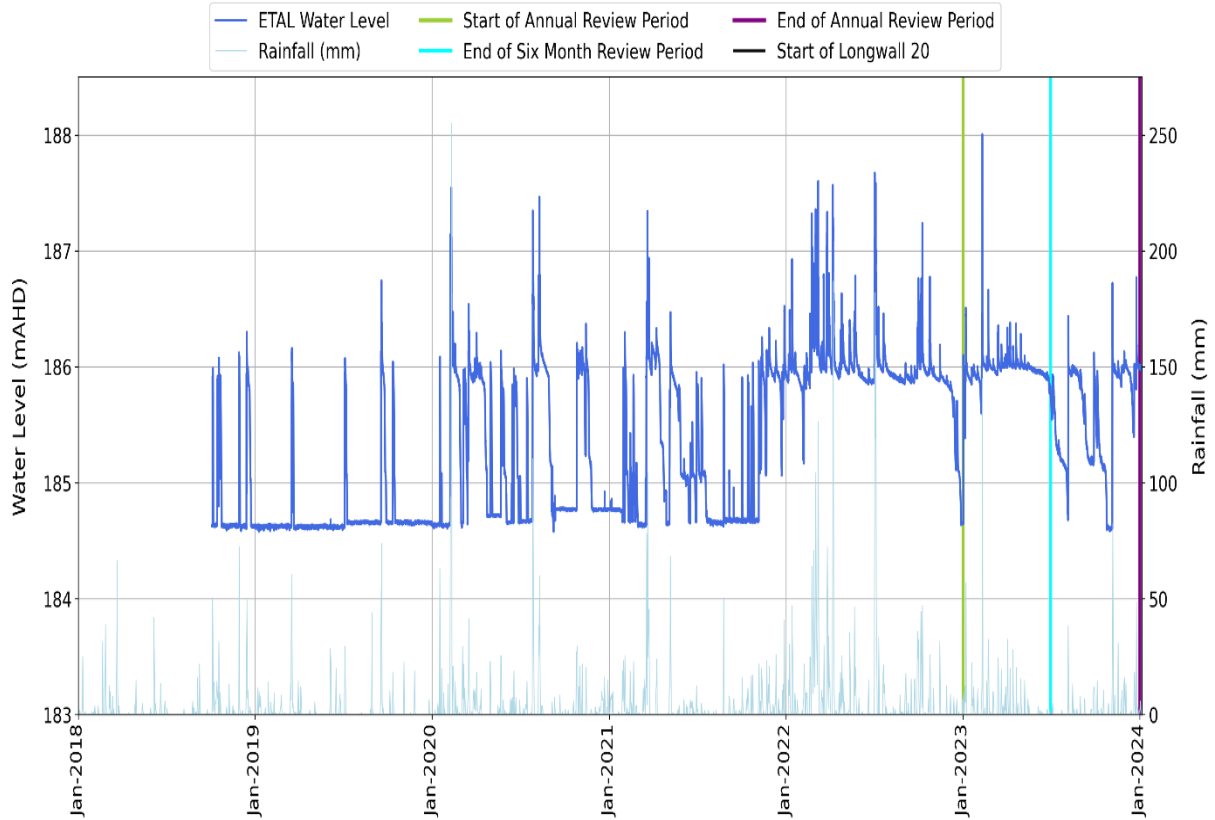
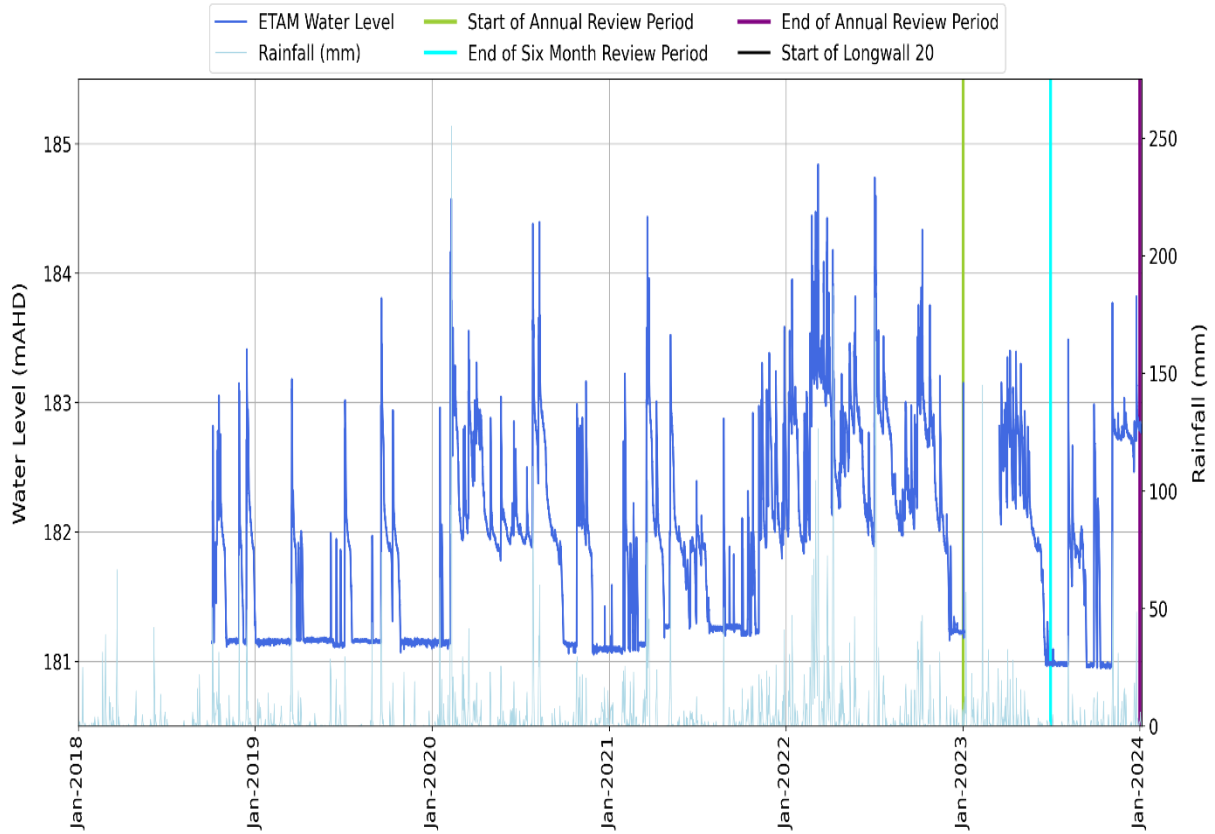
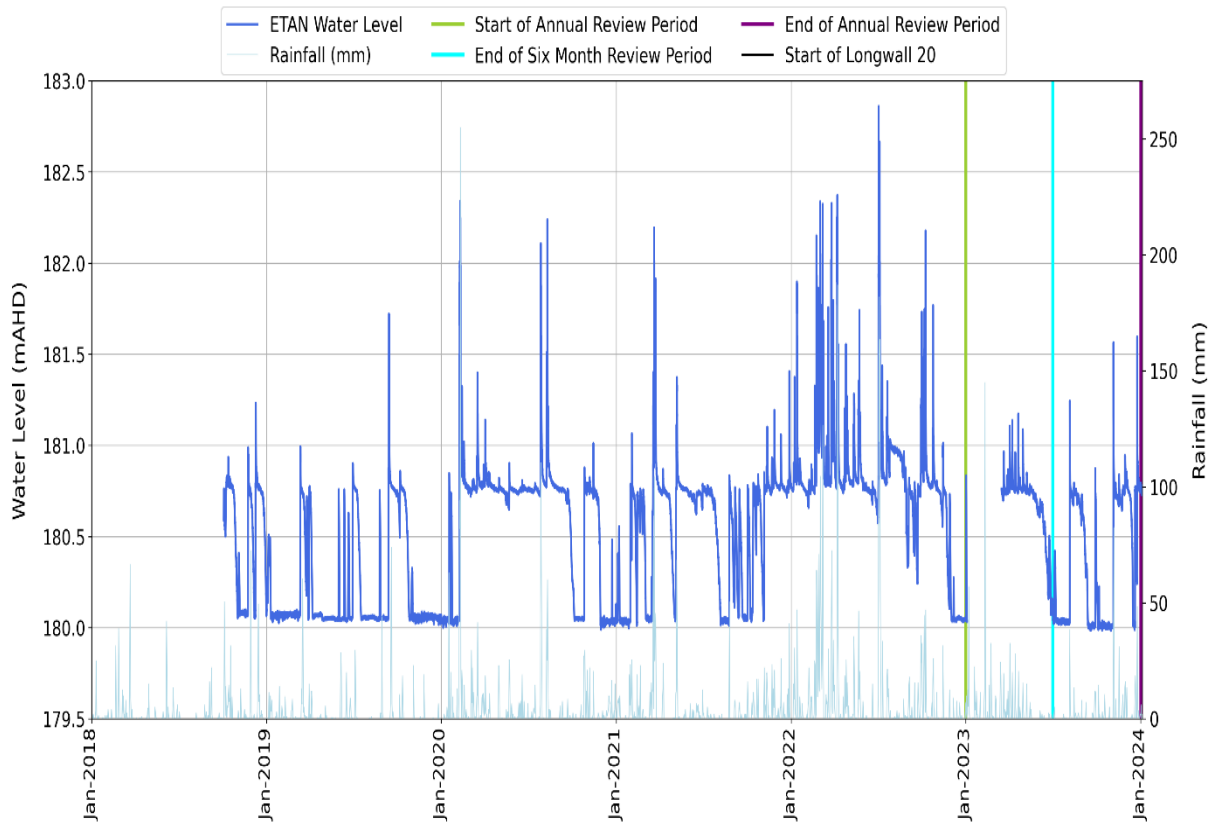


Chart 8 Pool ETAL



**Chart 9 Pool ETAM**



**Chart 10 Pool ETAN**



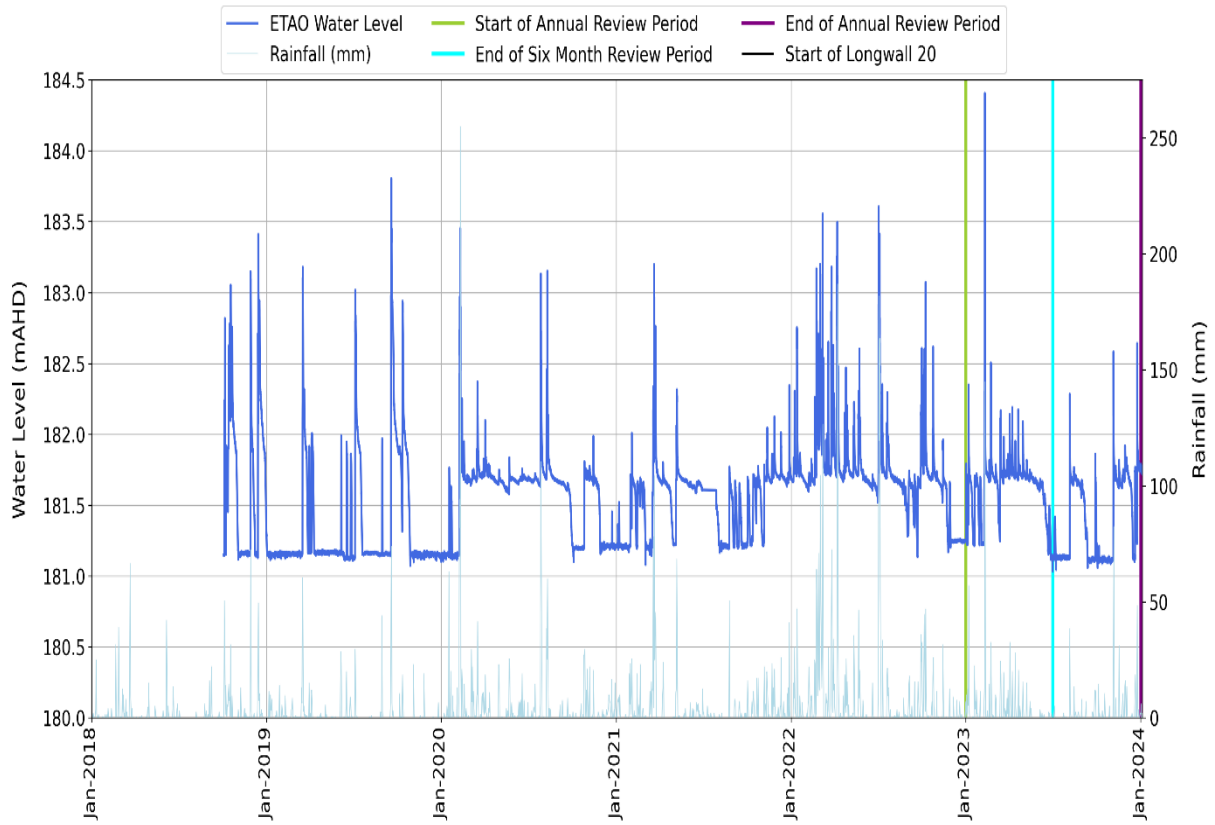


Chart 11 Pool ETAO

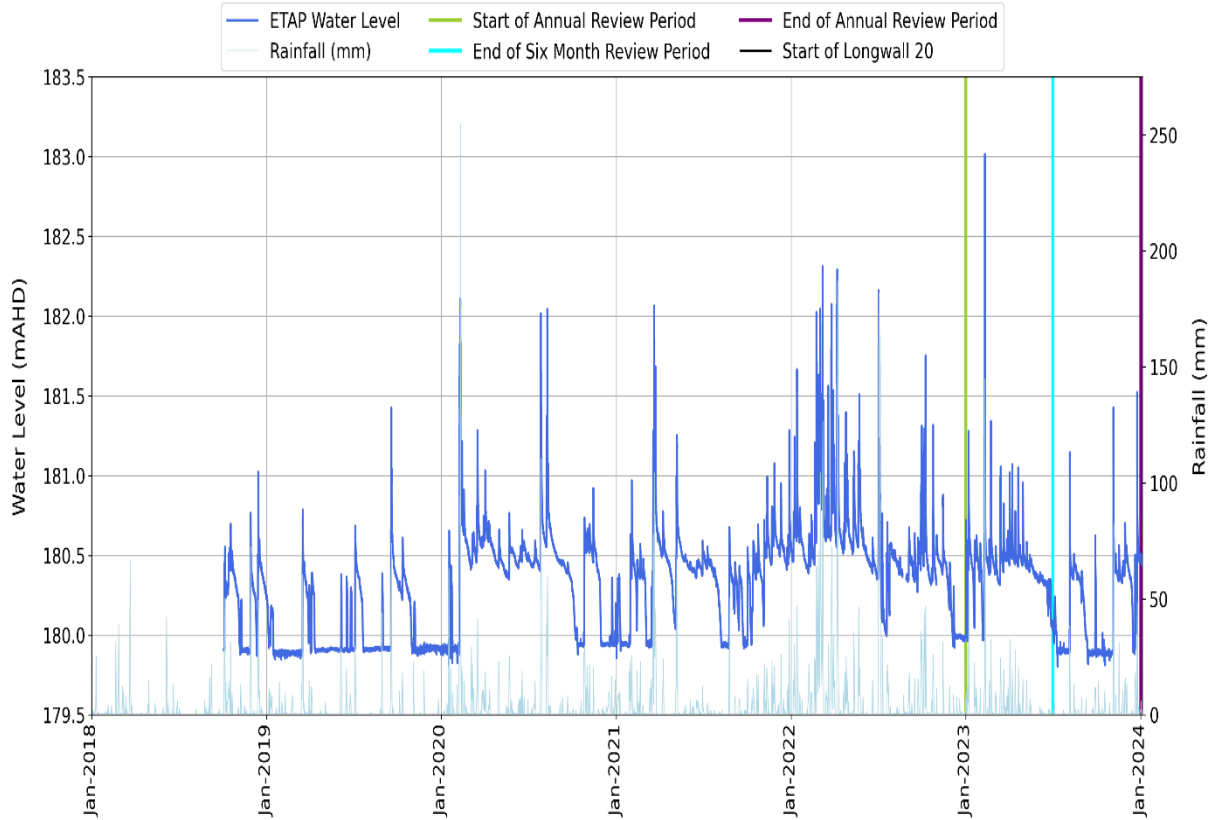


Chart 12 Pool ETAP

## 6.2.4 Stream Water Quality

Surface water quality sampling has been conducted monthly in the Waratah Rivulet (sites WRWQ2, WRWQ6, WRWQ8, WRWQ9, WRWQM, WRWQN, WRWQP, WRWQR, WRWQT, WRWQU, WRWQV, WRWQW), Eastern Tributary (sites ETWQF, ETWQJ, ETWQN, ETWQU, ETWQW, ETWQAF, ETWQAH, ETWQAA, ETWQAU), Tributary B (site RTWQ1), Tributary D (site UTWQ1), Far Eastern Tributary (site FEWQ1), Honeysuckle Creek (site HCWQ1), Bee Creek (site BCWQ1), Woronora Reservoir Tributaries (SR1, SR2 and SP1) and Woronora River (WOWQ1 and WOWQ2) (Figure 8) in accordance with the Metropolitan Coal Longwalls 308-310 Water Management Plan.

In October 2016, Metropolitan Coal increased the frequency of water quality sampling at select sites on the Eastern Tributary (sites ETWQF, ETWQN, ETWQAF, ETWQAG, ETWQAH, ETWQAI, ETWQAK, ETWQAA and ETWQAU) and at site WOWQ2 on the Woronora Reservoir from monthly to weekly in response to the Eastern Tributary Incident. Weekly sampling continued throughout the reporting period.

Trends in the monitoring data to date for key parameters (pH, electrical conductivity [EC], dissolved iron, dissolved manganese and dissolved aluminium) are summarised in Table 9 and shown on Charts 13 to 37 (Appendices B1 and B2).

Water quality data has been analysed for key water quality parameters of relevance to water supply and the effects of subsidence, namely iron, manganese and aluminium at site WRWQ9 on Waratah Rivulet, site ETWQ AU on Eastern Tributary and at control site WOWQ2 on the Woronora River.

The performance indicator, *Changes in the quality of water entering Woronora Reservoir are not significantly different post-mining compared to pre-mining concentrations that are not also occurring at control site WOWQ2*, is considered to have been exceeded if data analysis indicates a significant change in the quality of water post-mining of Longwall 20. Specifically, if<sup>4</sup>:

- any water quality parameter exceeds the adjusted baseline mean plus two standard deviations for two consecutive months; or
- over a three month period the water quality parameter exceeds the adjusted mean plus two standard deviations in the first month, the adjusted mean plus one standard deviation in the next month and the adjusted mean plus two standard deviations in the third month; or
- the six month mean of the water quality parameter exceeds the adjusted baseline mean plus one standard deviation for two consecutive assessment periods (i.e. over two six monthly reports); and
- there was not a similar exceedance of the trigger at the control site.

<sup>4</sup> Note each 'mean' is calculated as a geometric mean.

**Table 9**  
**Summary of Results for Key Water Quality Parameters During the Reporting Period**

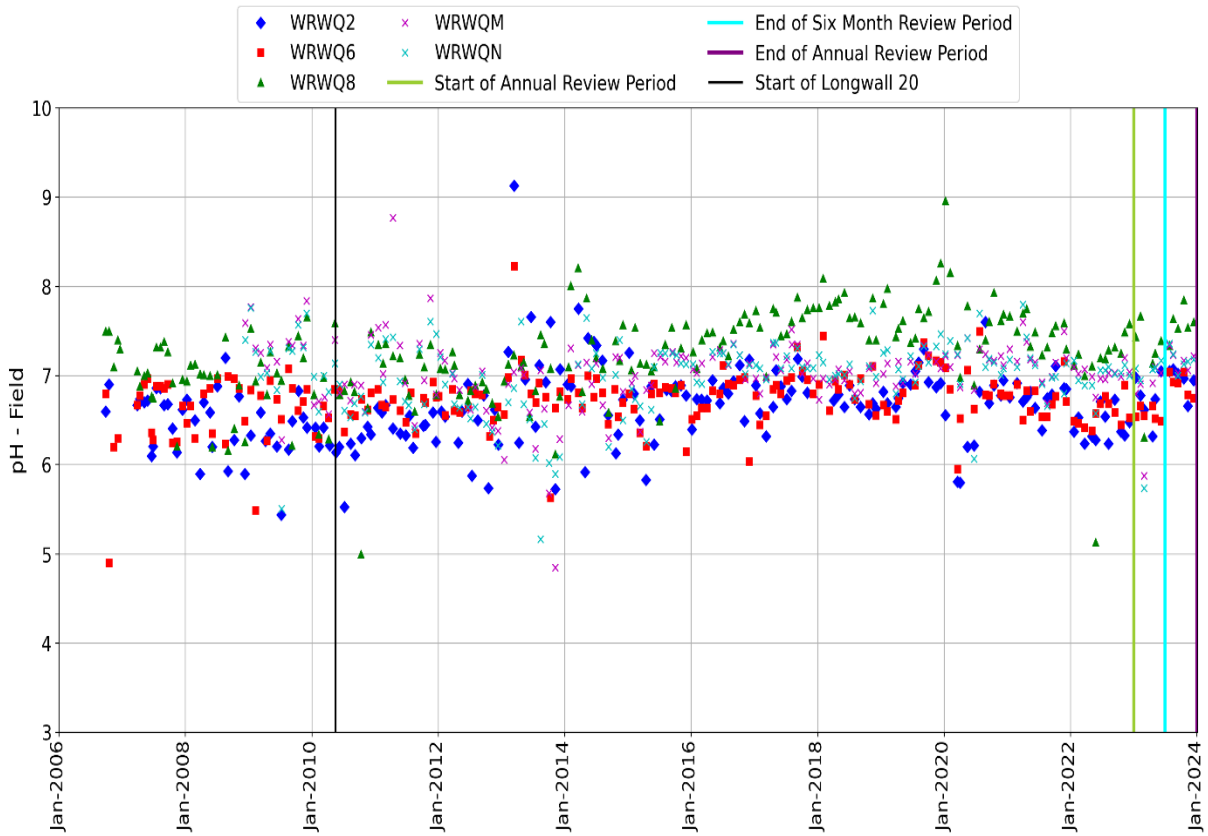
| Stream(s)   | pH  | EC  | Dissolved Iron   | Dissolved Manganese   | Dissolved Aluminium  |
|---|---|---|--|---|--|
| Waratah Rivulet<br>(sites WRWQ2, WRWQ6, WRWQ8, WRWQ9, WRWQM, WRWQN, WRWQP, WRWQR, WRWQT, WRWQU, WRWQV and WRWQW)<br>(Charts 13 to 22) | <ul style="list-style-type: none"> <li>Upstream to middle reach sites on Waratah Rivulet (sites WRWQ2, WRWQ6, WRWQ8, WRWQM and WRWQN) recorded generally circumneutral pH prior to July 2023, ranging from approximately 5.7 to 7.7. From July 2023 pH values increased slightly, ranging from approximately 6.7 to 7.85.</li> <li>Near neutral to slightly alkaline values recorded at lower reach sites (WRWQ T, WRWQ U, WRWQ V and WRWQ W).</li> <li>No historically high values were recorded during the reporting period.</li> </ul> | <ul style="list-style-type: none"> <li>All sites recorded values generally lower than historical values during the review period.</li> <li>Electrical conductivity at upper to middle reach sites were generally consistent over the review period while lower reach sites illustrate a generally decreasing trend from July to December 2023.</li> <li>No historically high values were recorded during the reporting period.</li> </ul> | <ul style="list-style-type: none"> <li>Concentrations at all lower reach sites increased between March to May 2023 and to a lesser extent in December 2023, however, concentrations remained below historical maxima.</li> <li>Concentrations at upper and middle reach sites were generally consistent for the duration of the review period and remained below 0.4 milligrams per litre (mg/L).</li> <li>Concentrations were within the range of historical values for all sites.</li> </ul> | <ul style="list-style-type: none"> <li>Concentrations at the upper and middle reach sites on the Waratah Rivulet were generally higher than those sites at the lower reach for the review period and were consistent with historical records.</li> <li>Concentrations at the lower reach sites generally increased between April and November 2023 with the exception of October 2023 results.</li> <li>Concentrations remained below the historical maxima.</li> </ul> | <ul style="list-style-type: none"> <li>Concentrations were generally consistent, with most records at or below the level of reporting (0.01 mg/L), with the exception of a slight increase in concentration recorded in April, May and December 2023 for lower reach sites.</li> </ul> |
| Woronora River<br>(sites WOWQ1 and WOWQ2, control stream)<br>(Charts 23 to 27)  | <ul style="list-style-type: none"> <li>Slightly acidic pH levels.</li> <li>pH levels at both sites were within the range of historical values.</li> </ul>   | <ul style="list-style-type: none"> <li>Values at WOWQ2 were generally higher than values recorded at WOWQ1.</li> <li>All sites were within the range of baseline conditions.</li> </ul>   | <ul style="list-style-type: none"> <li>Generally low and within the range of historical concentrations.</li> <li>Values at WOWQ1 were slightly elevated in March 2023.</li> </ul>  | <ul style="list-style-type: none"> <li>Consistent with historical values at WOWQ1.</li> <li>Slightly elevated at WOWQ2 during the review period.</li> </ul>   | <ul style="list-style-type: none"> <li>Concentrations recorded at WOWQ 2 were generally lower in comparison to WOWQ 1.</li> <li>Values within the range of historical concentrations.</li> </ul>   |

**Table 9 (Continued)**  
**Summary of Results for Key Water Quality Parameters During the Reporting Period**

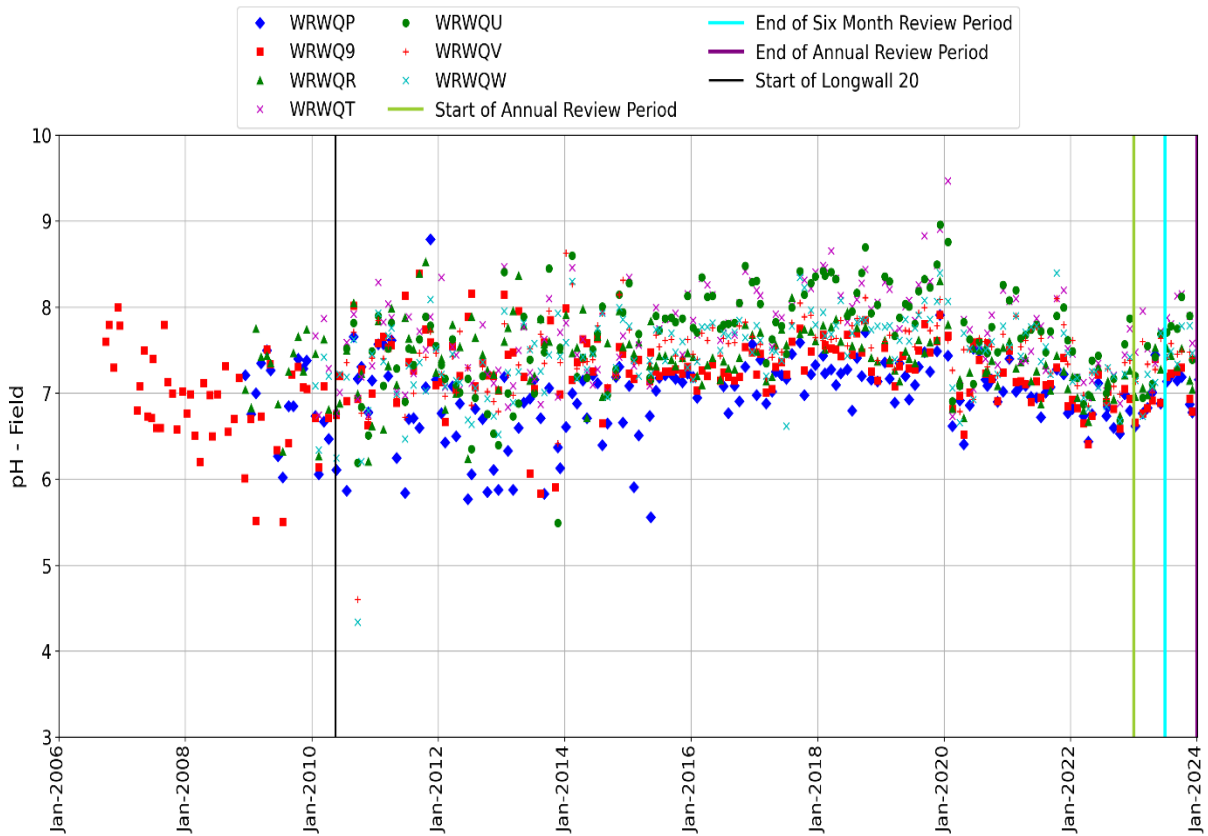
| Stream(s)   | pH   | EC  | Dissolved Iron  | Dissolved Manganese  | Dissolved Aluminium   |
|---|--|---|---|--|---|
| Eastern Tributary (sites ETWQF, ETWQJ, ETWQN, ETWQU, ETWQW, ETWQAF, ETWQAH, ETWQAQ and ETWQAU) <sup>1</sup> (Charts 28 to 32a)  | <ul style="list-style-type: none"> <li>Slightly acidic to near neutral conditions.</li> <li>Consistent with historical values.</li> </ul>  | <ul style="list-style-type: none"> <li>Elevated values were recorded at ETWQAF in April 2023, however, did not exceed the historical maximum.</li> <li>Values recorded during the reporting period were generally consistent with historical values.</li> </ul> | <ul style="list-style-type: none"> <li>Concentrations were generally at or below 1 mg/L during the review period for all sites except ETWQ AQ.</li> <li>At ETWQ AQ, recorded dissolved iron concentrations were variable and illustrate elevated results from June to December 2023, remaining below the historical maximum.</li> </ul> | <ul style="list-style-type: none"> <li>Values increased steadily between April and November 2023 at ETWQAU and ETWQAQ, however, did not exceed the historical maxima.</li> <li>Concentrations were within range of historical concentrations for the duration of the review period.</li> </ul> | <ul style="list-style-type: none"> <li>Concentrations were variable over the review period, however consistent with historical values.</li> </ul>   |
| Bee Creek (site BCWQ1, control stream), Honeysuckle Creek (site HCWQ1, control stream), Far Eastern Tributary (site FEWQ1), Tributary B (site RTWQ1) and Tributary D (site UTWQ1) (Charts 33 to 37) | <ul style="list-style-type: none"> <li>Bee Creek and Honeysuckle Creek had slightly acidic to acidic pH levels.</li> <li>Far Eastern Tributary and Tributary D generally had circumneutral pH levels.</li> <li>Tributary B had near neutral to slightly alkaline pH levels.</li> <li>Overall, the pH levels were consistent with historical values.</li> </ul> | <ul style="list-style-type: none"> <li>The values recorded during the reporting period were consistent with historical values.</li> </ul>   | <ul style="list-style-type: none"> <li>Concentrations were consistent with historical concentrations for all sites, however, concentrations at HCWQ 1 and UTWQ 1 increased in June and December 2023, and an elevated concentration was recorded for BCWQ 1 in December (whilst remaining below the historical maxima).</li> </ul>      | <ul style="list-style-type: none"> <li>Concentrations recorded during the review period were consistent with historical values.</li> </ul>   | <ul style="list-style-type: none"> <li>Concentrations were higher at BCWQ 1 and HCWQ 1 in comparison to the other sites but remained quite consistent during the review period and below historical maxima.</li> <li>Concentrations for RTWQ 1, UTWQ 1 and FEWQ 1 were below 0.1 mg/L for the duration of the review period.</li> </ul> |

**Table 9 (Continued)**  
**Summary of Results for Key Water Quality Parameters During the Reporting Period**

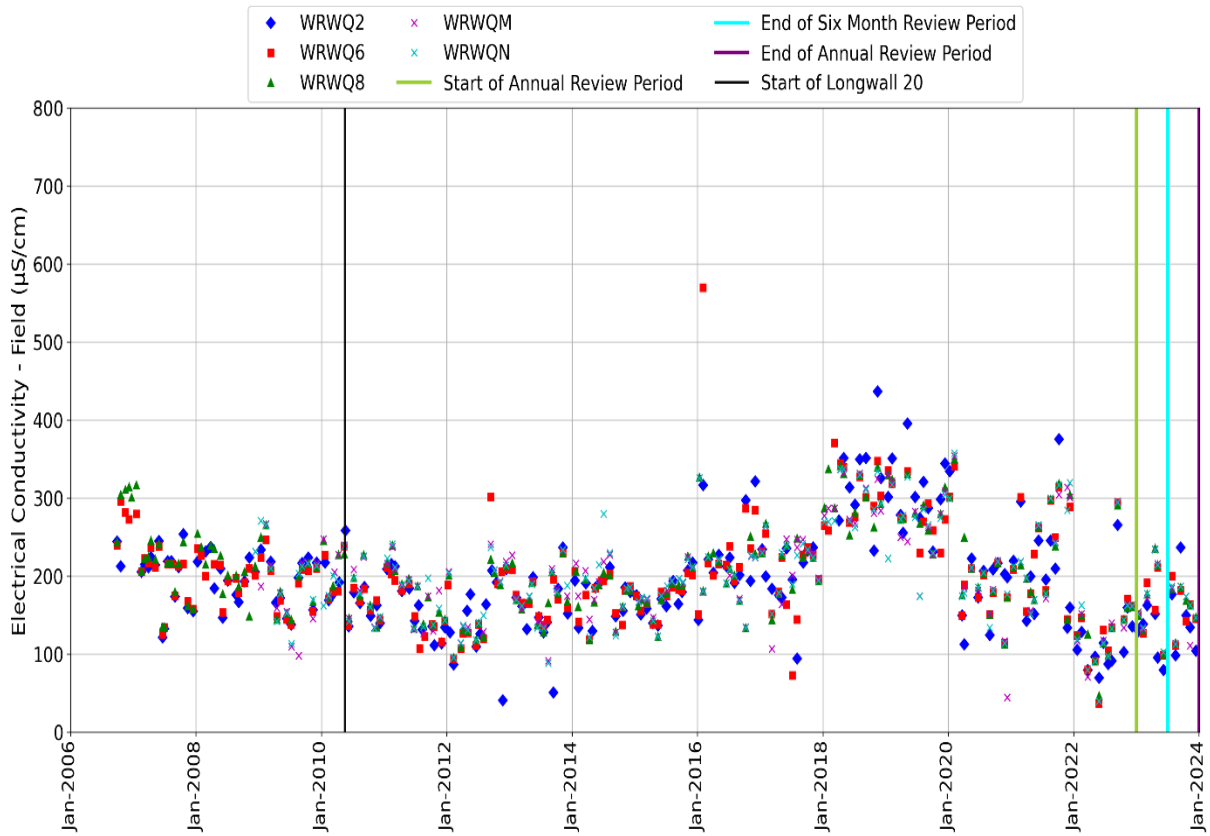
| Stream(s)   | pH  | EC   | Dissolved Iron  | Dissolved Manganese  | Dissolved Aluminium   |
|---|---|--|---|--|---|
| Western Tributaries of Waratah Rivulet (sites SP1, SR1 and SR2) | <ul style="list-style-type: none"> <li>Acidic pH levels were recorded at sites SP1, SR1 and SR2, ranging between pH levels of 4.5 and 5.8.</li> </ul> | <ul style="list-style-type: none"> <li>Values at all sites were generally higher between May and July 2023.</li> </ul> | <ul style="list-style-type: none"> <li>A historical maximum was recorded for dissolved iron concentrations at SR1 and SR2 in March 2023, with concentrations of 0.12 and 0.1 mg/L, respectively.</li> <li>A historical maximum for dissolved iron concentration of 0.5 mg/L was recorded in March 2023 at SP1.</li> </ul> | <ul style="list-style-type: none"> <li>Historical maxima were recorded for dissolved manganese at all sites in December 2023, with concentrations of 0.073 mg/L at SR1 and SR2 and 0.094 mg/L at SP1.</li> </ul> | <ul style="list-style-type: none"> <li>A historical maximum of 0.15 mg/L was recorded for SR2 in April 2023.</li> </ul> |



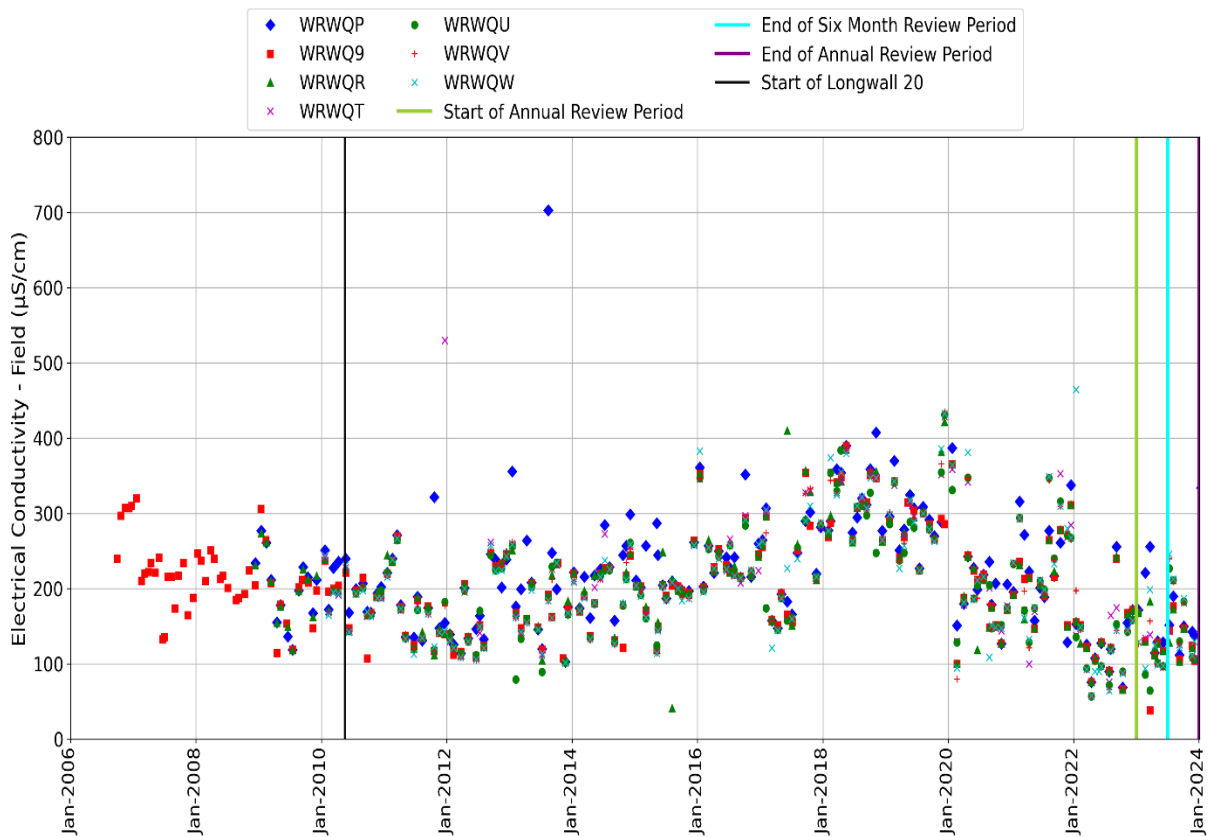
**Chart 13 pH Levels Waratah Rivulet – Upper to Middle Reach Sites**



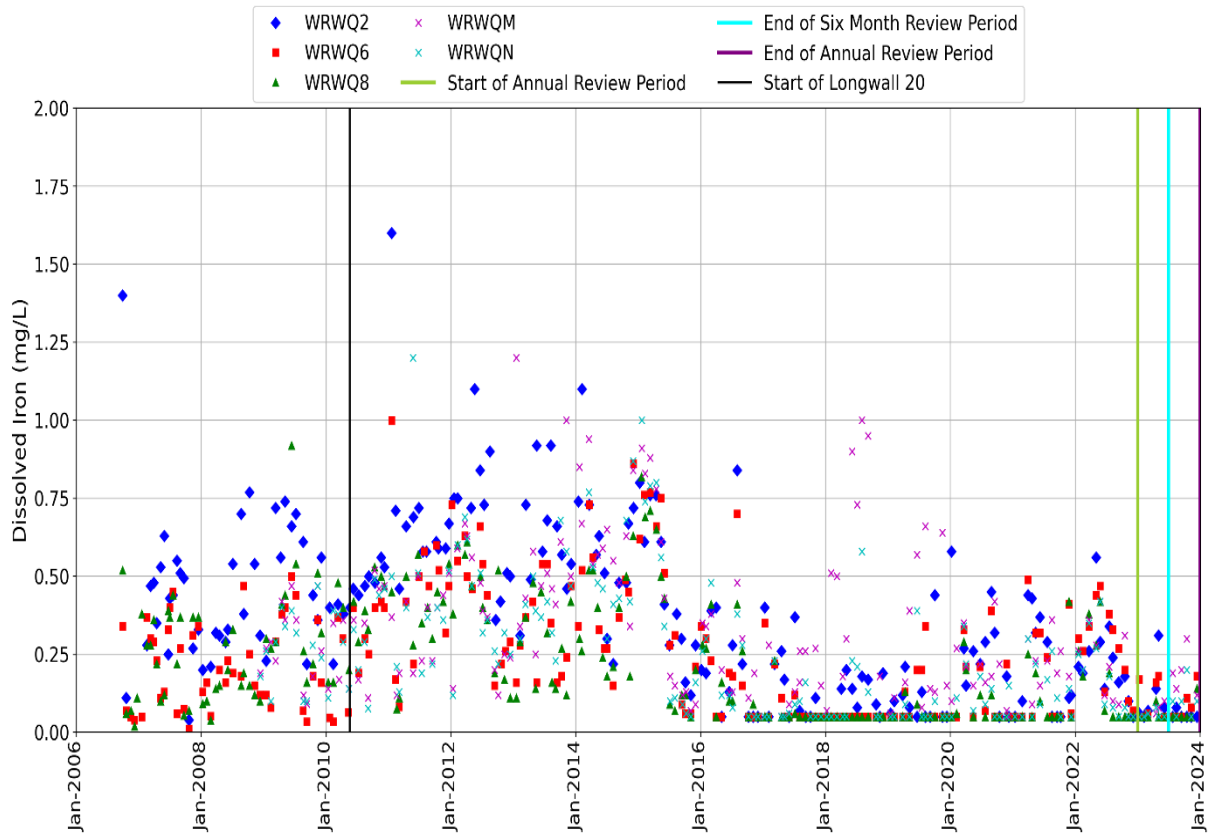
**Chart 14 pH Levels Waratah Rivulet – Lower Reach Sites**



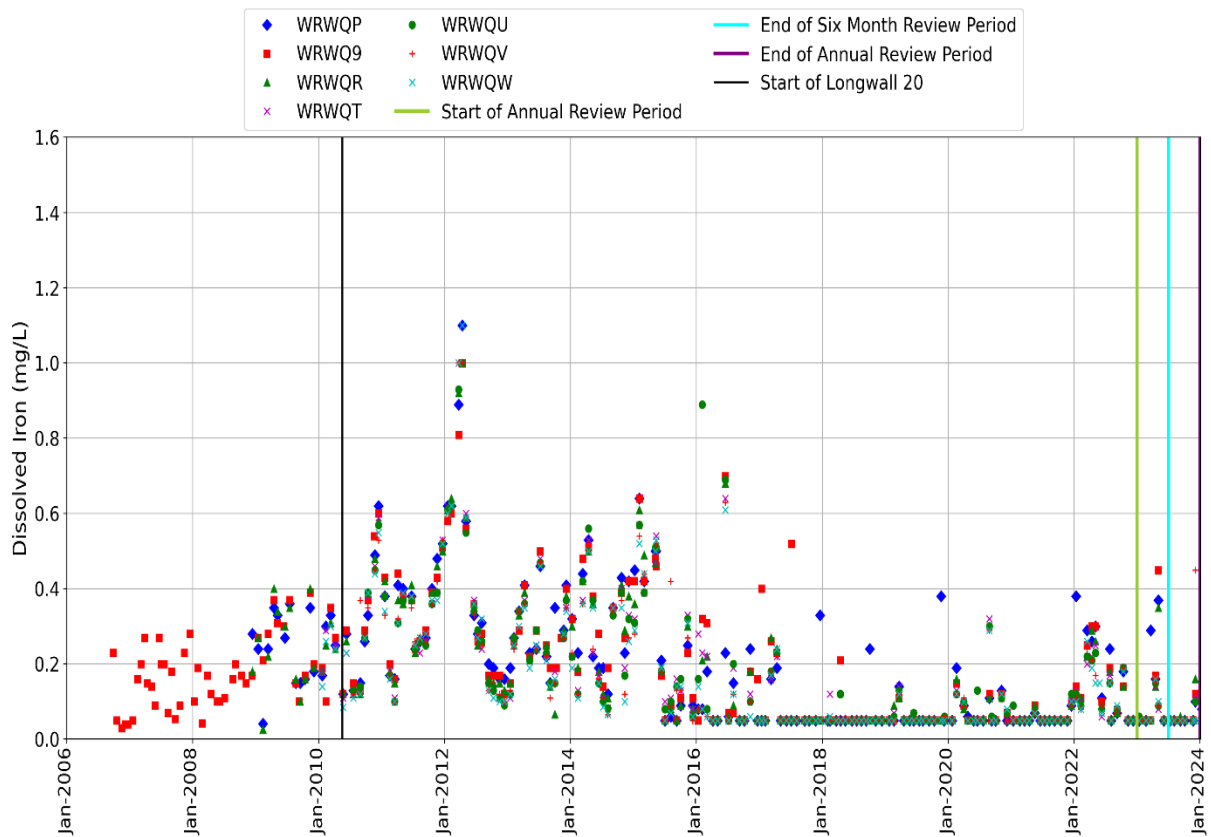
**Chart 15 EC Waratah Rivulet – Upper to Middle Reach Sites**



**Chart 16 EC Waratah Rivulet – Lower Reach Sites**

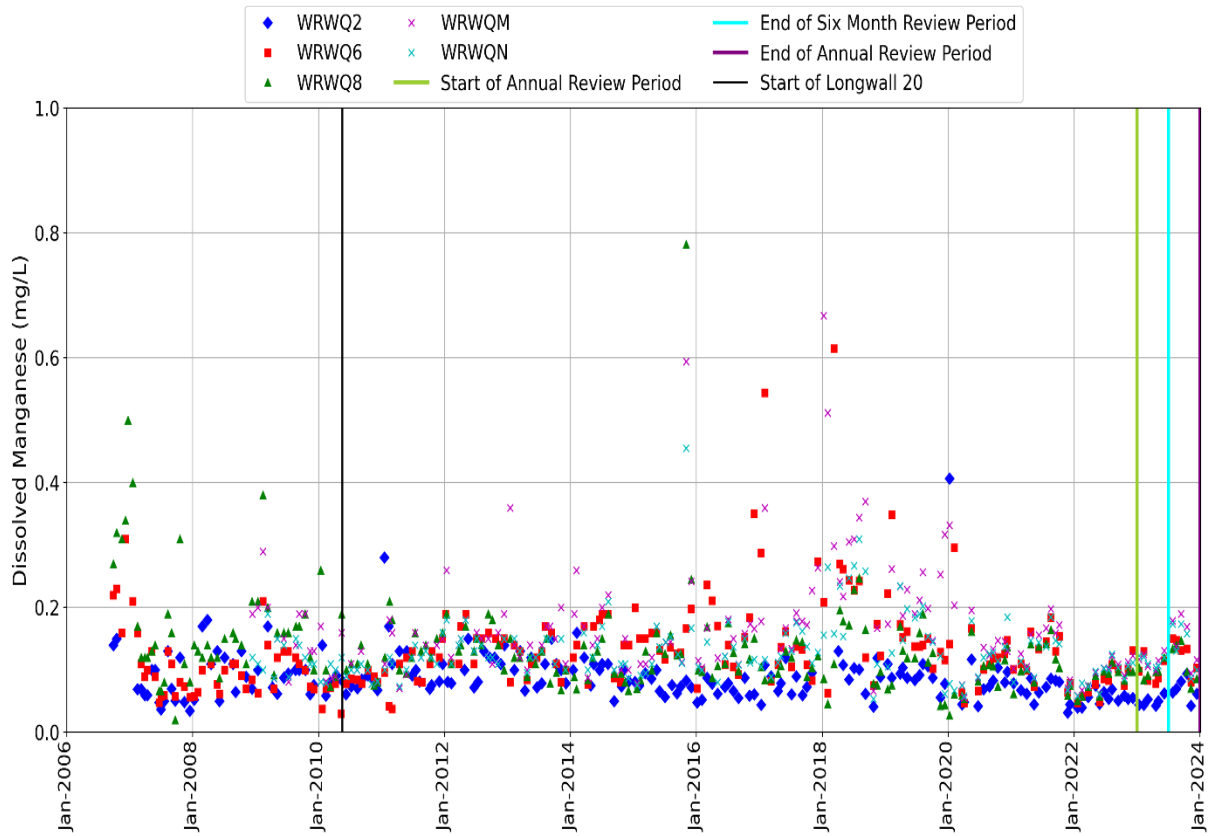


**Chart 17 Dissolved Iron Waratah Rivulet – Upper and Middle Reach Sites**

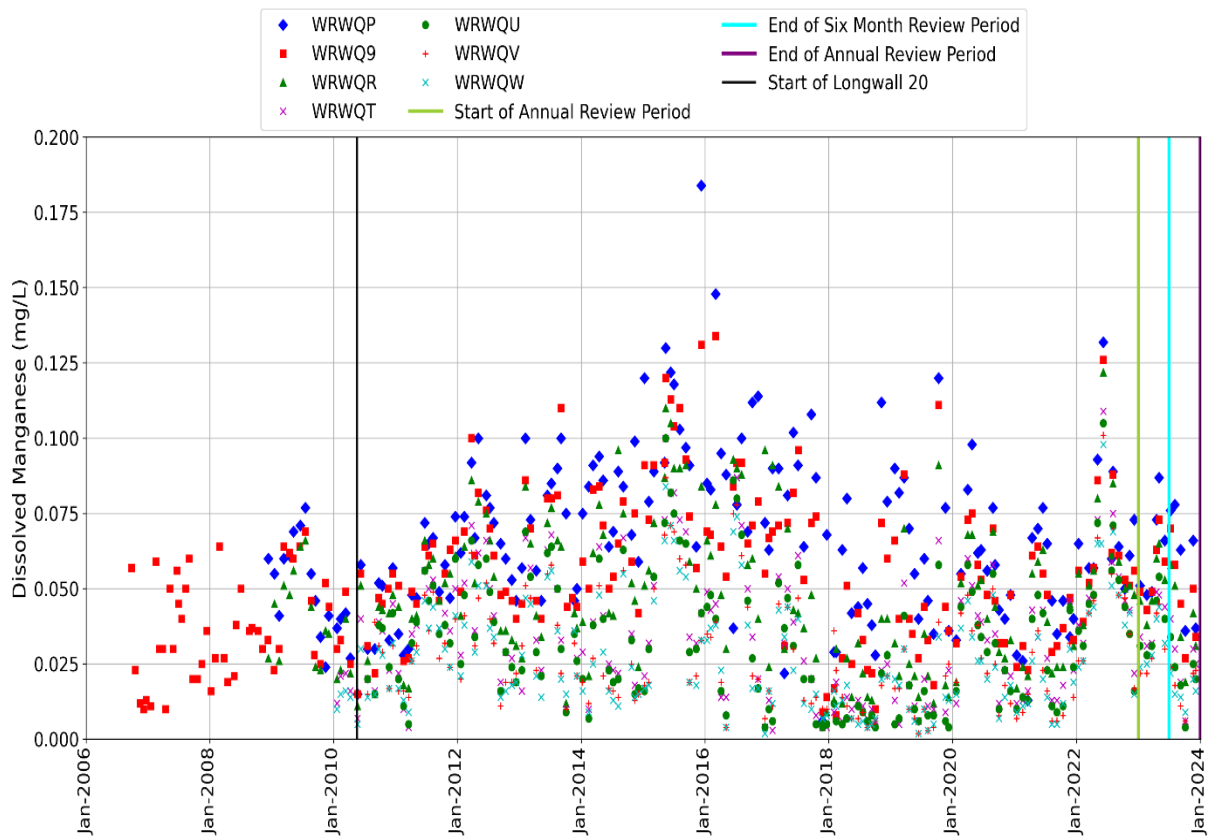


**Chart 18 Dissolved Iron Waratah Rivulet – Lower Reach Sites**

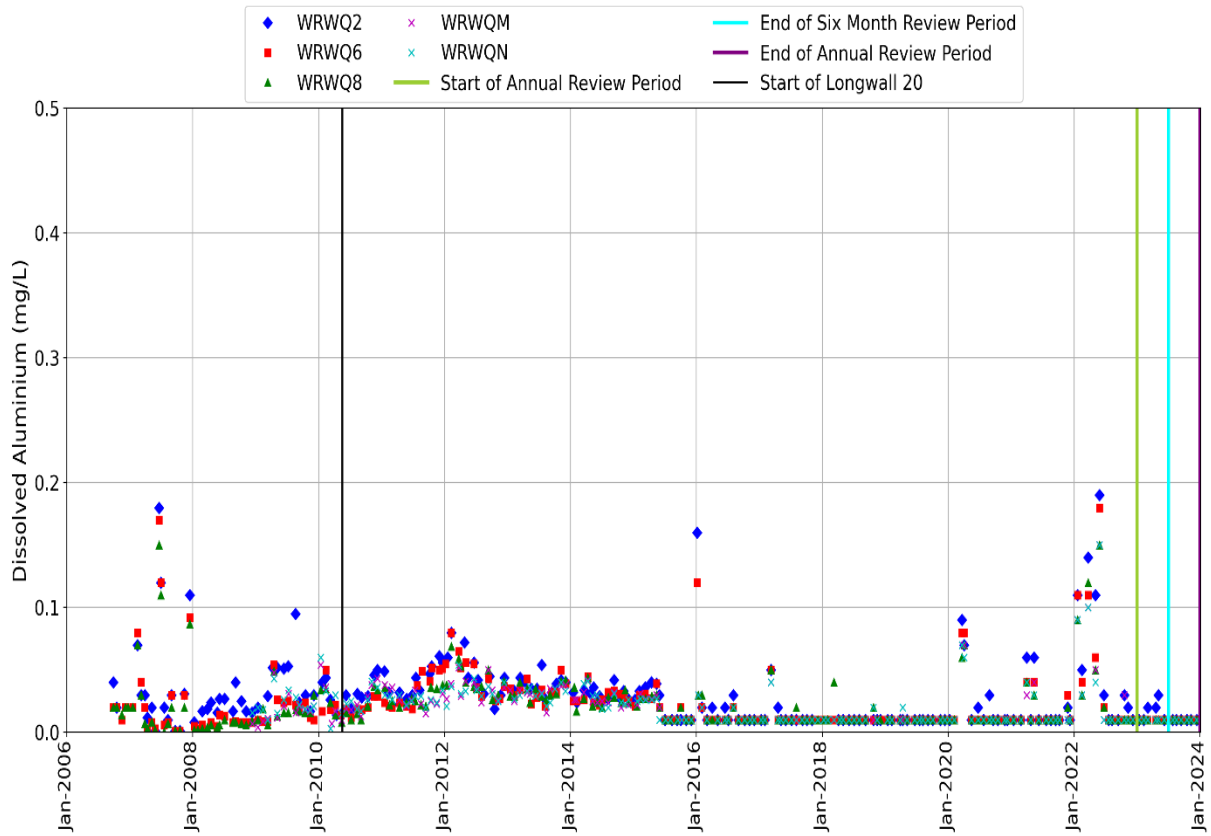




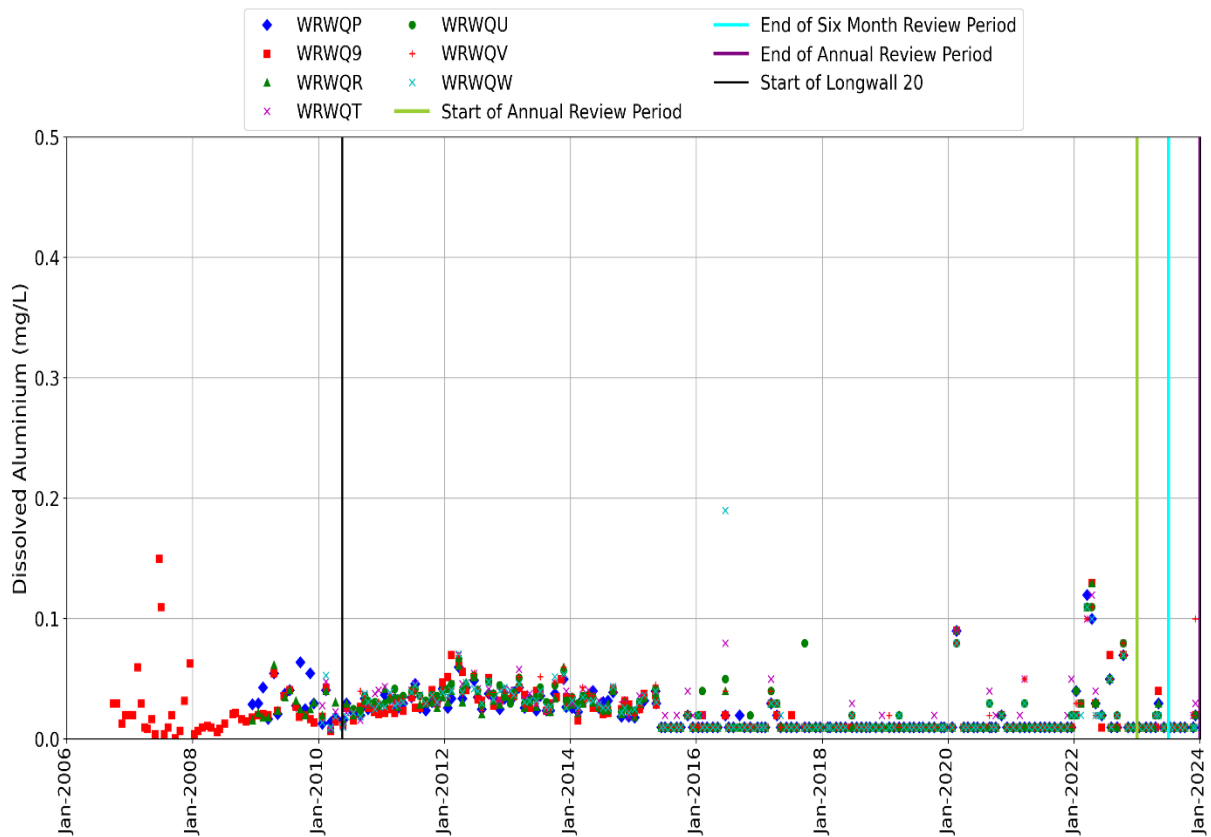
**Chart 19 Dissolved Manganese Waratah Rivulet – Upper to Middle Reach Sites**



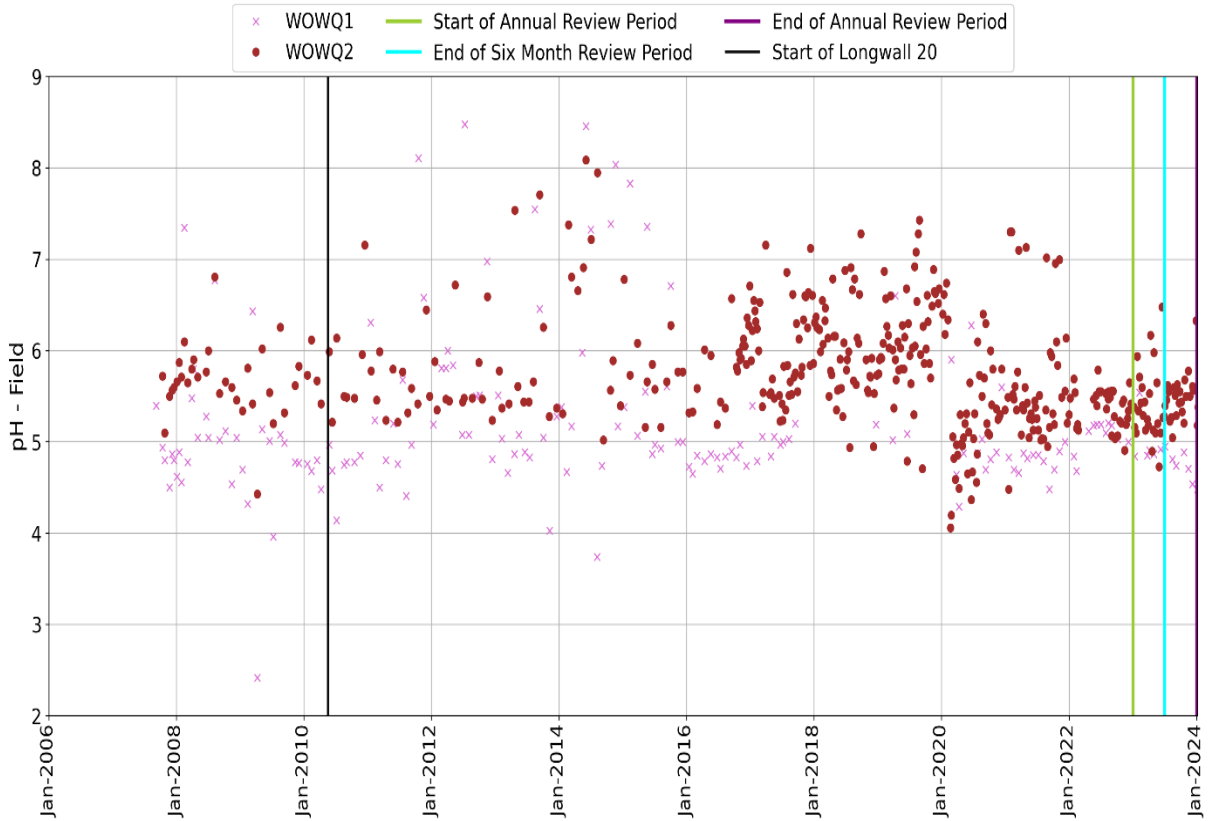
**Chart 20 Dissolved Manganese Waratah Rivulet – Lower Reach Sites**



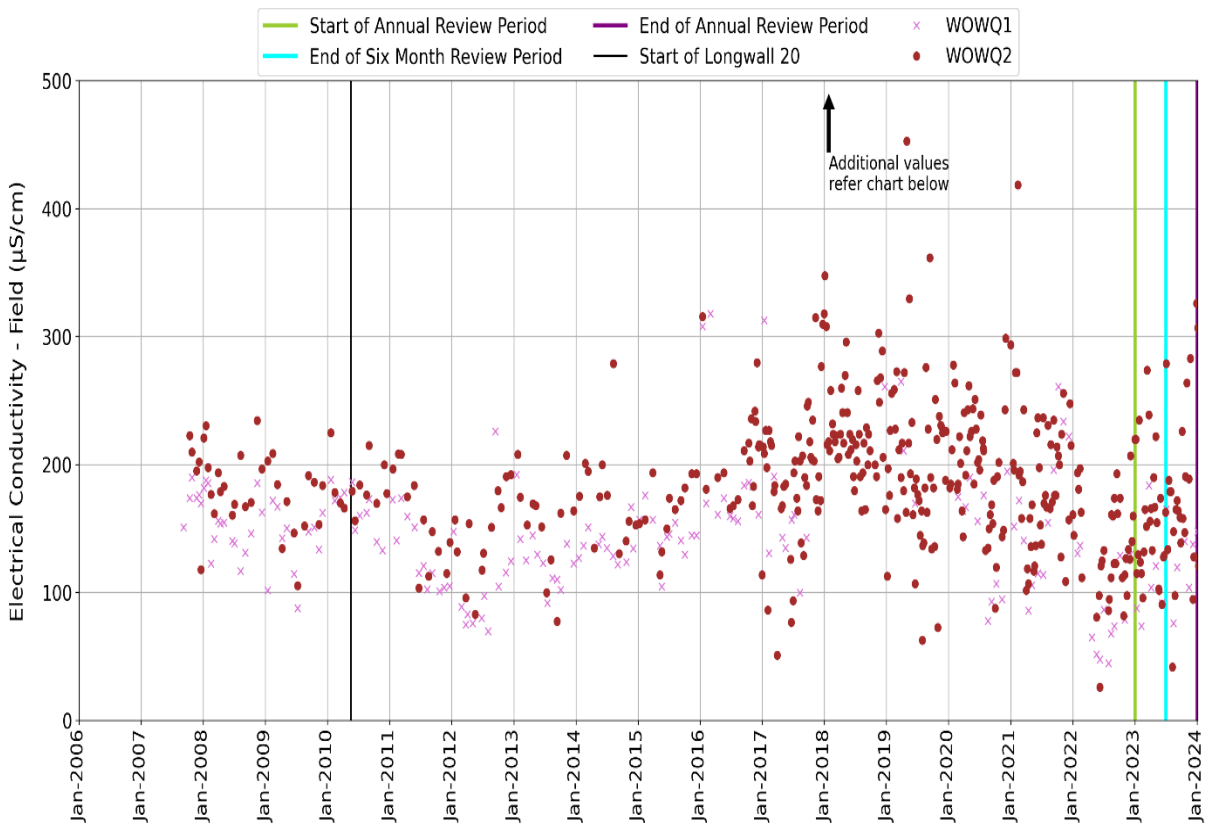
**Chart 21 Dissolved Aluminium Waratah Rivulet – Upper to Middle Reach Sites**



**Chart 22 Dissolved Aluminium Waratah Rivulet – Lower Reach Sites**

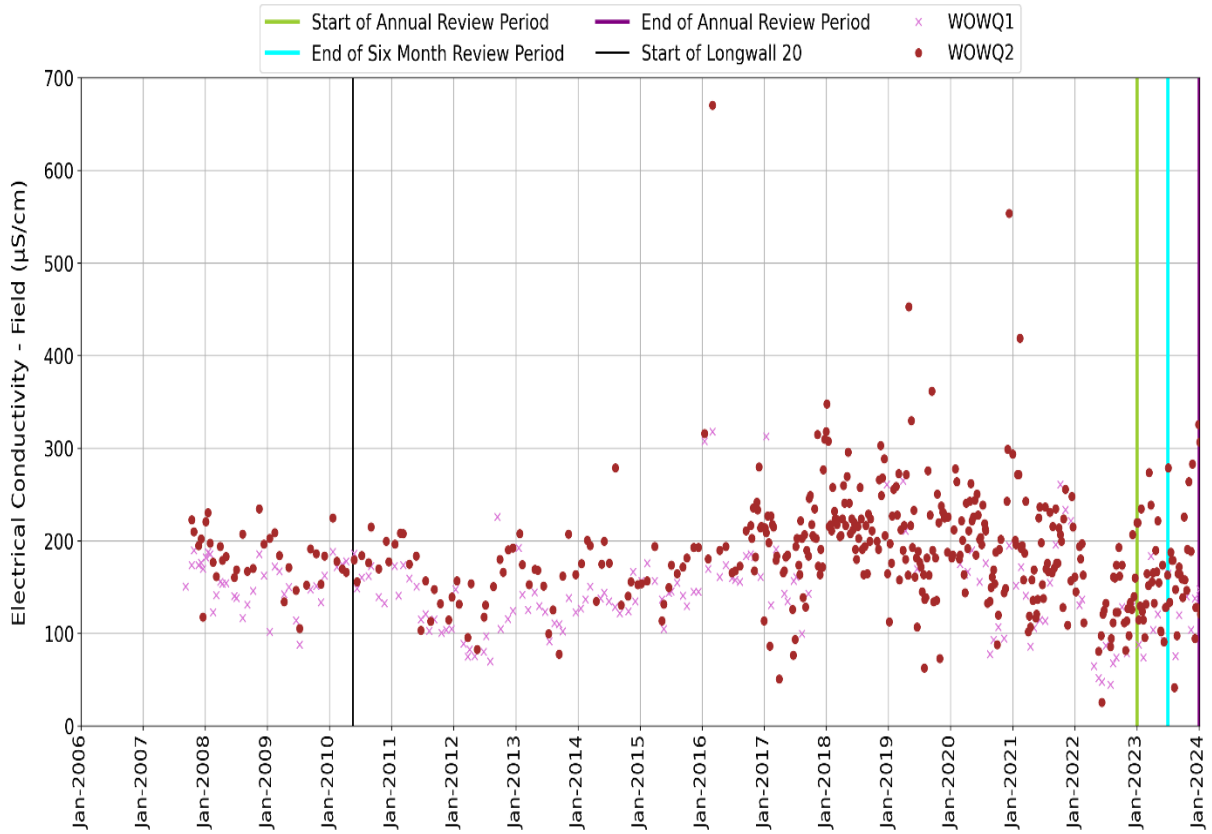


**Chart 23 pH Levels Woronora River<sup>5</sup>**

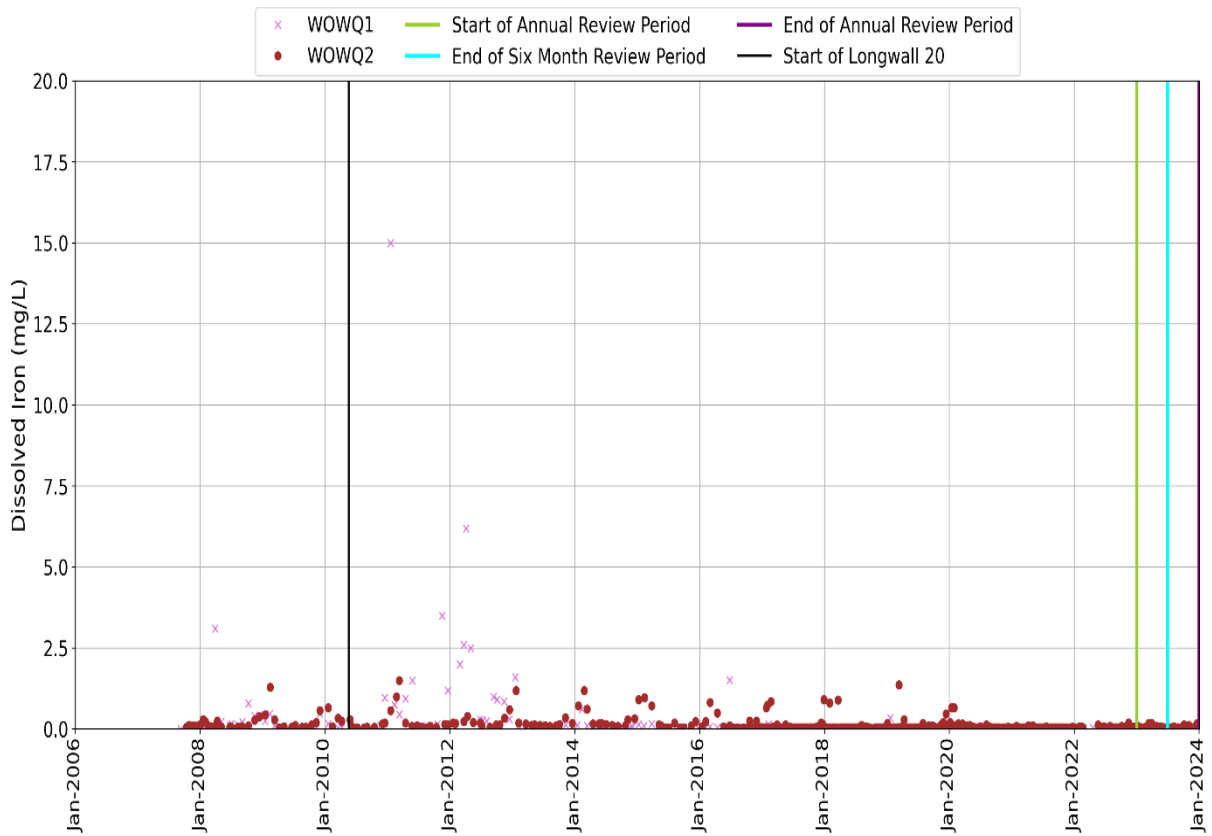


**Chart 24 EC Woronora River**

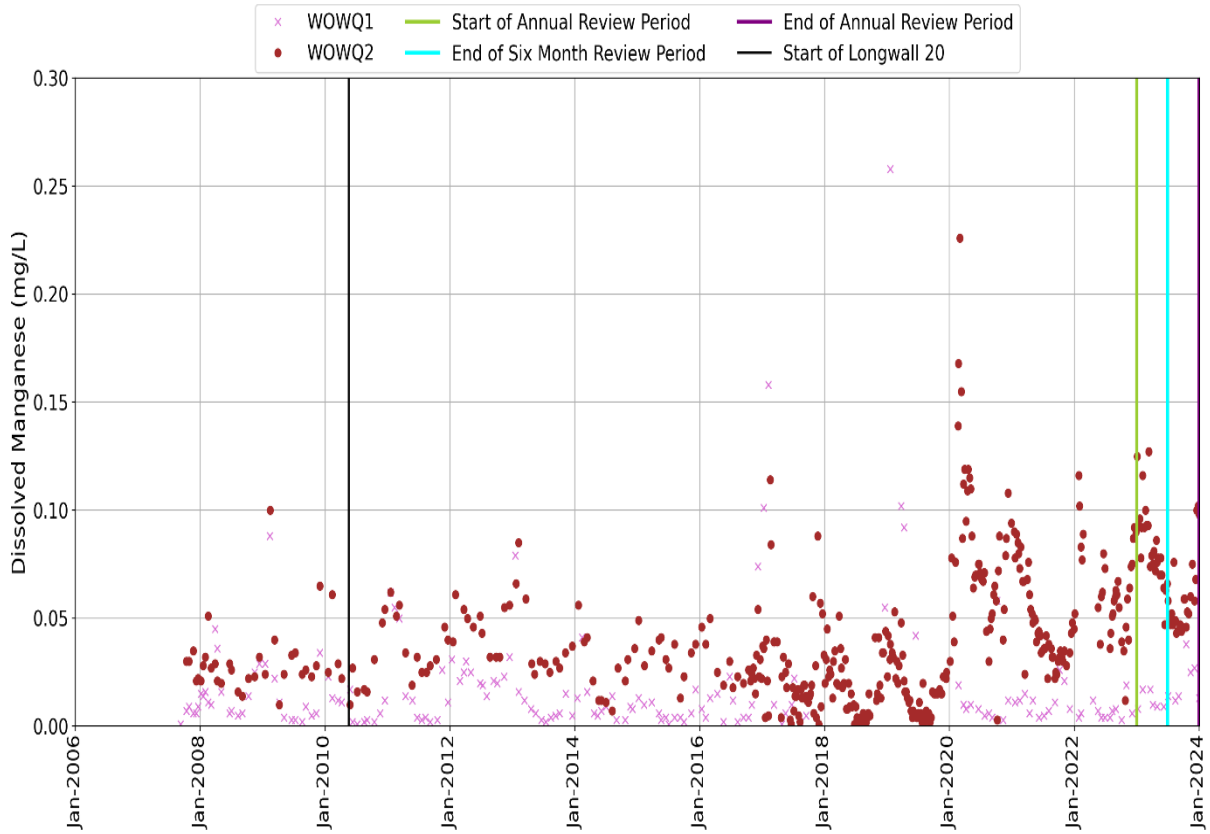
<sup>5</sup> WOWQ1 was dry between 23 October 2017 and 20 December 2018, in May 2019 and between 3 July 2019 and 12 December 2019 and hence no water quality samples were collected.



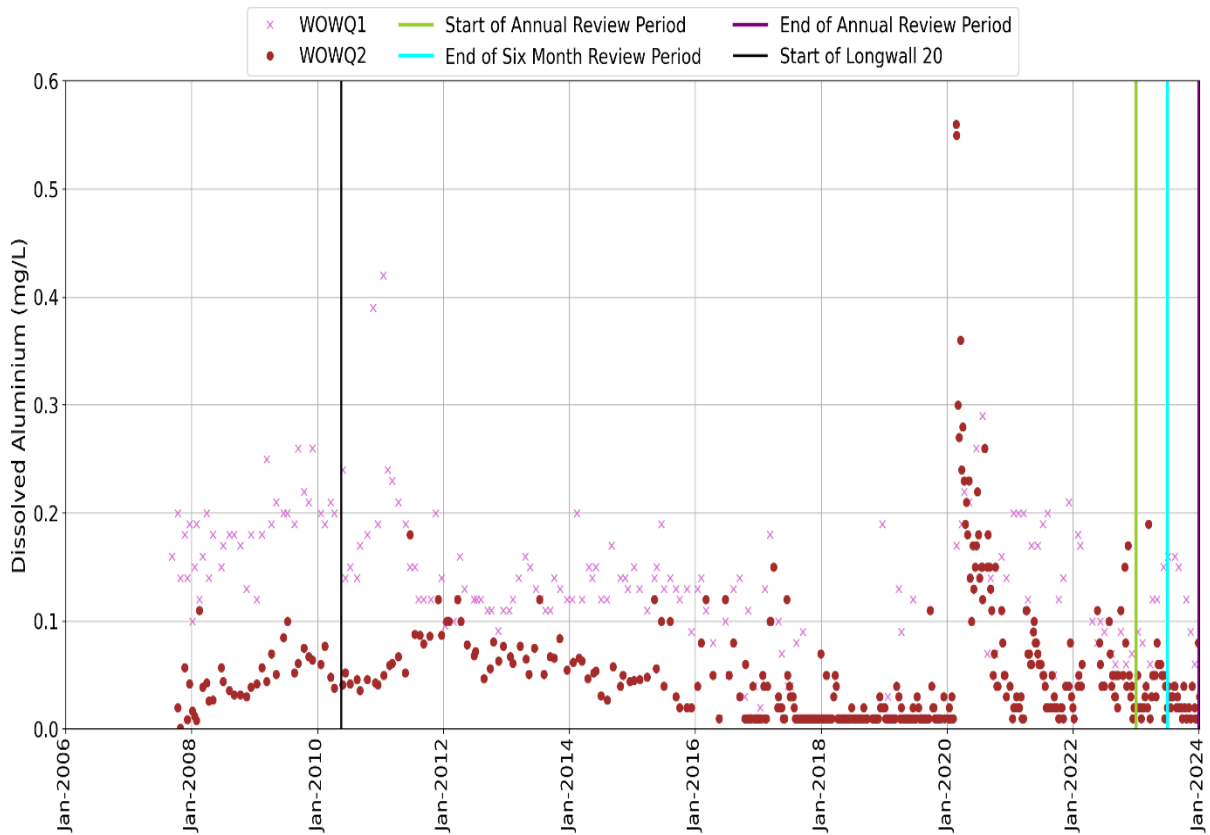
**Chart 24a EC Woronora River**



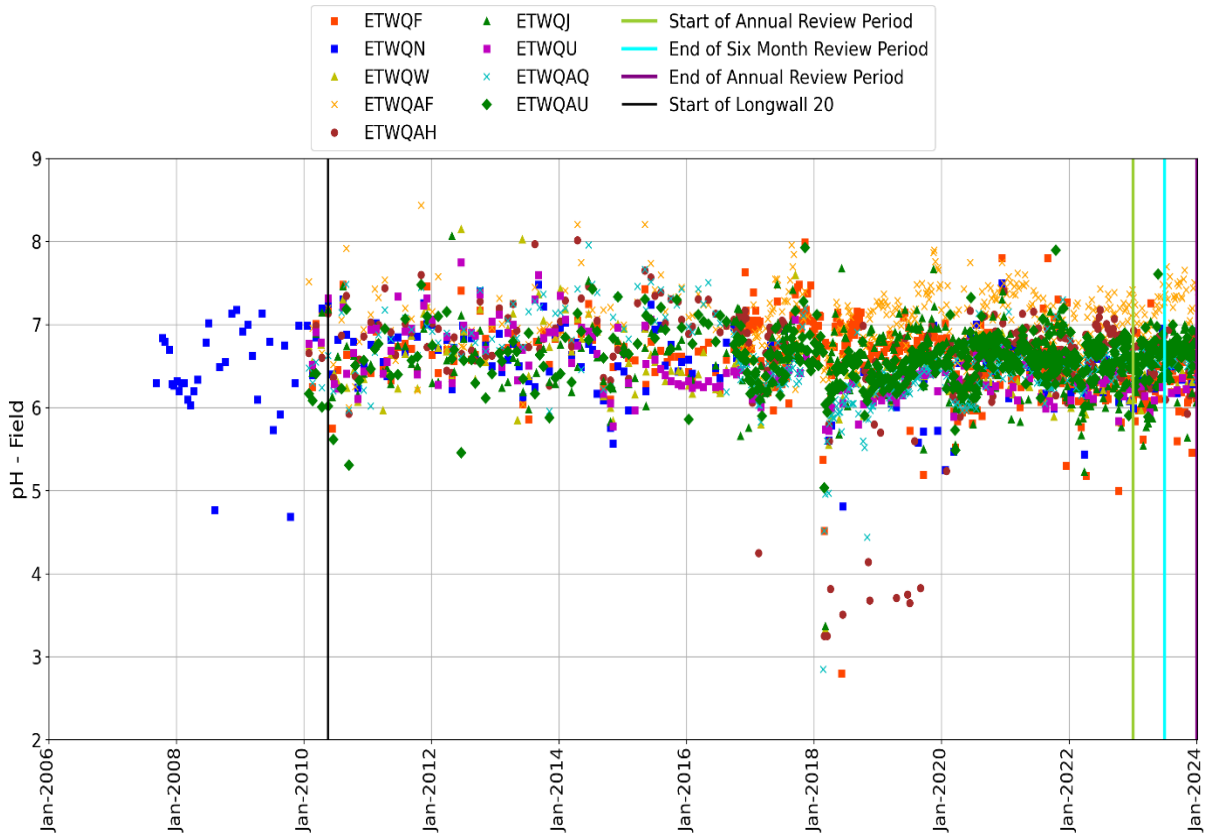
**Chart 25 Dissolved Iron Woronora River**



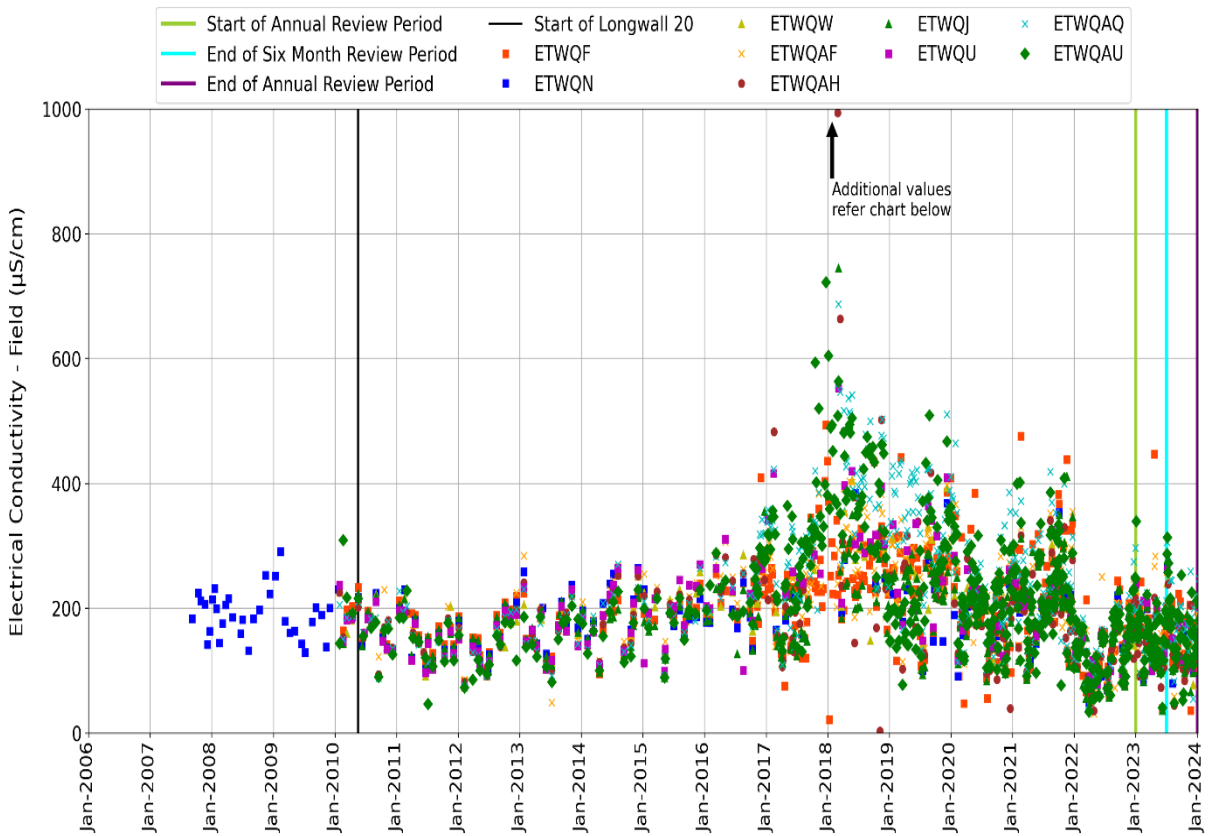
**Chart 26 Dissolved Manganese Woronora River**



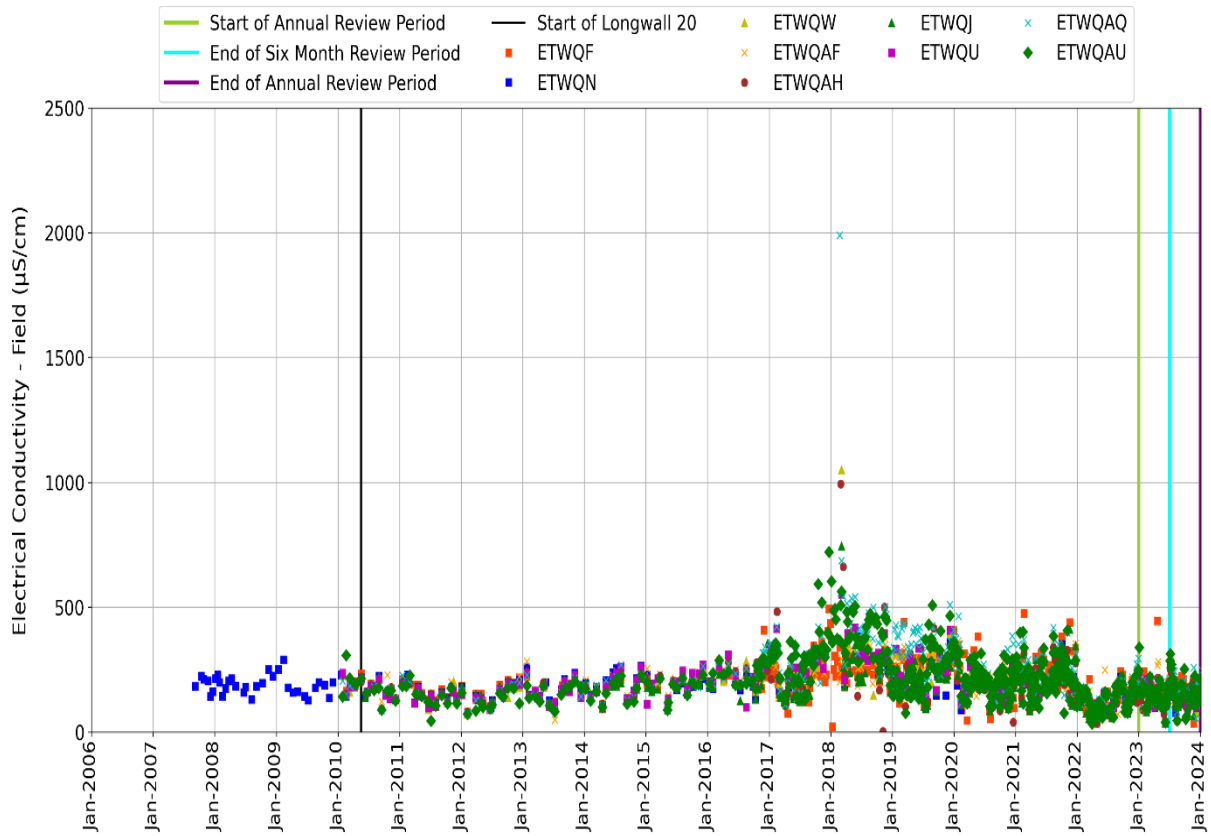
**Chart 27 Dissolved Aluminium Woronora River**



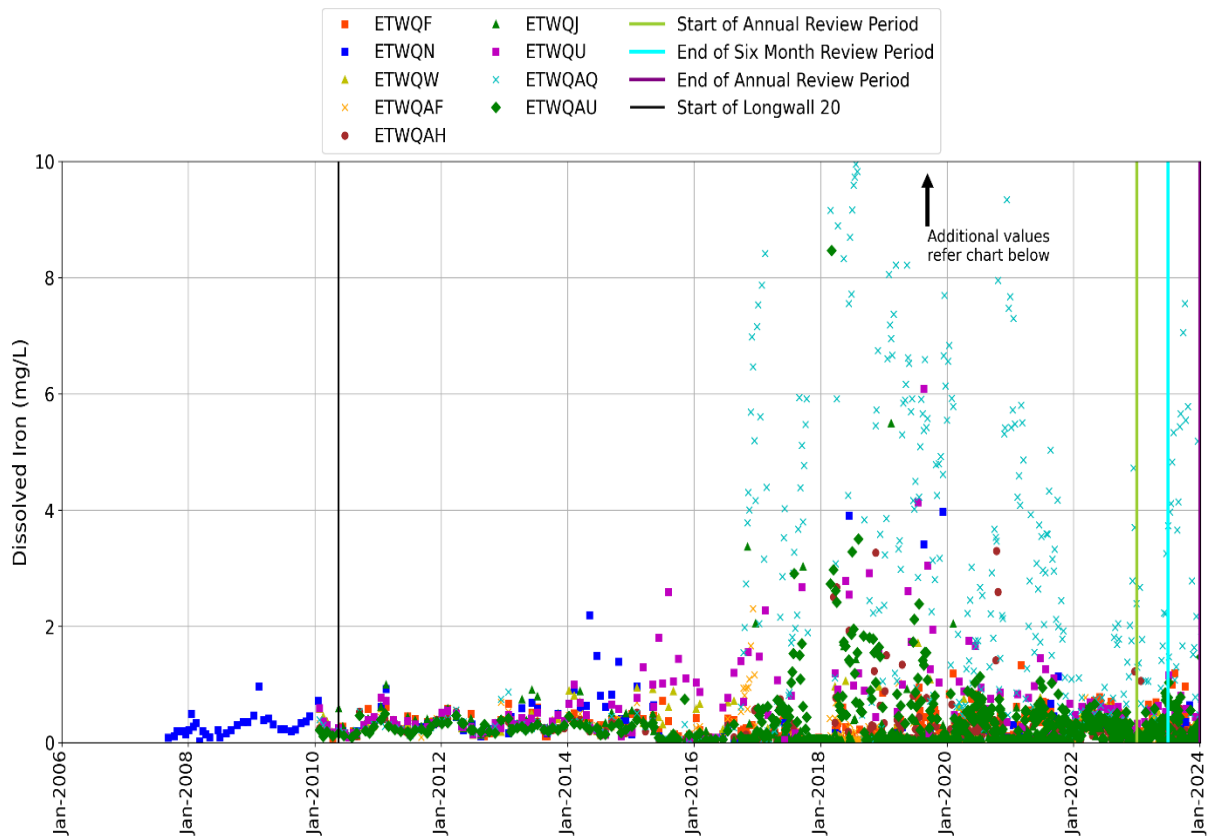
**Chart 28 pH Levels Eastern Tributary**



**Chart 29 EC Eastern Tributary**



**Chart 29a EC Eastern Tributary**



**Chart 30 Dissolved Iron Eastern Tributary**

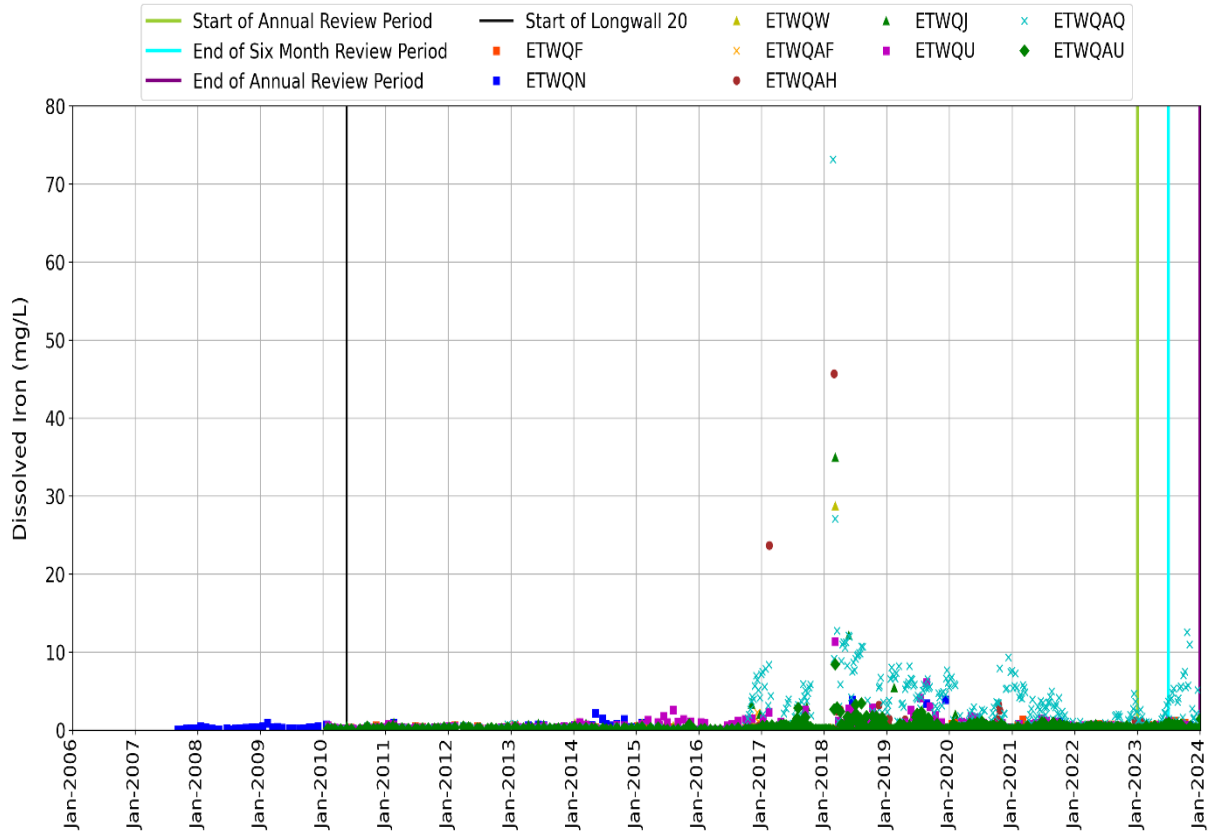


Chart 30a Dissolved Iron Eastern Tributary

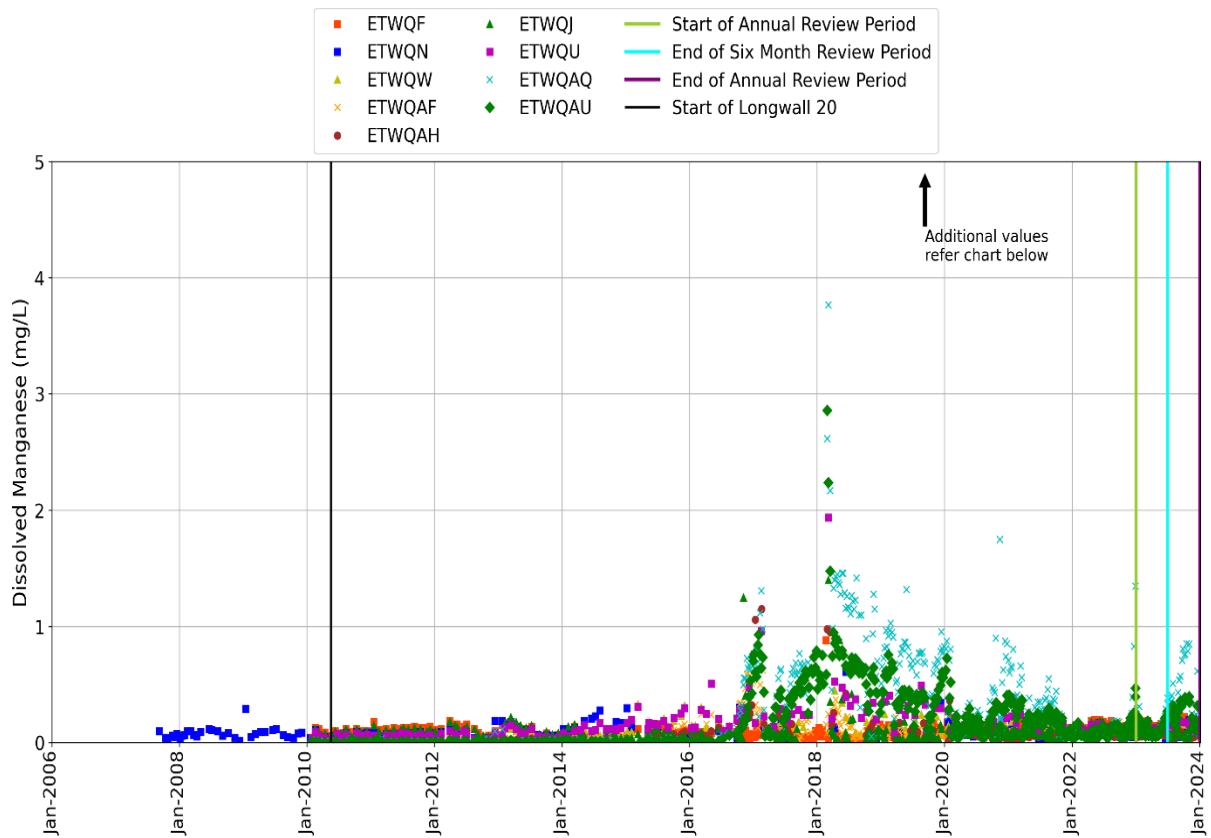


Chart 31 Dissolved Manganese Eastern Tributary



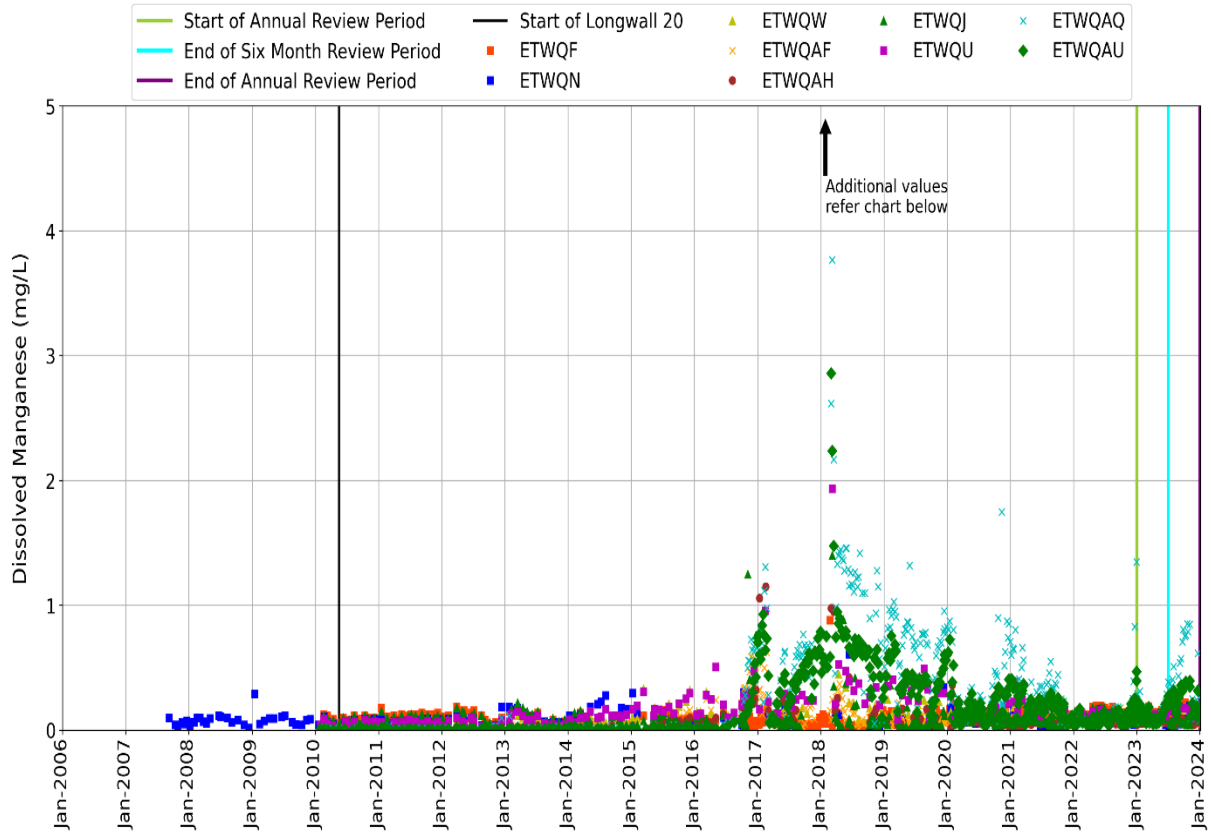


Chart 31a Dissolved Manganese Eastern Tributary

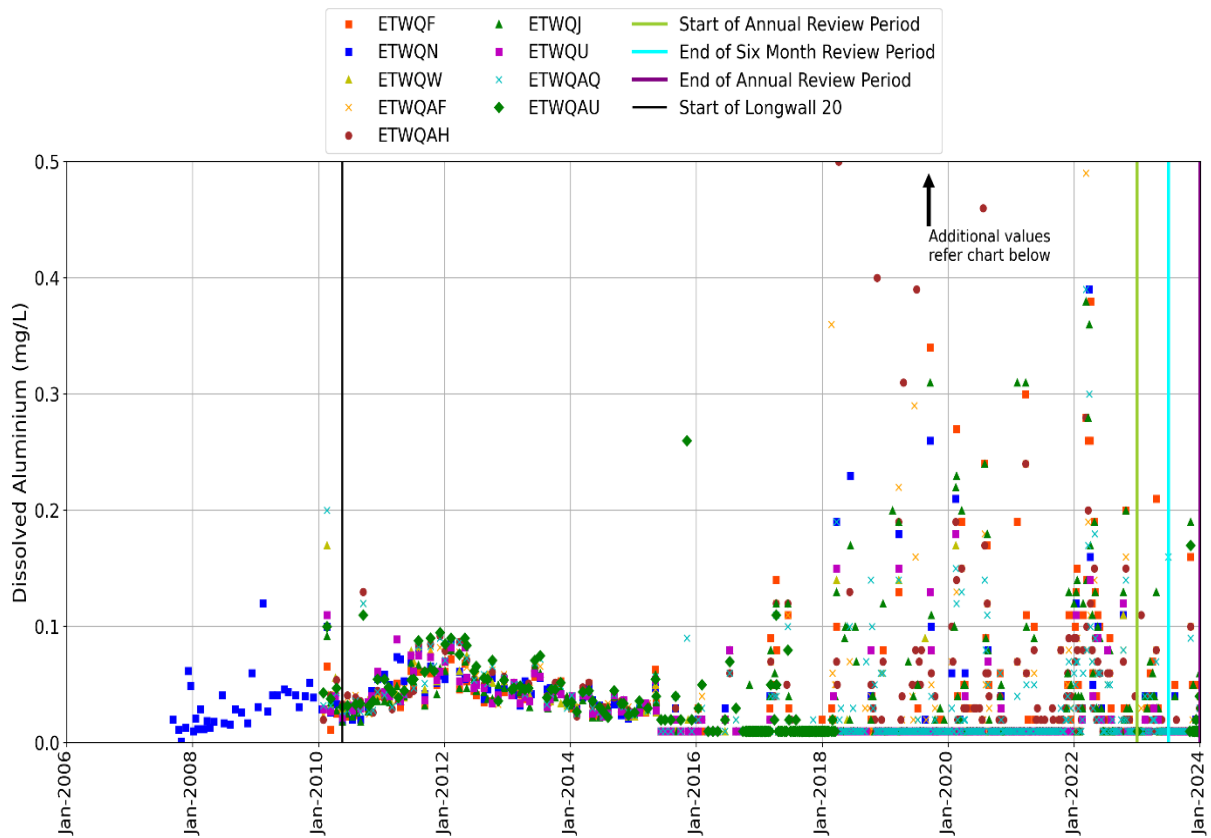
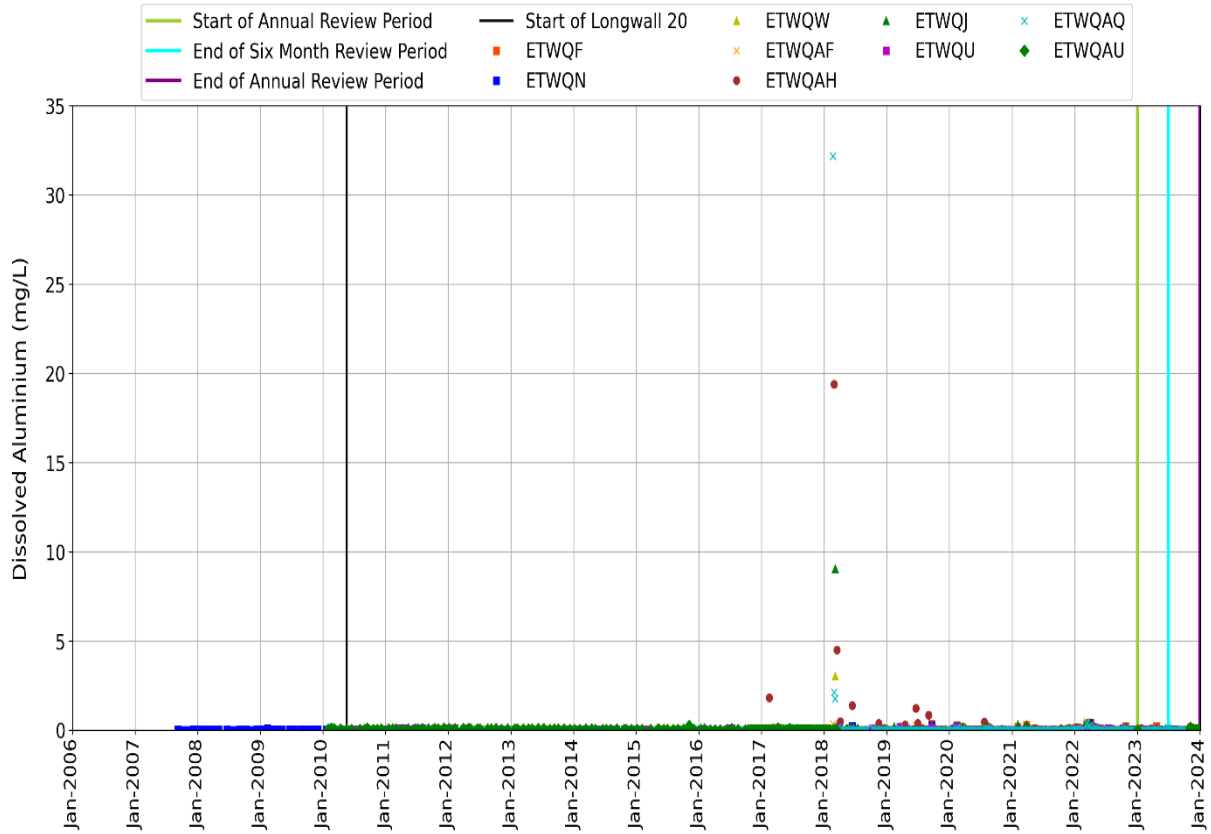
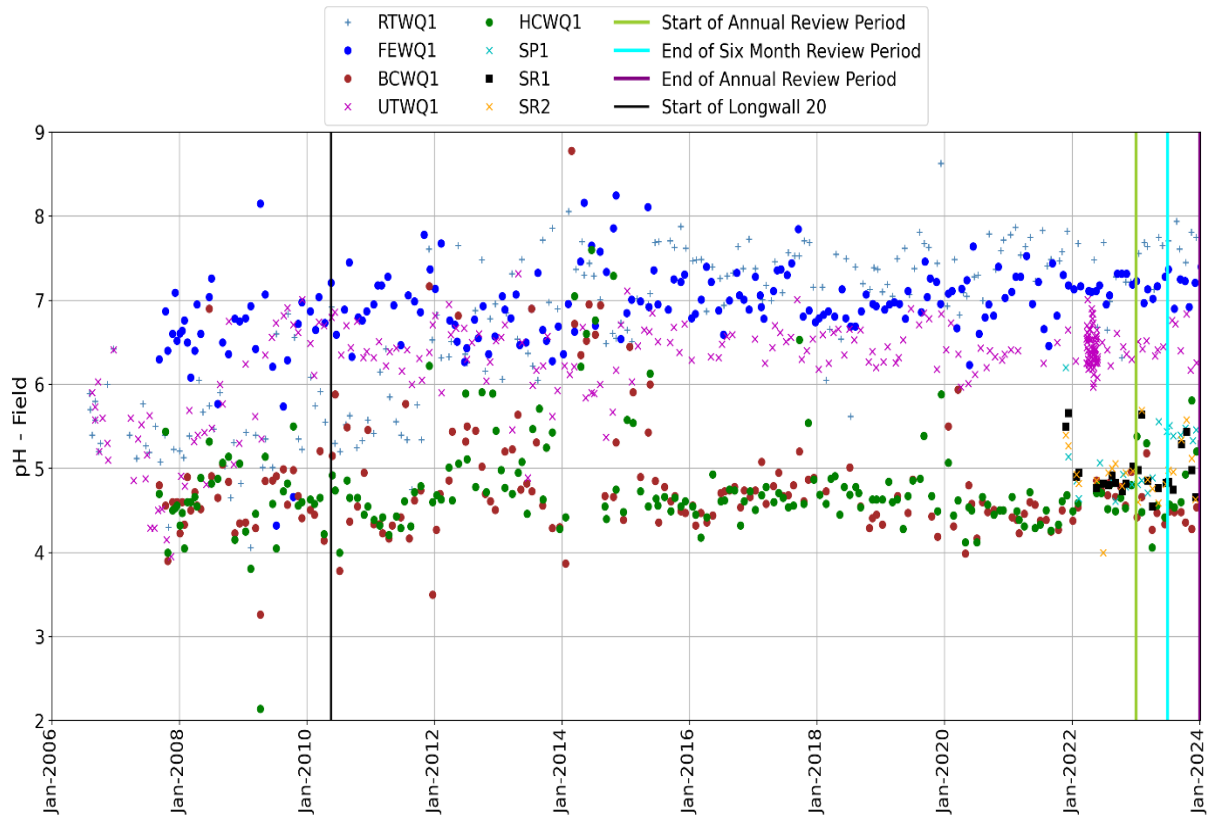


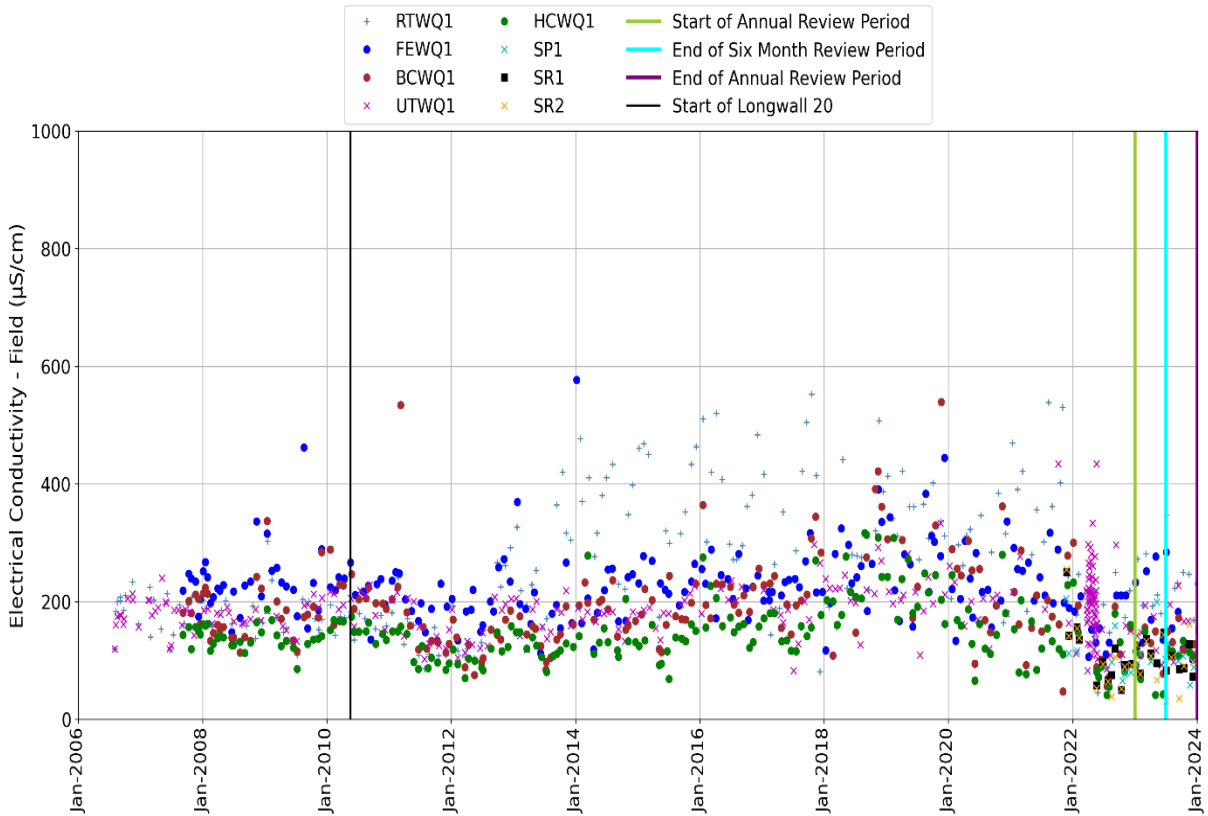
Chart 32 Dissolved Aluminium Eastern Tributary



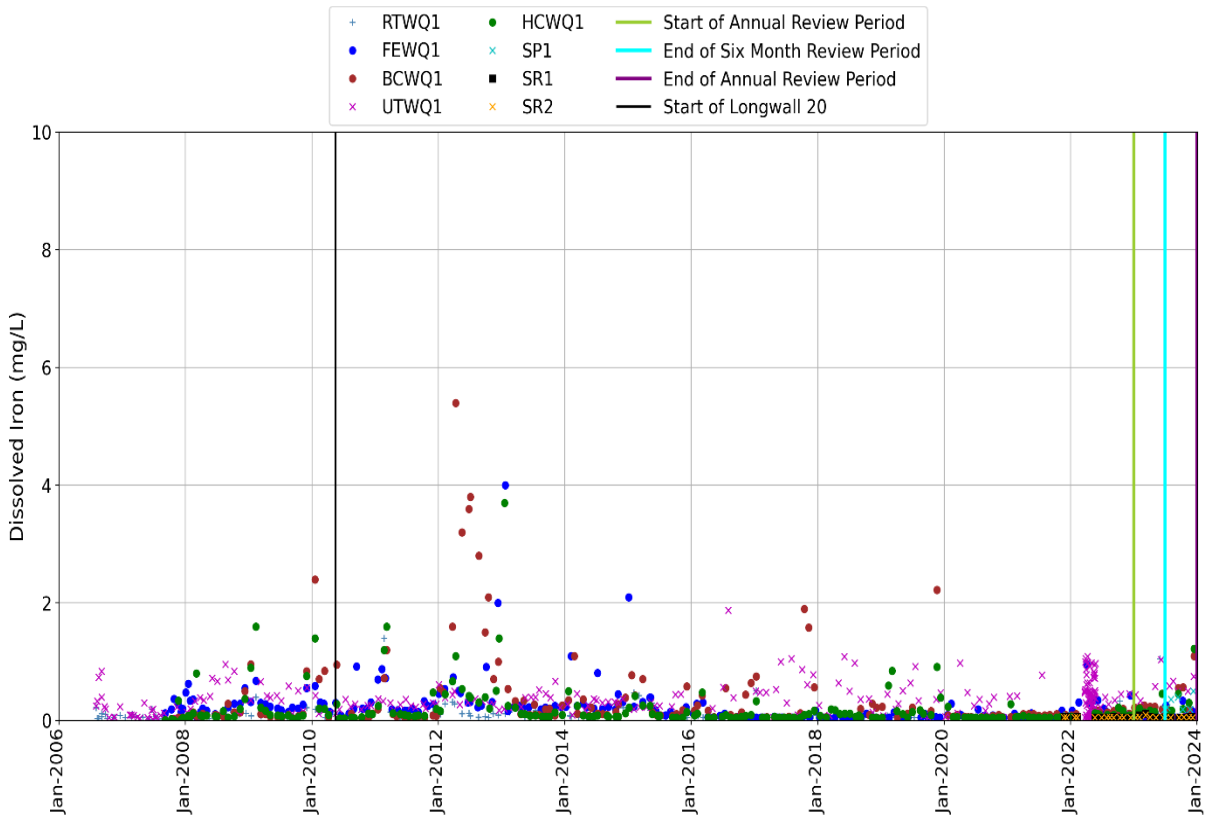
**Chart 32a Dissolved Aluminium Eastern Tributary**



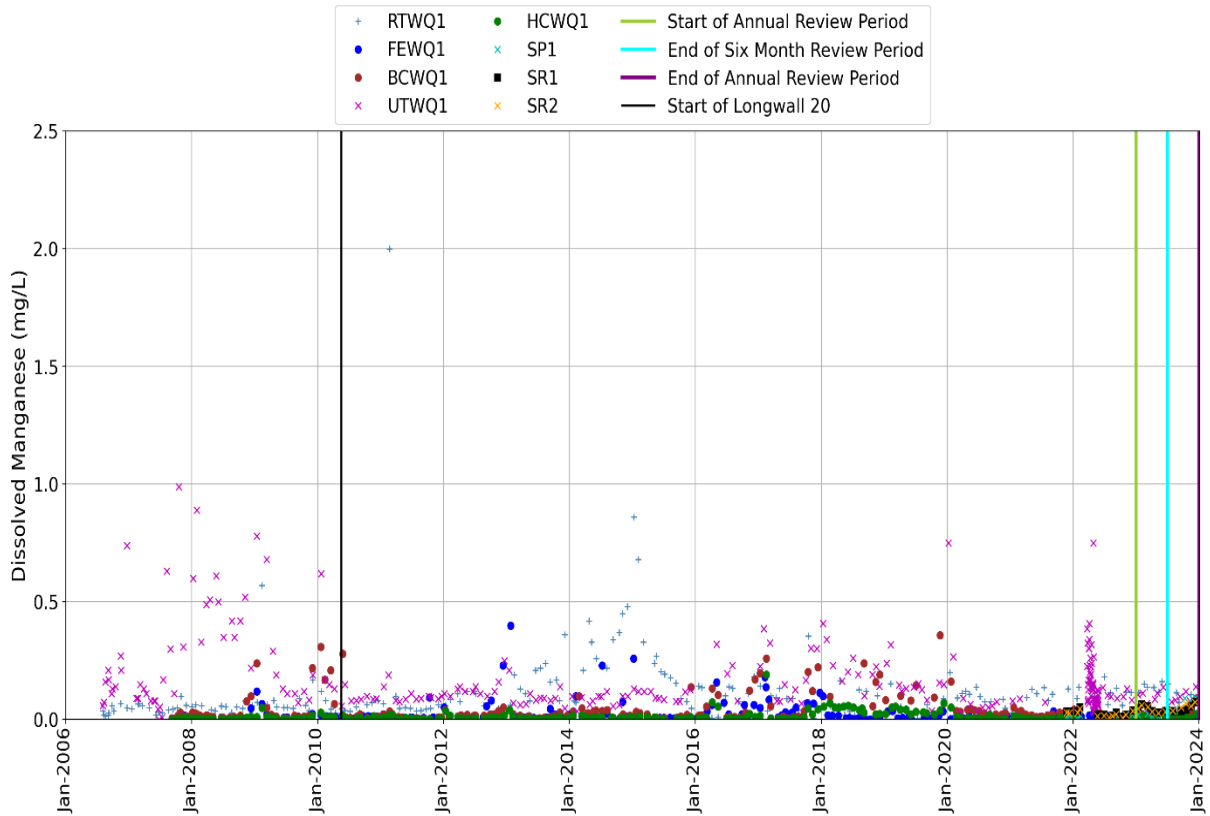
**Chart 33 pH Levels Tributary B, Tributary D, Far Eastern Tributary, Bee Creek and Honeysuckle Creek**



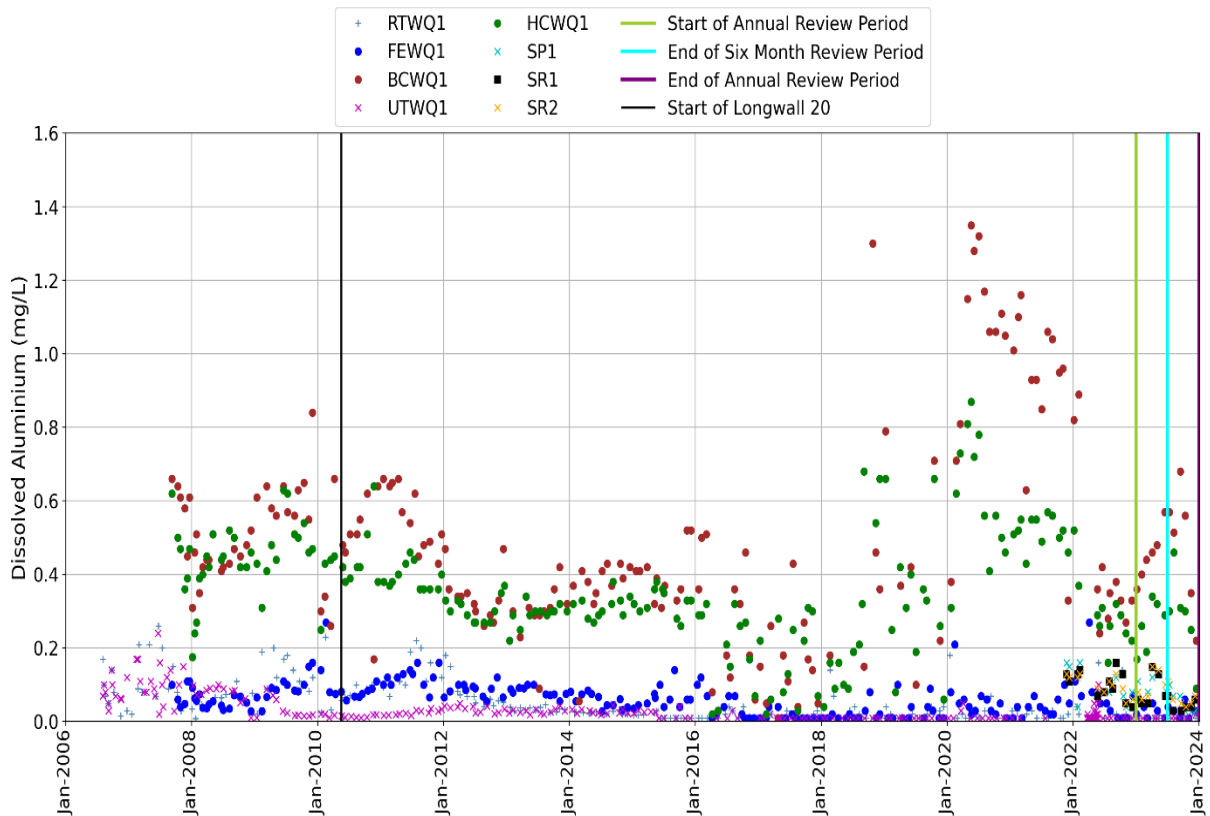
**Chart 34 EC Tributary B, Tributary D, Far Eastern Tributary, Bee Creek and Honeysuckle Creek**



**Chart 35 Dissolved Iron Tributary B, Tributary D, Far Eastern Tributary, Bee Creek and Honeysuckle Creek**



**Chart 36 Dissolved Manganese Tributary B, Tributary D, Far Eastern Tributary, Bee Creek and Honeysuckle Creek**



**Chart 37 Dissolved Aluminium Tributary B, Tributary D, Far Eastern Tributary, Bee Creek and Honeysuckle Creek**

**Assessment of Water Quality at Site WRWQ9**

There were no exceedances of the adjusted baseline mean plus two standard deviations for dissolved iron at site WRWQ9 on the Waratah Rivulet during the reporting period. The result equates to a Level 1 significance level for dissolved iron from January to December 2023 (Appendices B1 and B2).

There were no exceedances of the adjusted baseline mean plus two standard deviations for dissolved manganese at site WRWQ9 from January to December 2023. In comparison, there was an exceedance of the adjusted baseline mean plus two standard deviations for dissolved manganese at control site WOWQ2 on the Woronora River in January to March 2023 but no other months during the reporting period. The results equate to a Level 1 significance level from January to December 2023 (Appendices B1 and B2).

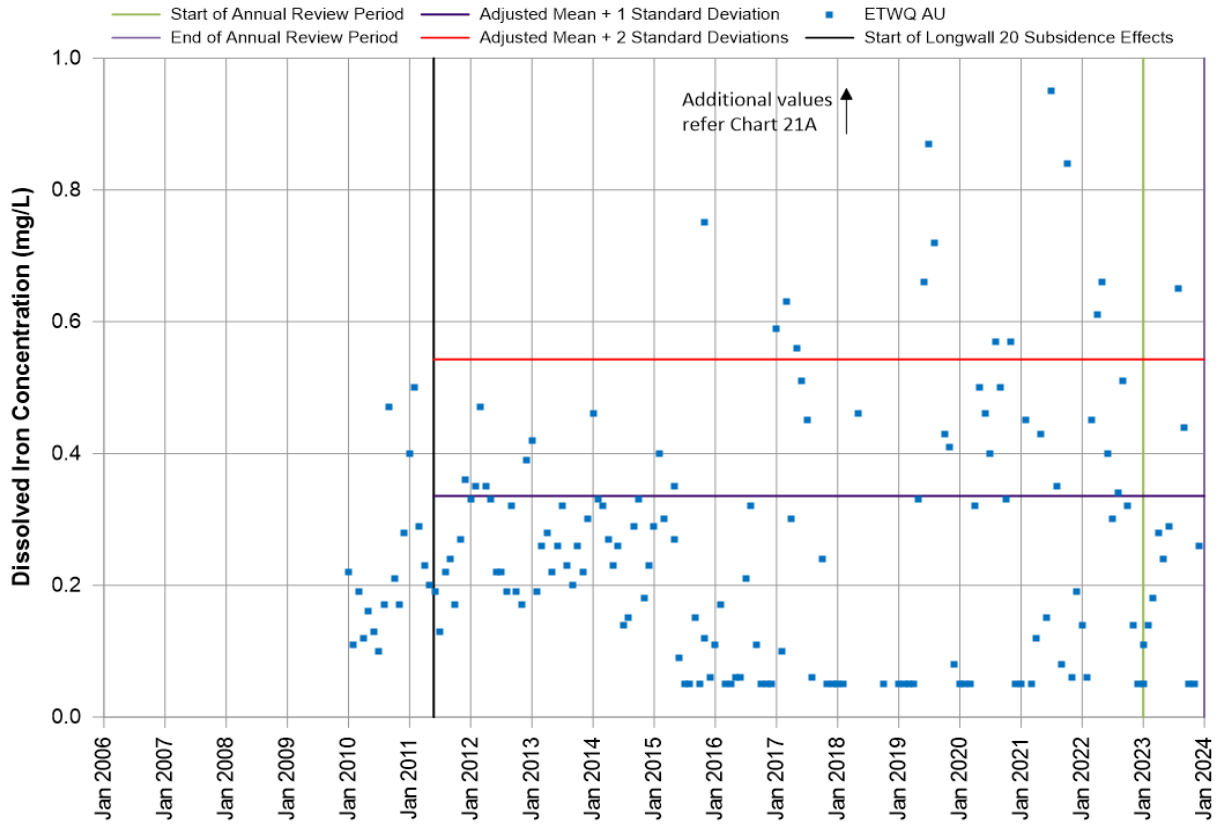
There were no exceedances of the adjusted baseline mean plus two standard deviation for dissolved aluminium at site WRWQ9 from January to December 2023. There were no exceedances of the adjusted baseline mean plus two standard deviations at control site WOWQ 2 on the Woronora River for dissolved aluminium during the reporting period. This results in a Level 1 significance level January to December 2023, (Appendices B1 and B2).

**Assessment of Water Quality at Site ETWQ AU**

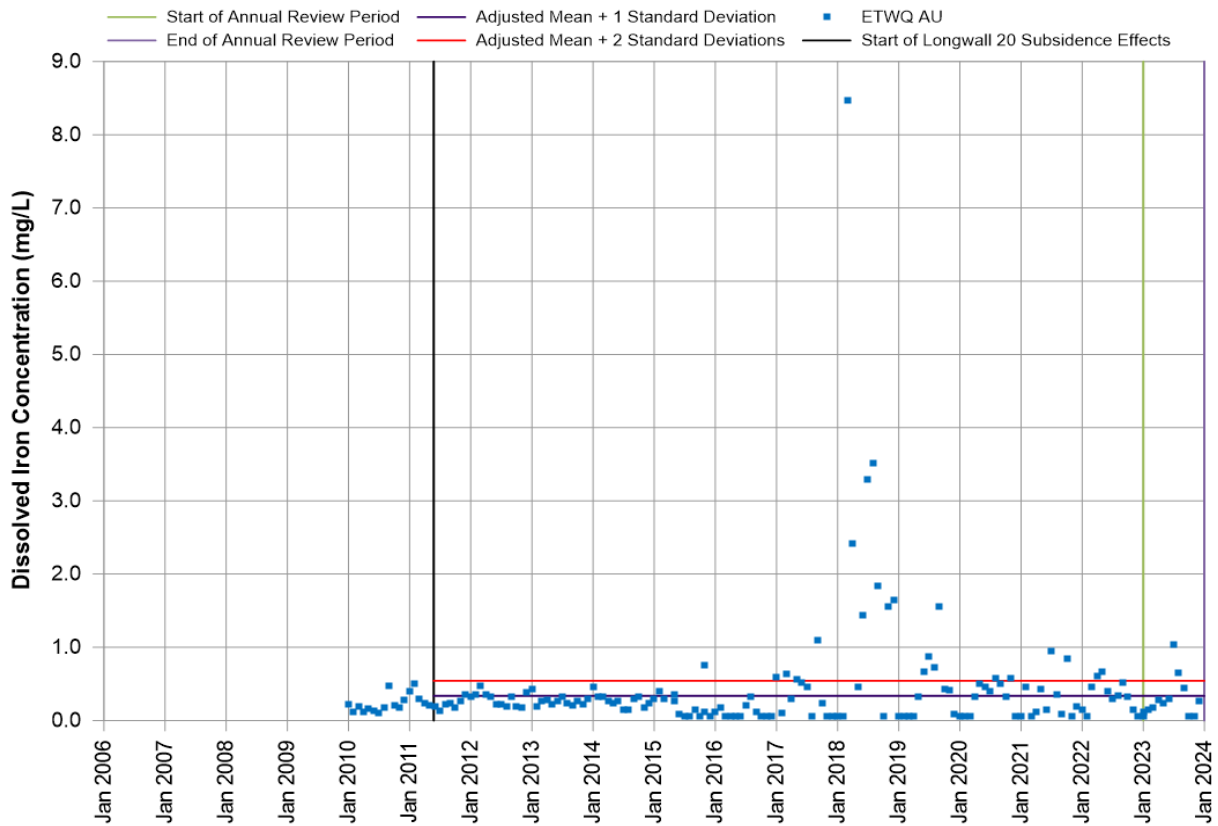
There were exceedances of the adjusted baseline mean plus two standard deviations for dissolved iron at site ETWQ AU during July and August 2023 (Charts 38 and 39). In September 2023, the recorded dissolved iron concentration was below the adjusted baseline mean plus two standard deviations but above the adjusted baseline mean plus one standard deviation. From October to December 2023, the recorded dissolved iron concentrations were below the adjusted baseline mean plus one standard deviation. In comparison, there were no exceedances of the adjusted baseline mean plus two standard deviations at control site WOWQ 2 on the Woronora River for dissolved iron. This equates to a Level 1 significance level in January to June and September to December 2023, Level 2 in July 2023, and a Level 3 significance in August 2023, with two consecutive months exceeding the adjusted baseline mean plus two standard deviations (July and August 2023) (Appendices B1 and B2).

The dissolved manganese concentrations continued to exceed the adjusted baseline mean plus two standard deviations at sampling site ETWQ AU in all months of the review period except for August 2023 (Chart 40). The monthly dissolved manganese concentration at the control site WOWQ 2 on the Woronora River exceeded the adjusted baseline mean plus two standard deviations for two month (January and February 2023) for dissolved manganese during the reporting period, but otherwise remained below the adjusted baseline mean plus one standard deviation for the reporting period. From March to June 2023 concentrations at control site WOWQ 2 remained below the adjusted baseline mean plus two standard deviations. Accordingly, the results equate to a Level 3 significance for dissolved manganese recorded at site ETWQ AU from March to July, and September to December 2023, Level 2 in January and February 2023 and a Level 1 significance for August 2023 (Appendices B1 and B2).

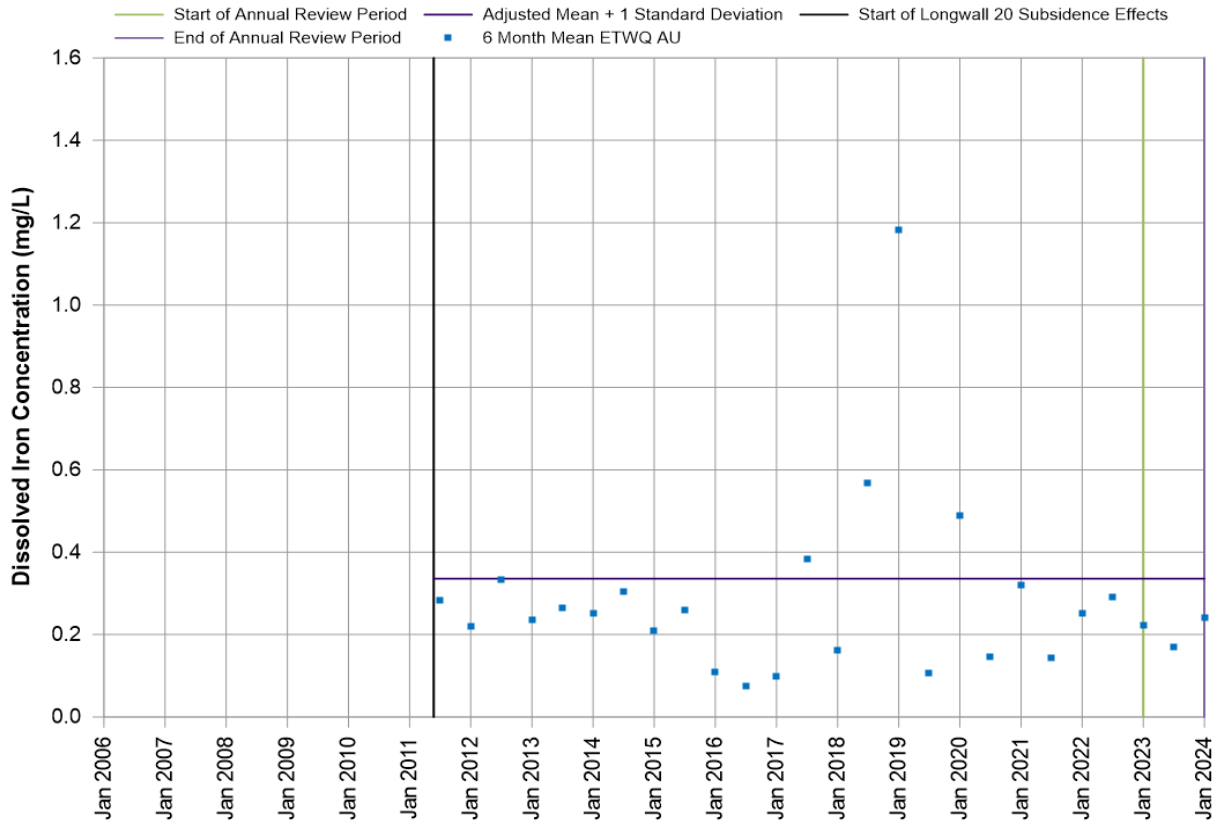
There were no exceedances of the adjusted baseline mean plus two standard deviations for dissolved aluminium during the reporting period (Chart 41). There were no exceedances of the adjusted baseline plus two standard deviations at control site WOWQ 2 on the Woronora River for dissolved aluminium. The results equate to a Level 1 significance level from January to December 2023 (Appendices B1 and B2).



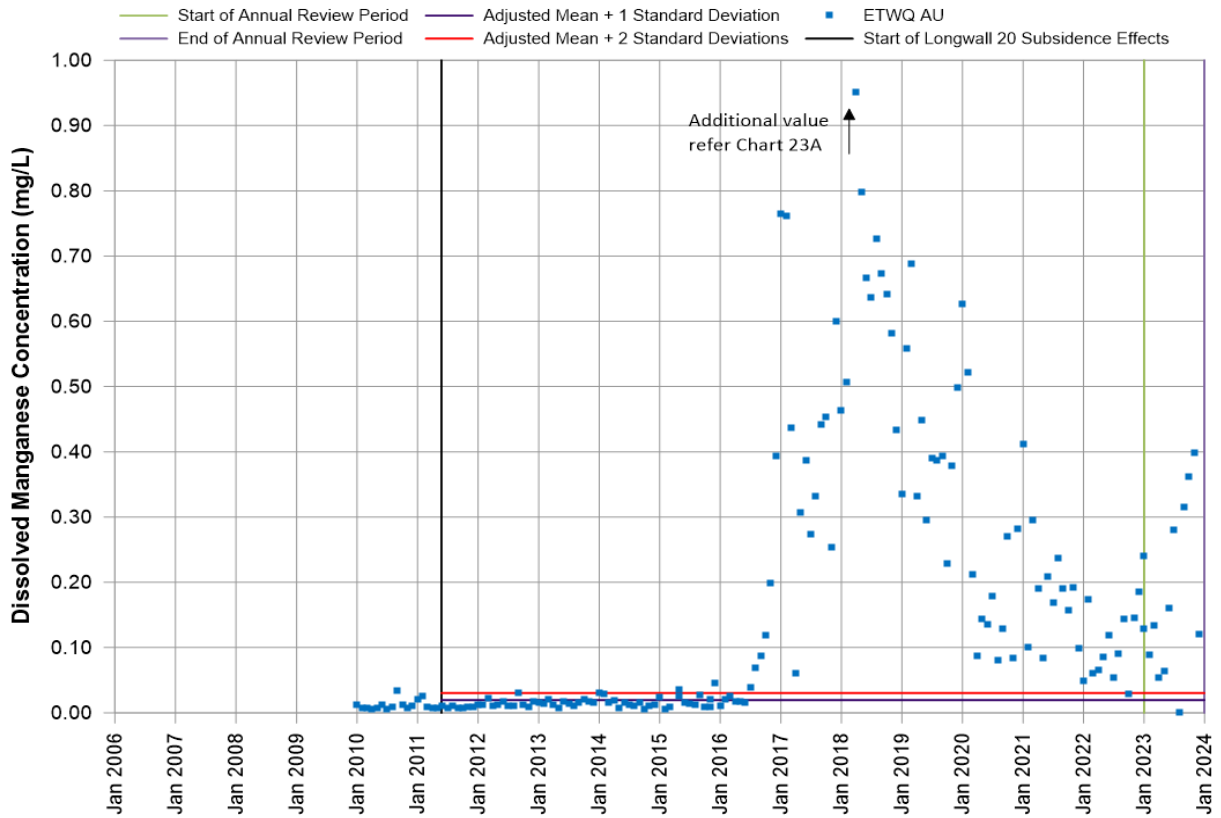
**Chart 38 Dissolved Iron Concentrations in Eastern Tributary at ETWQ AU**



**Chart 38a Dissolved Iron Concentrations in Eastern Tributary at ETWQ AU**



**Chart 39 Six Month Means of Dissolved Iron Concentrations in Eastern Tributary at ETWQ AU**



**Chart 40 Dissolved Manganese Concentrations in Eastern Tributary at ETWQ AU**

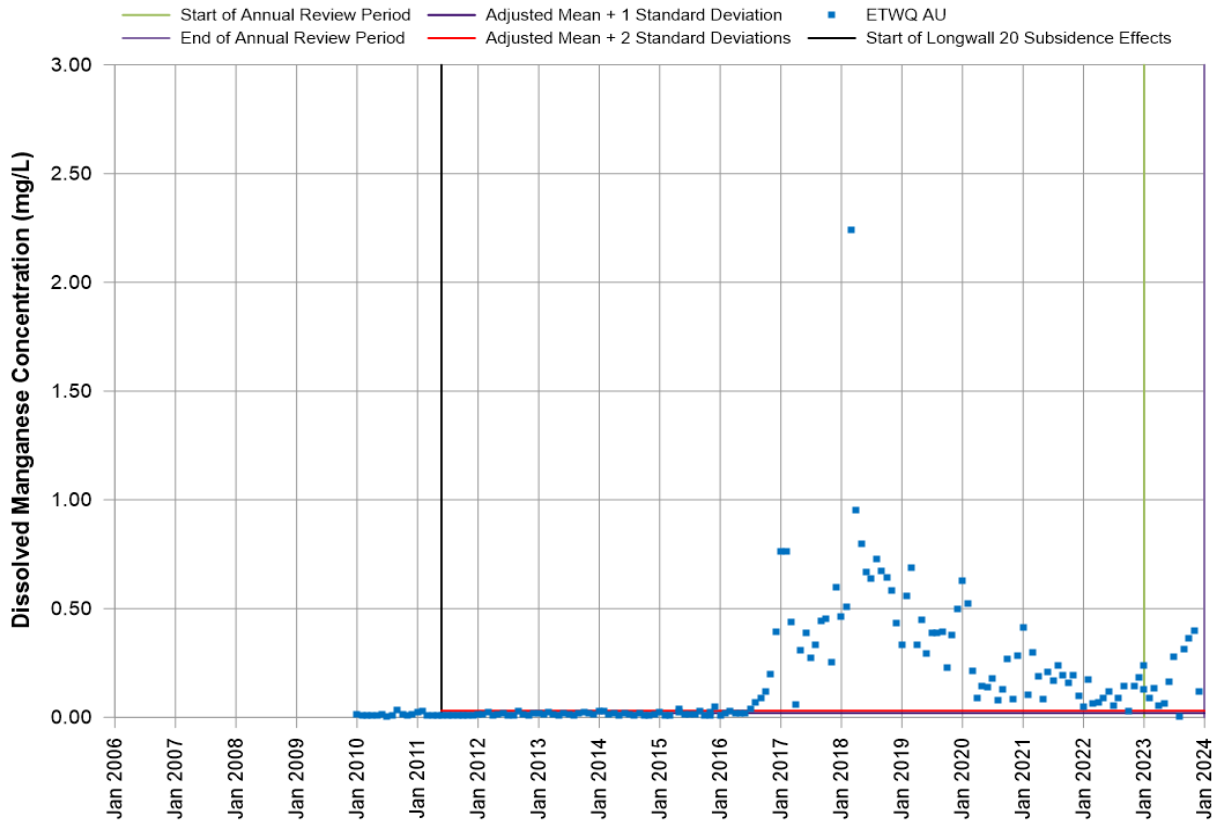


Chart 40a Dissolved Manganese Concentrations in Eastern Tributary at ETWQ AU

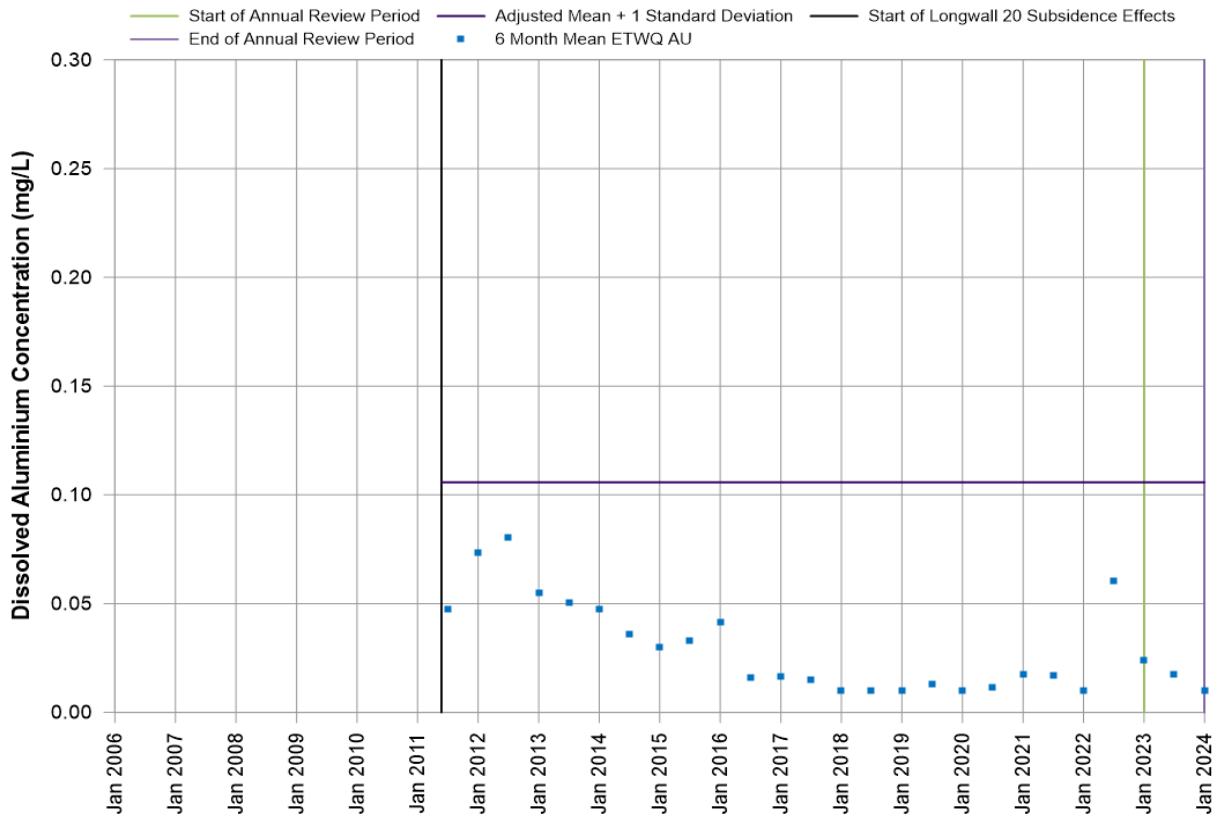


Chart 41 Six Month Means of Dissolved Aluminium Concentrations in Eastern Tributary at ETWQ AU



The cracking and dilation of bedrock and associated diversion of surface flow and leakage of water through rock bars at pools which has occurred on the Eastern Tributary, including at the location of the stream which was the subject of the exceedance of the Eastern Tributary watercourse performance measure (the Eastern Tributary Incident), has resulted in increases in dissolved manganese and iron.

As a result of the performance indicator exceedances for dissolved manganese at site ETWQ AU on the Eastern Tributary in January to December 2023, assessments were made against the subsidence impact performance measure, *Negligible reduction to the quality of water resources reaching the Woronora Reservoir*. The assessments were undertaken by Associate Professor Barry Noller and are provided in Appendix E, and consider the manganese concentrations reaching the Woronora Reservoir. These assessments found there has been a negligible reduction in the quality of water resources reaching the Woronora Reservoir. The watercourse performance measure, *Negligible reduction to the quality of water resources reaching the Woronora Reservoir*, is not considered to have been exceeded (Appendix E).

The environmental consequences of subsidence impacts on water quality were predicted by the Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans to be similar to that previously observed at Metropolitan Coal, specifically, transient pulses of iron, manganese and aluminium, which would likely occur following fresh cracking of the stream bed.

Monitoring and analysis of water quality data will continue in accordance with the Longwalls 308-310 Water Management Plan. Metropolitan Coal is committed to the remediation of pools on the Eastern Tributary. It is anticipated that ongoing stream remediation activities (described in Section 10.3.2) will reduce the transfer of iron and manganese from the groundwater to the Eastern Tributary.

#### **6.2.5 Woronora Reservoir Water Quality**

Metropolitan Coal has sourced water quality data for the Woronora Reservoir (at sampling location DWO1) from WaterNSW in accordance with a data exchange agreement. Results in relation to total iron, aluminium and manganese at levels from 0 m to 9 m below the reservoir surface for Woronora Reservoir throughout the period of record are presented in Charts 42 to 44.

The data presented in Charts 42 to 44 indicate that a gradual increasing trend in total iron, total aluminium and total manganese has been recorded since early to mid-2020 following the onset of higher rainfall conditions. The peak iron concentration recorded for the review period (0.75 mg/L recorded in June 2023) is less than the historical maximum (0.85 mg/L recorded in 1965). Total iron concentrations show a declining trend from July 2023, and concentrations reduced by approximately 0.3 mg/L by December 2023 (Chart 42). Following from elevated concentrations at the end of 2022, there was a decrease in total aluminium during the review period with concentrations recorded below 0.15 mg/L at the end of the review period (Chart 43). During the last six months of the review period, total manganese concentrations show a decreasing trend (Chart 44).

Water quality data in the Woronora Reservoir is analysed annually and assessed against the following performance indicator:

*Changes in the quality of water in the Woronora Reservoir are not significantly different post-mining compared to pre-mining concentrations.*

The performance indicator is considered to have been exceeded if data analysis indicates a significant change in the quality of water post-mining, specifically if the current year's duration exceedance curve for a water quality parameter in Woronora Reservoir (total iron, total manganese and total aluminium) is above the baseline 20 year average recurrence interval (ARI) exceedance curve for any range of the duration percentages from 0% to 75%. The results of this assessment are shown on Chart 45, Chart 46 and Chart 47, respectively.

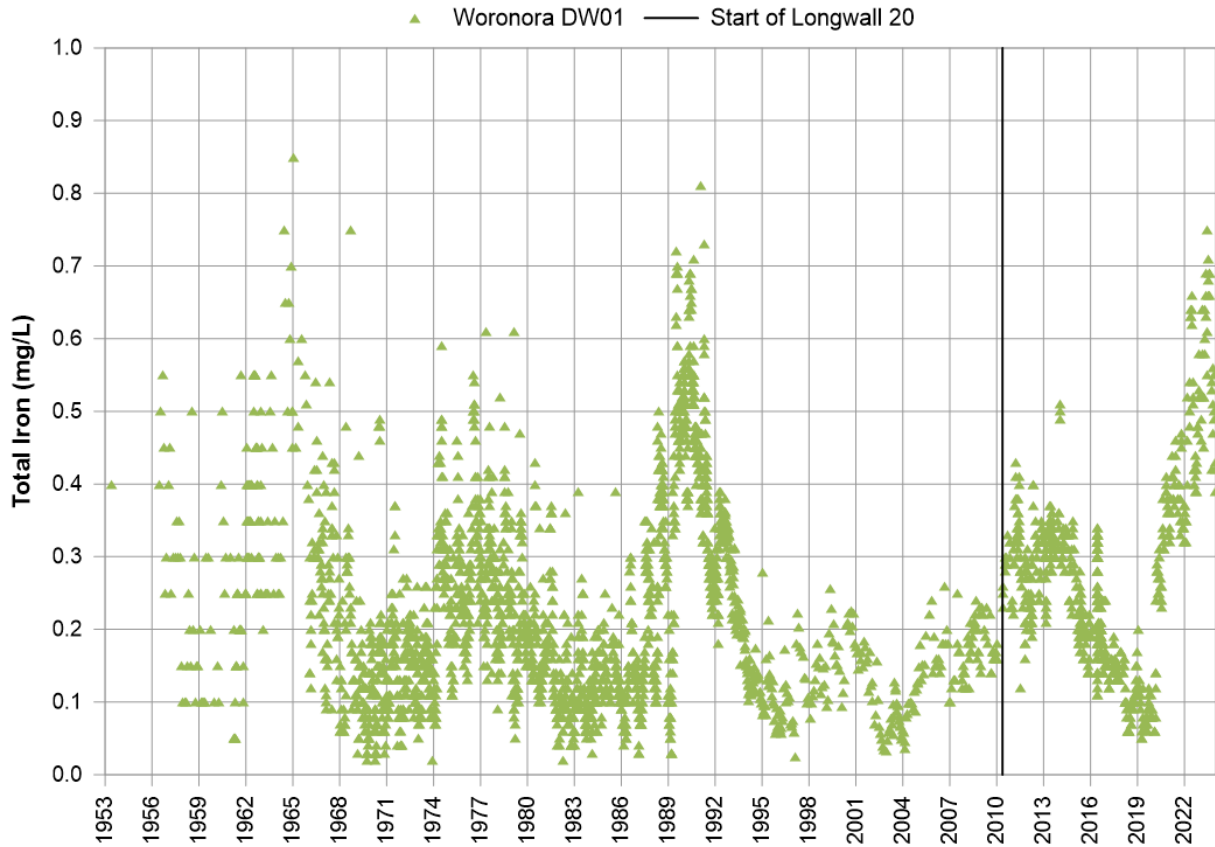


Chart 42 Total Iron Concentration Woronora Reservoir

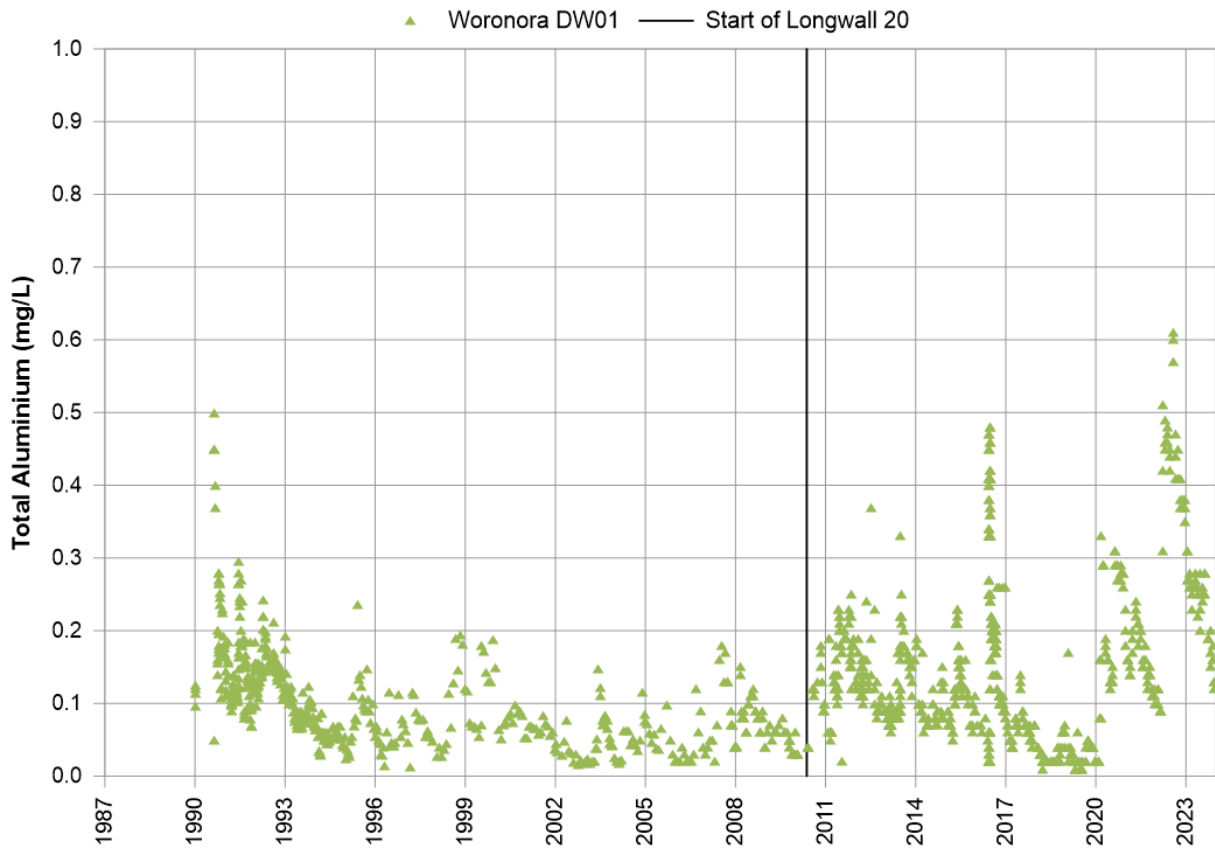
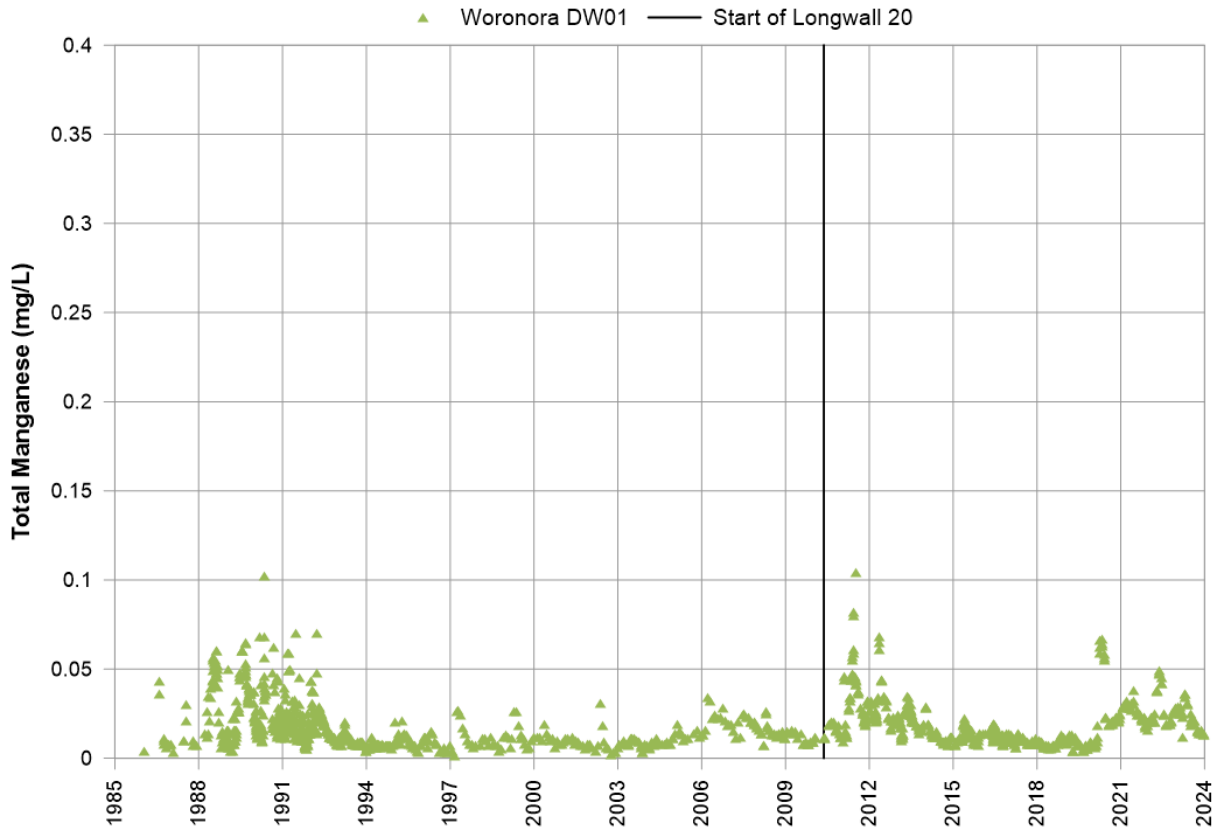
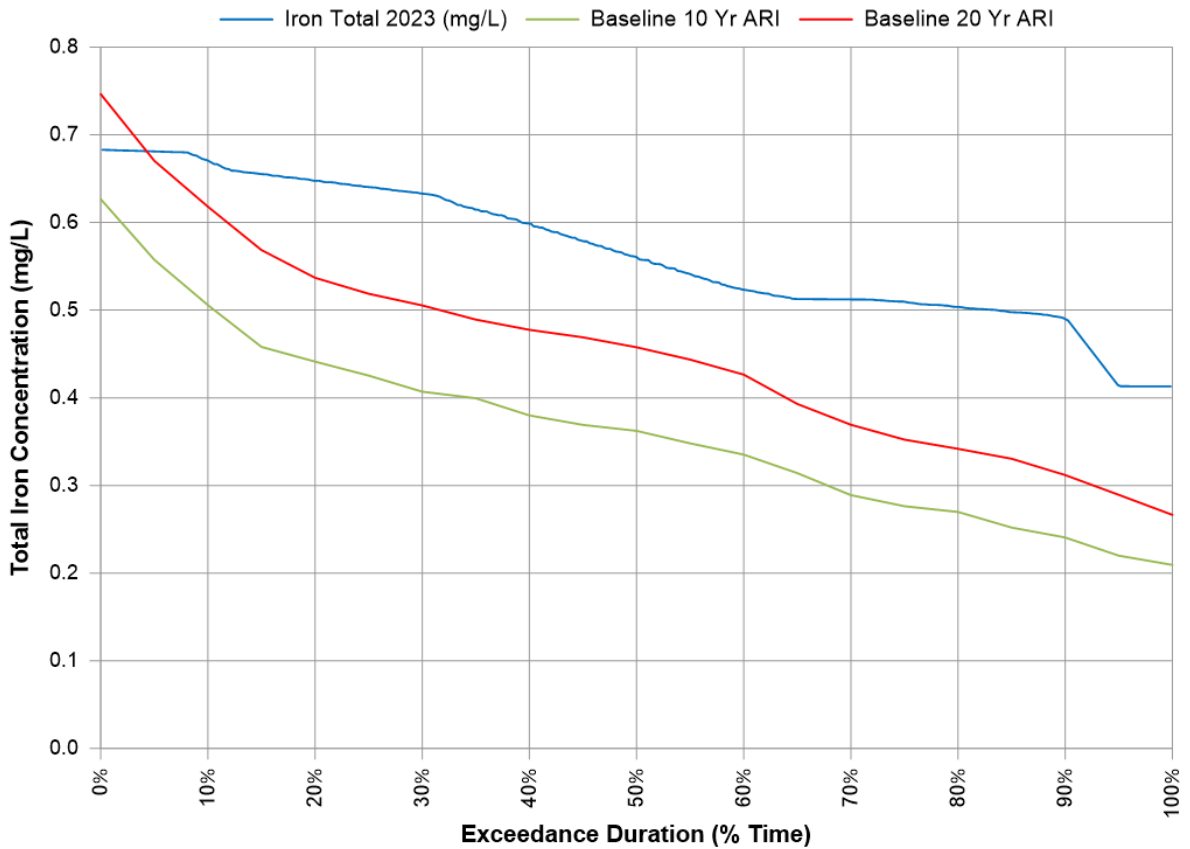


Chart 43 Total Aluminium Concentration Woronora Reservoir



**Chart 44 Total Manganese Concentration Woronora Reservoir**



**Chart 45 Total Iron Performance Indicator Woronora Reservoir 2023**

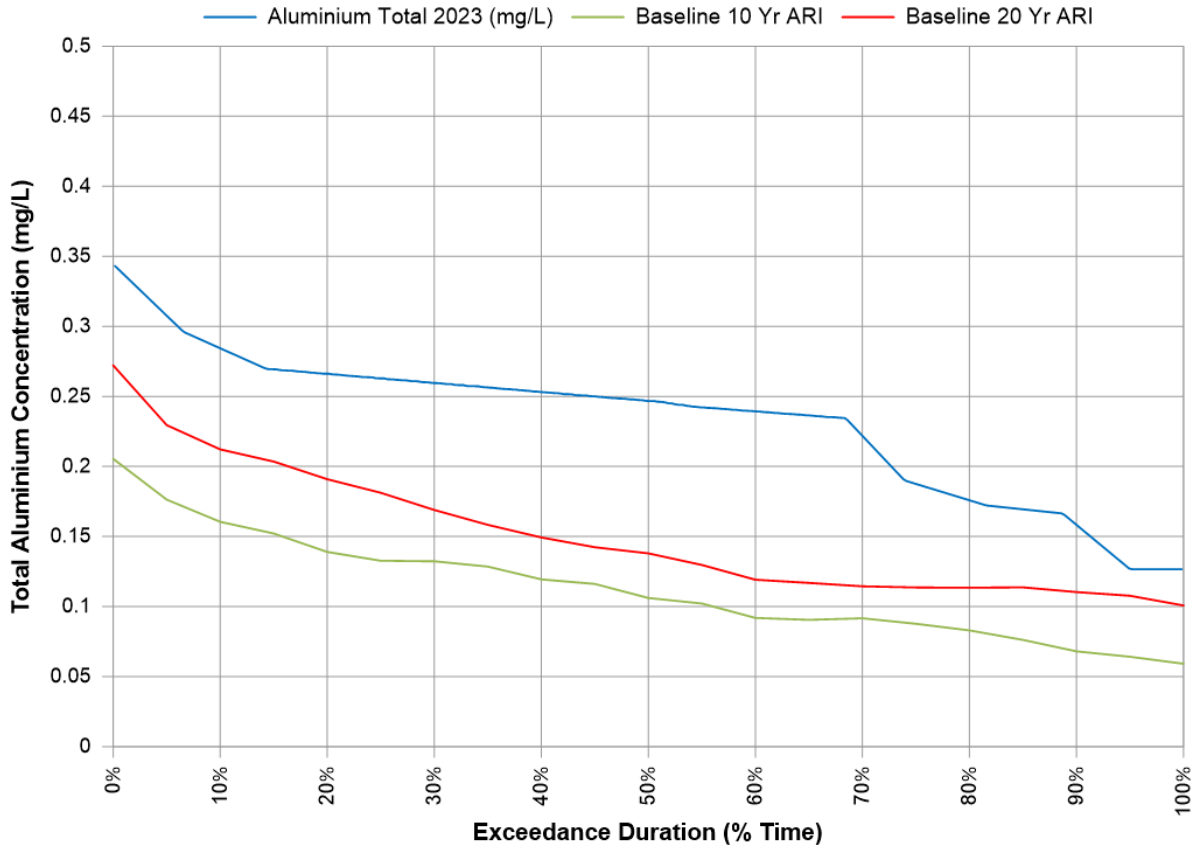


Chart 46 Total Aluminium Performance Indicator Woronora Reservoir 2023

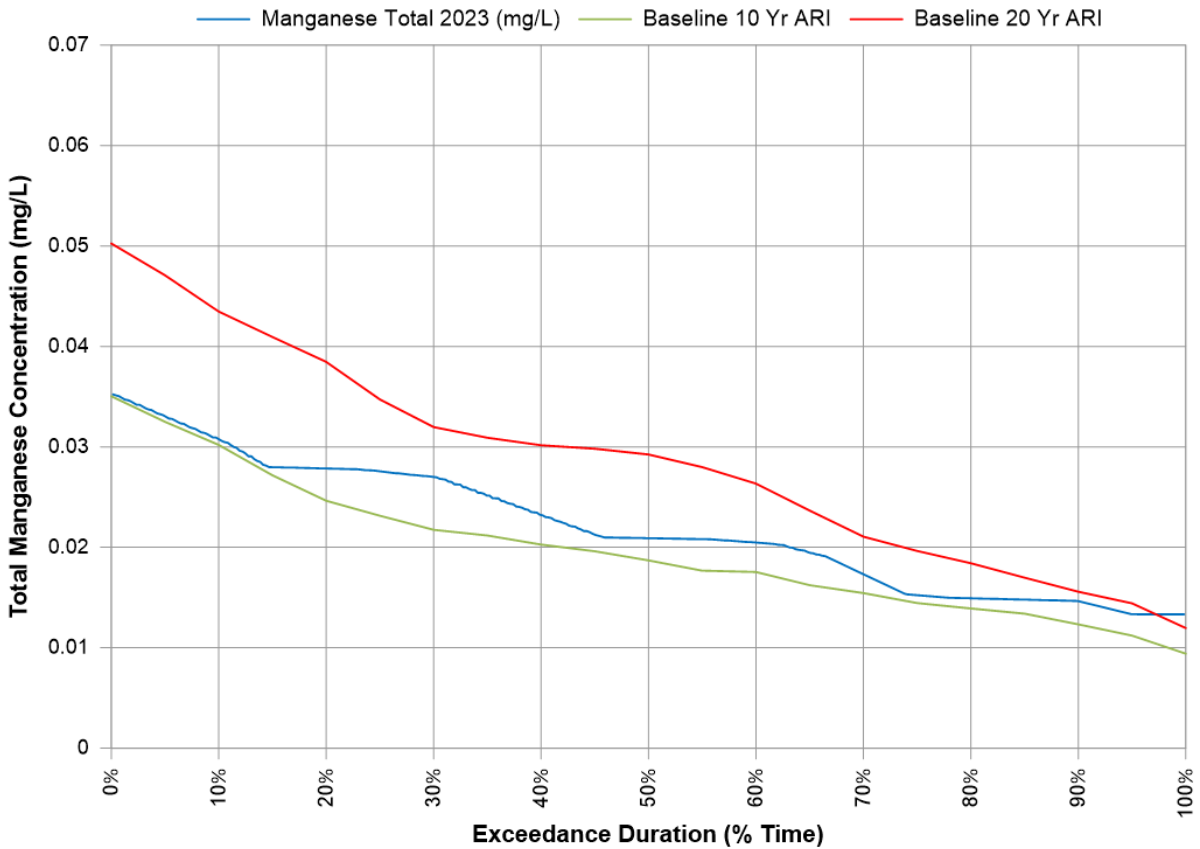


Chart 47 Total Manganese Performance Indicator Woronora Reservoir 2023

Total iron exceeded the baseline 10 Year ARI exceedance curve for 100% of the reporting period and exceeded the baseline 20 Year ARI exceedance curve for approximately 95% of the reporting period (Chart 45). Total aluminium exceeded the baseline 10 Year and 20 Year ARI exceedance curves for 100% of the review period (Chart 46). Total manganese exceeded the baseline 10 Year exceedance curve for 100% of the review period and marginally exceeded the baseline 20 Year ARI exceedance curve for approximately 5% of the review period (Chart 47). The results for total iron and total aluminium equate to a Level 3 significance and for total manganese equate to Level 2 significance.

In accordance with Longwalls 308-310 Water Management Plan, an assessment against the Performance Measure was completed by ATC Williams and is provided in Appendix B2. The assessment concluded that the performance measure, *Negligible reduction in the water quality of Woronora Reservoir*, has not been exceeded.

The elevated concentration of total aluminium at site DW01 in the Woronora Reservoir is unlikely to be related to mining activities and more likely to be related to elevated concentrations in surface water system inflows from catchments that are outside of the potential influence of mining during and following a period of substantial rainfall. The elevated concentrations of total iron and manganese at site DW01 are likely to be partly related to the elevated concentrations of the respective metal inflows from the Eastern Tributary. Although inflows from the Eastern Tributary are subject to potential mining influences, it should be noted that dissolved iron and manganese concentrations in inflow from the Eastern Tributary were also elevated at similar levels in 2019, with no significant increase in total iron or manganese concentrations in the Woronora Reservoir at this time.

The Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans predicted the Project would not impact on the performance of the Woronora Reservoir and would have a neutral effect on water quality. The water quality monitoring results are consistent with the predictions.

### 6.2.6 Swamp Groundwater Levels

Groundwater monitoring of upland swamps has involved the use, where practicable, of paired piezometers, one in the swamp substrate (at approximately 1 m depth) and one in the underlying sandstone (at a depth of approximately 10 m) (Figure 9). Data shows that water levels within the swamps over longwalls are typically perched above those of the local Hawkesbury Sandstone groundwater levels and indicates a separate control on swamp water levels. That is, the swamps are primarily surface water fed systems and generally water infiltrates downwards from the swamps to the groundwater.

Swamp substrate water levels at Swamps 25, 30, 33, 35, 40, 41, 46, 50, 51, 52, 53, 62, 64, 82, 71a, 72, 92, 101, 137a and 137b are used to assess the impact on threatened species, populations, or ecological communities in accordance with the Longwalls 308-310 Biodiversity Management Plan. Swamp substrate water levels are assessed against the following upland swamp groundwater performance indicator:

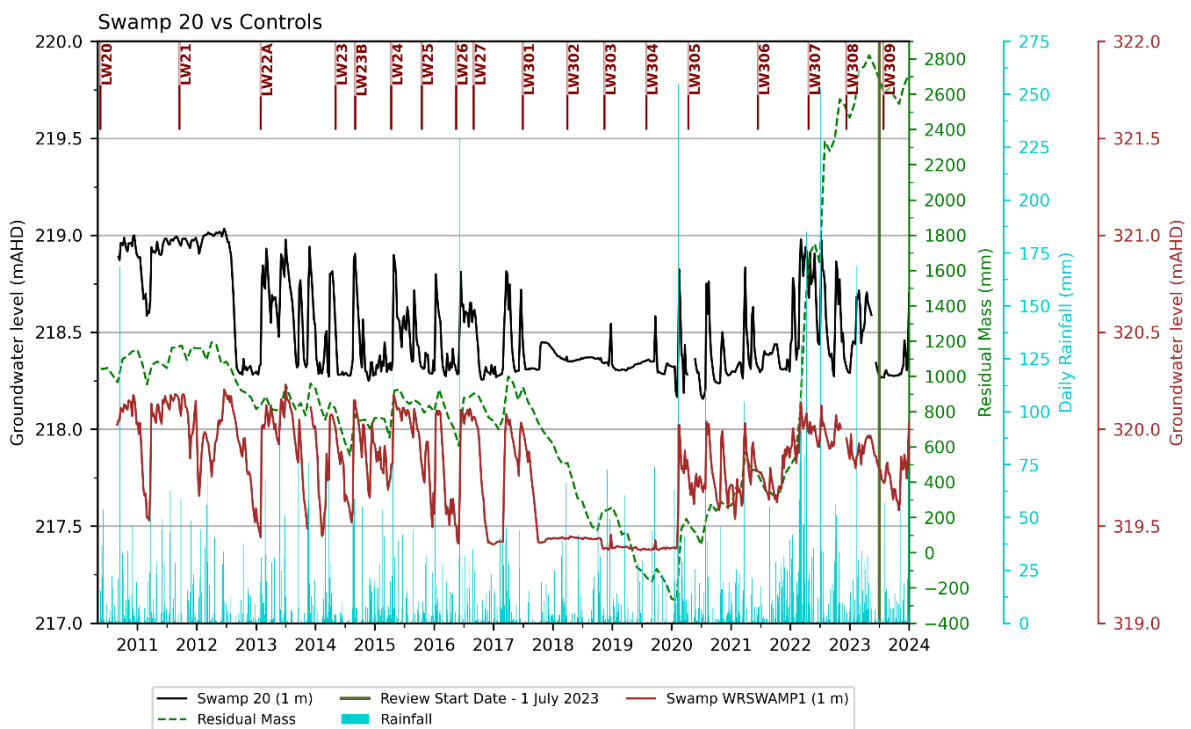
*Surface cracking within upland swamps resulting from mine subsidence is not expected to result in measurable changes to swamp groundwater levels when compared to control swamps or seasonal variations in water levels experienced by upland swamps prior to mining.*

#### **Swamp Monitoring for Longwalls 20-27**

Paired piezometers have been monitored in Swamp 25 overlying Longwalls 20-22, Swamps 28, 30, 33 and 35 overlying Longwalls 23-27, and in control swamps 101, 137a, 137b and Bee Creek Swamp (Figure 9). At Swamp 20 (overlying Longwall 21) and at control swamp Woronora River Swamp 1, multiple piezometers have been monitored (i.e. one swamp substrate piezometer to a depth of approximately 0.9 m and two sandstone piezometers to depths of approximately 4 and 10 m) (Figure 9).

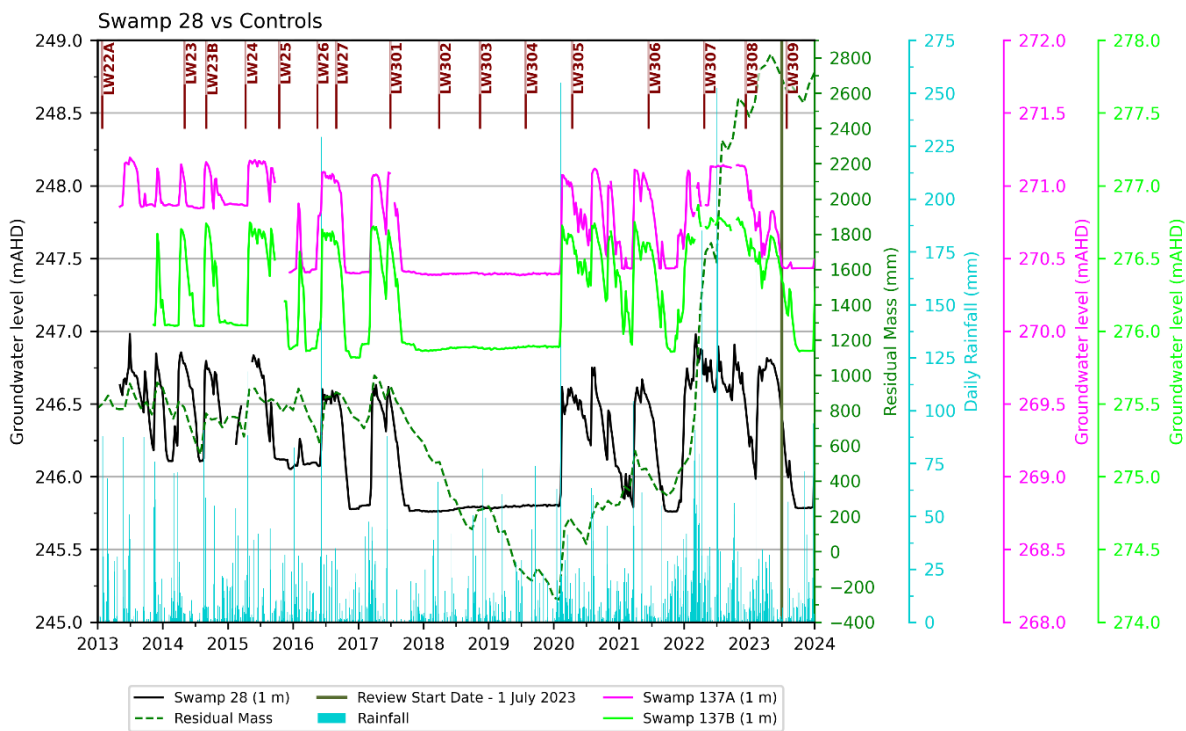
The Longwalls 305-307 Biodiversity Management Plan upland swamp groundwater performance indicator was exceeded at Swamp 20 since 2012 and at Swamp 28 since 2016 indicating a mining impact at these two swamps. As part of the Longwalls 308-310 Biodiversity Management Plan, no trigger is assigned to either Swamp 20 or Swamp 28 due to these swamps previously having been impacted by mining. These swamps are no longer assessed against performance criterion, however, are assessed annually by relevant specialists.

The upland swamp groundwater performance indicator has been exceeded at Swamp 20 since 2012. Swamp 20 substrate water levels changed from being permanently saturated to being periodically saturated as a result of the passing of Longwall 21 (Chart 48, and Appendices C1 and C2). There is a very strong correlation with rainfall trend at Swamp 20 and control swamp Woronora River Swamp 1 over the period of record. As the rate of decline in the two piezometers is similar between 2013 and 2016, but different in 2012, it is likely that Longwall 21 caused a mining effect at Swamp 20, but the effects have not been exacerbated by Longwalls 22-27 or Longwalls 301-306 (Appendices C1 and C2). In 2018 and 2019, both swamps reported water levels at the base of the substrate dataloggers for the full period apart from the short period of saturation recorded in Swamp 20 in September 2019. Both swamps increased in water levels after the large rain event in February 2020. However, following rainfall events throughout 2020, 2021 and 2022, Swamp 20 exhibited a decrease in groundwater levels whereas the WRSWAMP1 water levels remained at near-saturated levels. During the current reporting period both swamps water levels were concordant with rainfall, both experiencing upward trends due to October 2023 rainfall, with downward trends during the dryer months (Chart 48, and Appendices C1 and C2).



**Chart 48 Comparison of Piezometer Responses at Swamp 20 and Woronora River 1 Control Swamp**

A mining effect to the substrate water levels of Swamp 28 (overlying Longwall 24) was identified in 2016 based on the incomplete recovery of substrate water levels following rainfall events (Chart 49 and Appendices C1 and C2). Swamp 28 is considered to have an impact from mining of Longwall 25, although no effect on swamp substrate water levels occurred when Longwall 24 passed directly beneath the monitoring site (Appendices C1 and C2). The substrate piezometer at Swamp 28 returned to dry conditions from September 2017, remaining so until February 2020, as did the two control swamp piezometers (Swamps 137a and 137b; Chart 49). The substrate piezometer indicated saturated conditions until December 2020. Groundwater levels were intermittently saturated throughout 2021. Groundwater levels responded to rainfall events towards the end of 2021 in both Swamp 28 and the controls swamps. Over 2022, the substrate has been permanently saturated with groundwater levels constantly about 1 m above the sensor level in the first half of 2022, decreasing to 0.5 m by the end of the 2022. This decreasing trend continued into 2023, before a recharge event in February 2023 caused a rapid increase in substrate levels. The substrate water level gradually decreased to approximately sensor level from mid to late 2023.



**Chart 49 Groundwater Hydrographs at Swamp 28 and Two Control Swamps (137a and 137b)**

**Swamps Monitoring for Longwalls 301-304**

Paired piezometers (i.e. one swamp substrate piezometer and one sandstone piezometer) have been monitored in Swamps 40, 41, 46, 50, 51, 52 and 53 overlying Longwalls 301-304 (Figure 9). As indicated in Section 4.1, Longwall 303 was completed on 2 June 2019 and the extraction of Longwall 304 commenced on 27 July 2019 and was completed on 28 January 2020.

The swamp substrate hydrographs for Swamps 40, 41, 46, 50, 51, 52 and 53 indicate that the correlation of swamp substrate with the rainfall trend is strong (Appendices C1 and C2). Data analysis for the reporting period indicates the seven-day moving average for all swamps excluding swamp 50, was at or above the minimum established for the swamp’s length of record. The seven-day moving average minimum level of Swamp 50 was below the baseline minimum towards the end of 2023 (Appendices C1 and C2).

Between October 2019 and January 2020 the Swamp 50 (10 m) piezometer displayed a pronounced decline in water level coinciding with the passage of Longwall 304. After February 2020, groundwater levels have increased in response to increased regional rainfall; however, the maximum recorded groundwater levels during this period are approximately 3 m below those recorded prior to the passage of Longwall 304. This is an apparent mining affect considered to be related to mine subsidence. The Swamp 50 performance indicator relates to the substrate piezometer and not the shallow sandstone (10 m) piezometer. Since February 2020, the substrate piezometer has generally remained saturated, excluding short-term groundwater declines during low rainfall periods. However, the water level quickly responded to rainfall events. The water level in the substrate piezometer declined to sensor level in the first half of 2023 and subsequently fluctuated with rainfall events.

### ***Swamps Monitoring for Longwalls 305-307***

Paired piezometers (i.e. one swamp substrate piezometer and one sandstone piezometer) have been monitored in Swamps 71a and 72, relating to Longwalls 305-307 (Figure 9). Mining of Longwall 305 commenced on 12 April 2020 and ceased on 21 November 2020. Mining of Longwalls 306 commenced extraction on 15 June 2022 and was completed in March 2022. Mining of Longwall 307 commenced on 22 April 2022 and was completed on 21 November 2022.

Semi-quantitative comparisons of the swamp substrate water levels of Swamps 71a and 72 with control swamps and rainfall records during the reporting period do not show a definitive mining effect and the dry conditions are regarded as a natural response to reduced rainfall (Appendices C1 and C2).

### ***Swamps Monitoring for Longwalls 308-310***

Paired piezometers (i.e. one swamp substrate piezometer and one sandstone piezometer) have been monitored in Swamps 62, 64 and 92-2 and individual swamp substrate piezometers (i.e. one piezometer to a depth of approximately 1 m) have been monitored in Swamps 82, 92-1 and 92-3, relating to Longwalls 308-310 (Figure 9). Mining of Longwall 308 commenced on 12 December 2022 and ceased on 7 July 2023. Mining of Longwall 309 commenced on 28 July 2023 and is forecasted to be completed in February 2024.

Data analysis for the reporting period indicates the seven-day moving average for all swamps was at or above the minimum established for the swamp's length of record (Appendices C1 and C2).

The key potential subsidence impacts and environmental consequences on perched groundwater systems described in the Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans and Biodiversity Management Plans, included:

- Any cracking of the bedrock within upland swamps is expected to be isolated and of a minor nature, due to the relatively low magnitudes of the predicted strains and the relatively high depths of cover.
- Surface cracking resulting from mine subsidence within the upland swamps is not expected to result in an increase in the vertical movement of water from the perched water table into the regional aquifer as the sandstone bedrock is massive in structure and permeability decreases with depth.
- It is expected that any surface cracking that may occur would be superficial in nature (i.e. would be relatively shallow) and would terminate within the unsaturated part of the low permeability sandstone. Any changes in swamp water levels as a result of cracking are expected to be immeasurable when compared to the scale of seasonal and even individual rainfall event based changes in swamp groundwater levels.



- Whilst swamp grades vary naturally, the predicted maximum mining-induced tilts are generally orders of magnitude lower than the existing natural grades within the swamps. The predicted tilts would not have any significant effect on the localised or overall gradient of the swamps or the flow of water. Any minor mining-induced tilting of the scale and nature predicted is not expected to significantly increase lateral surface water movements which are small in relation to the other components in the swamp water balance.

No change to the fundamental surface hydrological processes and upland swamp vegetation were expected within upland swamps associated with Longwalls 301-310.

In relation to impacts of the Project on upland swamps, the NSW Planning Assessment Commission (2009) concluded that the mining parameters were such that:

- for most swamps in the Project Area, there was low risk of negative environmental consequences; and
- that there was a very low risk that a significant number of swamps would suffer such consequences.

While the water lost from Swamp 20 and Swamp 28 was retained in the unsaturated sandstone above the regional water table, the changes in swamp water levels as a result of cracking are measurable when compared to seasonal individual rainfall event based changes in swamp groundwater levels. There is currently no sign that the vegetation in Swamp 20 is being impacted by the changed hydrological conditions, however, the vegetation monitoring results suggest that the changes in vegetation occurring in Swamp 28 were significantly different to changes in the control swamps from autumn 2017 to spring 2019 (Appendices F3 and F4).

## 6.2.7 Shallow Groundwater Levels

### *Shallow Groundwater Level Sites near Streams*

Continuous water level monitoring of shallow groundwater levels has been conducted at sites WRGW1, WRGW2 and WRGW7 along Waratah Rivulet and sites ETGW1<sup>6</sup> and ETGW2 on the Eastern Tributary (Figure 10).

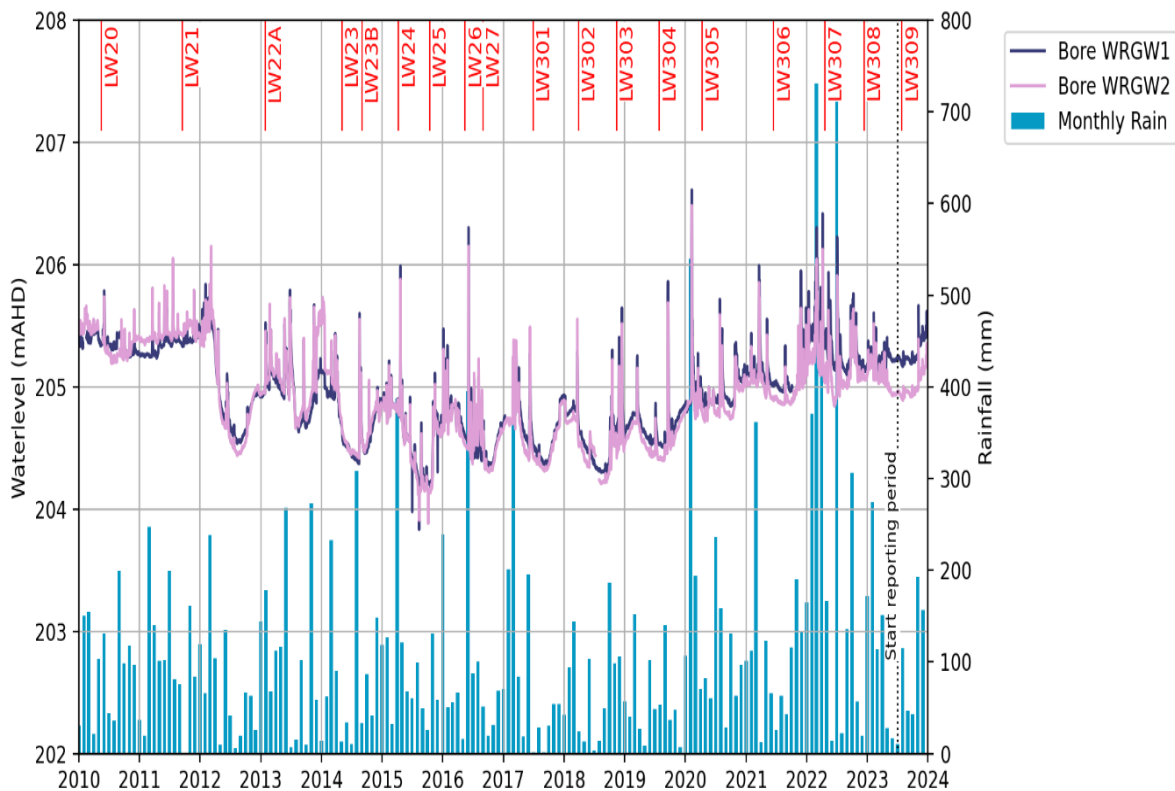
At the time of passage of the Longwall 21 mining face past the piezometer sites WRGW1 and WRGW2 on the Waratah Rivulet (March 2012), the measured groundwater levels dropped by approximately 1 m (Chart 50). As wet conditions prevailed at the time, this was not a climatic effect. Since March 2012, groundwater levels recorded at sites WRGW1 and WRGW2 have fluctuated in response to seasonal rainfall variations with a seasonal (dry) minimum that is approximately 0.75 m below previous levels (Chart 50 and Appendices C1 and C2). From January to June 2018 the rainfall residual mass continued to decline and water levels at WRGW1 and WRGW2 spiked following rainfall in March 2018. From July 2018, the water level trend followed the rainfall residual mass trend, declining from July to September 2018 and increasing from October to December 2018. During January to June 2019, the water level correlated with the daily rainfall including a large spike following the March rainfall event, and generally correlated with the residual mass curve except for January and February, when following rainfall in December 2018 the water level increased while the monthly rainfall was below average. The water levels have not returned to pre-March 2012 levels.

The groundwater level trends at both sites continued to be concordant with rainfall throughout the 2023 reporting period with rapid response to rainfall events and sharp spikes associated with runoff events, indicating interaction with the Waratah Rivulet. It is noted that WRGW2 displayed a more rapid drawdown at the end of the reporting period than WRGW1.

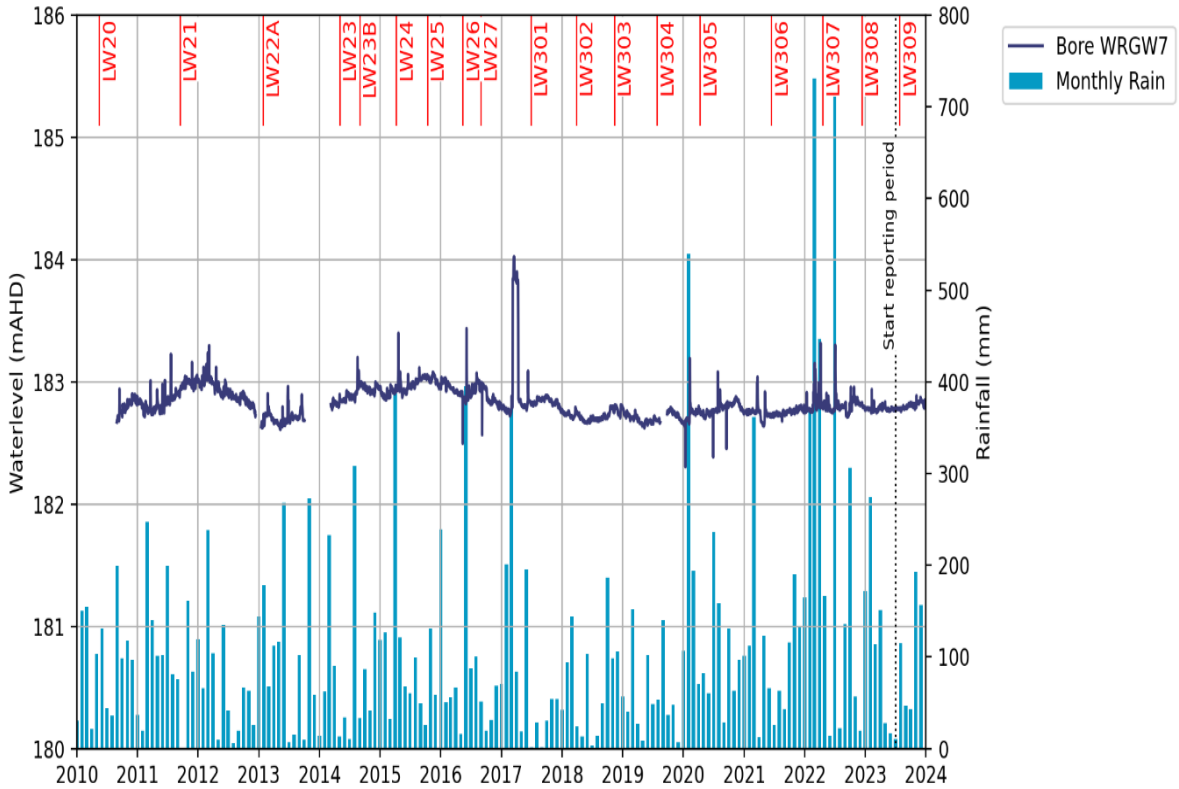
<sup>6</sup> Site ETGW1 was unable to be sampled since August 2017.

Shallow groundwater levels at site WRGW7 remained correlated with rainfall trends and unaffected by mining during the reporting period (Chart 51, and Appendices C1 and C2).

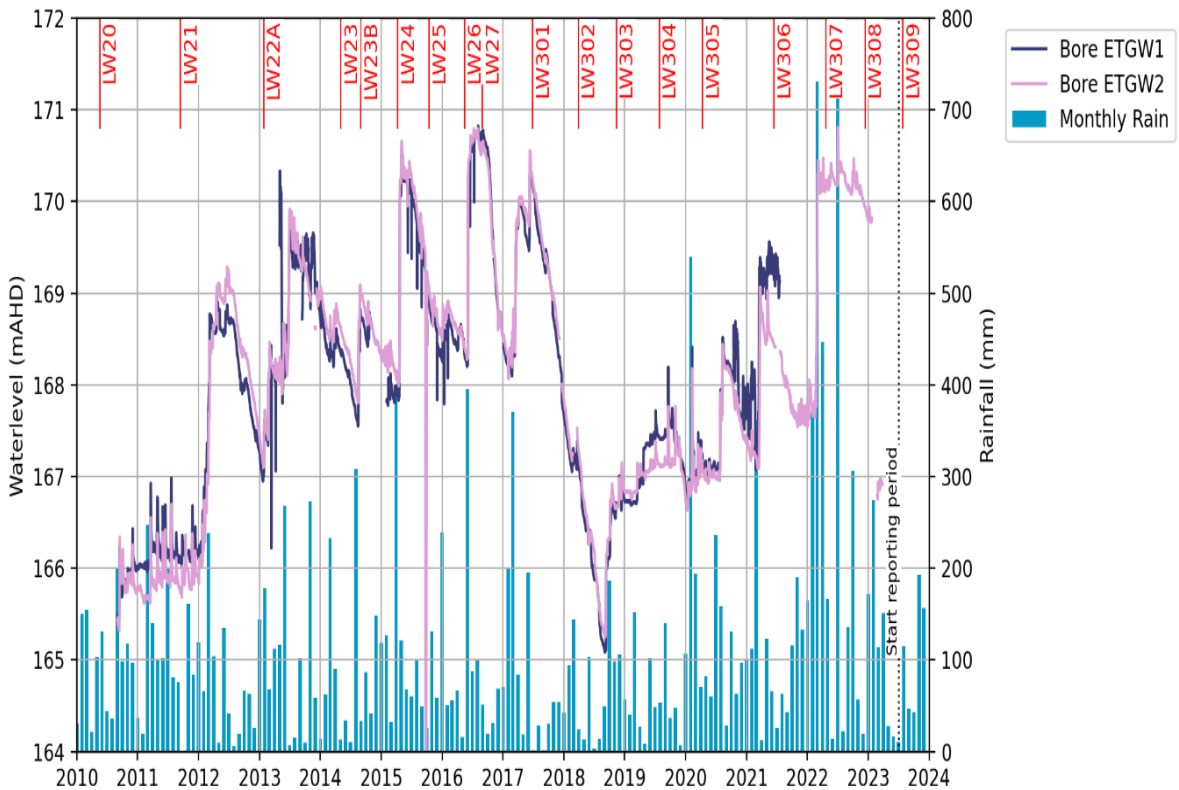
At the Eastern Tributary sites ETGW1 and ETGW2, shallow groundwater levels have previously followed the rainfall trends closely (Chart 52) and have continued to show a close correlation during the reporting period. The variations at these sites are unrelated to mining (Appendices C1 and C2). Although Woronora Reservoir water levels also respond to rainfall with a similar pattern, a groundwater hydraulic gradient is maintained towards the reservoir because the groundwater levels were 2 to 3 m higher than the dynamic reservoir levels, which were observed to be approximately 169 metres with respect to the Australian Height Datum (mAHD) during the reporting period (Appendices C1 and C2).



**Chart 50 Shallow Groundwater Hydrographs on Waratah Rivulet at WRGW1 and WRGW2**



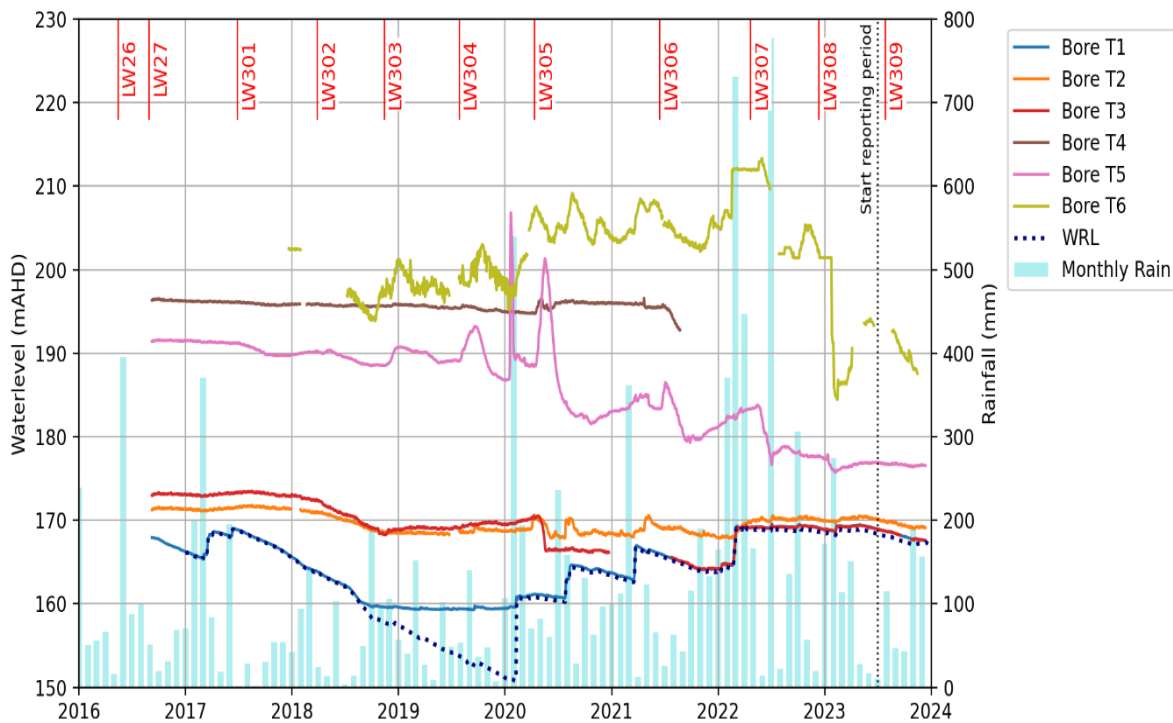
**Chart 51 Shallow Groundwater Hydrograph on Waratah Rivulet at WRGW7**



**Chart 52 Shallow Groundwater Hydrographs on Eastern Tributary at ETGW1 and ETGW2**

### Shallow Groundwater Transect

Continuous groundwater level monitoring has also been conducted at an approximately east-west transect of bores (sites T1, T2, T3, T4, T5 and T6) located above Longwalls 305-307 (T1-T5) and to the west on the other side of Woronora reservoir (T6) located above the chain pillar between Longwalls 309 and 310. The water levels of the six bores, the Woronora Reservoir Level (WRL) and the monthly rainfall are shown in Chart 53.



**Chart 53 Groundwater Level in Bores T1 to T6**

Bore T1, the closest of the five bores to Woronora Reservoir, has almost identical water levels to those measured in the reservoir, until an old weir across the rivulet is exposed at low water levels. In that case, T1 water levels are maintained a little below the water level in the weir pool, but above the WRL (Appendices C1 and C2).

Bore T2 has shown fairly stable water levels, with limited response to the rainfall events over 2022. The water levels showed a slight continual increase in early 2022, before stabilising at approximately 170 mAHD over late 2022 and into this reporting period. The hydraulic gradient was maintained from T2 towards T1 and the reservoir for all of the reporting period (Appendices C1 and C2).

Bore T3 has been dry since May 2020 until it ceased recording in December 2020. The bore has been replaced by a redrilled bore T3-R in May 2021, approximately 10 m to the north of the original T3 location. The redrilled bore is around 20 m deeper than the original bore. The current observations show a reflection of the reservoir (and T1) water levels (Appendices C1 and C2).

Bore T4 stopped working in August 2021 after a sharp decline in water levels after the passage of Longwall 306. Prior to this, bore T4 was anomalous, as its head was higher than the head at upgradient site T5. This is unlikely to be a groundwater divide as it is not related to the topographic ridge well upgradient. The sharp decline in groundwater levels in July 2021 occurred after the passage of Longwall 306. Given that the bore is located in the footprint of Longwall 306, this decline is interpreted as a mining effect. As T4 has never provided meaningful information, there is no need to reinstate this bore (Appendices C1 and C2).

In the first half of 2020, the water levels at T5 showed a high variability. The water level increased by 15 m in early January 2020 and decreased in late January 2020. This spike in water level was unrelated to the large rainfall event in February 2020. Since April 2020 (after Longwall 305 started), the water levels increased again, this time over a longer period and have again decreased. The second spike is reflected in the observations for T4, which shows a lower rise and fall at the same time. The broad rises in T5 water levels in 2019 and 2020 are compressive effects associated with the passage of Longwalls 304 and 305, respectively. After the passage of Longwall 306, the water levels at T5 showed another decrease to 180 mAHD, before stabilising at that level in the last quarter of 2021. In early 2022, water levels increased in the first half before decreasing from May 2022 onwards, after the passage of Longwall 307. This is indicative of a mining effect associated with shallow tensile cracking above the eastern edge of the longwall panel. Although there appears to be a permanent lowering of the water table at this site due to mining, a positive hydraulic gradient towards the reservoir is maintained and the water levels in T5 have been stable in 2023 (Appendices C1 and C2).

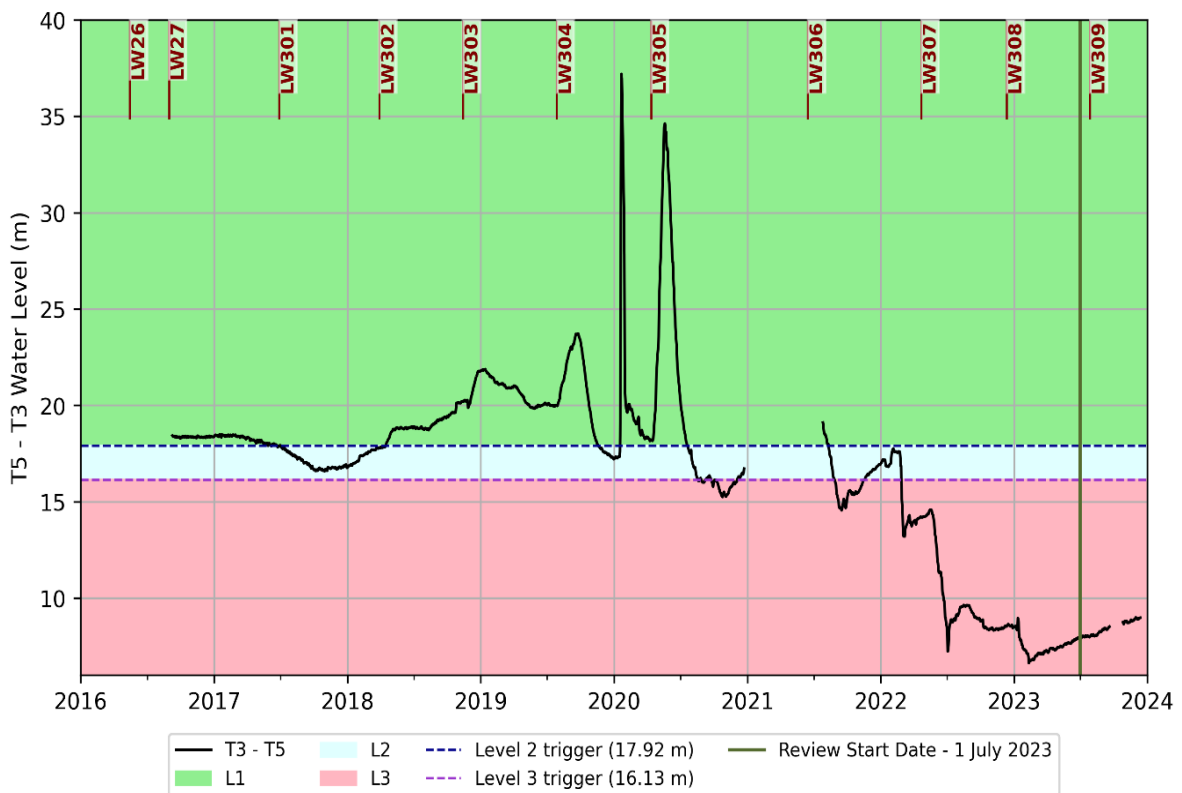
Bore T6 lies on the western side of Woronora Reservoir at a higher elevation than the eastern transect. Unlike the eastern bores T1 to T5, it responds readily to rainfall recharge and its dynamics closely correlate with the rainfall trends. Since January 2023, the water level rapidly decreased, independent of the high rainfall during this time period. The decrease correlates to the passing of Longwall 308, which lies 200 m east of Bore T6. In July 2023, data was not recorded in Bore T6, after which a decrease in groundwater level was observed. Bore T6 ceased working since November 2023. Although there appears to be a lowering of the water table at this site due to mining, a positive hydraulic gradient towards the reservoir is maintained (Appendices C1 and C2).

The hydraulic gradient at transect bores T2, T3 and T5 has been assessed against the performance indicators below in accordance with the Longwalls 308-310 Water Management Plan:

*The hydraulic gradient from transect bore T5 to bore T3 is reduced by no more than 10% from that measured on 30 June 2017.*

The performance indicator is designed to provide an early warning for the assessment of negligible leakage from the Woronora Reservoir. Leakage from the Woronora Reservoir to the surrounding groundwater environment would occur if there were a reversal of hydraulic gradient (i.e. when the water table in surrounding piezometers is below the water level in the Woronora Reservoir).

The hydraulic gradient from transect bore T5 to transect bore T3 over the reporting period is presented on Chart 54. At the start of the reading of T3-R, the performance level was at Level 2. Previously, a decrease in the gradient was observed, bringing the performance indicator into the Level 3 trigger in February 2022. The difference in water levels started to stabilise towards the end of 2022, experienced a decrease in early 2023, and then gradually increased from February 2023 up to the present. Both bores T5 and T3 require close monitoring due to the unusual observations which could have an impact on the gradient in the future.



**Chart 54 Hydraulic Gradient Measured from Bore T5 to T3**

The exceedance of the Level 3 Trigger Level in the performance indicators for bore T5-T3-R has been assessed by SLR (2023), and is provided as Appendix F.

The findings of SLR (2023) are summarised below:

- Leakage from the Woronora Reservoir to the surrounding groundwater environment would occur if there was a reversal of hydraulic gradient (i.e. if the water table in surrounding piezometers falls below the water level in the Woronora Reservoir).
- Bores T2 and T5 maintain a hydraulic gradient to the reservoir, whereas bore T3-R has a water level almost coinciding with reservoir level. However, this does not imply an overall absence of hydraulic gradient, as the intervening bore T2 defines the effective hydraulic gradient close to the reservoir. Both bores T3-R and T5 show localised depressurisation of the groundwater, in the case of T5 definitely due to mining beneath the bore, and in the case of bore T3-R probably due to mining directly beneath the bore.
- The performance measure relating to bores T2, T3 and T5, *Negligible leakage from the Woronora Reservoir*, has not been exceeded.

The key potential subsidence impacts and environmental consequences on shallow groundwater systems and inflows to the Woronora Reservoir described in the Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans included:

- Permanent mining-induced changes in the groundwater levels of shallow aquifers in connection with streams and ecosystems at Metropolitan Coal would not occur to any significant degree (i.e. the direction of shallow groundwater system flow [i.e. in the Hawkesbury Sandstone] has not been altered by mining).
- As there is an alternation of thick sandstone/claystone lithologies, there is a constrained zone in the overburden that remains rigid and acts as a bridge which isolates shallow and deep aquifers. At the substantial depths of cover of the Project, there would not be connective cracking from the mined seam to the surface.
- The depressurisation effects described below for the deep groundwater system would not propagate to the Hawkesbury Sandstone where the shallow groundwater system is located. As a result, no measurable impacts on registered bores in the wider Project Area and surrounds would be expected.

Based on the analysis of the conceptual groundwater system, there would be negligible loss of groundwater yield to the Woronora Reservoir. This is reinforced by the groundwater modelling which indicates negligible reduction in cumulative average inflows to the Woronora Reservoir. In relation to the potential loss of catchment yield, the NSW Planning Assessment Commission (2009) was of the view that the risk of any significant loss is very low unless a major geological discontinuity is encountered during mining that provides a direct hydraulic connection between the surface and the mine workings.

The groundwater monitoring results are consistent with the potential subsidence impacts and environmental consequences described in the Project EA, Preferred Project Report, and the Metropolitan Coal Water Management Plans.

## 6.2.8 Deep Groundwater Levels

Immediately above a mined coal seam, rocks collapse into the void created by the removal of coal to form a caved zone and a fractured zone develops above the caved zone. This causes aquifer properties to change (e.g. permeability and porosity) and results in a higher vertical permeability as a result of mining.

A three-dimensional numerical model of groundwater flow was developed in 2008 for the Project EA. The groundwater model was recalibrated in December 2012 for the Preferred Project Layout by revising the hydraulic conductivities in the Hawkesbury Sandstone and the Bald Hill Claystone. At this time, two extra layers were added to the Hawkesbury Sandstone section to improve resolution of the vertical hydraulic gradient in the shallow groundwater system. The model simulations are based on initial conditions at the end of Longwall 14, consistent with the Project EA assessment (Heritage Computing, 2008).

Transient calibration was undertaken to incorporate Metropolitan Coal updates to the geological model. The revised model includes an update of the topographical surface and geological interfaces, the addition of two model layers below the Bulli Seam and updated estimates of the fractured zone height. A report for the updated model has been prepared (HydroSimulations, 2018a) and this model has been used for the assessment of Longwall 304 and Longwalls 305-307.

In 2020, and consistent with the recommendations of the Woronora Reservoir Impact Strategy (WRIS) Panel Stage 2 Report (Hebblewhite *et al.*, 2019), the groundwater model was updated to include the incorporation of 'stacked drains' to represent the fractured zone instead of using enhanced hydraulic conductivity and storage properties. A calibration report for the updated model was prepared by SLR (2020), which was used for the assessment of Longwalls 308-310.

In December 2020, Metropolitan Coal commissioned Dr Justin Bell (JBS&G) to undertake a peer review of the calibration report for the updated model (SLR Consulting, 2020). Although the peer review was focussed around the incorporation of stacked drains, Dr Bell reviewed the complete groundwater model as described in the calibration report. Dr Bell concluded that "*the current approach to the groundwater model is 'fit-for-purpose', as per the definition of the NSW Aquifer Interference Policy*".

### 6.2.8.1 Time Series Head Variations and Vertical Head Differences

Continuous deep groundwater level monitoring is conducted at bores 9HGW0 (Longwall 10 Goaf Hole), 9EGW1B, 9FGW1A, 9GGW1-3, 9GGW1-80, 9GGW2B, 9HGW1B, PM02, PM01 (9DGGW1B), 9EGW2A, 9EGW2-4, S1997, PM03, PHGW1B, PHGW2A, LW305-Goaf, F6GW3A, F6GW4A, F6GW4D, TBS02 and TBS03 (Figure 10) in accordance with the Longwalls 308-310 Water Management Plan. The time-series head variations and vertical head differences for these bores have been examined (Appendices C1 and C2).

The time-series head variations and vertical head differences for these bores have been examined, with the following outcomes:

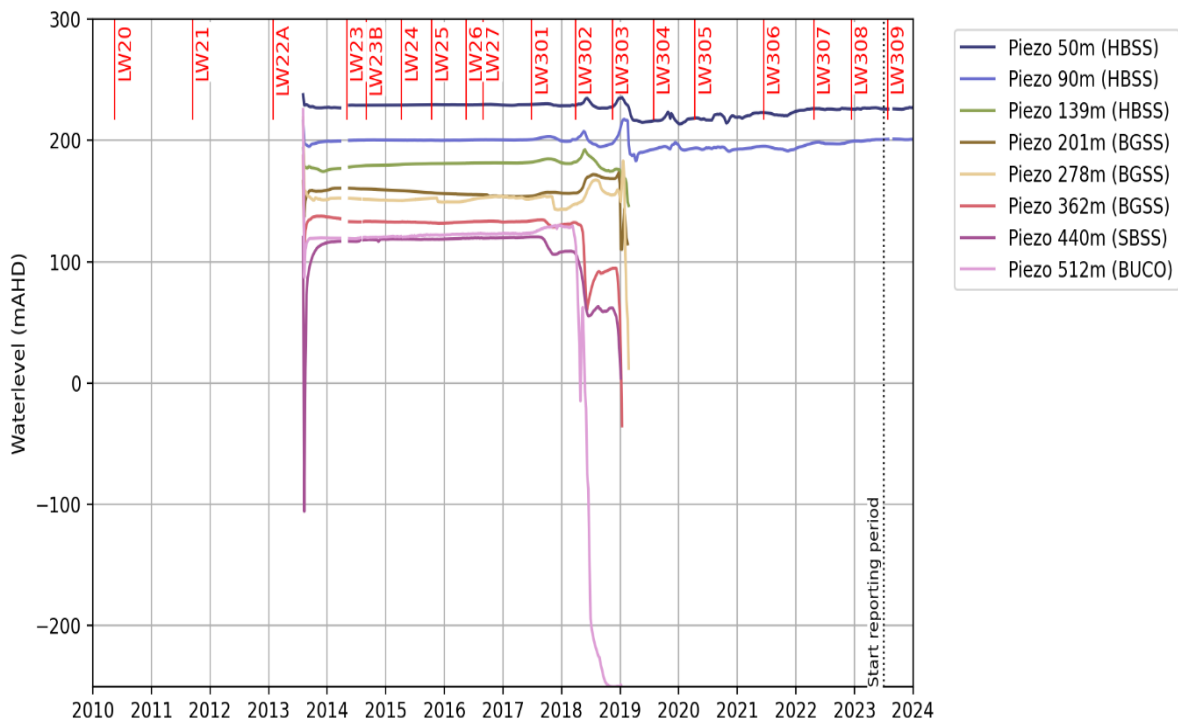
- sites close to current mining show significant depressurisation with depth, consistent with the Project EA (HCPL, 2008); and
- sites close to old workings at Helensburgh show substantial depressurisation with depth, consistent with the Project EA.

Of those monitoring sites mentioned above, the following bores are located within 600 m from Longwalls 308-310 secondary extraction: bores PHGW2A, 9EGW2A, and LW305-Goaf. Located outside of that area, but still in proximity, are bores PHGW1B (north) and F6GW3A (east) (Figure 10 and Appendices C1 and C2).



### Bore F6GW4A

Bore F6GW4A overlies the chain pillars between Longwalls 303 and 304. The time-series record for bore F6GW4A is shown on Chart 55. This bore is two panel widths from Longwall 301 and one panel width from Longwall 302. The respective mining faces came closest to the bore in late-September 2017 and late-May 2018, at which times distinct features are evident on all hydrographs. The passage of Longwall 301 caused mild responses, generally short-term increases in head, while the passage of Longwall 302 caused sharp cusp-like features on the Hawkesbury Sandstone hydrographs, sustained rises in the upper and mid Bulgo Sandstone, and strong declines in the three deepest piezometers. In January 2019, F6GW4A was undermined by Longwall 303 causing the depressurisation and disabling of the six lower sensors (i.e. 139 metres below ground level [mbgl], 201 mbgl, 278 mbgl, 362 mbgl, 440 mbgl and 512 mbgl). The upper and mid Hawkesbury Sandstone piezometers (50 mbgl and 90 mbgl) also displayed a lowering of groundwater head following the passage of Longwall 303, however, they showed no significant decline after the passage of Longwall 304, 305, 306, 307, 308 or 309. Both piezometers showed stable water levels during the reporting period.

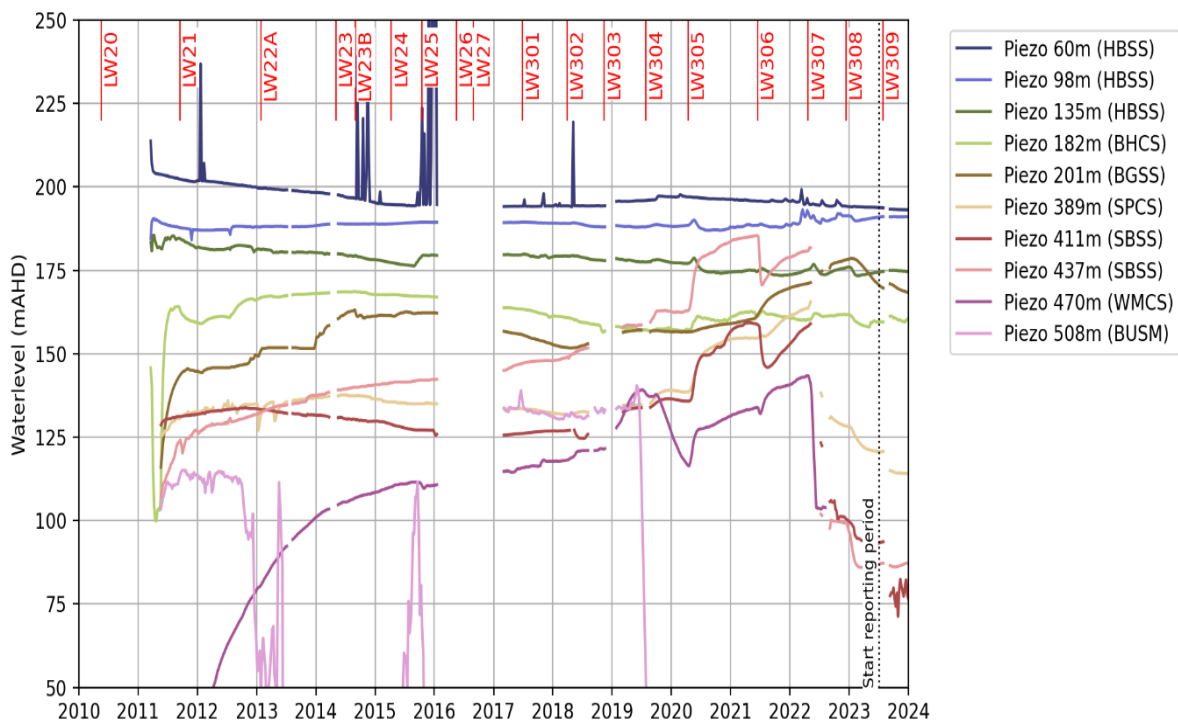


**Chart 55 Time Variations in Potentiometric Heads at F6GW4A**

### Bore PHGW2A

Chart 56 shows the groundwater levels at site PHGW2A, located about 400 m north-east of the commencement of Longwall 309. A connection failure prevented upload of data for sensors in PHGW2A in 2016. Sensors have now been reinstated. All vibrating wire piezometers (VWPs), except for the shallowest 60 mbgl piezometer, had a compressive response to the commencement of Longwall 305, about 400 m away. In June 2021, the three deepest piezometers (piezometers at 411 mbgl, 437 mbgl and 470 mbgl) showed a depressurisation, likely linked to the start of mining of Longwall 306. After this rapid depressurisation, the water levels showed a recovery. Most piezometers showed an increase in levels from June 2021, with the top two piezometers showing rises and declines in response to individual rainfall events. The deepest piezometer (470 mbgl) experienced a rapid depressurisation in early May 2022 of approximately 40 m; this occurred after the start of Longwall 307, which was 288 m from PHGW2A at this time.

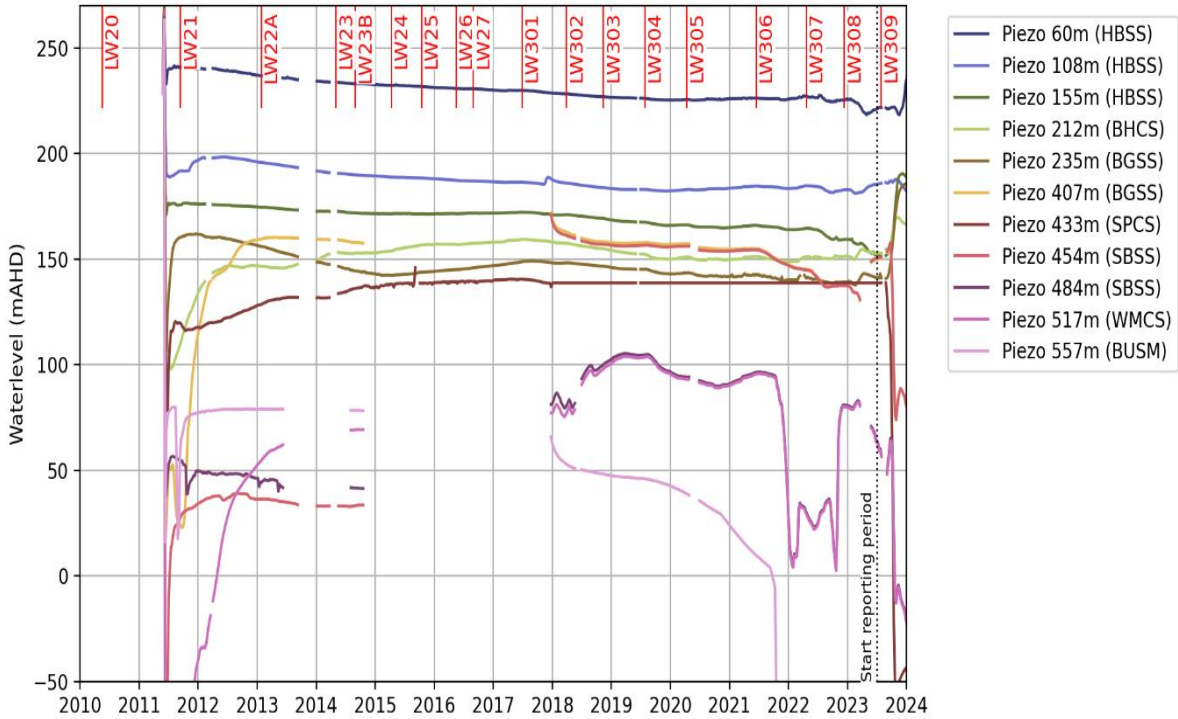
By early September 2022, three piezometers (piezometers at 389 mbgl, 411 mbgl, and 437 mbgl) experienced depressurisation after a period of non-recording, coinciding with the start of Longwall 307. In the last reporting period, only four of the 10 piezometers (piezometers at 60 mbgl, 97.5 mbgl, 135 mbgl, 181.5 mbgl) were recording during this reporting period, all four show a decrease in groundwater pressure, before increasing in mid-2023. Additionally, lost monitoring data from early 2023 for piezometers 389 mbgl, 411 mbgl, and 437 mbgl were recovered and updated. In this reporting period, most piezometers (piezometers at 60 mbgl, 98 mbgl, 135 mbgl, 201 mbgl, 182 mbgl, 389 mbgl, and 437 mbgl) showed stable readings, with a brief interruption in data recording in August 2023. This is seemingly independent of the climate. During this period, the Hawkesbury piezometers maintained relatively stable water levels, while the deeper piezometers indicated potential depressurisation, likely resulting from the activity of Longwall 309.



**Chart 56 Time Variations in Potentiometric Heads at PHGW2A**

### **Bores 9EGW2A and 9EG2A-4**

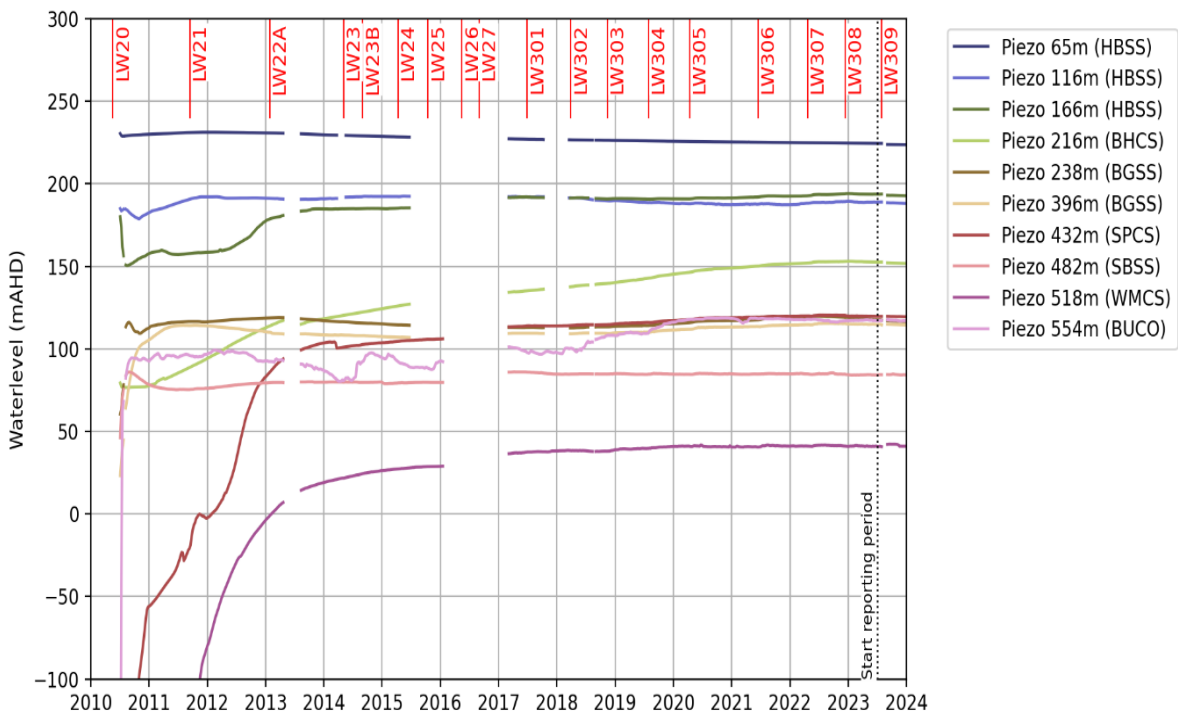
Chart 57 shows the potentiometric heads for bores 9EGW2A and 9EG2A-4 which are about 100 m west of Longwall 308. Piezometers 484 mbgl, 517 mbgl, and 557 mbgl showed a significant decline in late 2021 and a rapid increase at the end of 2022. This decrease can be attributed to in-seam gas drainage holes, which arrived at this location. Geophysics showed an unusually high pore space in the respective claystone formations above the Bulli Seam, which is thought to be the reason for those declines. Piezometers at 484 mbgl and 517 mbgl have shown an oscillation response with rapid recovery towards the end of 2022. Spikes in water level were observed in piezometers 60 mbgl and 235 mbgl before becoming stable in late 2022, this is likely due to the loggers malfunctioning. In October 2023, piezometers 60 mbgl, 155 mbgl, and 235 mbgl have shown a sustained rise, whilst strong declines in the deeper piezometers 407 mbgl, 433 mbgl, 454 mbgl, and 517 mbgl. This is likely due to the passage of Longwall 309; further monitoring data is required for confirmation.



**Chart 57 Time Variations in Potentiometric Heads at 9EGW2A and 9EGW2-4**

**Bore PHGW1B**

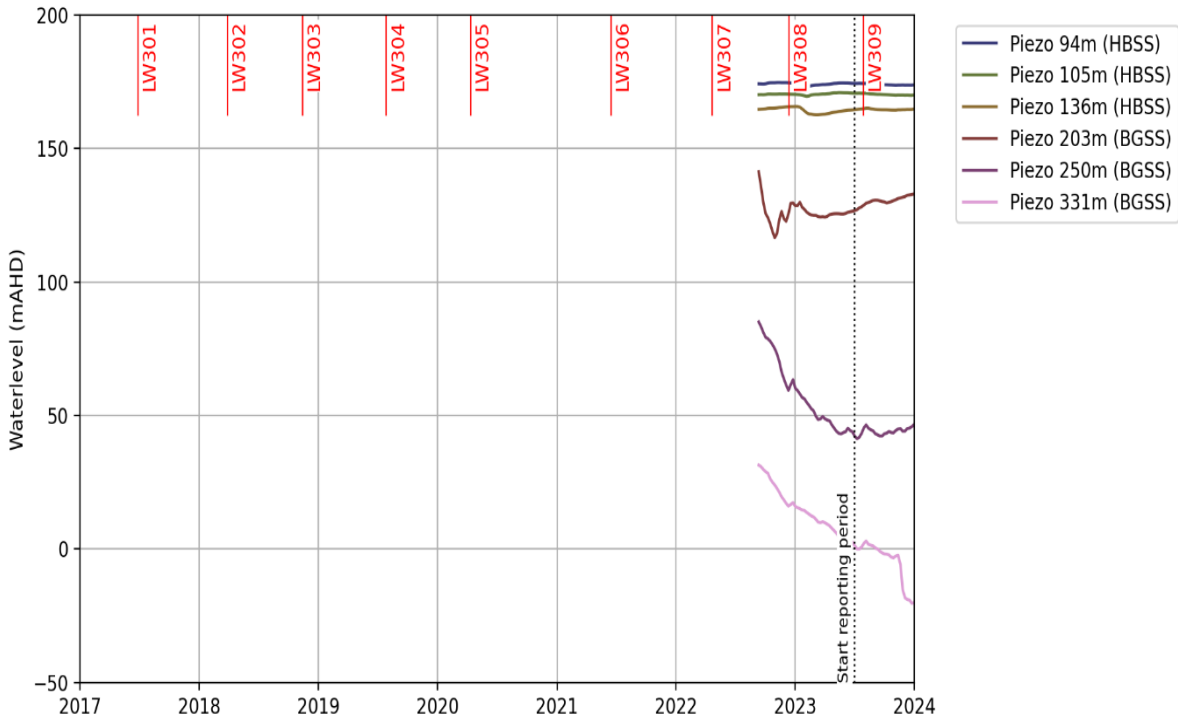
Chart 58 shows the water levels at bore PHGW1B. The piezometers are located approximately 700 m north of Longwall 308. A connection failure prevented the upload of data for sensors in PHGW1B in 2016. Sensors have now been reinstated. During the reporting period, all piezometers showed steady water pressures and no response to the mining of Longwall 308.



**Chart 58 Time Variations in Potentiometric Heads at PHGW1B**

**Bore LW305-Goaf Hole**

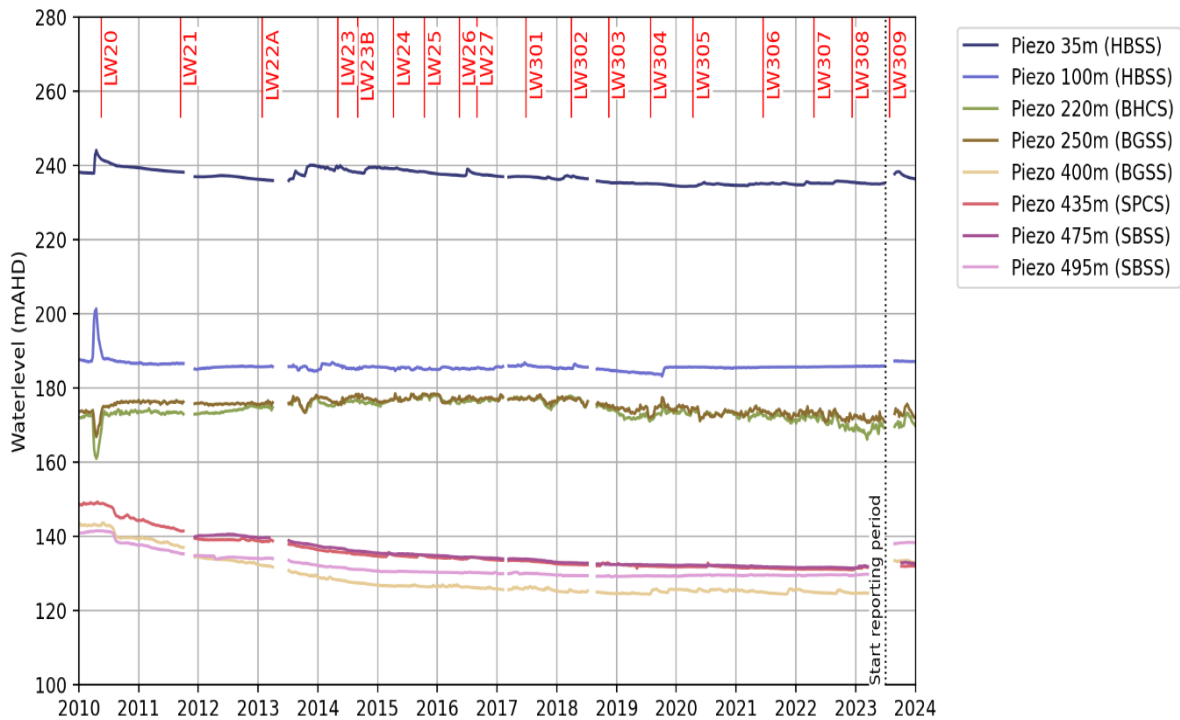
Chart 59 shows the water levels at bore LW305-Goaf Hole. Bore LW305-Goaf Hole was installed in 2022 for post-extraction monitoring of narrow longwall extraction geometry being used underneath the reservoir as required in the Longwalls 305-307 Extraction Plan. The three shallowest piezometers in the Hawkesbury Sandstone have showed stable water levels since monitoring began. The upper Bulgo Sandstone sensor (piezometer at 203 mbgl) showed a decrease in 2022, followed by a consistent increase over this reporting period. The lower two sensors in the Bulgo Sandstone (piezometers at 250 mbgl and 331 mbgl) have shown continually declining groundwater levels, with the deepest sensor experiencing a sharp decline at the end of the reporting period.



**Chart 59 Time Variations in Potentiometric Heads at LW305-Goaf**

**PM02**

Chart 60 shows the groundwater levels at PM02, located along Fire Trail 9D. The passage of Longwalls has had seemingly no effect on the piezometers at PM02. Minor rises and declines observed within the piezometers, particularly piezometers 220 mbgl and 250 mbgl are likely to reflect variations in the climate (rainfall events). During the reporting period, all piezometers showed water pressures aligned with historical levels and no response to mining at Longwall 309. At the start of the reporting period, data gaps were observed, likely from a logger malfunction. After recovery, the readings in piezometers 400 mbgl and 495 mbgl exhibited a minor jump from previous levels but remained stabilized. Therefore, the data is seemingly useful but awaits further confirmation.



**Chart 60 Time Variations in Potentiometric Heads at PM02**

#### 6.2.8.2 Assessment of Vertical Potentiometric Head Profiles

Vertical potentiometric head profiles at bores PHGW2A and PM02 are used to assess connective cracking between the surface and the mine in accordance with the Longwalls 308-310 Water Management Plan.

The vertical potentiometric head profiles have been assessed against the following performance indicators:

*Significant departure from the predicted envelope of the vertical potentiometric head profile at Bore PHGW2A does not occur.*

*Significant departure from the predicted envelope of the vertical potentiometric head profile at Bore PM02 does not occur.*

The performance indicators were not exceeded during the reporting period because the measured potentiometric head profiles are consistent in shape and do not lie significantly to the left of the predicted model curves (Appendices C1 and C2).

### 6.2.8.3 Assessment of Hydraulic Gradient to the Woronora Reservoir

The groundwater head of Bores PHGW2A, 9EGW2A and PM02 are compared to the full supply level of the Woronora Reservoir to assess reductions in hydraulic gradient from the bores to the Woronora Reservoir in accordance with the Longwalls 308-310 Water Management Plan.

The results have been assessed against the following performance indicators:

*The hydraulic gradient to the Woronora Reservoir at full supply level from Bore PHGW2A is reduced by no more than 40% from that measured to 30 June 2017.*

*The hydraulic gradient to the Woronora Reservoir at full supply level from Bore 9EGW2A is reduced by no more than 40% from that measured to 30 June 2017.*

*The hydraulic gradient to the Woronora Reservoir at full supply level from Bore PM02 is reduced by no more than 40% from that measured to 30 June 2017.*

The performance indicators for bores PHGW2A, 9EGW2A and PM02 were not exceeded during the reporting period (Appendices C1 and C2).

The key potential subsidence impacts and environmental consequences on the deep groundwater system described in the Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans, included:

- Based on experience at Metropolitan Coal, substantial depressurisation of the deep aquifers in the fractured zone above the goaf is restricted to a height of less than 130 m from the top of the goaf, while transient pressure effects have been observed to propagate to a height of about 300 m above the goaf. That is, there is a pronounced increase in vertical hydraulic gradient in the deep groundwater system over the Metropolitan Coal longwalls.
- Above goaf zones there would be substantial changes in fracture porosity and permeability, due to opening up of existing joints, new fractures and bed separation. Permeability increases would have accompanying reductions in lateral hydraulic gradients, with associated changes in groundwater levels and pressures. Pronounced changes in groundwater levels can occur without any significant drainage into a mine, particularly from the Narrabeen Group sandstones.
- Groundwater discharge to the mined seam would occur from above and below the seam in proportion to local permeabilities. Based on earlier modelling, the water make (i.e. groundwater inflow) was expected to be in the order of 0.1 megalitres per day (ML/day) for Longwalls 20-27 and from 0.045 to 0.6 ML/day for Longwalls 301-303. Modelling indicated that the inflow could be up to 0.5 ML/day from the deep groundwater system during mining of Longwall 24 and up to 0.6 ML/day during the mining of Longwall 302. The 2018 groundwater model predicted that inflow for Longwalls 305-307 would be approximately 0.02 ML/day to approximately 0.24 ML/day at the end of Longwall 307. A recalibration of the groundwater model was completed by SLR in 2020 and predicted groundwater inflow of approximately 0.1 ML/day. Improving the previous overly conservative prediction of inflows that predicted of up to 0.24 ML/day.
- Due to the substantial depths of cover at the Project, there would not be connective cracking from the mined seam to the surface. Groundwater modelling for the Project indicates that there is expected to be eventual recovery of deep groundwater system pressures over many decades following the cessation of mining.

The NSW Planning Assessment Commission (2009) concluded that given the considerable depth of mining and the restricted panel width in the Project Area, that, in the absence of geological structures such as faults and igneous intrusions (sills, dykes and diatremes), there is a very high probability that a constrained zone will be associated with the mine layout proposed over the Project Area, thereby preventing direct hydraulic connections between mine workings and surface water bodies.

The groundwater monitoring results are consistent with the potential subsidence impacts and environmental consequences described in the Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans.

### **6.2.9 Groundwater Quality**

#### ***Waratah Rivulet***

Groundwater quality at sites WRGW1 to WRGW7<sup>7</sup> on Waratah Rivulet (Figure 11) is shown on Charts 61 to 63 for iron, manganese and pH, respectively.

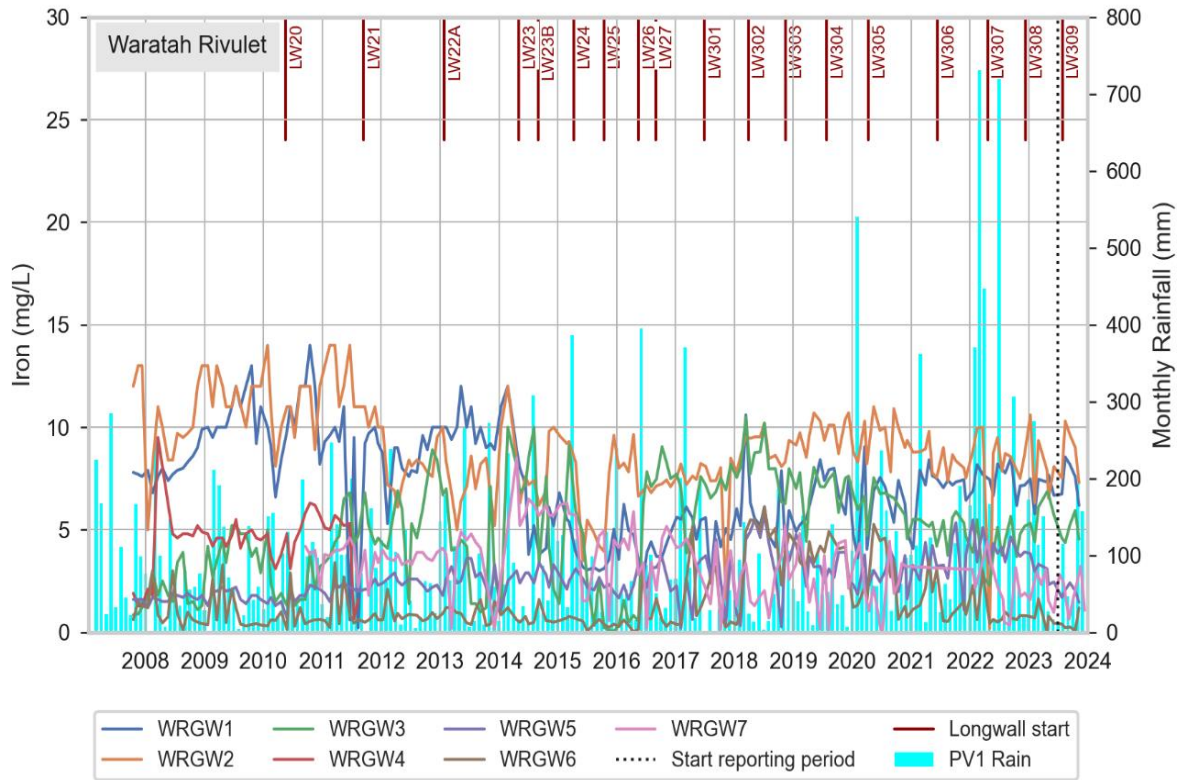
Groundwater quality monitoring at sites WRGW1 to WRGW7 indicates dissolved iron concentrations are usually in the 1 to 10 mg/L range, with the exception of sites WRGW1 and WRGW2 which peaked at 14 mg/L in earlier years (2010-2011) (Chart 61). Iron concentrations in groundwater at WRGW1 and WRGW2 have decreased since 2011. During the reporting period, concentrations remained below 10 mg/L at both bores excluding WRGW2 in August 2023 that reached 10.3 mg/L.. Dissolved iron concentrations in groundwater at site WRGW7 remained below 5 mg/L during the reporting period (Chart 61, and Appendices C1 and C2).

Dissolved manganese concentrations at sites WRGW1 to WRGW7 are typically less than 1 mg/L. Higher concentrations of manganese were reported for WRGW3 in June 2015 (3.36 mg/L), September 2015 (1.47 mg/L), March 2017 (1.31 mg/L) and April 2017 (1.65 mg/L) and for WRGW6 in April 2017 (1.77 mg/L) (Chart 62). Dissolved manganese concentrations at WRGW3 have followed a slight increasing trend since 2007. The trend has reversed in 2018 and the concentrations are decreasing slightly and are now in the range of 0.5 to 0.75 mg/L. In the current reporting period, all sites remained below 1 mg/L (Chart 62, Appendices C1 and C2).

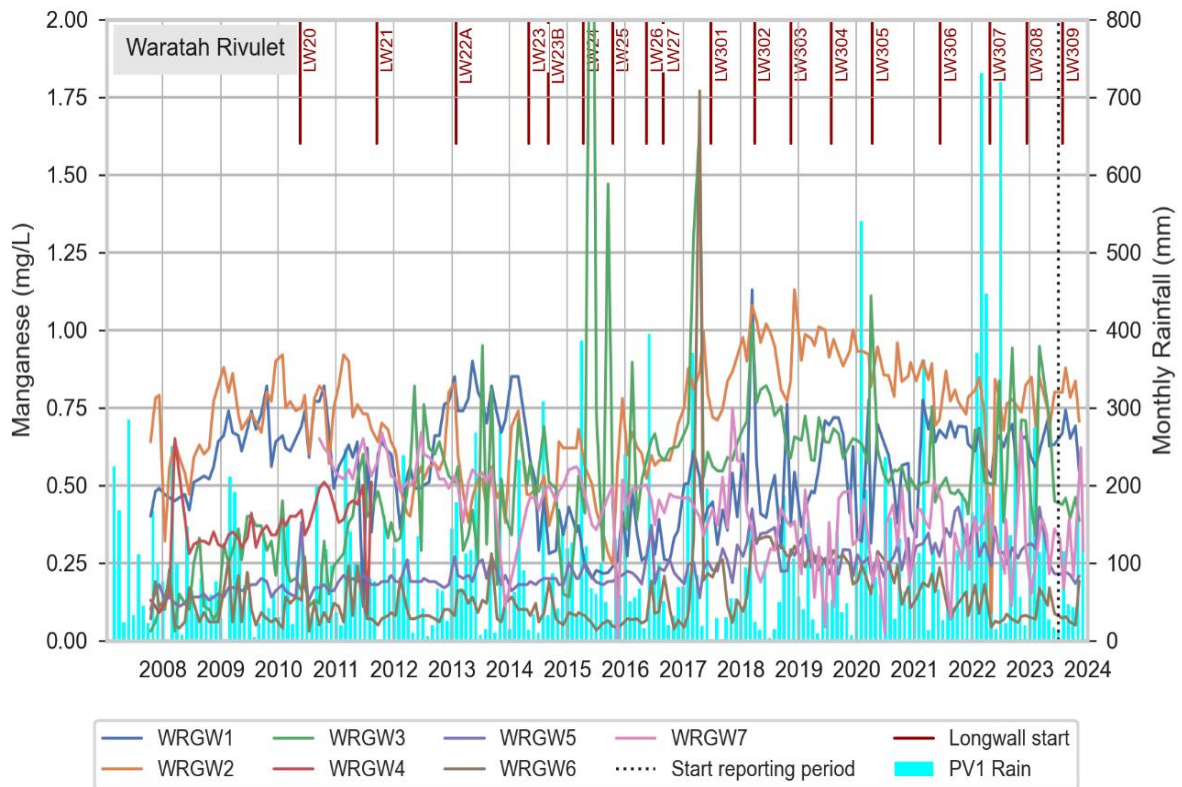
The pH level at the Waratah Rivulet sites has been generally acidic and usually between pH 5.5 and 7. Occasional occurrences in excess of pH 9 and less than pH 5 in prior reporting periods are unsustainable outliers. The pH at all sites increased towards more neutral/alkaline conditions compared to the historical range during the reporting period, with pH observed between 6.3 and 8 (Chart 63, and Appendices C1 and C2).

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<sup>7</sup> Site WRGW4 was sheared in 2011 and has subsequently not been sampled.

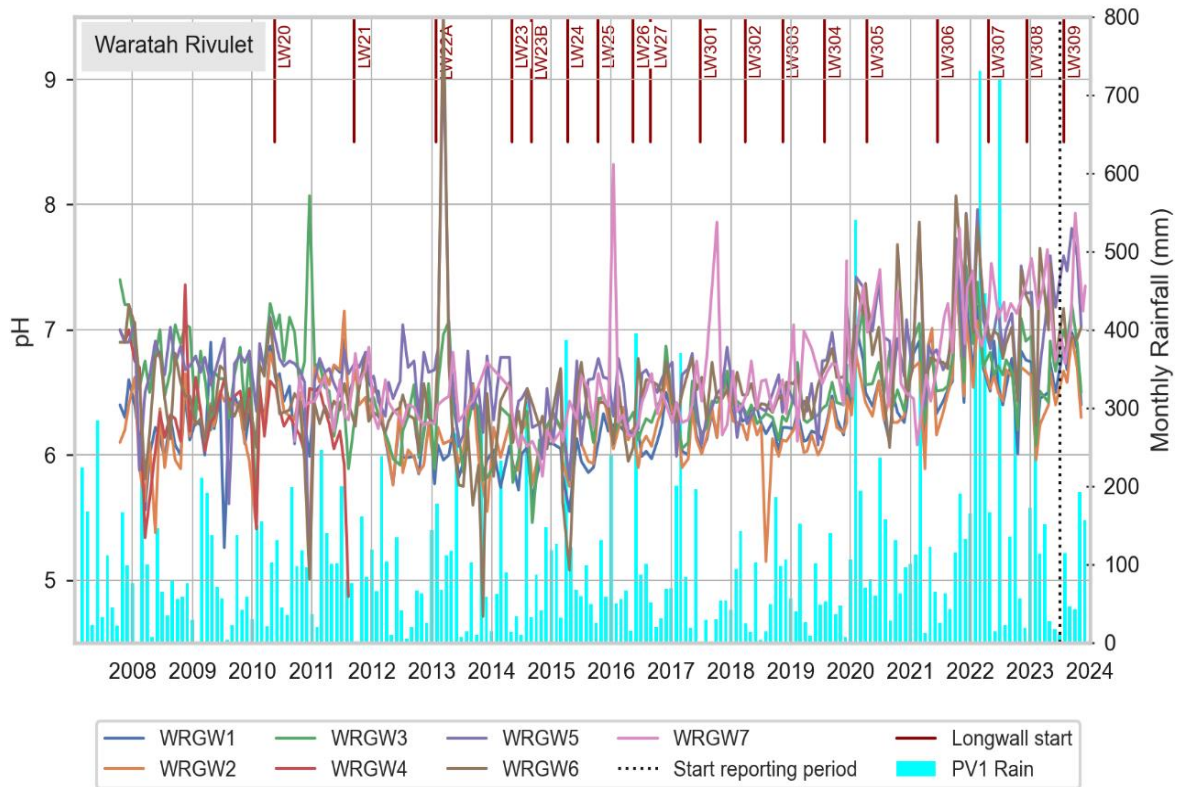


**Chart 61 Iron Concentrations at WRGW1 to WRGW7**



**Chart 62 Manganese Concentrations at WRGW1 to WRGW7**





**Chart 63 pH Levels at WRGW1 to WRGW7**

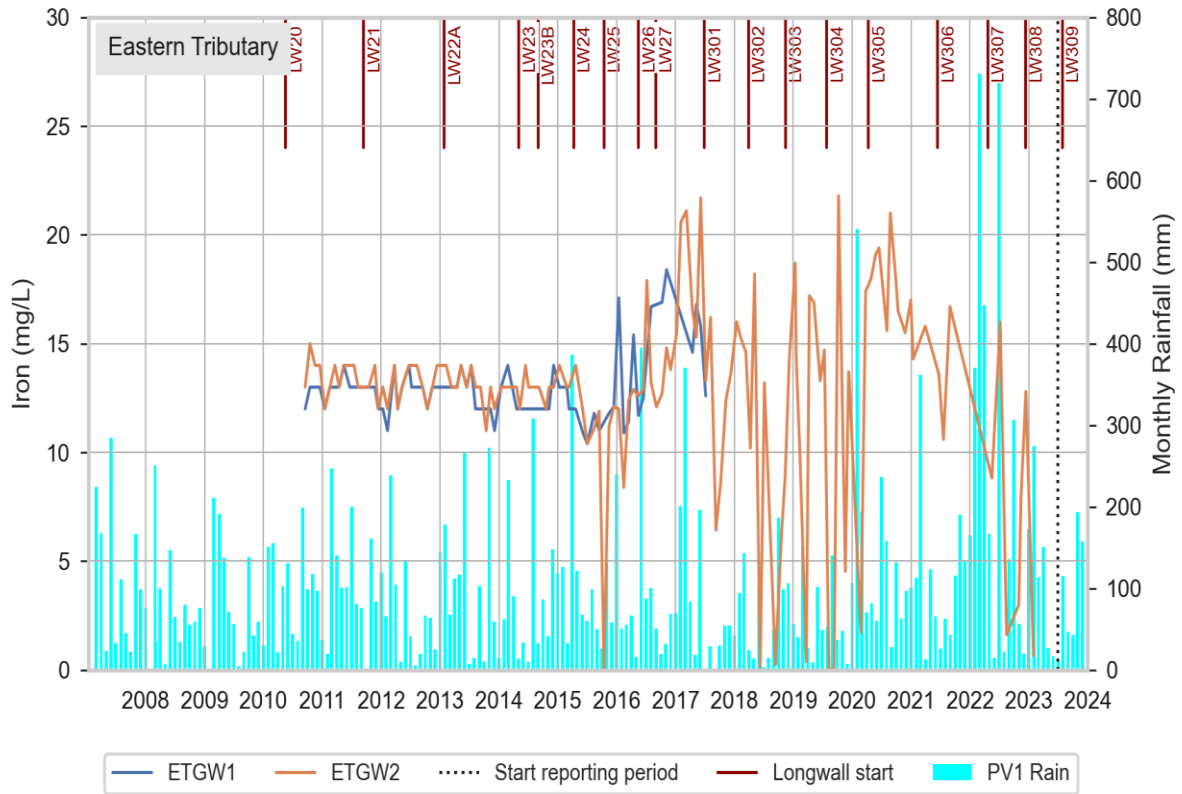
### ***Eastern Tributary***

Groundwater quality at the two Eastern Tributary sites ETGW1 and ETGW2 (Figures 10 and 11) is shown on Charts 64 to 66 for iron concentration, manganese concentration and pH, respectively. Bore ETGW1 was unable to be sampled for groundwater quality from January to March 2017. Further, ETGW1 was sheared in July 2017 and has subsequently not been sampled. In August 2021, bore ETGW2 sheared. Bore ETGW2 was unable to be sampled during the first half of 2022, however quality monitoring has again resumed during this reporting period.

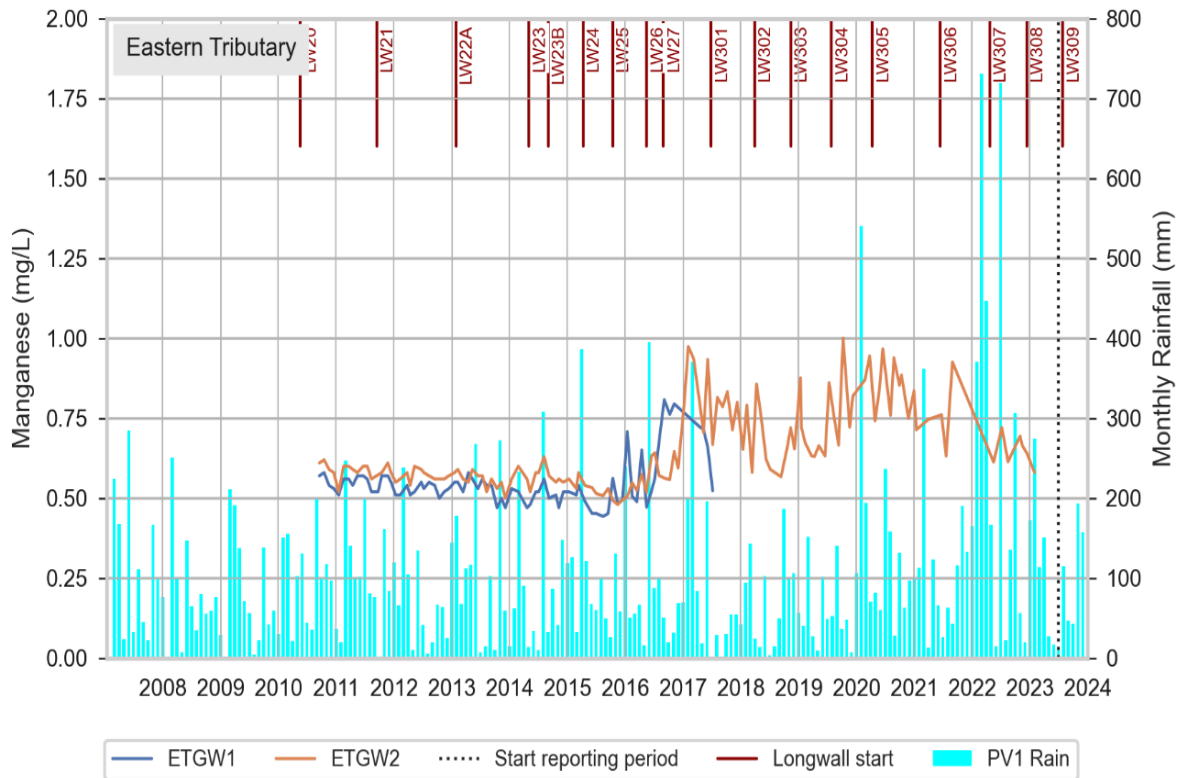
Groundwater quality monitoring on the Eastern Tributary (Figure 11) indicates high iron concentrations with an increasing trend, and larger variability than recorded in the period 2010 to 2015, persisted until July 2017 when the concentration decreased. During 2019, ETGW2 displayed a variable trend and recorded the maximum recorded concentration of 21.8 mg/L in October 2019 and the historical minimum of 0.4 mg/L in March 2019. Sampling in 2022 displayed a high variability with a lowest value of 3 mg/L (October 2022) and highest value of 16 mg/L (July 2022). Conversely, January 2023 recorded a very low iron concentration of 0.65 mg/L (Chart 64).

During the reporting period, manganese concentrations in samples collected continue to be consistently higher than the historically recorded manganese concentrations at ETGW2. Up to 2017, ETGW2 recorded manganese concentrations below 0.6 mg/L, but these have increased to a range of 0.6 to 1 mg/L since then. The manganese concentrations seem to have stabilised at this range of concentrations, which has been observed since 2017 (Chart 65).

The groundwater at the Eastern Tributary sites is generally acidic, ranging between pH 5.5 and pH 6.5 for most of the monitoring record (since 2010). At ETGW2, recent data has shown an increasing pH trend to a more neutral range of 6.5 to 7, potentially associated with increased recharge from surface water. The January 2023 measurement showed a reduction of pH to 6.2. (Chart 66, Appendices C1 and C2).

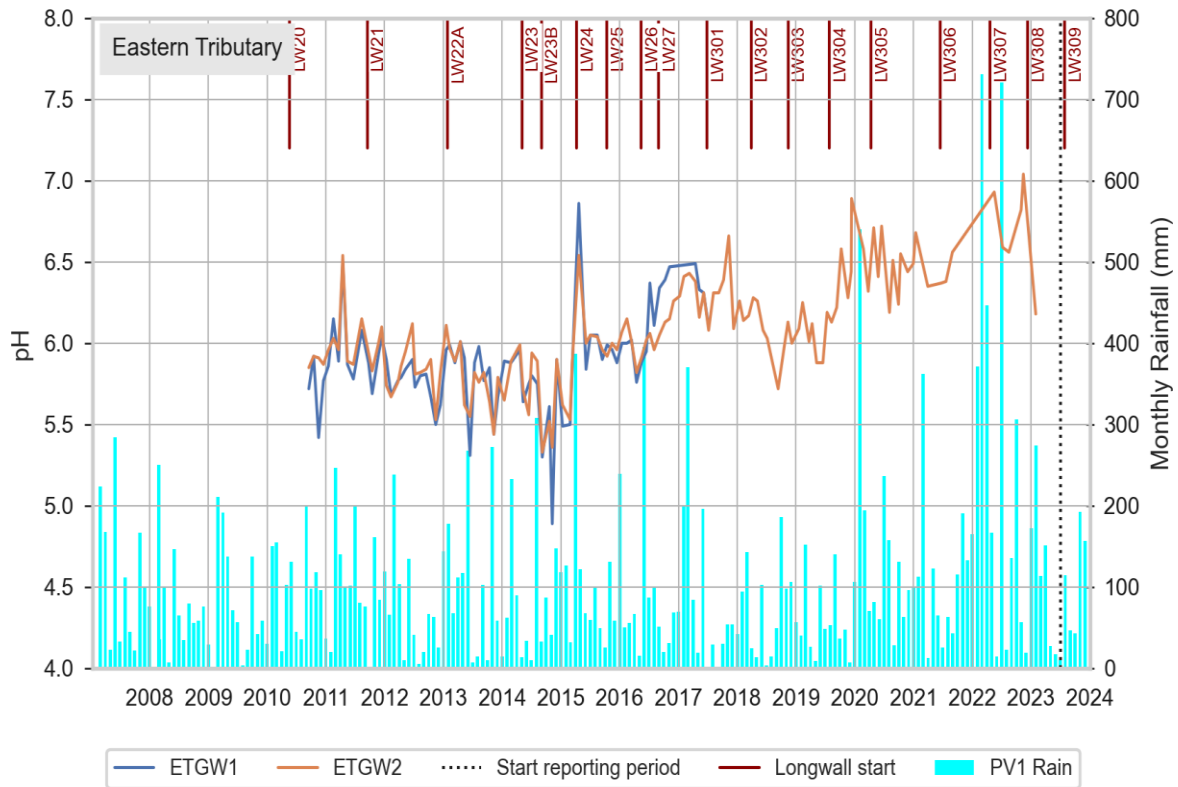


**Chart 64 Iron Concentrations at ETGW1<sup>8</sup> and ETGW2**



**Chart 65 Manganese Concentrations at ETGW1 and ETGW2**

<sup>8</sup> Site ETGW1 was unable to be sampled from January to March 2017, and since August 2017.



**Chart 66 pH Levels at ETGW1 and ETGW2**

The Project EA, Preferred Project Report and Metropolitan Coal Water Management Plans predicted local surface water quality impacts as a result of enhanced groundwater-surface water interactions (as described for surface water quality above). The groundwater quality monitoring results are considered to be consistent with the predictions.

### 6.2.10 Inspections of Mine Workings

Mine inspections did not identify any abnormal water flows from the goaf, geological structure, or strata generally during the reporting period.

### 6.2.11 Mine Water Intake

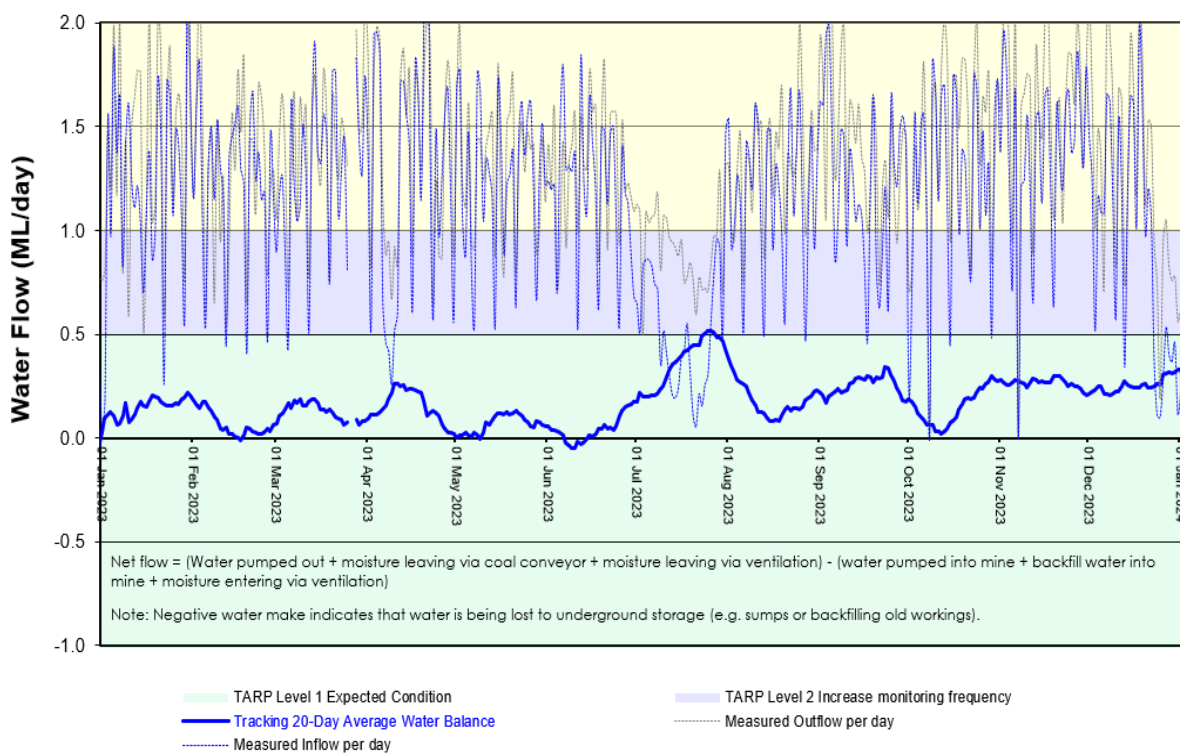
Monitoring of the mine water balance comprises:

- Metered water reticulated into the mine (recorded continuously and downloaded monthly).
- Backfill water used to assist pumping into the mine (recorded continuously and downloaded monthly).
- Metered water reticulated out of the mine (recorded continuously and downloaded monthly).
- Manual measurement of moisture content into and out of the mine through the mine ventilation system using a digital psychrometer. The frequency of readings is as follows:
  - every hour over a nine hour period on two occasions during a 12 month period;
  - daily (week day) except public holidays or other circumstances (access, fan maintenance, etc.) that prevent readings to be taken; and
  - once per week as a minimum.

- Measurement of the *in-situ* moisture content of the coal during channel sampling for coal quality.
- Measurement of the moisture content of ROM coal conveyed out of the mine at the drift portal using an automated moisture scanner. A fully automated data acquisition system records and stores the data.

The inferred water make (i.e. groundwater that has seeped into the mine from the strata) is calculated from the difference between total mine inflows (reticulated water into the mine, moisture in the downcast ventilation, and the *in-situ* coal moisture content) and total mine outflows (reticulated water out of the mine, moisture in the exhaust ventilation, and moisture in the ROM coal). Given the large fluctuations in daily water usage and the cycle period for water entering the mine, a 20 day average is used to provide a more reliable estimate of water make.

The 20 day average daily mine water make was approximately 0.18 ML/day during the reporting period (i.e. well below the 0.5 ML/day Level 2 TARP trigger) (Chart 67).



**Chart 67 Estimated Daily Mine Water Make**

### 6.3 BIODIVERSITY MANAGEMENT

The Metropolitan Coal Longwalls 308-310 Biodiversity Management Plan was prepared to manage the potential environmental consequences of the Longwalls 308-310 Extraction Plan on aquatic and terrestrial flora and fauna, with a specific focus on swamps, in accordance with Condition 6, Schedule 3 of the Project Approval.

The Longwalls 308-310 Biodiversity Management Plan includes post-mining monitoring and management of potential subsidence impacts and environmental consequences associated with Longwalls 20-22, Longwalls 23-27, Longwalls 301-303, Longwall 304 and Longwalls 305-307.

Sections 6.3.1 to 6.3.5 provide a summary of the biodiversity assessments for the reporting period. Section 6.8 provides a summary of the assessments against the biodiversity subsidence impact performance indicators and measures for the reporting period.

### 6.3.1 Upland Swamp Vegetation Monitoring

#### 6.3.1.1 Longwalls 20-22 and Longwalls 23-27

Upland swamp vegetation monitoring is conducted biannually (in autumn and spring) at a number of swamps overlying or adjacent to Longwalls 20-22 and Longwalls 23-27, and at a number of control swamps (Figure 9).

In autumn 2023, visual inspections were conducted in Swamps 16, 17, 18, 19, 20, 24, 25, 28, 30, 31, 32, 33, 34, 35, 36 and 94 overlying or adjacent to Longwalls 20-27 and in control Swamps 101, 111a, 125, 135, 136, 137a, 137b, 138, Bee Creek Swamp, Dahlia Swamp, Woronora River 1, and Woronora River south arm.

Transect/quadrat monitoring of Longwalls 20-22 sites was discontinued from autumn 2023 onwards, as outlined in the Longwalls 308-310 Biodiversity Management Plan. This was due to the relative stability of the vegetation condition, as reflected by species richness, in the Longwalls 20-22 sites over the eight years since the completion of mining of Longwalls 20-22. This was applicable to all sites overlying or immediately adjacent to Longwalls 20-22, namely Swamps 16, 17, 18, 20, 24, and 25. Transect/quadrat monitoring was conducted in Swamps 28, 30, 33, 35 and 94 overlying or adjacent to Longwalls 23-27 and in control Swamps 101, 111a, 125, 135, 136, 137a, 137b, 138, Bee Creek Swamp, Woronora River 1, and Woronora River south arm.

Indicator species monitoring for Longwalls 20-22 includes 20 tagged individuals of *Epacris obtusifolia* (in Swamps 18, 24, 25, 101, 111a and 125), *Pultenaea aristata* (in Swamps 18, 24, 25, 101 and 111a) and *Sprengelia incarnata* (in Swamps 24, 101 and 125). Three indicator species characteristic of the Tea Tree Thicket vegetation community, namely *Banksia robur*, *Callistemon citrinus* and *Leptospermum juniperinum* are monitored in Swamp 20 and at control Swamps Woronora River 1, Woronora River south arm and Dahlia Swamp.

Indicator species monitoring for Longwalls 23-27 includes 20 tagged individuals of *Epacris obtusifolia* (in Swamps 19, 30, 33, 35, 94, 101, 111a, 125, 135, 136, 137a, 137b and 138), *Pultenaea aristata* (in Swamps 19, 30, 33, 35, 94, 101, 111a, 135, 136, 137a and 138), *Sprengelia incarnata* (in Swamps 19, 33, 35, 94, 101, 125, 135, 136, 137a and 138) and *Banksia robur* and *Callistemon citrinus* in Swamp 28 and control Swamps Woronora River 1, Woronora River south arm and Dahlia Swamp.

The vegetation survey results for spring 2022 and autumn 2023 have been assessed in accordance with the Longwalls 308-310 Biodiversity Management Plan. The results of the spring 2022 and autumn 2023 survey in relation to the Biodiversity Management Plan TARP are summarised in Section 6.8.

The spring 2022 and autumn 2023 Longwalls 20-22 and Longwalls 23-27 Vegetation Monitoring Reports prepared by Eco Logical Australia (Eco Logical) describe the results of these surveys, and are provided as Appendices F1, F2, F3 and F4, respectively.

### 6.3.1.2 Longwalls 301-304

The upland swamp vegetation monitoring program used for Longwalls 301-304 (visual, transect/quadrat and indicator species monitoring) is consistent with those used for the Longwalls 20-22 and Longwalls 23-27 upland swamp vegetation monitoring programs. Upland swamp vegetation monitoring is conducted biannually (in autumn and spring) at a number of swamps overlying or adjacent to Longwalls 301-304 and at a number of control swamps (Figure 9).

In autumn 2023, visual inspections were conducted for swamps overlying or adjacent to Longwalls 301-304 (Swamps 40, 41, 46, 47, 48, 49, 50, 51/52, 53 and 58) and in control Swamps 101, 111a, 125, 135, 136, 137a, 137b and 138 to record evidence of potential subsidence impacts.

Transect/quadrat monitoring was also conducted in autumn 2023 at Swamps 40, 41, 46, 48, 50, 51/52 and 53. Control Swamps 101, 111a, 125, 135, 136, 137a, 137b and 138, were selected for comparison and the same transect/quadrat monitoring methodology was used to survey each of these swamps. Swamps 46 and 51/52 were subject to WaterNSW hazard reduction burns following the autumn 2017 baseline survey and prior to the spring 2017 survey, resulting in vegetation along transects in these swamps no longer being comparable to the control swamps. Similarly, sections of Swamps 40, 47, 48, 49 and 50 were burnt in a WaterNSW hazard reduction burn during the autumn 2021 survey period, although only a portion of each was directly affected and the majority of the previous vegetation community still remains.

Indicator species monitoring for Longwalls 301-304 previously included 20 tagged individuals of *Epacris obtusifolia* (in Swamps 40, 51/52, 53, 101, 136 and 137a) and *Sprengelia incarnata* (in Swamps 40, 51/52, 53, 101, 136 and 137b). However, subsequent to the autumn 2017 baseline survey and prior to the spring 2017 survey, Swamp 51/52 was subject to WaterNSW hazard reduction burns, resulting in the death of indicator species in Swamp 51/52. As a result, indicator species monitoring in Swamp 51/52 was removed from the monitoring program.

The vegetation survey results for autumn 2023 have been assessed in accordance with the Longwalls 308-310 Biodiversity Management Plan. The results of the autumn 2023 survey in relation to the Biodiversity Management Plan TARP are summarised in Section 6.8. The results of the Longwalls 301-304 upland swamp vegetation monitoring program (up to and including the autumn 2023 survey) can be summarised as follows:

- Visual inspections did not identify any cracking of exposed bedrock areas or swamp sediments in either longwall or control swamps as a result of mine subsidence.
- Areas in which active erosion was observed were generally minor to moderate and limited to flow paths along existing tracks (Swamps 49 and 125) or transects (Swamps 50 and 138).
- The autumn 2023 survey was conducted following a period of below-average rainfall, with the below-average rainfall throughout the months of December 2022 to February 2023. During the autumn 2022 survey, rainfall was well above average in March and July 2022. The conditions leading up to, and throughout, the survey period reflect the variability of seepage recorded in longwall and control valley side swamps.
- Vegetation in autumn 2023 at both longwall and control sites was found to be in a generally good condition. Four exceptions to this were: patches of senescencing shrubs were observed along all three Transects Swamp 50 (portions of Banksia thicket dead/collapsing); noted yellowing tinge to most shrub species throughout control Swamp 125; new dieback of *Xanthorrhoea resinosa* was common along Transect 2 and 3 in Swamp 41; and collapsing dead shrubs in Swamp 58, however, this is due to a recent hazard reduction burn and recovery is evident. Isolated dieback and senescence of individual plants was observed in both longwall and control sites, although healthy individuals of all species observed with dieback were also observed throughout the sites.

- Species richness within individual valley side swamps in autumn 2023 was within the range recorded in previous seasons for most longwall and control swamps and was consistent with the fluctuations observed within the baseline monitoring period. The exception to this were the longwall Swamps 135 and 137a, where species richness decreased below previously recorded levels (by nine and four species, respectively). Species richness at one longwall site, Swamp 50, was the equal highest ever recorded for this site across all monitoring seasons. In autumn 2023, a small decrease in species richness compared to the previous season, spring 2022, was recorded at three longwall sites (Swamps 48, 51/52 and 53). One longwall site recorded a small increase in species richness (Swamp 46), two sites recorded a moderate increase (Swamps 40 and 50) and one site recorded a large increase (Swamp 41). Species richness declined in four of the five control sites, with decreases in species richness ranging from large (Swamp 135), to moderate (Swamp 137a), to small (Swamps 101 and 137b), compared to spring 2022. A moderate increase in species richness compared to spring 2022 was recorded at one control site (Swamp 136).
- Fluctuations in species cover/abundance and condition were recorded across all sites throughout the reporting period. No patterns of increasing or decreasing cover/abundance, or declines in vegetation condition, were identified during the autumn 2023 monitoring in relation to individual species across sites or groups of species (i.e. swamp indicator species, generalist species, shrubs, ground covers) within sites.
- In autumn 2023, the proportion of upland swamp indicator species which were dead was greater at longwall sites than control sites for *Epacris obtusifolia*. This trend has been observed since the baseline monitoring period. Since the large increase in the proportion of dead indicator species observed for control sites in autumn 2018, the seasonal increases have been consistent between longwall and control sites. Mortality of tagged indicator species may be attributed to environmental conditions including the stress associated with drying out of shallow soils during periods of below-average rainfall.
- In autumn 2023, the mean vegetation condition of tagged *Epacris obtusifolia* individuals was lower than the range observed across the baseline monitoring seasons for both longwall and control sites. As these declines have occurred at both longwall and control swamps, it is considered to reflect the natural fluctuations in plant health associated with herbivory, resource competition, ageing plants and, in particular, the ongoing drought conditions following an extended period of below-average rainfall from July 2017 to February 2020.
- The flowering status of tagged indicator species, as recorded in the mean reproductive status shows that across all seasons, flowering has been highly variable, particularly within control sites. The mean reproductive status of tagged indicator species has also been variable between longwall and control swamps in individual seasons. Flowering in autumn 2023 has been similar to previous autumn surveys for both longwall and control sites.
- The upland swamp performance indicator '*The vegetation in upland swamps is not expected to experience changes significantly different to changes in control swamps*' has not been exceeded for any of the Longwalls 301-304 upland swamps to date.

The spring 2022 and autumn 2023 Longwalls 301-304 Vegetation Monitoring Reports prepared by Eco Logical are provided as Appendices H5 and H6, respectively.

### 6.3.1.3 Longwalls 305-307

The upland swamp vegetation monitoring program used for Longwalls 305-307 (visual and transect/quadrat monitoring) is consistent with those used for the Longwalls 20-22, Longwalls 23-27 and Longwalls 301-304 upland swamp vegetation monitoring programs. Upland swamp vegetation monitoring is conducted biannually (in autumn and spring) at a number of swamps overlying or adjacent to Longwalls 305-307 and at a number of control swamps (Figure 9).

In autumn 2023, visual inspections were conducted in Swamps 69, 70, 71a, 71b, 72 and 73, and transect/quadrat monitoring was conducted in Swamp 71a overlying or adjacent to Longwalls 305-307. Control Swamps 101, 111a, 125, 135, 136, 137a, 137b, and 138 were selected for comparison with the swamps over Longwalls 305-307 and the same transect/quadrat monitoring methodology was used to survey each of these swamps. Swamps 69, 70, 71a and 71b were subject to WaterNSW hazard reduction burns in 2016 and 2017.

The vegetation survey results for autumn 2023 have been assessed in accordance with the Longwalls 308-310 Biodiversity Management Plan. The results of the autumn 2023 survey in relation to the Longwalls 308-310 Biodiversity Management Plan TARP are summarised in Section 6.8. The results of the Longwalls 305-307 upland swamp vegetation monitoring program (up to and including the autumn 2023 survey) can be summarised as follows:

- Visual inspections in autumn 2023 did not identify any areas of cracking of exposed bedrock areas or swamp sediments in longwall swamps, other than minor cracks in exposed bedrock which have previously been recorded (e.g. weathering artefact and fire damage in Swamp 137b).
- Areas in which active erosion was observed were minor and limited to pre-existing tracks (Swamp 125). The exception to this was Swamp 73 where moderate to severe erosion occurred along existing water flow paths, resulting in loss and deposition of sediments and exposure of plant roots.
- Vegetation in autumn 2023 at both longwall and control sites was found to be generally in good condition with no unusual areas of vegetation senescence observed. An exception to the generally good condition of vegetation was a noted yellowing tinge to most shrub species throughout control Swamp 125. Isolated dieback and senescence of individuals was observed in both longwall and control sites, although healthy individuals of all species observed with dieback were also observed throughout the sites.
- The vegetation structure, dominant species and estimated cover for each stratum has been variable across the baseline monitoring period and the three monitoring seasons since the commencement of longwall mining (spring 2020 and autumn 2021), with variations recorded between sites, seasons and strata. This variability is considered to reflect both the natural variations in the height and cover/abundance of vegetation structural layers through time, as well as the subjective nature of data collection and impacts from fire.
- Fluctuations in species cover/abundance and condition were recorded across all sites. No patterns of increasing or decreasing cover/abundance were identified in relation to individual species across sites or groups of species (i.e. swamp indicator species, generalist species, shrubs, ground covers) within sites.



- Species richness within individual valley side swamps in autumn 2023 was within the range previously recorded across all previous monitoring seasons for the single longwall site (Swamp 71a) and most control sites, the exception being Swamps 135 and 137a, which declined below previously recorded levels. Species richness declined in four of the five control sites, with decreases in species richness ranging from large (Swamp 135), moderate (Swamp 137a) to small (Swamps 101 and 137b), compared to spring 2022. A moderate increase in species richness compared to spring 2022 was recorded at one control site (Swamp 136).
- The upland swamp performance indicator, '*The vegetation in upland swamps is not expected to experience changes significantly different to changes in control swamps*' has not been exceeded in autumn 2023.

The spring 2022 and autumn 2023 Longwalls 305-307 Vegetation Monitoring Reports prepared by Eco Logical are provided as Appendices F7 and F8, respectively.

#### 6.3.1.4 Longwalls 308-310

In autumn 2023, visual inspections were conducted for swamps overlying or adjacent to Longwalls 308-310 (Swamps 61, 62, 63, 64, 78, 79, 80, 81, 82, 83, 88, 89, 90, and 92SH and S92TTT) and in control Swamps 101, 111a, 125, 135, 136, 137a, 137b and 138 to record evidence of potential subsidence impacts.

Transect/quadrat monitoring was also conducted in autumn 2023 at Swamps 62, 64, 78, 79, 80, 81, 82, 89, 90, 92SH and 92TTT. Control Swamps 101, 111a, 125, 135, 136, 137a, 137b and 138, were selected for comparison and the same transect/quadrat monitoring methodology was used to survey each of these swamps.

The vegetation survey results for autumn 2023 have been assessed in accordance with the Longwalls 308-310 Biodiversity Management Plan. The results of the autumn 2023 survey in relation to the Biodiversity Management Plan TARP are summarised in Section 6.8. The results of the Longwalls 308-310 upland swamp vegetation monitoring program (up to and including the autumn 2023 survey) can be summarised as follows:

- Vegetation monitoring in upland Swamps 61, 62, 63, 64, 78, 79, 80, 81, 82, 83, 88, 89, 90, 92SH and 92TTT indicates there is no declining trend in the condition of the swamp vegetation and there are no significant changes in vegetation between these longwall and control swamps. Swamp vegetation is consistent with the baseline monitoring results. These swamps therefore remain at 'significance Level 1' in accordance with the upland swamp vegetation monitoring TARP.
- Areas in which active erosion was observed were minor and limited in extent within both longwall and control sites.
- Visual inspections did not identify any cracking of exposed bedrock areas or swamp sediments in either longwall or control swamps.
- The occurrence of seepage across the baseline monitoring period was variable both between seasons and between longwall and control swamps, with a greater amount generally recorded in spring 2022. Changes in water colour were observed during the baseline monitoring period where the iron-stained seepage and the presence of metallic sheens across standing water. Both the metallic sheen and the iron-staining of seepage is known to be caused by naturally occurring iron bacteria, which proliferate when high rainfall releases an abundance of iron from sandstone rock and soils.

- Vegetation in autumn 2023 at both longwall and control sites was found generally to be in a good condition with no unusual areas of vegetation senescence observed. Some isolated dieback and senescence of individuals occurred in most longwall and control swamps throughout the baseline period, particularly in spring 2022.
- No notable changes in vegetation structure, dominant species or estimated cover and abundance were recorded within longwall or control swamps over the baseline period.
- Species richness within upland swamps was variable within and between both longwall and control swamps.
- In autumn 2023, minor fluctuations in species cover/abundance and condition were recorded across all sites throughout the baseline monitoring period. No patterns of increasing or decreasing cover/abundance, or declines in vegetation condition, were identified in relation to individual species across sites or groups of species (i.e. swamp indicator species, generalist species, shrubs, ground covers) within sites.
- No weed species were observed within any of the longwall sites during the autumn 2023 visual inspections. However, weed species were observed within one control site, during the autumn 2023 visual inspections.
- In autumn 2023, three species of conservation significance were recorded at upland swamp control monitoring sites, namely *Darwinia diminuta*, *Tetratheca neglecta* and *Pultenaea aristata*. These species were recorded in healthy condition.

The autumn 2023 Longwalls 308-310 Vegetation Monitoring Report prepared by Eco Logical is provided as Appendix F9.

### **6.3.2 Upland Swamp Groundwater Monitoring**

Swamp substrate water levels are assessed against the following upland swamp groundwater performance indicator:

*Surface cracking within upland swamps resulting from mine subsidence is not expected to result in measurable changes to swamp groundwater levels when compared to control swamps or seasonal variations in water levels experienced by upland swamps prior to mining.*

As described in Section 6.2.6, semi-quantitative comparisons of the swamp substrate water levels of Swamps 25, 30, 35 and 50 with control swamps and rainfall records do not show a definitive mining effect and the dry conditions are regarded as a natural response to reduced rainfall (Appendices C1 and C2).

The swamp substrate hydrographs for Swamps 33, 35, 40, 41, 46, 51, 52, 53, 71a and 72 indicate that the correlation of swamp substrate with the rainfall trend is strong (Appendices C1 and C2). Data analysis for the reporting period indicates the seven-day moving averages for all swamps apart from Swamps 50 and 72, were at or above the swamp's minimum recorded in the baseline period (Appendices C1 and C2) The seven-day moving average minimum level of Swamps 50 and 72 were below the baseline minimum towards the end of 2023.

The upland swamp groundwater performance indicator has been exceeded at Swamp 20 since 2012. Swamp 20 substrate water levels changed from being permanently saturated to being periodically saturated as a result of the passing of Longwall 21 (Chart 48 and Appendices C1 and C2). Rainfall events in 2020 and 2021 saw short-term increases in the water levels. Over the first half of 2022, the substrate piezometer showed a more permanent increase in water levels with the piezometer remaining fully saturated over the entire period, excluding a brief period in February 2023 when water levels were close to the sensor level. This correlates with the intensive rainfall events experienced over the first half of 2022. Over late 2022, the substrate levels showed a declining trend to the sensor level, and the swamp is once again showing temporally saturated behaviour during the first half of 2023. In late 2023, the substrate level was generally at the sensor level, with a slight increase observed towards the end.

A mining effect to the substrate water levels of Swamp 28 (overlying Longwall 24) was identified in 2016 based on the incomplete recovery of substrate water levels following rainfall events (Chart 49 and Appendices C1 and C2). Swamp 28 is considered to have an impact from mining of Longwall 25, although no effect on swamp substrate water levels occurred when Longwall 24 passed directly beneath the monitoring site (Appendices C1 and C2). The substrate piezometer at Swamp 28 returned to dry conditions from September 2017, remaining so until the end of December 2019, as did the two control swamp piezometers (Swamps 137a and 137b; Chart 49). With the large rain in February 2020, the water level in both the substrate and the shallow piezometer recovered. The substrate recorded saturated conditions until the end of the reporting period in December 2020. Over 2022, the substrate has been permanently saturated with groundwater levels constantly about 1 m above the sensor level in the first half of 2022, decreasing to 0.5 m by the end of the 2022. This decreasing trend continued into 2023, before a recharge event in February 2023 caused a rapid increase in substrate levels. The substrate water level gradually decreased to approximately sensor level from mid to late 2023.

### 6.3.3 Riparian Vegetation Monitoring

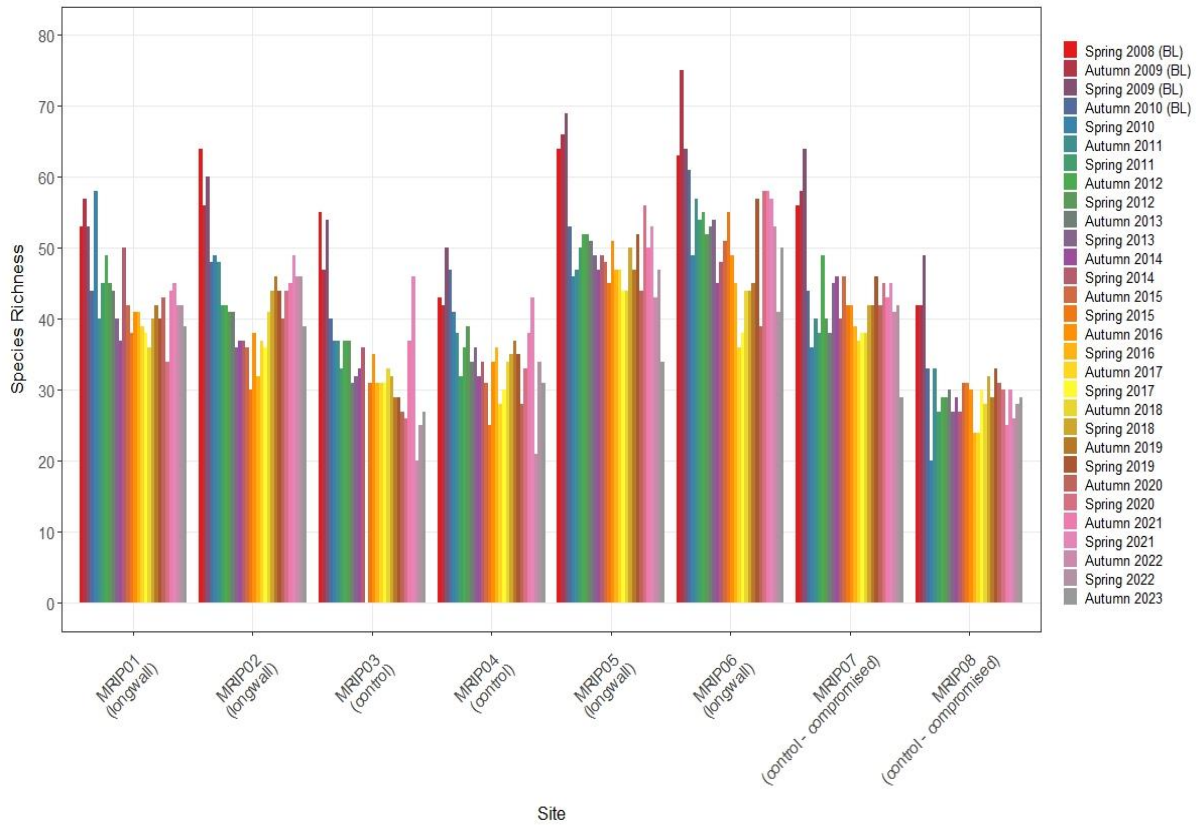
Riparian vegetation monitoring is conducted at a number of sites on the Waratah Rivulet and Eastern Tributary, overlying Longwalls 20-27 and downstream of Longwalls 20-27 (Figure 13).

The vegetation survey results for autumn 2023 have been assessed in accordance with the Longwalls 308-310 Biodiversity Management Plan. The results of the autumn 2023 survey in relation to the Biodiversity Management Plan Trigger Action Response Plan are summarised in Table 10 in Section 6.8. The results of the Longwalls 20-22 and Longwalls 23-27 autumn 2023 riparian vegetation monitoring surveys can be summarised as follows:

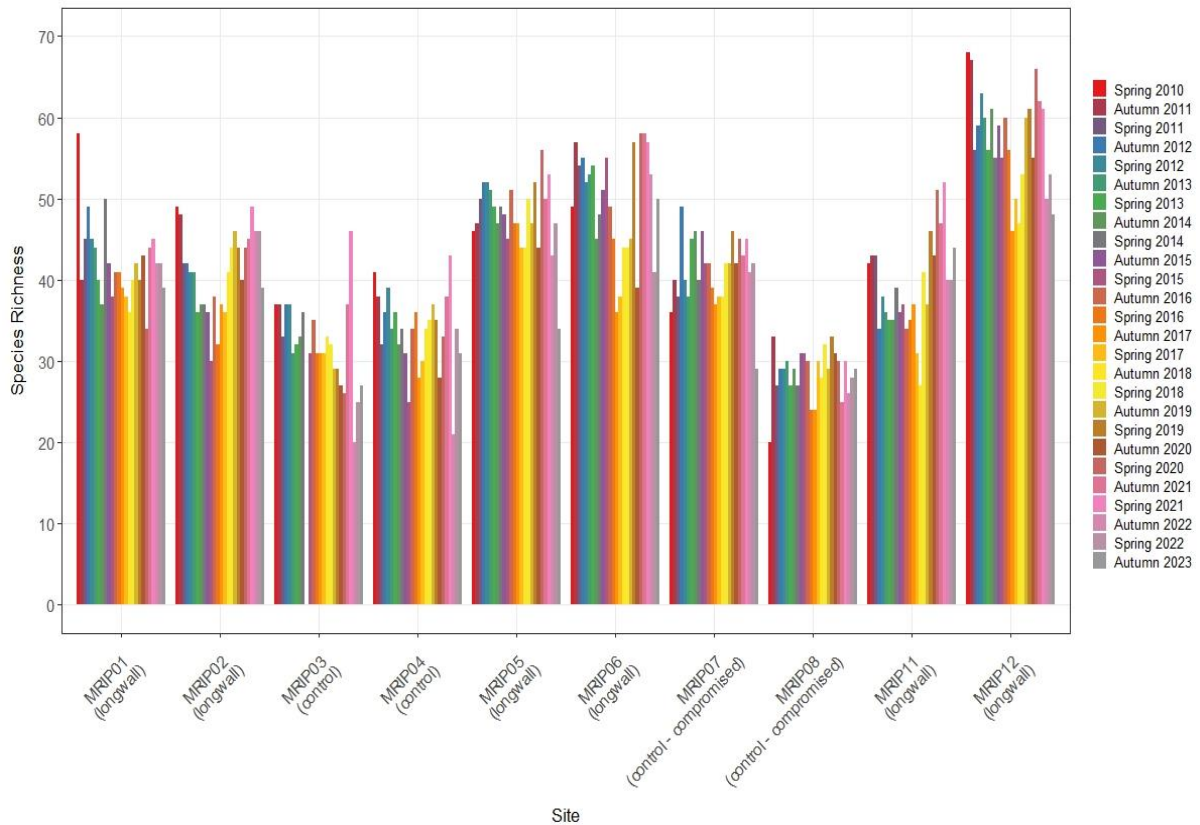
- Water levels at all riparian sites along the Waratah Rivulet, both Longwall (MRIP01 and MRIP02) and control (MRIP03 and MRIP04,) were similar to the previous spring 2022 survey.
- All riparian sites were subject to high water flows immediately prior to, and during, the autumn 2023 surveys. In all instances, high water flows resulted in impacts including flood-swept and prone vegetation, loss of individual plants, burial of vegetation by adjacent vegetation, and burial by woody flood debris and sediment. Erosion, bank scouring and undercutting was observed at most sites in autumn 2022 and was generally only slightly extended in spring 2022. These impacts were greatly exacerbated in autumn 2023. Erosion, bank scouring and sediment deposition impacted all sites in autumn 2023 as a result of flood impacts. These impacts occurred throughout all sites and in worse cases included erosion and undercutting along both banks, leaving roots and bedrock exposed, trees uprooted, significant deposition of sediment and debris and the loss of entire sections of slabs and rock shelves.
- Vegetation was generally observed in good condition across and adjacent to all riparian monitoring sites in autumn 2023, despite the flood impacts. Exceptions to the generally good condition of vegetation within these riparian sites was limited to isolated and scattered individuals observed with dieback and flood impacts including prone vegetation and burial by flood debris.

- In autumn 2023, the percent cover and height of the structural layers was generally similar to that recorded for previous seasons. Across all seasons (since the surveys commenced in spring 2008), the vegetation structure, dominant species and estimated cover for each stratum has varied between sites and between seasons within sites, with no clear trends in vegetation cover across sites.
- Species richness in autumn 2023 sites was generally similar to previous seasons, with most values falling within the range observed across previous seasons for individual sites. The exception to this was the longwall site MRIP05 and control (compromised) site MRIP07, both of which declined significantly below previously recorded levels (Charts 68 and 69). When comparing species richness in autumn 2023 to spring 2022, a decrease in species richness occurred at three longwall sites (MRIP01 – three species, MRIP02 – seven species, and MRIP05 – 13 species), at one control site (MRIP04 – two species) and at one control (compromised) site (MRIP07 – 13 species).
- Up to and including the autumn 2023 survey, mean vegetation condition has decreased over the entire survey period for the three riparian indicator species *Lomatia myricoides*, *Prostanthera linearis* and *Schoenus melanostachys*, within both longwall and control sites, with the extent of decline greatest for *Prostanthera linearis* and only a minor decline observed for *Lomatia myricoides*.
- In autumn 2023, the mean reproductive status for tagged riparian indicator species was similar, and minimal, at longwall and control sites for *Lomatia myricoides* and *Prostanthera linearis* whilst for *Schoenus melanostachys* it was higher at longwall sites than control sites. The mean reproductive status of *Prostanthera linearis* and *Schoenus melanostachys* has been considerably more variable between seasons, and between longwall and control sites within seasons, than for *Lomatia myricoides*, preventing any discernible trend from being detected.
- Four species of conservation significance were recorded at riparian vegetation monitoring sites in autumn 2022, namely *Eucalyptus luehmanniana*, *Pultenaea aristata*, *Hibbertia nitida* and *Lomandra fluviatilis*. Generally, the significant species observed were recorded in a good condition. *Hibbertia nitida* was recorded in a healthy condition at both longwall and control sites, with exceptions to the generally healthy condition being limited to isolated individuals observed with dieback.
- Two introduced species were observed in riparian monitoring sites: *Conzoya sp.* (Fleabane) (MRIP10) and *Sonchus oleraceus* (Common Sowthistle) (MRIP04).

The spring 2022 and autumn 2023 Longwalls 20-22 and Longwalls 23-27 Vegetation Monitoring Reports prepared by Eco Logical are provided in Appendices H1, H2, H3 and H4, respectively.



**Chart 68 Native Species Richness within Riparian Monitoring Sites across All Seasons – Longwalls 20-22 Monitoring Program**



**Chart 69 Native Species Richness within Riparian Monitoring Sites across All Seasons – Longwalls 23-27 Monitoring Program**

### 6.3.4 Aquatic Biota and Their Habitats

The aquatic ecology monitoring programs for Longwalls 20-22 and Longwalls 23-27 were designed to monitor subsidence-induced impacts on aquatic ecology (referred to as stream monitoring) and the response of aquatic ecosystems to the implementation of potential future stream remediation works (referred to as pool monitoring). The locations of the monitoring sites are shown on Figure 14.

The Longwalls 308-310 Biodiversity Management Plan include post-mining monitoring and management of potential subsidence impacts and environmental consequences associated with Longwalls 20-22 and Longwalls 23-27. No additional aquatic ecology monitoring sites have been established for Longwalls 301-310.

Multivariate and univariate statistical procedures (Permutational Multivariate Analyses of Variance [PERMANOVA] and Plymouth Routines in Multivariate Ecological Research [PRIMER] software packages) are used to examine temporal and spatial patterns in macroinvertebrates and macrophytes sampled within the study area. Specifically, PERMANOVA's are used to test hypotheses related to differential changes (e.g. before-versus-after commencement of mining) in multivariate and univariate (e.g. total number of taxa, total abundance and abundances of the most important taxonomic groups identified from the samples) estimates occurring in streams or pools subject to mining (i.e. potential 'impact' streams), in comparison to independent streams or pools that are not subject to mine subsidence (i.e. control places).

The spring 2022 Longwalls 20-27 and autumn 2023 Longwalls 20-27 Aquatic Ecology Monitoring Reports prepared by Bio-Analysis Pty Ltd are provided in Appendices G1 and G2, respectively.

The results of the Longwalls 20-27 aquatic ecology programs (up to and including the autumn 2023 survey) are summarised below.

#### 6.3.4.1 Stream Monitoring Program

##### ***Eastern Tributary***

The results of the Longwalls 20-27 riparian vegetation monitoring surveys on the Eastern Tributary<sup>9</sup> in autumn 2023 can be summarised as follows:

- At Location C1, during autumn 2022, spring 2022 and autumn 2023, quantitative analyses detected a significant mining-related impact to aquatic macroinvertebrate fauna, namely a reduction in mean numbers of the freshwater shrimp family, Atyidae, post-extraction of the Longwalls 20-22. Quantitative analyses have continued to find no changes to other performance indicators. Change in the structure of the assemblage of aquatic macrophytes was detected at Location C1 in spring 2014 in relation to control locations, but not subsequently. This result did not appear to be related to mining activities.
- At Location C2, there has been evidence of significant mining-related reductions in mean numbers of Atyidae post-extraction of the Longwalls 20-22, in spring 2015, autumn 2021, spring 2021, autumn 2022 and autumn 2023. Multivariate analyses detected evidence of changes to the structure of assemblages of aquatic macroinvertebrates at Location C2 since spring 2019 as a result of mining activities of Longwalls 23-27. Mean numbers of Atyidae collected were significantly fewer within survey periods between autumn 2016 and 2018 and between autumn 2020 and spring 2021, but not during autumn 2023.
- At Location C3, statistical analyses have not detected significant changes in aquatic macroinvertebrate or aquatic macrophyte indicators that would indicate an impact from mining.

<sup>9</sup> The Eastern Tributary is also known as Tributary C. Locations ET1 to ET4 shown on Figure 14 are the same as Locations C1 to C4 discussed in this section of the Annual Review, and in Appendices J1 and J2.

- At Location C4, analyses show that the structure of the macroinvertebrate assemblage sampled from spring 2019 to autumn 2023 surveys differed significantly from assemblages collected within the before-period. Temporal patterns in diversity of macroinvertebrates and mayflies (Leptophlebiidae) at Location C4 have become significantly variable between periods since autumn 2018, in relation to the control locations. Significantly fewer Atyidae were collected at Location C4 in autumn 2016, spring 2018, spring 2019 and autumn 2020, but not subsequently. The structure of the aquatic macrophyte assemblage at Location C4 has differed significantly from assemblages within the before-period since autumn 2018.

The subsidence impacts at Locations C2 and C4 have triggered an assessment against the biodiversity subsidence impact performance measure, *Negligible impact on threatened species, populations, or ecological communities*. Assessments will be undertaken by Ecoplanning and Cenwest.

### **Waratah Rivulet**

The results of the Longwalls 20-27 riparian vegetation monitoring surveys on the Waratah Rivulet in autumn 2023 can be summarised as follows:

- An iron precipitate/micro-organism complex has commonly been observed at Locations WT3, WT4 and WT5 since sampling commenced in spring 2008. Cracking of bedrock in the stream channel due to subsidence was first noted at Location WT3 in spring 2013. Mining-related cracking does not appear to have occurred at Locations WT4 or WT5.
- To date, analyses comparing temporal changes in components of assemblages of macroinvertebrates and macrophytes at Locations WT3, WT4 and WT5 on the Waratah Rivulet with control locations have not detected significant changes that would indicate an impact during or after mining of the Longwalls 20-22 underground area.
- Univariate analyses, however, have detected a significant change in mean diversity of macroinvertebrates at Location WT3, in spring 2016, autumn 2018 and subsequent surveys (including autumn 2023). A significant mining related impact to mean numbers of Atyidae was detected at Location WT3 in spring 2021, autumn 2022, spring 2022 and autumn 2023. Atyidae have declined significantly at WT3 but not at the control locations.
- There were no conspicuous differences in mean diversity at Locations WT4 or WT5 in relation to the control locations. Mean abundance of macroinvertebrates and mean numbers of Leptophlebiidae and Atyidae did not differ at Location WT4 or WT5 in relation to the control locations between the before- and after-mining periods.
- There were no detectable changes to aquatic macrophytes at the Waratah Rivulet locations in relation to the control locations that could be associated with mining.

The subsidence impacts at Location WT3 triggered an assessment against the biodiversity subsidence impact performance measure, *Negligible impact on threatened species, populations, or ecological communities*. Assessments will be undertaken by Ecoplanning and Cenwest.

#### **6.3.4.2 Pool Monitoring Program**

### **Eastern Tributary**

As described in the Longwalls 308-310 Biodiversity Management Plan, Pools ETAG, ETAH, ETAI and ETAK on the Eastern Tributary monitored by the previous pool monitoring program were impacted by mine subsidence in late 2016 or early 2017. Since that time, Pools ETAG, ETAH, ETAI and ETAK have often been dry or contained insufficient aquatic habitat for sampling as a result of the mine subsidence impacts. As described in Section 10.3.2, Metropolitan Coal is conducting stream remediation activities on the Eastern Tributary in accordance with the Metropolitan Coal Stream Remediation Plan.

Monitoring of Pools ETAG and ETAH will recommence subsequent to the conduct of stream remediation activities at Pool ETAH and will be conducted biannually<sup>10</sup>. Monitoring of Pools ETAI and ETAK will recommence subsequent to the conduct of stream remediation activities at Pool ETAK and will be conducted biannually<sup>11</sup>.

The relevant control pools on the Woronora River (larger Pool WP and/or smaller Pools WP-A, WP-B and WP-C) and O'Hares Creek (larger Pool OC and/or smaller Pools OC-A, OC-B and OC-C) will be monitored biannually when sampling of the pools described above recommences.

#### 6.3.4.3 *Assessment of Subsidence Impacts and Environmental Consequences on Aquatic Habitats and Biodiversity*

The key potential subsidence impacts and environmental consequences for streams described in the Project EA, Preferred Project Report and Metropolitan Coal Biodiversity Management Plans include impacts on aquatic habitats (e.g. alteration of hydrology, pool habitat, in-stream connectivity and water quality), and on biodiversity (e.g. aquatic macrophytes, macroinvertebrates, fish and riparian vegetation). In summary, the key potential environmental consequences described in the Project EA, Preferred Project Report, and Metropolitan Coal Biodiversity Management Plans include:

- Changes in stream flows as a result of fracturing of bedrock and the consequent diversion of a portion of the total stream flow as underflow. The effects of underflow would be most noticeable during periods of low flow and on the frequency of no flow, while the effects on the frequency and magnitude of high flows would be negligible.
- Changes in pool water levels and in-stream connectivity - underflow has been observed to result in lower water levels in pools as they become hydraulically connected with the fracture network. During prolonged dry periods when flows recede to low levels, the number of instances where loss of flow continuity between pools increases with a greater proportion of these lower flows being conveyed entirely in the subsurface fracture network.
- Impacts on water quality following cracking of the stream bed that can reduce the quality of habitat for aquatic biota (e.g. generation of iron flocculent material).
- Minor stream bank erosion, where changes in channel gradients result in increases in flow energy.
- Impacts on aquatic macrophytes plants (e.g. as a result of changes in hydrology described above) resulting in exposure and desiccation or smothering of plants by iron flocculent material. Aquatic macrophytes have evolved reproductive strategies to cope with the variable nature of flow in streams and wetlands within Australia. Obligate water plants generally require permanent water, however, they can recolonise once water becomes available again.
- Localised impacts on aquatic macroinvertebrates as a result of changes in aquatic habitat/hydrology described above. The Project is unlikely to have any significant long-term impacts on assemblages of macroinvertebrates.
- The conveyance of surface water flows to sub-surface fractures in the area affected by subsidence has the potential to reduce available habitat for fish and connectivity among sections of the stream channel, impeding fish passage.

The results of aquatic ecology monitoring are considered to be consistent with the potential subsidence impacts and environmental consequences described in the Project EA, Preferred Project Report and the Metropolitan Coal Water Management Plans and Biodiversity Management Plans.

<sup>10</sup> Monitoring will commence after the first stream remediation campaign at Pool ETAH has been conducted (i.e. once the stream remediation activities have moved from the site).

<sup>11</sup> Monitoring will commence after the first stream remediation campaign at Pool ETAK has been conducted (i.e. once the stream remediation activities have moved from the site).



The subsidence impacts on Locations C2, C4 and WT3 during the reporting period on the Eastern Tributary and Waratah Rivulet have triggered assessments against the biodiversity subsidence impact performance measure, *Negligible impact on threatened species, populations, or ecological communities*. The threatened flora and fauna assessments will be undertaken by Ecoplanning and Cenwest.

Subsidence impacts on Tributary B have resulted in no surface flow along the stream in the vicinity of Location B1 for an extended period of time. This change in aquatic habitat/hydrology has resulted in long term impacts to the aquatic macroinvertebrate assemblage at this location (Location B1) and downstream at Location B2. This has not resulted in an exceedance of the biodiversity subsidence impact performance measure, *Negligible impact on threatened species, populations or ecological communities*.

Metropolitan Coal will continue to conduct stream remediation of pools on the Eastern Tributary in accordance with the Metropolitan Coal Stream Remediation Plan (Section 10.3.2.).

### **6.3.5 Amphibian Surveys**

Monitoring programs have been developed for Longwalls 20-22, Longwalls 23-27, Longwalls 301-307<sup>12</sup> and Longwalls 308-317 to monitor amphibian species, with a focus on the habitats of the two threatened species, including the Giant Burrowing Frog (*Heleioporus australiacus*) and Red-crowned Toadlet (*Pseudophryne australis*) associated with tributaries. The threatened species Littlejohn's Tree Frog (*Litoria littlejohni*) was located for the first time in 2016, and occasionally thereafter. The locations of the monitoring sites are shown on Figure 15.

Sites are surveyed annually in spring/summer (i.e. October to February) during suitable weather conditions. The 2022 spring/summer survey was carried out in two separate surveys each comprising six days and six nights, the first in March 2023 (6 to 11 March 2023) and late April to early March (26 April 2023 to 1 May 2023).

#### **6.3.5.1 Longwalls 20-22 Amphibian Monitoring**

The spring/summer 2022 Longwalls 20-22 Amphibian Monitoring Report prepared by Cenwest is provided as Appendix J1.

The spring/summer 2022 survey is the thirteen amphibian survey for Longwalls 20-22. All six test sites above Longwalls 20-22 have been undermined for periods between eight to eleven years prior to the commencement on the 2022 survey (Figure 15). Habitats of five test sites (1, 2, 4, 5 and 6) have been impacted by longwall mining.

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<sup>12</sup> The two amphibian monitoring sites established for Longwalls 305-307 are reported in Appendix J3, along with the six test sites established for Longwalls 301-303.

Three amphibian species were recorded by the spring/summer 2022 survey, including two in test sites and three in control sites, being representatives from the two families *Myobatrachidae* and *Hylidae*. Species diversity across individual sites varied from one to two in test sites and from one to three in control sites. The most species-diverse sites, with three species present, was sites 8, followed by sites 1 and 7 with two species recorded during the 2022 survey and sites 6, 9, 10 and 12 each with one observed species. Site 1 was unavailable for surveying in both 2021 and 2022 survey periods due to high river flows creating unsafe conditions. Individuals of the Giant Burrowing Frog have been recorded during the 2009 (1 control site), 2011 (1 test site, 1 control site), 2016 (1 control site) surveys and 2020 surveys (1 control site). No individuals were recorded during the 2021 and 2022 survey periods. Littlejohn's Tree Frog was recorded for the first time for Longwalls 20-22, during the spring/summer 2017 survey at control site 10. In 2018 and 2020 it was observed again at sites 10 and 11, respectively. During the survey period, the Common Eastern Froglet (*Crinia signifera*), and Bibron's Toadlet (*Psuedophryne bibrioni*) were located in both test and control sites. The Southern Rocket Frog was observed in a control site, and the Green Stream Frog was located in a test site.

Three breeding events were recorded by the spring/summer 2022 survey in only control sites. All three breeding events recorded during the survey period were associated with the Common Eastern Froglet (*Crinia signifera*) populations. Three breeding events were recorded at control sites 7, 8 and 10 during the current survey period. No breeding events were recorded for the Giant Burrowing Frog, Red-crowned Toadlet or Littlejohn's Tree Frog.

Since the commencement of the Longwalls 20-22 amphibian monitoring program, species diversity across all sites has varied between four (2022) and 11 (2009) species. At test sites, species diversity has varied between three (2018 and 2022) and nine (2009) species and at control sites, between two (2013) and nine (2011) species. During the survey period, species diversity at test sites was given as three, and at control sites, was given as three.

#### 6.3.5.2 Longwalls 23-27 Amphibian Monitoring

The spring/summer 2022 Longwalls 23-27 Amphibian Monitoring Report prepared by Cenwest is provided in Appendix H2.

The spring/summer 2022 survey is the 13<sup>th</sup> amphibian survey for Longwalls 23-27. All test sites above Longwalls 23-27 had been undermined prior to the commencement of the spring/summer 2016 survey. Habitats of two sites (13 and 14) have been impacted by longwall mining. However, both sites 13 and 14 have usually demonstrated the highest amphibian species diversity when compared to the remaining survey sites over 12 survey years.

Three amphibian species were recorded by the spring/summer 2022 survey, including two in test sites and two in control sites, being representatives from the two families *Myobatrachidae* and *Hylidae*. The most widespread frog was the Common Eastern Froglet, recorded at four sites. The Red-crowned Toadlet has been recorded at least once in each survey year except in 2017 and 2022. Littlejohn's Tree Frog was recorded for the first time for Longwalls 23-27 during the spring/summer 2017 survey at control site 18, and again at site 18 in 2019 but has not been recorded since. The Giant Burrowing Frog was located as tadpoles at site 22 during the 2021 survey period. One species previously observed for the first time in 2021, Bibron's Toadlet, was again located in 2022 at site 20 as adult toadlets. The Green Stream Frog not located between 2010 - 2017 was located for the first time in 2018, again in 2021 but not in this survey year. Frogs not observed in this survey year (2022) but present in one or more of the preceding years 2010-2021, included Peron's Tree Frog (*Litoria peronii*), Southern Rocket Frog, Red-crowned toadlet, Spotted grass Frog, the Brown-striped Frog, the Smooth Toadlet, the Blue Mountains Tree Frog, the Bleating Tree Frog, the Jervis Bay Tree Frog, Broad-palmed Frog, Littlejohn's Tree frog and Lesueur's Frog.

Only one species was observed to be breeding in spring/summer 2022 survey. Breed events for the Common Eastern Froglet were observed at one site during the survey period.

Since the commencement of the Longwalls 23-27 amphibian monitoring program, species diversity across all sites has varied between three (2017 and 2022) and eight (2010, 2019 and 2021). At test sites, species diversity has varied between two (2017) and seven (2010 and 2015) species and at control sites, between one (2020) and seven (2019) species.

#### 6.3.5.3 Longwalls 301-307 Amphibian Monitoring

The spring/summer 2022 Longwalls 301-307 Amphibian Monitoring Report prepared by Cenwest is provided in Appendix H3.

Baseline amphibian surveys were conducted in spring/summer 2015 at six test sites (23, 24, 25, 26, 27 and 28) overlying Longwalls 301-304, and in spring/summer 2018 at two test sites overlying Longwalls 305-307 (Figure 14). The control sites for Longwalls 301-307 consist of the 11 existing sites associated with Longwalls 20-22 (sites 7 to 12) and Longwalls 23-27 (sites 18 to 22). The spring/summer 2022 survey was the eighth spring/summer survey for Longwalls 301-304, and the sixth survey conducted since the commencement of Longwalls 301-303.

At the time of the spring/summer 2022 surveys, Sites 23-30 overlying Longwalls 301-307 had been undermined or in the case of Sites 29 and 30 were within the angle of draw.

In the spring/summer 2022 survey, four amphibian species were recorded at test sites. Bibron's Toadlet was observed for the first time in 2022 at sites 27 and 30. Peron's Tree Frog was located at site 27, Spotted Grass Frog (*Limnodynastes tasmaniensis*) was located at site 27 and Common Eastern Froglet was located at sites 23 and 25-30. The Giant Burrowing Frog and Littlejohn's Tree Frog has not been located at test sites 23-30 over eight years.

Two species were observed breeding during the spring/summer 2022 survey. Adults of the Common Eastern Froglet were found breeding at three sites in the spring/summer 2022 survey (sites 25, 27 and 28). Additionally, adults of the Peron's Tree Frog were observed breeding at two test sites during the survey period (sites 27 and 29). No breeding events were observed for the Red-crowned Toadlet, the Giant Burrowing Frog, Brown-striped Frog and Littlejohn's Tree Frog.

#### 6.3.5.4 Longwalls 308-317 Amphibian Monitoring

The spring/summer 2022 Longwalls 307-317 Amphibian Monitoring Report prepared by Cenwest is provided in Appendix H4.

Baseline surveying of six test sites associated with Longwalls 301-307 commenced in spring/summer 2015 with two additional survey sites added to the spring/summer 2018 survey. Nine additional sites were added to the amphibian monitoring program in spring/summer 2019, located in the vicinity of Longwalls 308-317 (Sites 31 to 39). At the time of the spring/summer 2022 surveys, Sites 31 to 39 overlying Longwalls 308-317 had not yet been undermined.

In the spring/summer 2022 survey, five amphibian species were recorded at test sites; the Common Eastern Frog as adults and tadpoles, the Brown Striped frog in tadpole form, and three species as adults: Smooth Toadlet, Southern Rocket Frog, and Bibron's Toadlet. No threatened species were located in the period 2019 to 2022. The Common Eastern Froglet was found at all sites except sites 32 and 38, the Brown-striped Frog was found at site 37, the Bibron's Toadlet was observed at sites 31, 34 and 35, the Smooth Toadlet was located at sites 31 and 36 and the Southern Rocket Frog was located at site 37.

No species were observed breeding in spring/summer 2022 survey. The total number of sites used by all species, 2019 to 2022 is 13 out of 27 sites. The total breeding events for test sites over three years is 10. The species with no breeding events observed over three years at each site varied from 13 to 17.

### 6.3.5.5 Statistical Analysis of Amphibian Monitoring Results

A feature of the amphibian surveys to date is the high numbers of zero records that dominate the data, indicating a non-normal distribution (i.e. a skewed distribution of data). This means that the results of the amphibian surveys cannot be analysed by simple parametric statistics such as Chi<sup>2</sup> or an ANOVA. A Poisson regression<sup>13</sup> analysis has been carried out by Dr Bernard Ellem for Cenwest to analyse the amphibian survey results obtained to date (i.e. to spring/summer 2022). The four data sets (Longwalls 20-22, 23-27, 301-307 and 308-317) have been analysed together to increase the resolution of the analyses.

Data gathered from 2009 – 2021, indicated no adverse impact from mining had been detected for the amphibian assemblage at the 95% confidence level based on abundance and diversity measures for Longwalls 20-22, 23-27, 301-307 and 308-317, including the Giant Burrowing Frog, the Red-crowned Toadlet and Littlejohn's Tree Frog.

Notwithstanding, and as reported previously in the Metropolitan Coal 2018, 2019, 2020, 2021 and 2022 Annual Reviews, a significant difference between the test and control sites at the 95% confidence level at sites 15, 16 and 17 for the spring/summer 2014 survey was initially detected by analyses undertaken following the Longwalls 23-27 spring/summer 2017 survey. The impact was not detected by the Poisson regression analyses conducted following the 2014, 2015 and 2016 surveys and may be a result of the improved capacity of the model over time as the data set builds. However, an ongoing impact could not be detected in the three subsequent years – 2015, 2016 and 2017.

Statistical analysis for the 2022 survey period has determined there are significant differences between test and control sites at the 95% confidence level. Thus, the performance indicator, '*The amphibian assemblage at mined sites is not expected to experience changes significantly different to the amphibian assemblage at control sites*', has been (technically) exceeded. This difference has been determined by using the equivalent of a t-test used in parametric statistical analysis.

However, the performance indicator refers to the amphibian assemblage (17 amphibian populations) as a whole. Hence whilst a breach has been detected, it is not possible to determine which species have been impacted by longwall mining, nor can it be determined if the three threatened species have been adversely impacted.

Assuming that there is a similar distribution of amphibian species across the Woronora Plateau as occurs above the mining domain, any adverse impact of mining, is likely diluted at the landscape level, although this should not distract readers from the exceedance of the performance indicator determined in the 2022 analysis.

Other factors that are of interest in interpreting the analysis include:

- Additional analysis carried out by Dr Ellem suggests that there is some evidence that independent of potential adverse impacts from mining on the amphibian population, the amphibian population is in slow decline. However, more data is needed to confirm this possibility.
- It is possible that the 2022 analysis finding is an aberration. It is recommended that the 2023 amphibian monitoring data is collected and analysed before determining a response (if any). The 2023 field work is not yet completed, and the analysis is likely to be completed later in 2024. If the adverse findings in this report are repeated than this would likely confirm the 2022 analysis.
- The 2022 analysis particularly honed in on test sites where potential impact pathways have been observed such as loss of flow in streams, cracking across streams, and diversion of stream flows.
- The available data cannot distinguish between species including threatened species, but only if there has been an impact on the population as a whole. This understanding is built into the null hypothesis i.e. '*The amphibian assemblage at mined sites is not expected to experience changes significantly different to the amphibian assemblage at control sites*'.

<sup>13</sup> Poisson regression is a generalised linear model form of regression analysis used to model count data and contingency tables.

## **6.4 LAND MANAGEMENT**

The Metropolitan Coal Longwalls 308-310 Land Management Plan was prepared to manage the potential environmental consequences of Longwalls 308-310 extraction on cliffs, overhangs, steep slopes and land in general in accordance with Condition 6, Schedule 3 of the Project Approval.

The Longwalls 308-310 Land Management Plan includes post-mining monitoring and management of potential subsidence impacts and environmental consequences associated with Longwalls 20-27, Longwalls 301-303, Longwall 304 and Longwalls 305-307.

Sections 6.4.1 and 6.4.2 provide a summary of the land assessments for the review period. Section 6.8 provides a summary of the assessments against the cliffs and overhangs, steep slopes and land in general subsidence impact performance indicators and measures for the reporting period.

### **6.4.1 Cliffs and Overhangs**

Visual inspections of cliffs and overhangs were conducted monthly when mining of Longwalls 20-22 and/or Longwalls 23-27 were within 400 m of sites COH1, COH2, COH3, COH4, COH5, COH6, COH6A, COH7, COH8, COH9, COH10, COH14, COH15 and COH16 (Figure 16) and following the completion of each longwall to record evidence of subsidence impacts. A vertical tension crack (approximately 50 mm wide and 15 m long) on the cliff face and a small rock fall (approximately 1.5 m long, 0.5 m wide and 0.5 cubic metres) were recorded at site COH2 (Figure 16) in December 2013 during the mining of Longwall 22. No additional subsidence impacts at the cliff or overhang sites were recorded following the completion of Longwall 27.

Visual inspections of sites COH9, COH10, COH11, COH12, COH13 and COH16 were conducted monthly when mining of Longwall 308 was within 450 m of the site and following the completion of Longwall 308. No subsidence impacts at any of the sites were identified during the reporting period.

Visual inspections for subsidence impacts will be conducted at sites COH9, COH10, COH11, COH12, COH13 and COH16 during and after the extraction of Longwalls 309, in accordance with the Longwalls 308-310 LMP.

The Project EA, Preferred Project Report and Metropolitan Coal Land Management Plans predicted that the length of potential cliff instabilities would be expected to be less than 3% of the lengths of the cliffs. The total length of cliffs and associated overhangs within the Project underground mining area is approximately 924 m. Less than 3% of the total length of cliffs (and associated overhangs) within the mining area have experienced mining-induced rock fall.

### **6.4.2 Step Slopes and Land in General**

Visual inspections for subsidence impacts on steep slopes and land in general are conducted by Metropolitan Coal and its contractors as part of routine works conducted in the catchment.

No subsidence impacts on steep slopes or land in general were identified by Metropolitan Coal or its contractors during the reporting period. No management measures were required to be implemented.

The recorded subsidence impacts are consistent with the potential subsidence impacts described in the Project EA, Preferred Project Report and Metropolitan Coal Land Management Plans. The size and extent of surface cracking at the steep slopes and land in general would be similar to that observed previously at Metropolitan Coal, and that the maximum predicted systematic strains would be of sufficient magnitude to result in the fracturing of sandstone and, hence, there is potential for rock falls, particularly where rock ledges are marginally stable.

## **6.5 HERITAGE MANAGEMENT**

The Metropolitan Coal Longwalls 308-310 Heritage Management Plan was prepared to manage the potential environmental consequences of the Longwalls 308-310 Extraction Plan on Aboriginal heritage sites or values in accordance with Condition 6, Schedule 3 of the Project Approval.

The Longwalls 308-310 Heritage Management Plan includes post-mining monitoring and management of potential subsidence impacts and environmental consequences associated with Longwalls 20-22, Longwalls 23-27, Longwalls 301-303, Longwall 304 and Longwalls 305-307.

Sections 6.5.1 and 6.5.2 provide a summary of the heritage assessments for the reporting period. Section 6.8 provides a summary of the assessments against the Aboriginal heritage sites subsidence impact performance indicators and measures.

### **6.5.1 Longwalls 20-27, Longwalls 301-303 and Longwall 304**

Aboriginal heritage monitoring programs have been implemented at Metropolitan Coal for Longwalls 20-22, Longwalls 23-27, Longwalls 301-303 and Longwall 304 to monitor the impacts and environmental consequences of Project related subsidence on Aboriginal heritage sites. The monitoring programs have been undertaken by a suitably qualified archaeologist (with experience in rock art recording and management) and representatives of the Aboriginal stakeholders.

Of the 77 Aboriginal heritage sites that have been subject to monitoring for Longwalls 20-22, Longwalls 23-27, Longwalls 301-303 and/or Longwall 304, 13 have been determined to have changes due to mining induced subsidence.

Five Aboriginal heritage sites (FRC 15, FRC 281, FRC 283, FRC 284 and MET 1) have been determined to have changes due to mining induced subsidence from Longwalls 20-22 (Figure 17). The observed impacts at each site were as follows:

- Site FRC 15 – vertical cracking, not coincident with any art.
- Site FRC 281 – multiple cracks running either through or adjacent to the motifs (although the majority of art showed no damage or changes).
- Site FRC 283 – cracking of the rear wall of the shelter, not coincident with any art.
- Site FRC 284 – fracturing of the rear wall of the shelter and exfoliation, not coincident with any art.
- Site MET 1 – two vertical cracks along the rear wall and ceiling of the shelter, not coincident with any art.

Seven Aboriginal heritage sites (FRC 28, FRC 29, FRC 34, FRC 60, FRC 176, FRC 275 and FRC 301) have been determined to have changes due to mining induced subsidence from Longwalls 23-27 (Figure 17). The observed impacts at each site were as follows:

- Site FRC 28 – vertical cracking of the rear shelter wall, opening of horizontal planes/joints and movement of the rock shelf that is part of the shelter floor, not coincident with any art.
- Site FRC 29 – horizontal crack along the back wall and a joining vertical crack, not coincident with any art.
- Site FRC 34 – horizontal cracking along the roof of the shelter and cracking over the most southern hand stencil on the back panel.
- Site FRC 60 – three vertical cracks along the back wall of the shelter, no art recorded at this shelter, the artefacts could not be relocated.
- Site FRC 176 – where vertical cracking along the northern and southern ends of the shelter was observed, not coincident with art.
- Site FRC 275 – opening of horizontal bedding plane at rear of the shelter, five vertical hairline cracks along the back wall of the shelter, not coincident with any art.
- Site FRC 301 – surface cracking on the rock platform, not coincident with the grinding grooves.

One Aboriginal heritage site, FRC 76, was determined to have changes due to mining induced subsidence from Longwalls 301-303. The observed impacts were as follows:

- Site FRC 76 – opening of the horizontal bedding plane along the back wall, not coincident with any art.

The Longwall 304 monitoring survey found there were no further changes from mining observed at FRC 76 and no subsidence related changes were observed at site FRC 77, FRC 78, FRC 86, FRC 90 and FRC 309.

Aboriginal heritage site monitoring results for Longwalls 20-27 and Longwalls 301-304 have been assessed against the Aboriginal heritage subsidence impact performance measure:

*Less than 10% of Aboriginal heritage sites within the mining area are affected by subsidence impacts.*

For the purpose of measuring performance against the Aboriginal heritage subsidence impact performance measure, sites are considered to be “affected by subsidence impacts” if they exhibit one or more of the following consequences that cannot be attributed to natural weathering or deterioration:

- overhang collapse;
- cracking of sandstone that coincides with Aboriginal art or grinding grooves; and
- rock fall that damages Aboriginal art.

The mining area is defined by the Project Approval and is shown on Figure 1 of this report (labelled as Project Underground Mining Area Longwalls 20-27 and 301-317). There are 189 Aboriginal heritage sites within the mining area.

Of the sites at which changes due to mining induced subsidence have occurred, sites FRC 34 and FRC 281 have been affected by subsidence impacts as a result of cracking of sandstone that coincides with Aboriginal art. This means that less than 2% of sites within the mining area have been affected by subsidence impacts. In addition to the changes recorded as a result of mining induced subsidence, natural weathering processes can also result in changes/deterioration of Aboriginal heritage sites.

Metropolitan Coal acknowledges that all Aboriginal heritage sites are considered to be culturally significant to the Aboriginal people who have a traditional connection to Country.

The Aboriginal heritage monitoring results are consistent with the potential subsidence impacts and environmental consequences described in the Project EA, Preferred Project Report and Metropolitan Coal Heritage Management Plans, including the potential for open sites and overhang sites to be impacted by the cracking of sandstone resulting from mine subsidence. The observed rate of subsidence effects at the time of the Project EA and Preferred Project Report was that up to 10% of sites experienced an effect such as cracking, accelerated weathering or blockfall. It was expected that the majority of identified Aboriginal heritage sites would experience no significant change, particularly when compared to natural deteriorating processes unrelated to mining.

### **6.5.2 Longwalls 305-307**

In accordance with the Metropolitan Coal Longwalls 305-307 Heritage Management Plan, monitoring of Aboriginal heritage sites FRC 67, FRC 68, FRC 70, FRC 71, FRC 76, FRC 77, FRC 78, FRC 85, FRC 86, FRC 87, FRC 90, FRC 91, FRC 93, FRC 117, FRC 309, FRC 310 and FRC 325 was undertaken within three months of the completion of Longwall 305.

The Longwall 305 monitoring survey found there were no further changes from mining observed at FRC 76 and no subsidence related changes were observed at sites FRC 67, FRC 68, FRC 70, FRC 71, FRC 77, FRC 78, FRC 85, FRC 86, FRC 87, FRC 90, FRC 91, FRC 93, FRC 117, FRC 309, FRC 310 and FRC 325.

In accordance with the Metropolitan Coal Longwalls 305-307 HMP, monitoring of Aboriginal heritage sites FRC 67, FRC 68, FRC 70, FRC 71, FRC 76, FRC 77, FRC 78, FRC 85, FRC 86, FRC 87, FRC 90, FRC 91, FRC 93, FRC 117, FRC 309, FRC 310, FRC 325, FRC 97, FRC 101, FRC 180, FRC 254, FRC 311, FRC 316, FRC 320, FRC 321, and FRC 325 was undertaken for Longwall 306 in August 2022 after delays due to ongoing heavy rainfall events between January and July 2022 and resultant catchment closures enforced by WaterNSW.

The Longwall 306 Aboriginal Cultural Heritage Monitoring Report found that no mining related changes were recorded at sites FRC 67, FRC 68, FRC 70, FRC 71, FRC 76, FRC 77, FRC 78, FRC 85, FRC 86, FRC 87, FRC 90, FRC 91, FRC 93, FRC 117, FRC 309, FRC 310, FRC 325, FRC 97, FRC 101, FRC 180, FRC 254, FRC 311, FRC 316, FRC 320, FRC 321, and FRC 325.

### **6.5.3 Longwalls 308-310**

In accordance with the Metropolitan Coal Longwalls 308-310 Heritage Management Plan, monitoring of Aboriginal heritage sites FRC 67, FRC 68, FRC 70, FRC 71, FRC 87, FRC 93, FRC 94, FRC 97, FRC 101, FRC 180, FRC 184, FRC 185, FRC 186, FRC 187, FRC 189, FRC 191, FRC 194, FRC 195, FRC 198, FRC 199, FRC 254, FRC 310, FRC 311, FRC 313, FRC 316, FRC 323, FRC 324, FRC 340, FRC 344, FRC 345 and MET 6 was undertaken within three months of the completion of Longwall 308. None of the Aboriginal sites were observed to display changes or mining related impacts.

## **6.6 BUILT FEATURES MANAGEMENT**

The Metropolitan Coal Longwalls 308-310 Built Features Management Plan was prepared to manage the potential environmental consequences of the Metropolitan Coal Longwalls 20-22, Longwalls 23-27 Longwalls 301-303, Longwall 304 and Longwalls 305-307 Extraction Plans on built features in accordance with Condition 6, Schedule 3 of the Project Approval.



During the reporting period, Metropolitan Coal continued subsidence monitoring to infrastructure in consultation with the infrastructure owners. The maximum observed total conventional subsidence along the 300 XL Line West was less than predicted for the reporting period. The maximum observed incremental and total subsidence and tilt due to the extraction of Longwall 308 are less than predicted. The maximum observed incremental and total tensile and compressive strain are greater than predicted.

As a result, the Sydney Water pipelines, TfNSW infrastructure, and Old Princes Highway are at Level 1 significance in accordance with the relevant Metropolitan Coal Longwalls 308-310 Built Features Management Plan TARP (Table 4).

During the reporting period, the following non-survey monitoring occurred:

- Water Pipeline – visual inspections of pipeline route for moisture when longwall face in proximity to pipe.
- Princes Highway – final visual inspection of highway pavement, culverts and road furniture for Longwall 308 end of panel.

Monitoring of infrastructure owned by TfNSW, Sydney Water and Wollongong City Council was conducted during the reporting period for subsidence impacts.

The Project Approval requires Metropolitan Coal not to exceed the following built features subsidence impact performance measure:

*Safe, serviceable and repairable, unless the owner and the MSB agree otherwise in writing.*

The built features subsidence impact performance measure was not exceeded during the reporting period.

The Project Approval also requires Metropolitan Coal not to exceed the subsidence impact performance measure for items of heritage or historical significance at the Garrawarra Centre:

*Negligible damage (fine or hairline cracks that do not require repair), unless the owner of the item and the appropriate heritage authority agree otherwise in writing.*

The subsidence impact performance measure for items of heritage or historical significance at the Garrawarra Centre was not exceeded during the reporting period.

## **6.7 PUBLIC SAFETY MANAGEMENT**

The Metropolitan Coal Longwalls 308-310 Public Safety Management Plans were prepared to manage the potential consequences of the Metropolitan Coal Longwalls 308-310 Extraction Plan on public safety within the underground mining areas in accordance with Condition 6, Schedule 3 of the Project Approval.

Monitoring of cliffs and overhangs, steep slopes and land in general has been conducted for subsidence impacts in accordance with the Metropolitan Coal Longwalls 308-310 Land Management Plan. Monitoring of infrastructure items has been conducted in accordance with the Metropolitan Coal Built Features Management Plans. No subsidence impacts were identified during the reporting period that were considered to pose a risk to public safety.

Further, no subsidence safety incidents were reported by visitors, personnel or contractors to Metropolitan Coal in the underground mining area during the reporting period.

## **6.8 ASSESSMENT OF ENVIRONMENTAL PERFORMANCE**

The subsidence impact performance indicators and performance measures in Table 10 were developed to address the predictions of subsidence impacts and environmental consequences on water resources, watercourses, biodiversity, land, heritage, built features and public safety included in the Project Environmental Assessment, Preferred Project Report, and Metropolitan Coal Longwalls 308-310 Extraction Plan.

Assessments against the subsidence impact performance indicators and performance measures have been conducted for the reporting period in Table 10.

**Table 10**  
**Assessment of Environmental Performance – Underground Mining Area and Surrounds**

| Performance Measure  | Performance Indicator  | Monitoring Site(s) Being Assessed                        | Parameters   | Highest Significance Level/Trigger Recorded | Comments   | Subsidence Impact Performance Indicator Exceeded?   | Subsidence Impact Performance Measure Exceeded? |  |
|--|--|--|--|---|--|---|---|--|
| <b>WATER MANAGEMENT</b>  |  |  |  |   |  |   |   |  |
| <b>Negligible Reduction to the Quantity of Water Resources Reaching the Woronora Reservoir</b>             |  |  |  |   |  |   |   |  |
| <b>Negligible reduction to the quantity of water resources reaching the Woronora Reservoir</b>             | <i>Changes in the quantity of water entering Woronora Reservoir are not significantly different post-mining compared to pre-mining, that are not also occurring in the control catchment(s)</i>                    | WaterNSW gauging station on Waratah Rivulet (GS 2132102) | Surface water flow   | Level 1                                     | The median of the ratios does not fall below the 35 <sup>th</sup> percentile of the baseline data.   | Surface water flow was at Level 1 throughout the review period.   | No  | No   |
| <b>Negligible Reduction to the Quality of Water Resources Reaching the Woronora Reservoir</b>              |  |  |  |   |  |   |   |  |
| <b>Negligible reduction to the quality of water resources reaching the Woronora Reservoir</b>              | <i>Changes in the quality of water entering Woronora Reservoir are not significantly different post-mining compared to pre-mining concentrations that are not also occurring at control site WOWQ2</i>             | Site WRWQ9 on the Waratah Rivulet                        | Iron (Fe)<br>Manganese (Mn)<br>Aluminium (Al)<br>[Field filtered]                | Level 1                                     | Data analysis indicates no water quality parameter exceeds the adjusted baseline mean plus two standard deviations.  | Dissolved iron, dissolved aluminium and dissolved manganese were at Level 1 throughout the review period.   | No  | No   |
|  |  | Site ETWQ AU on the Eastern Tributary                    | Iron (Fe)<br>Manganese (Mn)<br>Aluminium (Al)<br>[Field filtered]                | Level 1                                     | Data analysis indicates no water quality parameter exceeds the adjusted baseline mean plus two standard deviations.  | Dissolved iron was at Level 1 from January to June and September to December 2023.<br>Dissolved aluminium was at Level 1 throughout the reporting period.<br>Dissolved manganese was at Level 1 in August 2023. | No  | No   |
|  |  |  |  | Level 2                                     | Data analysis indicates any water quality parameter exceeds the adjusted baseline mean plus two standard deviations for one month.   | Dissolved iron was at a Level 2 in July 2023.<br>Dissolved manganese was a Level 2 in January and February 2023.  | No  | No   |
| <b>Negligible Reduction to the Quantity of Water Resources Reaching the Woronora Reservoir (Continued)</b> |  |  |  |   |  |   |   |  |
| <b>Negligible reduction to the quality of water resources reaching the Woronora Reservoir (Continued)</b>  | <i>Changes in the quality of water entering Woronora Reservoir are not significantly different post-mining compared to pre-mining concentrations that are not also occurring at control site WOWQ2 (Continued)</i> | Site ETWQ AU on the Eastern Tributary (Continued)        | Iron (Fe)<br>Manganese (Mn)<br>Aluminium (Al)<br>[Field filtered]<br>(Continued) | Level 3                                     | Data analysis indicates: <ul style="list-style-type: none"> <li>any water quality parameter exceeds the adjusted baseline mean plus two standard deviations for two consecutive months; or</li> <li>over a three month period the water quality parameter exceeds the adjusted mean plus two standard deviations in the first month, the adjusted mean plus one standard deviation in the next month and the adjusted mean plus two standard deviations in the third month; or</li> <li>the six month mean exceeds the adjusted baseline mean plus one standard deviation for two consecutive assessment periods (i.e. over two six monthly reports); and</li> <li>there was not a similar exceedance of the trigger at the control site.</li> </ul> | Dissolved iron was at Level 3 in August 2023.<br>Dissolved manganese was at Level 3 from March to July 2023 and September to December 2023.   | Yes   | No<br>Assessments conducted by Associate Professor Barry Noller (Appendix E) |

**Table 10 (Continued)  
Assessment of Environmental Performance – Underground Mining Area and Surrounds**

| Performance Measure   | Performance Indicator   | Monitoring Site(s) Being Assessed | Parameters   | Highest Significance Level/Trigger Recorded | Comments   | Subsidence Impact Performance Indicator Exceeded?   | Subsidence Impact Performance Measure Exceeded? |
|---|---|-----------------------------------|--|---|--|---|---|
| <b>WATER MANAGEMENT (Continued)</b>   |   |                                   |  |   |  |   |   |
| <b>No Connective Cracking Between the Surface and the Mine and Negligible Leakage from Woronora Reservoir</b> |   |                                   |  |   |  |   |   |
| <b>No connective cracking between the surface and the mine</b>  | <i>Visual inspection does not identify abnormal water flow from the goaf, geological structure, or the strata generally</i>         | Underground                       | Inspections of development workings for water accumulation   | Level 1                                     | Normal water flow identified from the goaf, geological structure, or the strata generally.   | -   | No  |
|   | <i>The 20-day average mine water make does not exceed 1 ML/day</i>  | Underground                       | <ul style="list-style-type: none"> <li>• Metered water reticulated into the mine (mine inflow)</li> <li>• Metered water reticulated out of the mine (mine outflow)</li> <li>• Moisture content into and out of the mine through the mine ventilation system (mine inflow and outflow)</li> <li>• In-situ moisture content of the coal (mine inflow)</li> <li>• Moisture content of ROM coal conveyed out of the mine at the drift portal (mine outflow)</li> </ul> | Level 1                                     | 20-day average mine water make is less than or equal to 0.5 ML/day.  | The 20-day average daily mine water make was approximately 0.18 ML/day during the reporting period. | No  |
|   | <i>Significant departure from the predicted envelope of the vertical potentiometric head profile at Bore PHGW2A does not occur.</i> | Bore PHGW2A                       | Groundwater pressures/levels   | Level 1                                     | PHGW2A Head Profile is consistent with the shape of and does not lie significantly to the left of the predicted High Inflow Model Curve. | -   | No  |
|   | <i>Significant departure from the predicted envelope of the vertical potentiometric head profile at Bore PM02 does not occur</i>    | Bore PM02                         | Groundwater pressures/levels   | Level 1                                     | PM02 Head Profile is consistent with the shape of and does not lie significantly to the left of the predicted High Inflow Model Curve.   | -   | No  |

**Table 10 (Continued)**  
**Assessment of Environmental Performance – Underground Mining Area and Surrounds**

| Performance Measure   | Performance Indicator  | Monitoring Site(s) Being Assessed   | Parameters                              | Highest Significance Level/Trigger Recorded | Comments   | Subsidence Impact Performance Indicator Exceeded?                    | Subsidence Impact Performance Measure Exceeded? |   |
|---|--|---|---|---|--|--|---|---|
| <b>WATER MANAGEMENT (Continued)</b>   |  |   |   |   |  |  |   |   |
| <b>No Connective Cracking Between the Surface and the Mine and Negligible Leakage from Woronora Reservoir (Continued)</b> |  |   |   |   |  |  |   |   |
| <b>No connective cracking between the surface and the mine</b><br><b>Negligible leakage from the Woronora Reservoir</b>   | <i>The hydraulic gradient to the Woronora Reservoir at full supply level from Bore PHGW2A is reduced by no more than 40% from that measured to 30 June 2017.</i> | Bore PHGW2A (97.5 m)  | Groundwater pressures/levels            | Level 1                                     | PHGW2A $\geq$ 186.92 m AHD.  | -  | No  | No  |
|   | <i>The hydraulic gradient to the Woronora Reservoir at full supply level from Bore 9EGW2A is reduced by no more than 40% from that measured to 30 June 2017.</i> | Bore 9EGW2A (107.5 m)   | Groundwater pressures/levels            | Level 2                                     | 9EGW2A < 186.32 m AHD and > 179.35 m AHD   | Bore 9EGW2A was at Level 2 throughout the reporting period.          | No  | No  |
|   | <i>The hydraulic gradient to the Woronora Reservoir at full supply level from Bore PM02 is reduced by no more than 40% from that measured to 30 June 2017.</i>   | Bore PM02 (100 m)   | Groundwater pressures/levels            | Level 1                                     | PM02 $\geq$ 183.86 m AHD.  | -  | No  | No  |
|   | <i>The hydraulic gradient from transect bore T5 to bore T3 is reduced by no more than 10% from that measured on 30 June 2017</i>                                 | Bores T5 to T3  | Groundwater levels                      | Level 3                                     | T5-T3 $\leq$ 16.13 m   | The T5-T3 TARP was at level 3 throughout the reporting period.       | Yes   | No<br>Assessment against the performance measure conducted by SLR (2023). Investigation to be undertaken in Q2 2024. (Appendix F) |
| <b>WATER MANAGEMENT (Continued)</b>   |  |   |   |   |  |  |   |   |
| <b>Negligible Reduction to the Quality of Water Resources in the Woronora Reservoir</b>                                   |  |   |   |   |  |  |   |   |
| <b>Negligible reduction in the water quality of Woronora Reservoir</b>  | <i>Changes in the quality of water in the Woronora Reservoir are not significantly different post-mining compared to pre-mining concentrations</i>               | Woronora Reservoir (site DW01) (subject to data availability from WaterNSW) | Total Manganese (Mn)                    | Level 2                                     | The current year's duration exceedance curve for a water quality parameter in Woronora Reservoir (total iron, total manganese and total aluminium) is above the baseline 10 year ARI but below the baseline 20 year ARI exceedance curve for any range of the duration percentages from 0% to 75%. | Total manganese was above the baseline 10 year ARI exceedance curve. | Yes   | No<br>Assessment against the performance measure conducted by ATC Williams (2023) (Appendix B2)                                   |
|   |  |   | Total Aluminium (Al)<br>Total Iron (Fe) | Level 3                                     | The current year's duration exceedance curve for a water quality parameter in Woronora Reservoir (total iron, total manganese and total aluminium) is above the baseline 20 year ARI exceedance curve for any range of the duration percentages from 0% to 75%.                                    |  |   |   |

**Table 10 (Continued)**  
**Assessment of Environmental Performance – Underground Mining Area and Surrounds**

| Performance Measure  | Performance Indicator   | Monitoring Site(s) Being Assessed   | Parameters                                | Highest Significance Level/Trigger Recorded  | Comments   | Subsidence Impact Performance Indicator Exceeded?                 | Subsidence Impact Performance Measure Exceeded? |    |
|--|---|---|---|--|--|---|---|----|
| <b>WATER MANAGEMENT (Continued)</b>  |   |   |   |  |  |   |   |    |
| <b>Negligible Environmental Consequences on Waratah Rivulet</b>  |   |   |   |  |  |   |   |    |
| <b>Negligible environmental consequences (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases) on the Waratah Rivulet between the full supply level of the Woronora Reservoir and the maingate of Longwall 23 (upstream of Pool P)</b> | <b>No Diversion of Flows, No Change in the Natural Drainage Behaviour</b>   |   |   |  |  |   |   |    |
|  | <i>No change to the natural drainage behaviour of Pools P, Q, R, S, T, U, V and W</i>   | Pools P to W on Waratah Rivulet   | Streambed cracking and drainage behaviour | Level 1  | No mine-induced surface cracking or impacts to natural drainage behaviour observed.  | Pools P to W were at Level 1 throughout the reporting period.     | No  | No |
|  | <i>Analysis of water level data for Pools P, T, U, V and W indicates the water level is at or above the pool's previous minimum</i>   | Pools P, T, U, V and W on Waratah Rivulet                                       | Pool water level                          | Level 1  | The water level in Pools P, T, U, V or W has not been below the pool's previous minimum.   | Pools P to W were at Level 1 throughout the reporting period.     | No  | No |
|  | <i>Analysis of water level data for Pools Q, R and S indicates the water levels are above that required to maintain water over the downstream rock bar</i>  | Pools Q, R and S on the Waratah Rivulet   | Pool water level                          | Level 1  | The water level in Pools Q, R or S has been above that required to maintain water over the downstream rock bar.  | Pools Q, R and S were at Level 1 throughout the reporting period. | No  | No |
| <b>Negligible Environmental Consequences on Waratah Rivulet</b>  |   |   |   |  |  |   |   |    |
| <b>Negligible environmental consequences (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases) on the Waratah Rivulet between the full supply level of the Woronora Reservoir and the maingate of Longwall 23 (upstream of Pool P)</b> | <b>Minimal Iron Staining</b>  |   |   |  |  |   |   |    |
|  | Visual inspection of the Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir does not show significant changes in the extent or nature of iron staining that isn't also occurring in the Woronora River (control site) | Waratah Rivulet, from Pool P to the full supply level of the Woronora Reservoir | Nature and extent of iron staining        | Level 1  | The extent or nature of iron staining in the Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir has not changed.   | -   | No  | No |
|  | <b>Minimal Gas Releases</b>   |   |   |  |  |   |   |    |
| <i>Gas releases in Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir have not increased beyond those observed up to the commencement of Longwall 301 extraction</i>   | Waratah Rivulet, from Pool P to the full supply level of the Woronora Reservoir   | Free Carbon Dioxide as CO <sub>2</sub> (mg/L)<br>Methane (mg/L)                 | Level 1                                   | Free carbon dioxide concentrations are equal to or less than 4 mg/L in Waratah Rivulet pools from Pool P to the full supply level of the Woronora Reservoir.<br>Methane concentrations are equal to or less than 0.159 mg/L in Waratah Rivulet pools from Pool P to the full supply level of the Woronora Reservoir. | Pool P was at Level 1 in all months in 2023 (free methane concentrations and free carbon dioxide concentrations).<br>Pool U was at Level 1 in all months in 2023 (free carbon dioxide concentrations and free methane concentrations). | No  | No  |    |

**Table 10 (Continued)**  
**Assessment of Environmental Performance – Underground Mining Area and Surrounds**

| Performance Measure  | Performance Indicator  | Monitoring Site(s) Being Assessed   | Parameters                             | Highest Significance Level/Trigger Recorded   | Comments   | Subsidence Impact Performance Indicator Exceeded?                             | Subsidence Impact Performance Measure Exceeded? |    |
|--|--|---|--|---|--|---|---|----|
| <b>WATER MANAGEMENT (Continued)</b>  |  |   |  |   |  |   |   |    |
| <b>Negligible Environmental Consequences on Eastern Tributary</b>  |  |   |  |   |  |   |   |    |
| <b>Negligible environmental consequences over at least 70% of the stream length (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases) on the Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26</b> | <b>No Diversion of Flows, No Change in the Natural Drainage Behaviour</b>  |   |  |   |  |   |   |    |
|  | <i>No change to the natural drainage behaviour of Pools ETAS, ETAT and ETAU</i>  | Pools ETAS, ETAT and ETAU on the Eastern Tributary  | Stream cracking and drainage behaviour | Level 1   | No mine-induced surface cracking at Pool ETAS or Pool ETAT; no increase in previous cracking at Pool ETAU.<br><br>No impacts to natural drainage behaviour observed. | Pools ETAS, ETAT and ETAU were at Level 1 throughout the reporting period.    | No  | No |
|  | <i>Analysis of water level data for Pool ETAS/ETAT and Pool ETAU indicates the water levels are above that required to maintain water over the downstream rock bar</i> | Pools ETAS, ETAT and ETAU on the Eastern Tributary  | Pool water level                       | Level 1   | The water levels in Pool ETAS/ETAT and Pool ETAU have been above that required to maintain water over the downstream rock bar.                                       | Pool ETAS/ETAT and Pool ETAU were at Level 1 throughout the reporting period. | No  | No |
|  | <b>Minimal Iron Staining</b>   |   |  |   |  |   |   |    |
|  | N/A  | Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26 | Nature and extent of iron staining     | On 14 October 2016, Metropolitan Coal reported the exceedance of the Eastern Tributary performance measure in relation to iron staining to the DP&E (now DPE) and other relevant agencies.<br><br>Iron staining/flocculent is present at a number of stream features between the maingate of Longwall 26 and the full supply level of the Woronora Reservoir.<br><br>Metropolitan Coal to monitor the nature and extent of iron staining on the Eastern Tributary during the mining of Longwalls 305-3037<br><br>Metropolitan Coal to implement contingency measures (stream remediation measures) in accordance with the Project Approval. | -  | N/A   | Yes   |    |
| <b>Minimal Gas Releases</b>  |  |   |  |   |  |   |   |    |
| <i>Gas releases in Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26 have not increased beyond those observed up to the commencement of Longwall 301 extraction</i>  | Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26  | Free Carbon Dioxide as CO <sub>2</sub> (mg/L)<br>Methane (mg/L)   | Level 1                                | Free carbon dioxide concentrations are equal to or less than 4 mg/L in Eastern Tributary pools between the full supply level of the Woronora Reservoir and the maingate of Longwall 26.<br><br>Methane concentrations are equal to or less than 0.159 mg/L in Eastern Tributary pools between the full supply level of the Woronora Reservoir and the maingate of Longwall 26.  | Pools ETAG, ETAH, ETAI, ETAJ, ETAL, ETAM, ETAN, ETAO, ETAP, ETAQ, ETAR, ETAS, ETAT, ETAU were at Level 1 throughout the reporting period.                            | No  | No  |    |

**Table 10 (Continued)**  
**Assessment of Environmental Performance – Underground Mining Area and Surrounds**

| Performance Measure  | Performance Indicator  | Monitoring Site(s) Being Assessed   | Parameters   | Highest Significance Level/Trigger Recorded | Comments  | Subsidence Impact Performance Indicator Exceeded?  | Subsidence Impact Performance Measure Exceeded? |    |
|--|--|---|--|---|---|--|---|----|
| <b>BIODIVERSITY MANAGEMENT</b>   |  |   |  |   |   |  |   |    |
| <b>Upland Swamp Vegetation Monitoring</b>  |  |   |  |   |   |  |   |    |
| <b>Negligible impact on Threatened Species, Populations, or Ecological Communities</b> | <i>The vegetation in upland swamps is not expected to experience changes significantly different to vegetation in control swamps</i> | Swamps 16, 17, 18, 20, 24 and 25 overlying or adjacent to Longwalls 20-22<br><br>Swamps 19, 28, 30, 31, 32, 33, 34, 35, 36 and 94 overlying or adjacent to Longwalls 23-27<br><br>Swamps 40, 41, 47, 48, 49, 50, 53 and 58 overlying or adjacent to Longwalls 301-303 and Longwall 304<br><br>Swamp 72 within the 35° angle of draw and/or predicted 20 mm subsidence contour of Longwall 305-307<br><br>Swamps 61, 62, 63, 64, 78, 79, 80, 81, 82, 83, 88, 89, 90, 92SH and 92TTT overlying or adjacent to Longwalls 308-310<br><br>Control Swamps 101, 111a, 125, 135, 136, 137a, 137b, 138, Bee Creek Swamp, Woronora River 1, Woronora River south arm and Dahlia Swamp | Visual inspections<br><br>Transect/ quadrat data<br><br>Population monitoring of indicator species | Level 1                                     | Data analysis indicates:<br><ul style="list-style-type: none"><li>there is not a declining trend in the condition of longwall swamp vegetation; and</li><li>there are no significant changes in vegetation between the mined and control swamps.</li></ul>  | Swamps 16, 17, 18, 19, 20 (autumn 2023), 24, 25, 30, 31, 32, 33, 34, 35, 36, 47, 49, 58, 61, 63, 72, 83, 88 and 94.  | No  | No |
|  |  |   |  | Level 2                                     | Data analysis indicates:<br><ul style="list-style-type: none"><li>there is a declining trend in the condition of longwall swamp vegetation over time, however a similar trend is occurring in control swamp vegetation; and</li><li>there are significant differences in vegetation between the mined and control swamps, however, the data indicates longwall swamp vegetation is consistent with the baseline monitoring results.</li></ul> | <u>Swamp 20:</u><br><br>In spring 2022, there was a declining trend in vegetation condition as indicated by the two indicator species observed in Swamp 20. Whilst a declining trend has been observed in control sites, it has not been as pronounced as seen in the longwall site in recent seasons.<br><br>However, dieback of <i>Gleichenia spp.</i> across Swamp 20 has ceased and full recovery is apparent, with abundant growth of this species throughout the swamp.<br><br>Continue to monitor.<br><br><u>Swamp 28:</u><br><br>The previous declining trend in vegetation condition of the Tea Tree Thicket component of Swamp 28 with regards to condition of understorey species and decline in species richness continues to stabilise in autumn 2023.<br><br>Similar trends are apparent in the vegetation of some control sites.<br><br>Continue close monitoring of trends in vegetation to assess the contribution of dry climatic condition versus mine subsidence impacts.<br><br><u>Swamps 40, 41, 48, 50 and 53:</u><br><br>Vegetation monitoring indicates a significant difference in vegetation condition between longwall (Swamps 40, 41 and 53) and control swamps in autumn 2022, however swamp vegetation is consistent with the baseline monitoring results.<br><br>Continue close monitoring of trends in vegetation to assess the contribution of dry climatic conditions versus mine subsidence impacts.<br><br><u>Swamps 62, 64, 78, 79, 80, 81, 82, 89, 90, 92SH and 92TTT:</u><br><br>Analysis of vegetation monitoring data indicates a significant difference in species richness between longwall and control swamps in autumn 2023. However, statistical analysis does not indicate a significant difference in vegetation condition or cover / abundance between longwall and control sites. Visual observations indicate Swamp vegetation is consistent with the baseline monitoring results. | No  | No |



**Table 10 (Continued)**  
**Assessment of Environmental Performance – Underground Mining Area and Surrounds**

| Performance Measure  | Performance Indicator   | Monitoring Site(s) Being Assessed  | Parameters         | Highest Significance Level/Trigger Recorded |   | Comments  | Subsidence Impact Performance Indicator Exceeded? | Subsidence Impact Performance Measure Exceeded? |
|--|---|--|--------------------|---|---|---|---|---|
| <b>BIODIVERSITY MANAGEMENT (Continued)</b>   |   |  |                    |   |   |   |   |   |
| <b>Upland Swamp Groundwater Monitoring</b>   |   |  |                    |   |   |   |   |   |
| <b>Negligible impact on Threatened Species, Populations, or Ecological Communities</b> | <i>Surface cracking within upland swamps resulting from mine subsidence is not expected to result in measurable changes to swamp groundwater levels when compared to control swamps or seasonal variations in water levels experienced by upland swamps prior to mining<sup>5</sup></i> | Swamp 20<br>Swamp 28   | Groundwater levels | N/A   | N/A   | Previously assessed as being impacted by mine subsidence.   | Yes   | To be assessed annually by relevant specialists |
|  |   | <ul style="list-style-type: none"> <li>Swamp 25 overlying Longwalls 20-22</li> <li>Swamps 30, 33 and 35 overlying Longwalls 23-27</li> <li>Swamps 40, 41, 46, 51, 52 and 53 overlying Longwalls 301-303</li> <li>Swamp 50 overlying Longwalls 304</li> <li>Swamps 71a and 72 within the 35° angle of draw and/or predicted 20 mm subsidence contour of LW305-307</li> <li>Swamps 62, 64, 82 and 89 within the 35° angle of draw and/or predicted 20 mm subsidence contour of Longwalls 308-310</li> <li>Control Swamps 101, 137a and 137b</li> </ul> |                    | Level 1                                     | Data analysis for Longwalls 20-27 swamps indicates: <ul style="list-style-type: none"> <li>the seven-day moving average for Swamps 25, 30, 33 and 35 is at, or above, the minimum established for the swamp's full length of record; and</li> </ul> Data analysis for Longwalls 301-310 swamps indicates: <ul style="list-style-type: none"> <li>the seven-day moving average for Swamps 40, 41, 46, 51, 52, 53, 71a, 62, 64, 82, and 92 is at or above the minimum established for the swamp's full length of record; and</li> <li>the seven-day moving average for Swamp 50 was at or above the minimum established for the swamp's full length of record during the July to December 2023 reporting period.</li> </ul> | Swamps 25, 30, 33, 35, 40, 41, 46, 50, 51, 52, 53, 71a, 62, 64, 82 and 92.  | No  | No  |
|  |   |  |                    | Level 2                                     | Data analysis of swamp substrate water levels indicates: <ul style="list-style-type: none"> <li>the seven-day moving average for Swamp 72 is below the minimum established for the swamp's full length of record;</li> <li>the seven-day moving average for Swamp 50 was below the minimum for the swamp's full length of record during the January to June 2023 reporting period; and</li> <li>- semi-quantitative comparisons with control swamps and rainfall record indicates that dry swamp conditions are natural.</li> </ul>   | Swamp 72.<br>Increase frequency of data analysis to quarterly (until such a time that data analysis indicates a return to Level 1). | No  | No  |

**Table 10 (Continued)**  
**Assessment of Environmental Performance – Underground Mining Area and Surrounds**

| Performance Measure  | Performance Indicator  | Monitoring Site(s) Being Assessed  | Parameters   | Highest Significance Level/Trigger Recorded | Comments   | Subsidence Impact Performance Indicator Exceeded?  | Subsidence Impact Performance Measure Exceeded? |    |
|--|--|--|--|---|--|--|---|----|
| <b>BIODIVERSITY MANAGEMENT (Continued)</b>   |  |  |  |   |  |  |   |    |
| <b>Riparian Vegetation Monitoring</b>  |  |  |  |   |  |  |   |    |
| <b>Negligible impact on Threatened Species, Populations, or Ecological Communities</b> | <i>Impacts to riparian vegetation are expected to be localised and limited in extent, similar to the impacts previously experienced at Metropolitan Coal</i> | Locations adjacent to riparian vegetation monitoring sites (MRIP01 to MRIP12) and areas traversed whilst accessing the monitoring sites: <ul style="list-style-type: none"> <li>sites MRIP01, MRIP02, MRIP05, MRIP06 and MRIP09 overlying Longwalls 20-22;</li> <li>sites MRIP11 and MRIP12 overlying Longwalls 23-27;</li> <li>sites MRIP03, MRIP04 and MRIP10 downstream of Longwall 23A; and</li> <li>sites MRIP07 and MRIP08 downstream of Longwalls 23-27.</li> </ul>   | The extent of vegetation subject to vegetation dieback | Level 1                                     | No dieback of riparian vegetation greater than 50 cm from the stream as a result of mine subsidence.   | In spring 2022, Sites MRIP01, MRIP03, MRIP04, MRIP06, MRIP07, MRIP08, MRIP10 and MRIP11 were at Level 1.<br><br>None of the sites have previously been observed with riparian vegetation dieback greater than 50 cm from the stream. | No  | No |
|  |  |  |  | Level 2                                     | Vegetation monitoring: <ul style="list-style-type: none"> <li>does not identify an increase in the extent of vegetation dieback compared to that observed at site MRIP02 on the Waratah Rivulet and between sites MRIP05 and MRIP09 on the Eastern Tributary; and</li> <li>does not identify vegetation dieback greater than 50 cm from the stream at sites MRIP01, MRIP03, MRIP04, MRIP06, MRIP07, MRIP08 or MRIP10, as a result of mine subsidence.</li> </ul> |  |   |    |
| <b>Monitoring of Aquatic Biota, Stream Monitoring</b>                                  |  |  |  |   |  |  |   |    |
| <b>Negligible impact on Threatened Species, Populations, or Ecological Communities</b> | <i>The aquatic macroinvertebrate and macrophyte assemblages in streams are not expected to experience long-term impacts as a result of mine subsidence.</i>  | Two sampling sites (approximately 100 m in length) at the following locations: <ul style="list-style-type: none"> <li>Location WT3 on Waratah Rivulet, Locations ET1, ET3 and ET4 on the Eastern Tributary overlying Longwalls 20-27.</li> <li>Locations WT4 on the Waratah Rivulet, adjacent to Longwalls 20-27.</li> <li>Location WT5 on the Waratah Rivulet and Location ET2 on the Eastern Tributary downstream of Longwalls 20-27.</li> <li>Control Locations: WR1 on Woronora River; and OC on O'Hares Creek.</li> </ul> | Aquatic macroinvertebrates<br>Aquatic macrophytes      | Level 1                                     | Data analysis indicates no significant changes in relation to control places pre-mining compared to post-extraction occur in the aquatic macroinvertebrate and/or macrophyte assemblages at Locations WT3, WT4 or WT5 on the Waratah Rivulet or Locations ET1, ET2, ET3 or ET4 on the Eastern Tributary during the mining of Longwalls 305-307.  | Locations WT4 and WT5, and ET3.  | No  | No |

**Table 10 (Continued)**  
**Assessment of Environmental Performance – Underground Mining Area and Surrounds**

| Performance Measure  | Performance Indicator   | Monitoring Site(s) Being Assessed  | Parameters  | Highest Significance Level/Trigger Recorded | Comments  | Subsidence Impact Performance Indicator Exceeded?  | Subsidence Impact Performance Measure Exceeded? |                             |
|--|---|--|---|---|---|--|---|-----------------------------|
| <b>BIODIVERSITY MANAGEMENT (Continued)</b>   |   |  |   |   |   |  |   |                             |
| <b>Monitoring of Aquatic Biota, Stream Monitoring (Continued)</b>                      |   |  |   |   |   |  |   |                             |
| <b>Negligible impact on Threatened Species, Populations, or Ecological Communities</b> | <i>The aquatic macroinvertebrate and macrophyte assemblages in streams are not expected to experience long-term impacts as a result of mine subsidence.</i> | Two sampling sites (approximately 100 m in length) at the following locations: <ul style="list-style-type: none"> <li>Location WT3 on Waratah Rivulet, Locations ET1, ET3 and ET4 on the Eastern Tributary overlying Longwalls 20-27.</li> <li>Locations WT4 on the Waratah Rivulet, adjacent to Longwalls 20-27.</li> <li>Location WT5 on the Waratah Rivulet and Location ET2 on the Eastern Tributary downstream of Longwalls 20-27.</li> <li>Control Locations: WR1 on Woronora River; and OC on O'Hares Creek.</li> </ul> | Aquatic macroinvertebrates<br>Aquatic macrophytes | Level 2                                     | Data analysis indicates significant (not long-term), changes in relation to control places pre-mining compared to post-extraction occur in the aquatic macroinvertebrate and/or macrophyte assemblages at Locations WT3, WT4 or WT5 on the Waratah Rivulet or Locations ET1, ET2, ET3 or ET4 on the Eastern Tributary during the mining of Longwalls 305-307. | Location ET1: significant decline in mean numbers of Atyidae during autumn and spring 2022 and autumn 2023.<br>Location WT3: significant decline in mean numbers of Atyidae during spring 2021, autumn and spring 2022 and autumn 2023.<br>Location ET2: significant change to the assemblage of macrophytes during autumn 2021 and subsequent surveys.<br>Location ET4: decreased numbers of Atyidae in autumn 2016, spring 2018, spring 2019 and autumn 2020, but not subsequently.  | No  | No                          |
| <b>Negligible impact on Threatened Species, Populations, or Ecological Communities</b> | <i>The aquatic macroinvertebrate and macrophyte assemblages in streams are not expected to experience long-term impacts as a result of mine subsidence.</i> | Two sampling sites (approximately 100 m in length) at the following locations: <ul style="list-style-type: none"> <li>Location WT3 on Waratah Rivulet, Locations ET1, ET3 and ET4 on the Eastern Tributary overlying Longwalls 20-27.</li> <li>Locations WT4 on the Waratah Rivulet, adjacent to Longwalls 20-27.</li> <li>Location WT5 on the Waratah Rivulet and Location ET2 on the Eastern Tributary downstream of Longwalls 20-27.</li> <li>Control Locations: WR1 on Woronora River; and OC on O'Hares Creek.</li> </ul> | Aquatic macroinvertebrates<br>Aquatic macrophytes | Level 3                                     | Data analysis indicates significant long-term changes in relation to control places pre-mining compared to post-extraction occur in the aquatic macroinvertebrate and/or macrophyte assemblages at Locations WT3, WT4 or WT5 on the Waratah Rivulet or Locations ET1, ET2, ET3 or ET4 on the Eastern Tributary during the mining of Longwalls 305-307.        | Location WT3: altered diversity of macroinvertebrate taxa in spring 2016, autumn 2018 and subsequent surveys, including autumn 2023.<br>Location ET2: significant change in assemblages of macroinvertebrates observed in spring 2019 and by subsequent surveys. Altered numbers of Atyidae between spring 2015 and autumn 2018, between autumn 2020 and autumn 2022, but not during spring 2022 or autumn 2023.<br>Location ET4: significant change to assemblage of macroinvertebrates detected in spring 2019 and subsequent surveys; altered patterns of diversity of macroinvertebrate taxa since autumn 2018; altered macrophyte assemblage since autumn 2018. | Yes   | Assessment to be conducted. |

**Table 10 (Continued)**  
**Assessment of Environmental Performance – Underground Mining Area and Surrounds**

| Performance Measure   | Performance Indicator   | Monitoring Site(s) Being Assessed   | Parameters  | Highest Significance Level/Trigger Recorded |  | Comments   | Subsidence Impact Performance Indicator Exceeded? | Subsidence Impact Performance Measure Exceeded?  |
|---|---|---|---|---|--|--|---|--|
| <b>Amphibian Monitoring</b>   |   |   |   |   |  |  |   |  |
| <b>Negligible impact on Threatened Species, Populations, or Ecological Communities</b>  | <i>The amphibian assemblage is not expected to experience changes significantly different to the amphibian assemblage at control sites</i>                | Test sites 1 to 6 overlying Longwalls 20-22<br>Test sites 13 to 17 overlying Longwalls 23-27<br>Test sites 23 to 28 overlying Longwalls 301-303<br>Test sites 29 and 30 overlying Longwalls 305-307<br>Test sites 12 and control sites 7 to 12 and 18 to 22 | Amphibian species diversity and relative abundance  | Level 3                                     | Data analysis identifies a significant change in the amphibian population for more than one survey period.   | Sites 1 to 6, 13 to 17 and 23 to 30.   | Yes   | Cenwest (2024) completed a threatened fauna species assessment at Swamp 20, Swamp 28 and sites on the Eastern Tributary and Waratah Rivulet. The assessment concludes that the Performance Measure continues to be met at these locations.<br><br>Cenwest recommends an additional survey data be collected and analysed for the threatened species-specific population. |
| <b>LAND MANAGEMENT</b>  |   |   |   |   |  |  |   |  |
| <b>Cliffs and Overhangs, Steep Slopes and Land in General</b>   |   |   |   |   |  |  |   |  |
| <b>Less than 3% of the total length of cliffs (and associated overhangs) within the mining area experience mining-induced rock fall</b> | <i>Cliff sites COH11, COH12, COH13, COH16 and/or COH17 experience cliff instabilities that do not require management measures to be implemented</i>       | Cliff sites COH11, COH12, COH13, COH16 and COH17  | Cliff instabilities   | Level 1                                     | No subsidence impacts (i.e. cliff instabilities) recorded.   | No cliff instabilities were recorded at cliff sites COH11, COH12, COH13, COH16 and COH17.  | No  | No   |
|   | <i>Steep slopes and land in general experience sandstone fracturing/cracking and rock falls that do not require management measures to be implemented</i> | Steep slopes and land in general within 600 m of Longwalls 20-27 and Longwalls 301-303  | Sandstone fracturing/cracking and rock falls  | Level 1                                     | No subsidence impacts (i.e. sandstone fracturing/cracking and rock falls) recorded on steep slopes or land in general not previously recorded within 600 m of Longwalls 20-27 or Longwalls 301-307 (after Longwalls 305 commencement). | No sandstone fracturing/cracking or rock falls were recorded on steep slopes or land in general.   | No  | No   |
| <b>HERITAGE MANAGEMENT</b>  |   |   |   |   |  |  |   |  |
| <b>Aboriginal Heritage Sites Monitoring</b>   |   |   |   |   |  |  |   |  |
| <b>Less than 10% of Aboriginal heritage sites within the mining area are affected by subsidence impacts</b>                             | <i>Less than 7% of Aboriginal heritage sites within the mining area are affected by subsidence impacts</i>  | Monitoring of Aboriginal heritage sites with the potential to be impacted by subsidence related to the extraction of Longwalls 305-307.   | Cracking of sandstone at open sites<br>Cracking and/or exfoliation of sandstone, blockfall, displacement, breakage and/or collapse of sandstone overhang sites<br>Damage or deterioration of art motifs | Level 1                                     | Monitoring results indicate sites FRC 281 and FRC 34 have been affected by subsidence impacts.   | No Aboriginal cultural heritage sites were recorded as having been affected by subsidence impacts by the post-Lognwall 308 monitoring surveys. | No  | No   |

**Table 10 (Continued)**  
**Assessment of Environmental Performance – Underground Mining Area and Surrounds**

| Performance Measure  | Performance Indicator  | Monitoring Site(s) Being Assessed  | Parameters  | Highest Significance Level/Trigger Recorded | Subsidence Impact Performance Indicator Exceeded? | Subsidence Impact Performance Measure Exceeded? |
|--|--|--|---|---|---|---|
| <b>BUILT FEATURES MANAGEMENT – TfNSW</b>   |  |  |   |   |   |   |
| <b>Safe, serviceable and repairable, unless the owner and the MSB agree otherwise in writing</b> | <ul style="list-style-type: none"> <li>measured absolute horizontal movements;</li> <li>distortion of bridge elements;</li> <li>cracking of bridge elements;</li> <li>pavement cracking and deformation;</li> <li>visual consequences of slope movement; and</li> <li>defects in culverts.</li> </ul>  | Ground, Bridge 2 (Princes Highway Underpass), Cawley Road Overbridge, Cuttings, Culverts, Pavement and others. | Subsidence effects parameters   | Level 1                                     | Expected subsidence conditions.                   | No  |
| <b>BUILT FEATURES MANAGEMENT – WOLLONGONG CITY COUNCIL OLD PRINCES HIGHWAY</b>                   |  |  |   |   |   |   |
| <b>Safe, serviceable and repairable, unless the owner and the MSB agree otherwise in writing</b> | <ul style="list-style-type: none"> <li>no pavement cracking exceeding mm, or other defects of the road pavement resulting in deterioration of ride quality;</li> <li>no ponding of water on the road surface as a result of changes in grade from subsidence associated with Longwalls 308-310;</li> <li>no joint displacement or cracking or other defects of the drainage structure (e.g. pipes/culverts) in excess of 5 mm; and</li> <li>serviceability of guard rails, marker posts and signage are maintained.</li> </ul> | Pavements, Drainage Structures and Furniture   | Subsidence effects parameters, observable subsidence ground deformations including ponding, pavement cracking, joint displacement or cracking/defects of drainage structures, defects in minor structures, and faults | Level 1                                     | Expected subsidence recorded                      | No  |
| <b>BUILT FEATURES MANAGEMENT – SYDNEY WATER</b>  |  |  |   |   |   |   |
| <b>Safe, serviceable and repairable, unless the owner and the MSB agree otherwise in writing</b> | <ul style="list-style-type: none"> <li>no more than repairable (minor) leakages of the water pipelines occur due to mining; and</li> <li>no more than repairable (minor) defects (cracks, etc.) in the structural integrity of the pipes and associated connections occur due to mining.</li> </ul>  | Pipelines  | Subsidence effects parameters, observable subsidence ground deformations or surface cracks, cracks or leaks, loss of flow/pressure, and faults  | Level 1                                     | Expected subsidence recorded                      | No  |
| <b>PUBLIC SAFETY MANAGEMENT</b>  |  |  |   |   |   |   |
| <b>Safe, serviceable and repairable, unless the owner and the MSB agree otherwise in writing</b> | Public safety will be ensured in the event that any hazard to the general public arising from subsidence effects becomes evident.  | Cliffs and overhangs, steep slopes and land in general<br>Built features                                       | Public safety   | Level 1                                     | Expected subsidence conditions                    | No  |

<sup>1</sup> A detailed assessment of this performance indicator was undertaken for a previous six monthly period (when the Level 3 trigger was first identified) and concluded that it had not been exceeded (HEC, 2019). The performance indicator will be considered to be exceeded if the median falls below the 20<sup>th</sup> percentile and the same is not also occurring in the control catchment.

<sup>2</sup> The no diversion of flows, no change in natural drainage behaviour component of this performance measure was exceeded during the mining of Longwalls 23-27, triggering contingency measures for the impacted pools. This TARP monitors pools not impacted during the mining of Longwalls 23-27.

<sup>3</sup> The minimal iron staining component of this performance measure was exceeded during the mining of Longwalls 23-27, triggering contingency measures for the impacted pools. The nature and extent of iron staining on the Eastern Tributary will continue to be monitored during the mining of Longwalls 305-307.

<sup>4</sup> Subsequent to the autumn 2017 baseline survey and prior to the spring 2017 survey, Swamp 46 and Swamp 51/52 were subject to WaterNSW hazard reduction burns.

<sup>5</sup> This performance indicator has been exceeded at Swamp 20 since 2012 and at Swamp 28 since 2016. Swamp water levels at Swamp 20 and Swamp 28 will continue to be analysed on a six monthly basis and assessments against the performance measure will be conducted annually.

<sup>6</sup> The performance indicator *The aquatic macroinvertebrate and macrophyte assemblages in pools are not expected to experience long-term impacts as a result of mine subsidence* has not been exceeded at Pools ETAG, ETAH, ETAI and ETAK. In accordance with the Longwalls 305-307 Biodiversity Management Plan, assessment against the performance indicator at these pools will be undertaken after one year of the completion of stream remediation on the Eastern Tributary.

## 7 ENVIRONMENTAL PERFORMANCE – SURFACE FACILITIES AREA

This section provides a summary of the key environmental monitoring results for noise, air quality, traffic and waste at the surface facilities area, an assessment of environmental performance, and a description of the management measures implemented during the review period.

The environmental performance of surface facilities water management is described in Section 8.

Each section indicates which management plan contains details of the surface facilities management and monitoring. The Metropolitan Coal management plans are available on the Peabody website (<http://www.peabodyenergy.com>).

### 7.1 NOISE MANAGEMENT

The Metropolitan Coal Noise Management Plan has been prepared for the surface facilities area in accordance with Condition 8, Schedule 4 of the Project Approval.

#### ***Real-time Noise Monitoring***

Real-time noise monitoring for the Project is undertaken using an unattended statistical noise logger located at the northern boundary of 16 Oxley Place (Figure 18). Real-time noise monitoring is used as an internal noise management tool and not for compliance purposes.

The real-time noise monitor records noise levels 24 hours a day, 7 days a week, and a graphical summary of the previous 24 hours of noise is sent to mine staff via email on a daily basis.

A real-time noise performance indicator, *The  $L_{Aeq(5\text{ minute})}$  night-time noise level does not exceed 50 dB(A) for six consecutive 5 minute samples*, has been developed in consideration of façade reflection and as an alert to the potential exceedance of the noise acquisition criteria.

Real-time noise monitoring includes an audio function which allows the monitor to record audio of the noise signal and an ‘alarm’ function whereby noise data is processed and compared against the real-time noise performance indicator. The audio of these events can then be reviewed to see if the cause is Project related, allowing Metropolitan Coal to investigate the causes and potential controls for high Project related noise events.

The real-time noise performance indicator is considered to be exceeded if the  $L_{Aeq(5\text{ minute})}$  night-time noise level exceeds 50 A-weighted decibels (dB[A]) for six consecutive 5 minute samples.

The real-time noise performance indicator was triggered 157 times during the review period, compared to 95 times in 2022, 36 times in 2021, 55 times in 2020, 53 times in 2019 and 125 times in 2018. Heavy rain and thunderstorms, particularly during the first half of 2022 were the primary source of triggers during the review period, with overflying aircraft, birds, and vehicles on Parkes Street, also identified during the review. On two occasions truck movements attributed to the mine were identified. In each case, the relevant trucking company was contacted to reinforce curfew times as outlined in the Traffic Management Plan.

#### ***Attended Noise Monitoring***

Consistent with the Metropolitan Coal Noise Management Plan, attended noise monitoring for the Project has consisted of quarterly monitoring at 16 Oxley Place, 53 Parkes Street, 50 Parkes Street and 36 Old Station Road (sites representative of the nearest residences to the Project [Figure 18]) to quantify the intrusive noise emissions from the mine, including coal processing and transportation operations that contribute to the overall level of ambient noise.

Noise monitoring is conducted for 15 minute periods during the daytime, evening and night-time over two consecutive days and nights and compared to applicable Noise Impact Assessment Criteria, Noise Mitigation Criteria and Noise Acquisition Criteria (refer Section 7.5 and Appendix I).

The attended quarterly noise monitoring and compliance results for the review period are available in the quarterly monitoring reports prepared by SLR (Appendix I). A comparison of the quarterly attended monitoring results at each location for the period September 2010 to December 2023 is provided in Figures 19a to 19d.

In summary, during 2023, attended monitoring indicated exceedances of the noise criteria detailed in Conditions 1, 2 and 3, Schedule 4 of Project Approval (08\_0149) as follows:

- Daytime ( $L_{Aeq}$ ):
  - Monitoring at 16 Oxley Place in Quarter 4 measured a level of 54 dBA which was non-compliant with the Noise Impact Assessment Criterion (50 dBA) and exceeded the daytime Noise Mitigation Assessment Criterion (53 dBA).
  - No exceedances of the Noise Mitigation Assessment Criterion (53 dBA) or Noise Acquisition Criterion (55 dBA) were recorded.
- Evening ( $L_{Aeq}$ ):
  - Monitoring at 16 Oxley Place in Quarters 2, 3 and 4 measured a level of 47 dBA which was conditionally compliant with the Noise Impact Assessment Criterion (45 dBA).
  - No exceedances of the Evening/Night-time Noise Mitigation Criterion (48 dBA) or Noise Acquisition Criterion (50 dBA) were recorded.
- Night-time ( $L_{Aeq}$ ):
  - Monitoring at 36 Old Station Road in Quarter 3 measured a level of 47 dBA which was conditionally compliant with the Noise Impact Assessment Criterion (45 dBA).
  - No exceedances of the Evening/Night-time Noise Impact Assessment Criterion (45 dBA), Noise Mitigation Criterion (48 dBA) or Noise Acquisition Criterion (50 dBA) were recorded.
- Night-time ( $L_{A1}$ ):
  - Monitoring at 16 Oxley Place in Quarters 1, 2 and 3 measured a noise levels of 58 dBA, 52 dBA and 51 dBA respectively, which were conditionally non-compliant (Quarter 1) and conditionally compliant (Quarters 2 and 3) with the Night-time  $L_{A1}$  Noise Impact Assessment Criterion (50 dBA).
  - Monitoring at 36 Old Station Road in Quarter 3 measured a noise level of 51 dBA which was conditionally compliant with the Night-time  $L_{A1}$  Noise Impact Assessment Criterion (50 dBA).

#### ***Identification of Sustained Non-compliances – Attended Noise Monitoring***

A conditional sustained non-compliance has been defined as two consecutive quarters of non-compliant noise monitoring results at the same representative attended noise monitoring location, coinciding with normal mine operations.

No sustained non-compliances with respect to the intrusive ( $L_{Aeq}$ ) Noise Impact Assessment Criteria or the ( $L_{A1}$ ) Noise Impact Assessment Criteria (Table 2; Condition 1, Schedule 4 of the Project Approval) have been identified during 2023.

Further details are provided in Section 7.4.

## **Noise Management**

Operational noise levels from the Metropolitan Coal Mine were materially higher prior to the approval of the Metropolitan Coal Project in June 2009.

A range of operational noise control measures have been implemented since that time, in association with extensive upgrades of existing infrastructure at the surface facilities area, including the upgrade of the CHPP. Extensive noise reduction works have been implemented progressively and noise monitoring and modelling has been used to identify areas where additional reasonable and feasible noise attenuation measures could be implemented. The Metropolitan Coal 2010 to 2022 Annual Reviews describe the noise mitigation measures implemented prior to 2023.

The extensive and long running noise control program has reduced noise emissions at nearby residences. However, Metropolitan Coal has found the number of remaining, reasonable and feasible noise controls is diminishing.

During 2017, in consultation with the DP&E, Metropolitan Coal prepared a technical review of remaining available feasible noise mitigation measures and an associated evaluation of the reasonableness of these options (the Noise Mitigation Assessment) (SLR, 2017). This assessment was independently peer reviewed by Hatch. The reasonable and feasible contingency mitigation measures identified by Metropolitan Coal included:

- Ensuring all crusher tower and washery doors are closed at all times (except when being accessed).
- Progressively replacing the idlers on all surface conveyors with low noise idlers.

Following DP&E's review of the Noise Mitigation Assessment, Metropolitan Coal signed a Voluntary Undertaking which formalised the implementation of the mitigation measures identified by the 2017 Noise Mitigation Assessment. This included a timeframe for implementation of the identified mitigation measures (i.e. all existing conveyor idlers were replaced with low noise idlers by 31 December 2018), subsequent remodelling of noise levels and consultation with residents with predicted residual noise exceedances above the noise mitigation criteria who had not previously accepted noise mitigation was undertaken in 2019.

In accordance with the Voluntary Undertaking, Metropolitan Coal completed an assessment in 2018 of Metropolitan's noise levels under the Noise Policy for Industry (released in 2017) and provided to DP&E in April 2018.

In 2020 Metropolitan Coal met with DPIE to discuss the findings of the assessment of Metropolitan's noise levels under the Noise Policy for Industry. DPIE requested that Metropolitan Coal commission a peer review of all noise mitigation and monitoring to date which was completed by Recognition Research in June 2020. In 2021, Metropolitan Coal met with DPIE to discuss the findings of the peer review. Metropolitan will continue to purchase and install equipment with a lower noise profile as opportunities arise such as new equipment purchases and upgrades.

Metropolitan Coal will continue to implement noise monitoring, management and modelling in accordance with the Metropolitan Coal Noise Management Plan.

It is noted that Metropolitan Coal did not receive any requests for at-receiver noise mitigation in accordance with Condition 3, Schedule 4 of Project Approval (08\_0149) in 2023. Metropolitan Coal has previously offered double glazing noise mitigation voluntarily to a number of the nearest private residences.



### ***Operational Noise Complaints***

During the review period, one complaint regarding noise from the product stockpile during night-time works was received. The complainant was contacted to explain that train scheduling delays resulted in trains being loaded later in the evening than usual. While the mine endeavours to minimise late night train loading, sometimes it is inevitable due to factors outside of Metropolitan Coal's control.

## **7.2 AIR QUALITY AND GREENHOUSE GASES MANAGEMENT**

The Metropolitan Coal Air Quality and Greenhouse Gas Management Plan has been prepared for the surface facilities area in accordance with Condition 13, Schedule 4 of the Project Approval.

Zephyr Environmental Pty Ltd (Zephyr) has reviewed the environmental performance of the Project in relation to air quality for the review period. The report prepared in support of this Metropolitan Coal 2023 Annual Review is provided in Appendix J.

### ***Dust Deposition***

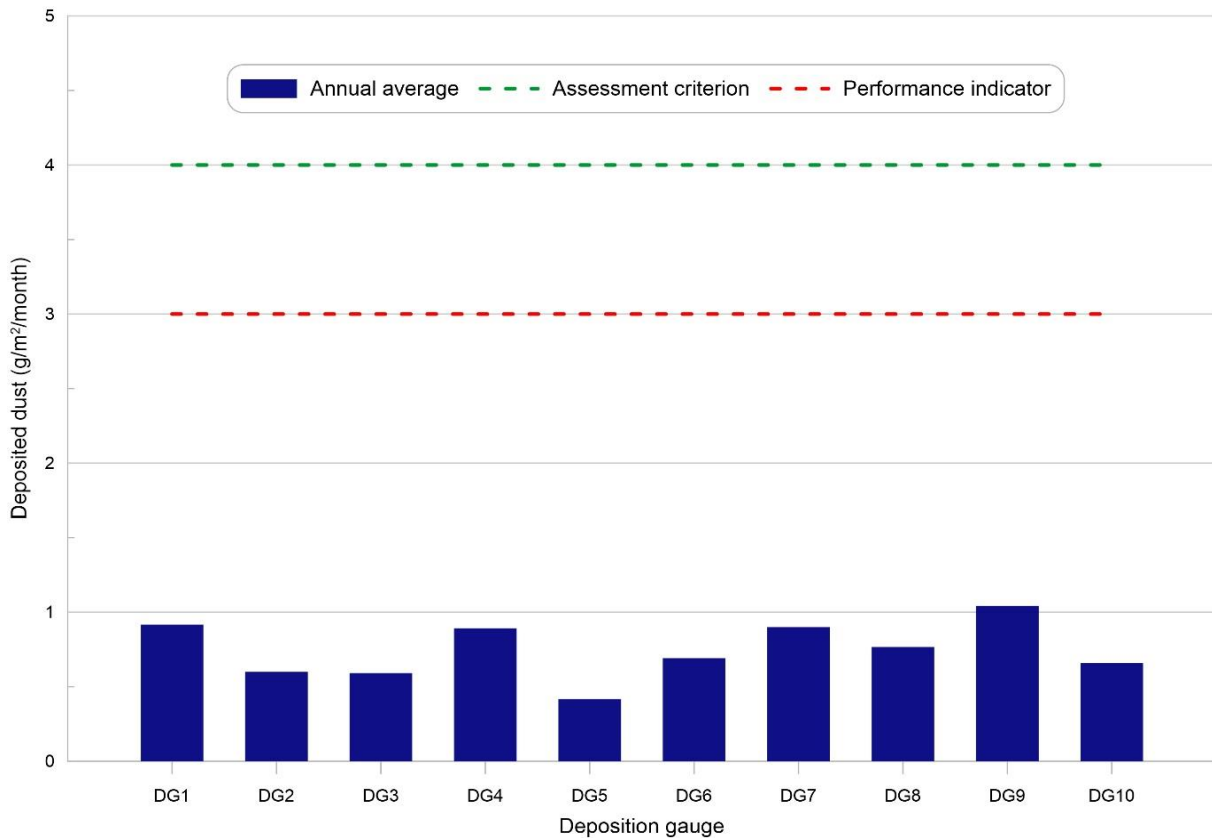
Metropolitan Coal monitors monthly dust deposition rates at ten dust gauges (DG1 to DG10; Figure 20), consistent with EPL No. 767 and the Metropolitan Coal Air Quality and Greenhouse Gas Management Plan.

Sampling during the reporting period was conducted at all monitoring points at the frequencies described in Conditions M2.1 and M2.2 of EPL No. 767. During 2023, all of the potential 120 samples (10 sites over 12 months) were deployed during the period and therefore represents 100% data capture.

The results of the dust deposition monitoring are assessed against air quality performance indicators and air quality impact assessment criteria. The results of the assessment are provided in Section 7.4 and key aspects are summarised below.

The performance indicator for annual average deposited dust of 3 grams per square metre per month ( $\text{g/m}^2/\text{month}$ ) was met at all the dust deposition gauges (D1 to D10) during the reporting period (Chart 70).

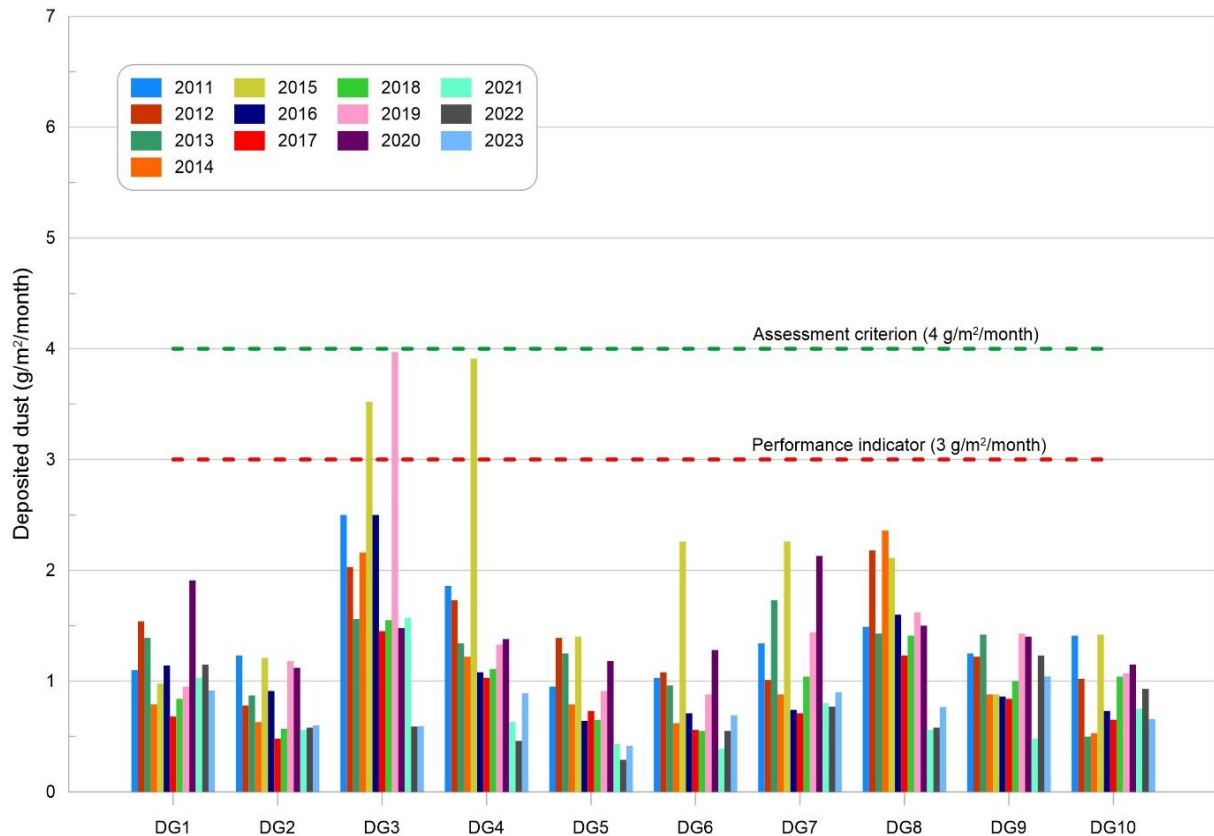
The annual average dust deposition rate at all dust gauges did not exceed  $4 \text{ g/m}^2/\text{month}$ . Compliance was thus achieved with the annual average performance criterion for dust deposition during the reporting period (Chart 70).



**Chart 70 Annual Average Dust Deposition Rates Measured at Dust Gauges (DG1 to DG10)**

Annual average dust deposition rates at each gauge from 2011 to 2023 are shown in Chart 71. From 2011 to 2023, there were no clear trends in dust deposition rates; however, relatively higher dust deposition rates were recorded exceeding the annual average performance indicator of 3 g/m<sup>2</sup>/month at DG3 in 2011, 2015 and 2019, and at DG4 in 2015. There were no exceedances of the annual average performance criterion of 4 g/m<sup>2</sup>/month at DG3 in 2011. The annual average dust deposition rate at each gauge in 2023 was within or below the range previously recorded for the dust gauges.

The Project EA (modelling for Years 3 and 15) predicted that the annual average dust deposition due to the Project plus background would not be above the applicable 4 g/m<sup>2</sup>/month amenity criterion at any receiver (modelling for Years 3 and 15). The air quality monitoring results are consistent with the Project EA predictions in relation to dust deposition.



**Chart 71 Annual Average Dust Deposition Rates at DG1 to DG10 from 2011 to 2023**

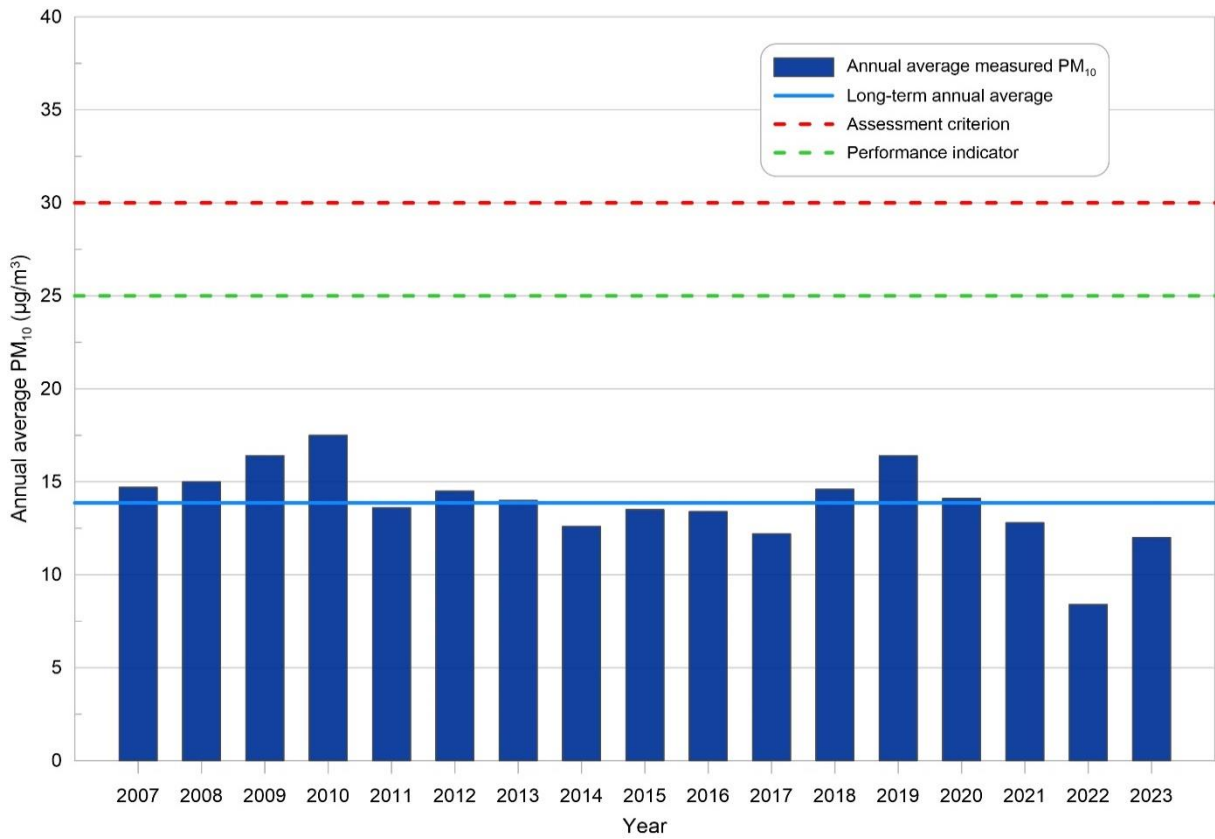
### ***Particulate Matter***

One Tapered Element Oscillating Microbalance (TEOM) and one High Volume Air Sampler (HVAS) are located near the surface facilities area (Figure 20). The TEOM allows for continuous measurement of particulate matter less than 10 micrometres in diameter (PM<sub>10</sub>) concentrations at ten-minute intervals, while the HVAS provides an average PM<sub>10</sub> concentration for a specific 24-hour period, on a one-day-in-six cycle.

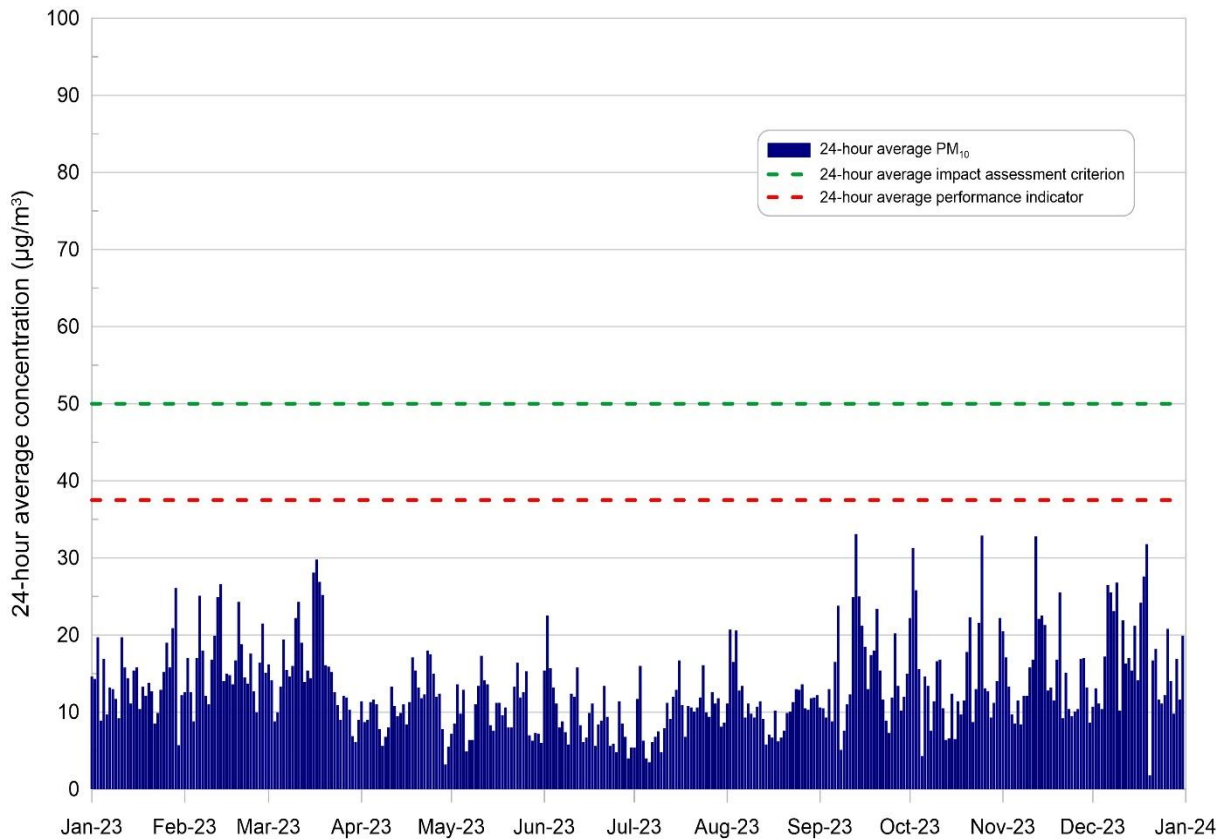
Sampling of PM<sub>10</sub> during the review period was conducted at all monitoring points at the frequencies described in Conditions M2.1 and M2.2 of EPL No. 767. The results of the PM<sub>10</sub> monitoring are assessed against air quality performance indicators and air quality impact assessment criteria. The results of the assessment are provided in Section 7.4 and key aspects are summarised below.

The annual average PM<sub>10</sub> concentrations (measured by the HVAS) from 2007 to 2023 are shown on Chart 72. The annual average PM<sub>10</sub> concentration measured at the HVAS for the review period was 12 micrograms per cubic metre (µg/m<sup>3</sup>), which is lower than the annual average PM<sub>10</sub> performance indicator of 25 µg/m<sup>3</sup> and well below the annual average PM<sub>10</sub> air quality impact assessment criterion of 30 µg/m<sup>3</sup> (Chart 72).

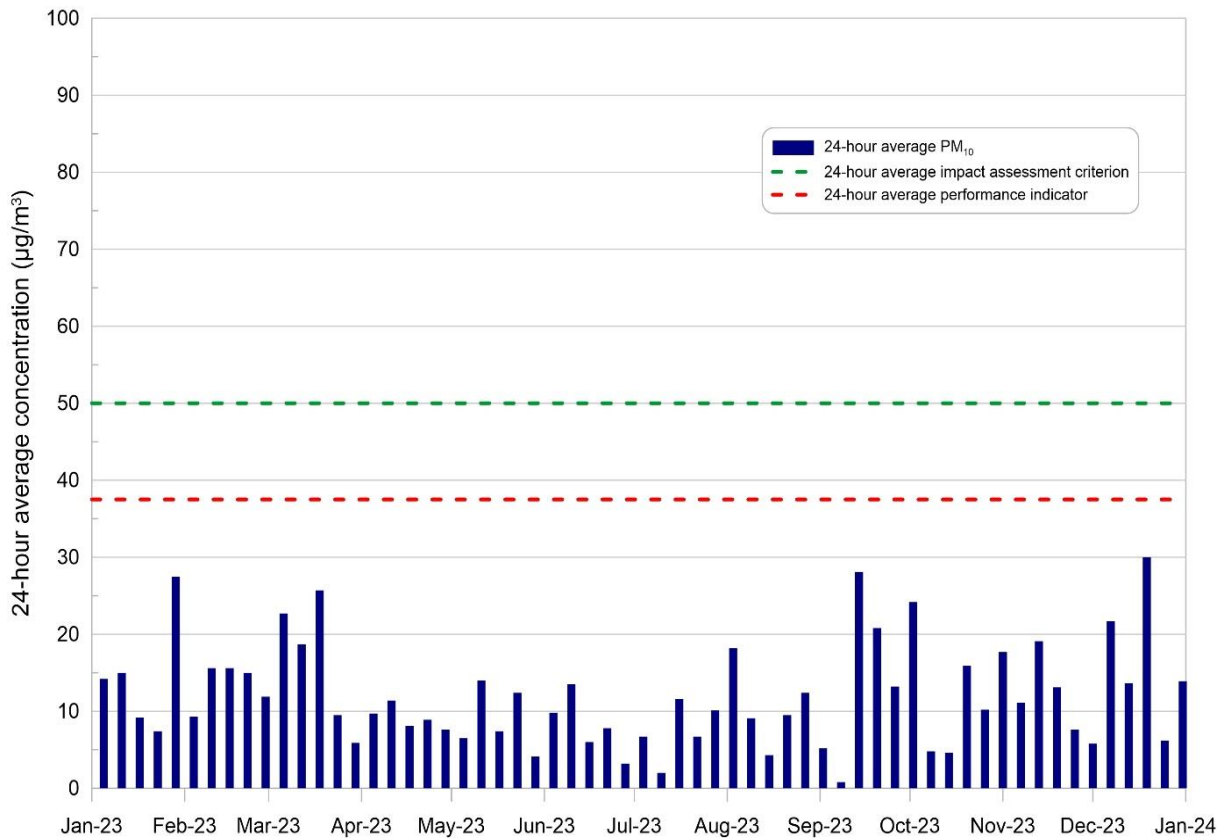
There were no exceedances of the PM<sub>10</sub> 24-hour average performance indicator concentration (37.5 µg/m<sup>3</sup>) recorded by the TEOM during 2023 (Chart 73) or the HVAS (Chart 74).



**Chart 72 Annual Average PM<sub>10</sub> Concentrations from 2007 to 2023 (measured by the HVAS)**



**Chart 73 24-hour Average PM<sub>10</sub> Concentrations (measured by the TEOM)**



**Chart 74 24-hour Average PM<sub>10</sub> Concentrations (measured by the HVAS)**

The highest 10-minute average PM<sub>10</sub> concentration measured at the TEOM for the reporting period was 179.7 µg/m<sup>3</sup> on 13 September 2023. There were six measurements above the air quality performance indicator for the 10-minute average PM<sub>10</sub> concentration of 150 µg/m<sup>3</sup>. All six of these measurements occurred on the same day, due to a hazard reduction burn.

The predicted annual average PM<sub>10</sub> (Project plus background) concentrations modelled for Years 3 and 15 in the Project EA were not predicted to be above the 30 µg/m<sup>3</sup> assessment criterion at any receiver. The maximum 24-hour average PM<sub>10</sub> concentrations modelled for Years 3 and 15 by the Project EA were not predicted to exceed the assessment criterion (Project only) of 50 µg/m<sup>3</sup> at any receiver. Residences located in close proximity to the major surface facilities area on Parkes Street were predicted to experience maximum 24-hour average PM<sub>10</sub> concentrations close to the criteria (i.e. 49 µg/m<sup>3</sup>) in Year 15 due to their close proximity to the coal stockpiles and train loading activities.

The monitoring results in 2023 are thus considered to be lower than the Project EA predictions in relation to particulate matter.

### **Management Measures**

A number of ongoing air quality management measures were implemented at Metropolitan Coal to manage and mitigate air quality impacts, as reported in previous Annual Reviews. Metropolitan Coal will continue to seek opportunities to manage and mitigate air quality impacts at the site.

During the review period, Metropolitan Coal did not identify any opportunities to significantly reduce greenhouse gas emissions. Notwithstanding, Metropolitan Coal continues to explore options to electrify equipment, including the implementation of an electric shuttle bus on-site. Metropolitan Coal is also in the process of procuring an electric Drift Runner vehicle to trial the transportation of personnel underground.

Metropolitan Coal is also in the planning phase of installation of a flare unit to be constructed in 2026, which will burn methane from the gas drainage plant once the percentage methane is suitable, as the Metropolitan Coal Mine is currently a high CO<sub>2</sub>, low methane mine, with higher methane levels expected as the mine progresses westward.

### 7.3 WASTE MANAGEMENT

The Metropolitan Coal Waste Management Plan has been prepared for the surface facilities area in accordance with Condition 25, Schedule 4 of the Project Approval to identify waste streams and monitor the quantities generated, identify waste management measures to minimise waste generation, and ensure that waste generated by Metropolitan Coal is appropriately stored, handled and disposed.

Waste generated by Metropolitan Coal can include tyres, oil, sewage effluent, paint, lead acid batteries, coal rejects, waste rock, office waste (e.g. paper, plastics, and cardboard), scrap metal, general inert waste (e.g. concrete, timber, pipe, rope and rags), underground waste (e.g. packaging, cloths and pipe), oil/fuel filters, aerosol cans, absorbents (e.g. spent oil spill material) and food waste.

Metropolitan Coal monitors waste generated on a monthly basis through waste disposal receipts provided by Metropolitan Coal's waste contractors. Figure 21(a) shows the amount of general waste disposed of in 2023 compared with previous calendar years. Approximately 858,370 kilograms (kg) of general waste was disposed of at a licensed landfill facility in 2023. Approximately 68,660 kg of diesel particulate filters from underground mine equipment was also disposed of at a licensed landfill facility during the review period.

Waste recycled by Metropolitan Coal during the review period included waste oil (28,860 kg), scrap metal (265,860 kg) and paper and cardboard (4,795 kg). Figure 21(b-e) shows the amount of waste oil, scrap wood, scrap metal and office waste recycled in 2023, respectively, compared with previous calendar years.

Figure 21(f) and Figure 21(g) show the amount of coal rejects emplaced by Metropolitan Coal in underground workings and disposed of at the Glenlee Washery, respectively, during the 2012 to 2023 calendar years.

The coal reject backfill emplacement project continued in 2023 emplacing 39,792 tonnes (t) of coal reject underground.

The Wollongong City Council is continuing works to confirm the suitability of Metropolitan Coal rejects to be beneficially re-used at the Helensburgh Landfill in consultation with the NSW EPA.

Metropolitan Coal is also continuing to investigate use of coal washer refuse (CWR) in the production of chailings, a bio-char like product used to increase nutrient and moisture holding capacity in soils. The NSW EPA has granted a draft Exemption and Order for the use of chailings in a field trial, to assess its effectiveness in improving soils.

The education program continued to be implemented during the review period to increase the awareness of mine site personnel in relation to waste management and measures to minimise the generation of waste. Metropolitan Coal will continue to seek opportunities for additional waste minimisation and for the recycling and re-use of materials at the site.

#### **7.4 ASSESSMENT OF ENVIRONMENTAL PERFORMANCE**

The performance indicators, impact assessment criteria and Project Approval conditions in Table 11 assess the performance of environmental management at the surface facilities area including those related to noise, air quality, greenhouse gases, odour, traffic, waste and visual impacts for the review period and reflect the predictions included in the Project EA, Preferred Project Report and the surface facilities management plans (Noise Management Plan, Air Quality and Greenhouse Gas Management Plan, Traffic Management Plan, Surface Facilities Water Management Plan and Waste Management Plan).

**Table 11**  
**Assessment of Environmental Performance – Surface Facilities Area**

| Monitoring Aspect  | Performance Indicator, Impact Assessment Criteria and/or Project Approval Condition  | Indicator, Criteria or Condition Met? | Comments   |
|--|--|---------------------------------------|--|
| <b>NOISE</b>   |  |                                       |  |
| Real-time Noise Performance Indicator  | <i>The <math>L_{Aeq(5\text{ minute})}</math> night-time noise level does not exceed 50 dB(A) for six consecutive 5 minute samples.</i> | No                                    | The Real Time Noise Performance Indicator was triggered 157 times during the review period. In all cases, source was determined to be non-mine related.  |
| Noise Impact Assessment Criteria (Project Approval Table 2, Condition 1, Schedule 4) | Day $L_{Aeq(15\text{ minute})}$ – 50 dBA   | Yes                                   | One non-compliance with respect to the Noise Mitigation Criterion was recorded at 16 Oxley Place during the review period (Appendix I).<br>No sustained exceedances of the Daytime Noise Impact Assessment Criterion were identified by monitoring during the review period (Appendix I).  |
|  | Evening $L_{Aeq(15\text{ minute})}$ – 45 dBA   | Yes                                   | Three conditionally compliant exceedances of the Noise Impact Assessment Criterion was recorded at 16 Oxley Place during the review period (Appendix I).<br>No sustained exceedances of the Evening Noise Impact Assessment Criterion were identified by monitoring during the review period (Appendix I).   |
|  | Night $L_{Aeq(15\text{ minute})}$ – 45 dBA   | Yes                                   | One conditionally compliant exceedance of the Noise Impact Assessment Criterion was recorded at 36 Old Station Road during the review period (Appendix I).<br>No sustained exceedances of the Night Noise Impact Assessment Criterion were identified by monitoring during the review period (Appendix I).   |
|  | Night $L_{A1(1\text{ minute})}$ – 50 dBA   | No                                    | One conditionally non-compliant exceedance and two conditionally compliant exceedances with respect to the night-time maximum Noise Impact Assessment Criterion were identified by noise monitoring at 16 Oxley Place and 36 Old Station Road during the review period (Appendix I).<br>No sustained exceedances of the Night Noise Impact Assessment Criterion were identified by monitoring during the review period (Appendix I). |



**Table 11 (Continued)**  
**Assessment of Environmental Performance – Surface Facilities Area**

| Monitoring Aspect   | Performance Indicator, Impact Assessment Criteria and/or Project Approval Condition  | Indicator, Criteria or Condition Met? | Comments  |
|---|--|---------------------------------------|---|
| <b>NOISE (Continued)</b>  |  |                                       |   |
| Noise Mitigation Criteria<br>(Project Approval Table 4, Condition 3, Schedule 4)  | Day $L_{Aeq(15\text{ minute})}$ – 53 dBA   | Yes                                   | No sustained exceedances of the day Noise Mitigation Criterion were identified by monitoring during the review period (Appendix K).                         |
|   | Evening $L_{Aeq(15\text{ minute})}$ – 48 dBA   | Yes                                   | No sustained exceedances of the evening Noise Mitigation Criterion were identified by monitoring during the review period (Appendix K).                     |
|   | Night $L_{Aeq(15\text{ minute})}$ – 48 dBA   | Yes                                   | No sustained exceedances of the night Noise Mitigation Criterion were identified by monitoring during the review period (Appendix K).                       |
| Noise Acquisition Criteria<br>(Project Approval Table 3, Condition 2, Schedule 4) | Day $L_{Aeq(15\text{ minute})}$ – 55 dBA   | Yes                                   | No sustained exceedances of the day, evening or night-time Noise Acquisition Criterion were identified by monitoring during the review period (Appendix K). |
|   | Evening $L_{Aeq(15\text{ minute})}$ – 50 dBA   | Yes                                   |   |
|   | Night $L_{Aeq(15\text{ minute})}$ – 50 dBA   | Yes                                   |   |
| Rail Noise<br>(Project Approval Conditions 4, 5 and 6, Schedule 4)                | 4. <i>The Proponent shall only use locomotives that are approved to operate on the NSW rail network in accordance with noise limits L6.1 to L6.4 in RailCorp's EPL (No. 12208) and ARTC's EPL (No. 3142) or a Pollution Control Approval issued under the former <u>Pollution Control Act 1970</u>.</i>                | Yes                                   | All locomotives used by Metropolitan Coal are approved for operations in accordance with the noise limits in the relevant EPL.                              |
|   | 5. <i>The Proponent shall use its best endeavours to minimise night-time movements of rolling stock on the Metropolitan rail spur.</i>   | Yes                                   | Metropolitan Coal has endeavoured to minimise night-time movements of rolling stock on the Metropolitan rail spur.  |
|   | 6. <i>In the event of any rail noise or vibration issues that may arise from the haulage of coal over the life of the Project, the Proponent shall liaise with the CCC and the rail service provider to facilitate resolution of these issues and implement additional noise reduction measures where appropriate.</i> | Yes                                   | No issues with rail noise or vibration were identified during the review period.  |

**Table 11 (Continued)**  
**Assessment of Environmental Performance – Surface Facilities Area**

| Monitoring Aspect   | Performance Indicator, Impact Assessment Criteria and/or Project Approval Condition   | Indicator, Criteria or Condition Met? | Comments   |
|---|---|---------------------------------------|--|
| <b>NOISE (Continued)</b>  |   |                                       |  |
| Notification of Landowners (Project Approval Condition 1, Schedule 5) | 1. <i>If the results of the monitoring required in schedule 4 identify that impacts generated by the project are greater than the relevant impact assessment criteria in schedule 4, except where a negotiated agreement has been entered into in relation to that impact, then the Proponent shall, within 2 weeks of obtaining the monitoring results, notify the Executive Director Mineral Resources, the affected landowners and tenants (including tenants of mine owned properties) accordingly, and provide quarterly monitoring results to each of these parties until the results show that the project is complying with the criteria in schedule 4.</i> | Yes                                   | No sustained non-compliances of the Noise Impact Assessment Criteria were identified in 2023.  |
| <b>AIR QUALITY</b>  |   |                                       |  |
| Air Quality Performance Indicators <sup>1,2</sup>                     | PM <sub>10</sub> indicator = 150 µg/m <sup>3</sup><br>(10-minute averaging period assessed using TEOM data)   | Yes                                   | The maximum 10-minute average PM <sub>10</sub> concentration recorded by the TEOM was 179.7 µg/m <sup>3</sup> on 13 September 2023. There were six exceedances of this metric on this day as a result of prescribed burning. |
|   | PM <sub>10</sub> indicator = 37.5 µg/m <sup>3</sup><br>(24-hour averaging period assessed using TEOM data)  | Yes                                   | There were no exceedances of the 24-hour average performance indicator concentration.  |
|   | PM <sub>10</sub> indicator = 37.5 µg/m <sup>3</sup><br>(24-hour averaging period assessed using HVAS data)  | Yes                                   | There were no exceedances of the 24-hour average performance indicator concentration.  |

**Table 11 (Continued)**  
**Assessment of Environmental Performance – Surface Facilities Area**

| Monitoring Aspect  | Performance Indicator, Impact Assessment Criteria and/or Project Approval Condition   | Indicator, Criteria or Condition Met? | Comments   |
|--|---|---------------------------------------|--|
| <b>AIR QUALITY (Continued)</b>   |   |                                       |  |
| Air Quality Performance Indicators <sup>1,2</sup><br>(Continued)                   | PM <sub>10</sub> indicator = 25 µg/m <sup>3</sup><br>(Annual averaging period assessed using HVAS data)   | Yes                                   | An annual average of PM <sub>10</sub> concentration of 12.0 µg/m <sup>3</sup> was recorded by the HVAS.  |
|  | Maximum total deposited dust level = 3 g/m <sup>2</sup> /month (Annual averaging period) <sup>3</sup>   | Yes                                   | The annual average dust deposition rates for each of the sites indicate that compliance with the deposited dust performance indicator was achieved at every one of the dust gauges during the reporting period.  |
| Air Quality Impact Assessment Criteria (Project Approval Condition 11, Schedule 4) | TSP Criteria <sup>4</sup> = 90 µg/m <sup>3</sup><br>(Annual averaging period)   | Yes                                   | Based on the annual average PM <sub>10</sub> concentrations recorded by the HVAS monitoring instrument, the annual average TSP is anticipated to be less than 24.0 µg/m <sup>3</sup> , significantly below the TSP air quality impact assessment criterion of 90 µg/m <sup>3</sup> . |
|  | PM <sub>10</sub> Criteria <sup>4</sup> = 30 µg/m <sup>3</sup><br>(Annual averaging period)  | Yes                                   | An annual average PM <sub>10</sub> concentration of 12.0 µg/m <sup>3</sup> was recorded by the HVAS monitoring instrument.   |
|  | PM <sub>10</sub> Criteria <sup>4</sup> = 50 µg/m <sup>3</sup><br>(24 hour averaging period)   | Yes                                   | There were no exceedances of the 24-hour average PM <sub>10</sub> impact assessment criterion of 50 µg/m <sup>3</sup> observed using the TEOM instrument. This was associated with prescribed burning.   |
|  | Maximum total deposited dust level = 4 g/m <sup>2</sup> /month (Annual averaging period)  | Yes                                   | The maximum annual average dust deposition rate was below 4 g/m <sup>2</sup> /month or less during the reporting period at all dust gauges.  |
| <b>ODOUR</b>   |   |                                       |  |
| Odour (Project Approval Condition 9, Schedule 4)                                   | 9. <i>The Proponent shall not cause or permit the emission of offensive odours from the site, as defined under Section 129 of the POEO Act.</i>   | Yes                                   | No odour complaints were received during the review period.  |
| <b>GREENHOUSE GASES</b>  |   |                                       |  |
| Greenhouse Gas Emissions (Project Approval Condition 10, Schedule 4)               | 10. <i>The Proponent shall implement all reasonable and feasible measures to minimise:</i><br><i>(a) energy use on site; and</i><br><i>(b) the scope 1, 2 and 3 greenhouse gas emissions produced on site, to the satisfaction of the Director-General.</i> | Yes                                   | Metropolitan Coal has implemented the viable energy saving measures contained within their Energy Savings Action Plan.   |

**Table 11 (Continued)**  
**Assessment of Environmental Performance – Surface Facilities Area**

| Monitoring Aspect   | Performance Indicator, Impact Assessment Criteria and/or Project Approval Condition  | Indicator, Criteria or Condition Met?   | Comments  |
|---|--|---|---|
| <b>TRAFFIC</b>  |  |   |   |
| Annual Road Maintenance Performance Indicators                            | <i>When annual road maintenance contribution negotiations are required, the negotiations should commence with the relevant councils and/or DP&amp;I by 31 August.</i>  | Yes   | No negotiations with the Wollongong City Council, Campbelltown City Council and Wollondilly Shire Council were required during the review period.   |
|   | <i>Annual road maintenance contributions to relevant councils are made by 30 November.</i>   | Yes   | Metropolitan Coal did not transport any coal wash reject from the site by road in the 2023 calendar year.   |
| Coal Transport Off-site Performance Indicators                            | <i>Coal transported off-site by road in a calendar year does not reach 150,000 tonnes prior to 31 October.</i>   | Yes   | Metropolitan Coal did not transport any product coal from the site by road in the 2023 calendar year.   |
| Coal Transport Off-site Performance Indicators (Continued)                | <i>Product coal truck movements to the Corrimal Cokeworks and Coalcliff Cokeworks do not exceed 22 and 27 movements respectively in any one day.</i>   | Yes   | Metropolitan Coal has ceased the transport of product coal to Corrimal Cokeworks and Coalcliff Cokeworks. No product coal was transported by road during the review period.   |
| Limits on Approval (Project Approval Condition 6[b], Schedule 2)          | <i>The Proponent shall not:</i><br><i>(a) ...</i><br><i>(b) transport more than 2.8 million tonnes of product coal from the site in a calendar year.</i>   | Yes   | Metropolitan Coal transported a total of 2,062,321 t of product coal and 447,470 t of coal wash reject from site by rail in the 2023 calendar year.   |
| Transport (Project Approval Conditions 17, 18, 19, 20 and 21, Schedule 4) | <i>17. By the end of 2010, the Proponent shall:</i><br><i>(a) undertake a road safety audit of the Parkes Street and Colliery Road intersection, in consultation with the RTA and WCC; and</i><br><i>(b) implement any recommendations of this audit,</i><br><i>to the satisfaction of the Director-General<sup>6</sup>.</i> | Yes, the road safety audit has been undertaken.<br><br>Further actions required in relation to the audit recommendations. | The Road Safety Audit of the Mine Access Road and Parkes Street intersection was conducted in September 2010 in accordance with Condition 17(a), Schedule 4 of the Project Approval. The Road Safety Audit recommended an upgrade of the Parkes Street and Colliery Road intersection. However, Metropolitan Coal was unable to address all of the recommended intersection upgrades due to the inability to obtain a mutually acceptable outcome with the Wollongong City Council.<br><br>Metropolitan Coal engaged a road safety expert to review whether the works undertaken are sufficient to address the original risk identified, or whether alternative/additional actions can be undertaken to address the risk. The review indicated that the civil works associated with the full intersection upgrade were not achievable within the Colliery Road Crown Land lease area. Metropolitan Coal continues to consult further in relation to the intersection upgrade. |

**Table 11 (Continued)**  
**Assessment of Environmental Performance – Surface Facilities Area**

| Monitoring Aspect   | Performance Indicator, Impact Assessment Criteria and/or Project Approval Condition  | Indicator, Criteria or Condition Met? | Comments   |
|---|--|---------------------------------------|--|
| <b>TRAFFIC (Continued)</b>  |  |                                       |  |
| Transport<br>(Project Approval Conditions 17, 18, 19, 20 and 21, Schedule 4)<br>(Continued) | 18. <i>From the end of 2009, the Proponent shall make a suitable annual contribution to WCC, WSC, and CC for the maintenance of local roads that are used as haulage routes by the project. If there is any dispute over the amount of the contribution, the matter must be referred to the Director-General<sup>6</sup> for resolution.</i>   | Yes                                   | No haulage of CWR via Wollongong City Council, Campbelltown City Council or Wollondilly Shire Council roads was undertaken in 2023.                |
|   | 19. <i>The Proponent shall not:</i><br><i>(a) load coal or coal reject onto trucks, or transport it off site by road, outside the hours of 7am and 6pm Monday to Friday;</i><br><i>(b) transport more than 170,000 tonnes of coal off site by road in a calendar year;</i><br><i>(c) transport any coal off site to the Port Kembla Coal Terminal by road;</i><br><i>(d) permit the departure of more than 25 trucks containing product coal for delivery to the Corrimal Cokeworks on any given day; or</i><br><i>(e) permit the departure of more than 30 trucks containing product coal for delivery to the Coalcliff Cokeworks on any given day.</i> | Yes                                   | The loading and transport of coal product and coal reject has been undertaken in accordance with Condition 19, Schedule 4 of the Project Approval. |
|   | 20. <i>During emergencies (such as the disruption of rail services) the Proponent may exceed the restrictions in condition 19 above with the written approval of the Director-General<sup>6</sup>.</i>   | Yes                                   | Metropolitan Coal did not transport CWR by road to PKCT during the reporting period.   |
|   | 21. <i>The Proponent shall monitor the amount of coal and coal reject transported from the site by road and rail each year, and report the results of this monitoring on its website every six months.</i>   | Yes                                   | The results of coal and coal reject transport monitoring have been provided on Metropolitan Coal's website and updated every six months.           |

**Table 11 (Continued)**  
**Assessment of Environmental Performance – Surface Facilities Area**

| Monitoring Aspect  | Performance Indicator, Impact Assessment Criteria and/or Project Approval Condition   | Indicator, Criteria or Condition Met? | Comments  |
|--|---|---------------------------------------|---|
| <b>WASTE</b>   |   |                                       |   |
| Waste Generation Performance Indicator                       | <p><i>Waste generation has been minimised, as evidenced by:</i></p> <ul style="list-style-type: none"> <li>• <i>an increase in the amount or type of waste recycled;</i></li> <li>• <i>a decrease in the amount of waste generated that is disposed of to licensed landfill facilities; and/or</i></li> <li>• <i>no practicable opportunities for additional waste minimisation have been identified to those currently being implemented.</i></li> </ul> | Yes                                   | <p>Metropolitan Coal has minimised waste generation during the review period.</p> <p>The underground emplacement project reduced the off-site disposal of coal reject by approximately 39,792 t during the review period.</p> <p>No further practicable opportunities for waste minimisation were identified.</p>   |
| Storage of Waste Performance Indicator                       | <p><i>Waste has been separated and stored according to type in appropriate storage facilities (e.g. sealed containers for liquid waste).</i></p>  | Yes                                   | <p>Waste on-site is adequately sorted and stored according to waste type prior to collection. Weekly site inspections are conducted by the Metropolitan Environment Department to ensure waste is separated and stored in accordance with the Metropolitan Coal Waste Management Plan.</p>  |
| Handling and Disposal of Waste Performance Indicator         | <p><i>The transport of particular waste types has been tracked in accordance with NSW EPA waste tracking requirements.</i></p> <p><i>Metropolitan Coal's waste management contracts, where relevant, specify that the waste is to be transported by an appropriately licensed contractor and disposed of at an appropriately licensed facility.</i></p>   | Yes                                   | <p>All transport of waste from the Metropolitan Coal site has been tracked in accordance with the NSW EPA waste tracking requirements. Metropolitan Coal's waste management contracts specify waste is to be removed by an appropriately licensed contractor and disposed of at an appropriately licensed facility.</p>   |
| Waste Generation (Project Approval Condition 24, Schedule 4) | <p><i>24. The Proponent shall:</i></p> <p><i>(a) minimise the waste (including coal reject) generated by the project; and</i></p> <p><i>(b) ensure that the waste generated by the project is appropriately stored, handled, and disposed of,</i></p> <p><i>to the satisfaction of the Director-General.</i></p>  | Yes                                   | <p>Metropolitan Coal has minimised waste (including coal reject) generated during the review period. The underground emplacement project had reduced the off-site transport of coal reject by approximately 39,792 t during the review period.</p> <p>Waste on-site is adequately sorted and stored according to waste type prior to collection. Weekly site inspections are conducted by the site Environment Department to ensure waste is separated and stored in accordance with the Metropolitan Coal Waste Management Plan.</p> <p>Metropolitan Coal's waste management contracts specify waste is to be removed by an appropriately licensed contractor and disposed of at an appropriately licensed facility.</p> |

**Table 11 (Continued)**  
**Assessment of Environmental Performance – Surface Facilities Area**

| Monitoring Aspect  | Performance Indicator, Impact Assessment Criteria and/or Project Approval Condition   | Indicator, Criteria or Condition Met? | Comments |
|--|---|---------------------------------------|----------|
| <b>VISUAL</b>  |   |                                       |          |
| Visual Impacts (Project Approval Condition 23, Schedule 4) | 23. <i>The Proponent shall minimise the visual impacts, and particularly the off-site lighting impacts, of the surface facilities area and two ventilation shaft sites to the satisfaction of the Director-General.</i> | Yes                                   | N/A      |

Note:  $L_{Aeq(15\text{ minute})}$  = intrusive equivalent noise level;  $L_{A1(1\text{ minute})}$  = short-term noise level; dBA = A-weighted decibels;  $PM_{10}$  = Particulate matter less than 10 microns; HVA1 = High Volume Air Sampler 1; TEOM1 = Tapered Element Oscillating Microbalance 1;  $\mu\text{g}/\text{m}^3$  = micrograms per cubic metre;  $\text{g}/\text{m}^2/\text{month}$  = grams per square metre per month; TSP = total suspended particulate matter; t = tonnes; CWR = coal washery refuse; PKCT = Port Kembla Coal Terminal. .

<sup>1</sup> Total measured level excluding extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities.

<sup>2</sup> Background  $PM_{10}$  concentrations due to all other sources plus the incremental increase in  $PM_{10}$  concentrations due to the mine alone.

<sup>3</sup> Dust deposition assessment criteria are to be measured using DG1 to DG10 excluding DG4, which is a control dust gauge that is located at the Helensburgh Golf Course some 2 km from the mine's surface facilities area.

<sup>4</sup>  $PM_{10}$  air quality impact assessment criteria are to be measured using HVA1 data.

## 8 WATER MANAGEMENT

A Metropolitan Coal Surface Facilities Water Management Plan has been prepared for the surface facilities area and ventilation shaft site in accordance with Condition 15, Schedule 4 of the Project Approval.

This section details the water use, licensed discharge and water quality monitoring results for the surface facilities area and the management measures implemented during the review period. The environmental performance of water management in the underground mining area and surrounds is described in Section 6.2.

The surface facilities area is located in a steep-sided valley adjacent to the town of Helensburgh and next to Camp Gully (Figure 2). The site water management system comprises a series of collection dams, sumps and treatment systems. The system is operated to avoid the mixing of clean water runoff and mine water, minimise off-site release of runoff, and to provide water supply requirements on-site.

### ***Water Use***

The main uses of water on-site are to supply underground mining operations and the coal washery. Metropolitan Coal draws its water from three main sources, namely, Camp Gully, the potable town water supply and water captured on-site.

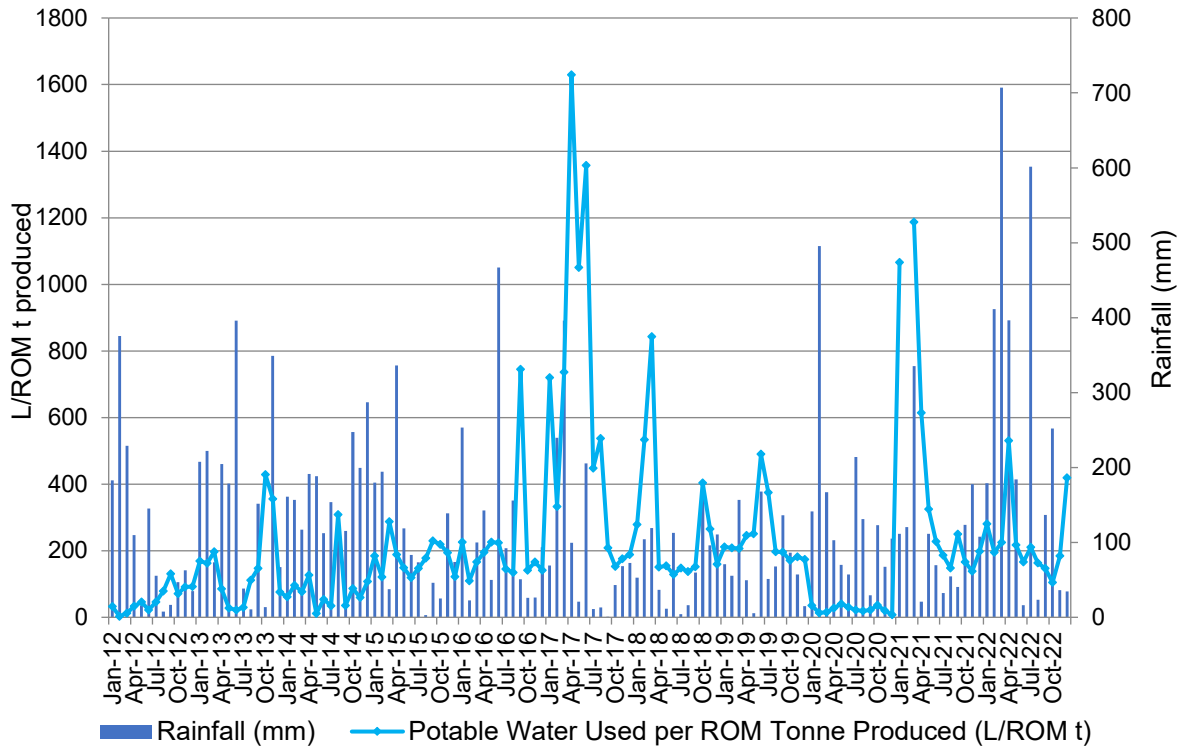
Camp Gully runs adjacent to the southern edge of Metropolitan Coal's surface facilities area (Figure 22). Metropolitan Coal's extraction of water from Camp Gully is specifically regulated by the Camp Creek Weir Surface Water Certificate of Title and more generally by the *Water Act 1912* and the *Water Management Act 2000*.

Metropolitan Coal's annual entitlement under the Camp Gully extraction licence is 130 megalitres (ML). A concrete weir was historically constructed on Camp Gully (approximately 1930s) to facilitate the extraction of water for the mine. Metropolitan Coal did not source any water from Camp Gully during the review period.

The use of potable water (sourced from Sydney Water) for mine purposes occurs when insufficient water is available from Camp Gully and/or on-site harvesting. Potable water is sourced from two mains, one of which supplies the bathhouses and drinking water utilities and one that supplements water supplies for mining purposes. Use of potable water is recorded and minimised in accordance with the site's commitments under the Water Savings Action Plan. Metropolitan Coal used approximately 442 ML of potable town water (as recorded by the Sydney Water meters) during 2023 (a monthly average of approximately 37 ML), in comparison to 398 ML in 2022, 239 ML in 2021, 301 ML in 2020, 387 ML in 2019 and 365 ML in 2018.

The use of potable water per tonne of ROM coal produced is variable and is generally higher during periods of low rainfall (Chart 75). Ongoing site auditing during the review period has not identified incidences of potable water being used where there is a viable alternative. In 2023 potable water consumption correlated well with ROM production throughout the year.





**Chart 75 Potable Water Used per ROM Tonne Produced vs Rainfall**

### ***Licensed Discharge***

Water discharged from the Water Treatment Plant to Camp Gully is monitored in accordance with EPL No. 767, which requires Metropolitan Coal to continuously monitor the volume (kilolitres per day) of water discharged from the clean water tank in the Water Treatment Plant to Camp Gully. The total amount of water discharged from the Water Treatment Plant to Camp Gully during the review period was approximately 116 ML, in comparison to 118 ML in 2022, 95 ML in 2021, 120 ML in 2020, 55 ML in 2019 and 67 ML in 2018.

### ***Water Quality***

Surface water quality monitoring of pH, oil and grease and total suspended solids is conducted at the Water Treatment Plant in accordance with EPL No. 767.

The water quality monitoring results indicate that pH levels (Mean of 7.71 pH), oil and grease (Mean of <5 mg/L) and total suspended solids (Mean of 14.17 mg/L) were within the water quality limits prescribed by EPL No. 767 (i.e. 6.5 to 8.5 pH, less than 10 mg/L for oil and grease, and less than 30 mg/L for total suspended solids) during the review period. Similarly, no exceedances of the EPL No. 767 concentration limits were recorded by Metropolitan Coal in the 2011 to 2021 calendar years.

The Project EA predicted there would be no material effect to downstream water quality as a result of water releases from the major surface facilities area to Camp Gully (which are constrained by EPL No. 767). The monitoring results are consistent with the Project EA predictions in relation to water quality.

### Overall System Integrity

Surface facilities water management items (such as pipelines and pumps, bunded areas, main water storages, signs of discharge of site runoff, upslope diversions and erosion control measures) are visually inspected by Metropolitan Coal and reported in accordance with the mine's maintenance system.

During the review period Metropolitan Coal completed the expansion and relining of Turkey's Nest Dam with shotcrete to increase storage capacity and improve efficiency of desilting activities.

Metropolitan Coal also implemented a real-time sediment monitoring system in Turkey's Nest Dam and Sediment Ponds to inform ongoing desilting activities as required.

### Assessment of Environmental Performance

In accordance with the Metropolitan Coal Surface Facilities Water Management Plan, an assessment of the environmental performance of water management at the surface facilities area is provided in Table 12.

A summary of the water take during the water reporting period (1 July 2022 to 30 June 2023) is provided in Table 13.

**Table 12**  
**Assessment of Environmental Performance – Surface Facilities Water Management**

| Monitoring Aspect                                 | Performance Indicator or Project Approval Condition  | Indicator or Condition Met? | Comments  |
|---|--|-----------------------------|---|
| <b>SURFACE FACILITIES WATER MANAGEMENT</b>        |  |                             |   |
| Water Use Performance Indicator                   | <i>The use of potable water (i.e. megalitres of town water used per tonne of coal produced) does not increase over time, after taking into consideration climatic conditions.<br/><br/>Potable water has not been used in circumstances where there is a viable alternative.</i> | Yes                         | Ongoing site auditing during the review period has not identified incidences of potable water being used where there is a viable alternative.   |
| Erosion Control Performance Indicator             | <i>Inspections of the major surface facilities area and ventilation shaft(s) indicate the measures implemented are effectively controlling erosion.</i>  | Yes                         | Weekly inspections of the surface facilities area and ventilation shaft(s) indicate that the erosion control measures implemented during the review period including sediment fencing and coir logs have effectively controlled erosion.  |
| Containment of Contaminants Performance Indicator | <i>Effective containment and/or isolation measures are in place for potential contaminants on site.</i>  | Yes                         | Weekly inspections have confirmed that effective containment and isolation measures have been in place for potential contaminants on-site.  |
| Licensed Discharge Performance Indicator          | <i>Surface water discharges comply with the requirements of EPL No. 767.</i>   | No                          | All discharges through LDP7 were compliant with EPL No. 767. No discharges occurred through LDP8 during the reporting period.<br><br>The EPA is currently investigating whether there has been a non-compliance with EPL 767 associated with a landslip incident in August 2023, further details of which are provided in Section 13. |
| System Integrity Performance Indicator            | <i>Inspections of system components indicate the integrity of the system is not at risk of being compromised.</i>  | Yes                         | Daily and weekly inspections of the water management system did not identify the need for maintenance of system components to reduce risk of compromise.  |

**Table 12 (Continued)**  
**Assessment of Environmental Performance – Surface Facilities Water Management**

| Monitoring Aspect                                      | Performance Indicator or Project Approval Condition  | Indicator or Condition Met? | Comments  |
|--|--|-----------------------------|---|
| <b>SURFACE FACILITIES WATER MANAGEMENT</b>             |  |                             |   |
| Discharges (Project Approval Condition 14, Schedule 4) | <i>14. The Proponent shall ensure that all surface water discharges from the site comply with the discharge limits (both volume and quality) set for the project in any EPL.</i> | No                          | All discharges through LDP7 were compliant with the EPL. No discharges occurred through LDP8 during the reporting period.<br><br>The EPA is currently investigating whether there has been a non-compliance with EPL 767 associated with a landslip incident in August 2023, further details of which are provided in Section 13. |

**Table 13**  
**Cumulative Water Take (1 July 2022 to 30 June 2023)**

| Water Licence # | Water Sharing Plan, Source and Management Zone (as applicable)                                  | Entitlement (ML/year) | Passive take / inflows (ML/year) | Active Pumping (ML/year) |
|-----------------|---|-----------------------|----------------------------------|--------------------------|
| 10BL603595      | Greater Metropolitan Region Groundwater Sources 2023<br>Sydney Basin Central Groundwater Source | 182.5                 | 47.1                             | 0.0                      |

## 9 CONSTRUCTION MANAGEMENT

A Metropolitan Coal Construction Management Plan has been prepared for surface construction works (excluding remediation or rehabilitation works) in the Woronora Special Area in accordance with Condition 11, Schedule 3 of the Project Approval.

As the requirement for surface construction works arise, Metropolitan Coal provide the specific details of the proposed surface construction works (in the form of a completed Surface Works Assessment Form [SWAF]) to the DPE and WaterNSW for comment. The Surface Works Assessment Form details the specific management measures that will be implemented to minimise potential impacts associated with surface construction works, including management measures relevant to vegetation, Aboriginal heritage, erosion and sediment control, fuel and spill management, transport, waste, bushfire preparedness, pest management and site clean-up. No SWAFs were submitted in 2023.

In 2024 Metropolitan Coal will lodge a SWAF for the installation of additional swamp groundwater and substrate moisture monitoring equipment in the Woronora Special Area.

No other construction activities in the underground mining area were conducted during the review period.

## **10 REHABILITATION**

In August 2023, a Rehabilitation Management Plan was prepared by Metropolitan Coal in accordance with the new standard rehabilitation conditions on mining leases imposed through an amendment to the *Mining Regulation 2016* under the *Mining Act 1992*. The Rehabilitation Management Plan is available on the Peabody website and addresses the rehabilitation requirements prescribed in the conditions of ML 1610, ML 1702, CCL 703, CL 379, MPL 320 and Condition 4, Schedule 6 of the Project Approval (08\_0149).

Rehabilitation activities at the Metropolitan Coal Mine are conducted in accordance with the Rehabilitation Management Plan.

In accordance with clauses 9 and 13 of Schedule 8A of *Mining Regulations 2016* and Part 1 of the NSW Resources Regulator Form and Way – *Annual Rehabilitation Report and Forward Program for Large Mines* (2021), Metropolitan Coal has prepared an Annual Rehabilitation Report for the 2022 reporting period. The 2023 Annual Rehabilitation Report describes the rehabilitation and disturbance activities undertaken at the Metropolitan Coal Mine between 1 January to 31 December 2023 (i.e. the Annual Review reporting period).

To ensure consistency between the reporting of rehabilitation activities required by Metropolitan Coal's mining leases and Project Approval (08\_0149), the Metropolitan Coal Annual Rehabilitation Report has been provided in Appendix K and is available on the Peabody website.

### **10.1 ASSESSMENT OF ENVIRONMENTAL PERFORMANCE**

An assessment of the environmental performance of rehabilitation management during the review period is provided in Table 14.

**Table 14**  
**Assessment of Environmental Performance – Rehabilitation**

| Monitoring Component   |   | Performance Indicator, Rehabilitation Objective and/or Project Approval Condition  | Indicator, Objective or Condition Met? | Comments   |
|--|---|--|--|--|
| Other land affected by the Project Performance Indicator                         |   | <p><i>Redundant equipment/infrastructure items have been removed.</i></p> <p><i>The site is neat and tidy (i.e. it does not contain any rubbish).</i></p> <p><i>No weed management measures are required.</i></p> <p><i>No erosion or sediment control measures are required.</i></p> <p><i>Where appropriate, native vegetation is naturally regenerating or active revegetation is establishing.</i></p> <p><i>No further active revegetation measures are required.</i></p> | Not currently applicable               | <p>Not applicable during the review period as no rehabilitation of surface distribution areas in the underground mining area has been conducted.</p> <p>Once a surface disturbance area is no longer being utilised, Metropolitan Coal will use the Rehabilitation Management Plan – Surface Disturbance Register to monitor the performance of the measures implemented to rehabilitate surface disturbance areas.</p>  |
| Stream Remediation Performance Indicator   |   | <p><i>Analysis of water level recession rates for a pool indicates a similar pool behaviour to that which existed prior to being impacted by subsidence.</i></p>   | To be determined                       | <p>While stream remediation activities have been conducted at Pools A, F and G on the Waratah Rivulet, assessment against the rehabilitation performance indicator has not been made to date. Assessment following the stream remediation works was delayed until a significant period of drier climatic conditions had been experienced and an updated Stream Remediation Management Plan including proposed pool remediation success assessment criteria, which was approved in November 2019.</p> |
| Rehabilitation Objectives<br>(Project Approval Table 11, Condition 1 Schedule 6) | Surface Facilities Area   | <p><i>Set through condition 2 below.</i></p>   | Yes                                    | <p>The rehabilitation objective for the surface facilities area is addressed in the Metropolitan Coal Rehabilitation Strategy.</p>   |
|  | Waratah Rivulet, between the downstream edge of Flat Rock Swamp and the full supply level of the Woronora Reservoir | <p><i>Restore surface flow and pool holding capacity as soon as reasonably practicable.</i></p>  | To be determined                       | <p>Metropolitan Coal will assess surface flow and pool holding capacity using the results of the assessment of the stream remediation performance indicator for the completed stream remediation activities at Pools A, F and G once a significant period of drier climatic conditions has been experienced.</p>   |
|  | Eastern Tributary, between the maingate of Longwall 26 and the full supply level of the Woronora Reservoir          |  | To be determined                       | <p>Metropolitan continued remediation of pools on Eastern Tributary in 2023. Monitoring data will be collected throughout the program to inform assessment of the stream remediation performance indicator.</p>  |
|  | Cliffs  | <p><i>Ensure that there is no safety hazard beyond that existing prior to mining.</i></p>  | Yes                                    | <p>No safety hazard associated with cliffs was identified during the review period.</p>  |

**Table 14 (Continued)**  
**Assessment of Environmental Performance – Rehabilitation**

| Monitoring Component  |   | Performance Indicator, Rehabilitation Objective and/or Project Approval Condition   | Indicator, Objective or Condition Met? | Comments   |
|---|---|---|--|--|
| Rehabilitation Objectives<br>(Project Approval Table 11, Condition 1 Schedule 6)<br>(Continued) | <i>Other land affected by the Project</i>   | <p><i>Restore ecosystem function, including maintaining or establishing self sustaining native ecosystems:</i></p> <ul style="list-style-type: none"> <li>• <i>comprised of local native plant species; with</i></li> <li>• <i>a landform consistent with the surrounding environment.</i></li> </ul> | Not currently applicable               | The Rehabilitation Management Plan – Surface Disturbance Register will be used to manage the implementation of rehabilitation measures. The performance indicator for other land affected by the Project will be used to monitor the performance of rehabilitation measures being implemented. |
|   | <i>Built features</i>   | <i>Repair/restore to pre-mining condition or equivalent.</i>  | Yes                                    | Assessed through the Metropolitan Coal Built Features Management Plans. No impacts to built features were recorded during the review period.   |
|   | <i>Community</i>  | <i>Minimise the adverse socio-economic effects associated with mine closure including the reduction in local and regional employment.</i>   | Not currently applicable               | The socio-economic effects associated with mine closure will be addressed in the Metropolitan Coal Mine Closure Plan and will be considered in consultation with the local community (through the Community Consultative Committee [CCC]) when determining the final land use option.          |
|   |   | <i>Ensure public safety.</i>  | Yes                                    | Assessed through the Metropolitan Coal Public Safety Management Plan for the underground mining area and in the Metropolitan Coal Rehabilitation Strategy for the surface facilities area.   |
| Rehabilitation Strategy – Surface Facilities Area<br>(Project Approval Condition 2, Schedule 6) | <p>2. <i>By the end of October 2011, the Proponent shall prepare a Rehabilitation Strategy for the surface facilities area to the satisfaction of the Director-General. This strategy must:</i></p> <p><i>(a) be prepared by a team of suitably qualified and experienced experts whose appointment has been endorsed by the Director-General;</i></p> <p><i>(b) be prepared in consultation with relevant stakeholders, including the WCC and the CCC;</i></p> <p><i>(c) investigate options for the future use of the area upon the completion of mining;</i></p> <p><i>(d) describe and justify the proposed rehabilitation strategy for the area; and</i></p> <p><i>(e) define the rehabilitation objectives for the area, as well as the proposed completion criteria for this rehabilitation.</i></p> | Yes   | -                                      |  |

**Table 14 (Continued)**  
**Assessment of Environmental Performance – Rehabilitation**

| Monitoring Component   | Performance Indicator, Rehabilitation Objective and/or Project Approval Condition  | Indicator, Objective or Condition Met? | Comments  |
|--|--|--|---|
| Progressive Rehabilitation<br>(Project Approval Condition 3, Schedule 6)     | 3. <i>To the extent that mining operations permit, the Proponent shall carry out rehabilitation progressively, that is, as soon as reasonably practicable following the disturbance.</i>   | Yes                                    | -   |
| Rehabilitation Management Plan<br>(Project Approval Condition 4, Schedule 6) | 4. <i>The Proponent shall prepare and implement a Rehabilitation Management Plan for the project to the satisfaction of the Executive Director Mineral Resources. This plan must be prepared in consultation with the relevant stakeholders, and submitted to DRE for approval prior to carrying out any second workings in the mining area.</i><br><br><i><u>Note: In accordance with condition 12 of schedule 2, the preparation and implementation of Rehabilitation Management Plans is likely to be staged, with each plan covering a defined area (or domain) for rehabilitation. In addition, while mining operations are being carried out, some of the proposed remediation or rehabilitation measures may be included in the detailed management plans that form part of the Extraction Plan. If this is the case, however, then the Proponent will be required to ensure that there is good cross-referencing between the various management plans.</u></i> | Yes                                    | -   |
| Catchment Improvement Works<br>(Project Approval Condition 5, Schedule 6)    | 5. <i>The Proponent shall:</i><br><br><i>(a) pay SCA \$100,000 by the end of 2011 to carry out catchment improvement works within the Woronora catchment area; or</i><br><br><i>(b) carry out catchment improvement works within this area that have an equivalent value to the satisfaction of SCA.</i>   | Yes                                    | While the value of these works now exceeds the value specified, Metropolitan Coal continues to conduct catchment improvement works in the Woronora catchment area, including sites identified in accordance with Condition 5(b), Schedule 6 of the Project Approval (refer Section 10.4). |

**Table 14 (Continued)**  
**Assessment of Environmental Performance – Rehabilitation**

| Monitoring Component                                  | Performance Indicator, Rehabilitation Objective and/or Project Approval Condition  | Indicator, Objective or Condition Met? | Comments   |
|---|--|--|--|
| Offsets<br>(Project Approval Condition 6, Schedule 6) | <p>6. <i>If the Proponent exceeds the performance measures in Table 1 of this approval, and either</i></p> <p><i>(a) The contingency measures implemented by the Proponent have failed to remediate the impact; or</i></p> <p><i>(b) The Director-General determines that it is not reasonable or feasible to remediate the impact, then the Proponent shall provide a suitable offset to compensate for the impact to the satisfaction of the Director-General.</i></p> <p><u><i>Note: Any offsets required under this condition must be proportionate with the significance of the impact.</i></u></p> | To be determined                       | <p>In October 2016 Metropolitan Coal identified the subsidence impact performance measure for the Eastern Tributary, between the full supply level of the Woronora Reservoir and the Longwall 26 maingate in Table 1, Condition 1, Schedule 3 of the Project Approval had been exceeded in relation to iron staining. In early 2017 the same performance measure was identified as being exceeded in relation to pool drainage behaviour (refer to Sections 6.2 and 13.1). Metropolitan Coal proposed to conduct stream remediation measures on the Eastern Tributary in accordance with the Longwalls 23-27 Water Management Plan Contingency Plan. In 2018 Metropolitan submitted a Stream Remediation Plan to relevant stakeholders prior to commencement of any stream remediation. The plan was approved in November 2019 with remediation activities commencing in 2021.</p> |



## 11 COMMUNITY

Metropolitan Coal engages with the Helensburgh community and strives to maintain positive relationships with stakeholders given the extensive history shared between the mine and township. Generations of locals have worked at the mine and it is widely accepted that the operation is an integral component of the Helensburgh community.

The majority of workers reside in the local area or within 50 km of the mine. As far as practicable, the mine seeks to employ local contractors, supply companies and services during the course of its operations.

Metropolitan Coal has also continued to provide sponsorship and/or donations to the local community during the review period. Metropolitan Coal's proactive community engagement program aims to work in partnership with the community for mutually beneficial and sustainable outcomes achieving this through the development of specific community programs as discussed below.

### 11.1 COMMUNITY ENGAGEMENT ACTIVITIES AND INITIATIVES

#### *Community Consultative Committee*

Three CCC meetings were held during the review period (28 March, 18 July and 21 November 2023). These meetings facilitated Metropolitan Coal consultation and engagement with community members on matters of general business and the environmental performance of the operation. Discussions during the review period included the Longwalls 308-310 Extraction Plan, monitoring and remediation of the Eastern Tributary, surface water management, exploration licence ELA 5918, proposed project modifications, CWR management and community funding.

### 11.2 COMMUNITY CONTRIBUTIONS

In addition to the community engagement activities and initiatives discussed above, Metropolitan Coal has made a number of significant donations to support the community of Helensburgh and the greater Illawarra region throughout 2023. All donation requests were assessed on their individual merit and funding was distributed accordingly.

In total, community donations and sponsorship during 2023 amounted to over \$150,000 and included the following:

- Donation to the Helensburgh Tigers Rugby League Club.
- Donation to the Helensburgh Tigers Junior Rugby League Club.
- Donation to Helensburgh Netball Club.
- Donation to Helensburgh Thistles Soccer Club.
- Donation to Helensburgh-Stanwell Park Surf Life Saving Club.
- Donation to Helensburgh Pony Club.
- Ongoing sponsorship of the Helensburgh Public School and Holy Cross Primary School gardening and environment programs.
- Donation to Corrimal Swim Club bathroom upgrade.
- Donation to Sutherland Shire Netball Association.
- Donations to Helensburgh Lions Club.
- Donation to the Lions Club of Woonona for their World Festival of Magic fundraiser.

- Donation to Helensburgh Hope Church Community Pantry.
- Donation to the Illawarra Convoy.
- Donation to Helensburgh Mens Shed.
- Funding of "Carols in the Burgh" fireworks display.
- Donation of old railway sleepers to assist Helensburgh Landcare upgrade of Parkes Street Old Mine Surgery gardens.

### **11.3 COMMUNITY COMPLAINTS**

A protocol for the management and reporting of complaints has been developed as a component of Metropolitan Coal's Environmental Management Strategy. A dedicated telephone number for the provision of comments or complaints is maintained by Metropolitan Coal (1800 115 003) and is displayed on signage at an entrance to the mine. Metropolitan Coal records and responds to all complaints and maintains a complaints register on its website.

During the review period, two complaints were received. One complaint pertained to black dust on a property neighbouring the mine. A meeting with the resident was held to review the dust, outline the extensive dust mitigation program operating onsite, as well as previous work undertaken to characterise the proportion of offsite dust originating from the mine which is typically less than 20%. An offer to undertake dust monitoring at the property was not accepted. A complaint was also received regarding loading of trains in the late evening period. The resident was advised of the site's ongoing efforts to minimise train loading during this period, which is sometimes unavoidable due to factors outside of Metropolitan Coal's control.

A summary of community complaints received since January 2006 is provided on Figure 23. Very few complaints have been received on an annual basis since the Project was approved in June 2009, and have typically related to noise, dust and/or traffic.

## **12 INDEPENDENT ENVIRONMENTAL AUDIT**

In accordance with Condition 8, Schedule 7 of the Project Approval, an Independent Environmental Audit of the Project is to be commissioned by the end of December 2011, and every three years thereafter, and be conducted by a team of experienced and independent experts endorsed by the Director-General (now Secretary) of the DPE (now DPHI).

Metropolitan Coal commissioned the 2023 Independent Environmental Audit by 31 December 2023. In accordance with Condition 9, Schedule 7 of the Project Approval, Metropolitan Coal will provide a copy of the Independent Environmental Audit to DPHI with Metropolitan Coal's response to the Audit recommendations upon completion.

Four Independent Environmental Audits have been completed to date (as reported in previous Annual Reviews). The next Independent Environmental Audit is to be commissioned by December 2026.

## 13 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

In accordance with Condition 4, Schedule 7 of the Project Approval (08\_0149), Metropolitan Coal reviews, and if necessary, revises the Metropolitan Coal Management Plans within three months of the submission of an incident report under Condition 6, Schedule 7 of the Project Approval (08\_0149).

### 13.1 EASTERN TRIBUTARY PERFORMANCE MEASURE

The Metropolitan Coal Project Approval (08\_0149) requires Metropolitan Coal not to exceed the subsidence impact performance measures outlined in Table 1 of Condition 1, Schedule 3.

The subsidence impact performance measure for the Eastern Tributary watercourse is:

*Negligible environmental consequences over at least 70% of the stream length (that is no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining and minimal gas releases)*

Monitoring conducted in accordance with the Metropolitan Coal Longwalls 23-27 Water Management Plan in 2016 identified that the Eastern Tributary watercourse performance measure for the Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26 was exceeded in relation to *minimal iron staining* in October 2016. The exceedance was reported to the Secretary of the DP&E and other relevant agencies on 14 October 2016 in accordance with Condition 6, Schedule 7 of the Project Approval and the Metropolitan Coal Longwalls 23-27 Water Management Plan Contingency Plan.

The *no diversion of flows, no change in the natural drainage behaviour of pools* component of the Eastern Tributary subsidence impact performance measure was exceeded in January 2017 and reported to the DP&E and other relevant agencies.

Since 2020 Metropolitan Coal has conducted stream remediation works in accordance with the Metropolitan Coal Stream Remediation Plan. PUR grout curtains to a depth of up to 10 m have been installed at pools ETAH, ETAK, ETAL, ETAM and ETAO with additional shallow pattern grouting to a depth of approximately 1 m also undertaken at Pools ETAQ and ETAR. Significant improvements in stream bed permeability and pool drainage behaviour have been noted, however an extended period of dry climatic conditions is needed to properly assess the efficacy of the remediation activities taken to date. Stream remediation may continue in 2024.

### 13.2 LANDSLIP ADJACENT TO CAMP CREEK

On 6 August 2023, after a period of intense rainfall, a landslip occurred on an embankment adjacent to an access road near the Water Treatment Plant on the site. This resulted in a section of the embankment dislodging and moving down into Camp Creek resulting in the deposition of water and historically emplaced fill material in the creek.

Following this incident, Metropolitan Coal activated its Pollution Incident Response Management Plan and promptly commenced activities to stabilise the slump. A program of works including removal of material by hand and machinery commenced on 7 August 2023, with the EPA confirming completion of the cleanup process on 19 December 2023. Works to stabilise and remediate the slope are ongoing with expected completion in June 2024.

Metropolitan Coal has continued to cooperate with the EPA in relation to this landslip incident, which remains the subject of an ongoing investigation by the EPA.

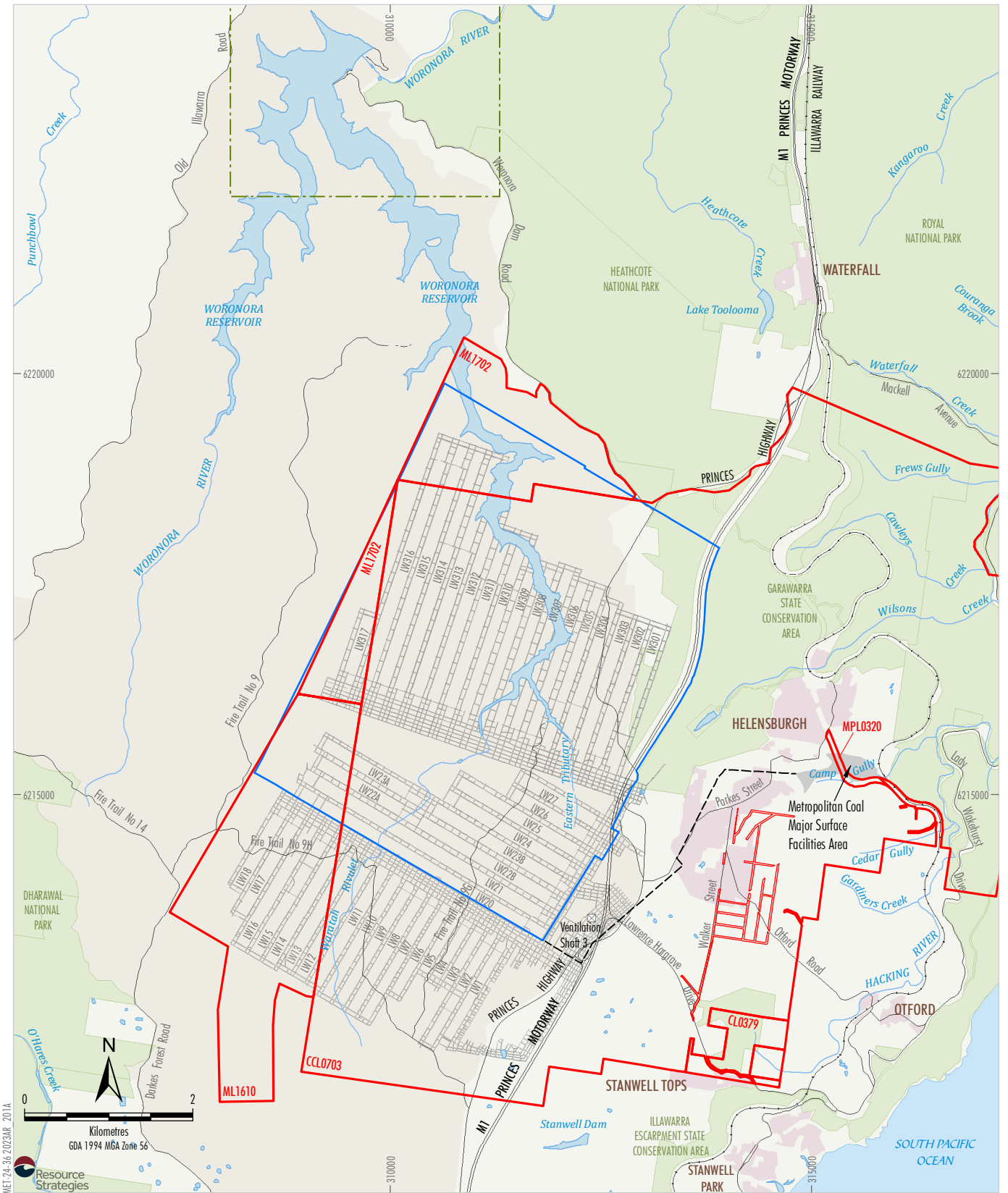
## 14 ACTIVITIES PROPOSED IN THE NEXT REPORTING PERIOD

In the next reporting period, Longwall 309 is expected to be completed in February 2024 and Longwall 310 is anticipated to commence in March 2024 and be completed in September 2024 (Figure 5).

In the next reporting period, the following activities will be conducted:

- Metropolitan Coal will continue to consult with stakeholders in relation to the next Extraction Plan.
- Metropolitan Coal will continue its ongoing consultation with the Wollongong City Council regarding the potential for coal rejects to be beneficially re-used at the Helensburgh Landfill.
- Metropolitan Coal will continue to investigate use of CWR in the production of chailings.
- The coal reject backfill emplacement project will also continue in 2024.
- Metropolitan Coal will continue to consult with the Wollongong City Council in relation to the upgrade of the Mine Access Road and Parkes Street intersection.
- Metropolitan Coal will continue works to vegetate the outer batters of the Turkey's Nest Dam and Camp Creek Gully.
- Metropolitan Coal will undertake additional stream remediation at Pool A on Waratah Rivulet.
- Metropolitan Coal will assess the need for, and if required undertake additional stream remediation on the Eastern Tributary
- Catchment improvement works will continue in the Woronora catchment area, namely, rehabilitation of the former quarry on Fire Road 9H and rehabilitation of the disused access track to the Darkes Forest Mine. Catchment improvement works in the Woronora catchment area will be undertaken as required throughout 2024.
- Installation of swamp groundwater and soil moisture monitoring equipment in the Woronora Special Area.
- Drilling of exploration boreholes in the EL 9364 area and installation of vibrating wire piezometers to monitor deep groundwater levels.

## FIGURES



MET-24-36-2023AR-201A  
Resource Strategies

**LEGEND**

- Mining Lease Boundary
- Woronora Special Area
- Railway
- Project Underground Mining Area  
Longwalls 20-27 and 301-317
- Woronora Notification Area
- Existing Underground Access Drive (Main Drift)

Source: Land and Property Information (2015); Department of Industry (2015);  
Metropolitan Coal (2023); MSEC (2024)

**Peabody**

METROPOLITAN COAL  
Metropolitan Coal Longwall Layout

**Figure 1**



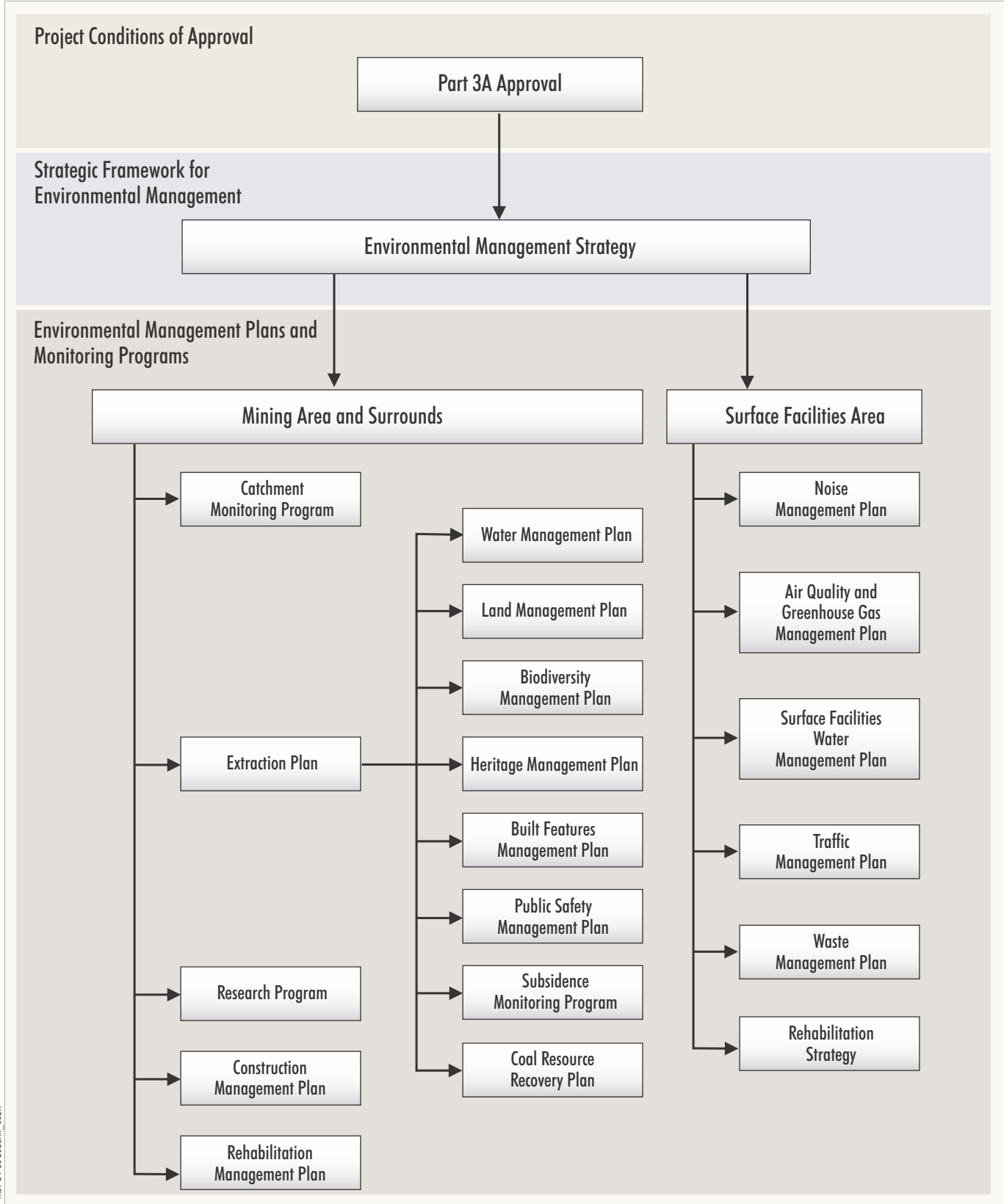
MET-24-36 2023AR\_001A

- LEGEND**
- Additional/Upgraded Project Infrastructure
  - Approximate Extent of Major Surface Facilities Area

Source: Aerial Photography (2005)

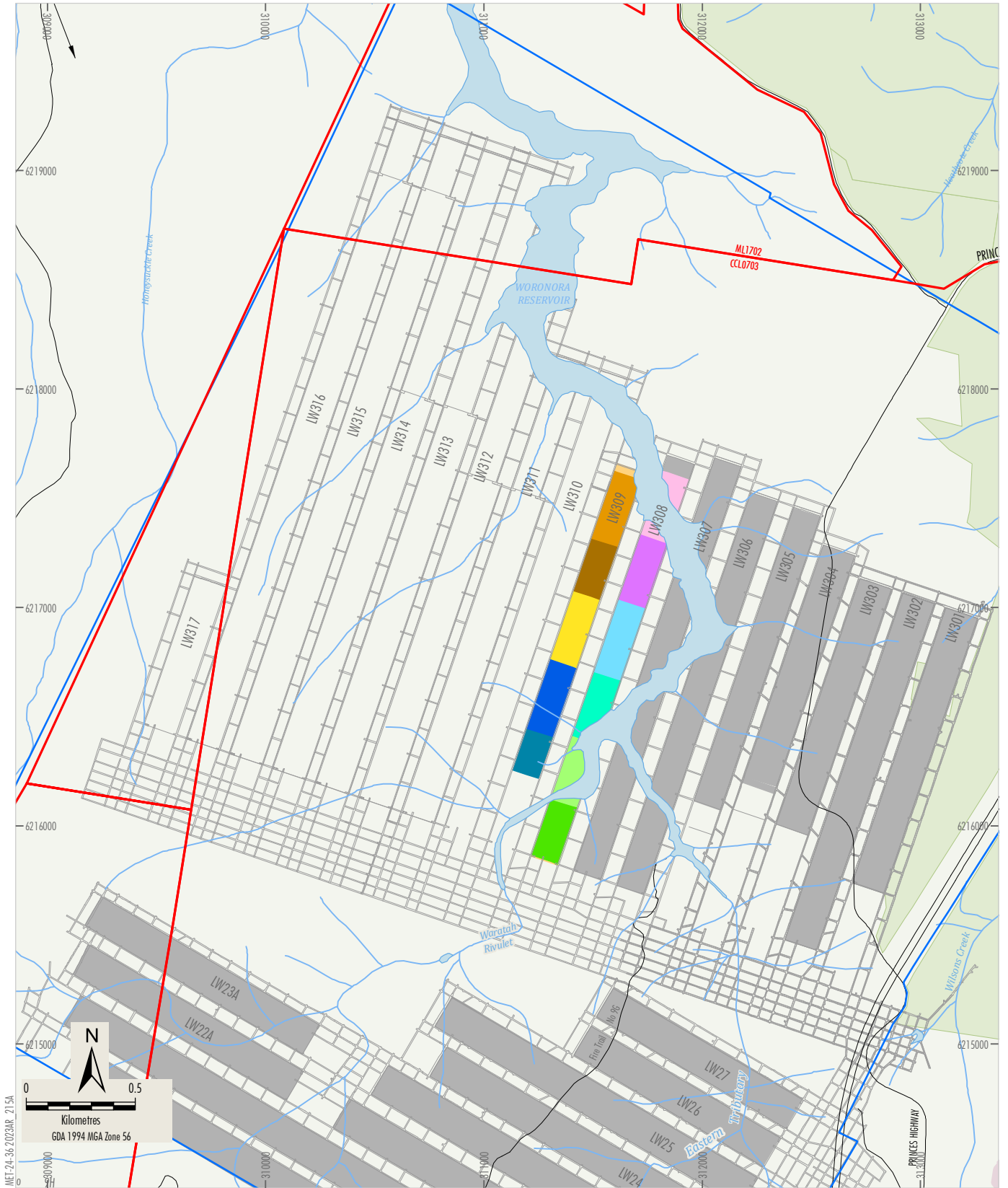
**Figure 2**





MEF-24-36 2023AR 002A

Figure 3



**LEGEND**

- Mining Lease Boundary
- Previous Extraction
- Railway
- Project Underground Mining Area Longwalls 20-27 and 301-317
- Existing Underground Access Drive (Main Drift)

**Monthly Development 2023**

- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December

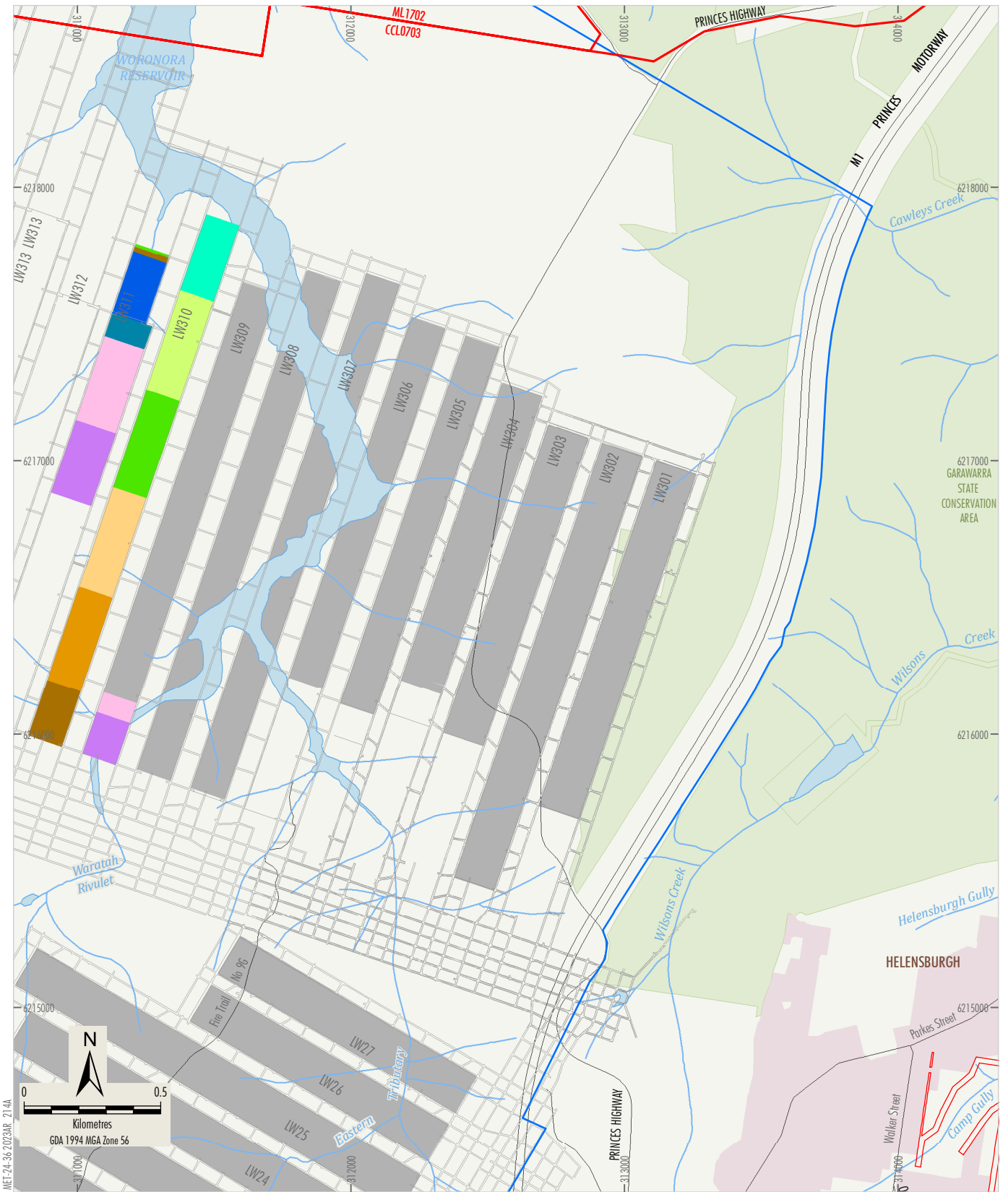
Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2024)

**Peabody**

METROPOLITAN COAL

Monthly Production Plan  
January to December 2023

**Figure 4**



**LEGEND**

- Mining Lease Boundary
- Previous Extraction
- Railway
- Project Underground Mining Area Longwalls 20-27 and 301-317

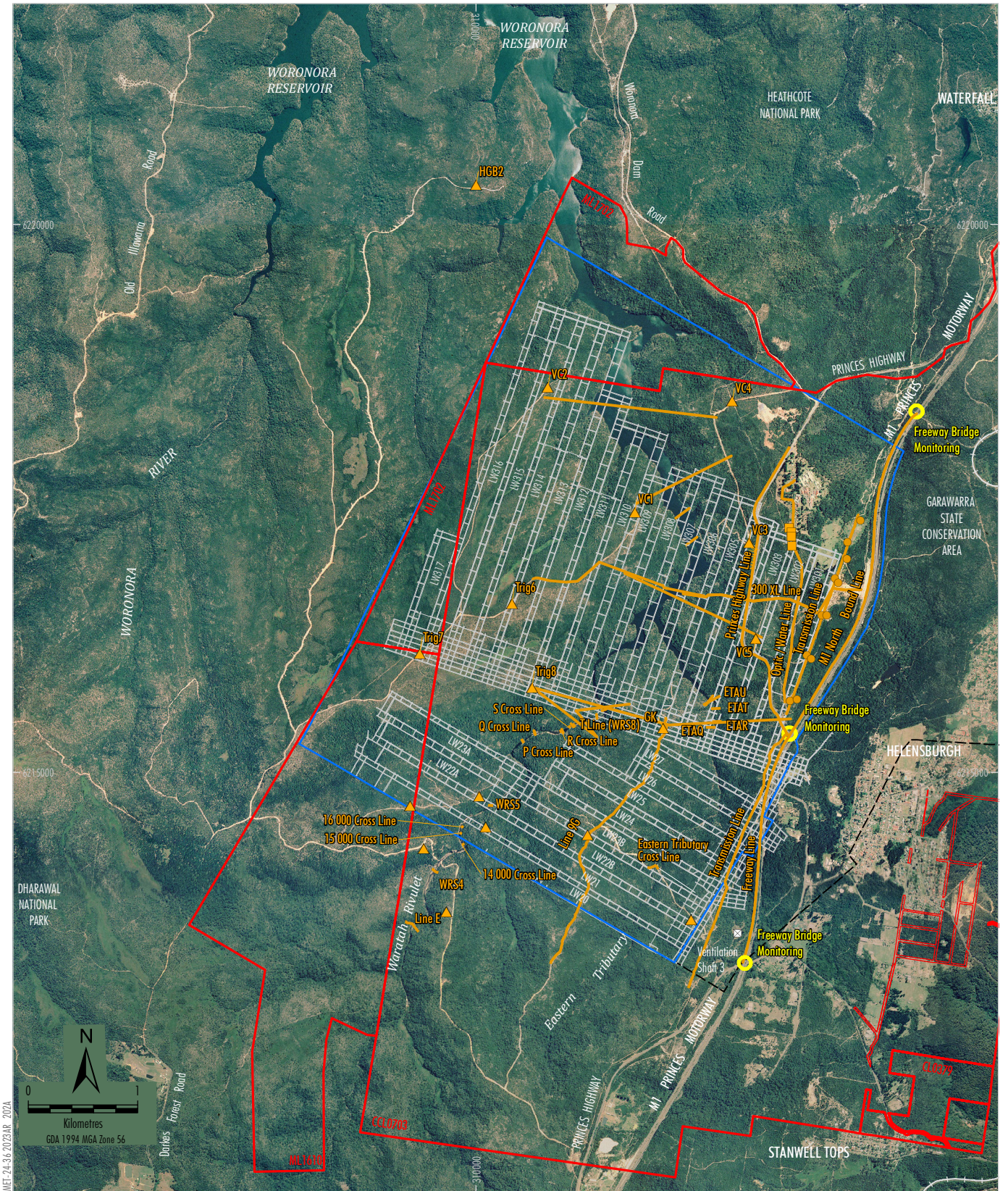
**Monthly Development 2020**

- January
- February
- April
- May
- June
- July
- August
- September
- November
- December

Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2024)

**Peabody**  
 METROPOLITAN COAL  
 Production Plan Forecast  
 January to December 2024

**Figure 5**



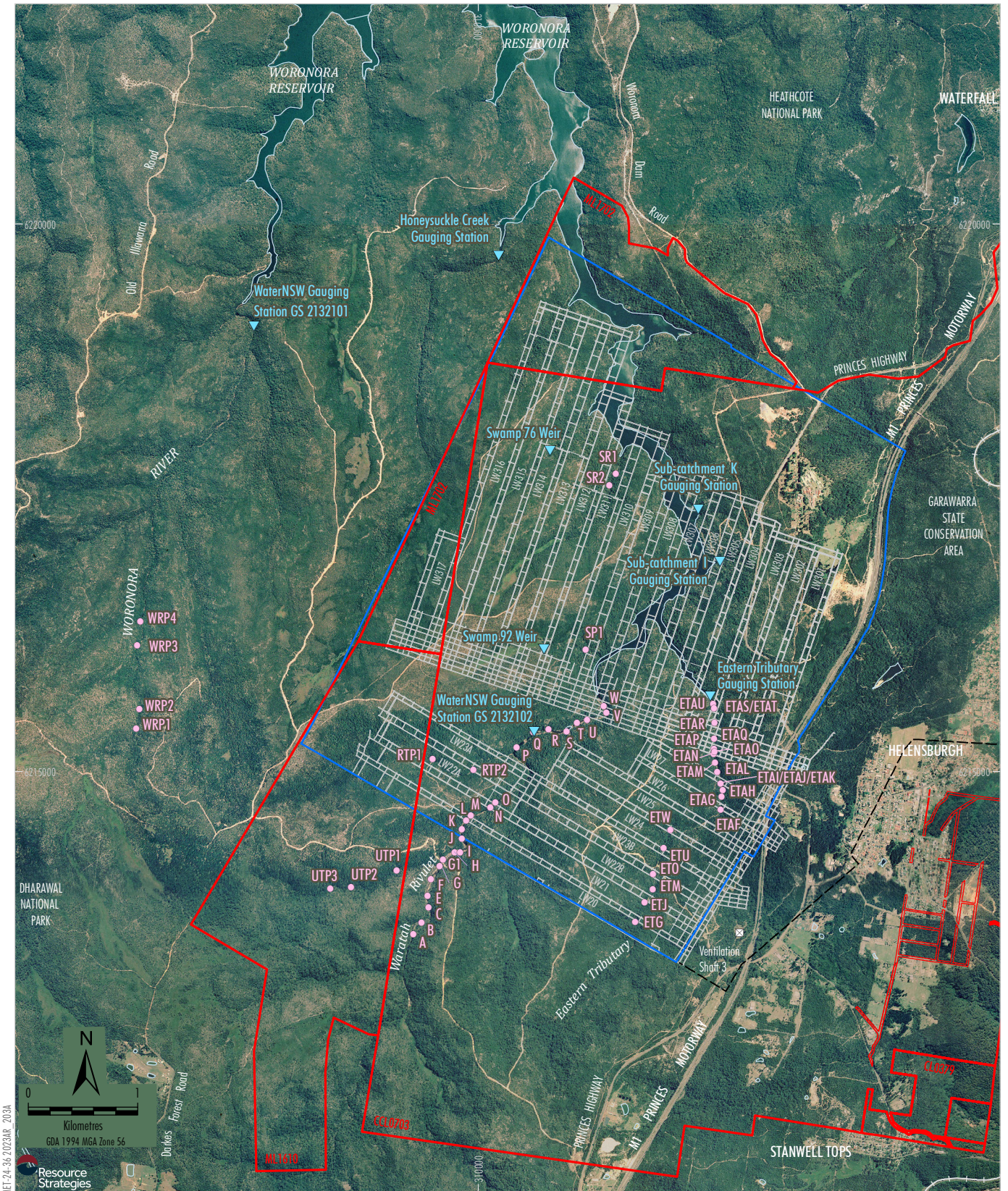
MET-24-36 2023.AR 2024

- LEGEND**
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Existing Underground Access Drive (Main Drift)
  - ▲ Ridge Survey Point
  - Subsidence Line
  - Transmission Towers - Endeavour Energy and TransGrid
  - Communications Towers
  - Freeway Bridge Subsidence Monitoring

Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2021, 2023); MSEC (2018)

**Peabody**  
METROPOLITAN COAL  
Subsidence Monitoring Locations

**Figure 6**



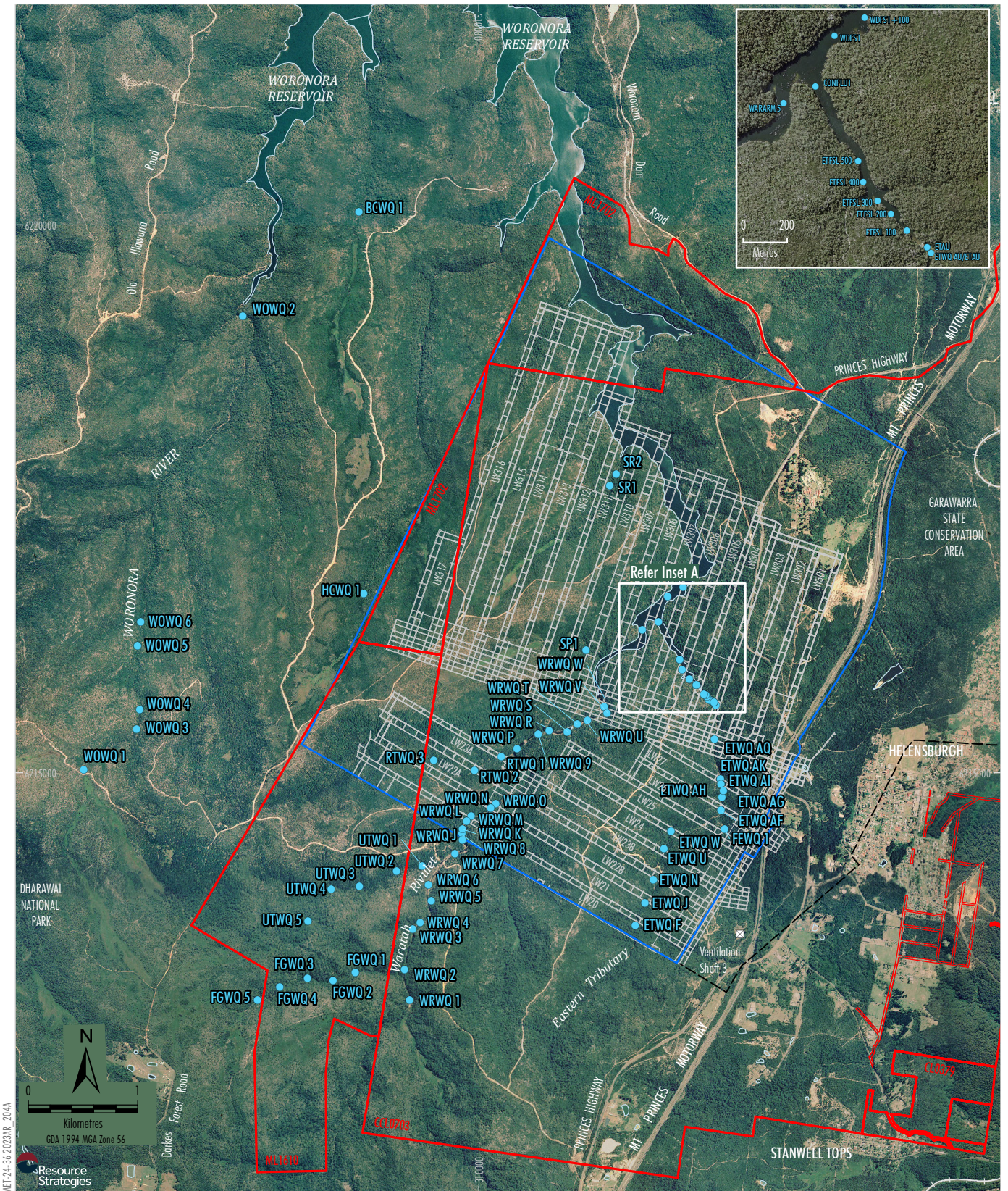
MET-24-36-2023AR-203A  
 Resource Strategies

- LEGEND**
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Existing Underground Access Drive (Main Drift)
  - ▼ Gauging Station
  - Pool Water Level Site

Source: Land and Property Information (2015); Date of Aerial Photography 1998;  
 Department of Industry (2015); Metropolitan Coal (2023); MSEC (2024)

**Peabody**  
 METROPOLITAN COAL  
 Surface Water Quantity Sites

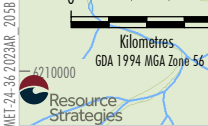
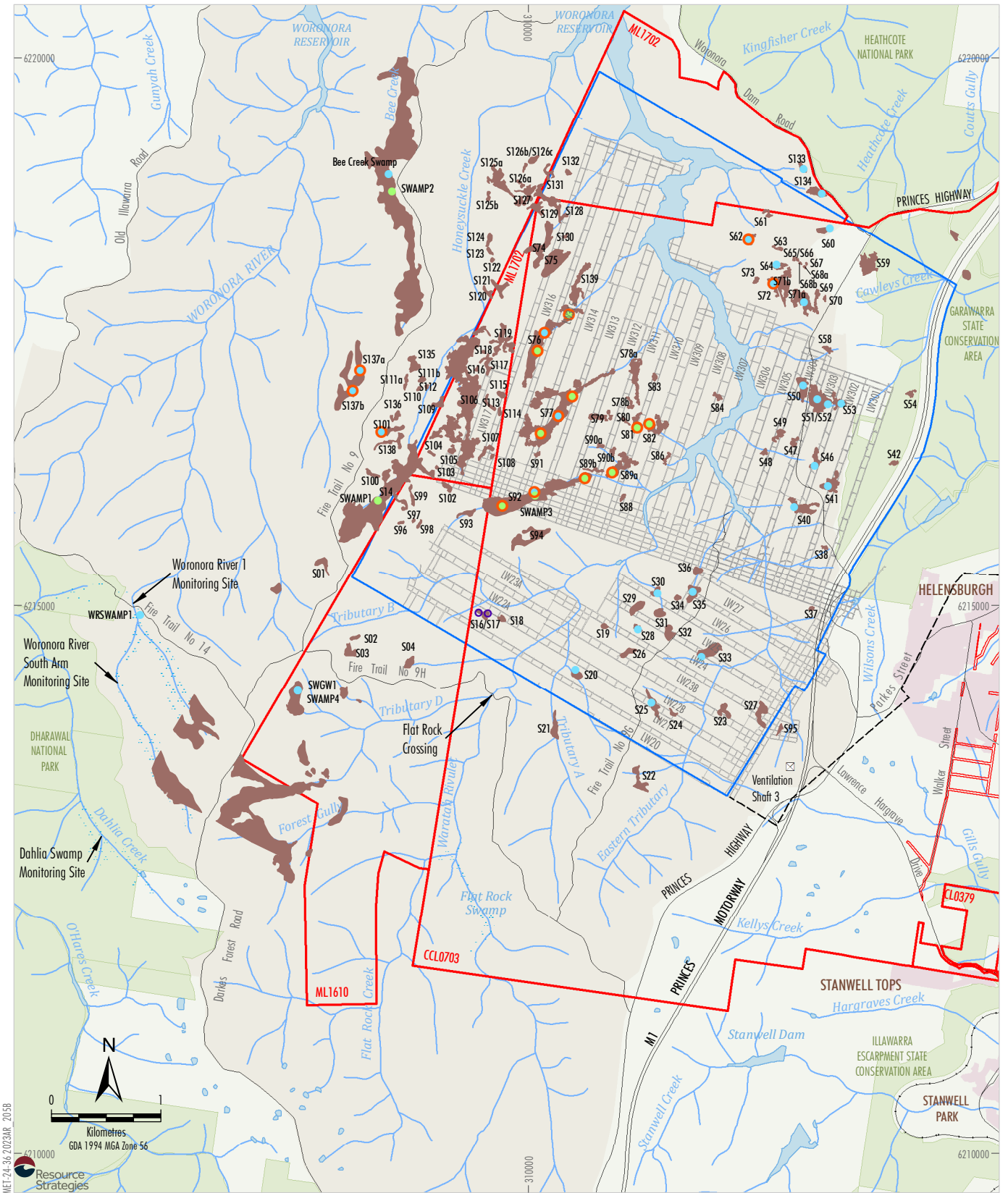
**Figure 7**



- LEGEND**
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Existing Underground Access Drive (Main Drift)
  - Surface Water Quality Site

Source: Land and Property Information (2015); Date of Aerial Photography 1998;  
Department of Industry (2015); Metropolitan Coal (2023); MSEC (2024)

**Figure 8**



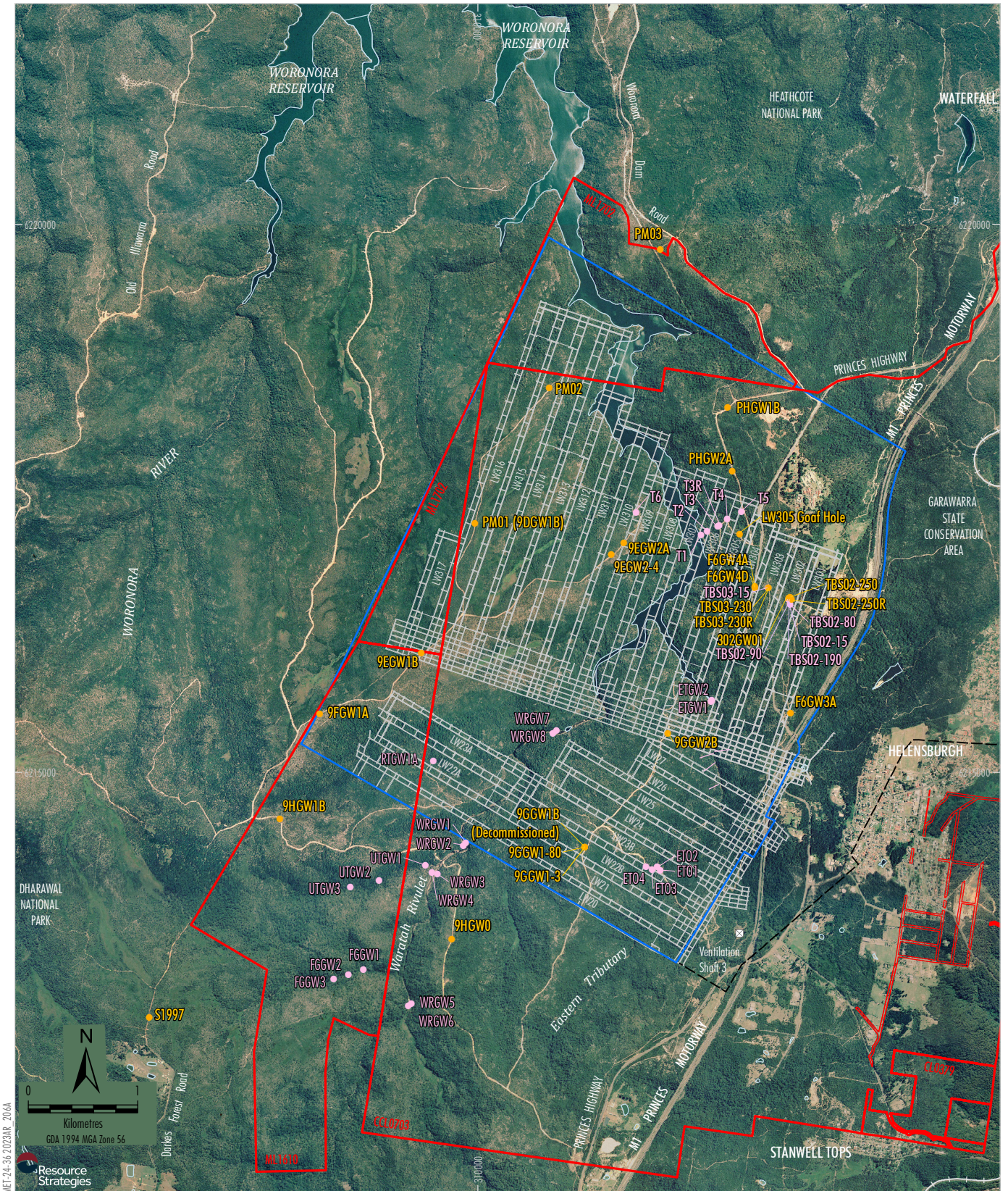
- LEGEND**
- Mining Lease Boundary
  - Woronora Special Area
  - Railway
  - Project Underground Mining Area Longwalls 20-27 and 301-317
  - Existing Underground Access Drive (Main Drift)

- Upland Swamp
- Swamp Substrate and Shallow Groundwater Piezometer
- Swamp Substrate Groundwater Piezometer
- Swamp Shallow Groundwater Piezometer
- Swamp Soil Moisture Probe

Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2023); MSEC (2024); after NPWS (2003), Bangalay Botanical Surveys (2008); Eco Logical Australia (2015; 2016; 2018) and Ecoplanning (2021, 2023)

**Peabody**  
 METROPOLITAN COAL  
 Upland Swamp Groundwater  
 Piezometer Locations

**Figure 9**

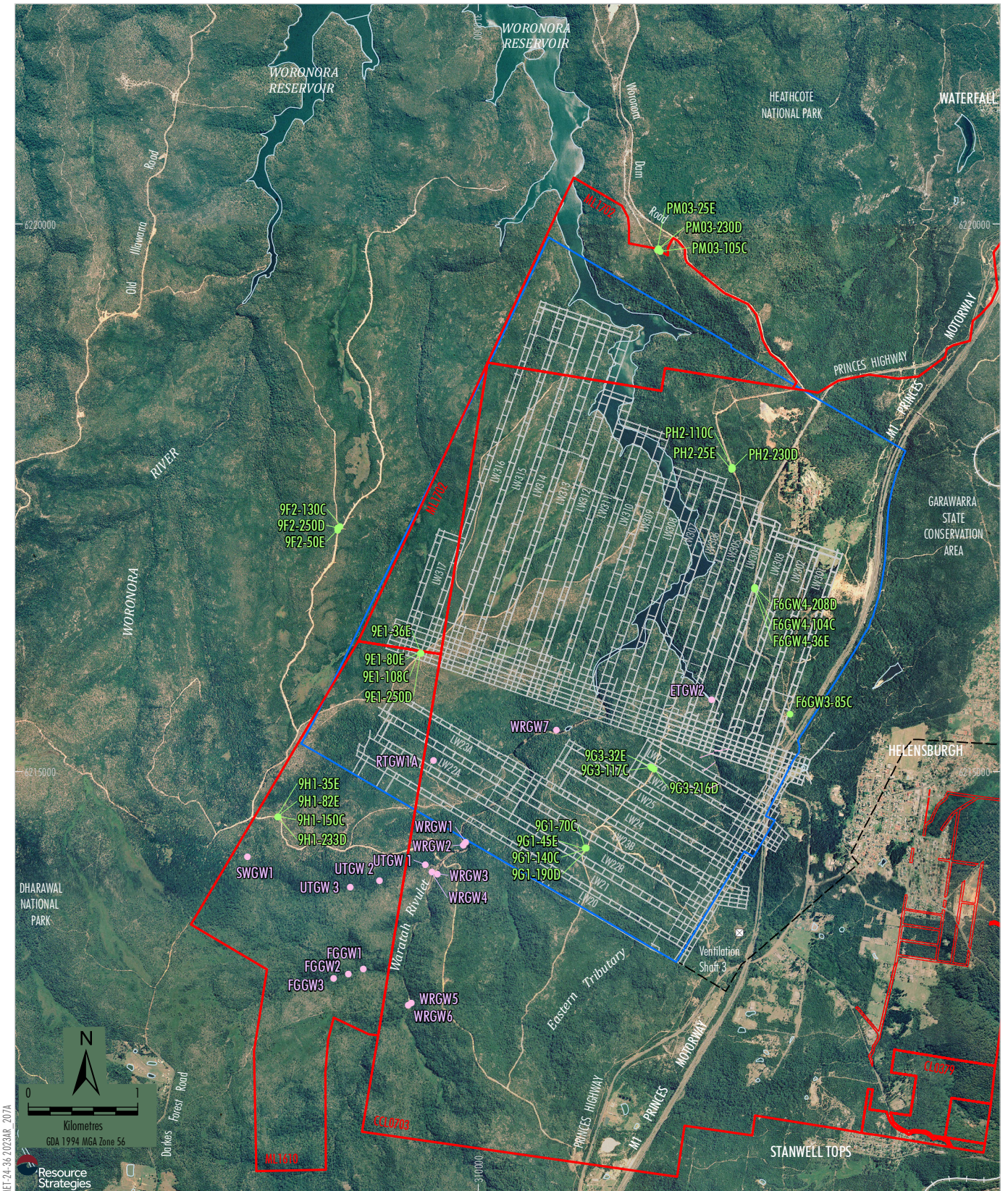


- LEGEND**
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Existing Underground Access Drive (Main Drift)
  - Groundwater Level/Pressure Bore
  - Groundwater Level Bore

Source: Land and Property Information (2015); Date of Aerial Photography 1998;  
Department of Industry (2015); Metropolitan Coal (2023); MSEC (2024)

**Figure 10**



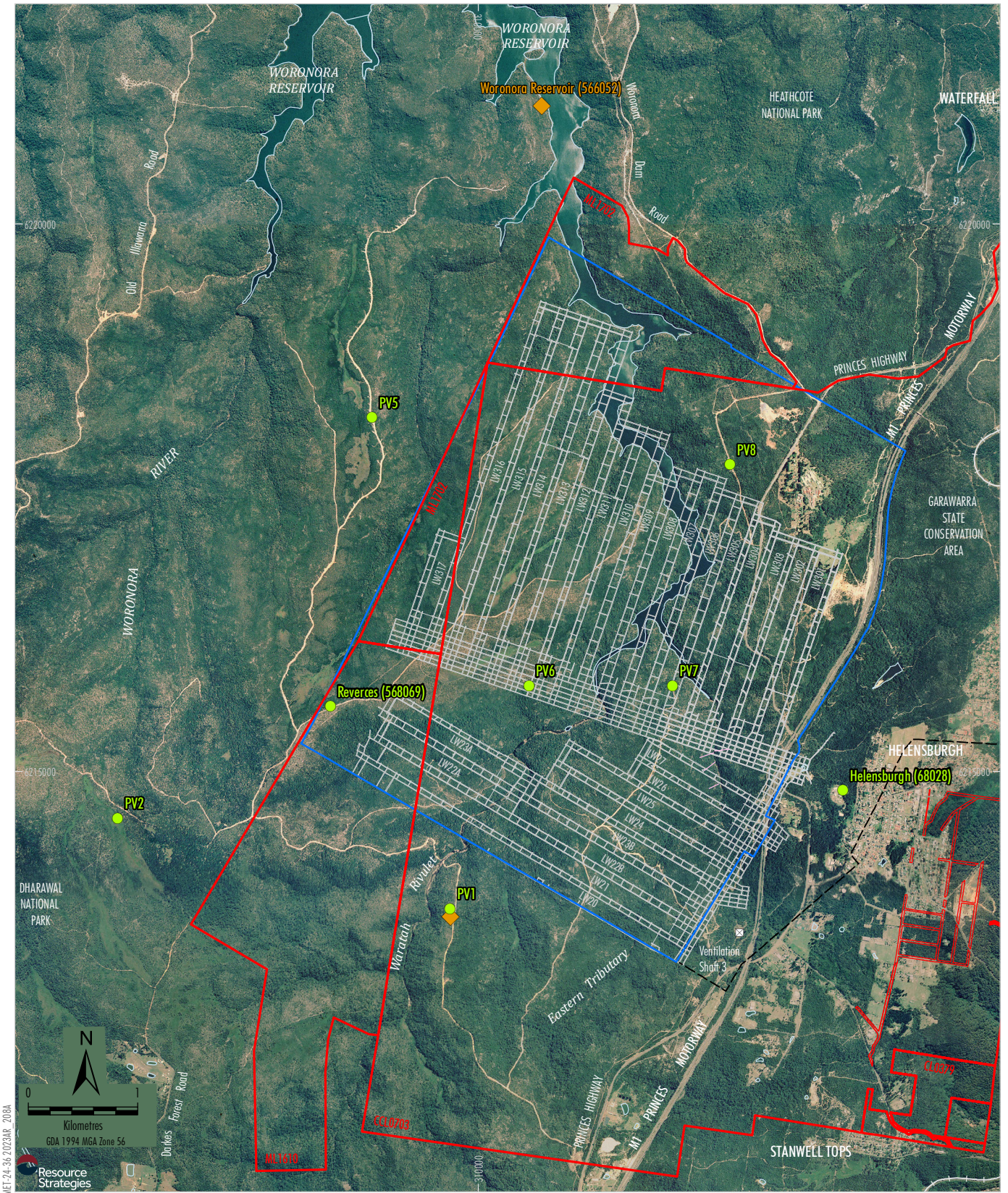


- LEGEND**
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Existing Underground Access Drive (Main Drift)
  - Deep Groundwater Chemistry Monitoring Site
  - Stream Shallow Groundwater Quality Monitoring Site

Source: Land and Property Information (2015); Date of Aerial Photography 1998;  
Department of Industry (2015); Metropolitan Coal (2023); MSEC (2024)

**Peabody**  
METROPOLITAN COAL  
Groundwater Quality Sites

**Figure 11**

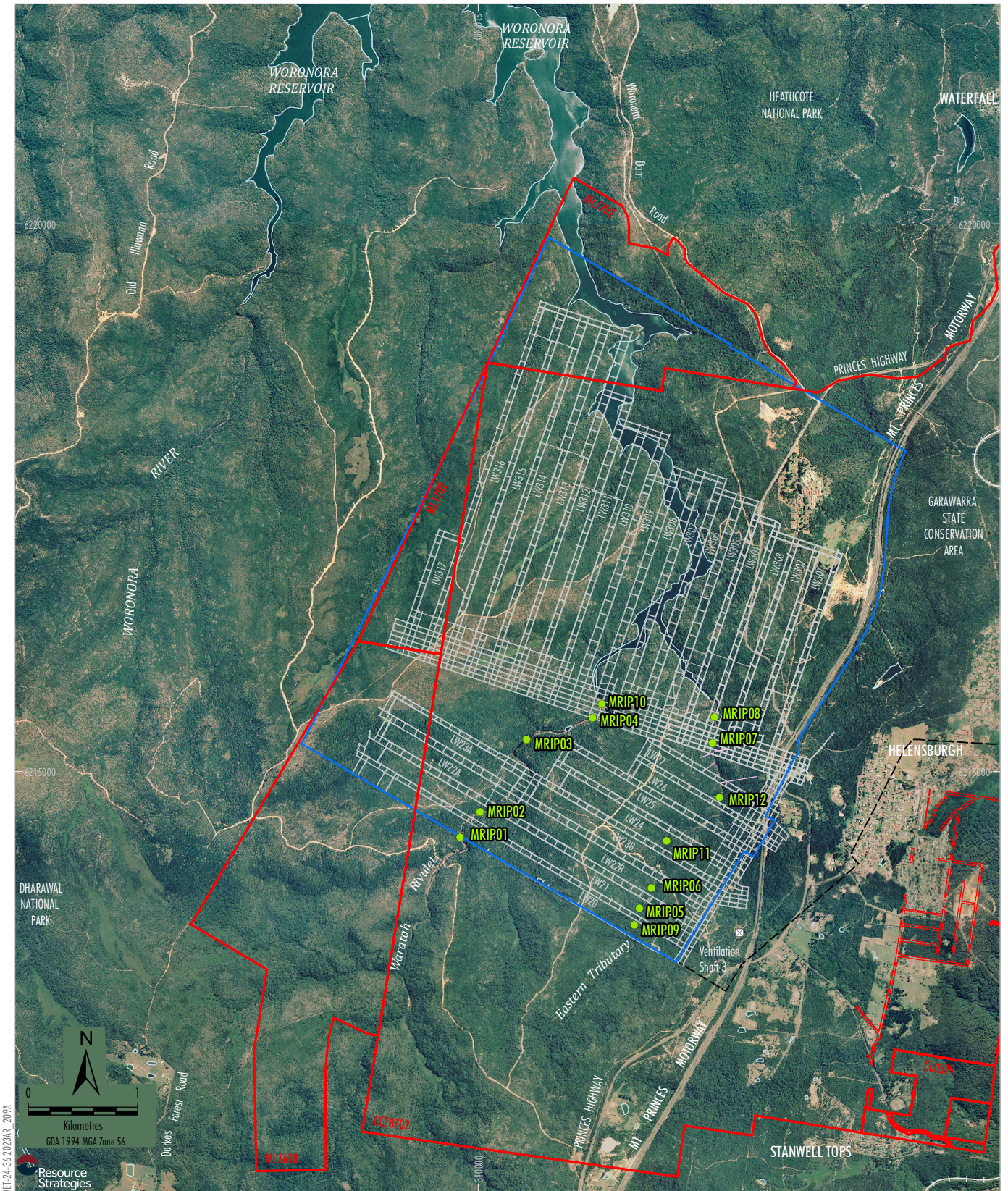


- LEGEND**
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Existing Underground Access Drive (Main Drift)
  - ◆ Evaporimeter
  - Pluviometer

- Notes:
1. The Bureau of Meteorology pluviometer at Darkes Forest (68024) is not shown. It is located approximately 3.75 km south of the Metropolitan Coal pluviometer (PV2).
  2. The Bureau of Meteorology pluviometer at Lucas Heights (66078) is not shown. It is located approximately 12.5 km north of the Metropolitan Coal pluviometer (PV8).

Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2023); MSEC (2024)

**Figure 12**



MET-24-36-2023AR-209A  
Resource Strategies

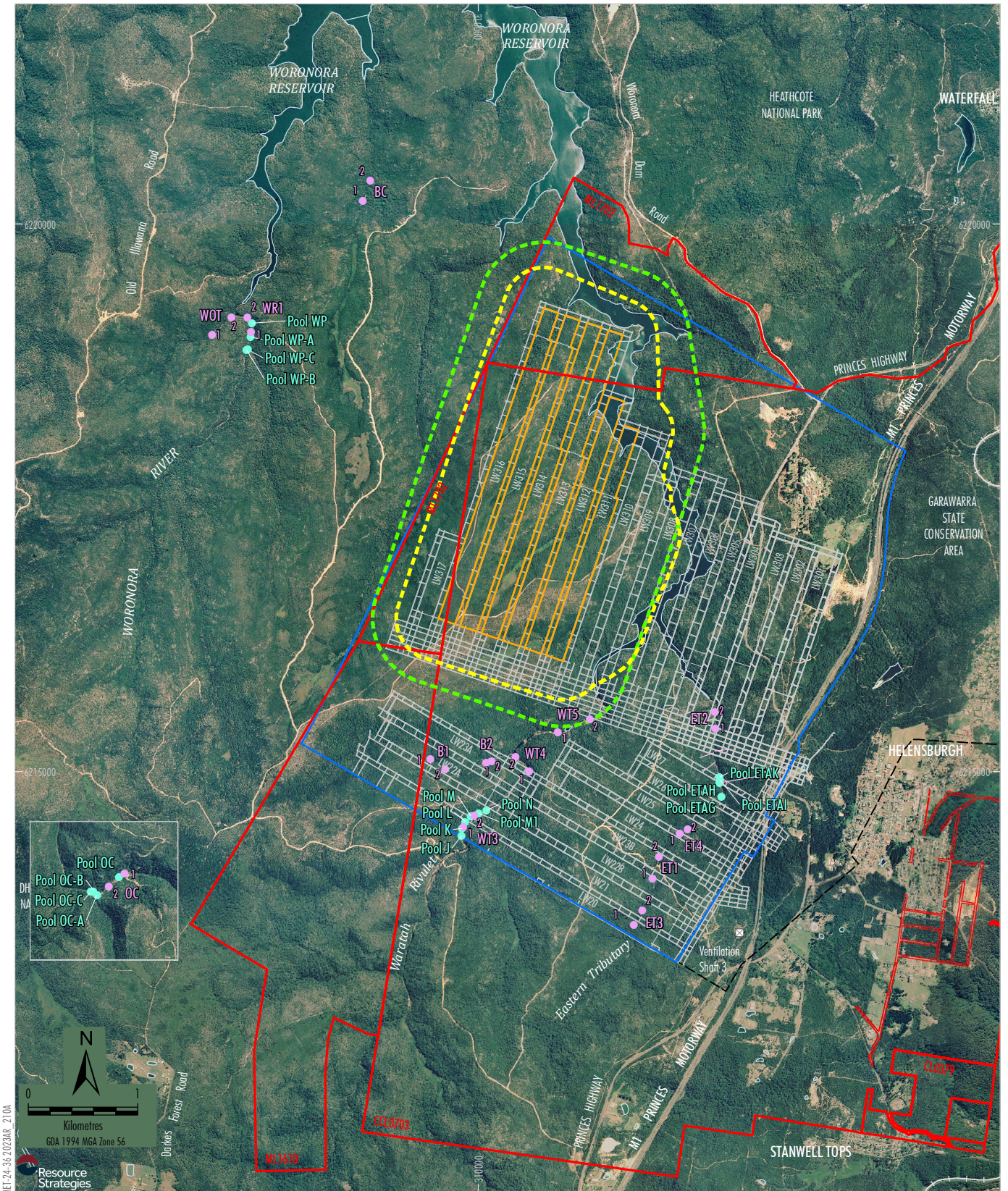
- LEGEND**
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Existing Underground Access Drive (Main Drift)

- Monitoring Site
- Riparian Vegetation Monitoring Site

Source: Land and Property Information (2015); Date of Aerial Photography 1998;  
Department of Industry (2015); Metropolitan Coal (2023); MSEC (2024)

**Peabody**  
METROPOLITAN COAL  
Riparian Vegetation Monitoring Locations

**Figure 13**



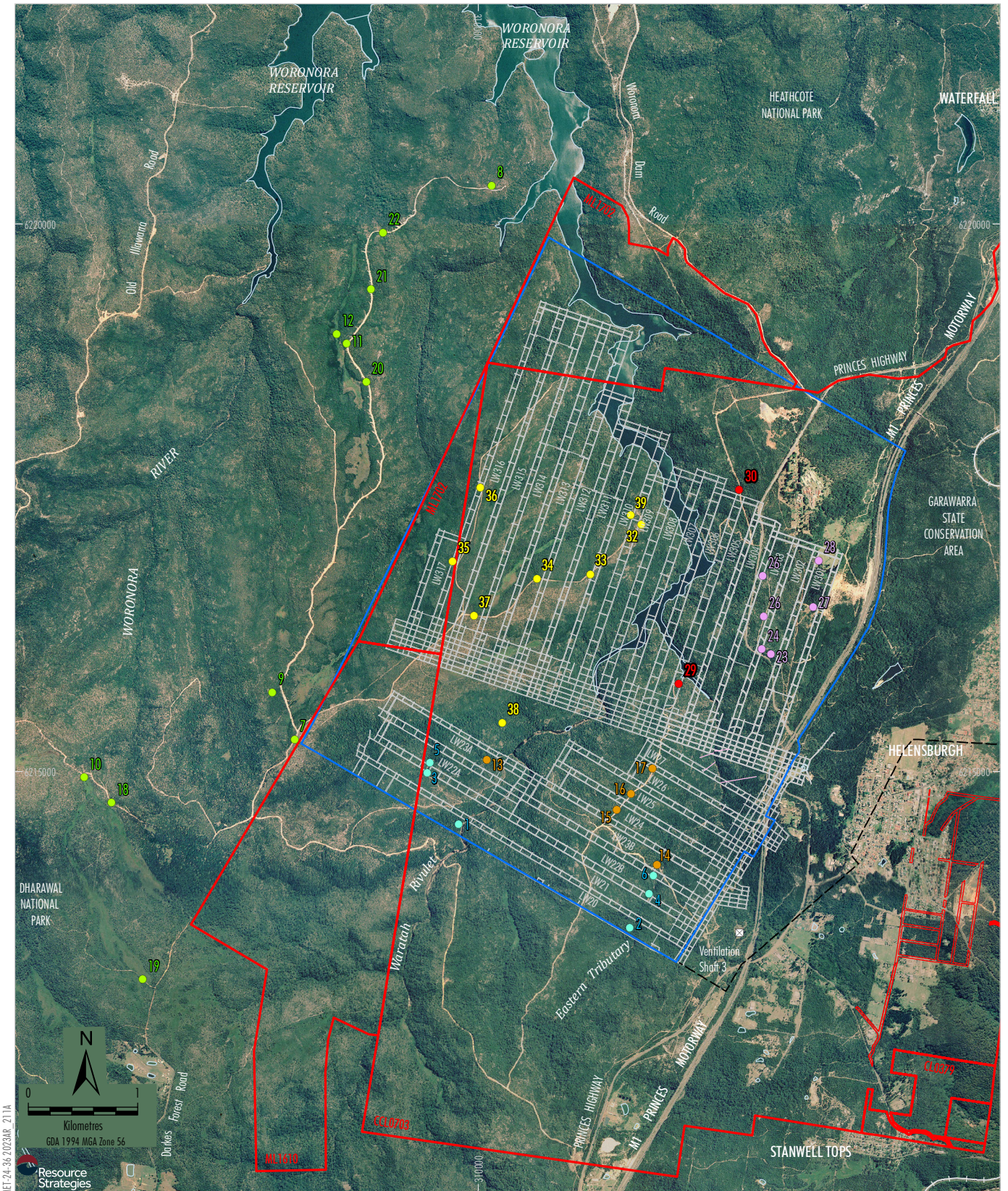
- LEGEND**
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Longwalls 311-316 Secondary Extraction
  - Longwalls 311-316 35° Angle of Draw and/or Predicted 20 mm Subsidence Contour
  - 600 m from Longwalls 311-316 Secondary Extraction
  - Existing Underground Access Drive (Main Drift)

- Monitoring**
- Pool Aquatic Ecology Sampling Site
  - Stream Aquatic Ecology Sampling Site

Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2023); MSEC (2024)

**Peabody**  
METROPOLITAN COAL  
Aquatic Ecology Monitoring Locations

**Figure 14**

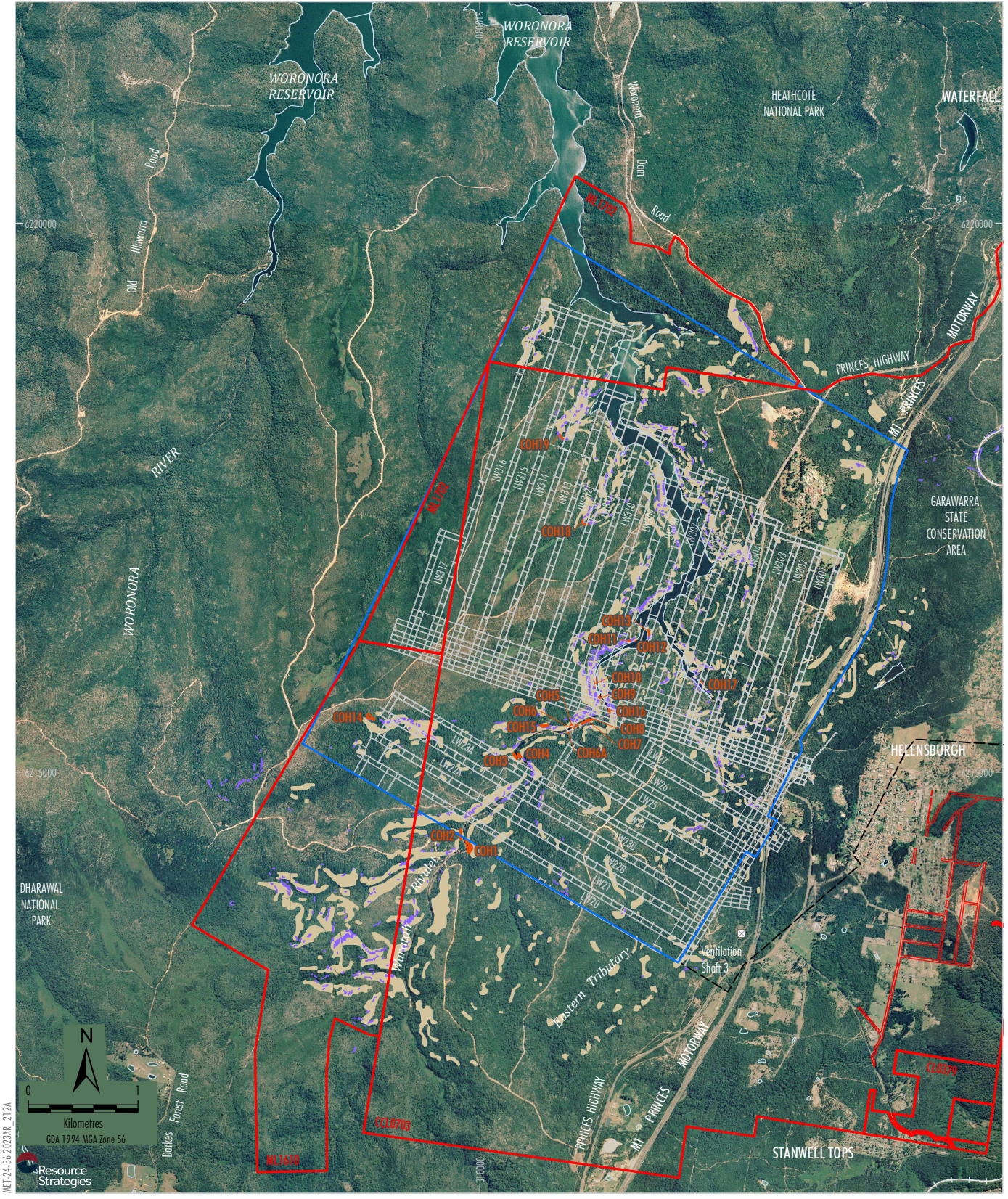


- LEGEND**
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Existing Underground Access Drive (Main Drift)

- Monitoring Sites**
- Longwalls 20-22 Amphibian Monitoring
  - Longwalls 23-27 Amphibian Monitoring
  - Longwalls 301-303 Amphibian Monitoring
  - Longwalls 305-307 Amphibian Monitoring
  - Longwalls 308-317 Amphibian Monitoring
  - Control Site

Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2023); MSEC (2024)

Figure 15



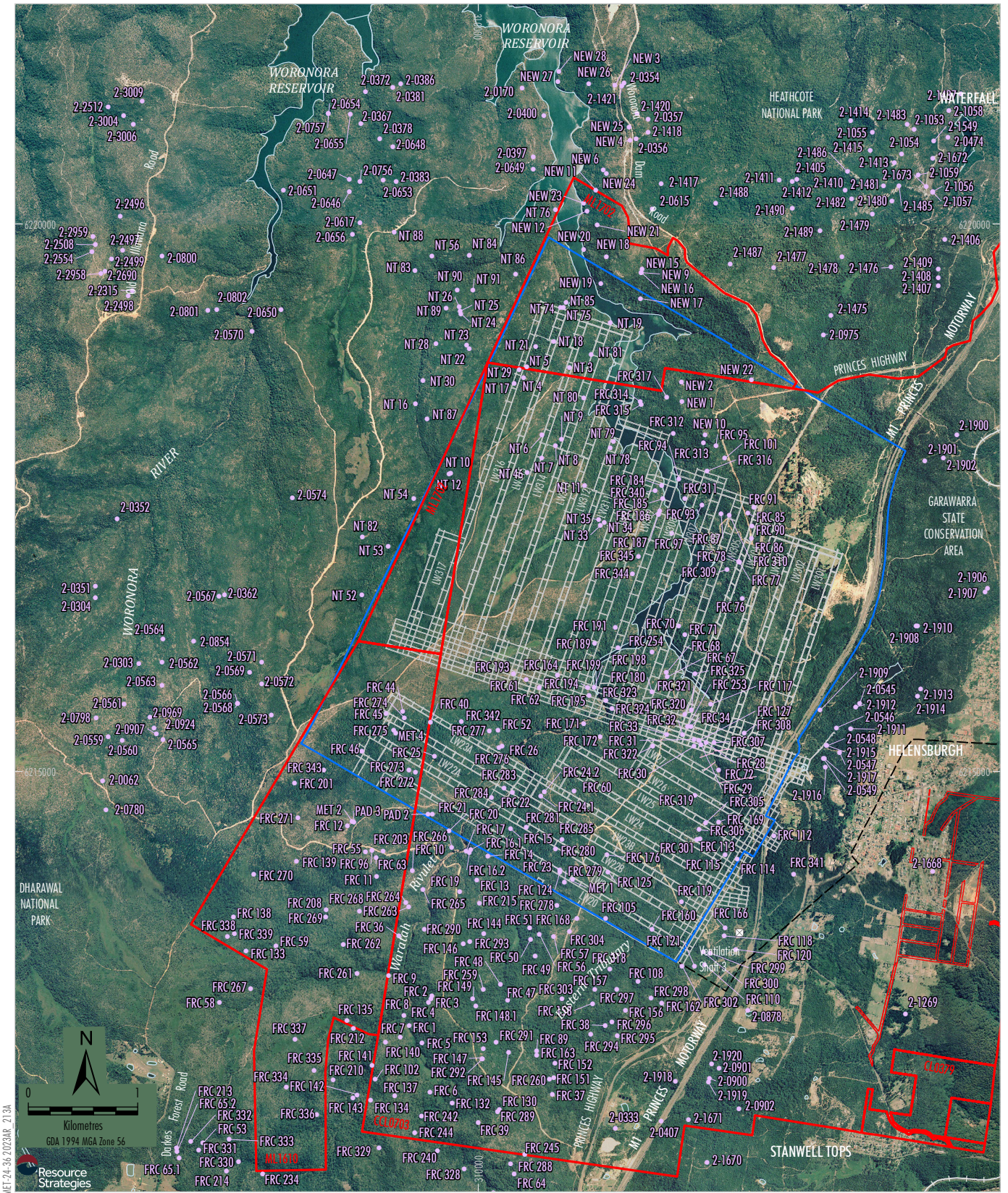
- LEGEND
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Existing Underground Access Drive (Main Drift)

- Cliffs and Overhangs
- Steep Slopes (Project Approval)
- Steep Slopes (Project Environmental Assessment)

Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2023); MSEC (2024)

**Peabody**  
 METROPOLITAN COAL  
 Cliffs and Overhangs, Steep Slopes and  
 Land in General within the Project  
 Underground Mining Area and Surrounds

Figure 16



- LEGEND**
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Existing Underground Access Drive (Main Drift)
  - Aboriginal Heritage Site

Source: Land and Property Information (2015); Date of Aerial Photography 1998;  
Department of Industry (2015); Metropolitan Coal (2023); MSEC (2024)

**Peabody**

METROPOLITAN COAL

Known Aboriginal Heritage Sites  
Within Project Underground Mining Area  
and Surrounds

Figure 17



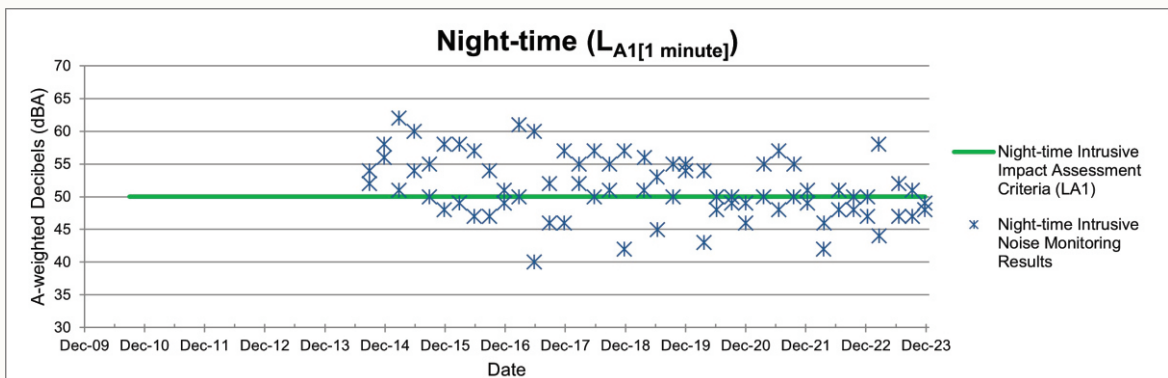
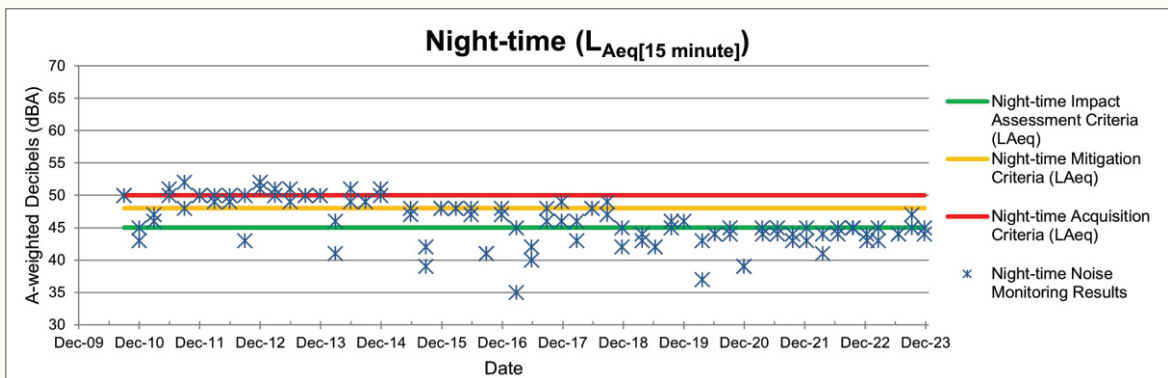
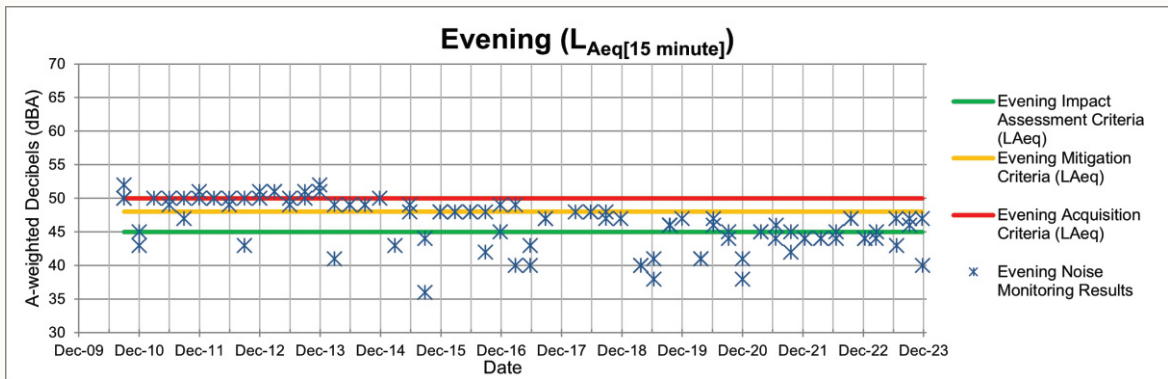
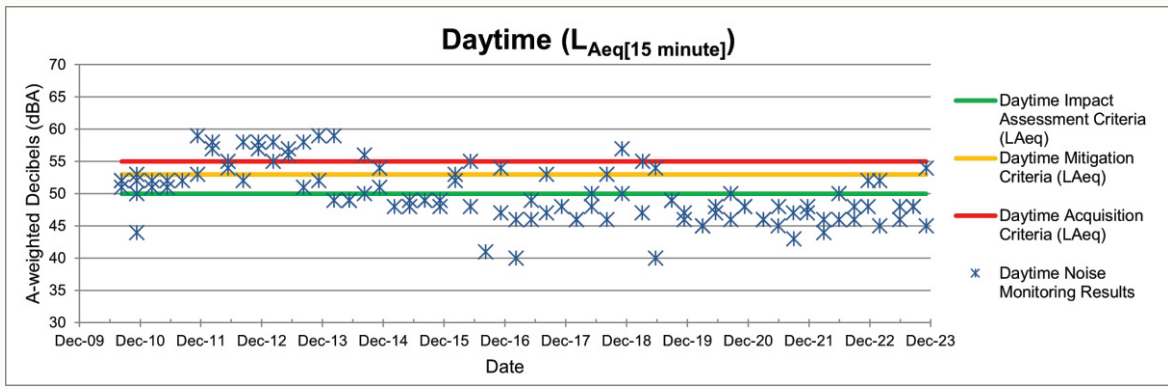
MET-24-36-2023AR\_003A

**LEGEND**

- P40 Receiver Location
- Approximate Extent of Major Surface Facilities Area
- Real-time Noise Monitoring Site
- Attended Noise Monitoring Site
- ★ Automatic Weather Station

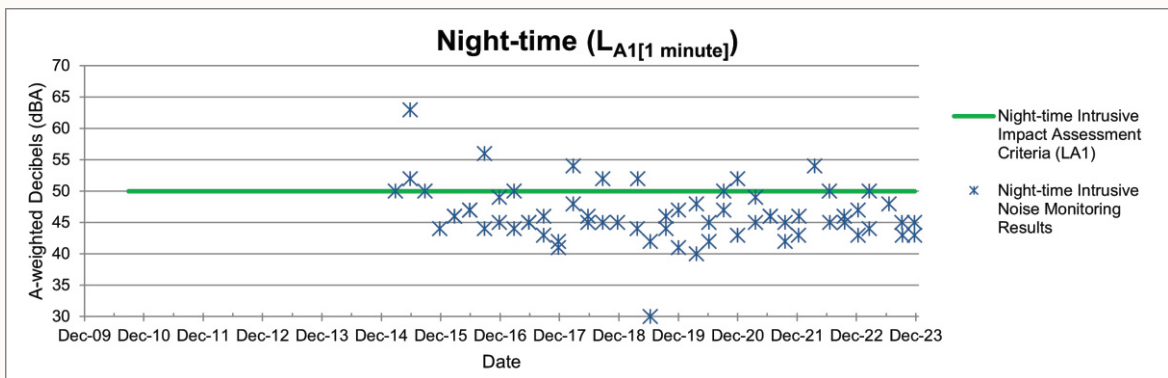
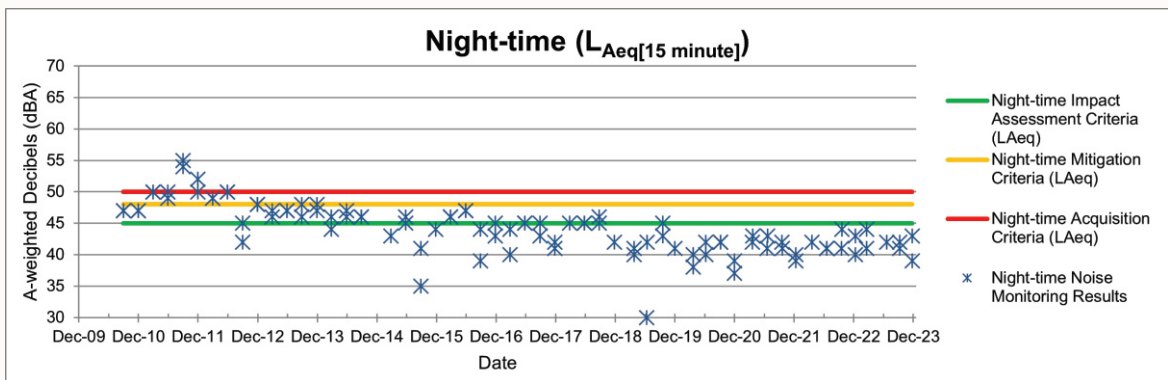
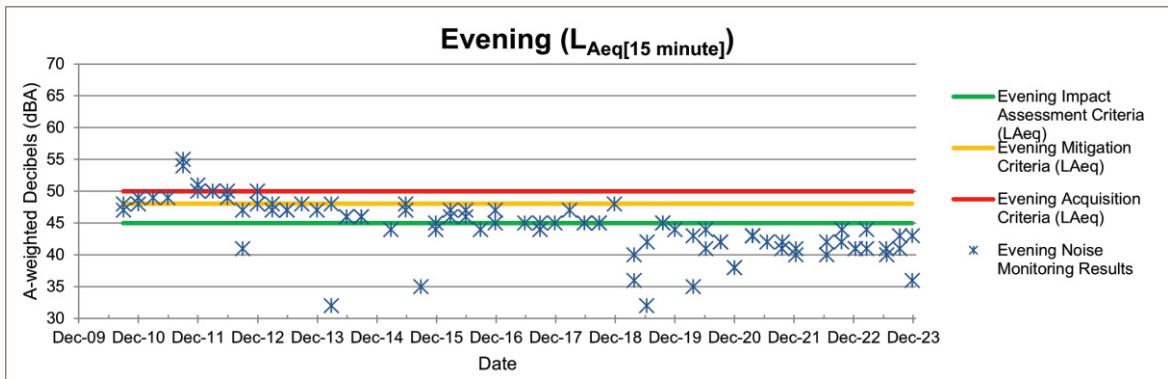
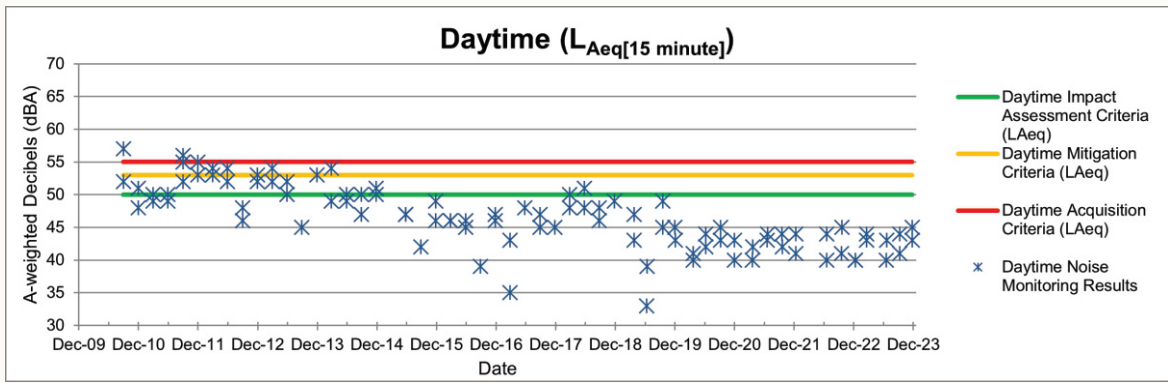
**Figure 18**





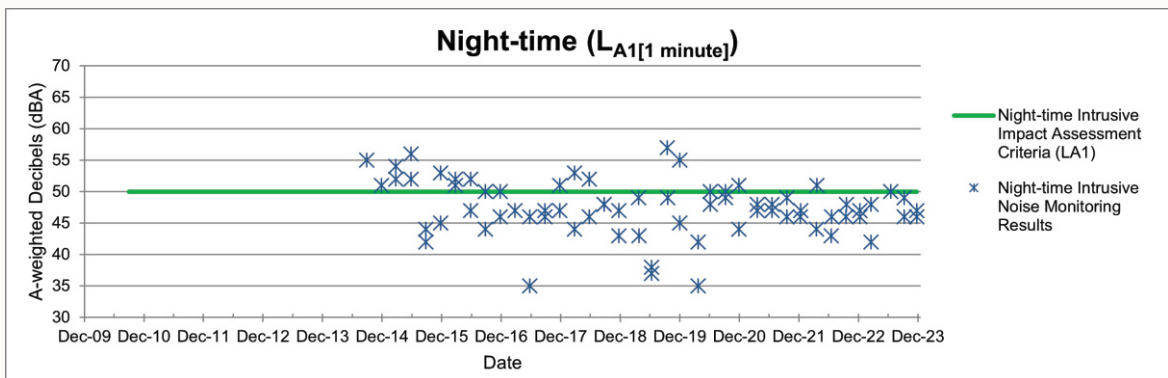
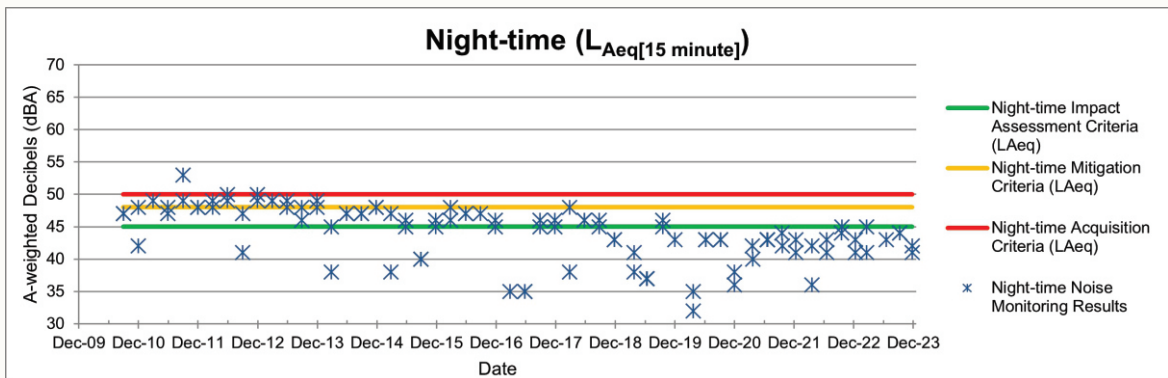
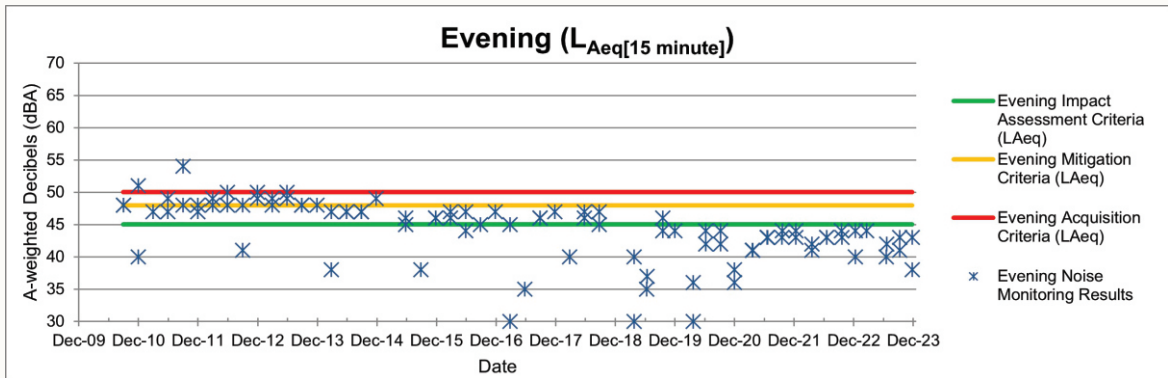
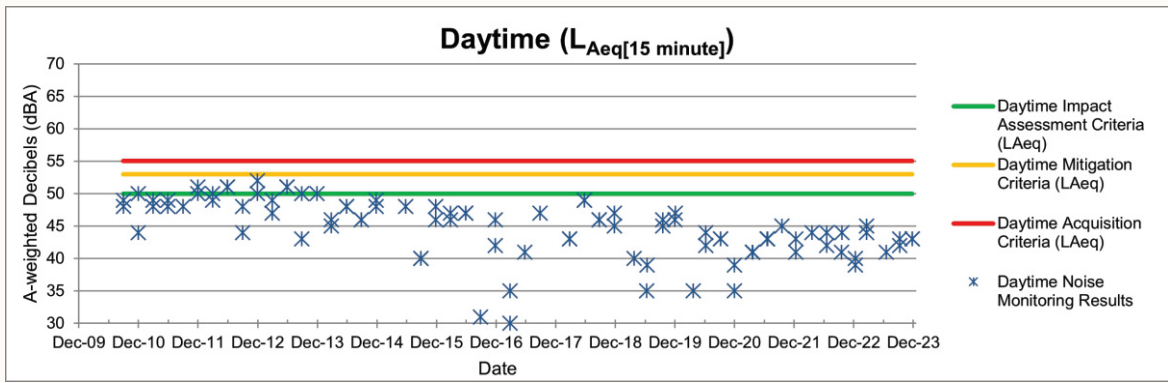
ME1-24-36 2023AR 006A

Note: In accordance with Conditions 1, 2 and 3, Schedule 4 of the Project Approval, the assessment, acquisition and mitigation criteria are only applicable from the end of 2014



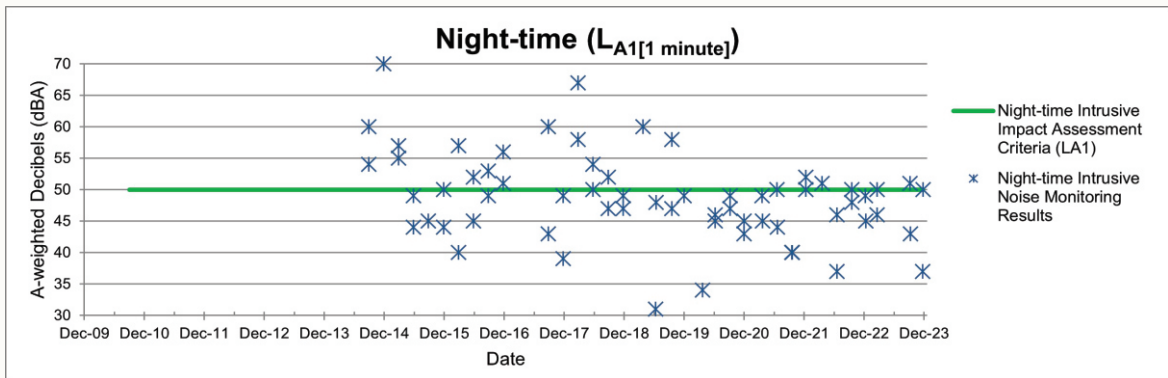
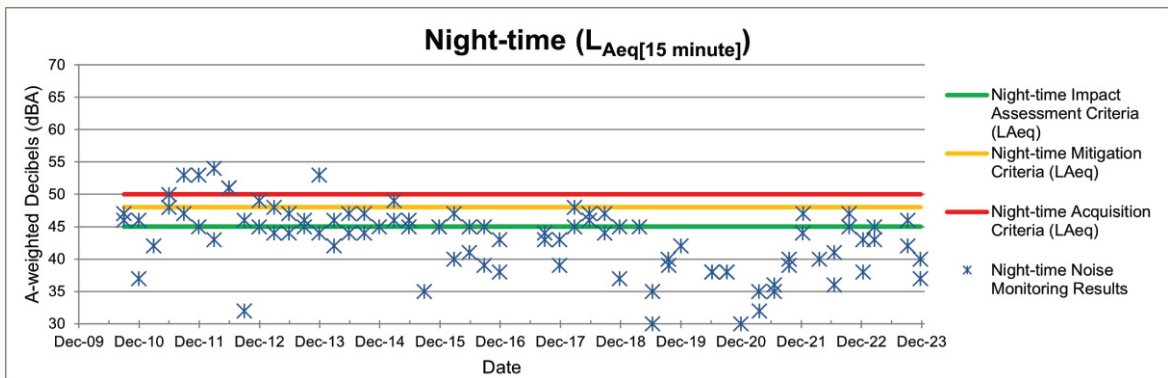
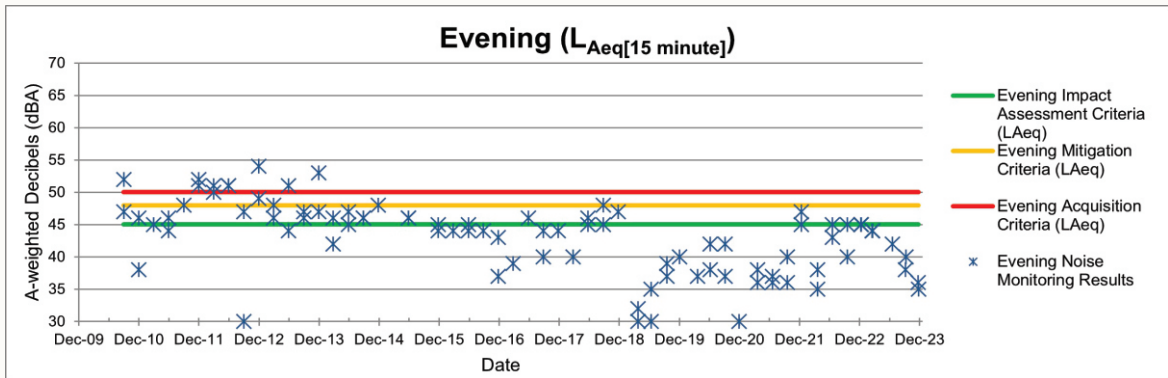
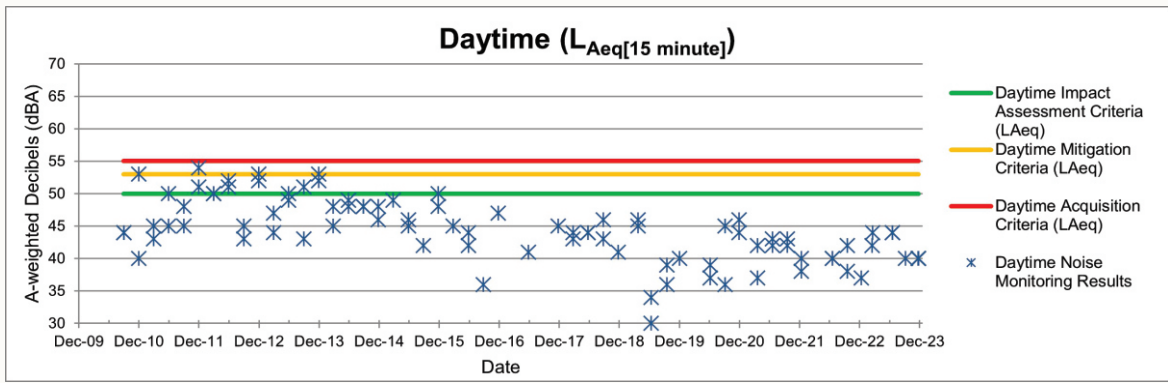
MET-24-36 2023AR 007A

Note: In accordance with Conditions 1, 2 and 3, Schedule 4 of the Project Approval, the assessment, acquisition and mitigation criteria are only applicable from the end of 2014



MET-24-36 2023AR 008A

Note: In accordance with Conditions 1, 2 and 3, Schedule 4 of the Project Approval, the assessment, acquisition and mitigation criteria are only applicable from the end of 2014



MET-24-36-2023AR-009A

Note: In accordance with Conditions 1, 2 and 3, Schedule 4 of the Project Approval, the assessment, acquisition and mitigation criteria are only applicable from the end of 2014



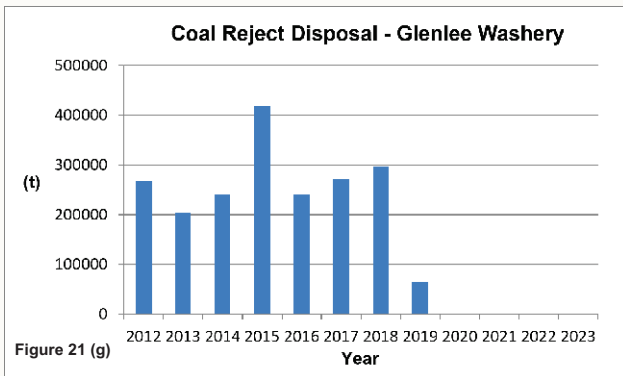
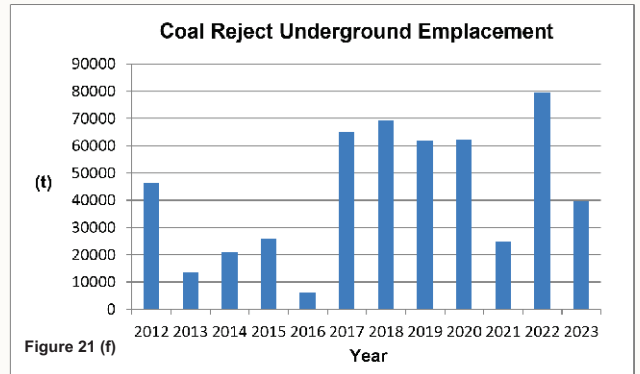
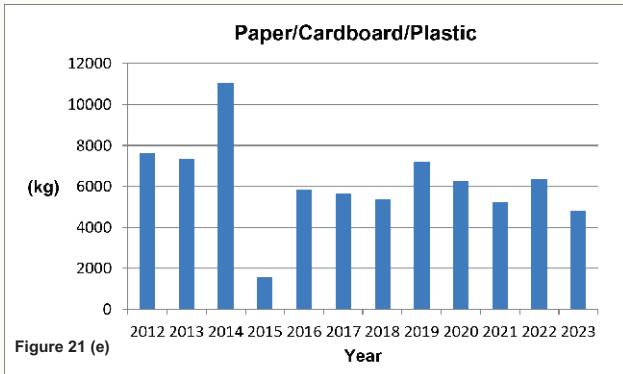
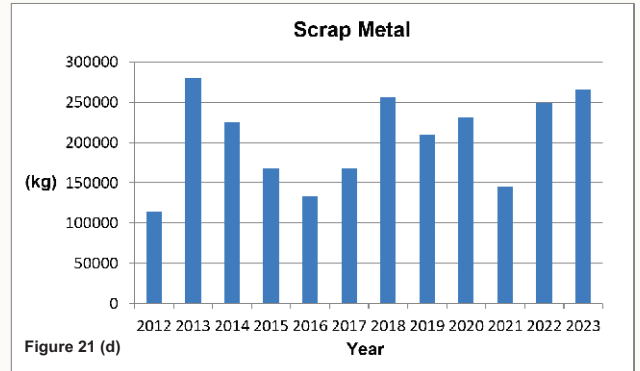
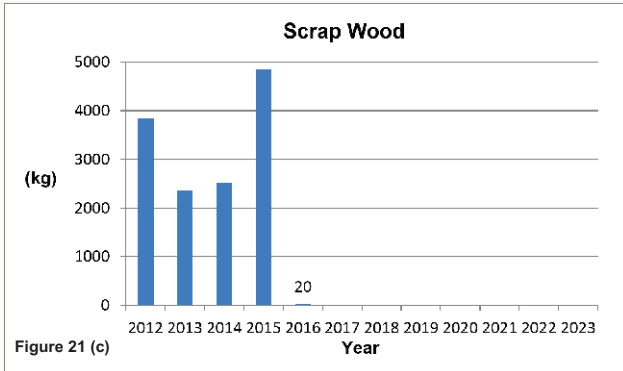
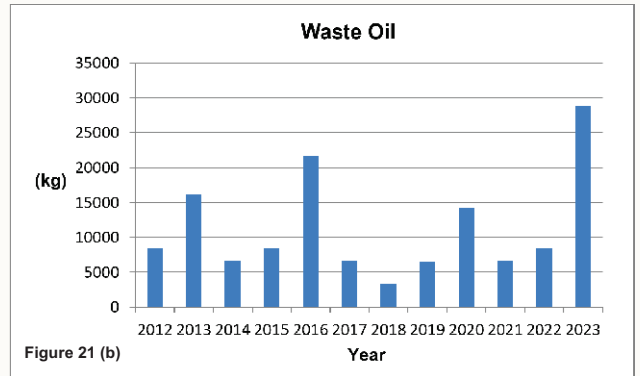
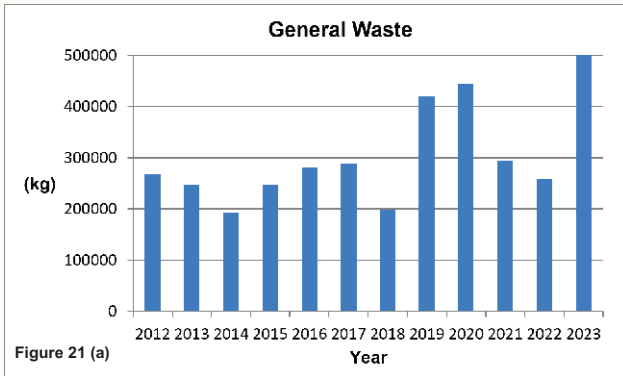
ME-24-36-2023AR\_004A

**LEGEND**

- Approximate Extent of Major Surface Facilities Area
- Receiver Location
- ▲ EPA Licenced Dust Deposition Gauge
- ★ Automatic Weather Station
- ◎ High Volume Air Sampler
- ◆ Real Time Dust Monitor

Source: Aerial Photography 2005

Figure 20





MET-24-35 2023AR\_0054

**LEGEND**

- Water Pipeline
- Camp Gully Water Extraction Pipeline
- Licensed Discharge Point
- Water Quality Monitoring
- Volume Monitoring

Note: Site D is located approximately 2.3 km upstream of Site A

Source: Metropolitan Coal (2014) Date of Aerial Photography October 2014

**Peabody**  
 METROPOLITAN COAL  
 Surface Facilities Area  
 Water Monitoring Sites

**Figure 22**

MET-24-36-2023AR\_010A

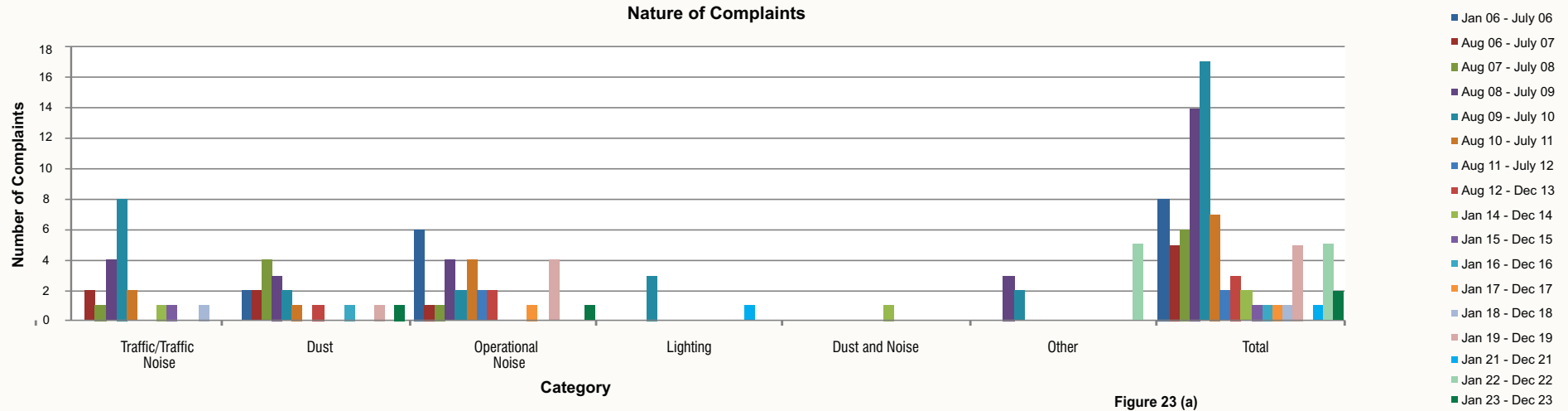


Figure 23 (a)

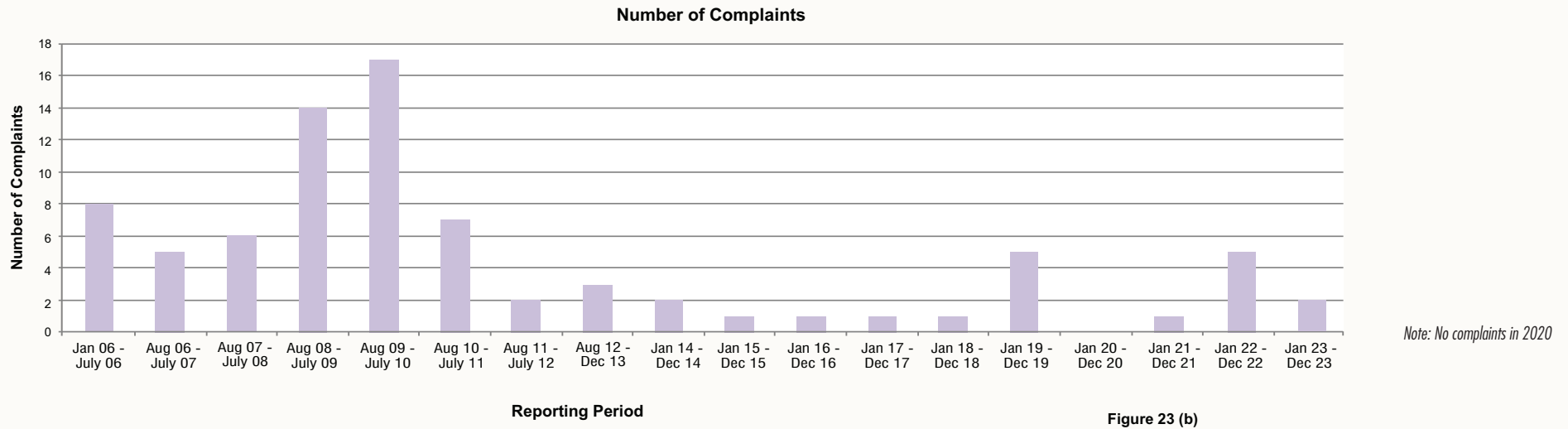


Figure 23 (b)

Note: No complaints in 2020



## APPENDICES

**APPENDICES A TO N ARE AVAILABLE ON REQUEST (AS LISTED BELOW):**

|             |  |
|-------------|--|
| Appendix A  | 2022 Annual Review Subsidence Monitoring Results   |
| Appendix B1 | Surface Water Review 1 January to 30 June 2023   |
| Appendix B2 | Surface Water Review 1 January to 31 December 2023   |
| Appendix C1 | Groundwater Review 1 January to 30 June 2023   |
| Appendix C2 | Groundwater Review 1 July to 31 December 2023  |
| Appendix D  | Mapped Pool Locations on The Waratah Rivulet, Eastern Tributary, Tributary A and Tributary B |
| Appendix E  | Assessments Against Water Quality Performance Measure – January to December 2023             |
| Appendix F1 | Longwalls 20-22 Spring 2022 Vegetation Monitoring Report                                     |
| Appendix F2 | Longwalls 20-22 Autumn 2023 Vegetation Monitoring Report                                     |
| Appendix F3 | Longwalls 23-27 Spring 2022 Vegetation Monitoring Report                                     |
| Appendix F4 | Longwalls 23-27 Autumn 2023 Vegetation Monitoring Report                                     |
| Appendix F5 | Longwalls 301-304 Spring 2022 Vegetation Monitoring Report                                   |
| Appendix F6 | Longwalls 301-304 Autumn 2023 Vegetation Monitoring Report                                   |
| Appendix F7 | Longwalls 305-307 Spring 2022 Vegetation Monitoring Report                                   |
| Appendix F8 | Longwalls 305-307 Autumn 2023 Vegetation Monitoring Report                                   |
| Appendix F9 | Longwalls 308-310 Autumn 2023 Vegetation Monitoring Report                                   |
| Appendix G1 | Longwalls 20-27 Spring 2022 Aquatic Ecology Monitoring Report                                |
| Appendix G2 | Longwalls 20-27 Autumn 2023 Aquatic Ecology Monitoring Report                                |
| Appendix H1 | Longwalls 20-22 Spring-Summer 2022 Amphibian Survey Report                                   |
| Appendix H2 | Longwalls 23-27 Spring-Summer 2022 Amphibian Survey Report                                   |
| Appendix H3 | Longwalls 301-307 Spring-Summer 2022 Amphibian Survey Report                                 |
| Appendix H4 | Longwalls 308-317 Spring-Summer 2022 Amphibian Survey Report                                 |
| Appendix I  | 2023 Quarterly Attended Noise Monitoring Results   |
| Appendix J  | 2023 Air Quality Monitoring and Environmental Performance Assessment Report                  |
| Appendix K  | 2023 Annual Rehabilitation Report  |