2024

Wambo Coal Mine 2024 Annual Review

1 JANUARY 2024 – 31 DECEMBER 2024

Name of operation	Wambo Coal Mine
Name of operator	Wambo Coal Pty Ltd
Development consent /Project Approval #	DA 305-7-2003, DA 177-8-2004, EPBC 2003/1138, EPBC 2016/7636, EPBC 2016/7816
Name of holder of development consent	Wambo Coal Pty Ltd
Title/Mining lease #	CL365, CL374, CL397, CCL743, ML1402, ML1572, ML1594, ML 1806, ML1873, A444, EL7211
Name of holder of mining lease	Wambo Coal Pty Ltd
Water licence #	As per Table 3
Name of holder of water licence	Wambo Coal Pty Ltd
Forward Program start date	9 March 2024
Forward Program end date	8 March 2027
Annual Review start date	1 January 2024
Annual Review end date	31 December 2024

I, Peter Jaeger, certify that this audit report is a true and accurate record of the compliance status of Wambo Coal Mine for the period 1 January 2024 to 31 December 2024 and that I am authorised to make this statement on behalf of Wambo Coal Pty Ltd.

Note:

a) *The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.*

b) *The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).*

Name of authorised reporting officer	Peter Jaeger
Title of authorised reporting officer	Manager: Environment & Community
Signature of authorised reporting officer	
Date	31/03/2025

Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
DA 305-7-2003	No
DA 177-8-2004	No
EPBC 2003/1138	No
EPBC 2016/7636	No
EPBC 2016/7816	No
CL365	Yes
CL374	Yes
CL397	Yes
CCL743	Yes
ML1402	Yes
ML1572	Yes
ML1594	Yes
ML1806	Yes
ML1873	Yes
A444	Yes
EL7211	Yes
EPL 529	No
Water licences (as per Table 3)	Yes

Compliance Status Key

Risk Level	Colour Code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence.
Medium	Non-compliant	Non-compliance with: • potential for serious environmental consequences, but is unlikely to occur; or • potential for moderate environmental consequences, but is likely to occur.
Low	Non-compliant	Non-compliance with: • potential for moderate environmental consequences, but is unlikely to occur; or • potential for low environmental consequences, but is likely to occur.
Administrative non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions).

Non-Compliances

Relevant Approval	Condition #	Condition Description (summary)	Compliance Status	Comment	Where addressed in Annual Review
DA 305-7-2003	B62	Water Management Performance Measures	Non-Compliant	Exceedances of water quality performance measure at monitoring bore P315.	Section 10.1
DA 305-7-2003	B66	Water Management Plan Performance Indicators	Non-Compliant	Exceedance of groundwater level performance indicators at two locations (P16 and GW15).	Section 10.1
EPBC 2003/1138	2(b)	Management Plans	Non-Compliant	Implementation of the BMP has not occurred with respect to: • Fencing • Quarterly routine inspections of the RWEAs	Section 10.2
EPBC 2003/1138	2	Management Plans	Non-Compliant		
EPBC 2003/1138	3	Management Plans	Non-Compliant		
EPBC 2016/7636	1b	Implement conditions A1 and A2 of Schedule 2 of the state development consent.	Non-Compliant	Non-compliances with Conditions B62 (Water Management Performance Measures) and B66 (Performance Indicators) of DA 305-7-2003 (refer above).	Appendix I
EPBC 2016/7816	1a				
EPL 529	M2.1	Requirement to Monitor Concentration of pollutants discharged	Non-Compliant	Due to dry conditions, unsafe access or no flow, monthly water quality samples were unable to be collected at the required frequencies at several monitoring locations during the reporting period.	Section 6.1.2
EPL 529	M2.3	Water and/or Land Monitoring Requirements	Non-Compliant	Due to dry conditions, unsafe access or no flow, monthly water quality samples were unable to be collected at the required frequencies at several monitoring locations during the reporting period.	Section 6.1.2

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APPENDICES

Appendix A Approval Conditions Specifically Relating to the Annual Review

Appendix B Daily Train Movement Summary

Appendix C Annual Noise Monitoring Report

Appendix D Annual Air Quality Monitoring Report

Appendix E Annual Flora and Fauna Monitoring Report

Appendix F Surface Water Quality Monitoring Data Summary

Appendix G Annual Stream Flow Monitoring Report

Appendix H Annual Groundwater Monitoring Report

Appendix I Annual Compliance Report (EPBC 2016/7636 and EPBC 2016/7816)

Appendix J EPBC Approval 2003/1138 Five-yearly Audit

1.0 Introduction

The Wambo Coal Mine (the Mine) is situated approximately 15 kilometres (km) west of Singleton, near the village of Warkworth, New South Wales (NSW) (**Figure 1**). The Mine is owned and operated by Wambo Coal Pty Limited (WCPL), a subsidiary of Peabody Energy Australia Pty Limited.

A range of open cut and underground mine operations have been conducted at the Mine since mining operations commenced in 1969. Mining under the current Development Consent (DA 305-7-2003) commenced in 2004 and previously permitted both open cut and underground operations and associated activities to be conducted. All product coal is transported from the Mine by rail.

Operations at the Mine also include a rail spur and loop, coal reclaim and rail loading facility for the Wambo Coal Terminal under Development Consent (DA 177-8-2004) which was granted in 2004.

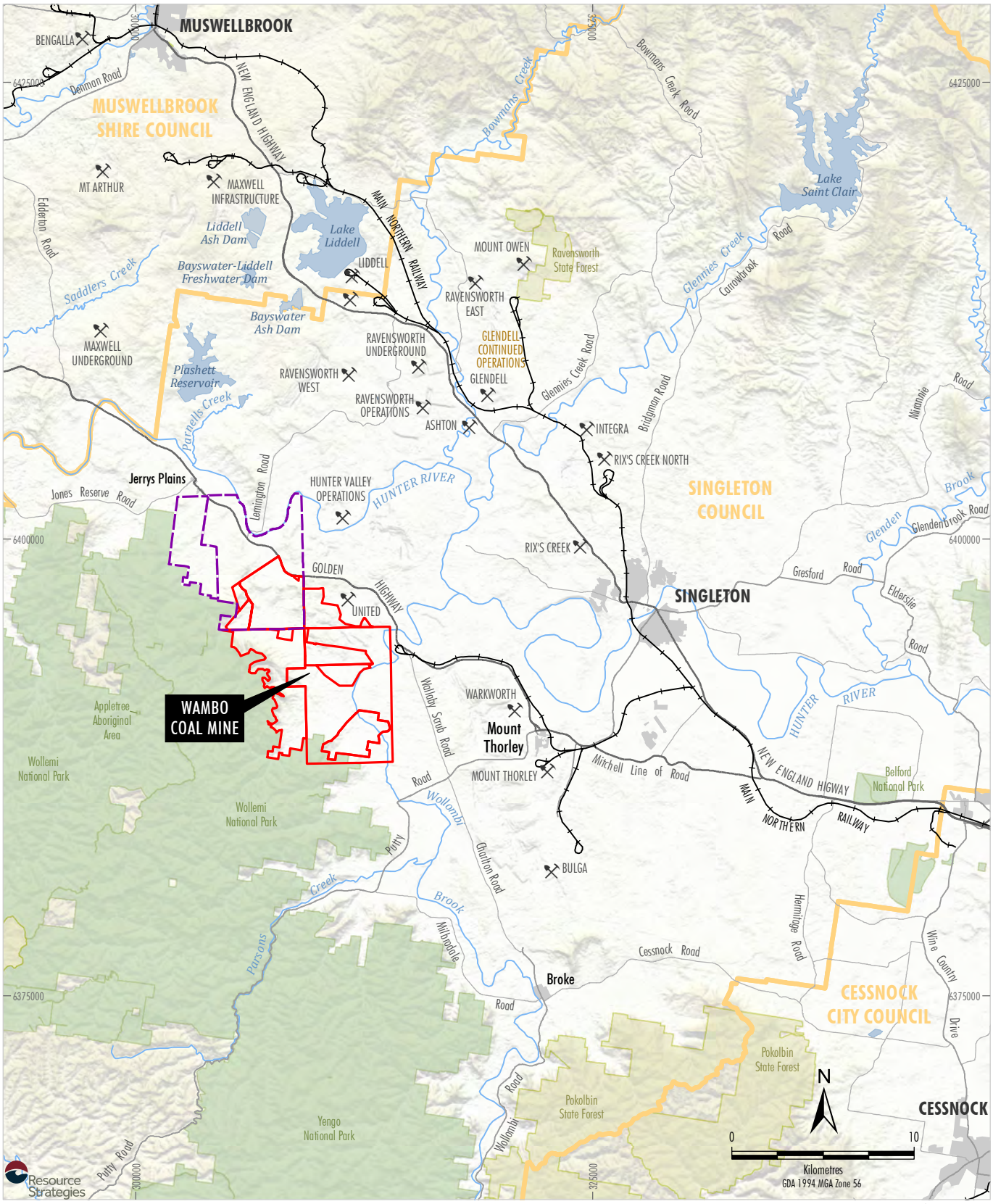
MOD 16 to (DA 305-7-2003) was approved by the Independent Planning Commission of NSW on 29 August 2019 and required development at the Mine to be undertaken in the following stages:

- Phase 1 – open cut mining operations at Wambo open cut mine, underground mining operations at Wambo underground mine and the operation of Wambo mine infrastructure (including minor upgrades to this infrastructure) under DA 305-7-2003.
- Phase 2 – underground mining operations at Wambo underground mine, the operation of Wambo mine infrastructure under DA 305-7-2003 and associated surface infrastructure.
- Phase 3 – following the cessation of underground mining operations that includes mine closure.

Phase 2 commenced on 1 December 2020, and therefore only underground mining operations and the operation of Wambo mine infrastructure and associated surface infrastructure are undertaken at the Mine under DA 305-7-2003. Operations under Development Consent DA 177-8-2004 have not changed following the commencement of Phase 2.

Upon the commencement of Phase 2 under DA 305-7-2003 (MOD 16), WCPL and United Collieries Pty Limited (United) (owned 95 per cent by Abelshore Pty Limited, a wholly owned subsidiary of Glencore Coal Pty Limited [Glencore] and 5 per cent by the Construction, Forestry, Mining and Energy Union [CFMEU]) entered into a 50:50 Joint Venture at the open cut mine. United manages Joint Venture tenements (i.e. open cut operations), under Development Consent SSD 7142, and WCPL continues to operate underground mining operations.

Following the approval of MOD16, DA305-7-2003 has been modified on three further occasions. The most recent, MOD 19 was granted 19 January 2023 and approved the reorientation of Longwalls 24 and 25, and the addition of Longwall 26.



Source: NSW Spatial Services (2024)

LEGEND

- Exploration Licence Boundary (AUTH, EL)
- Mining and Coal Lease Boundary (ML, CL, CCL)
- Local Government Area
- National Park
- State Forest
- Mining Operation

Peabody

WAMBO COAL MINE

Regional Location

Figure 1

Figure 2 shows the approved Mine layout including mining lease boundaries, current operational disturbance footprint and Remnant Woodland Enhancement Areas (RWEAs) for Phase 2. **Figure 3** shows the approved Mine longwall layout for Phase 2.

This Annual Review details WCPL's environmental and community performance for the reporting period 1 January 2024 – 31 December 2024. This Annual Review has been prepared in accordance with the NSW Department of Planning, Housing and Infrastructure (DPHI) *Post-approval requirements for State significant mining developments – Annual Review Guideline – October 2015* (NSW Department of Planning and Environment [DPE] 2015) and WCPL's statutory approvals (**Section 2.1**).

The Annual Review is not intended to be an exhaustive description of WCPL's operations, approvals and activities rather it is a summary of WCPL's compliance status with respect to WCPL's statutory approvals.

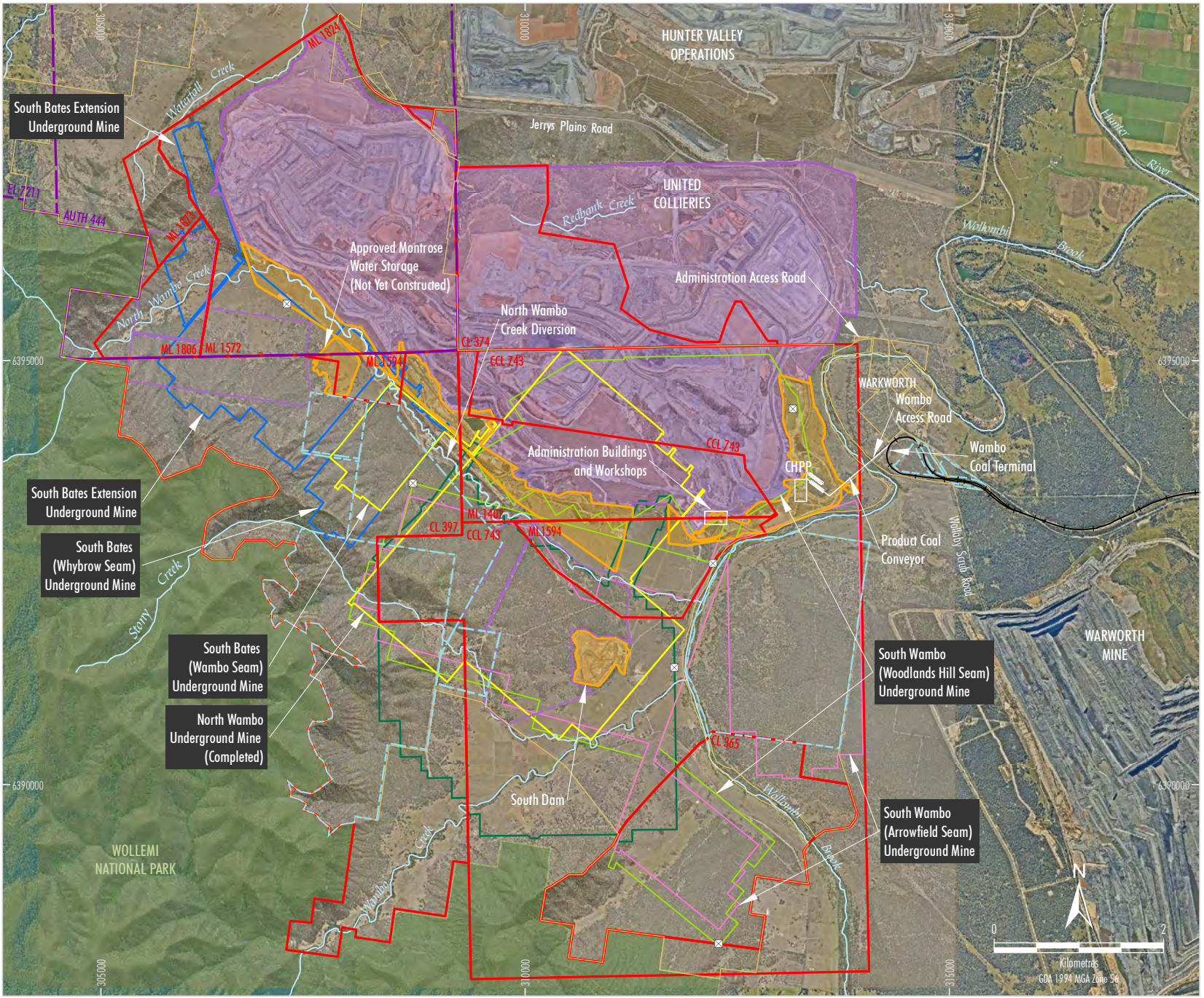
This Annual Review is distributed to a range of stakeholders including government authorities, Singleton Council and members of the Community Consultative Committee (CCC). A copy of the Annual Review will be made available on the Peabody Energy website (www.peabodyenergy.com).

1.1 Mine Contacts

The contact details of key WCPL personnel who are responsible for the environmental management of the Mine are listed in **Table 1**.

Table 1: Contact Details of Key WCPL Personnel

Name	Role	Phone No.
Micheal Alexander	Director NSW Projects	(02) 6570 2361
Peter Jaeger	Manager: Environment & Community	(02) 6570 2209



LEGEND

- National Park
- SSD 7142 Operational Area #
- Biodiversity Stewardship Site under SSD 7142
- WCPL Owned Land

Wambo Coal Mine

- Exploration Licence Boundary (AUTH, EL)
- Mining and Coal Lease Boundary (ML, CL, CCL)
- Remnant Woodland Enhancement Program (RWEP) Area
- Existing/Approved Surface Development Area (Phase 2)
- Ventilation Shaft

Underground Mining Areas

- Whybrow Seam
- Wambo Seam
- Woodlands Hill
- Arrowfield Seam
- Previous Underground Workings in Whybrow Seam

Under Phase 2 of mining at Wambo Coal Mine (commenced 1 December 2020), this area is operated by United Collieries Pty Ltd under the United Wambo Joint Venture Project.

Source: WCPL (2024); NSW Spatial Services (2024)
Orthophoto: WCPL (Nov 2023-May 2022)

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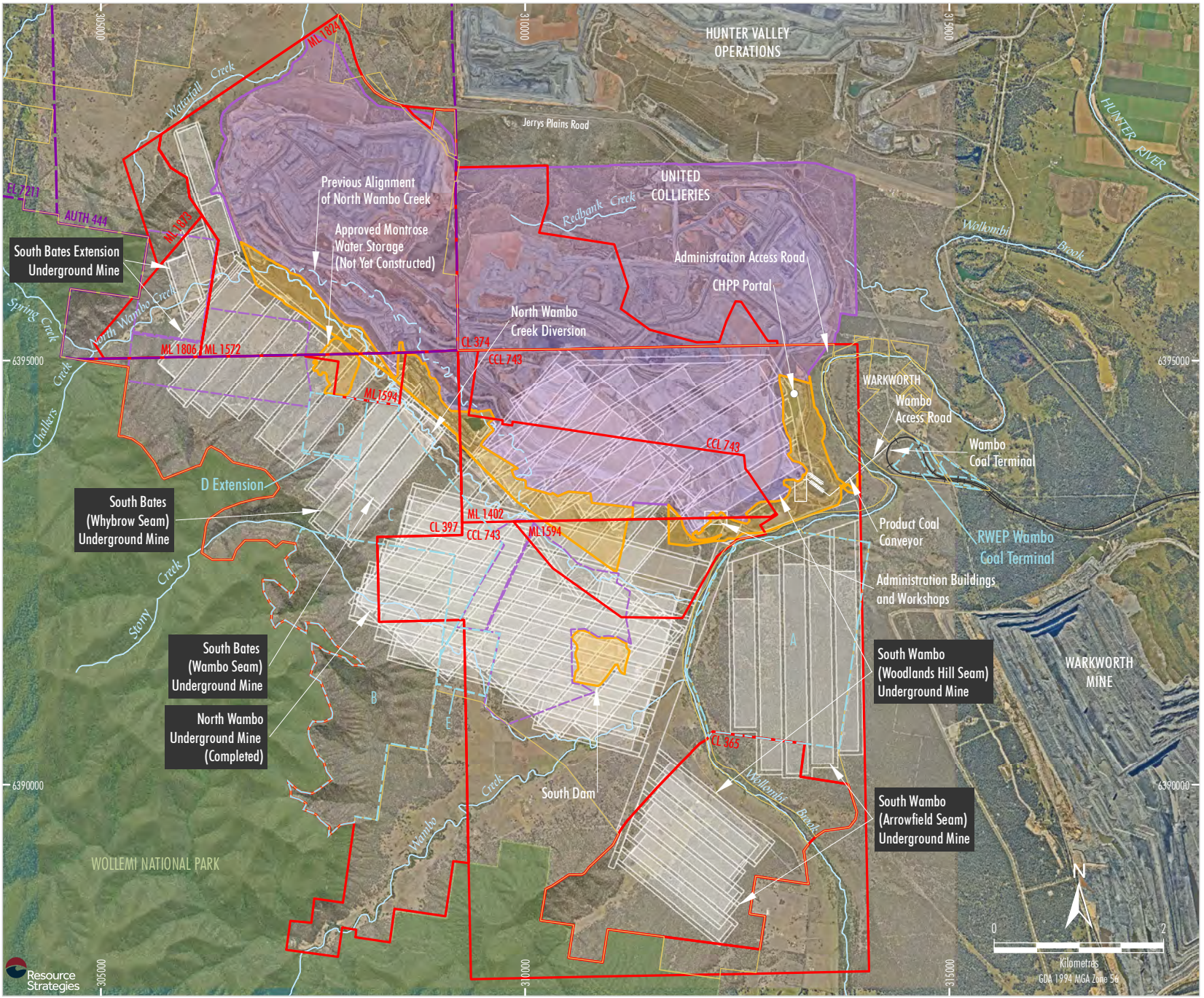
WAMBO COAL MINE

Existing/Approved Wambo Coal Mine General Arrangement

Figure 2

WAM-09-15 AR 2024_202A



LEGEND

- National Park
- SSD 7142 Operational Area #
- Biodiversity Stewardship Site under SSD 7142
- WCPL Owned Land

Wambo Coal Mine

- Exploration Licence Boundary (AUTH, EL)
- Mining and Coal Lease Boundary (ML, CL, CCL)
- Remnant Woodland Enhancement Program (RWEP) Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- Existing/Approved Underground Development

Under Phase 2 of mining at Wambo Coal Mine (commenced 1 December 2020), this area is operated by United Collieries Pty Ltd under the United Wambo Joint Venture Project.

Source: WCPL (2024); MSEC (2024); NSW Spatial Services (2024)
Orthophoto: WCPL (Nov 2023-May 2022)

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WAMBO COAL MINE

Existing/Approved Wambo Coal Mine Layout

Figure 3

2.0 Approvals

2.1 Current Approvals

WCPL has a number of statutory approvals, leases and licences that regulate activities at the Mine (**Table 2 and Table 3**). Conditions from WCPL's approvals that specifically relate to this Annual Review are detailed in **Appendix A.**

Table 2: WCPL's Statutory Approvals

Type	Description	Issued By[1]	Issue Date	Expiry Date
Development Consent	DA 305-7-2003[2]	DPHI	4/02/2004	31/12/2042
Development Consent	DA 177-8-2004[3]	DPHI	16/12/2004	31/08/2042
EPBC Approval[4]	EPBC 2003/1138	DCCEEW	23/11/2004	31/12/2029
EPBC Approval[4]	EPBC 2016/7636	DCCEEW	30/4/2017	1/3/2037
EPBC Approval[4]	EPBC 2016/7816	DCCEEW	4/5/2018	31/12/2039
Mining Lease	ML 1402	MEG	23/09/1996	25/07/2035
Mining Lease	ML 1572	MEG	21/12/2005	20/12/2026
Mining Lease	ML 1594	MEG	1/05/2007	30/04/2028
Mining Lease	ML 1806	MEG	11/08/2020	11/08/2041
Mining Lease	ML 1824	MEG	29/11/2021	29/11/2035
Mining Lease	ML 1873	MEG	29/01/2024	29/01/2045
Consolidated Coal Lease	CCL 743	MEG	9/03/1990	14/08/2043
Coal Lease	CL 365	MEG	19/09/1990	19/09/2032
Coal Lease	CL 374	MEG	6/12/1991	21/03/2026
Coal Lease	CL 397	MEG	4/06/1992	4/06/2034
Exploration Licence	A 444[5, 6]	MEG	4/10/2007	16/05/2027
Exploration Licence	EL 7211[7]	MEG	29/09/2008	29/09/2026
Environment Protection Licence	EPL 529	EPA	4/02/2021	-
S101 Approval[8]	Approval to discontinue use of the North East Tailings Dam (NETD)	MEG	3/09/2009	-

1. DCCEEW = Commonwealth Department of Climate Change, Energy, the Environment and Water, MEG = Mining, Exploration and Geosciences, EPA = NSW Environment Protection Authority, DPHI = Department of Planning, Housing and Infrastructure.
2. DA 305-7-2003 has been modified 18 times since the original approval was granted in 2004. One modification application was withdrawn subsequent to WCPL submitting the application. The latest modification (MOD19), for the South Bates Extension Underground Mine Longwalls 24 to 26 was granted approval in January 2023.
3. DA 177-8-2004 has been modified three times since the original approval was granted in 2004. The last modification (MOD3), for the United Wambo Joint Venture (UWJV), was granted approval in August 2019.
4. EPBC = *Environment Protection and Biodiversity Conservation Act 1999.*
5. A444 is an Authority to Prospect granted under the *Coal Mining Act 1973* and is deemed to be an Exploration Licence for the purposes of the *Mining Act 1992*.
6. A 444 is managed by United.
7. EL 7211 is managed by United.
8. Section 101 of the *Coal Mine Health and Safety Act 2002.*

Table 3: WCPL's Water Licences

Licence Number[1]	Description	Expiry Date	Entitlement	Category	Access Licence	Nominated Water Supply Work Approval	Expiry Date
Hunter Regulated River Water Source							
WAL 718 (20SL060212)	Hunter River Pump	Perpetuity	1,000 unit shares (high security)	Regulated River (high security)	20AL200631	20WA200632	30/06/2027
WAL 8599 (20SL061206)	Hunter River Pump	Perpetuity	6 unit shares (high security)	Regulated River (high security)	20AL201457	20CA201459	25/09/2028
WAL 8600 (20SL061206)	Hunter River Pump	Perpetuity	868 unit shares (general security)	Regulated River (general security)	20AL201458	20CA201459	25/09/2028
WAL 43299	TBC (extraction via Hunter River pump)	Perpetuity	80 units (general security)	Regulated River (general security)	20AL220689	-	-
WAL 8604 (20BL061206)	Hunter River Pump	Perpetuity	240 unit shares (supplementary water)	Supplementary Water	20AL203044	20CA201459	25/09/2028
Hunter Regulated River Water Source – Shared with United Colliery							
WAL 929 (20SL050661)	Other Pump	Perpetuity	3 unit shares	Domestic and Stock	20AL201147 (NOW Reference Number)	20WA201148	06/12/2027
WAL 1369 (20SL060416)	80 mm CP	Perpetuity	15 unit shares (supplementary water)	Supplementary Water	20AL203071 20AL204246 20AL204247	20CA201654	30/11/2028

Licence Number[1]	Description	Expiry Date	Entitlement	Category	Access Licence	Nominated Water Supply Work Approval	Expiry Date
WAL 15459 (20SL204246)	80 mm CP	Perpetuity	21 unit shares (general security)	Regulated River (general security)	20AL204246	20CA201654	30/11/2028
WAL 1164	100 mm CP	Perpetuity	180 Unit Shares	Regulated River (general security)	20AL201738	20CA201739	30/11/2027
WAL 902	38 mm CP	-	8 ML	Regulated River	20AL201097	20WA201098	30/06/2027
Hunter Regulated River Water Source – United Colliery							
WAL10541	-	-	300	Unregulated River	20AL200927	20WA200928	30/06/2027
Hunter Unregulated and Alluvial Water Sources (Lower Wollombi Brook Water Source)							
WAL 18437 (20SL033872)	Wollombi Brook Pump	Perpetuity	366.9 unit shares	Unregulated River	20AL208641	20WA208642	31/07/2032
WAL 23897 (20BL167737)	Well No. 2	Perpetuity	70 unit shares	Aquifer	20AL211371	20WA211372	31/07/2032
Hunter Unregulated and Alluvial Water Sources (Lower Wollombi Brook Water Source) – United Colliery							
WAL18445	Bywash Dam	-	200 unit shares	Unregulated River	20AL208713	20WA208714	13/03/2033
WAL18549	Other Pump	-	100 unit shares	Unregulated River	20AL208705	20WA208706	18/11/2032
North Coast Fractured and Porous Rock Groundwater Sources (Sydney Basin – North Coast Groundwater Source)							
WAL 42373[2]	-	Perpetuity	1,549 unit shares	Aquifer	20AL219997	20MW065010	-
WAL 41532 (20BL172156)	Dewatering	Perpetuity	98 unit shares	Aquifer	20AL218994	20MW065010	-

Licence Number[1]	Description	Expiry Date	Entitlement	Category	Access Licence	Nominated Water Supply Work Approval	Expiry Date
North Coast Fractured and Porous Rock Groundwater Sources (Sydney Basin – North Coast Groundwater Source) – United Colliery							
WAL41510	Dewatering	-	300 unit shares	Aquifer	20AL217075	20MW065011	-
North Coast Fractured and Porous Rock Groundwater Sources (Sydney Basin – North Coast Groundwater Source) – Groundwater Bores							
20BL168997	Piezometer	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL168998	Piezometer	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL168999	Piezometer	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL169000	Piezometer	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL170638	Piezometer	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL172237	Monitoring Bore (GW14, GW18, GW21)	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL172238	Monitoring Bore (GW12)	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL172240	Monitoring Bore (GW15)	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL172242	Monitoring Bore (GW16, GW17)	Perpetuity	Groundwater monitoring	NA	-	-	-

Licence Number[1]	Description	Expiry Date	Entitlement	Category	Access Licence	Nominated Water Supply Work Approval	Expiry Date
20BL172244	Monitoring Bore (GW20)	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL172255	Monitoring Bore (GW22)	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL172256	Monitoring Bore (GW13)	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL172257	Monitoring Bore (GW19)	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL172332	Piezometer	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL173290	Monitoring Bore	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL173291	Monitoring Bore	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL173292	Monitoring Bore	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL173293	Monitoring Bore	Perpetuity	Groundwater monitoring	NA	-	-	-
20BL173946	Monitoring	Perpetuity	Groundwater monitoring	NA	-	-	-
-	Bore	Perpetuity	Stock	Basic Rights	-	20WA214848	-
-	Bore	Perpetuity	Stock	Basic Rights	-	20WA214849	-
-	Bore	Perpetuity	Stock	Basic Rights	-	20WA214850	-
-	Bore	Perpetuity	Stock	Basic Rights	-	20WA214851	-

Licence Number[1]	Description	Expiry Date	Entitlement	Category	Access Licence	Nominated Water Supply Work Approval	Expiry Date
-	Spearpoints	Perpetuity	Stock/Domestic	Basic Rights	-	20WA215574	-

WAL = water access licence; mm = millimetres.

1. 20BL prefix bore licences with allocations have been replaced with WALs.
2. WAL 42373 was issued in 2019 to consolidate six of WCPL's previous WALs under the North Coast Fractured and Porous Rock groundwater Sources (Sydney Basin – North Coast Groundwater Source) including WAL 39735, WAL 39738, WAL 39803, WAL 41494, WAL 41528 and WAL 41520.
3. DPE-W has confirmed that licenses are not required for groundwater bores less than 40m deep.

2.2 Changes to Approvals

During the reporting period, the following changes were made to WCPL's approvals:

- A revised Extraction Plan for the revised layout of the South Bates Extension Underground Mine Longwalls 24 to 26 was submitted to the DPHI on 1 November 2024 and was approved on 6 December 2024.
- Variation to Aboriginal Heritage Impact Permit C0002000 for the South Dam water discharge system was granted on 13 December 2024.

2.3 Environmental Management System

WCPL operates an Environmental Management System to manage compliance and advance continual improvement across the Mine. A summary of the status of required management plans is presented in **Table 4**.

In accordance with Schedule 2, Condition D15(a) of DA 305-7-2003, copies of these management plans have been made available to the public on the Peabody Energy website https://www.peabodyenergy.com/Operations/Australia-Mining/New-South-Wales-Mining/Wambo-Approvals,-Plans-Reports.

In accordance with Schedule 2, Condition D6 of DA 305-7-2003, WCPL will review the strategies, plans and programs required under DA 305-7-2003 within three months of the submission of this Annual Review to relevant government regulators. If necessary, the strategies, plans and programs required under this consent must be revised, and submitted to the Planning Secretary for approval within six weeks of the review in accordance with Schedule 2, Condition D7 of DA 305-7-2003.

Table 4: Status of WCPL's Environmental Management Plans

Management Plan	Status	Approved Version[1]
North Wambo Underground Extraction Plan for Longwalls 8 to 10A (and associated component plans)	Approved – 2015	April 2015
South Bates Underground Mine Extraction Plan for Longwalls 11 to 16 (and associated component plans)	Approved – 2017	July 2017[2]
South Bates Extension Underground Mine Extraction Plan for Longwalls 17 to 20 (and associated component plans)	Approved – 2019	Revision C (June 2019)[3]
South Bates Extension Underground Mine Extraction Plan for Longwalls 21 to 24 (and associated component plans)	Approved – 2022	Revision E (December 2022)
South Bates Extension Underground Mine Extraction Plan for Longwalls 24-26 (and associated component plans)	Approved - 2023	Revision D (December 2024)
Forward Program	Resources Regulator Assessment	Forward Program (May 2024)
Environmental Management Strategy	Approved – 2020	Version 7 (November 2020)
Air Quality & Greenhouse Gas Management Plan[4]	Approved – 2020	Version 8 (November 2020)
Noise Management Plan	Approved – 2023	Version 12 (December 2023)
Water Management Plan	Approved – 2023	Version 4 (November 2023)
Groundwater Management Plan	Approved – 2023	Version 6 (November 2023)
Surface Water Management Plan	Approved – 2023	Version 3 (November 2023)
United Wambo and Wambo Site Water Balance	Approved – 2020	Version 2 (August 2020)
United Wambo and Wambo Water Monitoring Plan	Approved – 2023	Version 6 (November 2023)
Erosion and Sediment Control Plan	Approved – 2023	Version 4 (November 2021)
Biodiversity Management Plan (previously the Flora and Fauna Management Plan)	Approved – 2023	Version 6 (November 2024)
Heritage Management Plan	Approved – 2023	Version 2 (June 2023)
Wambo Homestead Complex Conservation Management Plan	Approved – 2019	Version 6 (May 2019)
Pollution and Incident Response Management Plan	Approval not required	Version 9 (August 2024)
Rehabilitation Management Plan	Approved – 2023	Version 3 (November 2023)

1. Approved version as at the end of the reporting period.
2. On 11 October 2017, DPHI approved the South Bates Underground Mine Longwalls 11 to 16 Extraction Plan with the exception of the Site Water Management Plan (and associated component plans), which were unable to be approved until they were updated in consultation with Department of Industry – Water (DI-Water) (now NSW Department of Climate Change, Energy, the Environment and Water [NSW DCCEEW). In 2018, the South Bates Extension Underground Mine Longwalls 17 to 20 Extraction Plan (including the Site Water Management Plan which had been updated in consultation with NSW DCCEEW was approved by DPHI.
3. On 4 September 2018, WCPL provided DPHI with correspondence explaining that geological structures had been encountered that may require changes to the main headings and finishing ends of Longwalls 18, 19 and 20. Accordingly, WCPL requested that DPHI approve the Extraction Plan for Longwalls 17 to 20 for extraction of Longwall 17 only. On 7 September 2018, DPHI approved the extraction of Longwall 17 only, on the basis that WCPL would prepare an amended Extraction Plan for Longwalls 18, 19 and 20. On 1 March 2019, WCPL submitted an amended Extraction Plan for Longwalls 17 to 20. DPHI approved the amended Extraction Plan on 4 June 2019.
4. An updated Air Quality Management Plan (version 9) was submitted to the DPHI in July 2023.

3.0 Operations Summary

3.1 2024 Mining Operations

The Mine operates seven days a week, 24 hours a day on a rotating shift basis. There have been no unplanned shutdowns during the reporting period.

During the reporting period, the following mining operations were undertaken at the South Bates Extension Underground Mine (current longwall mining area):

- Longwall 24A (completed June 2024);
- Longwall 24B (completed October 2024); and
- Longwall 25 (commenced November 2024).

Table 5 shows the production summary for 2024, compared to the production for 2023, and the forecast production for 2024 and 2025.

Following the commencement of Phase 2 operations on 1 December 2020, production material (including waste rock/overburden, ROM coal/ore, coarse/fine reject and saleable product) from open-cut operations is covered under SSD 7142.

Table 5: Production Summary

Material	Unit	Approved limit	2023 reporting period (actual)[3]	2024 reporting period (forecast)[3]	2024 reporting period (actual)[3]	2025 reporting period (forecast)[3]
Wambo Coal Mine						
Waste Rock/ Overburden	bcm	-	0	0	0	0
Underground ROM Coal/ Ore	Mt	9.75[1]	1.78	1.80	1.90	1.20
ROM Coal – Complex	Mt	14.7[4]	8.5	-	11.66	10.4
Coarse Reject	Mt	-	2.22	2.67	3.70	2.80
Fine Reject (Tailings)	Mt	-	0.82	0.91	0.77	0.89
Wambo Coal Terminal						
Railed Product	Mt	15[2]	5.8	-	6.9	-

Note: bcm = bank cubic metres, Mt = million tonnes.

1 DA 305-7-2003, Condition A16, Schedule 2.

2 DA 177-8-2004, Condition A8, Schedule 1. Refers to product coal transported off-site.

3 Under Phase 2 of the UWJV, open cut operations are undertaken by United

4 A maximum of 14.7 Mt of ROM coal from Wambo mining complex and United Wambo open cut coal mine in one calendar year.

During the reporting period, the ROM coal production at the Mine (1.90 Mt) was slightly higher than the forecast ROM coal production (1.80 Mt).

No overburden production occurred at the Mine as forecast.

During the reporting period, a total of 6.9 Mt of product coal was transported off-site via rail (no coal was hauled off-site by trucks). A summary of 2024 daily train movements, required by Schedule 2, Condition B29(b) of DA 177-8-2004 is provided in **Appendix B**.

The maximum daily train movements on any one day was six or less in accordance with Condition A9, Schedule 2 of DA 177-8-2004 (**Appendix B**).

Figure 4 shows the amount of saleable product coal transported off-site on a weekly basis.

Figure 4: Coal Transported Off-site during the Reporting Period

A total of 781 trains were loaded during the reporting period with 46 trains loaded on Friday evening (between 6 pm to 9 pm) and Sunday morning (between 9 am to 12 am). In accordance with Schedule 2, Condition A12 of DA 177-8-2004, WCPL took all reasonable steps to minimise train movements within these hours.

3.2 Next Reporting Period

Operations during the next reporting period will be undertaken in accordance with the approved relevant Extraction Plan and will include continued mining at the South Bates Extension Underground Mine, including:

- Longwall 25 (anticipated completion in April 2025); and
- Longwall 26 (anticipated commencement in May 2025).

It is anticipated that mining will be complete in the South Bates Extension Underground Mine in July 2025.

4.0 Actions Required from Previous Annual Review

A number of actions and improvements have been identified in the 2024 Annual Review undertaken by WCPL. Actions and improvements recommended in the 2024 Annual Review and their current status are summarised in **Table 6.** In addition, further information/actions requested by DPHI in relation to the 2024 Annual Review are also addressed in **Table 6**.

Table 6: Actions from Previous Annual Review

Action/Improvement required from previous Annual Review	Requested by	Action taken by the Operator	Where Discussed in Annual Review
Consider revising groundwater level triggers at P16 to incorporate model predictions which capture the observed mining effect	SLR	Model updates are scheduled in 2025 and will include recent climate and operational mining data (Glen Munro Pit and United Pit), with focus on matching observed responses to climate and mining in shallow and alluvial groundwater systems so that impacts and groundwater takes from these water sources are appropriately captured. The results from the model updates will then be used revise trigger levels at P16 to reflect the influence of both approved impacts and climatic conditions.	Appendix H
Provide update of groundwater and surface water monitoring data at Stony Creek to DPHI in November 2024	DPHI	Complete. Stony Creek monitoring data update report provided 18 November 2024.	Section 6.1.2
Outcome of the preliminary investigation into pH and EC exceedances at surface water location SW07	DPHI	Complete. The investigation concluded that Wambo Creek and SW07 could be influenced by the changes observed at Stony Creek. SW07 is now included as a monitoring location in Stony Creek monitoring data update reports.	Section 6.1.2
Redevelopment and purging of GW15, GW13. Sites P329a and P330a could also be considered for purging following review of comments in field sheets	SLR	GW15 was re-developed/ purged in August 2024, GW13, P329a and P329b are scheduled for Q2 2025.	Appendix H
Continuation of subsidence repair trials	WCPL	Ongoing	Section 5.9.4
Repair subsidence damage to tracks	WCPL	Ongoing	Section 5.9.4

5.0 Environmental Performance

5.1 Noise

Noise Impact Assessment Criteria for the Mine are defined in Table 4 of DA 305-7-2003 (Schedule 2, Condition B13 and B14) and in EPL529 (Condition L5). Additional noise conditions relating to land acquisition, operating hours, rail noise, noise monitoring and the WCPL Noise Management Plan (NMP) are also detailed in these approval documents.

EMM Consulting (EMM) (2025) prepared an annual noise monitoring report for the Mine and is presented in **Appendix C**.

5.1.1 Approval Criteria/EIS Predictions and Management Plan Requirements

A summary of the relevant approval criteria for noise in relation to sensitive receivers is included in **Table 7**.

Table 7: Impact Assessment Criteria for Noise DA 305-7-2003 (Phase 2 Operations)

Noise Assessment Area	Receiver	Applicable Noise Impact Assessment Criteria			
		Day $L_{Aeq,15minute}$ (dB)	Evening/Night $L_{Aeq,15minute}$ (dB)	Night $L_{Aeq,15minute}$ (dB)	Night $L_{A1,1minute}$ (dB)
	R007	37	37	37	47
	All other privately-owned residences	35	35	35	45
Area 2 – South Wambo	R025	39	39	39	49
	All other privately-owned residences	35	35	35	45
Area 3 Warkworth Village	All other privately-owned residences	44	44	43	53
All other areas	All other privately-owned residences	35	35	35	45

The noise impact assessment criteria in DA 305-7-2003 did not apply under meteorological conditions of:

1. *The noise criteria in condition B12 are to apply under all meteorological conditions except the following:*
   - a. *where 3°C/100 metres (m) lapse rates have been assessed, then:*
     - i. *wind speeds greater than 3 metres per second (m/s) measured at 10 m above ground level;*
     - ii. *temperature inversion conditions between 1.5°C/100 m and 3°C/100 m and wind speeds greater than 2m/s measured at 10 m above ground level; or*
     - iii. *temperature inversion conditions greater than 3°C/100 m.*
   - b. *where Pasquill Stability Classes have been assessed, then:*
     - i. *wind speeds greater than 3m/s at 10m above ground level;*
     - ii. *stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level;*
     - iii. *stability category G temperature inversion conditions.*

Condition L5.1 of EPL529 includes similar noise emission limits to those identified in DA 305-7-2003 for Phase 1 operations. Conditions L5.3 of EPL529 specify that the noise emission limits identified in Condition L5.1 do not apply under meteorological conditions of:

- wind speeds greater than 3 m/s at 10 m above the ground level;
- stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- stability category G temperature inversion conditions.

The noise criteria in the Development Consent (DA 305-7-2003) is more conservative than those in EPL529, and therefore have been used to assess compliance in 2024.

As lapse rates were not measured directly, meteorological conditions have been assessed against the Pasquill Stability Classes detailed in Condition 1(b), Appendix 5 of DA 305-7-2003.

In addition to the statutory requirements detailed in DA 305-7-2003, WCPL is also required to meet additional requirements detailed within the WCPL NMP. These requirements include reporting of monthly attended monitoring results on WCPL's website or when there is an exceedance of criteria.

5.1.2 Performance during the Reporting Period

The noise monitoring network during the reporting period consisted of five attended noise monitoring locations (two of which were coincident with real time noise monitors). During 2024, attended noise monitoring was undertaken monthly at N01, N16, N20A, N21 and N26. For further detail, refer to the WCPL Annual Noise Monitoring Report (**Appendix C**).

Noise levels from the Mine were generally inaudible at all receivers and WCPL complied with relevant noise criteria during all monitoring conducted during the reporting period (**Appendix C**). More detail is provided in **Appendix C**.

Results of monitoring were published on the WCPL website, in accordance with the WCPL NMP.

In addition, WCPL complied with all operational requirements detailed in the WCPL NMP.

No complaints were received relating to noise during the reporting period (**Section 8.3**).

Based on the performance of the noise management system outlined above, it is considered that the noise management system is effective.

5.1.2.1 Comparison with UWJV EIS Predictions

Phase 2 operations commenced on 1 December 2020, the Mine now only includes underground mining operations, the operation of Wambo mine infrastructure and associated surface infrastructure under DA 305-7-2003. Open cut operations are now managed by United under Development Consent SSD 7142.

Subsequently, comparison of measured Mine noise levels against the UWJV EIS noise model predictions (which includes open cut operations) is not relevant (**Appendix C**).

5.1.3 Trends and Key Management Implications

EMM (2025) concluded that noise levels from the Mine were generally inaudible at all receivers during 2024 noise monitoring (**Appendix C**). This conclusion is consistent with noise monitoring in the 2023 reporting period (EMM, 2024). No modifying factors were applicable to operations at the Mine. The Mine complied with relevant noise criteria during all measurements during 2024 noise monitoring.

WCPL will continue to implement the WCPL NMP next reporting period.

5.1.4 Implemented or Proposed Management Actions

WCPL will continue to implement the noise management measures detailed in the WCPL NMP, including documenting the timing and scale of any operational changes made in response to adverse conditions or noise alarms from monitoring units.

5.2 Blasting

Since the commencement of Phase 2, no blasting associated with open cut operations is allowed at the Mine in accordance with Condition B21 of DA 305-7-2003. Blasting activities associated with the UWJV open cut operations are managed by United.

During the reporting period, two small civil blasts were conducted during the wedge cut construction for the South Wambo Underground Portal Construction Stage 1 Project (i.e. not associated with open cut operations), which was completed in December 2024.

5.2.1 Approval Criteria/EIS Predictions and Management Plan Requirements

Condition B21, Schedule 2 of DA 305-7-2003 requires that no blasting associated with open cut operations is undertaken on site during Phase 2.

5.2.2 Performance during the Reporting Period

No blasting associated with open cut operations was undertaken by the Mine during 2024.

5.2.3 Trends and Key Management Implications

No blast-related trends were identified during the reporting period.

5.2.4 Implemented or Proposed Management Actions

At this stage, no blast-related management actions are currently scheduled in the next reporting period.

5.3 Air Quality

Air quality criteria for the Mine are defined in Table 6 of DA 305-7-2003 (Condition B42, Schedule 2) and EPL529 (Condition M2.2). Additional conditions relating to air quality, odour, land acquisition, operating conditions and the WCPL Air Quality and Greenhouse Gas Management Plan (AQGGMP) are also detailed in these approval documents.

Airen Consulting (Airen) (2025) prepared an annual air quality monitoring report for the Mine and is presented in **Appendix D**.

5.3.1 Approval Criteria/EIS Predictions and Management Plan Requirements

A summary of the approval criteria for air quality applicable during the reporting period is included in **Table 8.**

Table 8: Approval Criteria for Air Quality

Pollutant	Averaging Period	Criterion
Particulate Matter <10 µm (PM_{10})	Annual	[a,c] 25µg/m^3
	24 hour	[b] 50 µg/m^3
Particulate Matter < 2.5 µm ($PM_{2.5}$)	Annual	[a,c] 8 µg/m^3
	24 hour	[b] 25 µg/m^3
TSP matter	Annual	[a,c] 90 µg/m^3

Note: TSP = total suspended particles, PM_{10} = particulate matter with a diameter less than 10 micrometers, $PM_{2.5}$ = particulate matter with a diameter less than 2.5 micrometers, µg/m^3 = micrograms per cubic metre.

a. Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).

b. Incremental impact (i.e. incremental increase in concentrations due to the development on its own).

c. Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.

Following the determination of the UWJV, the appropriate EIS documentation to refer to is the UWJV EIS (Umwelt 2016) in regard to air quality predictions.

A summary of the UWJV EIS predictions for air quality is included in **Section 5.3.2.1**, along with WCPL's performance against these predictions during the reporting period. For more information on the UWJV EIS predictions, refer to the UWJV EIS (Umwelt 2016).

In addition to the statutory requirements detailed in **Table 8**, WCPL is also required to meet additional requirements outlined in the WCPL AQGGMP. These requirements include reporting of greenhouse gas monitoring data in the Annual Review (**Section 5.4**).

5.3.2 Performance during the Reporting Period

Air quality monitoring was undertaken during the reporting period, in accordance with the WCPL AQGGMP.

WCPL complied with all operational air quality requirements detailed in the WCPL AQGGMP.

Airen (2025) concluded that:

- In relation to PM_{10}:
  - The 24-hour average PM_{10} concentration did not exceed 50 µg/m^3 at any monitoring locations.
  - The annual average PM_{10} concentration did not exceed the 25 µg/m^3 criterion.
  - The monitoring demonstrates compliance with DA 305-7-2003 in terms of particulate matter as PM_{10}.
- In relation to $PM_{2.5}$:
  - The 24-hour average $PM_{2.5}$ concentration did not exceed 25 µg/m^3 at any monitoring locations.
  - The annual average $PM_{2.5}$ concentration did not exceed the 8 µg/m^3 criterion.
  - The monitoring demonstrates compliance with DA 305-7-2003 in terms of particulate matter as $PM_{2.5}$.
- In relation to TSP concentrations:
  - The annual average TSP concentration did not exceed the 90 µg/m^3 criterion/
  - The monitoring demonstrates compliance with DA 305-7-2003 in terms of TSP.

Noted in DA 305-7-2003, determination of compliance against the impact assessment criteria is to exclude “extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary”. Notwithstanding the above, as no extraordinary events were identified during the reporting period and therefore, the results with and without extraordinary events are the same.

No complaints were received regarding air quality or odour from the Mine during the reporting period (**Section 8.3**).

There were no other incidents relating to air quality or odour during the reporting period.

Based on the performance of the air quality management system outlined above, it is considered that the air quality management system is effective.

5.3.2.1 Comparison with UWJV EIS Predictions

The UWJV EIS (Umwelt 2016) included predicted cumulative TSP, PM_{10} and dust deposition levels for four operational scenarios (Years 2, 6, 11 and 16). These years approximately translate to 2022, 2026, 2031 and 2036.

A summary of the predicted cumulative annual average TSP, PM_{10} and $PM_{2.5}$ levels for the Year 2 and Year 6 scenarios at the WCPL air quality monitoring sites assessed in the UWJV EIS (Umwelt 2016) air quality assessment, is provided in **Table 9**. The annual average TSP, PM_{10} and $PM_{2.5}$ levels recorded during the reporting period are also provided in **Table 9**.

Table 9: Comparison of UWJV EIS Predictions and 2024 Monitoring Data – Air Quality

Parameter	UWJV EIS Predictions			2024 Monitoring
	Site	Year 2 (2022)	Year 6 (2026)	
Annual Average TSP (µg/m^3)[1]	AQ05 (D5 Kelly formerly AQ01)	66	63	68
	AQ02 (D2 Caban)	51	51	44
	AQ03 (D4 Thelander)	52	51	34
	AQ04 (D1 Muller)	57	54	57
Annual Average PM_{10} (µg/m^3)	AQ05 (D5 Kelly formerly AQ01)	34	33	22.5
	AQ02 (D2 Caban)	16	16	14.4
	AQ03 (D4 Thelander)	17	16	11.4
	AQ04 (D1 Muller)	22	21	18.8
Annual Average $PM_{2.5}$ (µg/m^3)	AQ03 (D4 Thelander)	6	7	5.4
	AQ05 (D5 Kelly formerly AQ01)	4	3	7.3

Source: After Umwelt (2016) and Airen (2025).

1. TSP is estimated from PM_{10} monitoring data based on the relationship that 33% of TSP is PM_{10}.

The annual average $PM_{2.5}$, PM_{10} and TSP concentrations were below the relevant predicted cumulative annual average concentrations for the Year 2 scenario at all monitoring locations during 2024, except at Site D5 Kelly, which recorded higher TSP and $PM_{2.5}$ concentrations than the predicted cumulative annual average, but still in compliance with the air quality criterion provided in Table 6 of Development Consent DA 305-7-2003.

5.3.3 Trends and Key Management Implications

There were no air quality or odour management implications arising from WCPL's operations for the reporting period.

5.3.3.1 TSP

A study on co-located TSP and PM_{10} monitors conducted in the Hunter Valley by the NSW Minerals Council (2010) indicated that dust generated from predominately coal mining sources has long-term average PM_{10} concentrations that are approximately 40% of the corresponding TSP concentration (or equivalently, TSP concentrations are approximately 2.5 times PM_{10} concentrations). This ratio was found to be reasonably accurate for long-term averages (e.g. annual averages).

The long-term average ratio of PM_{10} to TSP over the four co-located monitoring sites at the Mine over a six year period was 33% (or equivalently, TSP concentrations are approximately three times PM_{10} concentrations). Using this ratio, TSP levels from 2011 to 2024 are shown in **Table 10** and **Figure 5**. The data shows there was a general increase in recorded TSP levels from 2012 to 2014, with a dip in 2015 and 2016, before increasing again in 2017 and 2018 and then decreasing again in 2019 to 2022. Dry weather throughout 2023 resulted in TSP concentrations increasing across the four monitors. The TSP concentration was observed to reduce during the reporting period.

Table 10: TSP Annual Averages (µg/m^3) (2011-2024)

HVAS	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
HV01	56.7	64.8	61.0	66.0	54.8	47.8	68.8	77.1	60.0	46.3	62.1	41.9	71.8	68.0
HV02	48.8	61.4	62.0	58.0	51.5	47.7	61.6	70.8	62.5	46.0	37.9	31.6	50.2	44.0
HV03	49.0	38.9	41.0	48.0	40.6	39.5	50.0	55.8	45.0	40.5	25.5	23.8	38.8	34.0
HV04	41.0	58.6	49.0	63.0	60.6	56.6	64.1	75.3	62.5	46.8	40.0	36.3	59.0	57.0

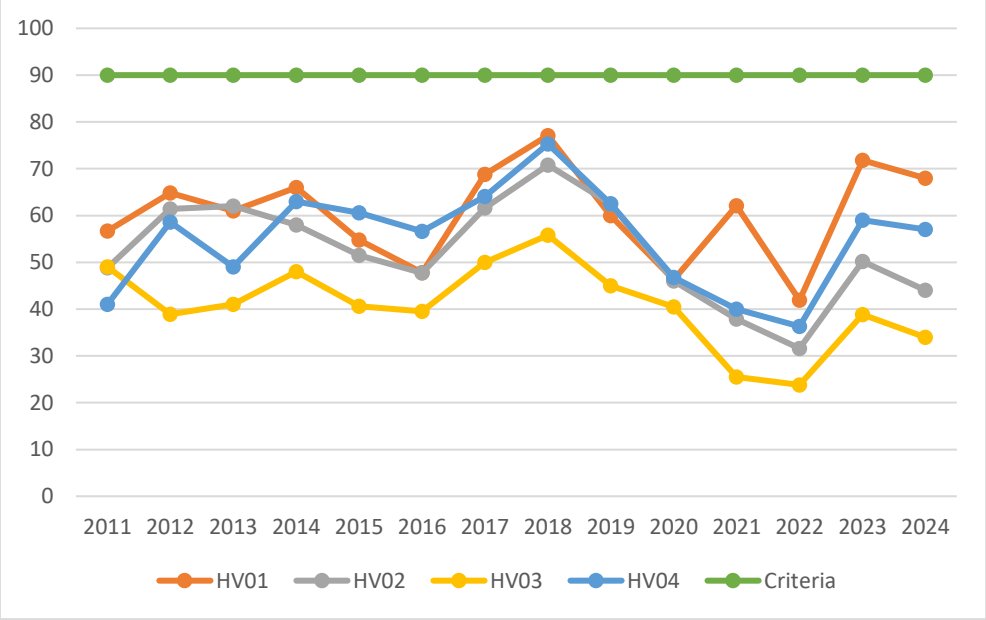


Figure 5: TSP Annual Averages (2011-2024)

5.3.3.2 PM_{10}

PM_{10} concentrations recorded by WCPL's four Tapered Element Oscillating Microbalance Analyser (TEOMs) from 2011 to 2024 are shown in **Table 11** and **Figure 6**.

The data shows that PM_{10} concentrations remained relatively consistent from 2011 to 2017, with the highest concentrations recorded to date observed in 2018. This is considered to be due to open cut mining moving to a more exposed location in the Montrose Open Cut Pit during 2018. The PM_{10} concentrations then generally reduced during 2019 to 2022, before returning to long-term trend levels in 2023 and during the reporting period.

Table 11: PM_{10} Monitoring Results (2011-2024)

TEOM	2011	2012	2013	2014	2015	2016	2017	2018[1]	2019	2020[2]	2021	2022	2023	2024
[3]Annual Average in µg/m³														
AQ05 (formerly AQ01)	16.8	21.0	19.3	18.0	15.7	15.6	20.6	25.7	24.1	21.6	20.5	13.8	23.7	22.5
AQ02 (PM02)	17.2	21.1	22.3	19.0	16.0	17.5	19.1	23.6	18.8	19.2	12.5	10.4	16.6	14.4
AQ03 (PM03)	16.7	16.6	16.5	15.3	12.9	14.1	14.6	18.6	25.1	14.7	8.4	7.9	12.8	11.4
AQ04 (PM04)	16.2	18.3	16.8	17.7	16.5	16.3	17.2	25.1	25.1	19.8	13.2	12.0	19.5	18.8
[4]Maximum 24-hour Average in µg/m³														
AQ05 (formerly AQ01)	49	47	65	55	52	49	66	151.9[1]	59	106.1	66	44.8	97.4	72.6
AQ02 (PM02)	83	76	97	70	55	49	52	163.5[1]	54	132.5	35	34	53.1	42.2
AQ03 (PM03)	43	47	71	51	43	39	39	143.8[1]	64	137.8	36	27.6	37.8	35.9
AQ04 (PM04)	43	45	65	56	71	44	49	125.0[1]	73	131.4	99	32.3	55.4	52.2
Number of Days Above 24-hour Average Criteria														
AQ05 (formerly AQ01)	0	0	4	2	1	0	5	15	9	13	0	0	9	0
AQ02 (PM02)	2	7	20	2	3	0	2	9	1	13	0	0	1	0
AQ03 (PM03)	0	0	1	1	0	0	0	6	9	9	0	0	0	0
AQ04 (PM04)	0	0	3	1	2	0	0	12	6	9	0	0	3	0

1. If the results on 22 and 23 November 2018 are discounted as they were the result of a state-wide dust storm, the maximum 24-hour averages are; 80.6 µg/m³ at AQ01, 66.0 µg/m³ at AQ02, 58.70 µg/m³ at AQ03 and 70.9 µg/m³ at AQ04.
2. Results shown are inclusive of “extraordinary days”.
3. Results shown for "Number of Days Above 24-hour Average Criteria" are inclusive of all sources (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).
4. Results shown for "Maximum 24-hour Average" are inclusive of all sources (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).

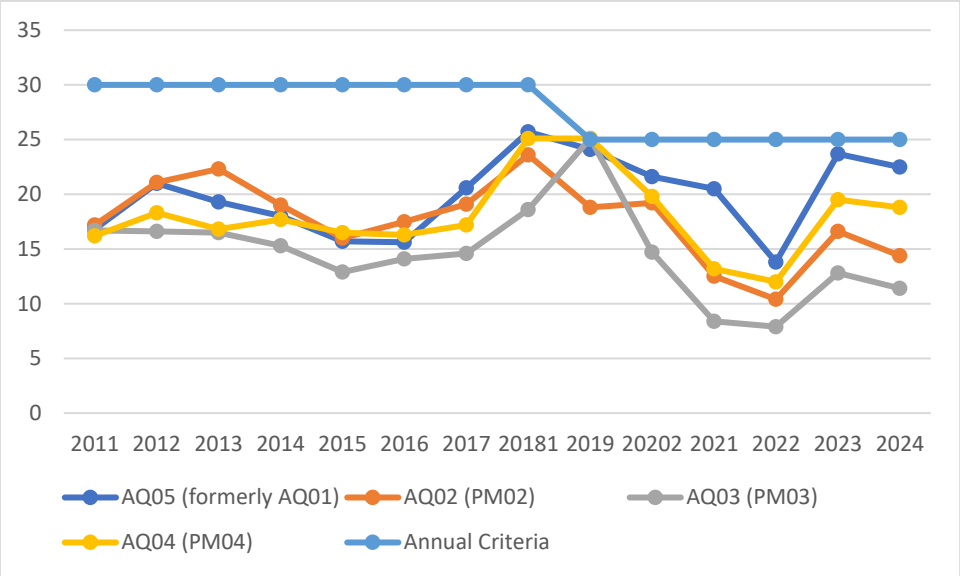


Figure 6: PM_{10} Annual Averages (2011-2024)

5.3.3.3 $PM_{2.5}$

On-site $PM_{2.5}$ data was available from late June 2020 onwards, following installation of the monitors. Results of monitoring during the reporting period are presented in **Table 12.** The data shows that $PM_{2.5}$ concentrations remained relatively consistent between 2020 and 2022, and presents a slight increase in the 2024 reporting year.

Table 12: PM2.5 Monitoring Results (2020-2024)

TEOM	2020[1, 2]	2021	2022	2023	2024
[3]Annual Average in µg/m³					
AQ05 (PM06)	5.2	5.5	4.7	7.0	7.3
AQ03 (PM07)	4.2	3.9	3.6	5.4	5.4
[4]Maximum 24-hour Average in µg/m³					
AQ01 (PM06)	15	14.9	15.3	22	26.8
AQ03 (PM07)	17	28.9	15.4	26.5	16.1
Number of Days Above 24-hour Average Criteria					
AQ01 (PM06)	0	0	0	0	0
AQ03 (PM07)	0	0	0	1	0

1. Results available from June 2020 onwards.
2. Results shown are exclusive of “extraordinary days”.
3. Results shown for "Annual Average" are inclusive of all sources (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).
4. Results shown for "Maximum 24 hour Average" are inclusive of all sources (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).

5.3.4 Implemented or Proposed Management Actions

WCPL will continue to implement the WCPL AQGGMP during the next reporting period.

5.4 Greenhouse Gas Emissions

There are no approval criteria for greenhouse gas emissions in WCPL's statutory approvals.

5.4.1 Approval Criteria/EIS Predictions and Management Plan Requirements

A summary of the EIS predictions for carbon dioxide (CO_2) emissions is included in **Section 5.4.2**, along with WCPL's performance against these predictions from 2024. For more information on the EIS predictions refer to the EIS (Resource Strategies 2003).

WCPL is required to report greenhouse gas monitoring data in the Annual Review, in accordance with the WCPL AQGGMP.

5.4.2 Performance during the Reporting Period

WCPL calculates and reports on greenhouse gas emissions at the end of every financial year, hence the summary data provided in **Table 13** is for the period 1 July 2023 to 30 June 2024. Data for the second half of the 2024 reporting period will be included in the 2025 Annual Review.

A total of 34,173 tonnes of carbon dioxide equivalent (CO_2-e) was emitted by the South Bates Underground Extension Mine's ventilation systems in 2024. This value is lower than predicted ventilation emissions from the South Bates Extension Mine in 2024 (i.e. 140,000 tonnes of CO2-e) (Todoroski Air Sciences, 2022).

It is also noted that ventilation emissions have been gradually decreasing over the years due to the change from methane rich coal seam gas to CO_2 rich coal seam gas, as the Mine has progressed from the North Wambo Underground Mine to the South Bates (Whybrow and Wambo Seam) Underground Mine. This change is part of a regional gas change that happens to occur across the Wambo lease.

A total of 210,631 tonnes of CO2-e was emitted from the other operations (fuel and electricity consumption). This is comparatively greater than the predicted emissions for the South Bates Extension Underground Mine (Todoroski Air Sciences, 2022). It is noted however, that Todoroski Air Sciences' (2022) predictions did not account for the emissions from the decommissioned North Wambo Underground Mine, which contributed and additional 151,051 tonnes of CO_2-e in 2024.

The 2023-2024 financial year was the seventh National Greenhouse and Energy Reporting (NGER) year that the Mine had emissions from a decommissioned mine due to North Wambo Underground Mine closing in April 2016. The total emissions emitted from the Mine during the reporting period (244,804 tonnes CO_2-e) is less than in previous reporting periods and the predicted emissions in the EIS (**Table 13**).

5.4.3 Trends and Key Management Implications

Levels of total CO_2 emissions monitored from the main ventilation shafts in 2014 to mid-2016 were indicative of the active mining at the North Wambo Underground Mine.

Following the closing of the North Wambo Underground Mine in 2016, a significant proportion of the methane (CH_4) emissions previously recorded at the main ventilation shaft shifted to being presented under a 'closed mine calculation'. The overall annual emissions from the Mine during the last seven reporting periods have remained relatively consistent.

During the reporting period, annual emissions from diesel and other sources (9,580 tonnes CO_2-e) for production related electrical generation was consistent with the emissions in the 2023 reporting period (8,566 tonnes CO_2-e). Electricity use during the reporting period remained consistent with the previous years.

5.4.4 Implemented or Proposed Management Actions

WCPL did not undertake any targeted energy saving projects during 2024, however energy efficiency is considered during mine planning.

Table 13: Comparison of EIS Predictions and Monitoring Data – Greenhouse Gas

Parameter	Monitoring Point	Monitoring Frequency	Emissions Calculated	Calculated CO_2-e tonnes for 2022-2023	Calculated CO_2-e tonnes for 2023-2024	EIS predicted CO_2-e tonnes for 2024[1]
Ventilation Systems						
Methane (CH4)	Main Ventilation Shaft	Real-time continuous	Emission factor to convert from tonnes of CH4 to tonnes of CO_2-e	44,541	19,000	**2,644,503**
Carbon Dioxide (CO_2)	Main Ventilation Shaft	Real-time continuous	Tonnes of CO_2-e	24,846	15,173	
Sub-Total				**69,387**	**34,173**	
Other (Fuel, Electrical Power and Other Fugitive Emissions)						
Diesel Use	Calculated from invoices	Annually	Emission factor to convert from kL use to tonnes of CO_2-e	8,475	9,848	**112,017**
Oil Use	Calculated from invoices	Annually	Emission factor to convert from kL use to tonnes of CO_2-e	90	122	
Grease Use	Calculated from invoices	Annually	Emission factor to convert from kL use to tonnes of CO_2-e	1	2	
Electricity Use	Calculated from invoices	Annually	Emission factor to convert from kWh use to tonnes of CO_2-e	50,378	49,608	
ROM Coal Production	Calculated from weight meter and survey	Monthly	Fugitive emissions factor based on ROM production[3]	128,957 (closed mine calculation, U/G Fugitives)	151,051 (closed mine calculation U/G fugitives)	
Gas Drainage[4]	-	Annually	Tonnes of CO_2-e	0	0	
Sub-Total				**187,901**	**210,631**	
Total				**257,288**	**244,804**	**2,756,520**

Note: kL = kilolitres, OC = Open Cut, UG = Underground, kWh = kilowatt hours.

1. Refer to Tables 16 and 17 of Appendix B of the WCPL EIS (Resource Strategies 2003).
2. Anomalous results recorded during 2014 for non-combustible grease and oil use are believed to be due to human error in internal accounting procedures.
3. Wambo Open Cut uses Method 2 in situ measured emissions calculations for fugitive emissions. This involves the application of a gas model to as-mined pit shells for the year to generate the measured emissions number.
4. Financial Year 17/18 was the first time that a gas drainage plant was used. The plant was used intermittently.

5.5 Meteorology

WCPL is required to maintain a meteorological monitoring station at the Mine and monitor the parameters specified in Condition B50, Schedule 2 (DA 305-7-2003) and EPL529 (Condition M4), using the specified units of measure, averaging period, frequency and sampling method described in the tables.

WCPL maintains the meteorological monitoring station in accordance with AS 2923-1987. The following parameters are monitored by the meteorological monitoring station, in accordance with WCPL's statutory conditions:

- temperature (at 2 m and 10 m);
- rainfall;
- lapse rate;
- wind speed (at 10 m);
- wind direction (at 10 m);
- solar radiation (at 10 m);
- humidity; and
- sigma theta.

Table 14 summarises the annual rainfall, temperature and wind direction data for 2024, compared to previous reporting periods.

Table 14: Environmental Performance – Meteorology (2016-2024)

Parameter	2016	2017	2018	2019	2020	2021	2022	2023	2024
Rainfall (mm)	721.18	442.50	536.2	387.4	966.6	1,188.6	1192.6	477.8	720.8
Maximum Temperature (°C)[1]	41.6 (Dec)	46.8 (Feb)	43.8 (Jan)	44 (Jan)	45 (Jan)	38.4 (Jan)	36.5 (Feb)	42.9 (Dec)	41.8 (Feb)
Minimum Temperature (°C)[1]	-3.4 (July)	-3.5 (July)	-5.5 (July)	-2.9 (Aug)	-1.5 (July)	-2.7 (July)	-1.3 (June)	-3.5 (July)	-1.6 (June)
Mean Temperature (°C)[1]	18.4	18.5	18.7	19.2	17.9	17.1	16.7	18.2	18.4
Predominant Wind Direction	S/SE (summer) SW (winter)	S/SE (summer) W/SW (winter)	S/SE/E (summer) NW (winter)	E/SE (summer) WNW/ NW (winter)	SE (summer) NW (winter)	SE (summer) NW (winter	SE (summer) NW (winter)	SE/ESE (summer) NW/ WNW (winter)	SE/ESE (summer) NW/ WNW (winter)

Note: °C = degrees Celsius, E = East, SE = South-east, W = West, NW = North-west, S = South, SW = South-west, mm = millimetres.

1. Measured at 2 m above ground.

5.6 Biodiversity

WCPL implemented the Biodiversity Management Plan (BMP) during the reporting period.

The BMP applies to all activities undertaken within WCPL's mining authorisations and approved mining areas that may impact on biodiversity, as well as biodiversity in WCPL's RWEAs and Open Cut Revegetation Areas. The BMP has been developed to:

- identify lands to be managed in accordance with this BMP;
- provide a framework for the management of biodiversity in the RWEAs and Open Cut Revegetation Areas;
- provide a clear, concise set of management actions and a schedule for the coordinated and effective delivery of biodiversity enhancement;
- define realistic Completion Criteria for RWEAs and Open Cut Revegetation Areas that can be quantitatively evaluated through a seasonally based monitoring program;
- define a seasonally based monitoring program suitable for determining management success (or otherwise);
- provide suitable contingency measures and associated Trigger Action Response Plans (TARPs) that adequately address any deviation from the Completion Criteria; and
- define the responsibilities for implementing, reviewing and reporting on the BMP.

The BMP also meets the requirement for a Biodiversity Management Plan under Condition B7(f), Schedule 2 of DA 305-7-2003 in support of the Extraction Plan for the South Bates Extension Underground Mine Longwalls 24 to 26.

It also addresses the requirements within the Voluntary Conservation Agreements (VCA) prepared under Condition B74 (g), Schedule 2 of DA 305-7-2003, and the requirements of the EPBC Act approvals (EPBC 2003/1138, EPBC 2016/7636 and EPBC 2016/7816).

5.6.1 Approval Criteria/EIS Predictions and Management Plan Requirements

Performance measures for subsidence impacts on biodiversity are detailed in Condition B1, Schedule 2 of DA 305-7-2003 (**Section 5.9.2**). In addition, performance measures for aquatic ecosystems are detailed in Condition B62, Schedule 2 of DA 305-7-2003 (**Section 6.0**).

WCPL is required to monitor and report on biodiversity in accordance with the conditions of DA 305-7-2003, DA 177-8-2004, EPBC 2003/1138, EPBC 2016/7636, EPBC 2016/7816 and the approved BMP.

The BMP includes biometric monitoring methodology. In September 2021 the BMP was modified to remove Landscape Function Analysis (LFA) as a monitoring method following recommendations from BCD. The floristic performance criteria are provided in **Table 15**.

Table 15: Floristic Performance Criteria for Plant Community Types in RWEAs and Performance Targets for Older Woodland Areas and Rehabilitation Sites

	Attribute[1]									
	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	OR	HBT	FL
Rehabilitation										
Older Woodland Areas with a canopy of Sugar Gum	>15	15-40	5-40	5-15	5-10	5-15	<20	1	-	5
Areas of Narrow-leaved Ironbark – Bull Oak – Grey Box open forest	>20	10-40	5-10	15-50	5-10	5-40	<20	1	-	-
RWEAs										
PCT42[2]	>20	10-50	10-50	20-60	1-5	5-30	<10	1	-	-
PCT1658[2]	>20	10-40	10-50	4-20	5-30	5-35	<10	1	-	-
PCT1603[2]	>25	10-40	5-10	15-50	5-10	5-40	<5	1	-	-
PCT1604[2]	>35	15-40	5-20	30-50	5-15	5-40	<5	1	-	-
PCT1176[2]	>21	15-40	5-30	5-30	0-25	2-10	<5	1	-	-
PCT1584[2]	>45	15-45	5-40	5-40	10-20	5-20	0	1	-	-

1. NPS = the number of native plant species (native to NSW), NOS (%) (including *E.cladocalyx*) = projected native foliage cover of canopy, NMS (%) (including *A.saligna*) = projected native midstorey cover, NGCG = native groundcover of grasses, NGCS = native groundcover of shrubs, NGCO = native groundcover of other plant types (sedges, herbs etc.), EPC = exotic plant cover, OR = overstorey regeneration over the whole vegetation zone, HBT = hollow bearing trees, FL= length of fallen logs >10 cm diameter within the vegetation plot, PCT = plant community type.
2. PCT42: River Red Gum/River Oak riparian woodland wetland in the Hunter Valley.
   PCT1658: Rough-barked Apple – Narrow-leaved Ironbark – Blakely's Red Gum – Bull Oak – Coast Banksia woodland on sands of the Warkworth area.
   PCT1603: Narrow-leaved Ironbark – Bull Oak – Grey Box shrub – grass open forest of the central and lower Hunter.
   PCT1604: Narrow-leaved Ironbark – Grey Box – Spotted Gum shrub – grass woodland of the central and lower Hunter.
   PCT1176: Slaty Box – Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion.
   PCT1584: White Mahogany – Spotted Gum – Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley.

5.6.2 Performance during the Reporting Period

During the reporting period, WCPL commissioned Eco Logical Australia to monitor the fauna and vegetation structure within the RWEAs and rehabilitation areas. Floristic surveys, bird surveys, LFA and riparian condition surveys were all conducted during Spring 2024 across both remnant woodland, general surface and rehabilitation areas. A copy of the Annual Flora and Fauna Monitoring Report Volume 1 and 2 prepared by Eco Logical Australia (2025) is included in **Appendix E**.

Results from 2024 surveys indicate that remnant woodland sites within RWEAs are generally performing well. Overall, native flora species diversity and native ground cover remains high with some decreases, likely in response to the above average rainfall in the past three years and lower rainfall in 2024 (**Appendix E**).

High exotic cover was recorded in RWEA A and RWEA Rail Loop within the Rough-barked Apple - Narrow-leaved Ironbark - Blakely's Red Gum - Bull Oak - Coast Banksia woodland on sands of the Warkworth area community and in the River Red Gum / River Oak riparian woodland community. The recorded levels failed to meet the performance criteria and Voluntary Conservation Area (VCA) targets at several sites. Key exotic species in these zones are *Melinis repens*, *Bryophyllum* sp., *Eragrostis curvula*, and *Ehrharta erecta* (**Appendix E**).

Bird survey results from remnant woodland sites within the RWEA areas reflected the good condition of these woodland areas continuing to support a large diversity of birds including several threatened species. Bird diversity and communities were largely consistent with the data available from previous monitoring years and the monitoring data does not indicate any major declines in local bird communities (**Appendix E**).

Floristic monitoring in the NWCD recorded acceptable native species diversity and native ground cover. Cover of shrubs and canopy were low however this is expected during establishment phase. Significant growth in Eucalypt and Acacia trees and shrubs was observed, including several areas where trees have naturally established along the creek channel. A large proportion of the NWCD remains as grassland and will require additional revegetation efforts to establish the target vegetation communities. An increased number of floristic sites is required to monitor this area (**Appendix E**).

The average total Riparian condition scores for Stony Creek, North Wambo Creek and South Wambo Creek were the highest recorded results compared to all years of data. North Wambo Creek and South Wambo Creek recorded an increase in the average total score compared to 2023. Stony Creek recorded decrease in the average total score compared to 2023, however it returned back to levels consistent with 2020-2022

Riparian condition scores for North Wambo Creek, Wambo Creek and Stony Creek were similar to 2023 reflecting the ongoing wetter conditions in 2020 to 2023 following previous drought years from 2017 to 2019 and in response to the reduction/exclusion of grazing. Understorey vegetation cover remains high following higher rainfall in 2020 to 2023, although a high proportion of ground cover contribution is from exotic species.

Exclusion of cattle from riparian areas has been recommended in previous monitoring reports and no evidence of cattle grazing was recorded in 2024. Cattle should continue to be excluded from riparian areas to encourage tree regeneration and prevent erosion. Evidence of pigs was recorded at one location at Stony Creek. Pig activity in the creek lines may reduce tree regeneration, promote erosion and spread exotic plant species. There is an active pig control program at the Mine, and it was recommended that this area be considered for targeted pig management. Planting native trees in over-cleared areas to facilitate more rapid regeneration is also recommended (**Appendix E**).

The *Melaleuca decora* low forest GDE community along North Wambo Creek was recorded to be in good condition with scores for most attributes increasing since 2019. This community was undermined during 2019 and 2020, and data collected to date may serve as suitable baseline for this community noting that 2019 was a dry year followed by wetter conditions in 2020, 2021 and 2022 and returning to drier conditions in 2023. The BioMetric results from the *Melaleuca decora* forest has shown minor fluctuations but remain stable with levels consistent to 2019-2020 results (**Appendix E**).

The River Oak riparian tall woodland GDE recorded tree growth and similar canopy extent, suggesting the health of the trees is mostly stable. Variation in results between the drier years in 2019 and 2023 and wetter years in 2020, 2021 and 2022 is likely to be useful to understand the natural changes which occur in the community when attempting to determine whether any future changes observed are the result of mining impacts or natural variation. The extent of the community remains unchanged since originally mapped in 2019, however the wetter years in 2020, 2021 and 2022 may have provided suitable conditions for the spread and germination of canopy and mid storey species which in the coming years may result in an increase in the extent of the community. (**Appendix E**).

Floristic and bird monitoring sites established in 2020 in the South Bates Extension underground mine area, including reference sites outside of the mining area were monitored for the third year. Vegetation and bird communities were recorded in good condition. An overall decrease in bird species richness was recorded, however no significant impacts to floristic attributes or bird communities were observed at sites within areas impacted by undermining to date (**Appendix E**).

Subsidence cracks were noted near flora site V11-B1 as per recent years. These cracks appeared slightly larger in 2024, however the cracking was not having any observable significant impacts on vegetation at the current time, with the adjacent trees and shrubs showing no visible signs of stress or damage (**Appendix E**).

5.6.3 Trends and Key Management Implications

The majority of RWEAs remain in good condition with high numbers of native species, few exotic species present and with low cover and abundance. No major issues were identified that require urgent management (**Appendix E**).

The number of native species generally increased from the previous year and was relatively high in several PCTs. The 2024 results appear to confirm that some lower scores for native species diversity recorded in recent years were a result of the dry conditions, with the increase in 2021 and 2022 in response to higher rainfall (**Appendix E**).

However, as reported in previous years, exotic species cover remains relatively high in RWEA A and continues to exceed performance criteria and VCA targets in certain locations. Continued weed management will be required to achieve performance criteria in these riparian and floodplain areas. In other areas within RWEA A, *Eragrostis curvula*, *Melinis repens* and *Bryophyllum* sp. continue to persist despite ongoing management efforts, and continuation of follow-up treatment is required.

The Rough-barked Apple - Narrow-leaved Ironbark - Blakely's Red Gum - Bull Oak - Coast Banksia woodland (PCT 1658) in RWEA A appears to be suffering from *Banksia integrifolia* die-off in the mid-storey, first observed in 2019. Low cover of Banksia integrifolia was recorded in 2023 in RWEA A monitoring plots V5B1 and V5B2. This observation suggested Banksia individuals may be recovering, or new plants may have germinated. In March 2024, *Banksia integrifolia* in RWEA A appeared to have successfully resprouted since dying back. New growth appeared healthy, and young flowers were present at the time of the site inspection when soil samples were collected. Ongoing monitoring within these plots will provide additional data on the recovery or ongoing decline of this species locally. This community recorded a lower than average exotic covers compared to higher exotic covers recorded in 2022. This community occurs on sandy soils, and it is possible the soils suffered more significant drying during the recent dry years than other areas and the rainfall to date has not been sufficient to recharge the soil (**Appendix E**). Future monitoring will continue to record the condition of this community and increased weed control will be applied.

The average number of bird species per site was lower than the levels recorded in previous years. It is recommended to continue monitoring this statistic. However, average individual birds per survey was broadly consistent with previous year (**Appendix E**).

As vegetation and habitat attributes in RWEA areas have remained relatively stable over time, variability in diversity and abundance between years is likely explained by a combination of factors such as varying numbers of nomadic and migratory bird species, weather and climate, sampling methods, differences in the skill of observers, the timing of surveys and surveys coinciding with the flowering of trees and also broader landscape scale and seasonal changes across the Hunter Valley. The total number of bird species detected each year has varied over time and the 77 species recorded during 2024 is within the range of previous years.

Threatened species appear to be persisting within the RWEAs, with Grey-crowned Babbler, Brown Treecreeper and Varied Sittella recorded in similar or greater numbers than the previous year. (**Appendix E**).

5.6.4 Implemented or Proposed Management Actions

In 2018, 50 nest boxes were installed in five clusters within RWEAs B, C and D. Three nest boxes had fallen to the ground and were replaced in March 2023. The third round of nest box monitoring was undertaken in September 2024, with fourteen nest boxes showing evidence of use and four occupied at the time of survey. Most nest boxes were noted to be in good condition.

WCPL will continue to give priority to managing weed species listed under the *Biosecurity Act 2015* that have the potential to become problematic in the wider region (e.g. *Olea europaea* subsp. *cuspidata* [African Olive]). A targeted weed survey and updated Annual Weed Treatment Plan were created in 2024, which recorded weed issues, incorporating the results of this monitoring program, and outlined proposed strategy for weed treatment in 2024/2025 in detail. WCPL has engaged Enright Land Management (ELM) to facilitate the management of target weed species across WCPL and within RWEAs A, B, C, D and E (Appendix E).

5.7 Heritage

WCPL manages Aboriginal heritage on-site in accordance with the relevant conditions of DA 305-7-2003 and the conditions of Aboriginal Heritage Impact Permits (AHIPs) #2222, #C0001474, #C0002000, #C0003213 and #5158. These AHIPs allow for the disturbance and/or salvage of all known and unknown Aboriginal objects within the extent of the relevant AHIP boundaries. Any Aboriginal objects salvaged under these permits are managed in accordance with a Care Agreement.

In 2016, WCPL developed a Heritage Management Plan (HMP) for the Mine, to consolidate all statutory requirements into one document and assist in the management of Aboriginal cultural heritage on-site. The HMP was updated in June 2023 for the inclusion with the Extraction Plan for Longwalls 24 to 26 which was approved in December 2023.

Aboriginal Cultural Heritage surveys were conducted associated with the South Dam Discharge Pipeline Corridor project. An Aboriginal due diligence survey was conducted in March 2024, which included excavation of several test pits and salvages undertaken in the pipeline corridor under AHIP #2222 and #C0002000. Following consultation with Heritage NSW, a Cultural Heritage Assessment Report was completed for the South Dam Discharge Pipeline outlet, located adjacent to Wollombi Brook, to accompany an application to vary AHIP #C0002000. The application was lodged with Heritage NSW in October 2024 and was granted 13 December 2024. A copy of the Aboriginal Cultural Heritage Assessment Report and Salvage reports were provided to Heritage NSW and the Registered Aboriginal Parties (RAPs) as required.

Archaeological sites 327 and 519 were salvaged above LW24 prior to subsidence remediation being undertaken. Open artefact sites were salvaged from the surface in the South Wambo Dam discharge pipeline corridor in July 2024, under AHIP #2222 and #C0002000. This included two new small open artefact sites (Wambo Site 529 and Wambo Site 530) which were identified during the inspection and a partial salvage of Wambo Site 473. Copies of the salvage reports were provided to Heritage NSW and the RAPs.

5.8 Non-Aboriginal Heritage

WCPL is required to prepare a Conservation Management Plan (CMP) for the Wambo Homestead Complex (WHC) in accordance with Condition B89, Schedule 2 of DA 305-7-2003. The current CMP (Version 6) was approved in May 2019.

Maintenance work that continued during the reporting period was guided by the Preventative and Cyclic Maintenance Program outlined in Table 15 of the CMP. Maintenance activities conducted at the WHC during the reporting period included general clean-up of the site, additional engineered propping, roofing of the servant wing, weed and pest control, installation of termite new baiting system (ongoing).

Section 57 Standard Exemption 19 works to repair and secure the Kitchen Wing commenced in 2022 and is ongoing. The removal of salt residue with a proprietary chemical poultice system was continued in 2024. After assessment in 2023, the structural wall remediation and roof repairs to Kitchen Wing were ongoing in 2024. Preparations for cellar stone repairs began in 2024, with works to continue in 2025 to stabilise the cellar.

A Section 60 application was submitted and approved in 2020, and the stabilisation works began in 2023. In 2023, the servants wing underwent significant repair, requiring the careful re-building of the walls, re-stabilising the chimney, rafters, and battens. The new roof was secured, flashing and gutters were installed on the servants wing in 2024.

An annual photographic record of the elevations of all structures at the WHC was completed during the reporting period and lodged with the Heritage Branch, Singleton Council and DPHI on early 18 December 2024, in accordance with Condition B91, Schedule 2 of DA 305-7-2003. During the reporting period, WCPL undertook no blasting that was within 2 km of the WHC.

In an effort to improve access to studies, reports, plans and surveys that have been prepared for the Wambo Homestead, WCPL created a platform on the Peabody website, specific to the WHC. Content includes '*Wambo Homestead-an artist's impression'* by Vivian Dwyer 2007, an outline of the history of the WHC, a drone fly-over video and black and white archive photographs. The website can be accessed at:
https://www.peabodyenergy.com/Operations/Australia-Mining/New-South-Wales-Mining/Wambo-Homestead

5.9 Subsidence

During the reporting period, underground mining occurred at Longwalls 24A and 24B of the South Bates Extension Underground Mine. Subsidence monitoring was undertaken in the reporting period for Longwalls 23 and 24A. At the time of subsidence monitoring and reporting, mining has not yet commenced at Longwall 24B.

5.9.1 Relevant Extraction Plans

Longwall mining during the reporting periods was undertaken in accordance with the relevant Extraction Plans, in accordance with Condition B9, Schedule 2 of DA 305-7-2003. A summary of the Extraction Plan reporting requirements related to subsidence is provided in the subsection below.

5.9.1.1 Extraction Plan for South Bates Extension Underground Mine Longwalls 24 to 26

The following reporting is required to be undertaken as part of the Extraction Plan for South Bates Extension Underground Mine Longwalls 24 to 26:

- Incident Report – to be prepared as required and submitted (by email) to DPHI (Manager, Mining Projects), NSW Resources Regulator (Subsidence Executive Officer), Subsidence Advisory NSW (District Manager) and other regulators as specified in management plans.
- Subsidence Management Status Reports – to be updated fortnightly and submitted (by email) if new impacts are identified or upon request, to DPHI (Manager, Mining Projects) and NSW Resources Regulator (Subsidence Executive Officer).
- Six Monthly Report – to be updated annually for the period 1 January to 30 June and submitted (by email) to DPHI (Manager, Mining Projects) and NSW Resources Regulator (Subsidence Executive Officer).

- Annual Review – to be updated annually for the period 1 January to 31 December and submitted (by email and/or post) to DPHI (Manager, Mining Projects), NSW Resources Regulator (Subsidence Executive Officer), NSW Resources Regulator (Manager Environmental Sustainability), Subsidence Advisory NSW (District Manager), BCD/EPA (General Contact), NSW DCCEEW (Water Regulation), Singleton Council (General Manager) and CCC Members.

5.9.2 Approval Criteria/EIS Predictions and Management Plan Requirements

In accordance with Conditions B1 and B4, Schedule 2 of the Development Consent (DA 305-7-2003), WCPL must ensure that there are no exceedances of the Subsidence Impact Performance Measures detailed in Tables 1 and 2 of the Development Consent (**Table 16**).

Table 16: Subsidence Impact Performance Measures[1]

Aspect	Performance Measures[2]
Water – Wollombi Brook	Negligible subsidence impacts and environmental consequences. Release of water from the site only in accordance with EPL requirements.
Land – Low level cliffs within the South Bates Extension Area	Minor environmental consequences (that is occasional rockfalls, displacement or dislodgement of boulders or slabs, or fracturing that in total do not impact more than 5% of the total face area of such features).
Biodiversity – Wollemi National Park	Negligible subsidence impacts and environmental consequence.
Biodiversity – Warkworth Sands Woodland Community	Minor cracking and ponding of the land surface or other subsidence impacts. Negligible environmental consequences.
Biodiversity – White Box, Yellow Box, Blakely's Red Gum Woodland/ Grassy White Box Woodland Community	Minor cracking and ponding of the land surface or other subsidence impacts. Negligible environmental consequences.
Biodiversity – Central Hunter Valley Eucalypt Forest and Woodland Ecological Community	Minor cracking and ponding of the land surface or other subsidence impacts. Negligible environmental consequences.
Biodiversity – Conservation Areas (including the proposed Wambo offset area under SSD 7142)	Negligible reduction to previously identified biodiversity credits.
Biodiversity – Threatened Species and Communities	Minor cracking and ponding of the land surface or other subsidence impacts. Negligible Environmental consequences.
Heritage – Wambo Homestead Complex	Negligible impact on heritage values, unless approval has been granted by the Heritage NSW and/or the Minister.
All Built Features (including public infrastructure and all structures on privately-owned land)	Always safe. Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. Damage must be fully repairable, and must be fully repaired or else replaced or fully compensate.
Public Safety	Negligible additional risk.

1. Note, the Subsidence Impact Performance Measures listed in Table 16 have been modified following the approval of MOD 19 in January 2023.
2. Note, the requirements of this condition only apply to the impacts and consequences of mining operations undertaken following the date of approval of Modification 9.

Underground mining was undertaken at South Bates Extension Underground Mine Longwalls 24A, 24B and 25 during the reporting period. Longwall 24A was completed in June 2024, Longwall 24B was completed in October 2024, and mining at Longwall 25 commenced in November 2024 and is anticipated to be completed in April 2025. Inspections of Longwall 23 and 24A were completed in the reporting period.

No longwall panels encroached upon the Wollombi Brook, Warkworth Sands Woodland Community or the White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community.

South Bates Extension Underground Mine Longwall 23 undermined North Wambo Creek (NWC) during the final 170m of the panel. Weekly inspections were conducted of NWC whilst mining occurred within 100m of the creek and identified negligible subsidence impacts not requiring remediation.

Longwalls 23 and 24A are offset from the base of the Wollemi National Park escarpment by a minimum 26.5 degree angle of draw. No impacts to the escarpment were observed during the reporting period (**Section 5.9.3**).

WCPL does not have approval for undermining of the WHC and as such no evidence of subsidence related impacts were identified during the reporting period. No impacts to non-Mine built features or threats to public safety resulting from the discussed mining activities were identified during the reporting period.

5.9.3 Performance during the Reporting Period

5.9.3.1 Subsidence Surveys

During the reporting period, WCPL undertook longwall mining in the South Bates Extension Underground Mine Longwalls 24A, 24B and 25 (**Section 3.1**). Subsidence monitoring was undertaken in accordance with the South Bates Extension Underground Mine Longwalls 21 to 24 Extraction Plan. Subsidence monitoring was undertaken for Longwalls 19, 20, 21 22, 23 and 24A (within 10 months of the longwalls being competed). Results for Longwalls 24B and 25 will be reported in the next Annual Review.

Table 17 summarises the actual versus predicted subsidence results for Longwall 23 at the South Bates Extension Underground Mine. The monitoring shows that the actual maximum subsidence recorded across Longwall 17 to 23 are generally similar but less than the predicted values [MSEC] 2024).

Table 18 summarises the maximum observed versus predicted subsidence parameters for Longwall 24A at the South Bates Extension Underground Mine. The maximum measured vertical subsidence is less than the maximum predicted vertical subsidence at LW 24A.

Table 17: Subsidence Monitoring – Actual versus Predicted for South Bates Underground Mine Longwalls 17 to 23 (8XL-Line)

Parameter	Predicted[1]	Actual[1]	Consistent with Predicted Range
Maximum Vertical Subsidence (mm)	1800	1225	Y
Maximum Tilt (mm/m)	50	26	Y
Maximum Hogging Curvature (km^{-1})	3.0	1.0	Y
Maximum Sagging Curvature (km^{-1})	2.5	0.9	Y

1. *South Bates Extension Underground Mine Subsidence Review Report for the South Bate Extension Underground Mine WYLW23* and *WYLW24A* (MSEC 2024).

Table 18: Subsidence Monitoring – Actual versus Predicted for Longwall 24A (9XL-Line)

Parameter	Predicted[1]	Actual[1]	Consistent with Predicted Range
Maximum Vertical Subsidence (mm)	1800	1525	Y
Maximum Tilt (mm/m)	50	44	Y
Maximum Hogging Curvature (km^{-1})	3.0	2.6	Y
Maximum Sagging Curvature (km^{-1})	2.5	1.5	Y

5.9.3.2 LiDAR Surveys

The changes in surface level due to mining at the South Bates Extension Underground Mine have been measured using Light Detection and Ranging (LiDAR) surveys. The changes in surface level due to the mining of Longwalls 17 to 23 and Longwall 24A have been determined by taking the differences between the surface levels measured in the LiDAR surveys carried out on 1 May 2017 (before the commencement of Longwall 17) and 20 May 2024 (nearing the completion of mining at Longwall 24A)

It should be noted that LiDAR surveys have an accuracy in the order of ±50 to ±150 mm. The accuracy of the observed changes in surface levels (i.e. the difference between the two surveys), therefore is in the order of ±100 to ±300 mm.

LiDAR survey results for Longwalls 17 to 24A are as follows (MSEC, 2024):

- The measured changes in surface level are greater than predicted adjacent to the commencing and finishing ends of Longwalls 23 and 24A partially due to the effects of the steep slopes beneath the escapement on the LiDAR surveys.
- The measured profiles of Longwalls 23 and 24A reasonably match the predicted profiles of vertical subsidence.

- It is considered that the ground movements measured using the LiDAR surveys are consistent with the prediction provided in the South Bates Extension Underground Mine Longwalls 21 to 24 Extraction Plan, and the South Bates Extension Underground Mine Longwalls 24 to 26 Extraction Plan.
- The subsidence model appears to be providing conservative predictions based on the single-seam mining conditions.
- No changes to the subsidence model are recommended based on the measured subsidence effects from the LiDAR survey.

5.9.3.3 Visual Inspections

Visual inspections were carried out by WCPL during and after the extraction of Longwalls 17 to 23 and Longwall 24A at the South Bates Extension Underground Mine (MSEC 2024). The surface cracks were mapped and added to the WCPL's subsidence impacts register.

Surface cracking predominately occurred above north-eastern end of Longwall 23 and above the northern end of Longwall 24A. The cracking was identified along and adjacent to the unsealed roads and tracks and accessible areas. However, long grass elsewhere made identification of surface deformations more difficult (MSEC, 2024).

The recorded surface crack widths above Longwalls 17 to 23 and Longwall 24A typically range between 10 mm and 50 mm (i.e. 90 % of cases) and the majority of the recorded crack widths are less than 200 mm (i.e. 99 % of cases). However, potholing was identified in several locations where the overall widths of the deformations exceeded 300 mm due to weathering and erosion. (MSEC, 2024).

It is considered that the recorded surface deformations above Longwalls 17 to 23 and Longwall 24A are typically within the range assessed. While surface cracking up to approximately 300 mm occurred in isolated locations, these impacts represent less than 1% of the total length of mapped surface cracking above the mining area (MSEC, 2024).

5.9.3.4 Bi-annual Audits of Subsidence Impacts

Bi-annual audits (May and November) of subsidence impacts were undertaken during the reporting period to identify new subsidence impacts over the South Bates Extension Underground Mine and to determine the status of known subsidence impacts (e.g. have they self-repaired, are they stable but pose a risk to long-term sustainable land use, or are they deteriorating in condition).

During the reporting period, subsidence monitoring and remediation focused on the South Bates Extension Underground Mine in the vicinity of Longwalls 19 to 23 and Longwall 24A.

The remediation of sites on and adjacent to access roads occurred throughout the year and consisted primarily of reactive subsidence remediation. The sites ranged from small potholes to cracks several meters in length. Due to a high volume of ground vegetation above Longwalls 22 and 23, limited subsidence impacts were observed. This resulted in no targeted subsidence remediation campaign in the South Bates Extension area occurring in 2024.

The methodology used continues to be fine-tuned with remediation of sites primarily including:

- Excavate the subsided area using an excavator. Store topsoil and subsoil in separate piles for later use.
- Excavate site until no subsurface void is identified or to the limit of the excavator.
- Insert geofabric to line the floor of the excavated pit.
- Backfill the pit using the excavated material mixed with gypsum at 2%.
- Compact the excavated material in layers using the back of the excavator bucket up to surface level.
- Topsoil and seed the disturbed area.

Bi-annual detailed subsidence monitoring will continue to monitor further subsidence, vegetation coverage and weeds in the next reporting period.

5.9.3.5 Remediation of Subsidence Impacts to 'Kharlibe'

In 2018, a Subsidence Remediation Plan (SRP) was developed for the 'Kharlibe' property located in Bulga, approximately 20 km west-southwest of Singleton in the Upper Hunter Valley of NSW.

Between 1991 and 2000, the property was undermined by the former Homestead Mine (owned by WCPL, now a subsidiary of Peabody Energy Australia Pty Ltd). The mining occurred within CL 397 and CCL 743 held by WCPL. The longwall mining resulted in the surface of the ground being lowered, and the formation of subsidence cracks – some of which took time to migrate through the alluvium to reach the surface.

Historical subsidence remediation works have been undertaken across the property by various contractors and consultants since the late 1990's. The success of these works was mixed and, in some instances, require remedial works.

In February 2018, the Resources Regulator issued a Notice under Section 240 (1)(b) and (c) of the *Mining Act 1992* (Mining Act) that required WCPL to prepare a SRP for Kharlibe. SLR and SCT Operations Pty Ltd (SCT) were approved as suitably qualified experts to prepare the SRP in consultation with the landholder and the Resources Regulator.

A second Section 240 Notice was issued by the Resources Regulator on 19 September 2019, requiring WCPL to:

- implement subsidence remediation works and associated works in accordance with the Subsidence Remediation Plan (with timing of works and associated monitoring bound by the Project Gantt Chart); and
- to provide quarterly Subsidence Remediation Reports including field observations, remediation works methodologies and results of any monitoring.

Initial (Phase 1) remediation works were undertaken at two sites on 21 and 22 May 2019. These features included an isolated sinkhole, a close spaced row of sink holes and five small depressions. The purpose of this initial remediation works was to identify constraints and opportunities to guide future remediation works.

The Phase 2 remediation works were undertaken from 17 – 21 June 2019 as they were considered high priority works. These works included the remediation of 20 sites.

Phase 3 remediation works were undertaken from 15 July – 20 December 2019 and included landform design and remediation works. Phase 3 works in 2019 included the remediation of 51 sites, with 33 completed in October to December 2019.

Phase 4 remediation works were undertaken across the Kharlibe property within Stony Creek (Site 99) between 3 – 24 March 2020. Further Phase 4 remediation works were undertaken throughout each quarter of 2020 with both newly treated areas and maintenance works on previously remediated sites occurring.

Throughout the reporting period ongoing maintenance works and monitoring was conducted across previously rehabilitated sites. Maintenance works included remediation of 30 sites during a targeted remediation maintenance campaign in October 2024.

5.9.3.6 Visual Inspections of Wollemi Escarpment (via Drone)

Baseline cliff top mapping of the Wollemi National Park escarpment in the vicinity of the South Bates Underground Mine was undertaken during 2015 utilising an Unmanned Aerial Vehicle (Microdrone MD4-1000) and a high-resolution camera along a designated route. Photos were taken of the cliff top at designated intervals and stitched to form a high-resolution panoramic image which can be used to assess subsidence. The route has been recorded and programmed to be repeatable from year to year.

The cliffs associated with the Wollemi escarpment were visually inspected using drones. The cliffs were inspected in October 2018 (before the extraction of Longwall 17), August 2019 (after the extraction of Longwall 17), August 2020 (after extraction of Longwall 19), April 2021 (after extraction of Longwall 20), October 2022 (after extraction of Longwall 21), March 2023 (after extraction of Longwall 22), October 2023 (during extraction of Longwall 23) and March 2024 (after extraction of Longwall 23). There were no cliff instabilities identified from the drone surveys along the section of escarpment adjacent to Longwalls 17 to 23.

It is noted that a boulder and train was previously observed along these section of escarpment, however the baseline arial photographs show that this occurred before May 2017, and, therefore before the commencement of mining at the South Bates Extension Underground Mine (WCPL, 2021).

Two rockfalls have been identified along sections of the escarpment located well away from the active longwalls at the South Bates Extension Underground Mine. The starting point of the site is approximately 1.9 km north-west from the maingate of Longwall 21.

5.9.4 Trends and Key Management Implications

It is considered by MSEC (2024) that the observed ground movements for South Bates Extension Underground Mine Longwalls 17 to 24A were consistent with predictions. It is also considered that the impacts on the natural and built environment are similar to those assessed and predicted.

Given the above, WCPL will implement the approved Extraction Plans for South Bates Extension Underground Mine Longwalls 24 to 26 in the next reporting period.

5.9.5 Implemented or Proposed Management Actions

During the next reporting period, WCPL will continue to implement the approved Extraction Plans for South Bates Extension Underground Mine Longwalls 24 to 26.

WCPL will also continue with the program of works for the remediation of the subsidence impacts identified by the bi-annual subsidence audits in areas away from active subsidence (**Section 5.9.3**).

5.10 Exploration

Eleven surface boreholes were completed in April 2024, with the primary purposed of collecting ongoing groundwater data. Two underground in seam (UIS) bores (MG25-4A-EX02 and S10-3B-IS01) were completed in August and September 2024. Seam gas coring for virgin gas assessment was undertaken in both UIS bores.

5.11 Waste

Waste management at WCPL is undertaken by a licensed waste management company under the basic principles of the Total Waste Management System (TWMS). Significant benefits of the TWMS include:

- segregation of waste at the source;
- expansion of recycling capabilities;
- reduction in the risk of contaminating non-hazardous waste;
- comprehensive monthly reports detailing volumes, recycling, disposal and transportation of waste; and
- improved data capture to increase the efficiency and accuracy when reporting.

During the reporting period, a total of 2,076,912 kilograms (kg) of waste was generated by the Mine. Of this, 896,017 kg was taken off-site for recycling. Of the total waste generated by site, 64.3%was recycled.

The total waste sent off-site by the Mine in 2024 (1,393,912 kg) was less than the amount of waste sent off-site in 2023 (1,731,902 kg) and the recycling rate for 2024 (64.3%) was also higher than to 2023 (60.01%) (**Figure 7**).

It is considered that waste minimisation program at the Mine has been effective during the reporting period.

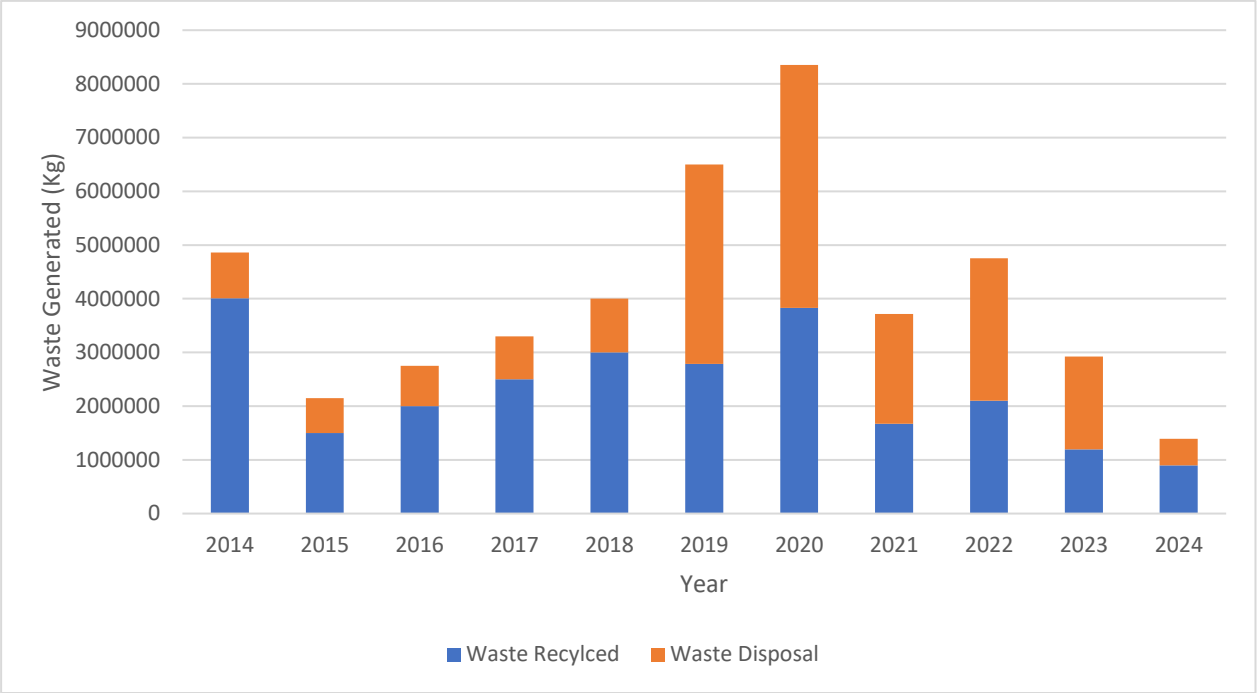


Figure 7: Waste Volumes (2014-2024)

5.12 Visual Amenity and Lighting

All mobile lighting plants are strategically positioned to avoid light being directed towards WCPL's neighbours and other identified potential sensitive receptors.

There were no complaints received during the reporting period relating to lighting impacts from WCPL's mining operations (**Section 8**).

5.13 Contaminated Land

No contaminated land event, that posed a threat of potential or material harm to the environment, occurred during the reporting period. Where possible, any contaminated material is managed on-site.

5.14 Topsoil Management

During Phase 2 operations at the Mine (i.e. from 1 December 2020), WCPL will no longer undertake topsoil management for open-cut disturbance areas. It will be managed by United as a component of the UWJV. During projects conducted for underground and complex infrastructure, where salvageable quantities of topsoil are generated, these will be managed and stockpiled per the Wambo Topsoil Management Procedure.

5.15 Weed and Pest Management

WCPL commissioned ELM to undertake management and control of weed species within the operational and offset areas at the Mine during 2025. Weed management techniques included spraying and manual removal (cut and paint). During the reporting period, a total of 421 hours (46.7 days) of weed control work at the Mine was undertaken (ELM, 2024).

Weed management was undertaken in RWEA A, RWEA C, RWEA D, RWEA E, rail loop area and Wambo general areas, including General Pit Top, WHC, Wollombi Brook and North Wambo Creek Diversion. A total 38.5 hours (4.2 days) was spent weed spraying at Wambo Creek Diversion, specifically targeting Galenia, Nightshade and African lovegrass. A summary of the total areas of specific weeds treated by ELM (2024) is provided in **Table 19** and shown in **Figures 8a and 8b**.

Table 19: Approximate Area of Weeds Treated at the Mine during 2024

Weeds Treated	Area (ha)	
	Jan to June	July to Dec
African lovegrass and natal grass (dense)	16	*
African olive (sparsely scattered)	42	–
Blue Heliotrope (sparse to medium)	69	*
Paterson's Curse (dense)	68	–
Silverleaf Nightshade, Fireweed, thistles, galenia and saligna (medium)	10	10
Mother of millions	115	125
Prickly pear (medium)	75	38
African Boxthorn	Isolated Infestations	
Galenia[1]	–	7
Lantana	Isolated infestations	
General woody weeds (incl. African Lovegrass, Blue Heliotrope, Castor Oil, Fireweed, Galenia, Green Cestrum, Moth Vine and Sweet Briar)*	–	48
Total Average	**395**	**228**

Note: ha = hectares.

1 Treated at the North Wambo Creek Diversion

* included in General Woody weeds

During the reporting period, WCPL undertook a vertebrate pest management program as part of the Hunter Local Land Services Pest Species Management program, along with other mines in the area, in Autumn (May) and Spring (October), targeting wild dogs and foxes. A combination of ground and ejector baiting was used (ELM 2024).

The results of the baiting program were considered to be positive due to the high rate of baits being taken by the target species. A total of 55 (in Autumn) and 60 (in Spring) bait locations were set up with a baiting efficiency of 22% and 18%. The baiting efficiency decreased slightly in Spring and increased in Autumn compared to the previous year.

Fox takes increased from 7% to 12% in Spring and decreased from 5% to 3% in Autumn for the preceding two baiting programs.

Figure 8a: Weed Control Overview for the Mine 1 January 2024 – 30 June 2024 (Enright, 2025)

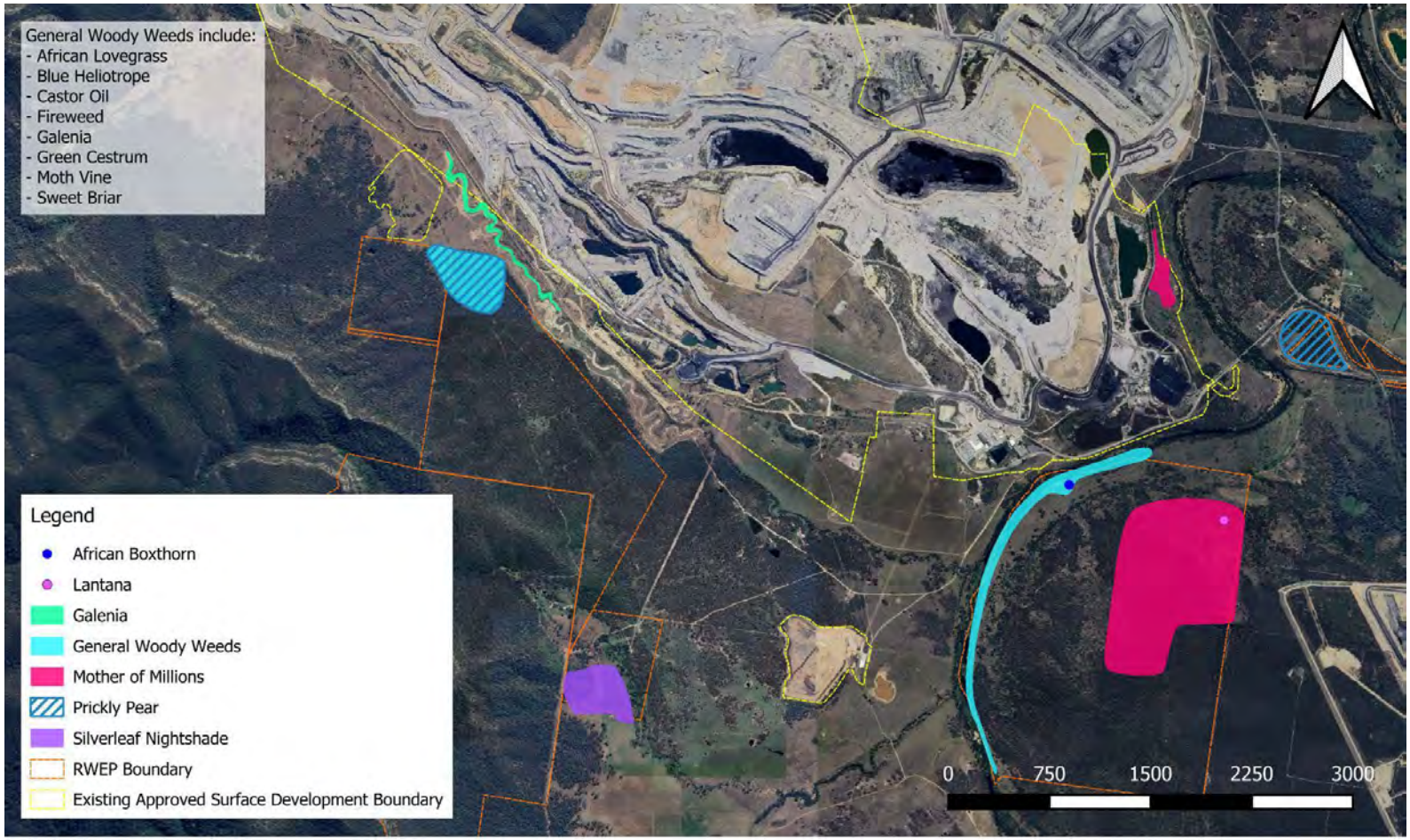


Figure 8b: Weed Control Overview for the Mine 1 July 2024 – 31 December 2024 (Enright, 2025)

Feral pig trapping was also successfully conducted at the Mine throughout 2024. Trapping was conducted through the free feeding of traps to bring in the target species. Once the target species had been identified utilising the traps, more feed was placed, and traps were set. There were four traps set up across WCPL property and monitoring for the duration of the trapping program.

During the next reporting period, WCPL intends to continue to work with Local Land Services, National Parks and Wildlife Services, neighbouring landowners and participate in coordinated pest control programs.

WCPL prepared an Annual Weed Treatment Plan in 2024 which guided weed management activities in 2024 and will continue to do so into the future. Pest and weed management will continue as required on-site and on agistment managed properties throughout the next reporting period.

5.16 Bushfire Management

There were no grassfires or bushfires reported within the mining boundaries during the reporting year. However, in late December 2024, a small bushfire ignited along the escarpment line in Wollemi National Park. The National Parks and Wildlife Service (NPWS) promptly responded, deploying a helicopter to the scene. WCPL assisted by directing them to an available water source to aid in extinguishing the fire. The NPWS later confirmed that the fire had been successfully extinguished.

Although Development Consents DA 305-7-2003 and DA 177-8-2004 no longer require a Bushfire Management Plan, hazard reduction and maintenance of fire trails will continue to be conducted as required.

During the next reporting period, WCPL will review opportunities to implement hazard reduction / environmental burning into the management of the RWEA.

5.17 Spontaneous Combustion Management

Inspections for spontaneous combustion form part of daily WCPL inspections across the two main operating areas (i.e., Underground and CHPP).

No spontaneous combustion events were identified by WCPL during the reporting period.

6.0 Water Management

Water management performance measures for the Mine are defined in Table 8 of Condition B62, Schedule 2 DA 305-7-2003 and Condition L2 of EPL529. Additional conditions relating to water supply, water and salt balances, discharge volume, effluent application to land, monitoring and recording requirements (including for the HRSTS), the NWCD, Glen Munro Dam, South Wambo Dam, WCPL's Water Management Plan and independent water audits are also detailed in these documents.

WCPL must also operate in accordance with the conditions of various water licences issued under the *Water Management Act 2000* as well as conditions of DA 177-8-2004.

6.1 Surface Water Monitoring

WCPL undertakes surface water monitoring at the Mine in accordance with the approved Surface Water Management Plan (SWMP), which is a component of the WCPL Water Management Plan. The SWMP has been developed to ensure WCPL complies with its statutory conditions relating to surface water monitoring at the Mine.

6.1.1 Approval Criteria/EIS Predictions and Management Plan Requirements

WCPL's EPL529 details the criteria for off-site water discharges (**Section 6.3.1**). WCPL has developed impact assessment criteria for surface water quality and stream flow as part of the SWMP.

For the surface water quality criteria (**Table 20**), where actual site-specific water quality monitoring data is available, the criteria have been set based on the 20th and 80th percentile for the available dataset. Where insufficient data is available, WCPL has adopted the applicable Australian and New Zealand Environment and Conservation Council (ANZECC) default guidelines values for slightly to moderately disturbed ecosystems (ANZECC 2000) or the Water Quality Objectives for the Hunter River.

Triggers for the local ephemeral creeks in the SWMP are based on the unexpected absence of flow in climatic situations when flows would be expected. The triggers would be met if there was no flow recorded at the flow monitoring site either on the day or the day after the recorded rainfall was equal to or greater than the nominated amount. Applicable criteria for stream flow are included and **Table 21.**

Table 20: Surface Water Quality Impact Criteria[1,2]

Sampling Site	Parameter[3]	Lower Limit	Upper Limit
SW02 – Wollombi Brook	pH	7.4	8.1
	EC (µS/cm)	599	1,947
	TSS (mg/L)	17 (low flow) to 308 (high flow)[4]	
SW05 – North Wambo Creek	pH	7.3	8.0
	EC (µS/cm)	1,155	2,350
	TSS (mg/L)	53 (low flow) to 1,110 (high flow)[4]	
SW07 – Wambo Creek	pH	7.4	7.9
	EC (µS/cm)	360	724
	TSS (mg/L)	29 (low flow) to 331 (high flow)[4]	
SW08 – Stony Creek	pH	6.8	7.4
	EC (µS/cm)	288	416
	TSS (mg/L)	5 (low flow) to 15 (high flow)[4]	
SW39 – Waterfall Creek	pH	7.3	7.8
	EC (µS/cm)	159	429
	TSS (mg/L)	582 (low flow) to 1,922 (high flow)[4]	

1. From Table 15 of the SWMP.
2. An exceedance occurs when water quality results exceed the impact criteria on three consecutive sampling events.
3. EC = electrical conductivity, TSS = total suspended solids, µS/cm = microSiemens per centimetre, mg/L = milligrams per litre.
4. Low flow condition based on 80th percentile of recorded concentrations and high flow criteria based on maximum recorded concentrations.

Table 21: Surface Water Flow Impact Assessment Condition

Watercourse and Flow Monitoring Site	Daily Rainfall when Flow Commenced on 80% of Recorded Occasions[1]
North Wambo Creek (FM1)	100 mm[2]
Stony Creek (FM13)	20 mm
South Wambo Creek (FM15)	20 mm

1. From Table 14 of the SWMP.
2. Streamflow measurements in North Wambo Creek daily rainfall data from stations adjacent to the catchment have been analysed and indicated a total depth of continuous rainfall depth of approximately 100 mm (can occur over more than one day) is required to generate surface flow in North Wambo Creek upstream of the diversion.

Condition B62 of DA 305-7-2003 and Condition B9 of 177-8-2004 require WCPL to comply with general water management performance measures. Performance indicators relevant to surface water are outlined in **Table 22**.

In addition, WCPL is also required to meet additional requirements, in accordance with the SWMP. These requirements include annual reporting on performance against the performance indicators detailed within the SWMP (**Table 23**).

Table 22: Surface Water Performance Measures

Aspect	Performance measure	Performance Indicator/Trigger
Downstream Surface Water Quality	Negligible change in surface water quality (compared to predicted impacts	• Surface water quality monitored is outside of the adopted trigger values for at least one parameter for more than two monitoring rounds.
Channel Stability	No increase in areas of instability within watercourses	• Channel stability monitoring indicates one or more areas of decreasing stability in watercourses.
Downstream Flooding Impacts	Negligible change in downstream flood access (compared to predicted impacts)	• No change to flood inundation of downstream properties in major flood events.
Stream and Riparian Health	Riparian Health	• No evidence of significant weed growth or death of vegetation
	Condition of channel	• No evidence of significant rill erosion, undercutting or slumping
	Deposition of sediment and debris	• No evidence of significant accumulation or deposition, large blockages in channel
	General conditions	• No evidence of significant hazards presented to the public, poor aesthetics or feral animals, or geomorphic instability
Surface Water User Supplies	Negligible impact to downstream surface water users (compared to predicted impacts)	• Mining extents / disturbance areas lie within approved boundaries. • Surface water take associated with baseflow impacts is licensed. • No complaints from downstream water users regarding loss of surface water (quality and/or quantity).
Post-mining Water Pollution from Rehabilitated Areas of the Site	Water discharged from the site is suitable for receiving waters and fit for aquatic ecology and riparian vegetation	• Runoff water quality from rehabilitation areas is within the range of water quality data recorded from analogue sites and/or baseline data and does not pose a threat to downstream water quality. • Drainage structures (including drainage lines established in the final landform) are stable and there is no evidence of overtopping or significant scouring as a result of runoff

Table 23: Surface Water Performance Indicators

Performance Indicator
Number of complaints received relating to surface water.
Number of non-compliances relating to surface water.
Number of exceedances of surface water impact assessment criteria[1].
Number of reportable environmental incidents relating to surface water.

1. An exceedance occurs when water quality results exceed the surface water impact assessment criteria (**Table 19**) for three consecutive sampling events.

6.1.2 Performance during the Reporting Period

6.1.2.1 Surface Water Quality

An exceedance of the surface water quality triggers is considered to have occurred when water quality results exceed the impact criteria (**Table 24**) for three consecutive sampling events.

WCPL recorded exceedances of the surface water quality impact criteria during the reporting period, at SW02 (for pH) and SW08 for (pH and EC).

Table 24: Summary of Exceedances of the Surface Water Quality Impact Criteria

Site	pH	EC
SW02	April – July	–
SW08[1]	July to August	July to August

[1] Dry during February and March 2024, and from October to December 2024. Sample location was unable to be accessed during January 2024, and from April to June 2024, and during September 2024, due to unsafe conditions. Exceedances at SW08 have been recorded since April 2021 and are part of an ongoing investigation.

The exceedances at SW02 and SW08 are continuations of exceedances identified in previous reporting periods. Investigations associated with these exceedances are further described in **Section 6.1.3**.

WCPL reported to the EPA that, due to dry conditions, unsafe access or no flow, monthly water quality samples were unable to be collected at the required frequencies at several monitoring locations during the reporting period. This resulted in a non-compliance with Condition M2.1 and M2.3 of EPL529. No known adverse impacts resulted due to the non-compliance.

No complaints relating to surface water quality were received during the reporting period.

A summary of the surface water quality monitoring data is included in **Appendix F.**

6.1.2.2 *Surface Water Flows*

AECOM (2025) prepared an annual stream flow monitoring report for the Mine and is presented in **Appendix G**.

The WCPL stream flow monitoring system consists of (**Figure 9**):

- five monitoring stations on North Wambo Creek (USFM1, FM1, FM2, FM3 and FM4);
- three monitoring stations on South Wambo Creek (FM9, FM15 and FM16);
- two Water NSW operated flow gauging stations monitoring stations on Wollombi Brook (FM11 and FM10);
- two monitoring stations on Stony Creek (FM12 and FM13); and
- one monitoring station on a major tributary to Stony Creek (FM14).

Table 25 presents a summary of flow events observed at the relevant streamflow monitoring stations on the days during the reporting period when 20 mm or greater rainfall was recorded at the WCPL meteorological station (refer **Table 20**).

There were seven days during the reporting period that recorded 20 mm or greater of rainfall. FM13 recorded zero flow events throughout the year, whilst FM15 recorded two flow events throughout the reporting period.

Table 25: Surface Water Flow Results

Date	24 hour rainfall (mm)	Site FM15	Site FM13
4/1/2024	38.2	No flow event recorded	No flow event recorded
20/2/2024	27.0	No flow event recorded	No flow event recorded
4/4/2024	29.4	No flow event recorded	No flow event recorded
5/4/2024	84.6	Flow event recorded starting 6/4/2024	No flow event recorded
6/5/2024	22.4	Flow event recorded	No flow event recorded
1/6/2024	20.4	Continuation of previous flow event	No flow event recorded
26/9/2024	27.2	No flow event recorded	No flow event recorded

6.1.3 Trends and Key Management Implications

WCPL recorded exceedances of the surface water quality impact criteria during the reporting period at SW02 (for pH) and SW08 for (pH and EC). (**Table 23**).

Prior to the reporting period, an investigation into low pH observations (and exceedance of the surface water impact assessment criteria (IAC) at SW02) was completed by Umwelt in July 2022 and concluded the following:

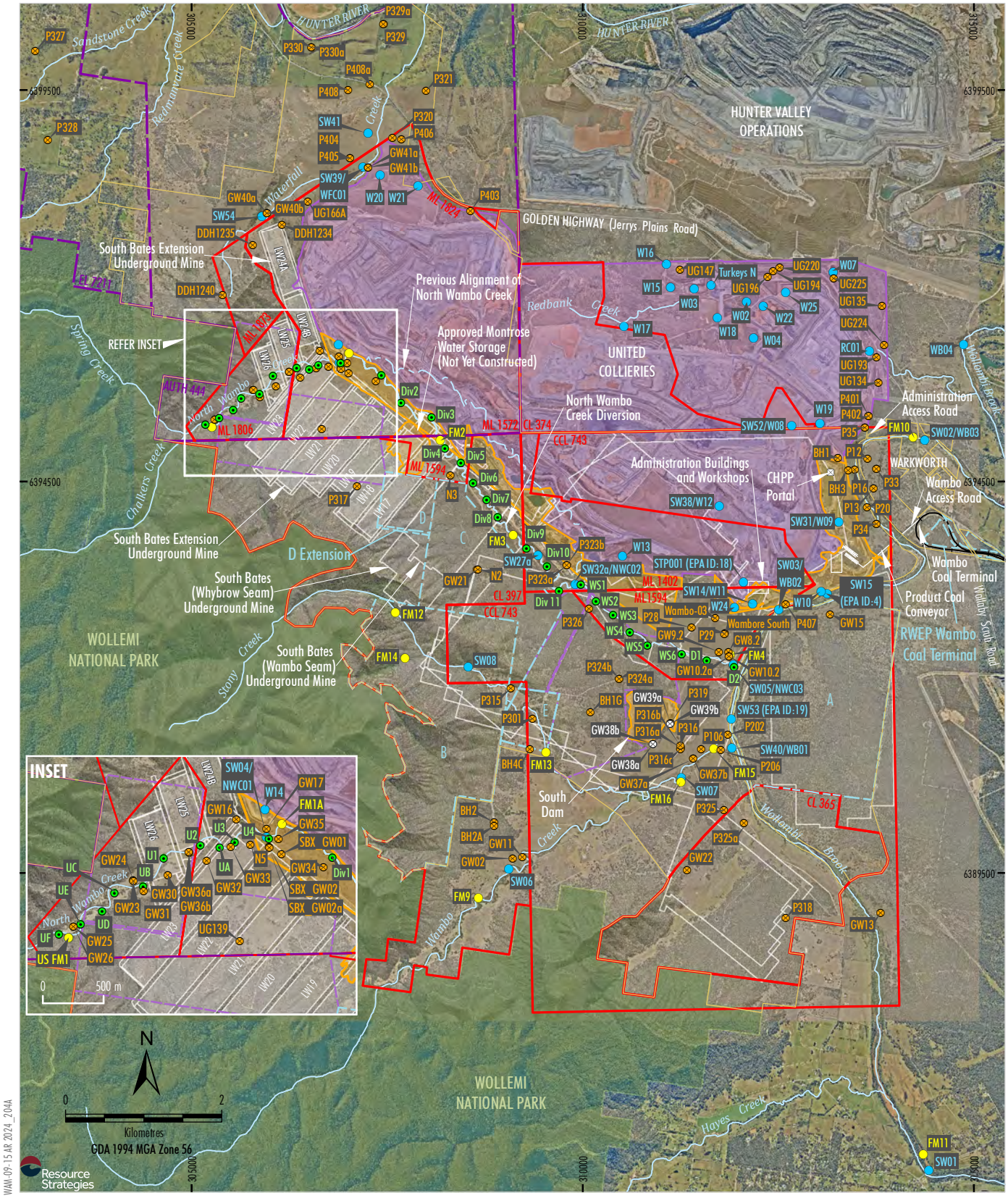
> *... highly unlikely that pH values below the IAC range at SW02... are related to mining operations. Given all of the results ... were within the historical and ANZG 2018 DGV ranges, it is considered that the exceedances are a result of natural variation.*

SW08 on Stony Creek remains the subject of an ongoing investigation with update reports provided to DPHI in March and November 2023, and November 2024. Investigations have concluded that the large magnitude recharge event in March 2021 may have resulted in sufficient recharge to the shallow groundwater system to enable the migration of surface and shallow groundwater through fractures in bedrock or dilated bedding planes within the Newcastle Coal Measures underlying the creek. Higher salinity was attributed to oxidation of freshly fractured rock and leaching of oxidation products during the period of sustained rainfall following several years of drought. It is noted that conditions are currently dry in Stony Creek. The next update will be provided in November 2025 and will include SW07 and any other downstream sites displaying increases in EC.

During the reporting period, SLR undertook a preliminary surface water quality investigation into factors which may have contributed to the observed water quality trigger exceedances during the 2023 reporting period and evaluate whether the exceedances have potentially occurred as a direct result of WCPL operations. The preliminary investigation was completed in June 2024 and concluded '*Wambo Creek and SW07 is a potential receptor for impacts observed at Stony Creek. All future reporting for Stony Creek should consider and include SW07 and any other downstream sites displaying increases in EC.'*

6.1.4 Implemented or Proposed Management Actions

During the next reporting period, WCPL will continue to implement the SWMP. If management actions are required as a result of the required preliminary investigations, WCPL will implement the actions accordingly.



Source: WCPL (2024); MSEC (2024); NSW Spatial Services (2024)
Orthophoto Mosaic: WCPL (Nov 2023-May 2022)

LEGEND

- National Park
- SSD 7142 Operational Area #
- Biodiversity Stewardship Site under SSD 7142
- WCPL Owned Land

Wambo Coal Mine

- Exploration Licence Boundary (AUTH, EL)
- Mining and Coal Lease Boundary (ML, CL, CCL)
- Remnant Woodland Enhancement Program (RWEP) Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- Existing/Approved Underground Development

Monitoring Sites

- Groundwater Monitoring Sites
- Proposed Groundwater Monitoring Sites
- Surface Water Flow Monitoring Site
- Surface Water Quality Monitoring Site
- Diversion and Subsidence Monitoring Site

Under Phase 2 of mining at Wambo Coal Mine (commenced 1 December 2020), this area is operated by United Collieries Pty Ltd under the United Wambo Joint Venture Project.

Peabody

WAMBO COAL MINE

Location of Surface Water and Groundwater Monitoring Sites

Figure 9

6.2 Groundwater Monitoring

WCPL undertakes groundwater monitoring at the Mine in accordance with the approved Groundwater Management Plan (GWMP), which is a component of the WCPL Water Management Plan. The GWMP has been developed to ensure WCPL complies with its statutory conditions relating to groundwater monitoring at the Mine.

In 2022, the Wambo groundwater model was updated to accommodate the Longwalls 24 to 26 Modification (DA 305-7-2003, Modification 19). It was identified in 2024 that there were differences between simulated and actual/ planned mining progression in the UWJV (open cut) so the model was updated to include a more accurate representation of mining in the open cut mine. No other changes were made to the model.

6.2.1 Approval Criteria/EIS Predictions and Management Plan Requirements

The GWMP includes triggers for groundwater levels and quality in shallow bores. These triggers have been developed using statistical analysis of baseline monitoring data and data acquired to 2014 (from a number of monitoring bores on and around the Mine) and the predicted effects presented in the EIS (Resource Strategies 2003) and subsequent Environmental Assessments.

The trigger values are not assessment criteria but are used to initiate investigations into the groundwater levels or groundwater quality as reported by the groundwater monitoring program. A summary of the groundwater triggers for shallow bores, as detailed in WCPL's approved GWMP is included in **Table 26**. In order to avoid false triggering, as a trigger would be initiated 20% of the time due to natural causes, triggers for groundwater level are defined to occur when two consecutive bi-monthly observations (over a 2-month interval) exceed or fall below the specified depth to groundwater. Triggers for groundwater quality are defined to occur when three consecutive bi-monthly observations (over a 2-month interval) exceed or fall below the specified pH or EC values.

In addition to the groundwater monitoring triggers detailed in **Table 26,** WCPL is also required to meet additional requirements, in accordance with the GWMP and approved Extraction Plans. These requirements include annual reporting on performance against the performance indicators detailed within the GWMP (**Table 27**).

Groundwater monitoring data from the Permian monitoring bores is assessed and reviewed as part of the Annual Review. Data is also used to validate the groundwater model.

Table 26: Water Quality and Level Trigger Values – Shallow Bores

Bore	Depth to Groundwater (mBTOC[1])		Conductivity (µS/cm)	pH	
	Min (10th percentile)	Max (90th percentile)	Maximum (Three Consecutive Bi-Monthly Exceedances)	Minimum (Two Consecutive Bi-Monthly Exceedances)	Maximum (Two Consecutive Bi-Monthly Exceedances)
P109[2]	4.6	6.7	695	6.5	7.6
P301	NA[5]	NA[5]	9,200	6.1	7.2
P315[2]	NA[5]	NA[5]	552	6.0	7.4
GW08.2[3]	ND[4]	ND[4]	NA[5]	NA[5]	NA[5]
GW09.2[3]	ND[4]	ND[4]	NA[5]	NA[5]	NA[5]
GW10.2[3]	ND[4]	ND[4]	NA[5]	NA[5]	NA[5]
GW15	10.4	11.1	730	6.7	7.2
P16	7.1	7.8	10,832	7.0	7.7
P20	7.1	8.2	10,625	7.0	7.6

1 mBTOC = metres below top of casing.

2 Monitoring has ceased at this location and will recommence once replacement bores are constructed in 2023. P315 was dry prior to NWU mining activity. Therefore, a specific depth to water trigger is not appropriate to indicate Wambo mining impacts. Data will be reviewed as part of the Annual Review to determine whether there are changes in groundwater level that can be attributed to Wambo mining activity. Monitoring has ceased at this location and will recommence once replacement bores are constructed in 2023.

3. GW08.2, GW09.2 and GW10.2 have been installed within unconsolidated strata near North Wambo Creek to serve as replacement bores to GW08 and GW09. Trigger levels for these bores will be established following the collection of baseline data and based on predicted drawdown from the revised groundwater model.

4. ND – Insufficient baseline data to develop meaningful trigger level.

5. NA – trigger level not appropriate for assessing Wambo mining impact at this location.

Table 27: Groundwater Performance Indicators

Performance Indicator	
Groundwater Management Performance Indicators	
Alluvial aquifers (including Wollombi Brook alluvium and excluding the NWC alluvium)	The performance indicators will be considered to have been exceeded if impacts exceed those predicted in the documents listed in condition A2c) (of DA305-7-2003), including: • A greater than negligible change in groundwater levels; • A greater than negligible change in groundwater quality; and • A greater than negligible impact to other groundwater users.
Groundwater dependent ecosystems	The performance indicators will be considered to have been exceeded if impacts exceed those predicted in the documents listed in condition A2c) (of DA305-7-2003), including: • Greater than negligible environmental consequences, beyond those predicted in the documents listed in condition A2c); and • Channel stability is not maintained or improved
North Wambo Underground Subsidence Performance Indicators	
• The performance indicators will be considered to have been exceeded if monitoring data suggests significant divergences away from the modelled groundwater	
South Bates and South Bates Extension Subsidence Performance Indicators	
• The performance indicators will be considered to have been exceeded if the groundwater levels in alluvial bores exceed the groundwater level criteria in the GWMP (Table 11 of the GWMP). • The performance indicators will be considered to have been exceeded if the groundwater quality in alluvial bores exceeds the groundwater quality criteria in the GWMP (Table 13 of the GWMP). • The performance indicators will be considered to have been exceeded if the impacts observed on riparian, aquatic or groundwater dependent ecosystems are beyond negligible.	

6.2.2 Performance during the Reporting Period

Monitoring of groundwater levels and quality in alluvial and Permian bores was undertaken in accordance with the GWMP.

SLR (2025) prepared an annual groundwater monitoring report for the Mine and is presented in **Appendix H**. Below average rainfall conditions occurred at the Mine during the reporting period leading to a gradual groundwater level decline within the Wambo Creek, North Wambo Creek and a number of Wollombi Brook alluvial bores.

The following GWMP trigger value exceedances were recorded during the reporting period (**Appendix H**):

- P315 (Stony Creek Alluvium) – ongoing exceedance of EC trigger level (first reported in 2021).
- GW15 (Wollombi Brook Alluvium) – maximum groundwater level trigger breach (first reported in 2021).
- P16 (Wollombi Brook Alluvium) – minimum groundwater level trigger breach (first reported in 2021).

Consistent with the GWMP, an investigation was commenced into the exceedances listed above (**Section 6.2.3** and **Appendix H**). No bores exceeded the pH trigger guidelines in 2024.

No complaints from groundwater users were received during the reporting period.

Observed groundwater levels during the reporting period are generally good matches with historical observations made during previous reporting periods. (**Appendix H**).

SLR (2025) reviewed groundwater monitoring results against the groundwater performance indicators (**Table 27**) and concluded that WCPL was compliant with the exception of the performance indicators for P315, GW15 and P16. P315 remains the subject of an ongoing investigation with a report provided to DPHI in November 2024 (**Section 6.1.2**). The exceedances of the minimum groundwater elevation trigger level at P16 is likely related to below average rainfall conditions in 2024 and a Glen Munro Pit mining effect. The results from the updated model may help revise trigger levels at P16 to reflect the influence of both approved impacts and climatic conditions (**Section 6.2.3**). Bore GW15 breached the maximum groundwater elevation trigger level in 2024, however it was concluded this is not related to WCPL's mining activity and requires no further investigation (SLR, 2025).

6.2.3 Trends and Key Management Implications

Groundwater monitoring data collected during the reporting period has been reviewed and assessed against the triggers in the approved GWMP (**Table 26)** by SLR (2025).

During the reporting period exceedances of the EC trigger level were recorded at P315 (Stony Creek Alluvium). EC was above the trigger level of 552 µS/cm for all of 2024 with a maximum EC of 1,196 µS/cm recorded in October 2024. This is considered an ongoing exceedance that was first identified in 2021 and is the subject of ongoing investigations. As outlined in **Section 6.1.3**, investigations have concluded that high rainfall from 2020 to 2022 may have resulted in sufficient recharge to enable "flushing" of groundwater through fractures in bedrock caused by undermining in the Newcastle Coal Measures (which is historically observed to have saline groundwater), which may flow laterally in to the Stony Creek alluvium, leading to the observed increase in EC. Data recorded in 2024 shows a decrease in EC compared to 2023 observations, which is likely related to the period of above average rainfall in April 2024.

Groundwater levels at P16 (Wollombi Brook Alluvium) have continued to be below the minimum groundwater elevation trigger level (49.7 mAHD) in all 2024 observations. The minimum observation in 2024 occurred in February, at the end of the period of below average rainfall that occurred for much of 2023, before groundwater elevations increase in response to above average rainfall in April 2024. Groundwater levels at P16 were previously below the groundwater elevation trigger from 2017 to 2021 and were associated with below average rainfall conditions and a mining effect from the excavation of the Glen Munro Pit that appears to have caused additional drawdown in the order of 1.2 m (SLR, 2025). The groundwater elevations below the trigger observed in 2024 are likely a continuation of this combined drier climate and an ongoing Glen Munro Pit mining effect. SLR (2025) recommends the results from the contemporary groundwater model be used to revise trigger levels at P16 to reflect the influence of both approved impacts and climatic conditions.

Bore GW15 breached the maximum groundwater elevation trigger level in 2024 which was determined to be not related to WCPL mining activity and requires no further investigation (**Appendix H**):

SLR (2025) has undertaken periodic reviews of the WCPL vibrating wire piezometer (VMP) monitoring network, both on-site and of the downloaded data. Key findings from the data quality assessment include (**Appendix H**):

- Unreliable data at VWP sites where sensors are within shallow overburden, Whybrow or Wambo seams. Sensors are dry or near-dry, likely associated with WCPL or regional mining activity. It is worth continuing to download these while at least one of the sensors is collecting reliable data, and where recovery / re-saturation is possible.
- As recommended in previous reviews, older sites and unlabelled sites, which are no longer collecting reliable data should be considered for removal from monitoring network.
- Data was not collected/ downloaded for the following sites in 2024: P325 (SW30), P328 (ELA5), SBX_GW01, SBX_GW02.

6.2.4 Implemented or Proposed Management Actions

SLR (2025) recommended:

- VWP locations identified with persistent poor-quality data should be considered for inspection and removed from the monitoring network if they cannot be repaired (see Appendix C). These sites include:
    - N3 – no reliable data in recent years.
    - Older VWPs at Wambo that have not been providing reliable data for a number of years. These should be inspected and assessed for decommissioning.
- Other VWP locations did not have data downloaded in 2024 and should be prioritised for inspection and data collection in 2025:
    - P325 (SW30), P328 (ELA5), SBX_GW01, SBX_GW01
    - Monitoring should be undertaken at P106 and P109 on two occasions in 2025 to enable comparison with data collected at the GW37a,b replacement sites.
- It is noted that GW02 and GW11 are former landholder wells with pumping equipment installed/ nearby. Replacement monitoring-only sites are recommended prior to commencement of South Wambo mining.
- Consider revising groundwater level triggers at P16 to incorporate model predictions which capture the observed mining effect.
- Provide update of groundwater and surface water monitoring data at Stony Creek to DPHI in November 2025 as per SLR (2024).
- The review of groundwater sampling field sheets and VWP data should continue throughout 2025 to enable as-needed repair of monitoring infrastructure and the continued collection of monitoring data. This should include a review of monitoring wells that are being sampled with HydraSleeves near Wambo Creek.

- Redevelopment and purging of GW13 should be undertaken in 2025 as per 2024 recommendations. It is understood that this is scheduled for Q1 2025. Sites P329a and P330a are also scheduled for purging/ development following review of comments in field sheets.
- The results from the contemporary groundwater model be used to revise trigger levels at P16 to reflect the influence of both approved impacts and climatic conditions.
- Future updates to the GWMP could consider the development and inclusion of trigger levels at operationally relevant sites on North Wambo Creek (upstream of the diversion) and Waterfall Creek.

6.3 HRSTS Discharges

WCPL is permitted to discharge water to the Hunter River in accordance with the conditions of EPL529 and the Hunter River Salinity Trading Scheme (HRSTS) guidelines. These guidelines include the following conditions:

- notification from NSW DCCEEW of discharge opportunity must be received;
- flow of water in Wollombi Brook at the NSW DCCEEW Bulga Gauging Station (FM11) needs to be more than 500 megalitres per day (ML/day);
- pH will be measured continuously throughout the discharge with an inline instrument;
- EC will be measured continuously in µS/cm throughout the discharge with an instrument designed to measure between 0 and 10,000 µS/cm; and
- TSS will be measured once a day during discharge.

A representative sample will be collected every day during discharge and sent to the lab for analysis.

During the reporting period WCPL initially held 61 credits under the HRSTS to 30 June 2024. Following participation in the HRSTS Credit Auction, WCPL increased the total HRSTS Credits to 75 for the remainder of the reporting period.

6.3.1 Approval Criteria/EIS Predictions and Management Plan Requirements

A summary of the approval criteria for off-site discharges (from EPL529) is included in **Table 28** in accordance with the Schedule 2, Condition B55 of DA 305-7-003.

Table 28: EPL529 Approval Criteria for Off-site Discharge

Parameter	Criteria[1]
pH	6.5-9.5[2]
TSS	120 mg/L[2]
EC	N/A
Volume	250 ML/day

1. Criteria as per EPL529 and DA 305-7-2003.
2. 100th percentile concentration limit.

6.3.2 Performance during the Reporting Period

During the reporting period, Wambo discharged on three events to the Wollombi Brook as permitted by conditions of EPL529 and the HRSTS guidelines.

There were no non-compliances from discharges under the HRSTS during the reporting period.

6.3.3 Trends and Key Management Implications

An overview of HRSTS releases over time is provided in **Table 29**.

Table 29: Summary of HRSTS Releases

Year	Number of Releases	Release Volume (ML)
2014	1	9.6
2015	6	140.1
2016	11	416
2017	0	0
2018	0	0
2019	0	0
2020	0	0
2021	4	75.1
2022	90	2838.5
2023	0	0
2024	3	37.6

6.3.4 Implemented or Proposed Management Actions

A written report of the activities undertaken by WCPL under the HRSTS (for the period 1 July 2023 to 30 June 2024) was submitted to the EPA on 28 August 2024 in accordance with Condition R5 of EPL529.

During the next reporting period, WCPL forecasts compliance with the HRSTS requirements, and predicts that, if the opportunity arises, it will use all of its HRSTS credits, as dictated by River Register releases.

6.4 North Wambo Creek Diversion Discharge Flows

The NWCD Plan was approved by the then NSW Department of Planning (now DPHI) in April 2008. A requirement of the approval was to comply with the requirements of the then Department of Water and Energy (now NSW DCCEEW). These requirements included reporting on the performance of the NWCD annually in the Annual Review.

During the reporting period, WCPL monitored flow within the North Wambo Creek at five locations:

- US-FM1, approximately 1 km upstream of FM1 (installed in December 2017);
- FM1, upstream of the NWCD;
- FM2, middle of the NWCD, downstream of FM1;
- FM3, middle of the NWCD, downstream of FM2; and
- FM4, downstream of the NWCD.

A review of the flow events at each monitoring site during the reporting period was undertaken by AECOM (2025) (**Appendix G**) and a summary is provided in **Table 30**. Flow monitoring data is included in the AECOM report (**Appendix G**).

Table 30: NWCD Discharge Flow Monitoring – 2024

Flow Monitoring Station	No. of Flow Events Recorded	Maximum Stream Height Recorded (m)	Maximum Theoretical Flow Rate Recorded (ML/day)
US-FM1	7	0.44	91
FM1	0	0	0
FM2	5	0.044	3.7
FM3	11	0.17	18
FM4	1	0.4	190

6.5 Water Take

The Wambo Complex (Wambo Underground and the United Wambo Open Cut (UWOC)) maintains a variety of WALs under the *Water Management Act 2000* which consist of High, General and Supplementary securities, as detailed in **Table 31**.

Table 31 shows the predicted annual groundwater volumes required to be licensed the Wambo Complex for both alluvial and porous/fractured rock groundwater sources. These values are from the groundwater model updated to incorporate as-mined and proposed future UWOC mining (SLR, 2025). Predicted take from the Lower Wollombi Brook Water Source (aquifer) in the updated model does not exceed 70 ML (provided in WAL23897) until after 2028.

Table 31: Complex Groundwater Licensing Summary

Water Sharing Plan	Management Zone/ Groundwater Source	Licensed Entitlement (ML/ year)	Predicted annual groundwater inflow volumes requiring Licensing (ML/year)
Hunter Unregulated and Alluvial Water Sources Water Sharing Plan 2009	Lower Wollombi Brook Water Source	736.9[1]	Av. 135 Max. 209 2024. 0[3]
	Jerrys Water Source	-	0
North Coast Fractured and Porous Rock Groundwater Sources ^^	Porous Rock	1,947[2]	Av. 714 Max. 1,110 2024. 636[4]

^^ Porous Rock is the Sydney Basin - North Coast Groundwater Source, as defined in the *WSP for the North Coast Fractured and Porous Rock Groundwater Sources*, released 1 July 2016.

1 Licence No. WAL23897, WAL18437, WAL18455, WAL18549.

2 Licence No. WAL42373, WAL41532, WAL41510.

3 Predicted take from the Lower Wollombi Brook Water Source in the updated model does not exceed 70 ML (provided in WAL23897) until after 2028.

4 Value derived from the Wambo Complex Numerical Groundwater Model (SLR 2022), Complex modelled groundwater inflow for 2023.

During the 1 July 2023 to 30 June 2024 water year, WCPL extracted a total 415 ML of water from the Hunter River (under WAL 718), 0 ML of water from Wollombi Brook (under WAL 18437), 0 ML of groundwater from Wollombi Brook alluvium (under WAL 23897), and 636 ML from porous rock groundwater sources (under WAL 42373). As shown in

Table 31, all water take during the 2023-2024 water year was less than the allowable limits under the relevant WALs.

No water was used for irrigation purposes between 1 July 2023 to 30 June 2024 (from licence 20WA200632).

6.6 Compensatory Water

WCPL did not provide any compensatory water to any water users during the reporting period.

Table 32: Environmental Performance – Water Take (1 July 2023 to 30 June 2024)

Licence Number[1]	Description	Expiry Date	Entitlement	Category	Passive take/ inflows (ML)	Active pumping (ML)	Total (ML)
Hunter Regulated River Water Source							
WAL 718 (20SL060212)	Hunter River Pump	Perpetuity	1,000 unit shares (high security)	Regulated River (high security)	0	415	415
WAL 8599 (20SL061206)	Hunter River Pump	Perpetuity	6 unit shares (high security)	Regulated River (high security)	0	0	0
WAL 8600 (20SL061206)	Hunter River Pump	Perpetuity	868 unit shares (general security)	Regulated River (general security)	0	0	0
WAL 8604 (20BL061206)	Hunter River Pump	Perpetuity	240 unit shares (supplementary water)	Supplementary Water	0	0	0
Hunter Regulated River Water Source – Shared with United Colliery							
WAL 929 (20SL050661)	Other Pump	Perpetuity	3 unit shares	Domestic and Stock	0	0	0
WAL 1369 (20SL060416)	80 mm CP	Perpetuity	15 unit shares (supplementary water)	Supplementary Water	0	0	0
WAL 15459 (20SL204246)	80 mm CP	Perpetuity	21 unit shares (general security)	Regulated River (general security)	0	0	0
Hunter Regulated River Water Source –United Colliery							
WAL 10541 (20AL200927)	-	-	300 unit shares	Regulated River	0	0	0
Hunter Unregulated and Alluvial Water Sources (Lower Wollombi Brook Water Source)							
WAL 18437 (20SL033872)	Wollombi Brook Pump	Perpetuity	366.9 unit shares	Unregulated River	0	0	0
WAL 23897 (20BL167737)	Well No. 2	Perpetuity	70 unit shares	Aquifer	0	0	0
Hunter Unregulated and Alluvial Water Sources (Lower Wollombi Brook Water Source) – United Colliery							
WAL18445	Bywash Dam	-	200	Unregulated River	0	0	0
WAL18549	Other pump	-	100	Unregulated River	0	0	0
North Coast Fractured and Porous Rock Groundwater Sources (Sydney Basin - North Coast Groundwater Source)							
WAL 42373[2]	-	Perpetuity	1,549 unit shares	Aquifer	636 (337 OC + 299 UG)[3]	0	636 (337 OC + 299 UG)[3]

Licence Number[1]	Description	Expiry Date	Entitlement	Category	Passive take/ inflows (ML)	Active pumping (ML)	Total (ML)
WAL 41532 (20BL172156)	Dewatering	Perpetuity	98 unit shares	Aquifer	0	0	0
North Coast Fractured and Porous Rock Groundwater Sources (Sydney Basin - North Coast Groundwater Source) – United Collieries							
WAL41510	Dewatering	-	300 unit shares	Aquifer	0	0	0

1. 20BL prefix bore licences with allocations have been replaced with WALs.
2. WAL 42373 was issued in 2019 to consolidate six of WCPL's previous WALs under the North Coast Fractured and Porous Rock groundwater Sources (Sydney Basin – North Coast Groundwater Source) including WAL 39735, WAL 39738, WAL 39803, WAL 41494, WAL 41528 and WAL 41520.

3 2024 calendar year - complex modelled groundwater inflow. OC = open cut, UG = underground

6.7 Site Water Balance

WCPL reviewed the Site Water Balance at the end of the reporting period, in accordance with the requirements of the Water Management Plan. A summary of the WCPL site water balance for the period 1 January to 31 December 2024 is provided in **Table 33.**

Table 33: Site Water Balance (1 January to 31 December 2024)

Water Sources	Volume (ML)
Hunter River	461
Wollombi Brook	0
United Collieries	942
Rainfall/Runoff	1,661
Underground Seepage	299
Dewatering Bores 2A and 4C	0
Total Water Inputs	**3,363**
Water Usage	**Volume (ML)**
Dust Suppression	184
CHPP Consumption	1,663
Underground (net)	537
United Collieries	482
CHPP/UG Potable Water	10
Domestic Usage	0
Total Water Usage	**2,876**
Water Loss	**Volume (ML)**
Evaporation – Mine Water & Tailings Dam	648
HRSTS Discharge	37
Reinjection	0
Seepage	0
CHPP Process (washdown)	63
Total Losses	**748**
Change in storages	**Volume (ML)**
Initial (29 December 2023)	1,002
Final (28 December 2024)	1,313
Change in Storage	**311**
Water Balance (ML)	**-572**

A total of 415 ML was extracted from the Hunter River and 0 ML was extracted from the Wollombi Brook during the reporting period. This total is above the EIS forecast annual average extraction volume of 106 ML (Resource Strategies 2003).

As 942 ML of water was transferred from the United Collieries during the reporting period, this brings the total volume of water imported to approximately 46% of the total water input. This is considerably higher than the EIS forecast of an average of 2.6% (Resource Strategies 2003). A total of 1,661 ML of runoff from rainfall was intercepted during the reporting period, 505 ML more than intercepted during 2023 (1,156 ML).

Underground seepage represented 8.9% of total supply compared to the 2003 forecast of 13.8% (Resource Strategies 2003), this is slightly lower than seepage in 2023. The contemporary numerical groundwater model predicts that 299 ML of seepage will have reported to the combined sources of the South Bates Underground Mine and South Bates Extension Underground Mine in 2024. This value has informed the site water balance (Engeny, 2025) and has been used to evaluate compliance with relevant groundwater licences.

No water was exported off-site during the reporting period. No water was discharged during the reporting period, except for three discharges into the Wollombi Brook, as permitted by conditions of EPL529 and the HRSTS guidelines.

6.7.1 Salt Balance

WCPL reviewed the Salt Balance at the end of the reporting period, in accordance with the requirements of the Water Management Plan. A summary of the WCPL salt balance for the period 1 January to 31 December 2023 is provided in **Table 34.**

Table 34: Salt Balance (1 January to 31 December 2024)

Inputs	Salt (t)
Raw water- Hunter	188
Raw water- Wollombi	0
Runoff	1,900
Groundwater (ROM coal)	419
Groundwater (Bores)	0
Groundwater (Seepage)	4,058
Transfer from UWJV	1,931
Total	**8,496**
Outputs	**Salt (t)**
Product Coal	849
Dust suppression	714
Release to HRSTS	133
Transfer to UWJV	**690**
Total	**2,387**
Balance	**6,109**

6.8 Erosion and Sediment Control

WCPL has developed an ESCP to address the relevant consent conditions and regulatory requirements.

6.8.1 Performance during the Reporting Period

During the reporting period, WCPL complied with all requirements ESCP under DA 305-7-2003 from 1 January 2024 to 31 December 2024.

No complaints were received relating to erosion and sediment control.

6.8.2 Trends and Key Management Implications

No trends or key management implications for erosion and sediment control were identified during the reporting period.

6.8.3 Implemented or Proposed Management Actions

During the next reporting period, WCPL will continue to implement the approved ESCP.

7.0 Rehabilitation

7.1 Rehabilitation Performance during the Reporting Period

In August 2022, a Rehabilitation Management Plan (RMP) was prepared by WCPL 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 RMP is available on the Peabody Website and addresses the rehabilitation requirements prescribed in the mining leases and Condition B107, Schedule 2 of DA 305-7-2003.

Version 3 of the RMP was approved in November 2023 to incorporate changes associated with the approval of Modification 19 to DA 305-7-2003.

Rehabilitation Activities at the Mine are conducted in accordance with the RMP.

In accordance with clauses 9 and 13 of Schedule 8A of the *Mining Regulation 2016* and Part 1 of the *Form and Way – Annual Rehabilitation Report and Forward Program for Large Mines* (NSW Resources Regulator, 2021), WCPL will prepare and submit an Annual Rehabilitation Report which describes the rehabilitation activities undertaken throughout the 2024 reporting period.

7.1.1 Status of Disturbance and Rehabilitation

WCPL is responsible for rehabilitating the remaining surface area and activities related to the Mine's approved underground activities. Due to the nature of this disturbance, there will be minimal progressive rehabilitation reported by WCPL over the coming years (i.e. as the disturbed surface area will be required for the life of the underground mine).

A summary of the proposed and actual rehabilitation activities undertaken in 2024 is provided in **Table 35**.

Table 35: Actual versus Proposed Rehabilitation Activities (2024)

	2024 Proposed	2024 Actual (at 31 December)	2025 Proposed
Total Disturbance (ha)	2.33	2.03	0.9
Total Rehabilitation (ha)	0	0	0.9
Cumulative Rehabilitation (ha)	119.3	119.3	120.2

During the reporting period, subsidence remediation focused on maintenance of historical subsidence on the Kharlibe property and minor repairs to access roads as required. During the reporting period, subsidence monitoring of trenches that were remediated with geofabric and those without geofabric showed little difference with no further subsidence in either area.

7.1.2 Status of North Wambo Creek Diversion Remediation

In 2019, WCPL commissioned Soil Conservation Services (SCS) to commence a five year program of remediation works which built on the NWCD Rehabilitation and Maintenance Plan produced by Alluvium Consulting. Rehabilitation and maintenance was completed in four stages, with Stage 1 completed in 2020, Stage 2 in 2021 and the final Stages, 3 and 4 completed in 2023.

No further North Wambo Creek remediation works were conducted in 2024 and maintenance works were limited to feral animal management and weed spraying for the duration of the reporting period.

7.1.3 Agreed Post Rehabilitation Land Use

The agreed post rehabilitation land use for the Mine is detailed in WCPL's EIS (Resource Strategies 2003), DA 305-7-2003 and the RMP. The final landform for WCPL proposes a balanced rehabilitation outcome which recognises the alternative land uses that exist in the region, and therefore aims to establish the potential for both sustainable agriculture and endemic woodland habitat. The proposed design of final landforms and the revegetation strategy are described in the RMP and in United's RMP.

All rehabilitation activities completed at the Mine are undertaken with consideration to the agreed post rehabilitation land use goals.

7.1.4 Key Rehabilitation Performance Indicators

Table 36 summarises WCPL's rehabilitation status at the end of the reporting period, compared to the previous reporting period.

As outlined above, WCPL is responsible for rehabilitating the remaining surface area and activities related to the Mine's approved underground activities. As such, there will be minimal progressive rehabilitation reported by WCPL over the coming years.

Table 36: 2024 Rehabilitation Status and Forecast

Annual Reporting Period	2024 (Forecast) (ha)	2024 Actual (at 31 December) (ha)	2025 (Forecast) (ha)
A. Total Disturbance Footprint – Surface Disturbance[1]	323.21	325.24	325.24
B. Total active disturbance[2]	201.31	201.31	201.31
C. Rehabilitation – Land Preparation[3]	0	0	0
D. Ecosystem and Land Use Establishment[4]	121.9	121.9	121.9
E. Ecosystem and Land Use Development[5]	0	0	0
F. Rehabilitation Completion[6]	0	0	0

1. All areas within a mining lease that either have at some point in time or continue to pose a rehabilitation liability due to surface disturbance activities. The total disturbance footprint is the sum of the total active disturbance, decommissioning, landform establishment, growth medium development, ecosystem and land use establishment, ecosystem and land use development and rehabilitation completion (see definitions below). Underground mining operations should not include the footprint of underground mining areas/subsidence management areas in the total disturbance footprint.
2. Includes on-lease exploration areas, stripped areas ahead of mining, infrastructure areas, water management infrastructure, sewage treatment facilities, topsoil stockpile areas, access tracks and haul roads, active mining areas, waste rock emplacements (active/unshaped/in or out-of-pit), tailings dams (active/unshaped/uncapped) and temporary stabilised areas (e.g. areas sown with temporary cover crops for dust mitigation and temporary rehabilitation).
3. Includes the sum of all disturbed land within a mining lease that has commenced any, or all, of the following phases of rehabilitation – decommissioning, landform establishment and growth medium development.
4. Includes the area which has been seeded/planted with the target vegetation species for the intended final land use. However, vegetation has not matured to a stage where it can be demonstrated that it will be sustainable for the long-term and/ or require only a maintenance regime consistent with target reference/analogue sites. Typically, rehabilitation areas would be in this phase for at least two years (and usually more) before rehabilitation can be classified as being in the ecosystem and land use development phase. This phase does not apply to infrastructure areas that are being retained as part of final land use for the site.
5. Rehabilitation has matured to a level where target revegetation outcomes are on a trajectory towards meeting the approved rehabilitation objectives and rehabilitation completion criteria (as verified by monitoring). This phase includes infrastructure areas that are to be retained for an approved final land use, following completion of all necessary measures to render the infrastructure fit for this purpose (for example structural integrity).
6. The NSW Resources Regulator has determined in writing that the mining area has achieved the approved rehabilitation objectives and approved rehabilitation completion criteria and final landform and rehabilitation plan following the submission of the relevant application by the lease holder.

7.1.5 Renovation or Removal of Buildings

No buildings were renovated or removed during the reporting period.

7.1.6 Other Rehabilitation Activities

In consultation with Resources Regulator, an extensive audit of historical exploration works commenced during 2015. The scope of the audit was to identify all historical exploration sites, rehabilitate as required and relinquish the sites to the Resources Regulator's satisfaction.

In 2016, the scope of the audit was finalised and a total of 222 sites associated with historical exploration were identified in A444 and 17 in EL7211. The sites were identified as requiring inspection, possible rehabilitation and eventual relinquishment.

Both the EL7211 and A444 audits were completed during 2017. Copies of these reports were provided to DRG (now RR) on 17 April 2017. In December 2017, DRG (now RR) requested an ESF2 Form (Rehabilitation Completion and/or Review of Rehabilitation Cost Estimate) be completed to accompany the Audit Reports. The ESF2 form was submitted to DRG (now RR) on 14 December 2017. Follow up inspections required for the remaining holes associated with this audit were delayed. These bores will be inspected as part of the ongoing exploration rehabilitation program (refer to **Section 5.10**).

7.1.7 Trials, Research Projects and Other Initiatives

There were no new trials, research projects or other initiatives undertaking during the reporting period. However, WCPL is currently preparing a works program for a revegetation plan aiming to target areas not currently meeting weeds management targets.

7.1.8 Variations in Activities Proposed in the RMP

During the reporting period, rehabilitation was undertaken in accordance with the activities proposed in the WCPL's approved RMP and approved Forward Program (March 2022 – March 2025).

7.1.9 Key Issues That May Impact Successful Rehabilitation

WCPL is responsible for rehabilitating the remaining surface area and activities related to the Mine's approved underground activities.

Due to the nature of this disturbance, there will be minimal progressive rehabilitation reported by WCPL over the coming years (i.e. as the disturbed surface area will be required for the life of the underground mine).

7.2 Actions for the Next Reporting Period

7.2.1 Rehabilitation Trials, Research Projects and Other Initiatives

The following rehabilitation trials, research projects and other initiatives are proposed over the next reporting period:

- Continuation of subsidence repairs.
- Continuation of maintenance to the NWCD.

7.2.2 Proposed Rehabilitation in the Next Reporting Period

Following the commencement of Phase 2 of the UWJV, rehabilitation activities for open cut operations is managed by United. Rehabilitation work for the Mine proposed during the next reporting period is limited to continued subsidence remediation works as triggered by subsidence monitoring.

Remediation works are proposed for South Wambo Creek in the later part of 2025.

8.0 Community

WCPL operates a 24 hour Community Enquiry Line (02 6570 2245), and a dedicated community email account (wambocommunity@peabodyenergy.com), to enable community members to make enquiries or lodge complaints regarding the operation of the Mine.

8.1 Community Engagement Activities and Initiatives

8.1.1 Community Consultative Committee

The CCC is made up of residents from the surrounding district, a representative of Singleton Council and WCPL management. The CCC representatives act as the point of contact between WCPL and the community. The CCC is chaired by an independent chairperson.

During the reporting period WCPL held four CCC meetings:

- Tuesday 6 February 2024;
- Tuesday 7 May 2024;
- Tuesday 13 August 2024; and
- Tuesday 12 November 2024.

Minutes of these meetings are available on the Peabody Energy website https://www.peabodyenergy.com/Operations/Australia-Mining/New-South-Wales-Mining/Wambo-Approvals,-Plans-Reports.

8.1.2 Newsletters

No community Newsletters were published during the reporting period.

8.1.3 Other Community Engagement Activities

WCPL attended the United Wambo Joint Venture Community Information Nights which were held on 17 April 2024 and 10 October 2024. The Information Night in October 2024 included operational updates and a formal open forum. Each Community Information Night had approximately 40 attendees.

8.2 Community Contributions

During the reporting period, WCPL contributed to the community through the following:

- Jerrys Plains Junior Cricket Club;
- Hunter Brolgas Netball;
- Newcastle Cystic Fibrosis;
- Maitland Football Club;
- Wambo Coal Singleton Hall of Fame;
- Beyond Blue; and
- Kirkton Public School.

8.3 Community Complaints

WCPL received no community complaints during the reporting period (**Figure 10**). This follows the trend of a significant reduction compared to eighty-three (83) in 2020, compared to forty-six (46) in 2019 and forty-four (44) in 2018. The reduction in complaints associated with the Mine is due to the commencement of Phase 2 operations which do not include open cut mining operations.

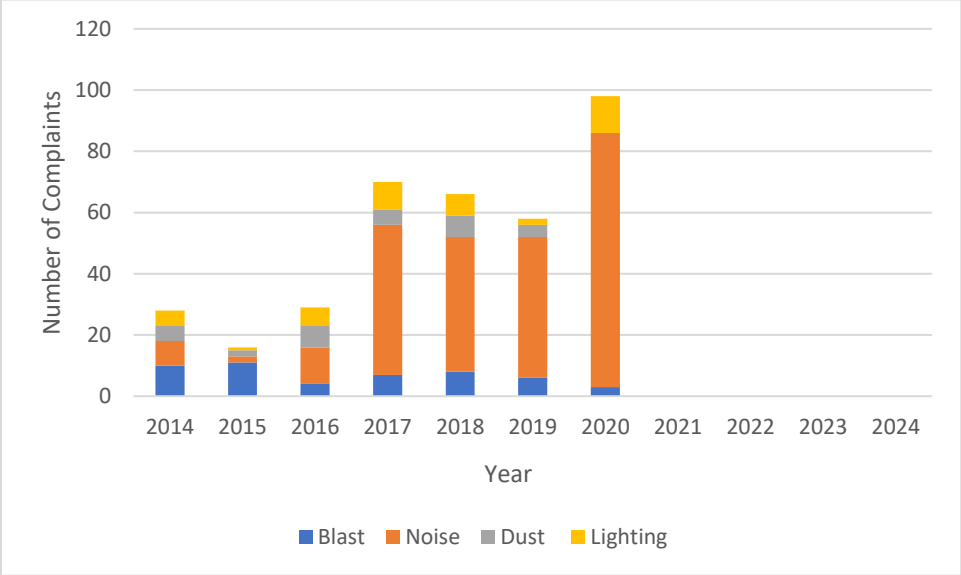


Figure 10: Community Complaints (2014-2024)

9.0 Independent Audits

Audits completed by WCPL with residual actions are summarised below.

- 2023 Independent Environmental Audit, undertaken by Onward Consulting. Thirteen (13) non-compliances were identified, including four (4) low-risk non-compliances and nine (9) administrative non-compliances. The status of these non-compliances are further described in **Section 9.1** and **Table 37.**
- 2024 EPBC Approval 2003/1138 five-yearly audit, undertaken by Australian Ecology Solutions. The audit identified non-compliances in three conditions of the approval, predominantly relating to the incorrect implementation of the BMP. Several recommendations for improvements to the BMP were made following the audit, which WCPL will consider and implement, as required. The findings of this five-yearly audit are further described in **Section 9.2**.

A copy of the audit reports is available on the Peabody Energy website https://www.peabodyenergy.com/Operations/Australia-Mining/New-South-Wales-Mining/Wambo-Approvals,-Plans-Reports
under the Audits tab. Audits completed more recently are outlined in the sections below.

In addition to the above, NSW Biodiversity Conservation Trust (BCT) conducted site visits and inspections of the Wambo offset areas subject to Conservation Agreements in May 2021 and June 2023. NSW Biodiversity Conservation and Science (BCS) conducted a site visit on August 12, 2024. A number of recommendations were made after all visits, generally pertaining to weed and pest management and fencing requirements. These recommendations are being addressed by WCPL.

9.1 2023 Independent Environmental Audit

An IEA was undertaken in October 2023 by Onward Consulting to assess compliance against DA 305-7-2003 and DA 177-8-2004 and other relevant environmental approvals and licences. The audit was conducted for the period 21 November 2020 to 30 October 2023.

Thirteen (13) non-compliances were identified, including four (4) low-risk non-compliances and nine (9) administrative non-compliances. The report also included corrective actions and recommendations for improvements, the status of which is described in **Table 37**.

Table 37: Corrective Actions and Recommendations Identified in the 2024 IEA

Consent / licence / lease	Condition	Corrective Action ID	Corrective Action Requirement	Status
DA 305-7-2003	D9	01	Develop a formal process for reporting non-compliances within seven days of becoming aware, where non-compliance occurs due to consecutive/multiple triggers under TARPs (e.g. multiple exceedances which result in a non-compliance) resulting in exceedance of performance criteria in relevant conditions of consent. *Note: should the 2026 IEA determine compliance with the requirements of Condition D9 of DA 305-7-2003, CA01 can be considered closed.*	Complete
DA 177-8-2004	B6	02	Consult with the EPA to understand their expectations in relation to flooding events of the Hales Crossing Sump and whether this location should be made a licensed discharge point via an EPL variation.	Ongoing
EPL 529	L1.1			
DA 305-7-2003 DA 177-8-2004 EPL 529	B54 B6 L1.1	01	Consult with the DPHI appointed surface water expert to determine if additional analytes should be tested in upstream monitoring sites (e.g. SW3, SW5, and SW40) to support ambient water quality monitoring at the discharge point on Wollombi Brook (e.g. SW15) and understand whether other water quality parameters are present in discharge water. The outcomes of this consultation should be provided to DPHI.	In progress
DA 305-7-2003	B66	02	Review the WMP document to confirm currency of some documents referenced (e.g. strategy), as some documents have been superseded.	Ongoing
		03	Provide additional detail in the ESCP: – to confirm the type of each water storage (i.e. sediment capture or mine water management); and covering flood conditions from Wollombi Brook within the context of potential impacts to the Hales Crossing Sump located at the train loading facility adjacent to the watercourse.	In progress – To be included in the next update to ESCP.
		04	Review and revise elements of the surface water management system, as it relates to the monitoring of flow rates over mined areas, and incorporate into a calibrated hydrology model approach that is reviewed on a six monthly to annual basis for those watercourses where there is a risk of flow diversion/flow loss due to mining.	To be considered in the next update of the SWMP.
		05	Update Table 2 of the SWMP to include performance criteria associated with aquatic, riparian and groundwater dependent ecosystems.	To be considered in the next update of the SWMP.
		06	Remove the commitment to include bi-monthly updates of groundwater monitoring data on the WCPL website from the GWMP.	Complete.

Consent / licence / lease	Condition	Corrective Action ID	Corrective Action Requirement	Status
N/A	N/A	07	Provide an update in the 2023 Annual Review on the progress of actions identified in the *Offset Conservation Site Audit Report for CA461 – Wambo Remnant Woodland Enhancement Areas CA* and *Offset Conservation Site Audit Report for CA464 – Wambo Coal Terminal RWEP* completed by BCT.	Section 9.1 of the 2023 Wambo Coal Mine Annual Review.

9.2 EPBC 2003/1138 5-yearly Audit

Australian Ecology Solutions Pty Ltd (AES) was engaged by Wambo Coal Pty Ltd (WCPL), to assist in undertaking the 5-yearly audit against the conditions of EPBC Approval 2003/1138, in accordance with Condition 4 of EPBC Approval 2003/1138. The five-yearly audit covers the period from January 2020 to December 2024, and is provided in **Appendix J**.

AES identified three non-compliances related to discrepancies between the management and monitoring undertaken, and the commitments made within the BMP (e.g. actions not being conducted at the specified frequency, and some actions appear to not have been undertaken) (**Appendix J**).

Some of the non-compliances were due to factors outside the control of WCPL, including staffing challenges during the COVID-19 pandemic, as well as environmental circumstances including major rainfall and flooding (**Appendix J**).

The auditor noted several recommendations for improvements to the BMP for WCPL to consider and implement, as required (**Appendix J**). These recommendations are summarised below:

- The BMP should be updated to contain a simple figure showing the location of fences, tracks, gates, and signs for the RWEAs.
- Management of feral goats onsite should be included in the annual monitoring plan, to ensure numbers are both quantified and managed appropriately.
- Revise the BMP commitment table with updated section references.

10.0 Incidents and Non-compliances during the Reporting Period

The following incidents and non-compliances were identified during the reporting period (refer **Statement of Compliance** at the front of this document):

- Exceedances of groundwater performance indicators (**Sections 6.2.3** and **10.1**).
- Non-compliances identified in the EPBC Approval 2003/1138 five-yearly audit (**Sections 9.2** and **10.2**).

10.1 Groundwater Trigger Levels

SLR (2025) reviewed compliance against the groundwater performance indicators (**Table 27**) and concluded that WCPL was compliant with the exception of the exceedance of trigger levels for P315, GW15 and P16.

P315 remains the subject of an ongoing investigation with a report provided to DPHI in November 2024 (**Section 6.1.3**).

Groundwater levels at GW15 exceeded the maximum groundwater elevation trigger level throughout the entirety of 2024, however it was concluded this is not related to WCPL's mining activity and requires no further investigation (SLR, 2025).

The groundwater elevations below the trigger observed at P16 in 2024 are likely a continuation of the combined drier climatic conditions in 2023, an ongoing Glen Munro Pit mining effect, and potentially some effect from United Pit.. The results from the updated groundwater model may help revise trigger levels at P16 to reflect the influence of both approved impacts and climatic conditions (**Section 6.2.3**).

10.2 EPBC Approval 2003/1138 Five-Yearly Audit

Under Condition 4 of EPBC Approval 2003/1138, WCPL require an independent audit of compliance with the conditions of EPBC Approval 2003/1138 every 5 years. This audit covers the period from January 2020 to December 2024.

The audit found three non-compliances with the conditions of EPBC Approval 2003/1138. It is noted that these three non-compliances result from discrepancies between the management and monitoring undertaken, and the commitments made within the BMP (i.e. non-compliances are considered administrative).

The auditor noted several recommendations for improvements to the BMP for WCPL to consider and implement, as required (**Section 9.2**).

10.3 EPBC Approval 2016/7636 and 2016/7816 Annual Compliance Report

Condition 1b of EPBC 2016/7636 and Condition 1a of EPBC 2016/7816 requires WCPL to:

> *Implement conditions A1 and A2 of Schedule 2 of the **state development consent** to minimise the impacts of the action on **protected matters**.*

As described in **Section 10.1**, WCPL recorded trigger level exceedances at three groundwater monitoring sites (i.e. P315, GW15 and P16).

The exceedances at P16 and GW15 have not resulted in a non-compliance with groundwater performance indicators (**Section 6.2.3**).

The exceedance at P315 has resulted in a non-compliance with Condition B62, Schedule 2 of DA 305-7-2003 (i.e. groundwater quality performance criteria) (**Appendix H**). It is noted that the exceedance at P315 has been observed since 2021 (**Section 6.2.3**).

This resulted in a non-compliance with Condition 1b of EPBC 2016/7636 and Condition 1a of EPBC 2016/7816. These non-compliances are considered to not be related to the EPBC 2016/7636 or 2016/7816 Action nor would they result in any significant impacts to relevant Matters of National Environmental Significance (**Appendix I**).

11.0 Regulator Requests for Information

During the reporting period, the DPHI, EPA and Resources Regulator made a number of requests for information relating to WCPL operations.

An overview of the information requested is provided in **Table 38**.

Table 38: Regulator Requests for Information

Date of Request	Relevant Agency	Comment
16 January 2024	EPA	Request for Operational Data relating to the EPA's Bust the Dust program. A response was provided to the EPA 7 February 2024.
	DPHI	Following submission of the draft AQGHGMP (Version 9) in December 2023, DPHI commissioned an independent review by Katestone Environmental who provided comments on the AQGHGMP. The comments were addressed in version 10 of the AQGHGMP which was re-submitted for approval 28 June 2024. The AQGHGMP has not yet been approved.
	DPHI	In February 2024, DPHI conducted a site inspection at WCPL which included Stony Creek. During the visit, it was requested that a brief letter report be provided reviewing observed versus predicted subsidence impacts for underground mining activities in the vicinity of Stony Creek. WCPL commissioned MSEC to undertake the review. The review was provided to DPHI 26 June 2024. Key Conclusions from MSEC (2024) include: - Maximum measured and predicted impacts of North Wambo Underground Mine near Stony Creek therefore considered that the measured subsidence effects for the ground monitoring lines at the NWUM located near Stony Creek are consistent with the predicted subsidence effects." - Maximum measured and predicted impacts of South Bates Underground Mine near Stony Creek"The inferred vertical subsidence for the section of Stony Creek adjacent to the SBUM of 20 mm to 60 mm is therefore within the accuracy of the predicted vertical subsidence and survey tolerance." Review of observed and assessed impacts: - "It is therefore understood that physical impacts (i.e. surface cracking or rock fracturing) have not been observed along Stony Creek due to the mining of longwalls at NWUM and SBUM." Observed changes in surface water flows and surface water quality are considered in other reports.
14 May 2024	EPA	Operation Bust the Dust Request for Operational data, specifically requesting average PM10 data concentration for each 10 minute interval for any operational ambient air quality monitors immediately upwind and downwind of WCPL for 4-6 August 2023 and 18-20 September 2023. A map showing each monitoring location was also requested. A response was provided 7 June 2024.
30 September 2024	Resources Regulator	Investigation into Alleged unauthorised carrying out of designated ancillary mining activities 'relating to South Wambo Dam. WCPL provided a response 25 October 2024. The matter was closed out in correspondence from the RR dated 13 November 2024. On 14 January 2025 WCPL submitted an application to apply for an Ancillary Mining Activity authorisation for South Wambo Dam (associated with CCL743).
29 November 2024	Resources Regulator	Request for further information around the Rehabilitation Cost Estimate (RCE). WCPL provided a response 13 December 2024.
20 December 2024	DPHI (DCCEEW-Water Group)	Comments provided on the revised GWMP seeking further information to - Demonstrate that the Waterfall Creek Bores were installed in accordance with DCCEEW Water Group previous recommendations - Provide an assessment of Waterfall Creek SW and GW connectivity. WCPL provided a response 20 February 2025.

12.0 Activities to be Reported in the next Reporting Period

The following activities will be undertaken and reported on by WCPL during the next reporting period:

- Consider revising groundwater level triggers at P16 to incorporate model predictions which capture the observed mining effect;
- Provide update of groundwater and surface water monitoring data at Stony Creek to DPHI in November 2025;
- Redevelopment and purging of GW13. Sites P329a and P330a could also be considered for purging following review of comments in field sheets;
- Continuation of subsidence repair trials;
- Update BMP in consideration of the findings of EPBC Approval 2003/1138 Five-Yearly Audit.
- Sealing of South Bates Extension Underground Mine; and
- Repair subsidence damage to tracks.

Where required, updated management plans and strategies will be submitted to relevant government authorities for approval and uploaded to the WCPL website.

13.0 References

- AECOM Australia Pty Ltd, 2025. *Report on stream flow events along North Wambo, South Wambo and Stoney Creeks for the period 1 January to December 2024.* 25 February 2025
- Airen Consulting, 2025. *Review of 2024 Air Quality Monitoring Data*
- Australian and New Zealand Environment and Conservation Council, 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Canberra.
- Australian Ecology Solutions Pty Ltd. *Wambo Coal Mine Development EPBC Approval 2003/1138 5-yearly audit.* 31 January 2025.
- Eco Logical Australia Pty Ltd, 2025. *Wambo Coal Annual Flora and Fauna Monitoring Report – Volumes 1 and 2*. 17 January 2025.
- EMM Consulting Pty Ltd, 2024. *Annual Environmental Monitoring Report 2023*. February 2024.
- EMM Consulting Pty Ltd, 2025. *Annual Environmental Monitoring Report 2024*. February 2025.
- Engeny, 2025. Site Water and Salt Balance. Prepared for Wambo Coal Pty Ltd.
- Enright Land Management Pty Ltd, 2024. *Wambo Peabody Underground Mine 2024 – Completed Weed Works Summary Report*
- Mine Subsidence Engineering Consultants, 2024. *South Bates Extension Underground Mine Subsidence Review Report for the South Bate Extension Underground Mine WYLW23 and WYLW24A.* October 2024
- New South Wales Department of Planning and Environment, 2015. *Post-approval requirements for State significant mining developments – Annual Review Guideline – October 2015.*
- New South Wales Minerals Council, 2010. *Technical Paper Particulate Matter and Mining Interim Report.*
- Resource Strategies, 2003. *Wambo Development Project Environmental Impact Statement.* Prepared for Wambo Coal Pty Ltd. July 2003.
- SLR Consulting Pty Ltd, 2025. *2024 Annual Review Groundwater – Wambo Coal Mine*. March 2025
- Todoroski Air Sciences, 2022. *Greenhouse Gas Assessment – Wambo Coal Mine Longwalls 24-26 Modification.*
- Umwelt, 2016. *United Wambo Open Cut Coal Mine Project Environmental Impact Statement*. August 2016.
- Umwelt, In preparation. *Stream Flow and Water Quality Impact Assessment Criteria Exceedance Investigation. Wambo Coal Mine.* March 2022.
- Wambo Coal Pty Ltd, 2021. *South bates Extension Underground Mine Extraction Plan Longwalls 21 to 24*.
- Wambo Coal Pty Ltd, 2024. *Extraction Plan Report for South Bates Extension Longwalls 24 to 26: 1 January 2024 - 30 June 2024*.

APPENDIX A

APPROVAL CONDITIONS SPECIFICALLY RELATING TO THE ANNUAL REVIEW

Approval	Condition	Description	Where Addressed
DA 305-7-2003	Condition B49, Schedule 2	For the life of the development, the Applicant must: (a) monitor the greenhouse gas emissions generated by the development; (b) investigate ways to reduce greenhouse gas emissions generated by the development; and (c) report on greenhouse gas monitoring and abatement measures in the Annual Review. to the satisfaction of the Planning Secretary.	Section 5.4
DA 305-7-2003	Condition B53, Schedule 2	The Applicant must report on water extracted or discharged from the site each year (direct and indirect) in the Annual Review, including water taken under each licence. *Note: under the water Act 1912 and/or the Water Management Act 2000, the Applicant is required to obtain all necessary water licences for the development, including during rehabilitation and post mine closure*.	Sections 6.3 to 6.7
DA 305-7-2003	Condition B66, Schedule 2	The applicant must prepare a Water Management Plan for the Wambo Mining Complex to the satisfaction of the Planning Secretary. This Plan must: (a) be prepared by a suitably qualifies and experiences person/s whose appointment has been endorsed by the Planning Secretary; (b) be prepared in consultation with DPIE Water and the EPA; (c) describe the measures to be implemented to ensure that the Applicant complies with the water management performance measures: … (vi) a protocol to report on the measures, monitoring results and performance criteria identified above, in the Annual Review referred to in condition D10.	Section 6
DA 305-7-2003	Condition B100, Schedule 2	The Applicant must: (a) take all reasonable steps to minimise the water (including coals rejects and tailings) generated by the development; (b) dispose of all waste at appropriately licensed waste facilities; (c) manage on-site sewage treatment and disposal in accordance with the requirements of Council; and (d) monitor and report of the effectiveness of the water minimisation and management measures in the Annual Review referred to in condition D10.	Section 6
DA 305-7-2003	Condition B111, Schedule 2	The Applicant must: (a) keep accurate records of the amount of coal transported from the site (on a daily basis); and (b) include these records in the Annual Review.	Section 3

Approval	Condition	Description	Where Addressed
DA 305-7-2003	Condition D10, Schedule 2	By the end of March each year or other timeframe agreed by the Planning Secretary, a report must be submitted to the Department reviewing the environmental performance of the development, to the satisfaction of the Planning Secretary. This review must: (a) describe the development (including any rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year; (b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, including a comparison of these results against the: (i) relevant statutory requirements, limits or performance measures/ criteria; (ii) requirements of any plan or program required under this consent; (iii) monitoring results of previous years; and (iv) relevant predictions in the documents listed in condition A2(c); (c) identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence; (d) evaluate and report on: (i) The effectiveness of the noise and air quality management systems; and (ii) Compliance with the performance measures, criteria and operating conditions in this consent; (e) identify any trends in the monitoring of data over the life of the development; (f) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and (g) describe what measures will be implemented over the next calendar year to improve the environmental performance of the development.	This Annual Review
EPBC 2016/7636	Condition 5	The person taking the action must publish a report on their website addressing compliance with each of the conditions of this approval, including implementation of any management plan, program, strategy and review required by condition 1. The reporting period and report publication must comply with conditions D10 and D15 of schedule 2 of the **state development consent**. Documentary evidence providing proof of the date of publication and non-compliance with any of the conditions of this approval must be provided to the **Department** at the same time as the compliance report is published. The person taking the action must continue to publish the report until such time as agreed in writing by the **Minister**.	Appendix J

Approval	Condition	Description	Where Addressed
EPBC 2016/7816	Condition 5	By 31 March of each year after the commencement of the action, the person taking the action must: publish a report on their website addressing compliance with each of the conditions of this approval, including implementation of any management plans and strategies required by conditions D10 and D15 of schedule 2 of the state development consent over the previous calendar year; and provide documentary evidence providing proof of the date of publication to the Department, by email to EPBCMonitoring@environment.gov.au (or another email address as stipulated by the Department). The person taking the action must continue publishing annual compliance reports and make all reports available on their website for the life of the approval, unless agreed in writing by the Minister.	Appendix J
S101 Approval (NETD)	Condition (h)	The North East Tailings Dam shall be reported on within the Annual Environmental Management Report for Wambo Coal. Consideration shall also be given to the rehabilitation performance for this site.	Sections 7.1.7 and 7.2.1
Water Licence 20AL200631, 20AL203044, 20AL201457	Condition 1	The licence holder must provide the Minister with figures recording the quantity of water taken via the nominated water supply works approval, when required to do so, and in the form specified by the Minister.	Section 6.5
Water Licence 20WA200632	Condition 9	The account holder must provide the Minister, in the approved form, with the following information when requested: A) A report detailing the quantity of water taken through the authorised work(s) and recorded by the approved measuring device, or where the work does not have a measuring device fitted to it, advise the Minister of the duration of any pumping, and B) Where the water is used for irrigation, the area of land irrigated, the planting date, area and yield of all crops grown on the property for each season. These details must include: i) The volume of water taken from the water source and applied directly to crops and/or pasture; ii) The volume of water taken from the water source and held in on-farm storages; iii) The volume of water taken from on-farm storages and applied to crops (including pasture); iv) The type and area of each crop (including pasture) irrigated; v) The method of irrigation for each class of crop and/or pasture; and vi) The volume of water applied to each individual class of crop and/or pasture.	Section 6.5

APPENDIX B

DAILY TRAIN MOVEMENT SUMMARY

Table B1: Daily Train Movements

Date	No Trains per Day	Date	No Trains per Day	Date	No Trains per Day
1/01/2024	1	15/02/2024	1	31/03/2024	3
2/01/2024	1	16/02/2024	3	1/04/2024	1
3/01/2024	1	17/02/2024	1	2/04/2024	1
4/01/2024	1	18/02/2024	1	3/04/2024	0
5/01/2024	0	19/02/2024	1	4/04/2024	0
6/01/2024	1	20/02/2024	0	5/04/2024	0
7/01/2024	2	21/02/2024	1	6/04/2024	3
8/01/2024	2	22/02/2024	2	7/04/2024	3
9/01/2024	2	23/02/2024	4	8/04/2024	3
10/01/2024	3	24/02/2024	0	9/04/2024	5
11/01/2024	0	25/02/2024	3	10/04/2024	3
12/01/2024	0	26/02/2024	0	11/04/2024	1
13/01/2024	0	27/02/2024	1	12/04/2024	2
14/01/2024	0	28/02/2024	0	13/04/2024	2
15/01/2024	1	29/02/2024	1	14/04/2024	2
16/01/2024	0	1/03/2024	2	15/04/2024	2
17/01/2024	1	2/03/2024	1	16/04/2024	1
18/01/2024	0	3/03/2024	2	17/04/2024	3
19/01/2024	0	4/03/2024	4	18/04/2024	0
20/01/2024	1	5/03/2024	3	19/04/2024	4
21/01/2024	1	6/03/2024	2	20/04/2024	2
22/01/2024	2	7/03/2024	1	21/04/2024	2
23/01/2024	1	8/03/2024	0	22/04/2024	3
24/01/2024	1	9/03/2024	3	23/04/2024	3
25/01/2024	1	10/03/2024	2	24/04/2024	5
26/01/2024	1	11/03/2024	3	25/04/2024	2
27/01/2024	1	12/03/2024	2	26/04/2024	0
28/01/2024	2	13/03/2024	2	27/04/2024	2
29/01/2024	3	14/03/2024	2	28/04/2024	1
30/01/2024	3	15/03/2024	4	29/04/2024	0
31/01/2024	1	16/03/2024	4	30/04/2024	1
1/02/2024	2	17/03/2024	4	1/05/2024	3
2/02/2024	0	18/03/2024	4	2/05/2024	1
3/02/2024	2	19/03/2024	4	3/05/2024	1
4/02/2024	0	20/03/2024	5	4/05/2024	3
5/02/2024	0	21/03/2024	3	5/05/2024	1
6/02/2024	0	22/03/2024	4	6/05/2024	0
7/02/2024	0	23/03/2024	3	7/05/2024	2
8/02/2024	0	24/03/2024	3	8/05/2024	1
9/02/2024	4	25/03/2024	3	9/05/2024	1
10/02/2024	1	26/03/2024	3	10/05/2024	0
11/02/2024	5	27/03/2024	0	11/05/2024	2
12/02/2024	5	28/03/2024	1	12/05/2024	0
13/02/2024	2	29/03/2024	3	13/05/2024	4
14/02/2024	1	30/03/2024	2	14/05/2024	2

Peabody

Table B1: Daily Train Movements

Date	No Trains per Day	Date	No Trains per Day	Date	No Trains per Day
15/05/2024	2	29/06/2024	2	13/08/2024	6
16/05/2024	2	30/06/2024	0	14/08/2024	2
17/05/2024	3	1/07/2024	2	15/08/2024	2
18/05/2024	2	2/07/2024	1	16/08/2024	0
19/05/2024	3	3/07/2024	3	17/08/2024	2
20/05/2024	4	4/07/2024	1	18/08/2024	3
21/05/2024	0	5/07/2024	3	19/08/2024	3
22/05/2024	0	6/07/2024	3	20/08/2024	2
23/05/2024	0	7/07/2024	0	21/08/2024	2
24/05/2024	3	8/07/2024	2	22/08/2024	3
25/05/2024	1	9/07/2024	2	23/08/2024	2
26/05/2024	1	10/07/2024	2	24/08/2024	3
27/05/2024	2	11/07/2024	3	25/08/2024	3
28/05/2024	3	12/07/2024	2	26/08/2024	2
29/05/2024	3	13/07/2024	1	27/08/2024	3
30/05/2024	3	14/07/2024	1	28/08/2024	4
31/05/2024	1	15/07/2024	2	29/08/2024	0
1/06/2024	1	16/07/2024	3	30/08/2024	5
2/06/2024	3	17/07/2024	1	31/08/2024	4
3/06/2024	5	18/07/2024	2	1/09/2024	4
4/06/2024	3	19/07/2024	4	2/09/2024	1
5/06/2024	2	20/07/2024	3	3/09/2024	2
6/06/2024	1	21/07/2024	4	4/09/2024	2
7/06/2024	3	22/07/2024	2	5/09/2024	5
8/06/2024	1	23/07/2024	5	6/09/2024	3
9/06/2024	2	24/07/2024	5	7/09/2024	1
10/06/2024	5	25/07/2024	5	8/09/2024	1
11/06/2024	4	26/07/2024	4	9/09/2024	0
12/06/2024	6	27/07/2024	3	10/09/2024	4
13/06/2024	4	28/07/2024	3	11/09/2024	1
14/06/2024	4	29/07/2024	2	12/09/2024	1
15/06/2024	5	30/07/2024	3	13/09/2024	2
16/06/2024	4	31/07/2024	3	14/09/2024	2
17/06/2024	1	1/08/2024	2	15/09/2024	2
18/06/2024	4	2/08/2024	3	16/09/2024	2
19/06/2024	2	3/08/2024	0	17/09/2024	4
20/06/2024	2	4/08/2024	0	18/09/2024	0
21/06/2024	1	5/08/2024	1	19/09/2024	2
22/06/2024	4	6/08/2024	4	20/09/2024	2
23/06/2024	2	7/08/2024	3	21/09/2024	1
24/06/2024	3	8/08/2024	2	22/09/2024	3
25/06/2024	3	9/08/2024	1	23/09/2024	3
26/06/2024	2	10/08/2024	3	24/09/2024	4
27/06/2024	1	11/08/2024	3	25/09/2024	2
28/06/2024	3	12/08/2024	4	26/09/2024	3

Peabody

Table B1: Daily Train Movements

Date	No Trains per Day	Date	No Trains per Day	Date	No Trains per Day
27/09/2024	3	9/11/2024	1	22/12/2024	4
28/09/2024	1	10/11/2024	4	23/12/2024	1
29/09/2024	4	11/11/2024	2	24/12/2024	2
30/09/2024	2	12/11/2024	1	25/12/2024	0
1/10/2024	0	13/11/2024	0	26/12/2024	2
2/10/2024	0	14/11/2024	0	27/12/2024	2
3/10/2024	0	15/11/2024	3	28/12/2024	3
4/10/2024	4	16/11/2024	2	29/12/2024	2
5/10/2024	5	17/11/2024	1	30/12/2024	2
6/10/2024	0	18/11/2024	3	31/12/2024	4
7/10/2024	4	19/11/2024	0		
8/10/2024	2	20/11/2024	0		
9/10/2024	1	21/11/2024	0		
10/10/2024	0	22/11/2024	3		
11/10/2024	0	23/11/2024	4		
12/10/2024	0	24/11/2024	3		
13/10/2024	3	25/11/2024	3		
14/10/2024	4	26/11/2024	1		
15/10/2024	3	27/11/2024	0		
16/10/2024	5	28/11/2024	4		
17/10/2024	2	29/11/2024	3		
18/10/2024	2	30/11/2024	3		
19/10/2024	2	1/12/2024	3		
20/10/2024	3	2/12/2024	0		
21/10/2024	2	3/12/2024	2		
22/10/2024	2	4/12/2024	2		
23/10/2024	1	5/12/2024	1		
24/10/2024	1	6/12/2024	2		
25/10/2024	1	7/12/2024	1		
26/10/2024	2	8/12/2024	5		
27/10/2024	3	9/12/2024	3		
28/10/2024	6	10/12/2024	2		
29/10/2024	4	11/12/2024	2		
30/10/2024	5	12/12/2024	3		
31/10/2024	4	13/12/2024	1		
1/11/2024	6	14/12/2024	3		
2/11/2024	4	15/12/2024	3		
3/11/2024	4	16/12/2024	4		
4/11/2024	2	17/12/2024	4		
5/11/2024	2	18/12/2024	2		
6/11/2024	3	19/12/2024	3		
7/11/2024	0	20/12/2024	1		
8/11/2024	2	21/12/2024	2		

Table B2: Train Movements within Sensitive Service Hours

(Friday 6pm-9pm & Sunday 9am-12am)

Date	Time
Friday, 26 January 2024	7:13:50 PM
Saturday, 27 January 2024	12:21:46 PM
Sunday, 11 February 2024	10:20:08 AM
Friday, 16 February 2024	10:33:07 PM
Sunday, 18 February 2024	2:02:08 PM
Friday, 23 February 2024	6:30:56 PM
Friday, 1 March 2024	6:48:10 PM
Friday, 15 March 2024	10:13:47 PM
Sunday, 17 March 2024	11:10:37 AM
Sunday, 31 March 2024	12:38:01 PM
Sunday, 7 April 2024	10:43:06 AM
Sunday, 21 April 2024	12:01:13 PM
Friday, 17 May 2024	6:10:13 PM
Sunday, 19 May 2024	11:13:54 AM
Friday, 7 June 2024	10:25:22 PM
Sunday, 9 June 2024	11:02:40 AM
Friday, 14 June 2024	6:43:13 PM
Sunday, 16 June 2024	10:47:00 AM
Friday, 21 June 2024	10:34:10 PM
Friday, 12 July 2024	7:49:33 PM
Sunday, 14 July 2024	11:06:07 AM
Friday, 19 July 2024	10:15:20 PM
Friday, 26 July 2024	9:44:02 PM
Sunday, 28 July 2024	11:21:09 AM
Friday, 2 August 2024	9:49:35 PM
Friday, 9 August 2024	7:12:48 PM
Sunday, 11 August 2024	9:26:42 AM
Sunday, 11 August 2024	12:04:58 PM
Sunday, 25 August 2024	12:41:15 PM
Friday, 30 August 2024	10:52:47 PM
Sunday, 8 September 2024	11:51:14 AM
Saturday, 14 September 2024	11:51:54 AM
Sunday, 22 September 2024	9:53:41 AM
Friday, 27 September 2024	10:47:41 PM
Sunday, 29 September 2024	11:41:17 AM
Friday, 4 October 2024	6:10:58 PM
Friday, 4 October 2024	10:07:00 PM
Friday, 25 October 2024	10:59:09 PM
Friday, 1 November 2024	7:30:04 PM
Sunday, 3 November 2024	12:34:37 PM
Sunday, 10 November 2024	11:56:52 AM
Friday, 22 November 2024	9:33:58 PM
Sunday, 24 November 2024	9:51:25 AM
Sunday, 1 December 2024	9:20:04 AM
Friday, 6 December 2024	10:11:14 PM
Sunday, 8 December 2024	1:16:53 PM

APPENDIX C

ANNUAL NOISE MONITORING REPORT

Wambo Coal Mine

Annual Environmental Monitoring Report 2024

Prepared for Wambo Coal Pty Ltd

February 2025

Wambo Coal Mine

Annual Environmental Monitoring Report 2024

Wambo Coal Pty Ltd

E231300 13

February 2025

Version	Date	Prepared by	Reviewed by	Comments
V1	23/01/2025	Ingrid Smith	Jesse Tribby	Draft
V2	27/02/2025	Ingrid Smith	Jesse Tribby	Final

Approved by

Jesse Tribby
Associate, Acoustics
27 February 2025

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ABN: 28 141 736 558

Executive Summary

EMM Consulting Pty Ltd (EMM) was engaged by Wambo Coal Pty Ltd to provide an Annual Environmental Monitoring Report for 2024 to compare noise monitoring results against relevant criteria.

This report summarises monthly attended noise monitoring surveys conducted at five monitoring locations around Wambo Coal Mine (WCM) during the reporting period 1 January to 31 December 2024. The purpose of the surveys was to quantify and describe the acoustic environment around the site and compare results with specified limits.

Attended noise monitoring described in this report was conducted monthly in accordance with the relevant development consents, Environment Protection Licence (EPL), and the WCM Noise Management Plan (NMP).

ES1.1 January to December 2024 compliance

WCM complied with relevant noise criteria during all measurements during 2024 noise monitoring.

ES1.2 Long-term noise trends

During the 5-year period analysed, WCM noise levels at most monitoring locations decreased from 2020 as mining moved underground. From 1 December 2021, open cut mining was no longer undertaken by WCM and noise emissions decreased significantly.

ES1.3 EIS comparison

WCM commenced Phase 2 on 1 December 2020, wherein WCM only manages underground operations and associated plant. Open cut operations are managed by United Wambo (UW) as part of the United Wambo Joint Venture (UWJV).

Noise levels from WCM were generally inaudible and therefore not comparable to Year 6 predictions in the EIS.

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1 Introduction

1.1 Background

EMM was engaged by Wambo Coal Pty Ltd to provide an Annual Environmental Monitoring Report (AEMR) for 2024 to compare noise monitoring results against modelling predictions and relevant noise limits.

This report summarises monthly attended noise monitoring surveys conducted at five monitoring locations around WCM during the reporting period 1 January to 31 December 2024. The purpose of the surveys was to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Attended noise monitoring locations

Monitoring locations for WCM are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows the actual monitoring positions, not the location of residences.

Table 1.1 Attended noise monitoring locations

Site Reference [1]	EPA Point [2]	Area Description	Properties Represented [3]
N01	N/A	North Bulga	3, 7, 379
N16	20	Jerrys Plains Road	Privately-owned residences near Jerry's Plains
N20A	21	Redmanvale Road Central	Privately-owned residences near Jerry's Plains
N21	22	South Wambo	25, 35a
N26	23	Redmanvale Road South	Privately-owned residences near Jerry's Plains

Notes: 1. Sourced from NMP – WA-ENV-MNP-503, November 2020.
2. Sourced from Environment Protection Licence 529, September 2021.
3. Property numbering is from Appendix 4 of DA 305-7-2003.

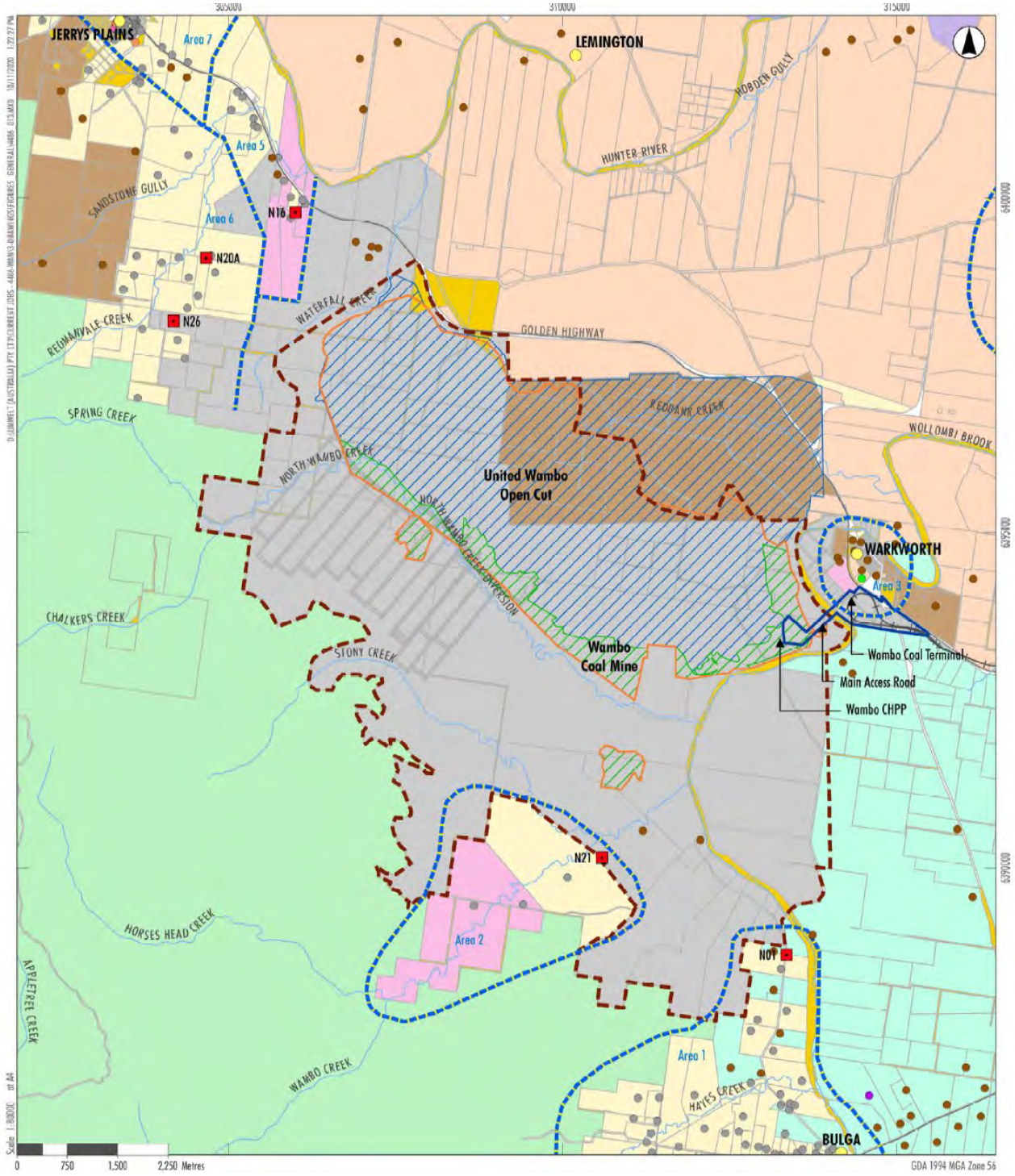

Figure 1.1 **WCM noise monitoring locations**

1.3 Terminology & abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise.
L_{Amax}	The maximum A-weighted noise level over a time period.
L_{A1}	The noise level which is exceeded for 1% of the time.
$L_{A1,1minute}$	The noise level which is exceeded for 1% of the specified time period of 1 minute.
L_{A10}	The noise level which is exceeded for 10% of the time.
L_{Aeq}	The average noise A-weighted energy during a measurement period.
L_{A50}	The noise level which is exceeded for 50% of the time and the median noise level during a measurement period.
L_{A90}	The level exceeded for 90% of the time. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	This is the period 7:00 am to 6:00 pm.
Evening	This is the period 6:00 pm to 10:00 pm.
Night	This is the period 10:00 pm to 7:00 am.
WC	Wambo Coal
WCM	Wambo Coal Mine
WCRS	Wambo Coal Road Spur

2 Regulator requirements and noise limits

2.1 WCM development consent

The most current development consent for WCM is DA 305-7-2003 (MOD 19, 25 January 2023). Schedule 2, Part B of the WCM consent details specific conditions relating to noise generated by WCM.

2.2 WCRS development consent

The most current development consent for Wambo Rail Loop is WCRS DA 177-8-2004 (MOD 3, 29 August 2019), last modified to include a rail refuelling facility. Schedule 2, Part B of the WCRS consent details specific conditions relating to noise generated by WCRS.

2.3 Environment protection licence

WCM holds Environment Protection Licence (EPL) No. 529 issued by the Environment Protection Authority (EPA) most recently on 30 September 2021.

2.4 Noise management plan

Noise monitoring requirements are detailed in the Wambo Coal Noise Management Plan WA-ENV-MNP-503 (NMP, July 2023), prepared in accordance with the WCM and WCRS consents.

2.5 Noise limits

Noise criteria detailed in Table 2.1 have been adopted for each monitoring location based on Phase 2 and 3 of the development consent (MOD 18) and the NMP.

Table 2.1 WCM Noise impact limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
N01 [1]	37	37	37	47
N16	35	35	35	45
N20A	35	35	35	45
N21 [2]	39	39	39	49
N26	35	35	35	45

Notes: 1. Noise criteria for the nearest privately-owned property (R007) have been adopted.

2. Noise criteria for the nearest privately-owned property (R025) have been adopted.

EPL noise limits have not been updated for Phase 2 and 3 of operations. As noise criteria in the development consent and NMP are now more conservative than those in the EPL, they have been adopted in Table 2.1.

2.6 Meteorological conditions

Appendix 5 of MOD 19 details specific meteorological conditions required for noise limits to be applicable:

APPENDIX 5 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in condition B12 are to apply under all meteorological conditions except the following:
   - (a) where 3°C/100 metres (m) lapse rates have been assessed, then:
     - (i) wind speeds greater than 3 metres/second (m/s) measured at 10m above ground level;
     - (ii) temperature inversion conditions between 1.5°C and 3°C/100m and wind speeds greater than 2m/s measured at 10m above ground level; or
     - (iii) temperature inversion conditions greater than 3°C/100m.
   - (b) where Pasquill Stability Classes have been assessed, then:
     - (i) wind speeds greater than 3m/s at 10m above ground level;
     - (ii) stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level;
     - (iii) stability category G temperature inversion conditions.

As lapse rates (VTG) were not measured directly, meteorological conditions have been assessed against requirements detailed in 1.(b), which are consistent with the EPL.

2.7 Additional requirements

Monitoring and reporting have been done in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017 and the 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

2.8 Very noise-enhancing meteorological conditions

In accordance with the Approved Methods, monthly noise monitoring for the site is scheduled to occur during forecasted meteorological conditions where noise limits in Table 2.1 will be applicable. However, in cases where actual meteorological conditions do not align with forecasts and noise limits are subsequently not directly applicable, it is the expectation of regulators that noise impact still be managed.

The NPfI states that:

> Noise limits derived for consents and licences will apply under the meteorological conditions used in the environmental assessment process, that is, standard or noise-enhancing meteorological conditions. For 'very noise-enhancing meteorological conditions' … a limit is set based on the limit derived under standard or noise-enhancing conditions (whichever is adopted in the assessment) plus 5 dB. In this way a development is subject to noise limits under all meteorological conditions.

Therefore, if monthly noise monitoring occurs during meteorological conditions outside of those specified in Section 2.6, site limits will be adjusted based on Table 2.1 plus 5 dB.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. Meteorological data was obtained from the WCM automated weather station (AWS) which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the night period at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site's contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, it was inaudible at the monitoring location. When site noise is noted as NM, this means it was audible but could not be quantified. All results noted as IA or NM in this report were due to one or more of the following:

- Site noise levels were very low, typically more than 10 dB below the measured background (L_{A90}), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as breeze in foliage or continuous road traffic noise) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods such as move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

If exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range but were determined to be at least 5 dB lower than relevant limits, then a maximum estimate of may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

Meteorological data was obtained from the AWS; this was logged at 10-minute intervals. Atmospheric parameters include wind speed, wind direction, rainfall, and sigma theta. When meteorological data is provided in less than 15-minute intervals, analysis must be conducted to determine the meteorological conditions present for most of each measurement period and whether those conditions result in noise criteria being applicable or not.

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI at the time of measurement. If applicable, modifying factor penalties have been reported and added to measured site-only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Comparison with United Wambo EIS model predictions

The MOD 17 environmental assessment (EA) and MOD 16 EIS both reference the noise impact assessment (NIA) prepared in July 2016 to support application for the UWJV project. The NIA includes noise impacts associated with ongoing operations from both WCM and UW.

WCM commenced Phase 2 on 1 December 2020, wherein WCM only manages underground operations and associated plant. Open cut operations are managed by UW as part of the UWJV. It is feasible for noise emissions from WCM ventilation fans, conveyors, coal preparation plant, and/or rail loop to contribute to total UWJV noise levels.

The NIA uses a cumulative distribution methodology wherein all meteorological conditions are considered and weighted based on how often they occur. Using this weighting, measured noise levels are expected to be greater than predicted noise levels provided in the NIA approximately 10% of the time. Measured noise levels are expected to be lower than noise levels predicted in the NIA the remaining 90% of the time. To compare measured and predicted noise levels, comparison should only occur when noise-enhancing atmospheric conditions are present.

Noise-enhancing conditions have been determined for each monitoring location in accordance with the NPfI. Meteorological parameter bounds used to identify corresponding meteorological conditions during attended monitoring are summarised in Table 3.1.

Table 3.1 Applicable meteorological condition definitions

Location	Condition	Wind speed m/s	Wind direction (°)	Stability category
N01	Wind only	Up to 3.0	W (267.5°-292.5°)	D and E
	Inversion	Up to 2.0	W (267.5°-292.5°)	F
N16	Wind only	Up to 3.0	SE (112.5°-157.5°)	D and E
	Inversion	Up to 2.0	SE (112.5°-157.5°)	F
N20A	Wind only	Up to 3.0	SE (112.5°-157.5°)	D and E
	Inversion	Up to 2.0	SE (112.5°-157.5°)	F
N21	Wind only	Up to 3.0	NNW (315°-360°)	D and E
	Inversion	Up to 2.0	NNW (315°-360°)	F
N26	Wind only	Up to 3.0	SE (112.5°-157.5°)	D and E
	Inversion	Up to 2.0	SE (112.5°-157.5°)	F

In the NIA, a subset of meteorological conditions were used to determine worst-case sleep disturbance and low-frequency noise impacts, reproduced below:

- 3 m/s wind from the south east (a vectored wind condition that can occur greater than 30% of the time during the evening and night time)
- 3 m/s wind from the north-west (a vectored wind condition that can occur up to 20% of the time during the day time)
- F Class stability, modelled as 4°C/100 metre inversion 1.3 m/s drainage flow from the south (the vectored wind condition can occur greater than 30% of the time during inversion conditions during winter night times (6pm to 7am)).

Predicted noise levels for "3 m/s wind from the north-west" atmospheric conditions were based on occurrence during the day period and have not been compared to attended monitoring results for sleep disturbance, which can only occur during the night period. Subsequently, three comparisons against predicted noise levels were feasible:

- Sleep disturbance noise predictions for "calm" atmospheric conditions are compared to attended measurements where wind speeds were less than 0.5 metres per second (m/s), including all wind directions, and Stability Category was D or E according to Table D2 of the NPfI.
- Sleep disturbance noise predictions for "3 m/s wind from the SE" atmospheric conditions are compared to attended measurements where wind speeds were in the range 0.5 to 3.0 m/s and Stability Category was D or E, according to Table D2 of the NPfI. The modelled wind direction was SE (135 degrees). Wind directions 22.5 degrees either side of the modelled direction were included.
- Sleep disturbance noise predictions for "F Class stability" atmospheric conditions are compared to attended measurements where wind speeds were up to 2.0 m/s and Stability Category was F according to Table D2 of the NPfI. The modelled wind direction was S (180 degrees). Wind directions 22.5 degrees either side of the modelled direction were included.

Meteorological parameter bounds used to identify corresponding meteorological conditions during attended monitoring are summarised in Table 3.2.

Table 3.2 Meteorological condition definitions

	Night		
Parameter	**Clam**	**SE wind**	**Inversion**
Wind speed (m/s)	0.0–0.5	0.5–3.0	0.0–2.0
Wind direction (°)	all	112.5° – 157.5°	157.5°–202.5°
Stability category	D and E	D and E	F

Noise predictions for Year 6 are closely aligned with 2024 calendar year so were compared with measured levels from attended compliance monitoring for corresponding meteorological conditions.

4 Results

4.1 January 2024

4.1.1 Total measured noise levels

Overall noise levels measured at each location during attended measurements are provided in Table 4.1.

Table 4.1 Total measured noise levels, dB – January 2024 [1]

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N01	23/01/2024 23:53	50	42	40	38	37	35	32
N16	23/01/2024 23:17	62	58	49	46	41	39	37
N20A	23/01/2024 22:28	44	41	39	37	37	35	33
N21	23/01/2024 23:28	50	37	35	33	33	31	29
N26	23/01/2024 22:00	51	49	41	40	38	36	34

Notes: 1. Levels in this table are not necessarily the result of activity at site.

4.1.2 Modifying factors

Measured site-only levels were assessed for the applicability of modifying factors in accordance with the NPfI and methodology described in Section 3.4.

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.1.3 Attended noise monitoring

Table 4.2 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing meteorological conditions as defined by the NPfI.

Table 4.2 Site noise levels and limits – January 2024

Location	Start date and time	Wind		Stability class	Very enhancing? [1]	Limits, dB		Site levels, dB [2]		Exceedances, dB	
		Speed m/s	Direction [3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N01	23/01/2024 23:53	0.8	213	E	No	37	47	IA	IA	Nil	Nil
N16	23/01/2024 23:17	1.2	149	F	No	35	45	IA	IA	Nil	Nil
N20A	23/01/2024 22:28	1.4	151	E	No	35	45	IA	IA	Nil	Nil
N21	23/01/2024 23:28	1.2	153	E	No	39	49	IA	IA	Nil	Nil
N26	23/01/2024 22:00	1.4	141	F	No	35	45	IA	IA	Nil	Nil

Notes: 1. Noise limits are adjusted by +5 dB during 'very enhancing meteorological conditions' in accordance with the NPfI.

2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties, if applicable.

3. Degrees magnetic north, "-" indicates calm conditions.

4.2 February 2024

4.2.1 Total measured noise levels

Overall noise levels measured at each location during attended measurements are provided in Table 4.1.

Table 4.3 Total measured noise levels, dB – February 2024 [1]

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N01	12/02/2024 23:15	52	51	51	45	38	36	34
N16	12/02/2024 23:55	48	43	42	41	41	40	37
N20A	12/02/2024 22:45	46	38	36	34	34	32	30
N21	12/02/2024 23:38	47	41	35	34	33	31	29
N26	12/02/2024 22:14	46	35	33	32	32	31	29

Notes: 1. Levels in this table are not necessarily the result of activity at site.

4.2.2 Modifying factors

Measured site-only levels were assessed for the applicability of modifying factors in accordance with the NPfI and methodology described in Section 3.4.

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.2.3 Attended noise monitoring

Table 4.4 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing meteorological conditions as defined by the NPfI.

Table 4.4 Site noise levels and limits – February 2024

Location	Start date and time	Wind		Stability class	Very enhancing? [1]	Limits, dB		Site levels, dB [2]		Exceedances, dB	
		Speed m/s	Direction [3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N01	12/02/2024 23:15	0.9	263	F	No	37	47	IA	IA	Nil	Nil
N16	12/02/2024 23:55	1.1	184	D	No	35	45	IA	IA	Nil	Nil
N20A	12/02/2024 22:45	1.2	124	D	No	35	45	IA	IA	Nil	Nil
N21	12/02/2024 23:38	0.7	228	F	No	39	49	IA	IA	Nil	Nil
N26	12/02/2024 22:14	0.8	158	F	No	35	45	IA	IA	Nil	Nil

Notes: 1. Noise limits are adjusted by +5 dB during 'very enhancing meteorological conditions' in accordance with the NPfI.

2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.

3. Degrees magnetic north, "-" indicates calm conditions.

4.3 March 2024

4.3.1 Total measured noise levels

Overall noise levels measured at each location during attended measurements are provided in Table 4.5.

Table 4.5 Total measured noise levels, dB – March 2024 [1]

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N01	7/03/2024 00:30	51	41	37	35	35	34	32
N16	6/03/2024 23:36	45	38	36	34	34	32	29
N20A	6/03/2024 22:39	48	38	35	33	32	30	28
N21	7/03/2024 00:01	40	39	38	36	35	33	31
N26	6/03/2024 22:07	40	36	35	34	33	32	31

Notes: 1. Levels in this table are not necessarily the result of activity at site.

4.3.2 Modifying factors

Measured site-only levels were assessed for the applicability of modifying factors in accordance with the NPfI and methodology described in Section 3.4.

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.3.3 Attended noise monitoring

Table 4.6 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing meteorological conditions as defined by the NPfI.

Table 4.6 Site noise levels and limits – March 2024

Location	Start date and time	Wind		Stability class	Very enhancing? [1]	Limits, dB		Site levels, dB [2]		Exceedances, dB	
		Speed m/s	Direction [3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N01	7/03/2024 00:30	0.8	90	F	No	37	47	IA	IA	Nil	Nil
N16	6/03/2024 23:36	1.4	88	D	No	35	45	IA	IA	Nil	Nil
N20A	6/03/2024 22:39	1.0	77	F	No	35	45	IA	IA	Nil	Nil
N21	7/03/2024 00:01	0.9	92	F	No	39	49	IA	IA	Nil	Nil
N26	6/03/2024 22:07	0.7	129	F	No	35	45	IA	IA	Nil	Nil

Notes: 1. Noise limits are adjusted by +5 dB during 'very enhancing meteorological conditions' in accordance with the NPfI.

2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.

3. Degrees magnetic north, "-" indicates calm conditions.

4.4 April 2024

4.4.1 Total measured noise levels

Overall noise levels measured at each location during attended measurements are provided in Table 4.7.

Table 4.7 Total measured noise levels, dB – April 2024 [1]

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N01	10/04/2024 23:12	45	41	40	38	38	37	35
N16	10/04/2024 23:24	54	47	42	39	38	34	32
N20A	10/04/2024 22:30	45	38	34	32	31	30	27
N21	10/04/2024 23:37	52	49	48	46	46	44	42
N26	10/04/2024 22:02	48	38	36	34	34	32	29

Notes: 1. Levels in this table are not necessarily the result of activity at site.

4.4.2 Modifying factors

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.4.3 Attended noise monitoring

Table 4.8 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing meteorological conditions as defined by the NPfI.

Table 4.8 Site noise levels and limits – April 2024

Location	Start date and time	Wind		Stability class	Very enhancing? [1]	Limits, dB		Site levels, dB [2]		Exceedances, dB	
		Speed m/s	Direction [3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N01	10/04/2024 23:12	0.8	225	F	No	37	47	IA	IA	Nil	Nil
N16	10/04/2024 23:24	0.3	271	F	No	35	45	IA	IA	Nil	Nil
N20A	10/04/2024 22:30	0.2	180	F	No	35	45	IA	IA	Nil	Nil
N21	10/04/2024 23:37	0.2	264	F	No	39	49	IA	IA	Nil	Nil
N26	10/04/2024 22:02	0.4	218	F	No	35	45	IA	IA	Nil	Nil

Notes: 1. Noise limits are adjusted by +5 dB during 'very enhancing meteorological conditions' in accordance with the NPfI.
2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.
3. Degrees magnetic north, "-" indicates calm conditions.

4.5 May 2024

4.5.1 Total measured noise levels

Overall noise levels measured at each location during attended measurements are provided in Table 4.9.

Table 4.9 Total measured noise levels, dB – May 2024 [1]

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N01	2/05/2024 00:21	46	36	33	32	32	30	29
N16	1/05/2024 23:10	46	38	34	32	31	29	26
N20A	1/05/2024 22:24	41	39	37	35	34	32	30
N21	1/05/2024 23:50	43	34	32	31	31	30	29
N26	1/05/2024 22:00	49	45	39	36	34	32	31

Notes: 1. Levels in this table are not necessarily the result of activity at site.

4.5.2 Modifying factors

Measured site-only levels were assessed for the applicability of modifying factors in accordance with the NPfI and methodology described in Section 3.4.

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.5.3 Attended noise monitoring

Table 4.10 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing meteorological conditions as defined by the NPfI.

Table 4.10 Site noise levels and limits – May 2024

Location	Start date and time	Wind		Stability class	Very enhancing? [1]	Limits, dB		Site levels, dB [2]		Exceedances, dB	
		Speed m/s	Direction [3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N01	2/05/2024 00:21	2.6	175	D	No	37	47	IA	IA	Nil	Nil
N16	1/05/2024 23:10	1.9	159	F	No	35	45	IA	IA	Nil	Nil
N20A	1/05/2024 22:24	2.4	182	D	No	35	45	IA	IA	Nil	Nil
N21	1/05/2024 23:50	2.0	187	D	No	39	49	IA	IA	Nil	Nil
N26	1/05/2024 22:00	2.0	167	F	No	35	45	IA	IA	Nil	Nil

Notes: 1. Noise limits are adjusted by +5 dB during 'very enhancing meteorological conditions' in accordance with the NPfI.

2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.

3. Degrees magnetic north, "-" indicates calm conditions.

4.6 June 2024

4.6.1 Total measured noise levels

Overall noise levels measured at each location during attended measurements are provided in Table 4.11.

Table 4.11 Total measured noise levels, dB – June 2024 [1]

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N01	19/06/2024 00:24	38	34	31	30	29	28	27
N16	18/06/2024 23:20	58	54	35	40	25	23	22
N20A	18/06/2024 22:28	43	33	27	25	24	22	20
N21	18/06/2024 23:44	47	35	33	31	30	28	25
N26	18/06/2024 22:00	50	32	26	25	22	20	17

Notes: 1. Levels in this table are not necessarily the result of activity at site.

4.6.2 Modifying factors

Measured site-only levels were assessed for the applicability of modifying factors in accordance with the NPfI and methodology described in Section 3.4.

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.6.3 Attended noise monitoring

Table 4.12 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing meteorological conditions as defined by the NPfI.

Table 4.12 Site noise levels and limits – June 2024

Location	Start date and time	Wind		Stability class	Very enhancing? [1]	Limits, dB		Site levels, dB [2]		Exceedances, dB	
		Speed m/s	Direction [3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N01	19/06/2024 00:24	0.7	95	F	No	37	47	IA	IA	Nil	Nil
N16	18/06/2024 23:20	0.6	75	F	No	35	45	IA	IA	Nil	Nil
N20A	18/06/2024 22:28	0.8	72	F	No	35	45	IA	IA	Nil	Nil
N21	18/06/2024 23:44	0.6	138	F	No	39	49	NM	NM	Nil	Nil
N26	18/06/2024 22:00	0.9	51	F	No	35	45	IA	IA	Nil	Nil

Notes: 1. Noise limits are adjusted by +5 dB during 'very enhancing meteorological conditions' in accordance with the NPfI.

2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.

3. Degrees magnetic north, "-" indicates calm conditions.

4.7 July 2024

4.7.1 Total measured noise levels

Overall noise levels measured at each location during attended measurements are provided in Table 4.13.

Table 4.13 Total measured noise levels, dB – July 2024 [1]

Location	Start Date and Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N01	22/07/2024 23:58	50	42	35	33	31	28	26
N16	22/07/2024 23:09	41	36	28	27	25	23	22
N20A	22/07/2024 22:23	45	40	33	30	26	23	19
N21	22/07/2024 23:33	46	37	34	33	32	31	29
N26	22/07/2024 22:00	43	33	31	28	27	23	21

Notes: 1. Levels in this table are not necessarily the result of activity at site.

4.7.2 Modifying factors

Measured site-only levels were assessed for the applicability of modifying factors in accordance with the NPfI and methodology described in Section 3.4

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.7.3 Attended noise monitoring

Table 4.14 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing meteorological conditions as defined by the NPfI.

Table 4.14 Site noise levels and limits – July 2024

Location	Start date and time	Wind		Stability class	Very enhancing? [1]	Limits, dB		Site levels, dB [2]		Exceedances, dB	
		Speed m/s	Direction [3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N01	22/07/2024 23:58	0.6	84	F	No	37	47	IA	IA	Nil	Nil
N16	22/07/2024 23:09	0.6	192	F	No	35	45	IA	IA	Nil	Nil
N20A	22/07/2024 22:23	0.7	297	F	No	35	45	IA	IA	Nil	Nil
N21	22/07/2024 23:33	0.6	219	F	No	39	49	IA	IA	Nil	Nil
N26	22/07/2024 22:00	0.6	308	F	No	35	45	IA	IA	Nil	Nil

Notes: 1. Noise limits are adjusted by +5 dB during 'very enhancing meteorological conditions' in accordance with the NPfI.

2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.

3. Degrees magnetic north, "-" indicates calm conditions.

4.8 August 2024

4.8.1 Total measured noise levels

Overall noise levels measured at each location during attended measurements are provided in Table 4.15.

Table 4.15 Total measured noise levels, dB – August 2024 [1]

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N01	28/08/2024 00:00	39	35	33	32	32	30	28
N16	27/08/2024 23:08	50	34	32	30	30	28	26
N20A	27/08/2024 22:23	47	44	42	40	39	37	34
N21	27/08/2024 23:33	44	37	35	34	34	33	31
N26	27/08/2024 22:00	60	48	45	43	41	39	35

Notes: 1. Levels in this table are not necessarily the result of activity at site.

4.8.2 Modifying factors

Measured site-only levels were assessed for the applicability of modifying factors in accordance with the NPfI and methodology described in Section 3.4.

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.8.3 Attended noise monitoring

Table 4.16 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing meteorological conditions as defined by the NPfI.

Table 4.16 Site noise levels and limits – August 2024

Location	Start date and time	Wind		Stability class	Very enhancing? [1]	Limits, dB		Site levels, dB [2]		Exceedances, dB	
		Speed m/s	Direction [3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N01	28/08/2024 00:00	2.8	308	F	Yes	42	52	IA	IA	Nil	Nil
N16	27/08/2024 23:08	3.1	303	E	Yes	40	50	IA	IA	Nil	Nil
N20A	27/08/2024 22:23	2.7	314	F	Yes	40	50	IA	IA	Nil	Nil
N21	27/08/2024 23:33	2.9	306	E	No	39	49	IA	IA	Nil	Nil
N26	27/08/2024 22:00	3.5	303	E	Yes	40	50	IA	IA	Nil	Nil

Notes: 1. Noise limits are adjusted by +5 dB during 'very enhancing meteorological conditions' in accordance with the NPfI.

2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.

3. Degrees magnetic north, "-" indicates calm conditions.

4.9 September 2024

4.9.1 Total measured noise levels

Overall noise levels measured at each location during attended measurements are provided in Table 4.17.

Table 4.17 Total measured noise levels, dB – September 2024 [1]

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N01	26/09/2024 00:06	36	32	29	28	28	27	25
N16	25/09/2024 23:21	60	55	42	41	28	26	25
N20A	25/09/2024 22:27	49	40	37	35	34	32	30
N21	25/09/2024 23:35	44	34	31	29	28	26	24
N26	25/09/2024 22:01	46	44	42	40	40	38	34

Notes: 1. Levels in this table are not necessarily the result of activity at site.

4.9.2 Modifying factors

Measured site-only levels were assessed for the applicability of modifying factors in accordance with the NPfI and methodology described in Section 3.4.

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.9.3 Attended noise monitoring

Table 4.18 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing meteorological conditions as defined by the NPfI.

Table 4.18 Site noise levels and limits – September 2024

Location	Start date and time	Wind		Stability class	Very enhancing? [1]	Limits, dB		Site levels, dB [2]		Exceedances, dB	
		Speed m/s	Direction [3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N01	26/09/2024 00:06	1.1	137	F	No	37	47	IA	IA	Nil	Nil
N16	25/09/2024 23:21	1.3	185	E	No	35	45	IA	IA	Nil	Nil
N20A	25/09/2024 22:27	0.3	231	F	No	35	45	IA	IA	Nil	Nil
N21	25/09/2024 23:35	1.2	156	F	No	39	49	IA	IA	Nil	Nil
N26	25/09/2024 22:01	0.4	332	F	No	35	45	IA	IA	Nil	Nil

Notes: 1. Noise limits are adjusted by +5 dB during 'very enhancing meteorological conditions' in accordance with the NPfI.

2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.

3. Degrees magnetic north, "-" indicates calm conditions.

4.10 October 2024

4.10.1 Total measured noise levels

Overall noise levels measured at each location during attended measurements are provided in Table 4.19.

Table 4.19 Total measured noise levels, dB – October 2024 [1]

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N01	15/10/2024 23:53	43	36	32	30	29	28	25
N16	15/10/2024 23:17	44	39	36	34	33	32	29
N20A	15/10/2024 22:27	45	35	32	30	30	28	26
N21	15/10/2024 23:24	48	38	35	33	33	31	27
N26	15/10/2024 22:00	41	36	33	31	30	29	26

Notes: 1. Levels in this table are not necessarily the result of activity at site.

4.10.2 Modifying factors

Measured site-only levels were assessed for the applicability of modifying factors in accordance with the NPfI and methodology described in Section 3.4.

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.10.3 Attended noise monitoring

Table 4.20 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing meteorological conditions as defined by the NPfI.

Table 4.20 Site noise levels and limits – October 2024

Location	Start date and time	Wind		Stability class	Very enhancing? [1]	Limits, dB		Site levels, dB [2]		Exceedances, dB	
		Speed m/s	Direction [3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N01	15/10/2024 23:53	1.0	184	D	No	37	47	IA	IA	Nil	Nil
N16	15/10/2024 23:17	1.0	188	D	No	35	45	IA	IA	Nil	Nil
N20A	15/10/2024 22:27	0.5	157	F	No	35	45	IA	IA	Nil	Nil
N21	15/10/2024 23:24	0.6	174	E	No	39	49	IA	IA	Nil	Nil
N26	15/10/2024 22:00	0.7	184	D	No	35	45	IA	IA	Nil	Nil

Notes: 1. Noise limits are adjusted by +5 dB during 'very enhancing meteorological conditions' in accordance with the NPfI.

2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.

3. Degrees magnetic north, "-" indicates calm conditions.

4.11 November 2024

4.11.1 Total measured noise levels

Overall noise levels measured at each location during attended measurements are provided in Table 4.21.

Table 4.21 Total measured noise levels, dB – November 2024 [1]

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N01	19/11/2024 23:58	47	41	38	36	35	34	32
N16	19/11/2024 23:09	57	51	43	42	40	38	36
N20A	19/11/2024 22:23	61	41	38	36	36	34	32
N21	19/11/2024 23:32	60	53	40	40	38	36	34
N26	19/11/2024 22:00	48	44	39	37	35	33	31

Notes: 1. Levels in this table are not necessarily the result of activity at site.

4.11.2 Modifying factors

Measured site-only levels were assessed for the applicability of modifying factors in accordance with the NPfI and methodology described in Section 3.4.

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.11.3 Attended noise monitoring

Table 4.22 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing meteorological conditions as defined by the NPfI.

Table 4.22 Site noise levels and limits – November 2024

Location	Start date and time	Wind		Stability class	Very enhancing? [1]	Limits, dB		Site levels, dB [2]		Exceedances, dB	
		Speed m/s	Direction [3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N01	19/11/2024 23:58	2.2	117	F	Yes	42	52	IA	IA	Nil	Nil
N16	19/11/2024 23:09	1.2	177	F	No	35	45	IA	IA	Nil	Nil
N20A	19/11/2024 22:23	1.4	149	F	No	35	45	IA	IA	Nil	Nil
N21	19/11/2024 23:32	2.2	113	F	Yes	44	54	IA	IA	Nil	Nil
N26	19/11/2024 22:00	2.0	133	F	No	35	45	IA	IA	Nil	Nil

Notes: 1. Noise limits are adjusted by +5 dB during 'very enhancing meteorological conditions' in accordance with the NPfI.

2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.

3. Degrees magnetic north, "-" indicates calm conditions.

4.12 December 2024

4.12.1 Total measured noise levels

Overall noise levels measured at each location during attended measurements are provided in Table 4.23.

Table 4.23 Total measured noise levels, dB – December 2024 [1]

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N01	3/12/2024 00:12	49	40	38	37	37	36	34
N16	2/12/2024 23:56	63	60	45	45	36	35	33
N20A	2/12/2024 23:06	43	40	39	37	36	35	33
N21	2/12/2024 23:45	55	38	36	35	35	34	33
N26	2/12/2024 22:40	57	48	45	42	41	39	35

Notes: 1. Levels in this table are not necessarily the result of activity at site.

4.12.2 Modifying factors

Measured site-only levels were assessed for the applicability of modifying factors in accordance with the NPfI and methodology described in Section 3.4.

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.12.3 Attended noise monitoring

Table 4.24 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing meteorological conditions as defined by the NPfI.

Table 4.24 Site noise levels and limits – December 2024

Location	Start date and time	Wind		Stability class	Very enhancing? [1]	Limits, dB		Site levels, dB [2]		Exceedances, dB	
		Speed m/s	Direction [3]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N01	3/12/2024 00:12	0.4	228	F	No	37	47	IA	IA	Nil	Nil
N16	2/12/2024 23:56	0.7	220	D	No	35	45	IA	IA	Nil	Nil
N20A	2/12/2024 23:06	0.8	196	F	No	35	45	IA	IA	Nil	Nil
N21	2/12/2024 23:45	0.6	217	F	No	39	49	IA	IA	Nil	Nil
N26	2/12/2024 22:40	0.8	206	E	No	35	45	IA	IA	Nil	Nil

Notes: 1. Noise limits are adjusted by +5 dB during 'very enhancing meteorological conditions' in accordance with the NPfI.

2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.

3. Degrees magnetic north, "-" indicates calm conditions.

5 Long term noise trends

Site-only L_{Aeq} noise levels measured during monthly attended environmental noise monitoring over a 5-year period from January 2020 to December 2024 have been collated and graphed to summarise WCM long-term noise performance.

Due to the qualitative nature of some attended noise monitoring descriptors, calculation of site noise statistics such as mean, median, and standard deviation is not always possible. Subsequently, site-only L_{Aeq} noise levels for each monitoring event have been grouped into one of three categories:

- WCM only L_{Aeq} was either inaudible (IA), not measurable (NM), or less than 30 dB, which together are represented by green bars
- WCM only L_{Aeq} was between 30 dB and the relevant noise criteria for that location (inclusive) represented by blue bars, or
- WCP only L_{Aeq} was greater than the relevant noise criteria for that location, represented by red bars.

For each calendar year, the percentage of occurrence for each of these categories is shown, as well as annual trend lines over the entire five-year period. Figures show site only L_{Aeq} noise levels, including adjustments due to modifying factors, as defined by the EPA NPfI.

Meteorological conditions and applicability of noise criteria have not been considered.

5.1 Noise trend graphs

Site only L_{Aeq} noise levels measured during attended environmental noise monitoring over a 5-year period have been collated and graphed to summarise long-term noise trends. Figure 5.1 to Figure 5.5 provide percentage occurrence information for WCM noise levels at eight monitoring locations.

As meteorological conditions and applicability of noise criteria have not been considered in long-term trend analysis, potential exceedances indicated in the following graphs may not have been applicable depending on weather conditions at the time of monitoring.

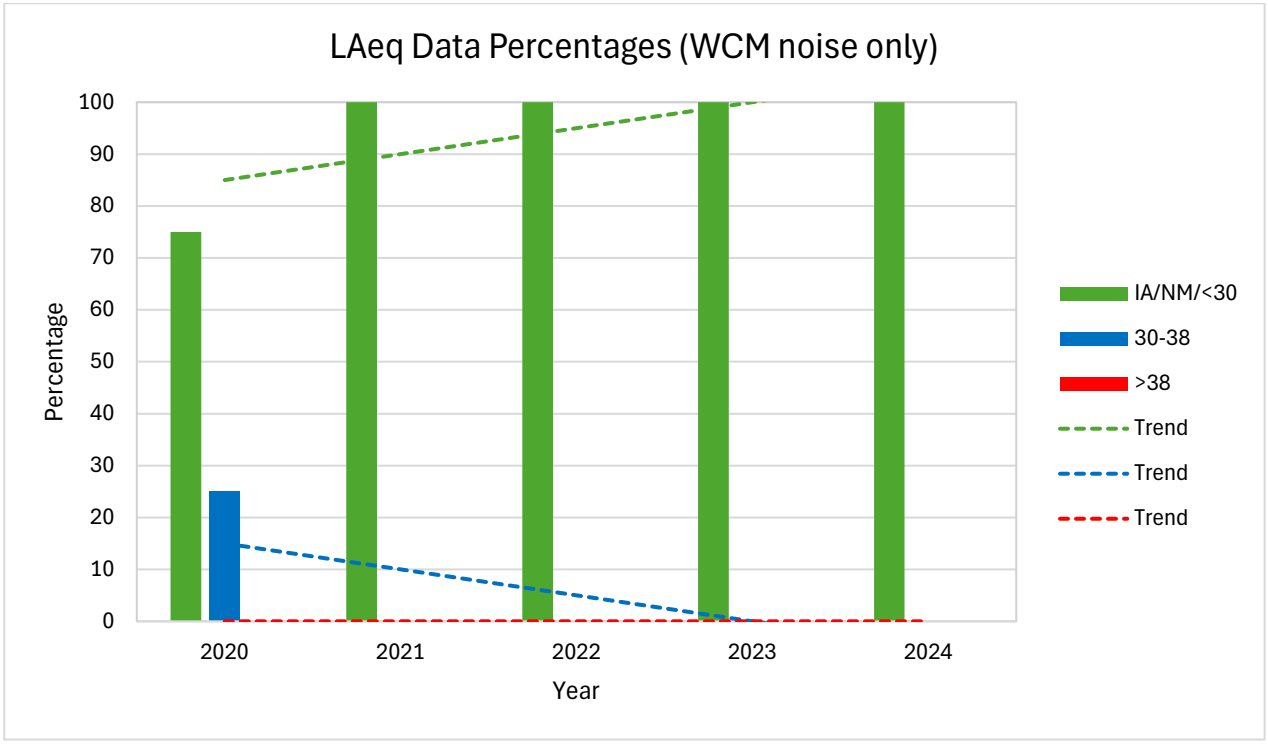

Figure 5.1 **Attended noise monitoring data, N01**

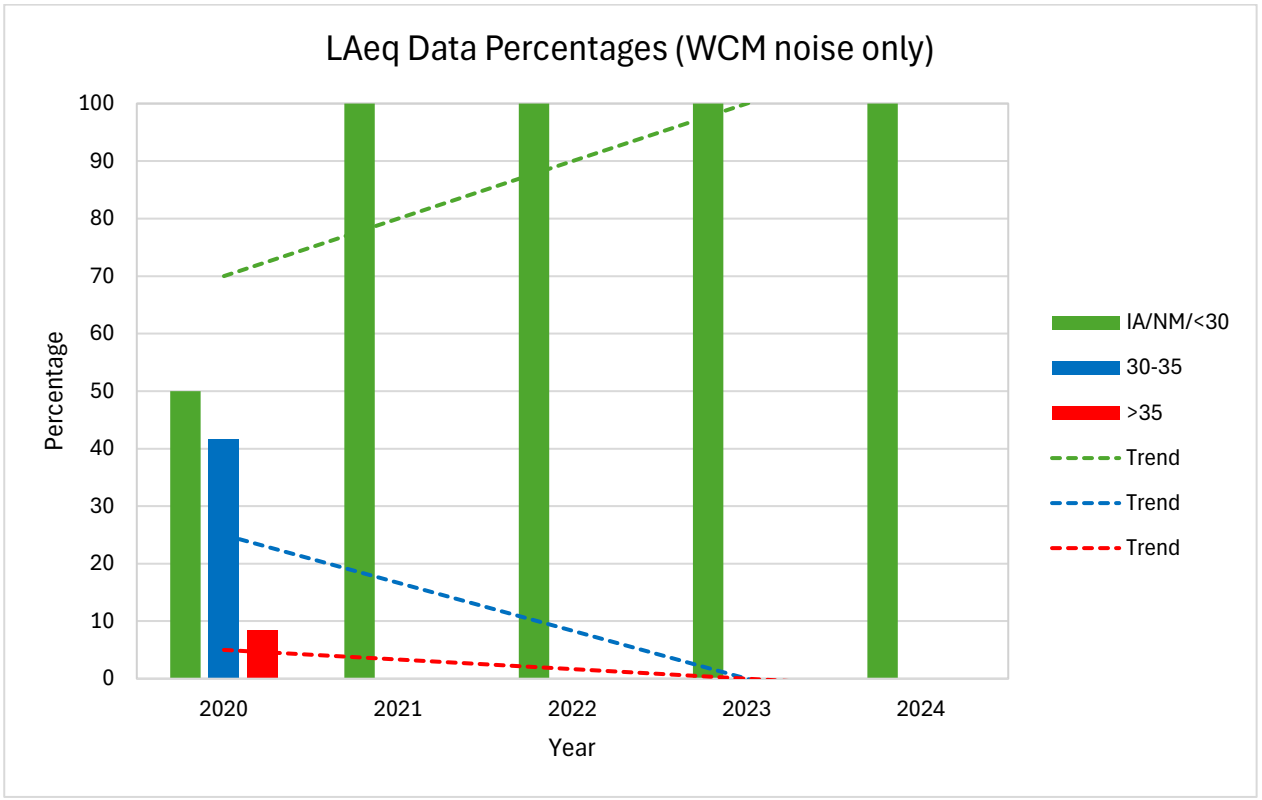

Figure 5.2 **Attended noise monitoring data, N16**

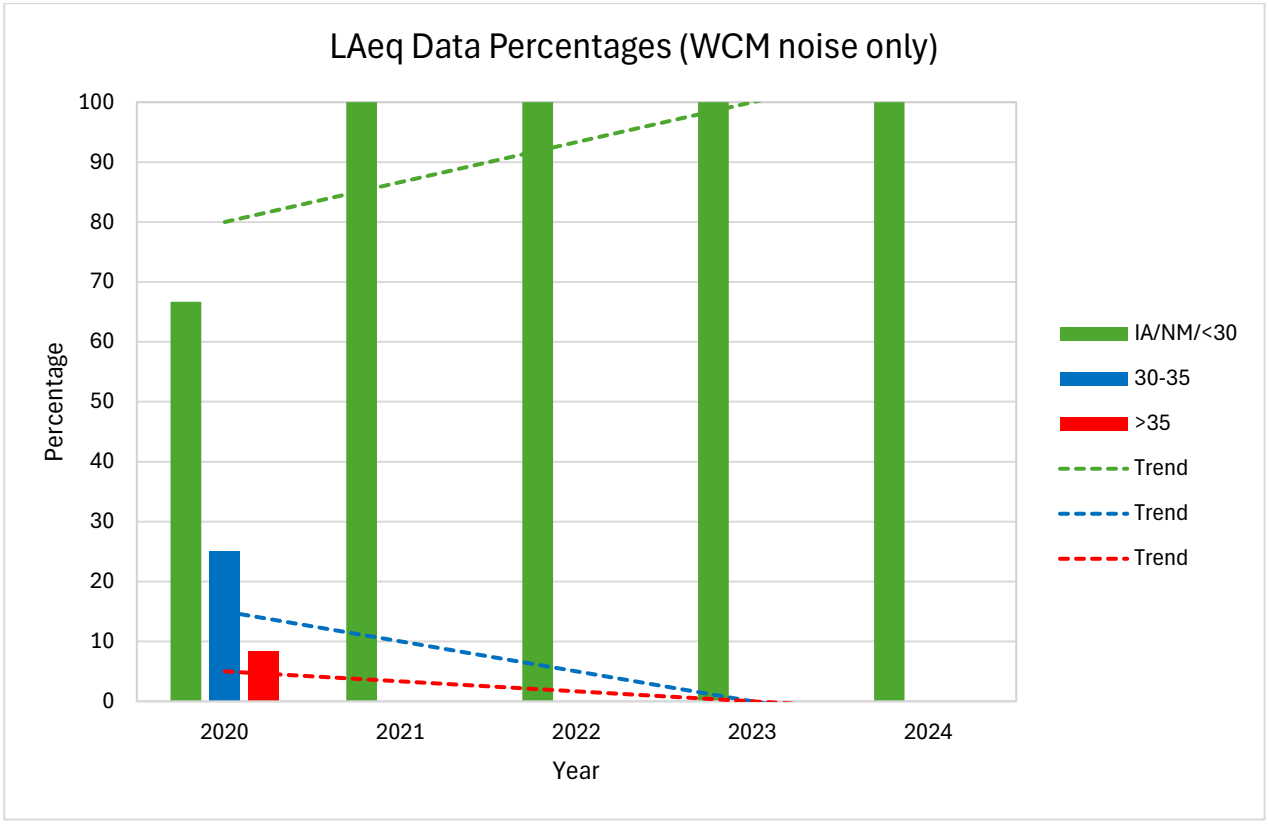

Figure 5.3 **Attended noise monitoring data, N20A**

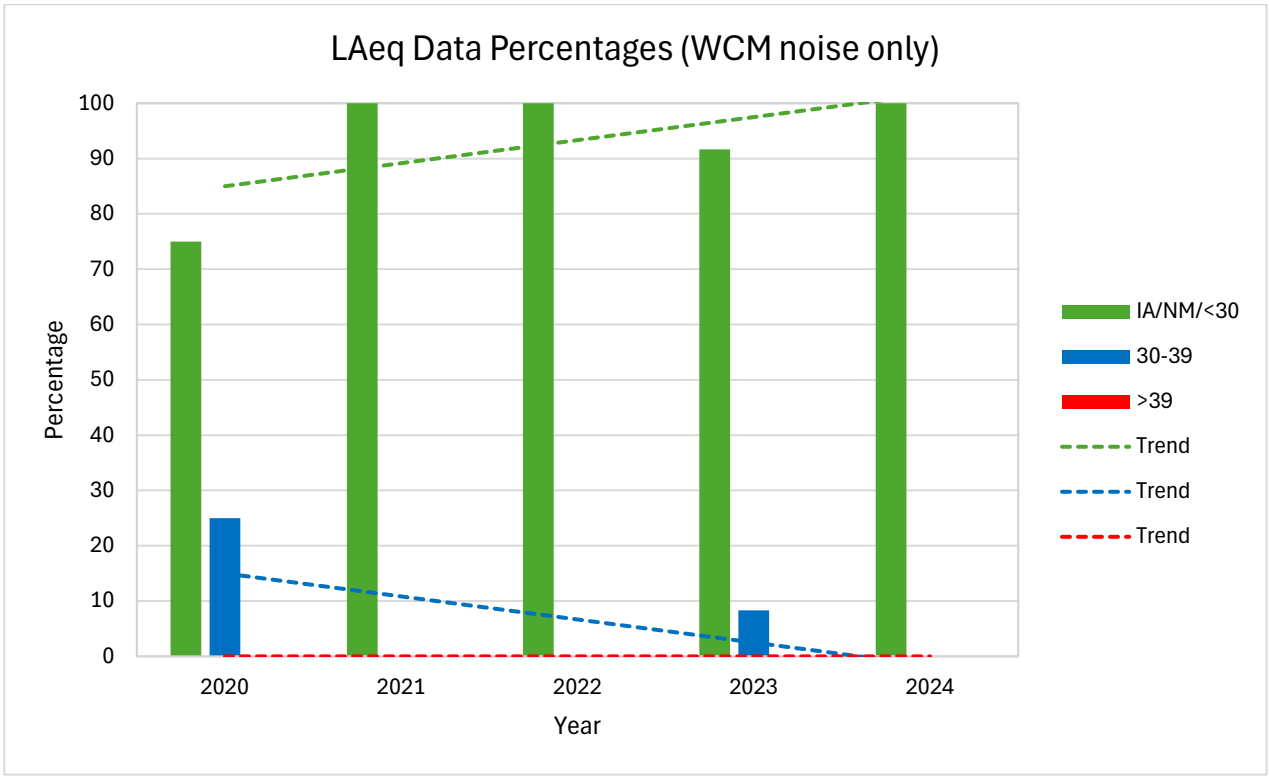

Figure 5.4 **Attended noise monitoring data, N21**

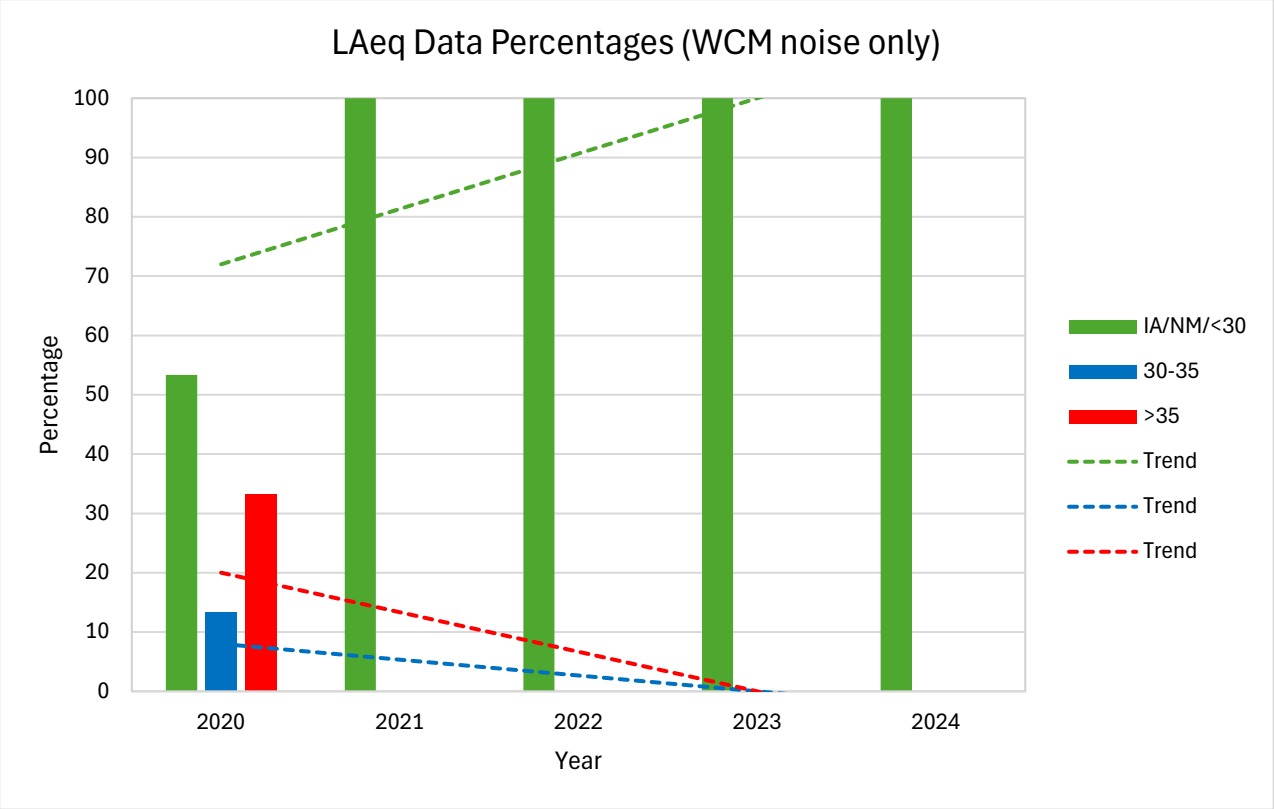

Figure 5.5 Attended noise monitoring data, N26

5.2 Discussion

Open cut mining was still being undertaken by WCM in 2020. From 1 December 2020, open cut mining was closed and noise emissions decreased significantly.

6 Comparison with EIS modelled predictions

A NIA was prepared in July 2016 as part of the EIS to support application for the United Wambo project. As part of the modelling assessment, cumulative noise levels from WCM and United Wambo were predicted for representative operating scenarios, time periods and weather conditions.

Predicted noise levels for Year 6 have been used for comparison to measured noise levels, as it most closely aligned to the 2024 reporting year. Table 6.1 summarises predicted $L_{Aeq,15minute}$ noise levels for specific monitoring locations detailed in Table F.1 of the NIA. These have been compared to noise-enhancing meteorological condition defined in Section 3.5 of this report.

Table 6.1 WCM operations predictions, Year 6 - dB

NMP descriptor	Monitoring locations	Nearest property ID	Night $L_{Aeq,15minute}$ Non-Winter	Night $L_{Aeq,15minute}$ Winter
N01	Wambo Road Residence	3	<30	34
N16	Jerrys Plains Road	39	40	42
N20A	Redmanvale Road Central	343	32	34
N21	Wambo South	25	32	37
N26	Redmanvale Road South	345	33	39

Table 6.2 summarises sleep disturbance noise levels for specific monitoring locations detailed in Table F.4 of the NIA under certain meteorological condition defined in Section 3.5 of this report.

Table 6.2 WCM sleep disturbance predictions, Year 6 - dB

NMP descriptor	Monitoring locations	Nearest property ID	Night $L_{A1,1minute}$ Calm	Night $L_{A1,1minute}$ SE Wind	Night $L_{A1,1minute}$ Inversion
N01	Wambo Road Residence	3	<30	<30	<30
N16	Jerrys Plains Road	39	<30	41	40
N20A	Redmanvale Road Central	33 [1]	<30	33	30
N21	Wambo South	25	<30	<30	32
N26	Redmanvale Road South	346 [2]	<30	30	<30

Notes: 1. Sleep disturbance prediction for Property 343 was not provided. Property 33 was the nearest residence with predicted noise levels.

2. Sleep disturbance prediction for Property 345 was not provided. Property 346 was the nearest residence with predicted noise levels

Table 6.3 to Table 6.7 of this report compare the measured operational levels to predicted noise levels in the NIA for Year 6. A positive difference indicates the measured level is greater than the predicted level and a negative difference indicates the measured levels are less than predicted in the NIA.

When meteorological conditions during the attended monitoring measurement do not correspond with those that are modelled, the meteorological conditions are considered “not applicable” (NA) and no further analysis is undertaken. When meteorological conditions during the measurement correspond with modelled conditions, but measured WCM noise levels were not directly quantifiable, measured and modelled noise levels are “not comparable” (NC) and no further analysis is required.

6.1 Results

6.1.1 N01, Wambo Road residence

Table 6.3 Measured WCM noise levels compared to Year 6 predicted noise levels at N01, dB(A)

Month	Applicable Meteorological Condition[1,2]	Measured WCM $L_{Aeq,15minute}$	Predicted WCM $L_{Aeq,15minute}$	Difference[2,3]	Applicable Meteorological Condition[1,2]	Measured WCM $L_{A1,1minute}$	Predicted WCM $L_{A1,1minute}$	Difference[2,3]
January	N/A	IA	-	N/A	N/A	IA	-	N/A
February	N/A	IA	-	N/A	N/A	IA	-	N/A
March	N/A	IA	-	N/A	N/A	IA	-	N/A
April	N/A	IA	-	N/A	N/A	IA	-	N/A
May	N/A	IA	-	N/A	N/A	IA	-	N/A
June	N/A	IA	-	N/A	N/A	IA	-	N/A
July	N/A	IA	-	N/A	N/A	IA	-	N/A
August	N/A	IA	-	N/A	N/A	IA	-	N/A
September	N/A	IA	-	N/A	N/A	IA	-	N/A
October	N/A	IA	-	N/A	N/A	IA	-	N/A
November	N/A	IA	-	N/A	N/A	IA	-	N/A
December	N/A	IA	-	N/A	N/A	IA	-	N/A

Notes: 1. Refer to Table 3.1 and Table 3.2 for applicable meteorological conditions.

2. N/A indicates meteorological conditions during the measurement did not correspond with any modelled meteorological conditions and were not applicable for comparison.

3. NC indicated measured WCP noise levels were inaudible (IA), not measurable (NM), or expressed as a “less than” (e.g. Less than 30 dB), therefore measured and predicted noise levels were not comparable.

6.1.2 N16, Jerrys Plains Road

Table 6.4 Measured WCM noise levels compared to Year 6 predicted noise levels at N16, dB(A)

Month	Applicable Meteorological Condition[1,2]	Measured WCM $L_{Aeq,15minute}$	Predicted WCM $L_{Aeq,15minute}$	Difference[2,3]	Applicable Meteorological Condition[1,2]	Measured WCM $L_{A1,1minute}$	Predicted WCM $L_{A1,1minute}$	Difference[2,3]
January	N/A	IA	-	N/A	Inversion	IA	40	NC
February	N/A	IA	-	NC	N/A	IA	-	N/A
March	N/A	IA	-	NC	N/A	IA	-	N/A
April	N/A	IA	-	N/A	N/A	IA	-	N/A
May	Inversion	IA	42	N/A	N/A	IA	-	N/A
June	N/A	IA	-	N/A	N/A	IA	-	N/A
July	Inversion	IA	42	N/A	N/A	IA	-	N/A
August	N/A	IA	-	N/A	N/A	IA	-	N/A
September	N/A	IA	-	NC	N/A	IA	-	N/A
October	N/A	IA	-	N/A	N/A	IA	-	N/A
November	Inversion	IA	40	N/A	N/A	IA	-	N/A
December	N/A	IA	-	N/A	N/A	IA	-	N/A

Notes: 1. Refer to Table 3.1 and Table 3.2 for applicable meteorological conditions.

2. N/A indicates meteorological conditions during the measurement did not correspond with any modelled meteorological conditions and were not applicable for comparison.

3. NC indicated measured WCP noise levels were inaudible (IA), not measurable (NM), or expressed as a “less than” (e.g. Less than 30 dB), therefore measured and predicted noise levels were not comparable.

6.1.3 N20A, Redmanvale Road Central

Table 6.5 Measured WCM noise levels compared to Year 6 predicted noise levels at N20A, dB(A)

Month	Applicable Meteorological Condition[1,2]	Measured WCM $L_{Aeq,15minute}$	Predicted WCM $L_{Aeq,15minute}$	Difference[2,3]	Applicable Meteorological Condition[1,2]	Measured WCM $L_{A1,1minute}$	Predicted WCM $L_{A1,1minute}$	Difference[2,3]
January	Wind only	IA	32	NC	SE Winds	IA	33	NC
February	Wind only	IA	32	NC	SE Winds	IA	33	NC
March	N/A	IA	-	N/A	N/A	IA	-	N/A
April	Inversion	IA	32	NC	N/A	IA	-	N/A
May	N/A	IA	-	N/A	N/A	IA	-	N/A
June	N/A	IA	-	N/A	N/A	IA	-	N/A
July	N/A	IA	-	N/A	N/A	IA	-	N/A
August	N/A	IA	-	N/A	N/A	IA	-	N/A
September	N/A	IA	-	N/A	N/A	IA	-	N/A
October	N/A	IA	-	N/A	Inversion	IA	30	NC
November	N/A	IA	-	N/A	Inversion	IA	30	NC
December	Inversion	IA	32	NC	N/A	IA	-	N/A

Notes: 1. Refer to Table 3.1 and Table 3.2 for applicable meteorological conditions.

2. N/A indicates meteorological conditions during the measurement did not correspond with any modelled meteorological conditions and were not applicable for comparison.

3. NC indicated measured WCP noise levels were inaudible (IA), not measurable (NM), or expressed as a “less than” (e.g. Less than 30 dB), therefore measured and predicted noise levels were not comparable.

6.1.4 N21, Wambo Road South

Table 6.6 Measured WCM noise levels compared to Year 6 predicted noise levels at N21, dB(A)

Month	Applicable Meteorological Condition[1,2]	Measured WCM $L_{Aeq,15minute}$	Predicted WCM $L_{Aeq,15minute}$	Difference[2,3]	Applicable Meteorological Condition[1,2]	Measured WCM $L_{A1,1minute}$	Predicted WCM $L_{A1,1minute}$	Difference[2,3]
January	Wind only	IA	32	NC	N/A	IA	-	N/A
February	N/A	IA	-	N/A	N/A	IA	-	N/A
March	N/A	IA	-	N/A	N/A	IA	-	N/A
April	N/A	IA	-	N/A	N/A	IA	-	N/A
May	N/A	IA	-	N/A	N/A	IA	-	N/A
June	N/A	NM	-	N/A	N/A	NM	-	N/A
July	N/A	IA	-	N/A	N/A	IA	-	N/A
August	N/A	IA	-	N/A	N/A	IA	-	N/A
September	N/A	IA	-	N/A	N/A	IA	-	N/A
October	N/A	IA	-	N/A	N/A	IA	-	N/A
November	N/A	IA	-	N/A	N/A	IA	-	N/A
December	N/A	IA	-	N/A	N/A	IA	-	N/A

Notes: 1. Refer to Table 3.1 and Table 3.2 for applicable meteorological conditions.

2. N/A indicates meteorological conditions during the measurement did not correspond with any modelled meteorological conditions and were not applicable for comparison.

3. NC indicated measured WCP noise levels were inaudible (IA), not measurable (NM), or expressed as a “less than” (e.g. Less than 30 dB), therefore measured and predicted noise levels were not comparable.

6.1.5 N26, Redmanvale Road South

Table 6.7 Measured WCM noise levels compared to Year 6 predicted noise levels at N26, dB(A)

Month	Applicable Meteorological Condition[1,2]	Measured WCM $L_{Aeq,15minute}$	Predicted WCM $L_{Aeq,15minute}$	Difference[2,3]	Applicable Meteorological Condition[1,2]	Measured WCM $L_{A1,1minute}$	Predicted WCM $L_{A1,1minute}$	Difference[2,3]
January	N/A	IA	-	N/A	Inversion	IA	<30	NC
February	Inversion	IA	33	NC	N/A	IA	-	N/A
March	N/A	IA	-	N/A	Inversion	IA	<30	NC
April	N/A	IA	-	N/A	N/A	IA	-	N/A
May	Inversion	IA	39	NC	N/A	IA	-	N/A
June	N/A	IA	-	N/A	N/A	IA	-	N/A
July	N/A	IA	-	N/A	N/A	IA	-	N/A
August	N/A	IA	-	N/A	N/A	IA	-	N/A
September	N/A	IA	-	N/A	N/A	IA	-	N/A
October	N/A	IA	-	N/A	N/A	IA	-	N/A
November	N/A	IA	-	N/A	Inversion	IA	<30	NC
December	N/A	IA	-	N/A	N/A	IA	-	N/A

Notes: 1. Refer to Table 3.1 and Table 3.2 for applicable meteorological conditions.

2. N/A indicates meteorological conditions during the measurement did not correspond with any modelled meteorological conditions and were not applicable for comparison.

3. NC indicated measured WCP noise levels were inaudible (IA), not measurable (NM), or expressed as a “less than” (e.g. Less than 30 dB), therefore measured and predicted noise levels were not comparable.

7 Summary

EMM was engaged by WC to provide an AEMR for 2024 to compare noise monitoring results against relevant criteria.

This report summarises monthly attended noise monitoring surveys conducted at five monitoring locations around WCM during the reporting period 1 January to 31 December 2024. The purpose of the surveys was to quantify and describe the acoustic environment around the site and compare results with specified limits.

Attended noise monitoring described in this report was conducted monthly in accordance with the relevant development consents, EPL, and the WCM NMP.

7.1 January to December 2024 compliance

WCM complied with relevant noise criteria during all measurements during 2024 noise monitoring.

7.2 Long-term noise trends

During the 5-year period analysed, WCM noise levels at most monitoring locations decreased from 2020 to 2021. From 1 December 2020, open cut mining was no longer undertaken by WCM and noise emissions decreased significantly.

7.3 EIS comparison

WCM commenced Phase 2 on 1 December 2020, wherein WCM only manages underground operations and associated plant. Open cut operations are managed by UW as part of the UWJV.

Noise levels from WCM were generally inaudible and therefore not comparable to Year 6 predictions in the EIS.

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APPENDIX D

ANNUAL AIR QUALITY MONITORING REPORT

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26 February 2025

Attention: Nicole Dobbins
Senior Environmental Advisor - Contract
Peabody Australia
PMB 1, Singleton NSW 2330

Project number: 22014

Dear Nicole

Review of 2024 air quality monitoring data

I have completed a review of the Wambo Mine air quality monitoring data for 2024. Please see attached for the outcomes.

In summary, it has been concluded that Wambo Coal Pty Ltd was in compliance with its development consent in terms of all relevant air quality indicators in 2024.

Yours sincerely

Shane Lakmaker
Director / Atmospheric Scientist
Airen Consulting

1. Background

The Wambo Mine is Ltd owned and operated by Wambo Coal Pty (Wambo Coal), a subsidiary of Peabody Energy Australia Pty Limited (Peabody). Mining is carried out under Development Consent DA 305-7-2003 as modified. The latest modification to DA 305-7-2003 (Mod 19) permits underground mining, operation of Wambo Mine infrastructure and associated surface development; collectively referred to as Phase 2 under DA 305-7-2003.

Wambo Coal has a network of air quality and meteorological monitoring equipment around the Wambo Mine which is designed to meet relevant conditions of DA 305-7-2003.

Figure 1 shows the meteorological and air quality monitoring network. This network includes:

- One (1) meteorological station referred to as M6.
- Four (4) tapered element oscillating microbalances (TEOM) measuring PM_{10}. Compliance is determined at AQ05 (D5 Kelly formerly AQ01), AQ02 (D2 Caban), AQ03 (D4 Thelander) and AQ04 (D1 Muller).
- Two (2) tapered element oscillating microbalances (TEOM) measuring $PM_{2.5}$. Compliance is determined at AQ05 (D5 Kelly formerly AQ01) and AQ03 (D4 Thelander).

A review of the air quality monitoring data collected in 2024 has been carried out. The main purpose of the review was to determine whether Wambo Coal had complied with the criteria specified in the development consent (DA 305-7-2003). Table 1 shows the relevant development consent criteria.

Table 1 Development consent criteria

Indicator	Averaging period	Criterion
Particulate matter (PM_{10})	24 hour	[b] 50 µg/m³
	Annual	[a,c] 25 µg/m³
Particulate matter ($PM_{2.5}$)	24 hour	[b] 25 µg/m³
	Annual	[a,c] 8 µg/m³
Particulate matter (TSP)	Annual	[a,c] 90 µg/m³

[a] *Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).*

[b] *Incremental impact (i.e. incremental increase in concentrations due to the development on its own).*

[c] *Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.*

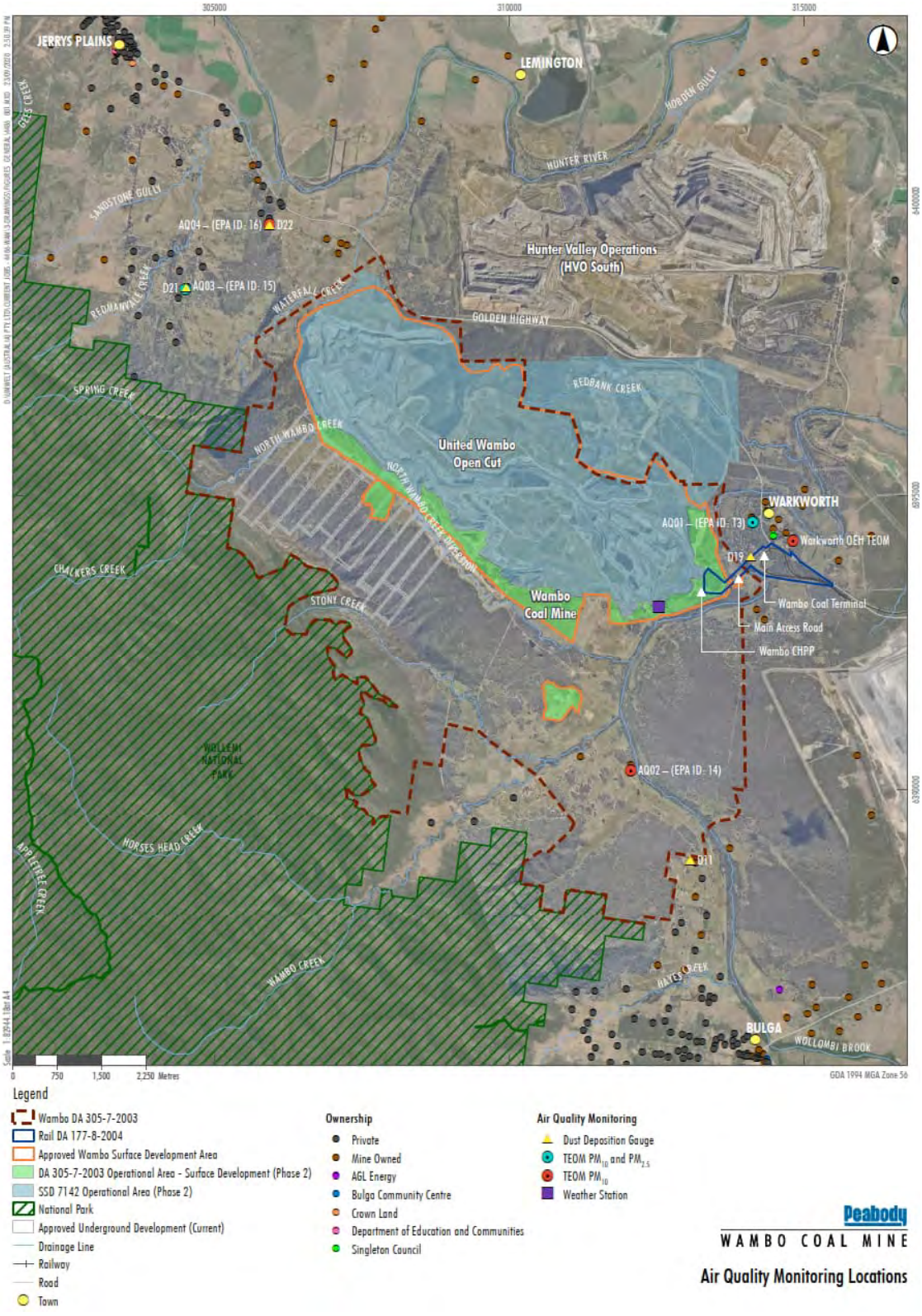

Figure 1 Location of air quality and meteorological monitoring sites

2. Approach to Review

2.1 Extraordinary Events

The Department of Planning, Housing and Industry (DPHI) has historically identified extraordinary events that are relevant to the Hunter Valley based on the Upper Hunter Air Quality Monitoring Network as well as other factors such as bushfires and dust storms. For example, in 2020 the DPHI identified 24 days as extraordinary events. The DPHI did not identify any "extraordinary event" days in 2024.

2.2 Particulate Matter (as PM_{10})

Evaluation of PM_{10} involved:

- Obtaining hourly average PM_{10} concentration data from all monitoring sites for 2024 and determining the 24-hour and annual averages.
- Obtaining hourly meteorological data from the Wambo Mine weather station for 2024 and calculating the contributions from the direction of Wambo Mine to each hourly PM_{10} concentration result.
- Summarising all monitored PM_{10} concentration data and estimated contributions from the direction of Wambo Mine and making comparisons to the consent criteria.

There is no standard prescribed methodology for determining contributions to air quality from mining operations. The methodology described below is based on the use of concurrent hourly meteorological and air quality monitoring data from suitably located monitoring stations around the mine site to estimate the potential contribution from the direction of the mining operation. This method is referred to as an "upwind / downwind" calculation approach. In this context, "upwind" is a location that collects data representative of background conditions, not influenced by the source of interest, and does not necessarily need to be upwind of the source of interest.

The maximum contributions from the direction of Wambo Mine to each measured hourly average result was calculated by first determining the wind direction ranges which represented a wind from the direction of Wambo Mine towards the monitor. Table 2 shows the wind direction ranges that represented the direction to Wambo Mine from each monitor.

Table 2 Wind directions to Wambo Mine for PM_{10} contribution calculations

Monitor	Direction to Wambo Mine
D1 Muller	Between 130 and 180 degrees from true north
D2 Caban	Between 320 and 10 degrees from true north
D5 Kelly	Between 255 and 300 degrees from true north
D4 Thelander	Between 110 and 140 degrees from true north

The potential contribution from the direction of Wambo Mine to each monitor was calculated for every 1-hour average record for every day based on the concurrent wind direction and from a "monitor" concentration minus "background" concentration calculation. Table 3 shows the data representing "monitor" and "background" conditions for each monitoring site. The "monitor" concentration minus "background" concentration result was only calculated for hours with wind speeds greater than 0 m/s.

Table 3 Data for monitor and background PM_{10} calculations

Monitor	Data representing "background" conditions
D1 Muller	D2 Caban
D2 Caban	D1 Muller

Monitor	Data representing “background” conditions
D5 Kelly	D4 Thelander
D4 Thelander	D5 Kelly

The potential contribution to each monitor was then calculated as 24-hour and annual averages (not including negative values) from the 8,784 hourly records.

2.3 Particulate Matter (as $PM_{2.5}$)

Evaluation of $PM_{2.5}$ involved:

- Obtaining hourly average $PM_{2.5}$ concentration data from all monitoring sites for 2024 and determining the 24-hour and annual averages.
- Obtaining hourly meteorological data from the Wambo Mine weather station for 2024 and calculating the contributions from the direction of Wambo Mine to each hourly $PM_{2.5}$ concentration result.
- Summarising all monitored $PM_{2.5}$ concentration data and estimated contributions from the direction of Wambo Mine and making comparisons to the consent criteria.

The maximum contributions from the direction of the Wambo Mine to each measured hourly average result was calculated in the same manner as for the calculated PM_{10} contributions, as described in Section 2.2. Table 4 shows the wind direction ranges that represented the direction to Wambo Mine from each monitor.

Table 4 Wind directions to Wambo mine for $PM_{2.5}$ contribution calculations

Monitor	Direction to Wambo Mine
D5 Kelly	Between 255 and 300 degrees from true north
D4 Thelander	Between 110 and 140 degrees from true north

The potential contribution from the direction of Wambo Mine to each monitor was calculated for every 1-hour average record for every day based on the concurrent wind direction and from a “monitor” concentration minus “background” concentration calculation. Table 5 shows the data representing “monitor” and “background” conditions for each monitoring site. The “monitor” concentration minus “background” concentration result was only calculated for hours with wind speeds greater than 0 m/s.

Table 5 Data for monitor and background $PM_{2.5}$ calculations

Monitor	Data representing “background” conditions
D5 Kelly	D4 Thelander
D4 Thelander	D5 Kelly

The potential contribution to each monitor was then calculated as 24-hour and annual averages (not including negative values) from the 8,784 hourly records.

2.4 Particulate Matter (as TSP)

TSP concentrations were estimated from the measured PM_{10} concentrations assuming that PM_{10} concentrations were 33% of the TSP concentrations, in accordance with the approved Air Quality and Greenhouse Gas Management Plan (Peabody, 2020).

3. Monitoring Results

3.1 Meteorology

Meteorological conditions are important for determining the transport of emissions, and the potential influences on air quality. Rainfall can influence air quality conditions, particularly dust. Figure 2 shows the rainfall data collected by Wambo Coal in the past ten years. Rainfall was well below the long-term average (695 mm) in 2017, 2018 and 2019, coinciding with drought, but exceeded the long-term average in 2020, 2021 and 2022. Rainfall in 2024 was close to the long-term average at 738 mm.

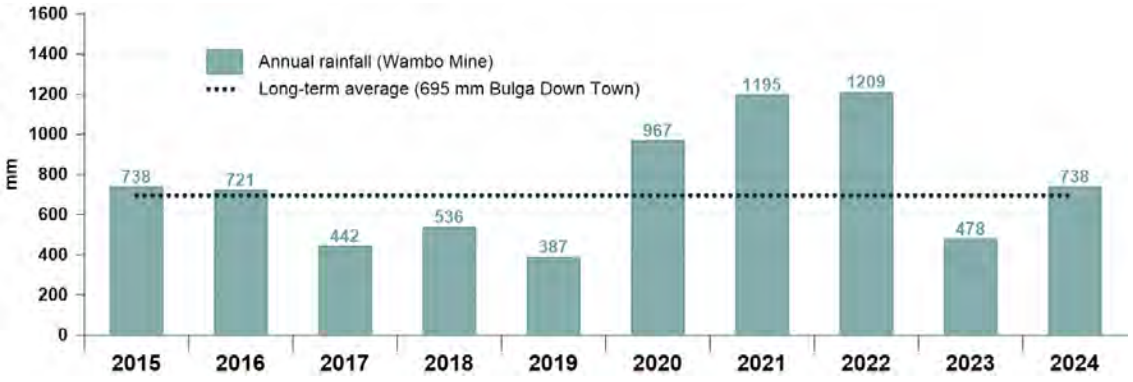

Figure 2 Annual rainfall

Wind-roses have been prepared to summarise the wind speed and wind direction data that were collected in 2024. The wind-roses (Figure 3) show the frequency of wind speeds and wind directions based on hourly records for each location. The circular format of the wind rose shows the direction from which the wind blew and the length of each "spoke" around the circle shows how often the wind blew from that direction. The different colours of each spoke provide details on the speed of the wind from each direction.

It can be seen from Figure 3 that winds in 2024 were from the southeast and northwest. This pattern of winds is common for many parts of the Hunter Valley and reflects the northwest-southeast alignment of the valley.

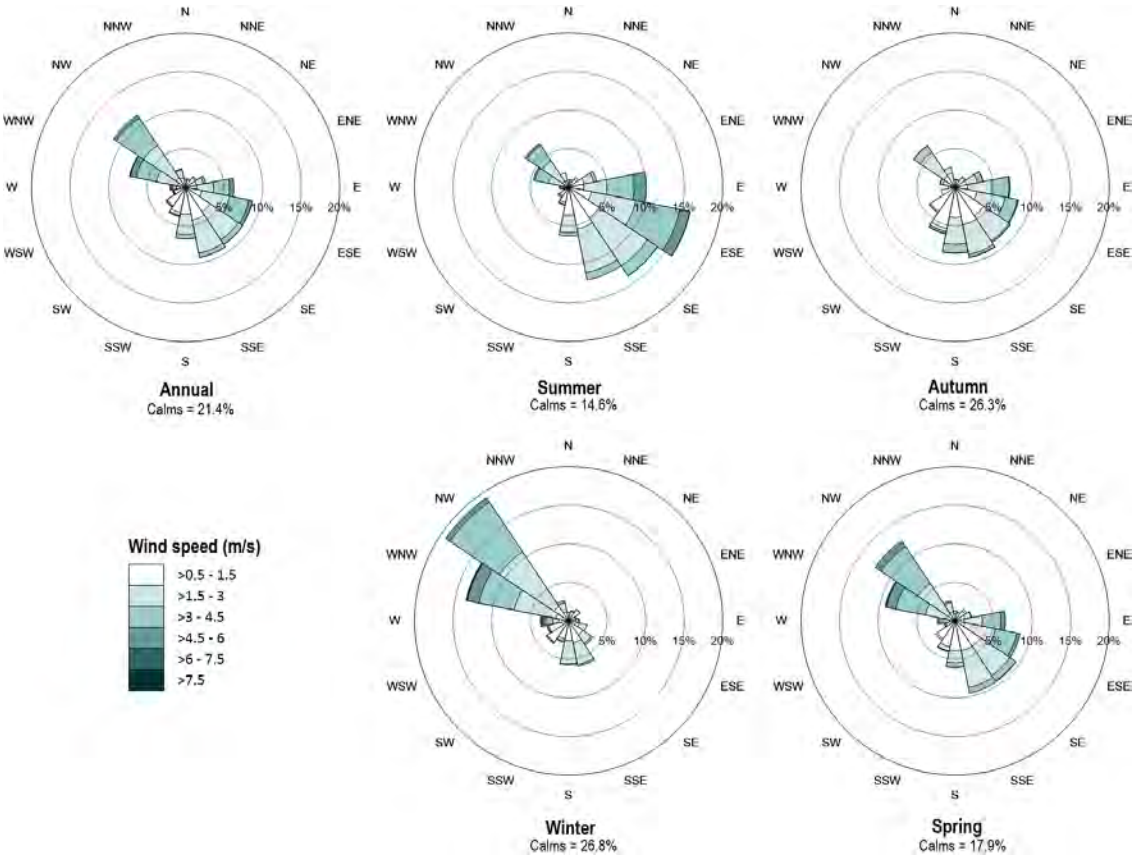

Figure 3 Annual wind-roses from data collected at Wambo Mine in 2024

3.2 Particulate Matter (as PM_{10})

Figure 4 shows the measured 24-hour average PM_{10} concentrations in 2024 from data collected at each compliance monitor. The calculated contributions from the direction of Wambo Mine to each monitoring location have been identified as per the methodology described in Section 2. The contribution from the direction of Wambo Mine is reported in order to assess compliance as the 24-hour average PM_{10} criteria from DA 305-7-2003 relate to an "incremental impact".

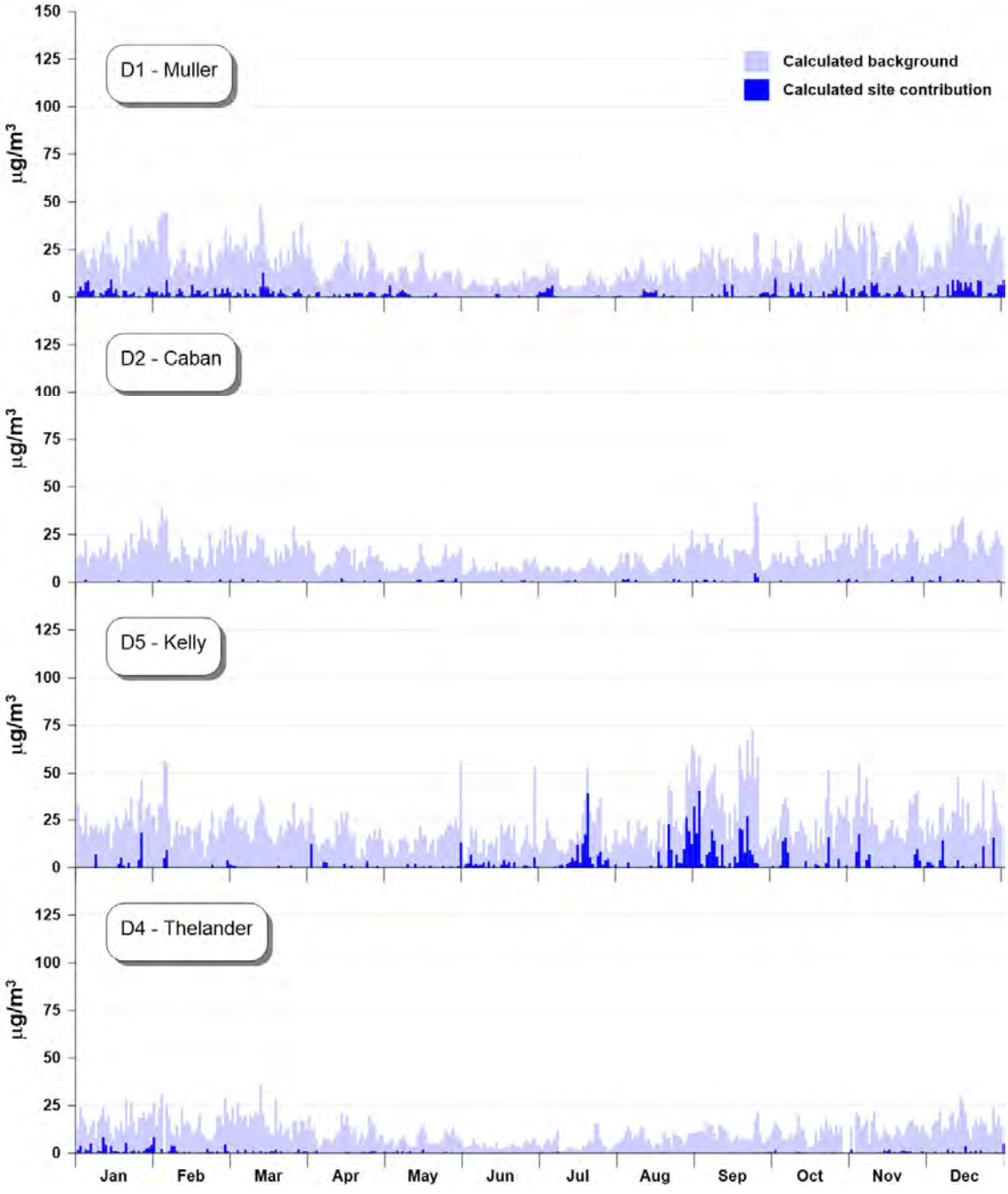

Figure 4 Measured 24-hour average PM_{10} concentrations at Wambo Mine monitors in 2024

Table 6 summarises the measured PM_{10} concentrations. The results have been calculated without extraordinary events (although it is noted that no extraordinary events were identified in 2024). The data in Table 6 show that the PM_{10} concentrations at all monitors were below the 24-hour (incremental) and annual average (cumulative) criteria. Consequently, the monitoring demonstrates compliance with DA 305-7-2003 in terms of particulate matter as PM_{10}.

Table 6 Summary of PM_{10} concentrations from Wambo Mine monitors in 2024

Statistic	D1	D2	D5	D4	Criterion
Measured maximum 24-hour average due to all sources (µg/m³)	52.2	42.2	72.6	35.9	NA
Calculated maximum 24-hour average from direction of Wambo Mine (µg/m³)	12.9	4.9	40.6	8.6	50
Measured annual average due to all sources (µg/m³)	18.8	14.4	22.5	11.4	25
Calculated annual average from direction of Wambo Mine (µg/m³)	1.9	0.3	2.4	0.5	NA

3.3 Particulate Matter (as $PM_{2.5}$)

Figure 5 shows the measured 24-hour average $PM_{2.5}$ concentrations in 2024 from data collected at each compliance monitor. The calculated contribution from the direction of Wambo Mine to each monitoring location is also shown as per the methodology described in Section 2. The contribution from the direction of Wambo Mine is reported in order to assess compliance as the 24-hour average $PM_{2.5}$ criteria from DA 305-7-2003 relate to an "incremental impact".

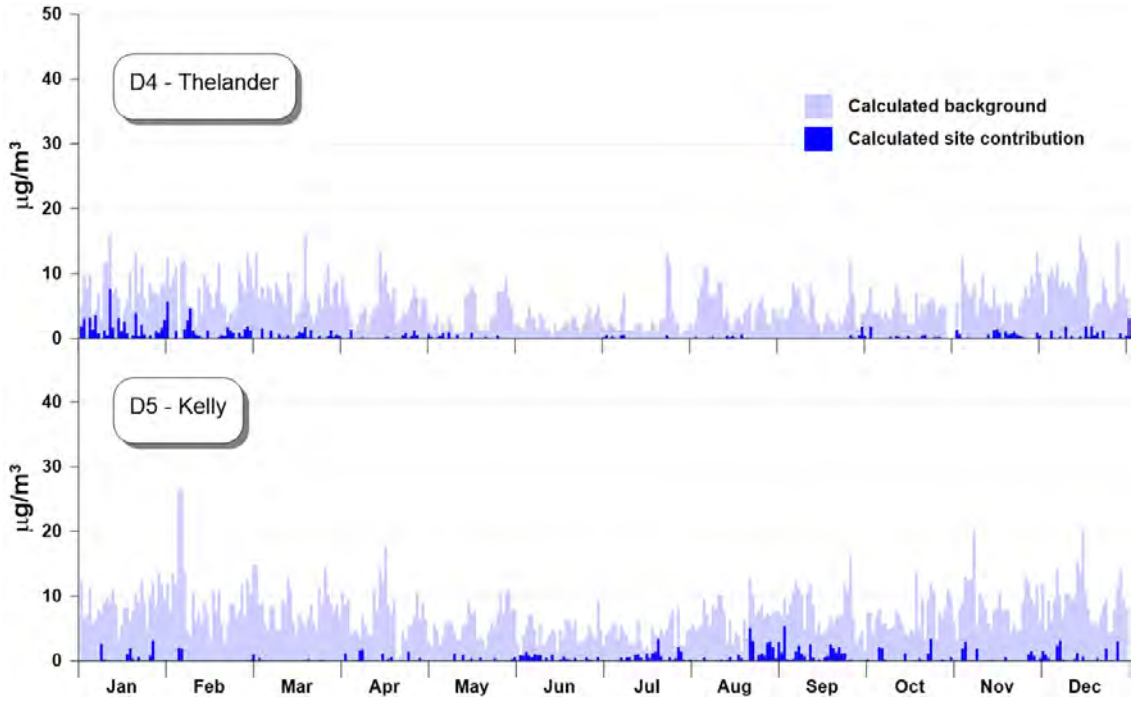

Figure 5 Measured 24-hour average $PM_{2.5}$ concentrations at Wambo Mine monitors in 2024

Table 7 summarises the measured $PM_{2.5}$ concentrations. The data in Table 7 show that the $PM_{2.5}$ concentrations were below the 24-hour (incremental) and annual average (cumulative) criteria. Consequently, the monitoring demonstrates compliance with DA 305-7-2003 in terms of particulate matter as $PM_{2.5}$.

Table 7 Summary of $PM_{2.5}$ concentrations from Wambo Mine monitors in 2024

Statistic	D5	D4	Criterion
Measured maximum 24-hour average due to all sources (µg/m³)	26.8	16.1	NA
Calculated maximum 24-hour average from direction of Wambo Mine (µg/m³)	5.4	7.6	25
Measured annual average due to all sources (µg/m³)	7.3	5.4	8
Calculated annual average from direction of Wambo Mine (µg/m³)	0.4	0.4	NA

3.4 Particulate Matter (as TSP)

Table 8 shows the estimated annual average TSP concentrations based on the measured PM_{10} data in 2024. The data show that the estimated TSP concentrations were below 90 µg/m³. These results therefore demonstrate compliance with the development consent in terms of particulate matter as TSP.

Table 8 Summary of TSP concentrations from Wambo Mine monitors in 2024

Statistic	D1	D2	D5	D4	Criterion
Estimated annual average due to all sources (µg/m³)	57	44	68	34	90

4. Conclusions

A review of the Wambo Mine air quality monitoring data from 2024 has been completed. Based on the review it has been concluded that Wambo Coal complied with its development consent (DA 305-7-2003) in terms of air quality impacts at all reportable monitoring sites for data collected in 2024.

5. Reference

NSW Government (2023) Development Consent issued under Section 80 of the *Environmental Planning & Assessment Act 1979* – Wambo Coal Mine – DA 305-7-2003 as modified in January 2023.

Peabody (2020) "Air quality and greenhouse gas management plan". Document No. WA-ENV-MNP-508. November 2020.

Appendix A Historical summary of air quality around Wambo Mine

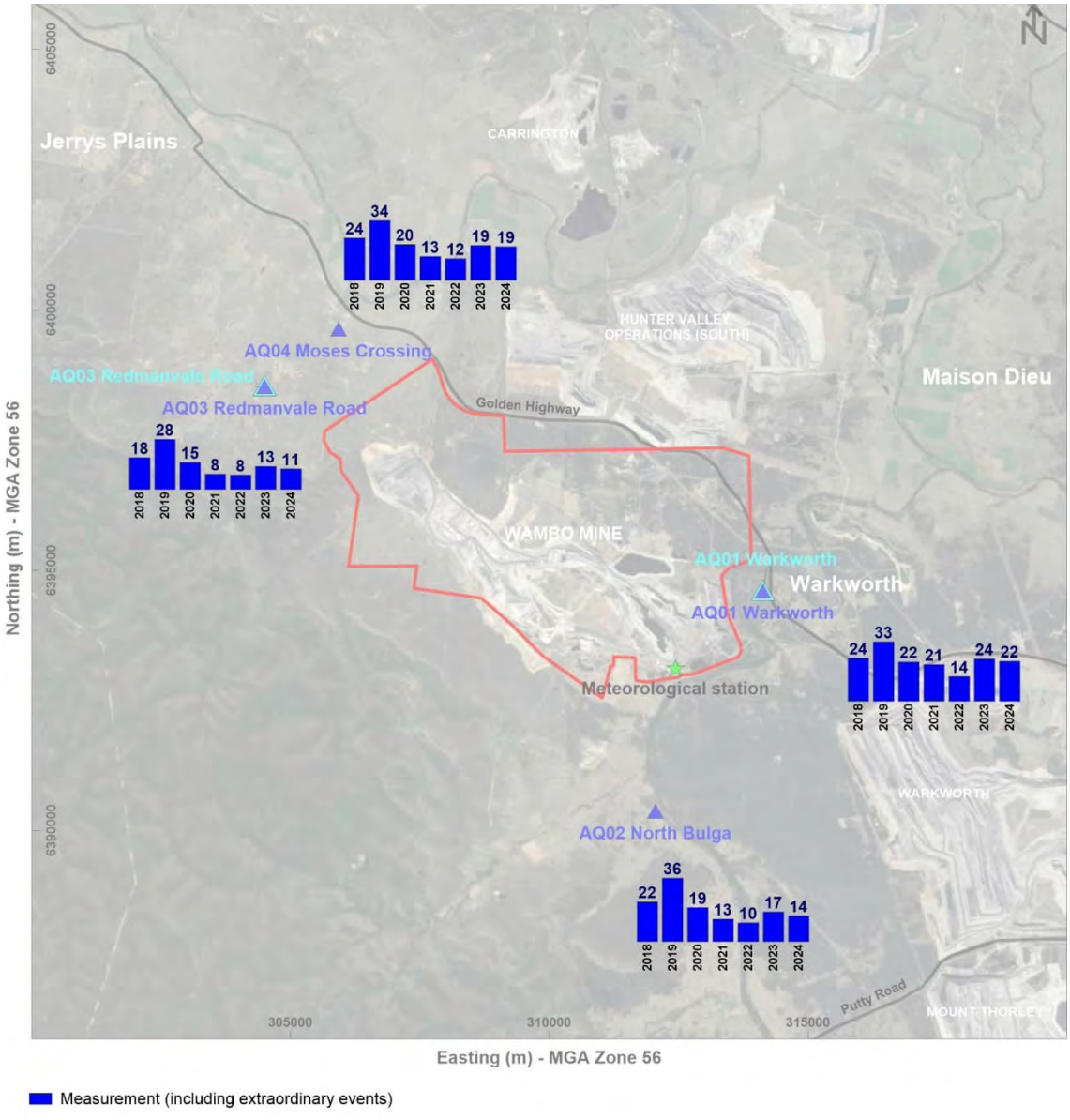

Figure A1 Annual average PM_{10} concentrations at Wambo Mine monitors from 2018 to 2024 (µg/m^3)

APPENDIX E

ANNUAL FLORA AND FAUNA MONITORING REPORT

Wambo Coal Annual Flora and Fauna Monitoring Report

Volume 1

Wambo Coal Pty Ltd

ecological AUSTRALIA
A TETRA TECH COMPANY

Document Tracking

Project Name: Wambo Coal Annual Flora and Fauna Monitoring – Volume 1

Project Number: 24NEW7979

Project Manager: Liam Scanlan

Version	Prepared by	Reviewed by	Approved by	Status	Date
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Abbreviations

Abbreviation	Description
AEMR	Annual Environmental Management Report
BC Act	NSW Biodiversity Conservation Act 2016
BS	Bare soil cover
BOA	Biodiversity Offset Area
BMP	Biodiversity Management Plan
BVT	Biometric Vegetation Type
CEEC	Critically Endangered Ecological Community
DBH	Diameter at Breast Height
DPI	NSW Department of Primary Industries
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EPBC Act	Federal Environment Protection and Biodiversity Conservation Act 1999
EPC	Exotic Plant Cover
FL	The length of Fallen Logs >10 cm diameter
GDE	Groundwater Dependent Ecosystem
HBT	Hollow-bearing Tree
INFI	Infiltration Index
LFA	Landscape Function Analysis
LI	Leaf litter cover
LOI	Landscape Organisation Index
NGCG	Native Ground Cover - Grasses
NGCO	Native Ground Cover - Other
NGCS	Native Ground Cover - Shrubs
NI	Nutrient Index
NMS	Native Mid-storey Cover – the projected native foliage cover of mid-storey (%)
NOS	Native Overstorey – the projected native foliage cover of canopy (%)
NPS	The number of Native Plant Species
NWCD	North Wambo Creek Diversion
OEH	NSW Office of Environment and Heritage
OR	Overstorey Regeneration
PCT	Plant Community Type
RWEA	Remnant Woodland Enhancement Area
RWEP	Remnant Woodland Enhancement Program
SI	Stability Index
SSA	Soil Surface Assessment
TEC	Threatened Ecological Community
VCA	Voluntary Conservation Area
WCPL	Wambo Coal Pty Ltd
WONS	Weed of National Significance

Executive Summary

The Wambo Coal Mine annual flora and fauna monitoring program was undertaken by Eco Logical Australia (ELA) in 2024. Floristic surveys, bird surveys and riparian condition surveys were conducted during Spring across both remnant woodland, general surface and rehabilitation areas.

Winter bird surveys targeting threatened bird species were undertaken in August 2024 and no threatened bird species were detected. Nest box monitoring was also undertaken in September 2024, with four nest boxes occupied at the time of survey, and most nest boxes in good condition.

Results from 2024 surveys indicate that remnant woodland sites within Remnant Woodland Enhancement Area (RWEA) areas are generally performing well. Overall, native flora species diversity and native ground cover remains high with some decreases, likely in response to the above average rainfall in the past three years and lower rainfall in 2024.

Groundcover exceeded the target range in a number of vegetation communities. Although this may be viewed as favourable, and not an urgent management concern, the opportunity to conduct fire management hazard reduction burns during a low-risk fire season should be investigated through liaison with NSW Rural Fire Service and National Parks and Wildlife Service.

High exotic cover was recorded in RWEA A and RWEA Rail Loop within the Rough-barked Apple - Narrow-leaved Ironbark - Blakely's Red Gum - Bull Oak - Coast Banksia woodland on sands of the Warkworth area community and in the River Red Gum / River Oak riparian woodland community. The recorded levels failed to meet the performance criteria and Voluntary Conservation Area (VCA) targets at several sites. Key exotic species in these zones are *Melinis repens*, *Bryophyllum* sp., *Eragrostis curvula*, and *Ehrharta erecta.*

Floristic and bird monitoring sites established in 2020 in the South Bates Extension underground mine area, including reference sites outside of the mining area were monitored for the third year. Vegetation and bird communities were recorded in good condition. An overall decrease in bird species richness was recorded, however no significant impacts to floristic attributes or bird communities were observed at sites within areas impacted by undermining to date.

High rainfall and flooding conditions of North Wambo Creek has naturally altered creek geomorphology and associated riparian and in-stream vegetation in recent years. Vegetation monitoring plots were not undertaken in this community in 2022, however, results for monitoring in 2024 have improved since 2020-2021. Tree monitoring shows that trees are generally healthy and in good condition.

Incidental observations of Feral Pig (*Sus scrofa*) activity appear to have decreased since 2023, however, Pig activity was still recorded in low levels along creeks in the General Surface Area.

Overall, no detrimental impacts of underground mining have been recorded within the RWEAs.

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1. Introduction

Wambo Coal Pty Limited (WCPL) is situated approximately 15 kilometres (km) west of Singleton, near the village of Warkworth, New South Wales (NSW). A range of open cut and underground mine operations have been conducted at WCPL since mining operations commenced in 1969. Mining under the current Development Consent (DA 305-7-2003) commenced in 2004 and permits both open cut, underground operations and associated activities to be conducted. As part of the development consent, a Remnant Woodland Enhancement Program (RWEP) has been established as a biodiversity offset for lands disturbed by open cut coal mining activities. The RWEP aims to conserve local and regional biodiversity by protecting and enhancing the habitat for flora and fauna within these areas through a conservation agreement.

HLA - Envirosciences Pty Ltd initially established a program to monitor the fauna and vegetation structure within the RWEP areas, as well as to monitor stream and riparian condition within North Wambo, being Wambo Creek and Stony Creek, with the aim of measuring and documenting the status and change in ecological condition. Eco Logical Australia (ELA) was commissioned by WCPL to undertake this monitoring program during Spring 2024, making this the eighth year that ELA has completed monitoring at this location. This monitoring program is conducted in response to the 2004 Development Consent condition (DA 305-7-2003 Schedule 4 Condition 48) and informs WCPL's Annual Environmental Management Report (AEMR).

ELA's scope of works included:

- Collection floristic and fauna habitat data from established monitoring locations throughout land owned by WCPL, including remnant woodland enhancement areas (RWEA) (otherwise known as Biodiversity Offset Areas (BOA) or Voluntary Conservation Areas (VCA))
- Conducting vegetation establishment monitoring along the North Wambo Creek Diversion (NWCD)
- Conducting riparian condition monitoring at North Wambo, South Wambo and Stony Creeks
- Conducting bird monitoring at established monitoring locations throughout land owned by WCPL, primarily in land set aside as part of the RWEP
- Winter bird surveys (in lieu of surveys scheduled to be undertaken in 2022)
- Monitoring GDEs above the South Bates Underground Extension area
- Reporting on any mine subsidence observations and other management issues
- Documenting results and compare to performance criteria or past results (where relevant) and identify what and where management actions may be required
- Providing a summary of management actions.

1.1. Report structure

This report has been set out in the following manner:

- Executive Summary – summary of the key findings of the monitoring works.
- Introduction – provides background information to the current report
- Remnant woodland enhancement areas (RWEAs) – provides methods, results and interpretation of data, as well as recommendations from flora and bird surveys primarily within RWEA areas

- Rehabilitation areas – provides methods, results and interpretation of data from vegetation establishment monitoring quadrats and biometric flora survey plots from the NWCD
- Riparian condition assessment – provides methods, results and interpretation of data, as well as management recommendations for riparian transects at North Wambo Creek, Wambo Creek and Stony Creek
- South Bates Underground Extension area – provides methods, results and interpretation of data from monitoring of GDEs, flora and birds in the area above the South Bates Underground Extension
- Mine subsidence observations and other management issues – provides observations of mine subsidence and other management issues on land owned by WCPL
- Summary of management actions – provides a summary of required and recommended actions.

Raw data and photographs from monitoring site surveys are included in Volume 2.

2. Remnant Woodland Enhancement Areas (RWEAs)

2.1. Floristic monitoring

2.1.1. Introduction

The aim of floristic and fauna habitat monitoring is to measure the current condition of vegetation within the RWEAs in terms of floristics and habitat complexity. The results aim to provide direction for the management of these areas and to inform monitoring programs in the future.

2.1.2. Methods

Data was collected by ELA ecologists Liam Scanlan and Mel Thurtell from September – October 2024. A standard biometric plot 50 x 20 m (Figure 1) was used to measure the following parameters and collect data following the BioBanking methodology (DECC 2008a):

- Full floristic species list (including cover abundance scores) in a nested 0.04 ha plot (20m x 20m)
- Canopy regeneration over whole vegetation zone
- Estimation of projected native foliage cover of ground cover from 50 points and canopy and mid-storey layer from 10 points along the 50 m transect
- Occurrence and abundance of weed species in 0.04 ha plot (20m x 20m)
- Number of hollow-bearing trees and length of logs (>10cm diameter) in the plot
- Photograph of each plot (at start of 50 m transect).

The abundance of each species in the 0.04 ha plot was estimated, using a modified Braun-Blanquet scale, as used in previous floristic monitoring at WCPL. These are listed below:

- 1 = few, small cover (<5%)
- 2 = numerous (<5%)
- 3 = 5 – 25%
- 4 = 25 – 50%
- 5 = 50 – 75%
- 6 = >75%.

All vascular plants species were recorded and identified to the lowest taxonomic level possible, with samples of unknown species collected for further identification where possible. Nomenclature followed the Flora of New South Wales as presented on PlantNet (RBGDT 2015).

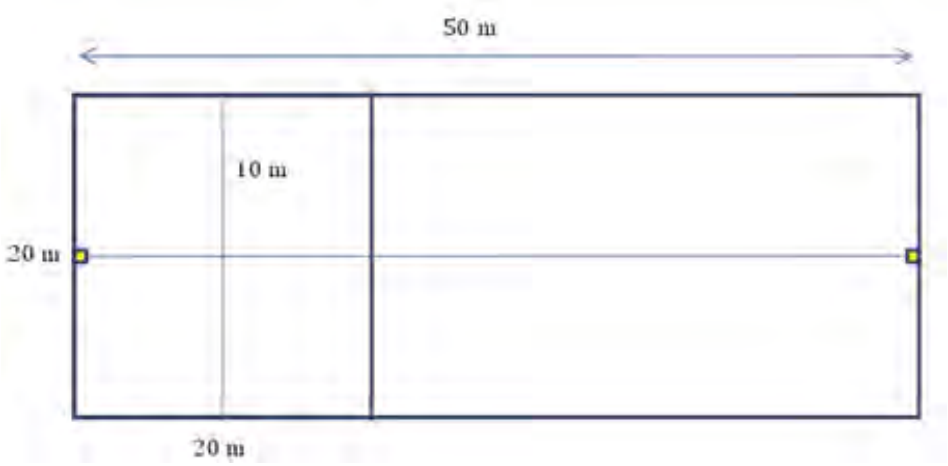


Figure 1: Biometric vegetation plot dimensions.

Flora monitoring plots were located within the ten vegetation communities originally mapped and described by Orchid Research (2003). Since this time, a number of changes in vegetation mapping standards in NSW have occurred. Previously a set list of plant communities known as Biometric Vegetation Types (BVT) were used as a state-wide standard by the NSW Office of Environment and Heritage (OEH). These BVTs have now been modified and are now known as Plant Community Types (PCT's). As such, the ten vegetation communities originally mapped and described by Orchid Research (2003) have been converted to their equivalent PCT within this report. Several of these communities are also listed under both State and Federal legislation as Threatened Ecological Communities (TECs) under different nomenclature. Table 1 clarifies the conversion of these vegetation communities.

Data was collected from the 34 locations previously surveyed as part of the RWEP monitoring program. During 2019 and 2020, several additional floristic monitoring plots were added outside of RWEAs in the NWCD and South Bates Extension Underground Mine area as part of the broader Wambo Coal Mine biodiversity monitoring program. These sites are monitored using the same methods described here, with results presented in the relevant sections of this report. All floristic plot locations are shown in Figure 2.

Table 1: Original vegetation classification, PCT classification and TEC status for each monitoring plot in remnant vegetation

Vegetation Community (Orchid Research 2003)	PCT	TEC	Plot name
River Oak / Rough-barked Apple Forest	PCT 42: River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	Listed as Endangered (E) under the NSW *Biodiversity Conservation Act 2016* (BC Act): Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions	V1-A1
			V1-A2
			V1-B1
			V1-B2
			V1-B3
River Red Gum Woodland			V2-A1
			V2-B1
			V2-B2
Yellow Box / Blakely's Red Gum / Rough-barked Apple Forest			V3-B1
			V5-B1

Vegetation Community (Orchid Research 2003)	PCT	TEC	Plot name
Coast Banksia / Rough-barked Apple / Blakely's Red Gum Forest	PCT 1653: Rough-barked Apple - Narrow-leaved Ironbark - Blakely's Red Gum - Bull Oak - Coast Banksia woodland on sands of the Warkworth area	Listed as E under the BC Act: Warkworth Sands Woodland in the Sydney Basin Bioregion, also listed as Critically Endangered (CE) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as Warkworth Sands Woodland of the Hunter Valley	V5-B2
			V5-B3
			V5-B4
Narrow-leaf Ironbark/Grey Box/Bulloak/Honeymyrtle Forest	PCT 1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	Listed as E under the BC Act: Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions, may also be listed as CE under the EPBC Act as Central Hunter Valley eucalypt forest and woodland, dependant on condition and landscape position	V6-A1c
			V6-A3
			V6-B1
			V6-B1c
			V6-B2
			V6-B2c
			V6-B3
			V6-B4
Grey Gum/Narrow-leaf/ Ironbark/Bulloak/Honeymyrtle Forest			V11-B1
			V11-B2
Spotted Gum/Narrow-leaf Ironbark/Bulloak/Paperbark Forest	PCT 1604: Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter	Listed as E under the BC Act: Central Hunter Ironbark - Spotted Gum - Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions, may also be listed as CE under the EPBC Act as Central Hunter Valley eucalypt forest and woodland, dependant on condition and landscape position	V9-A1
			V9-B1
			V9-B2
			V10-B1
Slaty Gum/Narrow-leaf Ironbark/Bulloak/Paperbark Forest	PCT 1176: Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Listed as Vulnerable (V) under the BC Act: Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion, may also be listed as CE under the EPBC Act as Central Hunter Valley eucalypt forest and woodland, dependant on condition and landscape position	V10-A1
			V10-A2
			V10-B3
White Mahogany/Rough-barked Apple Forest	PCT 1584: White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley	N/A	V13-B1

Vegetation Community (Orchid Research 2003)	PCT	TEC	Plot name
Brush Wilga/Native Olive Shrubland	PCT 1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	Listed as E under the BC Act: Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions	V14-A1
			V14-B1
			V14-B2

Cover/abundance scores for each species within each plot in the RWEAs was provided by WCPL from 2010 onwards, with the exception of woodland rehabilitation sites, which were sampled for the first time by ELA during monitoring undertaken in 2015. Biometric plot data using the current method was collected for the first-time during monitoring undertaken in 2014.

Data was examined for changes in native species richness within each sampled plant community over thirteen monitoring periods from 2010 to 2023 and cover of exotic species over the last eight monitoring periods (2016 to 2023). Monitoring point photographs were also compared where possible to determine if major structural elements of each community had changed since the earliest photos available were taken (generally in 2013). Data from each vegetation community was compared to established performance criteria, biometric benchmarks and compared with reference sites outside of the RWEA areas where possible.

Vegetation community condition benchmarks (developed by OEH for each PCT) have been modified to provide realistic, ambitious yet achievable performance criteria for each PCT. Monitoring results can then be compared to these criteria to determine if management actions are likely to be required.

A green, yellow, orange and red colour system has been developed to rank each measured attribute according to performance and management actions required (Table 2). The structure of this table has been derived from the *Terrestrial Biodiversity Assessment Tool – Operational manual* (DECC 2008b). The number of hollow-bearing trees and length of fallen logs have been presented as a measure of fauna habitat attributes. No performance criteria have been set for these attributes in remnant vegetation, as in situations where historical logging or clearing has been intensive, it may take many years for a suitable density of hollows and logs to form naturally.

Table 2: Colour ranking system for floristic attributes and performance targets

Attribute	Red (needs greater improvement)	Orange (in need of improvement)	Yellow (not meeting target but values still acceptable)	Green (excellent – within target range)
Native species richness	0–10%	>10 – <50% of target range	50 – <100% of target range	≥ target range
Native overstorey cover %	0 – 10% or >200% of target range	> 10 – <50% or >150 – 200% of target range	50 – <100% or >100 – 150% of target range	within target range
Native mid-storey cover %	0 – 10% or >200% of target range	>10 – <50% or >150 – 200% of target range	50 – <100% or >100 – 150% of target range	within target range

Attribute	Red (needs greater improvement)	Orange (in need of improvement)	Yellow (not meeting target but values still acceptable)	Green (excellent – within target range)
Native ground cover – grasses %	0 – 10% or >200% of target range	>10 – <50% or >150 – 200% of target range	50 – <100% or >100 – 150% of target range	within target range
Native ground cover – shrubs %	0 – 10% or >200% of target range	>10 – <50% or >150 – 200% of target range	50 – <100% or >100 – 150% of target range	within target range
Native ground cover – other %	0 – 10% or >200% of target range	>10 – <50% or >150 – 200% of target range	50 – <100% or >100 – 150% of target range	within target range
Proportion of native overstorey species regenerating	0	0-0.5	0.5-1	1
Exotic cover	>66%	33-66	5-33	0-5%

Several abbreviations for measured attributes are used in tables throughout the following section. An explanation of these is provided below.

- NPS – the number of native plant species
- NOS (%) – projected native foliage cover of canopy
- NMS (%) – projected native mid-storey cover
- NGCG (%) – native groundcover of grasses
- NGCS (%) – native groundcover of shrubs
- NGCO (%) – native groundcover of other plant types (sedges, herbs etc.)
- EPC (%) – exotic plant cover
- OR – proportion of overstorey species regenerating over the whole vegetation zone
- HBT – number of hollow-bearing trees present in the 20 x 50 m vegetation plot
- FL – length of fallen logs >10 cm diameter.

In addition to those performance criteria listed above, Annexure C of the VCAs for the RWEA areas requires that WCPL aim for an exotic plant cover within the Conservation Areas that does not exceed the percentages detailed in Table 3. Target limits for Years 6-10 are used for the ongoing. Photo-monitoring points established as part of the VCAs in 2013 were compared to photos at the same location during the current vegetation monitoring.

Table 3: Exotic plant cover criteria for VCA areas

RWEA	Aim	Timing
Coal Terminal	Exotic plant cover within the Conservation Area must not be permitted to exceed: - 5% of the foliage cover at monitoring site CT1 - 15% of the foliage cover at monitoring site CT2.	In Year 1 and at the end of Year 5
	Exotic plant cover within the Conservation Area must not be permitted to exceed: - 5% of the foliage cover at monitoring site CT1; and - 10% of the foliage cover at monitoring site CT2.	Years 2-5 (2017-2020)
	Exotic plant cover within the Conservation Area must not be permitted to exceed: - 5% of the foliage cover at monitoring site CT1; and - 5% of the foliage cover at monitoring site CT2.	Years 6-10 (2021-2025)
RWEAs A, B, C and D	Exotic plant cover within the Conservation Area must not be permitted to exceed: - 70% of the foliage cover at monitoring site A1 within Area A - 20% of the foliage cover at monitoring site A2 within Area A - 30% of the foliage cover at monitoring site A3 within Area A - 10% of the foliage cover at monitoring site A4 within Area A - 5% of the foliage cover at monitoring site B1 within Area B - 5% of the foliage cover at monitoring site B2 within Area B - 5% of the foliage cover at monitoring site C1 within Area C - 5% of the foliage cover at monitoring site D1 within Area D.	In Year 1 (2016)
	Exotic plant cover within the Conservation Area must not be permitted to exceed: - 60% of the foliage cover at monitoring site A1 within Area A - 15% of the foliage cover at monitoring site A2 within Area A - 20% of the foliage cover at monitoring site A3 within Area A - 5% of the foliage cover at monitoring site A4 within Area A - 5% of the foliage cover at monitoring site B1 within Area B - 5% of the foliage cover at monitoring site B2 within Area B - 5% of the foliage cover at monitoring site C1 within Area C - 5% of the foliage cover at monitoring site D1 within Area D.	Years 2-5+ (2017-2020)
	Exotic plant cover within the Conservation Area must not be permitted to exceed: - 40% of the foliage cover at monitoring site A1 within Area A - 10% of the foliage cover at monitoring site A2 within Area A - 15% of the foliage cover at monitoring site A3 within Area A - 5% of the foliage cover at monitoring site A4 within Area A - 5% of the foliage cover at monitoring site B1 within Area B - 5% of the foliage cover at monitoring site B2 within Area B - 5% of the foliage cover at monitoring site C1 within Area C; and - 5% of the foliage cover at monitoring site D1 within Area D,	Years 6-10 (2021-2025)
RWEA E	Exotic plant cover within the Conservation Area must not be permitted to exceed: - 10% of the foliage cover at monitoring site E1	In Year 1
	Exotic plant cover within the Conservation Area must not be permitted to exceed: - 5% of the foliage cover at monitoring site E1	Years 2-5
	Exotic plant cover within the Conservation Area must not be permitted to exceed: - 5% of the foliage cover at monitoring site E1	Years 6-10

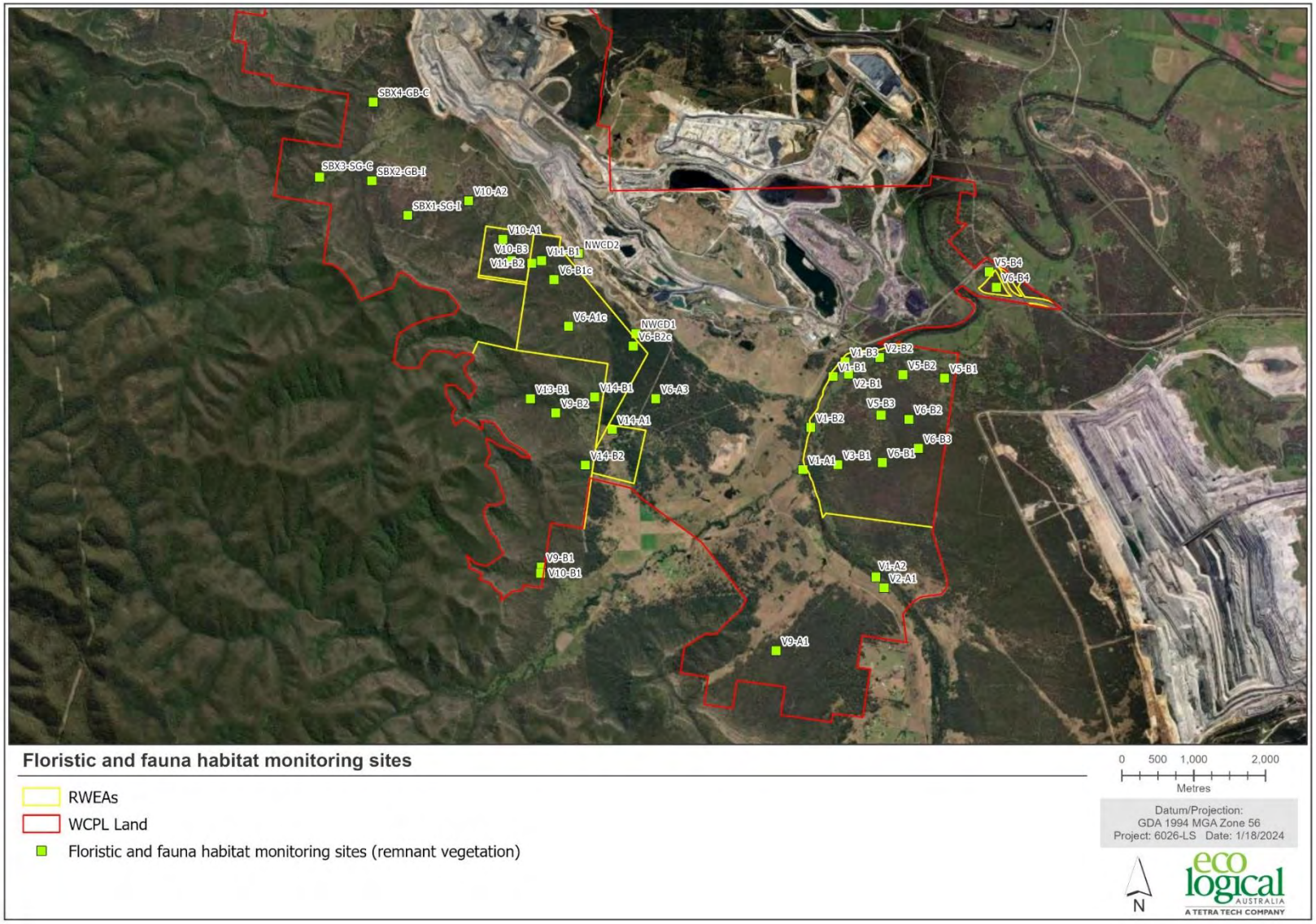


Figure 2: Floristic and habitat monitoring sites and RWEAs

1.1.1. Results

The floristic and biometric data collected during floristic and fauna habitat monitoring is summarised below, with a focus on monitoring features that fell below the performance criteria. The full floristic plot data and other data including plot photographs are provided in Volume 2.

1.1.2. River Red Gum / River Oak riparian woodland wetland in the Hunter Valley

This community is one of the most disturbed vegetation communities on WCPL land, as it occurs on more fertile soils on the banks and floodplains of Wollombi Brook, is naturally disturbed by flood events and has been historically used more intensively for agricultural purposes (Photograph 1).

River Red Gum / River Oak riparian woodland is distinguished by an overstorey of *Eucalyptus camaldulensis* (River Red Gum), *Casuarina cunninghamiana* subsp. *cunninghamiana* (River Oak), *Angophora floribunda* (Rough-barked Apple) and *Eucalyptus melliodora* (Yellow Box) on floodplains and riparian areas. This PCT conforms to the BC Act listed Endangered Ecological Community (EEC) *Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions*. This community also contains the threatened population *Eucalyptus camaldulensis population in the Hunter catchment*, which is listed as Endangered under the BC Act.

Photograph 1: River Red Gum / River Oak riparian woodland wetland on North Wambo Creek in 2024 (Site V1-A1 within the Wollombi Brook channel)

Nine monitoring plots are located within this PCT. V1 monitoring sites are located within *Casuarina cunninghamiana* dominated forest along the banks of Wollombi Brook. V2 monitoring sites are located on the partially cleared red gum dominated floodplains of Wollombi Brook and the V3 monitoring site is located in a slightly wetter location on the boundary of the floodplain and sand dunes supporting Warkworth Sands type vegetation.

Three sites (V1-A1, V1-A2 and V2-A1) appear to have been originally intended as reference sites at the commencement of the monitoring program, as they are located outside of the RWEP areas. However, cattle have been fenced out of the immediate riparian zone on Wollombi Brook (including sites V1-A1, V1-A2) and thus treatments for both reference sites and management sites are similar.

Overall, average NPS, NMS and NGCS were below the performance criteria target and EPC exceeded the upper limit of the performance criteria target in 2024. Targets were met or acceptable for all other performance criteria (Table 4).

1.1.2.1. Native plant species richness

Number of native plant species recorded were below the performance criteria target for RWEA monitoring sites in 2024. Average NPS was 12.67 and the target is >20.

The sites with the lowest scoring NPS for this PCT were V1-A1, V1-A2 and V1-B3 which all had NPS of <10 species. These sites all occur in the River Oak / Rough-barked Apple Forest community, which typically experience the most frequent levels of flooding and inundation.

The low NPS in this PCT is not considered a management concern. The natural disturbance regimes associated with these communities including occasional flooding along creek banks or semi-permanent inundation within low lying stream vegetation are likely to contribute to low NPS. For example, by removing vegetation strata, or creating conditions that require semi-aquatic plant traits (e.g. *Phragmites australis* (Common Reed)) which excludes species that are intolerable of these conditions. These sites have remained consistently low (average 7.6 NPS at V1-A1) since 2010.

1.1.2.2. Native midstorey cover and shrub groundcover

Native midstorey cover was below the performance criteria target for RWEA monitoring sites in 2024. Average NMS was 1.17% and the target is 10-50%. Similarly to native plant species richness, this is not considered a management concern within these vegetation communities due to the natural disturbance of occasional flooding and inundation. For example, inundation at V3-B1 favours high groundcover of rushes and sedges (Photograph 2 and Photograph 3), and flooding along the lower banks of Wollombi Brook likely limits the midstrata from developing to a high cover (Photograph 4 and Photograph 5).

Photograph 2: Flora monitoring site V3-B1 during 2015

Photograph 3: Flora monitoring site V3-B1 during 2024

Photograph 4: Monitoring site A3 during 2013

Photograph 5: Monitoring site A3 during 2024

1.1.2.3. Exotic Plant Cover

EPC has been recorded since 2014 and results are variable over time (Figure 3). In 2024, EPC was notably lower than 2020-2023, and exotic plant cover was second lowest since monitoring began. The trends suggest EPC is related to rainfall. Floristic plot data suggests total exotic plant cover is a result of a combination of both annual and perennial species.

Several priority weeds are present within this PCT, these are listed in Table 6 below, along with their biosecurity duty according to NSW Department of Primary Industries (DPI 2017). Priority weed distribution and abundance was generally similar to previous years. *Senecio madagascariensis* (Fireweed) was recorded at all sites except V3-B1.

Photo monitoring points in this PCT show no obvious changes within this PCT between years 2015 and 2024 (Photograph 2; Photograph 3), and 2013 and 2024 monitoring (Photograph 4; Photograph 5), although evidence of recent wetter seasonal conditions in the last few years is evident in the understorey of some 2024 photos.

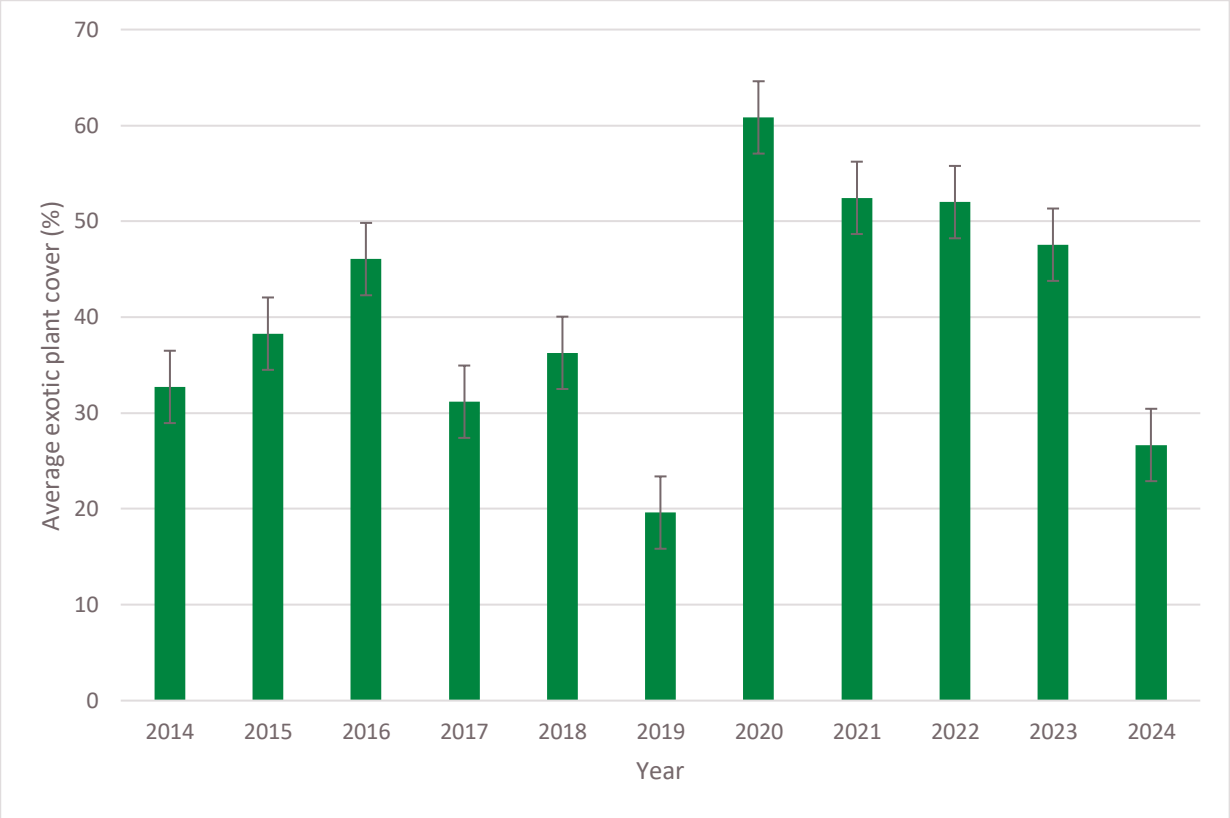


Figure 3: Average EPC within all riparian woodland monitoring sites per year. Error bars represent the standard error of the mean.

Table 4: Floristic results and performance criteria for River Red Gum / River Oak riparian woodland wetland

Vegetation Community (Orchid Research 2003)	PCT	RWEP Area	Plot Name	NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	HBT	FL (m)
River Oak / Rough-barked Apple Forest	PCT 42: River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	Outside of RWEP	V1-A1	7	5.5	0	76	0	0	12	1	0	80
		Outside of RWEP	V1-A2	8	15.2	0	40	0	0	52		1	28
		A	V1-B1	13	7.5	0	18	0	24	2		1	60
		A	V1-B2	10	10.2	0	46	0	6	26		0	18
		A	V1-B3	9	6	1.3	18	0	0	34		0	10
River Red Gum Woodland		Outside of RWEP	V2-A1	10	38	2.7	68	2	14	0		2	0
		A	V2-B1	14	17.5	0	50	2	0	70		1	6
		A	V2-B2	15	19.5	5.7	48	0	8	40		2	18
Yellow Box / Blakely's Red Gum / Rough-barked Apple Forest		A	V3-B1	15	4.1	0	30	0	60	4		4	30
Average values for RWEA monitoring sites				12.67	10.80	1.17	35.00	0.33	16.33	29.33	1	1.3	23.7
Performance criteria				>20	10-50	10-50	20-60	1-5	5-30	<10	1	-	-

1.1.3. Rough-barked Apple - Narrow-leaved Ironbark - Blakely's Red Gum - Bull Oak - Coast Banksia woodland on sands of the Warkworth area

Within WCPL owned land, this community is mostly restricted to the eastern side of Wollombi Brook, primarily within the RWEP area A (Photograph 6). This PCT corresponds to the EPBC Act listed Critically Endangered Ecological Community (CEEC) *Warkworth Sands Woodland of the Sydney Basin Bioregion* and is also listed under the BC Act. This PCT occurs on aeolian sand deposits and is restricted to the Warkworth area.

In 2020-2021 vegetation monitoring, *Banksia integrifolia* (Coast Banksia) was observed as subjected to die-back with no live individuals recorded in any plots. Live individuals and seedlings were observed more broadly within this PCT during 2022-2024 monitoring surveys. Pathogen detection tests were undertaken to determine if die-back may be related to *Phytophthora*. It was concluded that the die-back event was most likely related to pre-2019 drought conditions. Further details and discussion of *Banksia integrifolia* die-back are provided in Section 6.3.

In 2023, average NGCG was 69.5%, well above the performance criteria target of 4-20%, with high grass cover likely to be continuing as a result of high rainfall in 2021 and 2022, and a absent of fire from the community. High grass cover was recorded again in 2024, however has decreased to an average of 56%.

Management intervention is not recommended to reduce high grass cover at this stage as burning may favour the establishment of exotic grasses including *Melinis repens* (Red Natal Grass) and *Eragrostis curvula*.

Overall, this PCT is performing acceptably, although floristic monitoring, walk-over surveys and ongoing weed control should continue given the Critically Endangered status of this community. Extensive work has been undertaken since 2020 to manage *Bryophyllum* sp. (Mother of Millions), and more recently *Melinis repens* and *Eragrostis curvula*.

Photograph 6: Warkworth Sands Woodland within RWEA A in 2024 (Site V5-B2)

1.1.3.1. Exotic plant cover

In 2023 and 2024, EPC decreased and has met the performance criteria of <10%. In recent years, the environmental weed *Bryophyllum* sp. (Mother of Millions) has been observed to be abundant in certain locations within this vegetation community, both within RWEA A and inside the Rail Loop area. *Bryophyllum* sp. is listed as a priority weed in the Hunter under the *Biosecurity Act 2015* (LLS 2023) and this species is currently the focus of a weed management program in RWEA A and Rail Loop. *Melinis repens* and *Eragrostis curvula* have also established with high cover in RWEA A in recent years and are being treated on an ongoing basis by land management contractors.

The progress of the weed management program is evident in 2023-2024 monitoring results, with *Bryophyllum* sp. recorded in V5-B1 and B5-B2, *Melinis repens* in V5-B4 and *Eragrostis curvula* in V5-B2 and V5-B4. However, these species were also recorded opportunistically in locations outside of the monitoring plots throughout RWEA A.

Photo-monitoring point A2 within this PCT shows a minor change in vegetation between the 2013 and 2024 monitoring periods, with a reduction in cover of *Pteridium esculentum* (Bracken) and an increase in woody shrubby vegetation including *Jacksonia scoparia* (Winged Broom-pea) (Photograph 7 and Photograph 8).

Photograph 7: Photo monitoring point A2 during 2013

Photograph 8: Photo monitoring point A2 during 2024

Table 5: Floristic results and performance criteria for Rough-barked Apple - Narrow-leaved Ironbark - Blakely's Red Gum - Bull Oak - Coast Banksia woodland

Vegetation Community (Orchid Research 2003)	PCT	RWEP Area	Plot Name	NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	HBT	FL
Coast Banksia / Rough-barked Apple / Blakely's Red Gum Forest	PCT 1658: Rough-barked Apple - Narrow-leaved Ironbark - Blakely's Red Gum - Bull Oak - Coast Banksia woodland on sands of the Warkworth area	A	V5-B1	23	30.3	2.8	78	6	6	0	1	1	11
		A	V5-B2	21	5.5	0	46	0	30	0		3	5
		A	V5-B3	31	6	7	42	6	30	2		2	12
		Rail Loop	V5-B4	32	14	9	58	37	23	0		1	8
Average values for RWEP and Rail Loop monitoring sites				26.75	13.95	4.7	56	12.25	22.25	0.5	1	1.8	9
Performance criteria				>20	10-40	10-50	4-20	5-30	5-35	<10	1	-	-

1.1.4. Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter

This community on land owned by WCPL is generally dominated by the canopy species *Eucalyptus crebra* (Narrow-leaved Ironbark) and occasionally *Eucalyptus moluccana* (Grey Box). A sparse mid-storey or shrub layer of *Allocasuarina luehmannii* (Bull Oak), *Bursaria spinosa* subsp. *spinosa* (Blackthorn) and *Notelaea microcarpa* var. *microcarpa* (Mock Olive), with a grassy understorey is often present. *Eucalyptus punctata* (Grey Gum) and *Melaleuca decora* also occur in some areas.

Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest forms part of the BC Act listed EEC *Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions*. Sections of this community in good condition with a Eucalypt canopy are also likely to be the *Central Hunter Valley eucalypt forest and woodland* CEEC listed under the EPBC Act.

This community appears to be performing well with generally very low cover of exotic species and high diversity of native species present at each monitoring plot (Photograph 9).

Performance criteria were met or acceptable for all other attributes and slightly exceeded for NGCS by 4% cover.

Photo monitoring point A4 (Photograph 10 and Photograph 11) samples this community, and overall general stability is observable between the 2013 and 2024 monitoring periods.

Subsidence cracking is present at four of the eight monitoring plots within this PCT. However, no impacts to vegetation condition have been observed. Very large cracks are present at site V11-B1 in RWEA C and ELA recommends WCPL inspect this area and undertake remediation of large subsidence cracks if possible.

Photograph 9: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest at WCPL (site V6-A3 in 2024)

Photograph 10: Photo-monitoring point A4 during 2013

Photograph 11: Photo-monitoring point A4 during 2024

Table 6: Priority weeds for the Hunter Region observed within the River Red Gum / River Oak riparian woodland PCT plots in 2024

Scientific Name	Common Name	Site	Biosecurity duty (NSW Biosecurity Act 2015)
Asparagus asparagoides	Bridal Creeper	V2-B1	Prohibition on dealings - Must not be imported into the State or sold.
Echium plantagineum	Patterson's Curse	V1-A2, V1-B3	Regional Recommended Measure - Land managers should mitigate the risk of new weeds being introduced to their land. Land managers should mitigate spread from their land. The plant should not be bought, sold, grown, carried or released into the environment.
Eragrostis curvula	African Lovegrass	V1-B3, V2-A1, V2-B1	Regional Recommended Measure - Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment.
Galenia pubescens	Galenia	V2-B1	Regional Recommended Measure - An exclusion zone is established for all land in the region, except the core infestation which includes parts of: Lake Macquarie Local Government Area, Maitland Local Government Area, Muswellbrook Local Government Area, Newcastle Local Government Area, Singleton Local Government Area, Upper Hunter Local Government Area. Entire Hunter Local Land Services region: Land managers should mitigate the risk of the plant being introduced to their land. Exclusion zone: Notify local control authority if found. Land managers should eradicate the plant from the land and keep the land free of the plant. A person should not deal with the plant, where dealings include but are not limited to buying, selling, growing, moving, carrying or releasing the plant. Core infestation: Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.
Heliotropium amplexicaule	Blue Heliotrope	V1-A2, V1-B2, V1-B3, V2-A1, V2-B1, V2-B2	Regional Recommended Measure - Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.
Olea europaea subsp. *cuspidata*	African Olive	V1-B3, V2-B1	Regional Recommended Measure - Land Area 1: Singleton and Maitland. Land Area 2: outbreaks in Hunter region except Singleton and Maitland. Land Area 1: Land managers should mitigate the risk of new weeds being introduced to their land. Land managers should mitigate spread from their land. Land Area 2: Land managers should mitigate spread from their land. Land managers should mitigate the risk of new

Scientific Name	Common Name	Site	Biosecurity duty (NSW Biosecurity Act 2015)
			weeds being introduced to their land. Plant should not be bought, sold, grown, carried or released into the environment.
Salix species	Willows	V1-A1, V1-B1	Prohibition on dealings - Must not be imported into the State or sold.
Senecio madagascariensis	Fireweed	All sites except V3-B1	Prohibition on dealings - Must not be imported into the State or sold.

Table 7 : Floristic results and performance criteria for Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest

Vegetation Community (Orchid Research 2003)	PCT	RWEP Area	Plot Name	NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	HBT	FL
Narrow-leaf Ironbark/ Grey Box/ Bulloak/ Honeymyrtle Forest	PCT 1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	C	V6-A1c	35	12.4	15.9	52	10	34	0	1	2	22
		Outside of RWEP	V6-A3	35	26.7	1	36	14	16	0		0	15
		A	V6-B1	25	9.1	5.5	44	4	0	10		2	32
		C	V6-B1c	42	10.1	4.1	34	12	0	0		0	28
		A	V6-B2	25	15.7	10.7	28	4	18	0		1	50
		C	V6-B2c	30	28	2	42	26	0	0		0	24
		A	V6-B3	29	14.3	5.2	76	8	10	0		3	35
		Rail Loop	V6-B4	14	20	10	75	24	30	0		0	6
Grey Gum/ Narrow-leaf Ironbark/ Bulloak/ Honeymyrtle Forest		C	V11-B1	25	9.4	6.2	22	36	0	0		0	55
		C	V11-B2	33	9.1	16.6	42	2	24	0		0	28
Average values for RWEP and Rail loop monitoring sites				28.7	14.2	8.5	46.1	14.0	12.9	1.1	1	0.9	31.1
Performance criteria				>25	10-40	5-10	15-50	5-10	5-40	<5	1	-	-

1.1.5. Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter

Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter at WCPL is characterised by an overstorey of *Eucalyptus crebra*, *Corymbia maculata* (Spotted Gum) and *E. moluccana. E. punctata* and *Eucalyptus dawsonii* (Slaty Gum) are also occasionally present. The mid-storey or shrub layer often includes *Melaleuca decora, Bursaria spinosa subsp. spinosa, Allocasuarina luehmannii* and *Olearia elliptica* (Sticky Daisy Bush). This community corresponds to the EEC *Central Hunter Ironbark -Spotted Gum – Grey Box Forest* listed under the BC Act. Sections of this community in good condition with a Eucalypt canopy are also likely to be the *Central Hunter Valley eucalypt forest and woodland* CEEC, listed under the EPBC Act.

This PCT is performing well meeting all performance criteria in 2024 (Table 8). Average NGCS exceeded the upper limit by 3% cover and is not considered to be a management concern as the shrubs contributing to NGCS are native species.

Photo-monitoring points in this community show no negative changes in vegetation structure between the 2013 and 2024 monitoring periods (Photograph 12 and Photograph 13). Overall, this PCT is performing well, and no additional management actions are required at this stage.

Photograph 12: Photo-monitoring point B2 during 2013

Photograph 13: Photo-monitoring point B2 during 2024

Table 8: Floristic results and performance criteria for Narrow-leaved Ironbark - Grey Box - Spotted Gum woodland at Wambo

Vegetation Community (Orchid Research 2003)	PCT	RWEP Area	Plot Name	NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	HBT	FL
Spotted Gum / Narrow-leaf Ironbark/ Bulloak / Paperbark Forest	PCT1604: Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass of the central and lower Hunter	Outside of RWEP	V9-A1	29	13.8	3.8	40	12	0	2	1	1	18
		B	V9-B1	36	16.5	29	54	14	16	0		2	25
		B	V9-B2	34	30	8.3	22	36	4	0		0	17
		B	V10-B1	48	44.5	28.5	46	4	40	0		3	36
Average values for RWEP monitoring sites				39.33	30.33	21.93	40.67	18	20	0	1	1. 7	26
Performance criteria				>35	15-40	5-20	30-50	5-15	5-40	< 5	1	-	-

1.1.6. Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion

The canopy of Slaty Box - Grey Gum shrubby woodland is typically dominated by *Eucalyptus dawsonii* and several other species including *E. punctata, E. moluccana* and *E. crebra. Acacia salicina* (Cooba) and *Allocasuarina luehmannii* may form a small tree layer or be part of the upper-most canopy. The shrub layer includes species such as *Olearia elliptica, Acacia cultriformis* (Knife-leaved Wattle), *Canthium odoratum* (Shiny-leaved Canthium), *Notelaea microcarpa var. microcarpa* and *Dodonaea viscosa* subsp. *cuneata* (Wedge-leaf Hopbush). The groundcover is generally sparse to very sparse and can be poor during drier years (Photograph 14). This community is listed under the BC Act as the EEC *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion*. Sections of this community in good condition with a Eucalypt canopy are also likely to be the *Central Hunter Valley eucalypt forest and woodland* CEEC under the EPBC Act.

At WCPL, this PCT primarily occurs on the smaller ridge tops and slopes and is patchily distributed at lower elevations. *E. crebra* is often present and may co-dominate the canopy with *E. dawsonii*. This PCT is generally in good condition, particularly on the slopes and ridgetops where historical disturbance from forestry and grazing has been minimal. Occasional occurrences of the priority weed *Opuntia* spp. were observed at low densities, similar to other woodland areas at WCPL.

The monitoring sites in this community are located in or near RWEA D. All performance criteria were met or acceptable in 2024 (Table 9). Overall, this PCT is considered to be performing well, and no additional management actions are required at this stage.

Photograph 14: A typical example of Slaty Box woodland at WCPL during 2023 (Site V10-B3)

Table 9: Floristic results, performance criteria for Slaty Box - Grey Gum shrubby woodland

Vegetation Community (Orchid Research 2003)	PCT	RWEP Area	Plot Name	NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	HBT	FL
Slaty Gum / Narrow-leaf Ironbark / Bulloak / Paperbark Forest	1176: Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	D	V10-A1	34	12.3	7.2	46	2	2	0	1	0	28
		Outside of RWEP	V10-A2	28	32.5	2.5	28	28	0	0		0	12
		D	V10-B3	24	35.1	5.1	22	26	2	0		2	40
Average values for RWEP monitoring sites				29	23.7	6.15	34	14	2	0	1	1	34
Performance criteria				>21	15-40	5-30	5-30	0-25	2-10	<5	1	-	-

1.1.7. White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley

At WCPL, this community occurs along Stony Creek and is sheltered by steep sandstone escarpments to the south and a large ridgeline to the north. This PCT is in good condition with many native species and occasional large remnant trees with hollows. One monitoring plot (V13-B1) samples this PCT (Photograph 15).

This monitoring site met or exceeded most performance targets in 2024 (Table 10). NOS and NGCS were below the target range, with NOS and NGCS decreasing by 12.2% cover and 80% cover since 2023 respectively.

Review of floristic plot photos shows that there were no major differences in vegetation condition including midstorey cover between 2023 and 2024, and the large decrease in NGCS is likely attributable to observer variation and differences in interpretation of overstorey and midstorey vegetation, and shrubby groundcover. Overall, this PCT is considered to be performing well and no additional management actions are required at this stage.

1.1.7.1. Potential bell miner associated dieback

It was noted that canopy dieback is present in this community which may be attributable to bell miner (*Manorina melanophrys*) in this community.

Bell miner associated dieback (BMAD) is a process where eucalypts enter a cycle of defoliation and regrowth, but if conditions persist, large areas of dieback and tree death can occur (Silver and Carnegie 2017). BMAD is associated with an over-abundance of the native bell miner bird and psyllid insects (including *Glycaspis* and *Cardiaspina* spp.).

BMAD is typically associated with a dense understorey of woody weeds including Lantana camara and native, fire sensitive species including *Pittosporum undulatum* and *Cissus* spp., which provide nesting sites for bell miners and leads to an increase in the local population of bell miner (Silver and Carnegie 2017). This increase in bell miner population leads to a decrease in insectivorous, psyllid-eating birds such as spotted pardalote, white-naped honeyeater and crimson rosella, due to the aggressive behaviour of the bell miners which exclude other avian species from their territory.

The decrease in psyllid-eating insectivorous birds leads to an increase in psyllids, which is linked to defoliation. Psyllids damage leaves via sap-sucking, causing discolouration and/or necrosis, which leads to defoliation. Repeated defoliation of eucalypts can hinder photosynthesis, and deplete carbohydrate stores, increase attack by secondary pests and diseases (e.g. fungi) and ultimately result in tree mortality (Silver and Carnegie 2017).

Lantana camara is largely absent from this community however the understorey contains a dense layer of native shrub species including *Notelaea microcarpa*, *Bursaria spinosa*, *Hibiscus heterophyllus*, *Trema tomentosa* and *Breynia oblongifolia*, *Melia azedarach* and *Olearia elliptica*, and native vines including *Clematis aristata*, *Pandorea pandorana*, and *Stephania japonica*. This species composition has likely developed in the absence of fire, which appears to have led to conditions favourable to bell miner nesting habitat and bell miner associated dieback.

Previous management of BMAD in north-east NSW has involved low intensity burns intended to reduce nest habitat for bell miners, by reducing cover and height of midstorey, including rainforest saplings. This may be a viable option for this community, however, further investigation into the extent and severity of the dieback is recommended as well as consultation with fire management services (consultants or NSW Rural Fire Service), and NSW Biodiversity Conservation Trust.

Photograph 15: White Mahogany - Spotted Gum - Grey Myrtle forest at V13-B1 in 2024

Table 10: Biometric scores and performance criteria for White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest at Wambo

Vegetation Community (Orchid Research 2003)	PCT	RWEP Area	Plot Name	NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	HBT	FL
White Mahogany / Rough-barked Apple Forest	PCT 1584: White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley	B	V13-B1	44	7.8	32.5	20	2	46	0	1	1	35
Performance criteria				>45	15-45	5-40	5-40	10-20	5-20	0	1	-	-

1.1.8. Brush Wilga/Native Olive Shrubland

The monitoring plots within this PCT are dominated by the shrubs *Notelaea microcarpa var. microcarpa, Geijera salicifolia* (Brush Wilga), *Olearia elliptica* and the small tree *Brachychiton populneus* (Kurrajong) (Photograph 16). Occasional *Eucalyptus crebra* or *E. moluccana* are present as canopy species. The PCT sampled by floristic monitoring may be a partially derived community, resulting from the historic removal of overstorey species in Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest combined with a south facing aspect. These areas are in good condition, with a large number of native species and few exotic species.

Monitoring sites for this community met or exceeded most performance targets in 2024, with NGCG exceeding the target by 11% cover (Table 11). In 2023, NGCG, NGCS and NGCO all exceeded targets and have decreased within the target range in 2024. This decrease is not considered to be a management concern and due to a lack of visibly obvious change in plot photographs, is likely attributable to observer variation, or natural senescence of low groundcover vegetation.

Overall, this PCT is considered to be performing well and no additional management actions are required at this stage.

Photograph 16: Brush Wilga/Native Olive Shrubland at V14-B2 in 2024

Table 11: Biometric scores and performance criteria for Brush Wilga / Native Olive Shrubland at WCPL

Vegetation Community (Orchid Research 2003)	PCT	RWEP Area	Plot Name	NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	HBT	FL
Brush Wilga/Native Olive Shrubland	PCT 1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	Reference site/now within RWEA E	V14-A1	47	9	49	50	0	38	0	1	0	8
		B	V14-B1	26	9.5	33	44	4	8	0		0	30
		B	V14-B2	44	19.7	22.2	78	8	40	0		0	7
Average values for RWEP monitoring sites				35	14.6	27.6	61	6	24	0	1	0	18.5
Performance criteria				>30	5-40	5-40	30-50	5-10	10-40	<5	1	-	-

1.1.9. Conservation agreement requirements and photo monitoring points

Annexure C of the VCAs requires that WCPL aim for an exotic plant cover within the Conservation Areas that does not exceed the EPC percentages detailed in Table 3. Target limits for Years 6-10 are used.

Three of the ten monitoring plots exceeded the exotic cover limits for the 6–10-year targets (Table 12). The sites exceeding limits are located within RWEA A.

Table 12: Exotic plant cover at monitoring sites in regard to VCA targets

RWEA	Site Code for VCA	Corresponding flora monitoring plot	Exotic cover limits yr 1	Exotic cover limits yrs 6-10	Total exotic cover from biometric plot in 2024
Coal Terminal (Rail Loop)	CT1	V6-B4	5	5	4
Coal Terminal (Rail Loop)	CT2	V5-B4	15	15	0
A	A1	V2-B1	70	40	70
A	A2	V5-B1	20	10	0
A	A3	V1-B2	30	15	26
A	A4	V6-B1	10	5	10
B	B1	V13-B1	5	5	0
B	B2	V9-B1	5	5	0
C	C1	V11-B1	5	5	0
D	D1	V10 -B3	5	5	0
E	E1	V14-A1	10	5	0

At site A1, within the riparian zone of Wollombi Brook in RWEA A, high exotic cover (70%) was recorded, consistent with 2020-2023 monitoring.

This exceeds the target limit of 40%, which is a high target reflective of the disturbed condition of the site. Exotic cover at this site is dominated by *Eragrostis curvula* (African Lovegrass), *Heliotropium amplexicaule* (Blue Heliotrope) and *Ehrharta erecta* (Panic Veldtgrass). This site has previously had exotic cover as high as 95% in 2014. The high cover in 2024 is a result of continuing strong growth of ground cover vegetation in response to rainfall and surface water flows in the Wollombi Brook channel.

At site A3, monitored at V1-B2, recorded total exotic cover of 26% with dominant exotic species of *Ehrharta erecta, Pavonia hastata, Heliotropium* amplexicaule and Setaria *parviflora*. Total exotic cover at this site has remained relatively stable since 2015, with an average exotic cover from 2014-2023 of 46%. The year 2020 recorded 94% cover, which has steadily decreased since 2021.

At site A4, monitored at V6-B1, recorded 10% exotic cover with dominant exotic species of *Eragrostis curvula* and *Ehrharta erecta*, *Heliotropium amplexicaule*, *Lysimachia arvensis* occurring with lower cover. This is the highest exotic cover recorded at this site since monitoring began. From 2014-2023, this site had an average exotic plant cover of 1.05%. The increase in exotic plant cover at this site appears to be associated with an increase of *Eragrostis curvula* and *Ehrharta erecta*.

Exotic cover is very low or zero at the remaining sites and all these fell below the exotic cover limits.

Comparison of photo-monitoring sites between 2013 and 2024 monitoring show no major changes in vegetation over this time period. Drier conditions in 2023-2024, compared to wetter conditions during 2020 – 2022, are apparent in some photographs, but in general, no major changes in species composition or structure are apparent. Dry conditions were also observed and reported in previous years (2017-2019). These observations correspond to the floristic data collected within biometric plots with higher ground cover scores recorded across most PCTs during 2024.

1.1.10. Floristic monitoring discussion and recommendations

The majority of remnant woodland areas remain in good condition with high numbers of native species, few exotic species present and with low cover and abundance. No major issues were identified that require urgent management in RWEAs B-E. However, as reported in previous years, exotic species cover remains relatively high in RWEA A and continues to exceed performance criteria and VCA targets in certain locations. Continued weed management will be required to achieve performance criteria in these riparian and floodplain areas. In other areas within RWEA A, *Eragrostis curvula*, *Melinis repens* and *Bryophyllum* sp. continue to persist despite ongoing management efforts, and continuation of follow-up treatment is required.

The number of native species generally remained the same from the previous year and was relatively high in several PCTs. The 2023-2024 results appear consistent with previous findings that some lower scores for native species diversity recorded in recent years were a result of the dry conditions, with the increase in 2021 and 2022 in response to higher rainfall.

Several weed species listed under the Biosecurity Act 2015 were observed in these areas that have potential to become problematic in the wider region e.g. *Bryophyllum* sp., *Olea europaea* subsp. *cuspidata*, or have the potential to severely alter and degrade vegetation community composition e.g. *Melinis repens*, *Eragrostis curvula* and *Ehrharta erecta*. It is recommended to give priority to species such as these in the mine's weed control program. As discussed in previous monitoring reports, planting of canopy species should be considered in RWEA A, where natural regeneration is unlikely to occur in a reasonable timeframe (i.e. the open grassland areas of on the Wollombi Brook floodplain). Once established, these plantings may also reduce issues with exotic flora species in these areas.

The RWEA Conservation Agreement states that a fire management hazard reduction burn must be implemented between Years 1 – 10 of RWEA management. The high groundcover of shrubs, grasses and other within a number of communities in 2023-2024, following high rainfall in 2020-2022, indicates that a hazard reduction burn may be beneficial. The Conservation Agreement states that NSW Rural Fire Service or fire management contractor should be consulted to implement a hazard reduction burn. The Agreement also states that the burn must be conducted during a low-risk fire season, taking into account the recommended fire intervals given in *Bush Fire Environmental Assessment Code for New South Wales* (RFS 2021) and the guidelines contained in the *Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code* or equivalent replacements.

It is recommended that any planning on hazard reduction plans within RWEA A and Rail Loop takes a strong focus on reducing the spread and further establishment of *Melinis repens* and *Eragrostis curvula*.

1.2. Bird monitoring within RWEAs

1.2.1. Introduction

The bird monitoring program is a requirement of the current Development Consent conditions and has been designed in an effort to measure the performance of the WCPL RWEP. The consent conditions (DA 305-7-2003) specify that "Terrestrial fauna surveys should be conducted to monitor the usage of enhancement areas by vertebrate fauna. Monitoring may include fauna species diversity and abundance or, alternatively, the use of indicator species to measure the effectiveness of enhancement measures".

Methods, results (including a comparison with previous monitoring), and interpretation of results, are included below.

Data from previous year's bird surveys are limited to:

- RPS Australia East (RPS) 2009. Annual Ecological Monitoring Report. Remnant Woodland Enhancement Monitoring Program Riparian and Bed and Bank Stability Monitoring, Stoney Creek, South Wambo Creek and North Wambo Creek. Prepared for Wambo Coal Pty Limited
- Niche 2014b. EMP010 Monitoring 2014 – Indicator Species (birds). Prepared for Wambo Coal Pty Limited
- Eco Logical Australia (ELA) 2015-2023. Wambo Coal Mine Flora and Fauna Monitoring Reports Prepared for Wambo Coal Pty Ltd.

1.2.2. Methods

1.2.2.1. Bird monitoring surveys

Bird monitoring during Spring 2024 was consistent with the nine previous monitoring events in methods and general timing of surveys. During the survey, two observers spent 10 minutes recording birds seen and heard within 50 m radius (0.8 ha) of a central point, followed by an additional 10 minutes searching the balance of a 2-ha plot, and recording the total numbers of birds detected (seen and heard). One morning and one afternoon survey was conducted per site.

Thirty (30) bird monitoring sites (Figure 4) were surveyed by ELA Senior Ecologist Dan McKenzie and Alex Yates in September – October 2024. Twenty-six bird monitoring sites (BP01 – BP26) are located within RWEAs. The remaining four bird sites (BP27 - BP30) are used in monitoring the South Bates Extension Underground Mine area and are discussed in Section 5.

The total number of bird species recorded each year 2007-2024, average number of bird species per 20-minute bird survey, average number of birds per survey, bird density and the distribution and relative abundance of threatened species were examined. Broad comparisons between the bird species recorded in previous years and the current year were also made.

1.2.2.2. Targeted winter bird survey

Winter bird surveys targeting Swift Parrot and Regent Honeyeater are undertaken every second year. Winter bird surveys scheduled for 2022 could not be undertaken due to high rainfall creating inaccessible track conditions. To compensate, a winter bird survey was undertaken by ELA in June 2023. Winter surveys were again undertaken on 12 August 2024 by ELA Senior Ecologist Dan McKenzie and Alex Yates in accordance with the regular winter bird monitoring schedule. Future winter bird surveys will occur every second year with the next survey scheduled for 2026.

No fixed survey sites are used; however, the survey targeted areas of high-quality habitat, including any flowering Eucalypts, and sought to cover as much of the site as possible. A rapid call-playback method was used where the calls of the target species were broadcast over a loudspeaker for 2-5 minutes followed by 5-10 minutes of searching the vicinity of the playback site. All bird species observed or heard during the survey were recorded.

Figure 4: Bird monitoring locations and remnant woodland enhancement areas.

1.2.3. Results

1.2.3.1. Bird monitoring surveys

A total of 77 birds species from 26 monitoring sites were recorded during formal bird surveys of RWEAs in 2024. This result is 4 species less than the 2007-2023 average number of species of birds (Figure 5).

A total of 131 bird species have been recorded during timed bird surveys over the last seven years, with 77 of these recorded in 2024 within RWEAs.

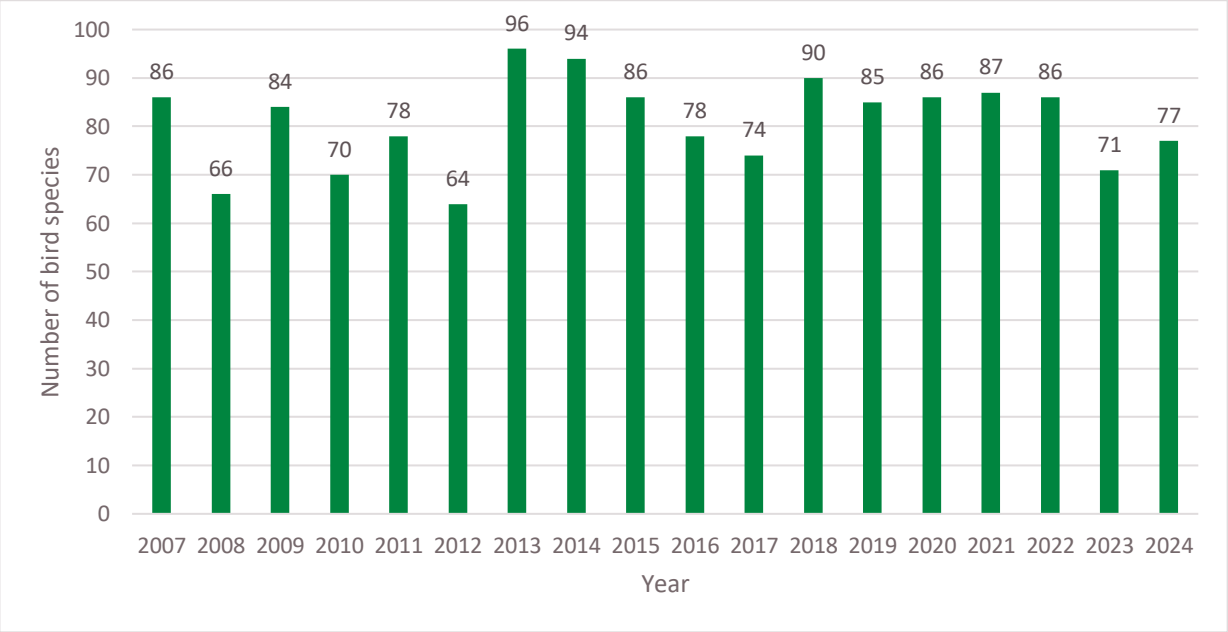


Figure 5: Number of bird species recorded at monitoring plots within RWEAs 2007 – 2024

In 2024, the average number of bird species per 20-minute bird survey (9.35) and bird species per site (14.61) was consistent with 2023 (±0.5). These numbers are similar to the lower limit of previous years within available data (2015 – 2022) (Figure 6; Figure 7). The year 2017 recorded two species higher than the 2023 and 2024 average number of bird species per monitoring site at 16.83, and 2009 recorded 17.87.

The average number of birds recorded per survey was 27.32 in 2024. This represents a decrease from 2023 (31 species), however, this number is within the range of previous years which range from 30 – 22 species (Figure 7). Numbers of birds were not presented in RPS (2009), and it is assumed only bird species richness was recorded.

Five sites recorded >20 species over the two surveys. The most species-rich site during 2024 was BP18 recording 22 species over the two surveys. The remaining four sites recorded 20-21 species (BP08, BP11, BP17, BP27). BP02 and BP29 recorded the lowest species richness at 9 and 7 species respectively.

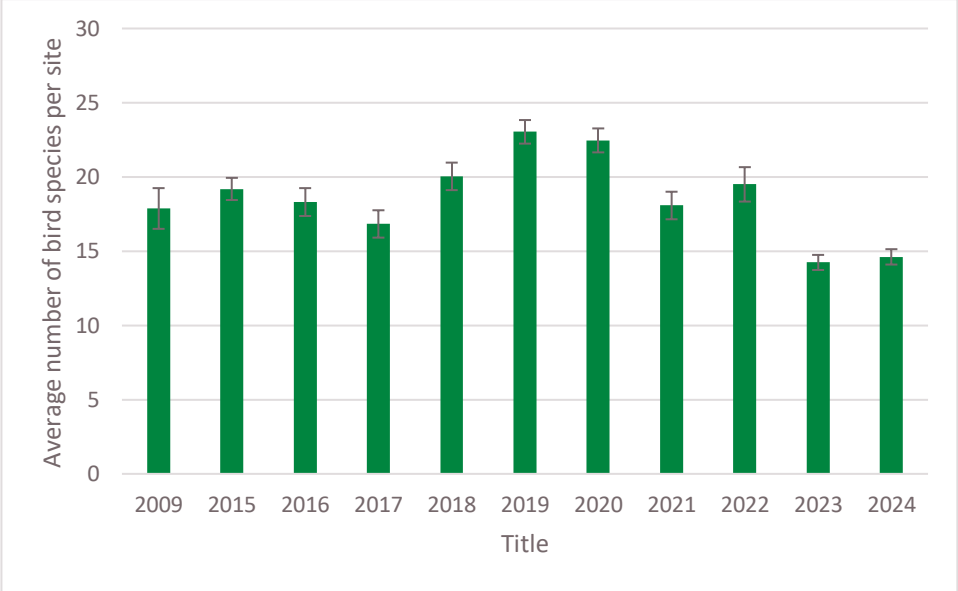


Figure 6: Average number of bird species recorded per monitoring site during 2009 and 2015-2023. Error bars represent the standard error of the mean.

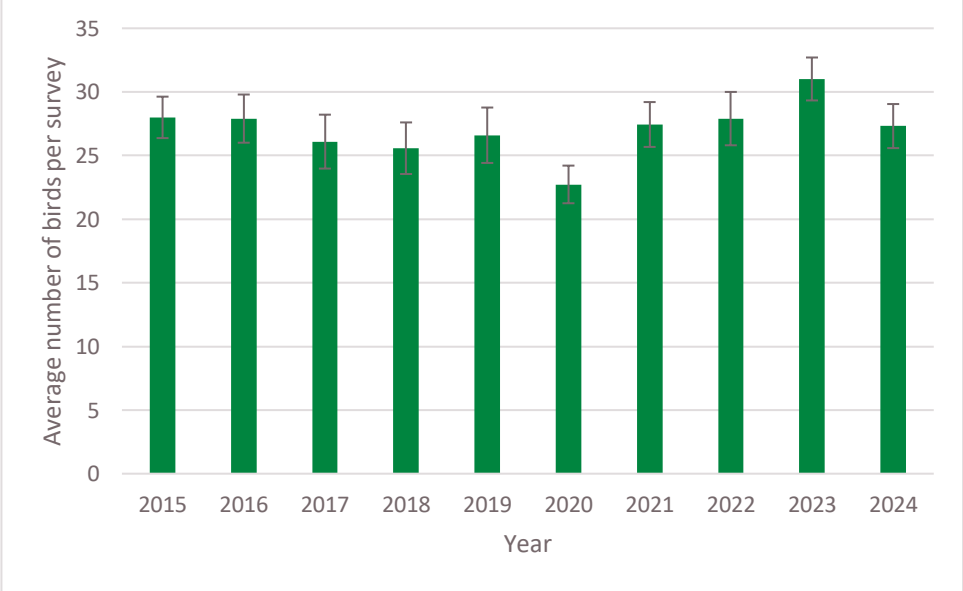


Figure 7: Average number of birds recorded per survey (2015-2023). Error bars represent the standard error of the mean.

Bird assemblages over time were not compared statistically, however, assemblages appear broadly similar to the previous seven years and also to data from 2009 monitoring. When comparing the 20 most widely recorded species from each year, the results from 2024 contain an average of 13.8 of the same species recorded in the top 20 from previous years. The most widely recorded species in 2024 were Rufous Whistler (*Pachycephala rufiventris*), Yellow-faced Honeyeater (*Caligavis chrysops*) and Superb Fairy-wren (*Malurus cyaneus*), all of which were also widely recorded in previous years.

Fire threatened species listed under the BC Act were recorded during 2024 (Table 13). These threatened species are part of a group that are regularly recorded during the monitoring surveys, with between five and eight threatened bird species annually recorded between 2014 to 2024.

Table 13: Number of individuals recorded of threatened species in 2024.

Common name	EPBC Act	BC Act	Bird monitoring site								
			07	08	09	12	15	19	22	25	28
Brown Treecreeper	V	V	4	-	-	-	-	-	-	-	-
Dusky Woodswallow	-	V	-		8	-	-	-	-	-	-
Grey-crowned Babbler	-	V	1	-	-	-	-	-	-	2	4
Speckled Warbler	-	V	-	-	-	1	1	5	-	-	-
Varied Sittella	-	V	-	4	-	-	-	-	9	-	-

Comparison of numbers of individuals of threatened species from 2015-2024, and number of sites they were recorded at from 2015-2024 was undertaken. The number of sites that threatened species were recorded at in 2024 was a slight decrease from 2023 but was overall consistent with results from 2022-2024. Number of individuals and number of sites was generally higher for all species pre-2022. The average number of individuals recorded between 2019-2021 was 6.5 higher than the number of individuals recorded between 2022-2024. The average number of sites where threatened species were recorded decreased by 1.8 sites when comparing averages between 2019-2021 and 2022-2024.

1.2.3.2. Targeted winter bird survey

No Swift Parrot or Regent Honeyeater were recorded during 2024 winter bird surveys.

1.2.4. Bird monitoring discussion

RWEA and other remnant woodland sites at WCPL continue to support a large diversity of bird species and no introduced bird species were detected within RWEA areas.

The average number of bird species per site was lower than the levels recorded in previous years. It is recommended to continue monitoring this statistic. However, average individual birds per survey was broadly consistent with previous year.

As vegetation and habitat attributes in RWEA areas have remained relatively stable over time (see previous section), variability in diversity and abundance between years is likely explained by a combination of factors such as varying numbers of nomadic and migratory bird species, weather and climate, sampling methods, differences in the skill of observers, the timing of surveys and surveys coinciding with the flowering of trees and also broader landscape scale and seasonal changes across the Hunter Valley. The total number of bird species detected each year has varied over time and the 77 species recorded during 2024 is within the range of previous years.

Threatened species appear to be persisting within the RWEAs, with Grey-crowned Babbler, Brown Treecreeper and Varied Sittella recorded in similar or greater numbers than the previous year.

1.3. Nest box monitoring

1.3.1. Introduction

In 2018, a total of 50 nest boxes were installed in five clusters within RWEAs B, C and D (Figure 8). The nest boxes were installed in response to recommendations made in the 2015 Independent Environmental Audit, however no recommendations regarding monitoring were made.

In 2019, ELA recommended the establishment of a nest box monitoring program to document the use and effectiveness of the nest boxes and ensure they are maintained in usable condition. The BMP now details that nest boxes are to be inspected every two years. In November 2020, initial nest box inspections occurred representing the first survey of the next boxes since their installation, with the second round of monitoring occurring in September 2022.

Three replacement nest boxes were installed in 2023 in response to damaged boxes identified in 2022 monitoring.

The 2024 monitoring is the third round of monitoring to occur within the RWEAs since the nest boxes were installed.

1.3.2. Methods

Nest box inspections were conducted by ELA ecologists Daniel McKenzie and Alex Yates in September 2024. Nest boxes were inspected using a GoPro Hero7 camera attached to an extendable fibreglass pole. The camera was connected and controlled via Bluetooth where the surveyor could take photographs and video.

Due to their open bottom design, microbat boxes were inspected visually from the ground using binoculars with the inside of the box illuminated by torchlight. Details of species presence, indications of usage, and any maintenance issues were recorded.

1.3.3. Results

Fourteen of the 50 nest boxes showed evidence of use, including four nest boxes that were occupied at the time of monitoring. Three boxes contained *Trichosurus vulpecula* (Brushtail Possum) and one bat box contained *Chalinolobus gouldii* (Gould's Wattled Bat).

All nest boxes were in good condition, including the three replacements boxes installed in 2023, and excluding Box 11 which had no lid. Despite this, this box was occupied by Brushtail Possum. One nest box (Box 16) could not be relocated in the field, likely due to inaccuracies of GPS co-ordinates in heavily vegetated areas. Nest box monitoring results are provided in Table 14.

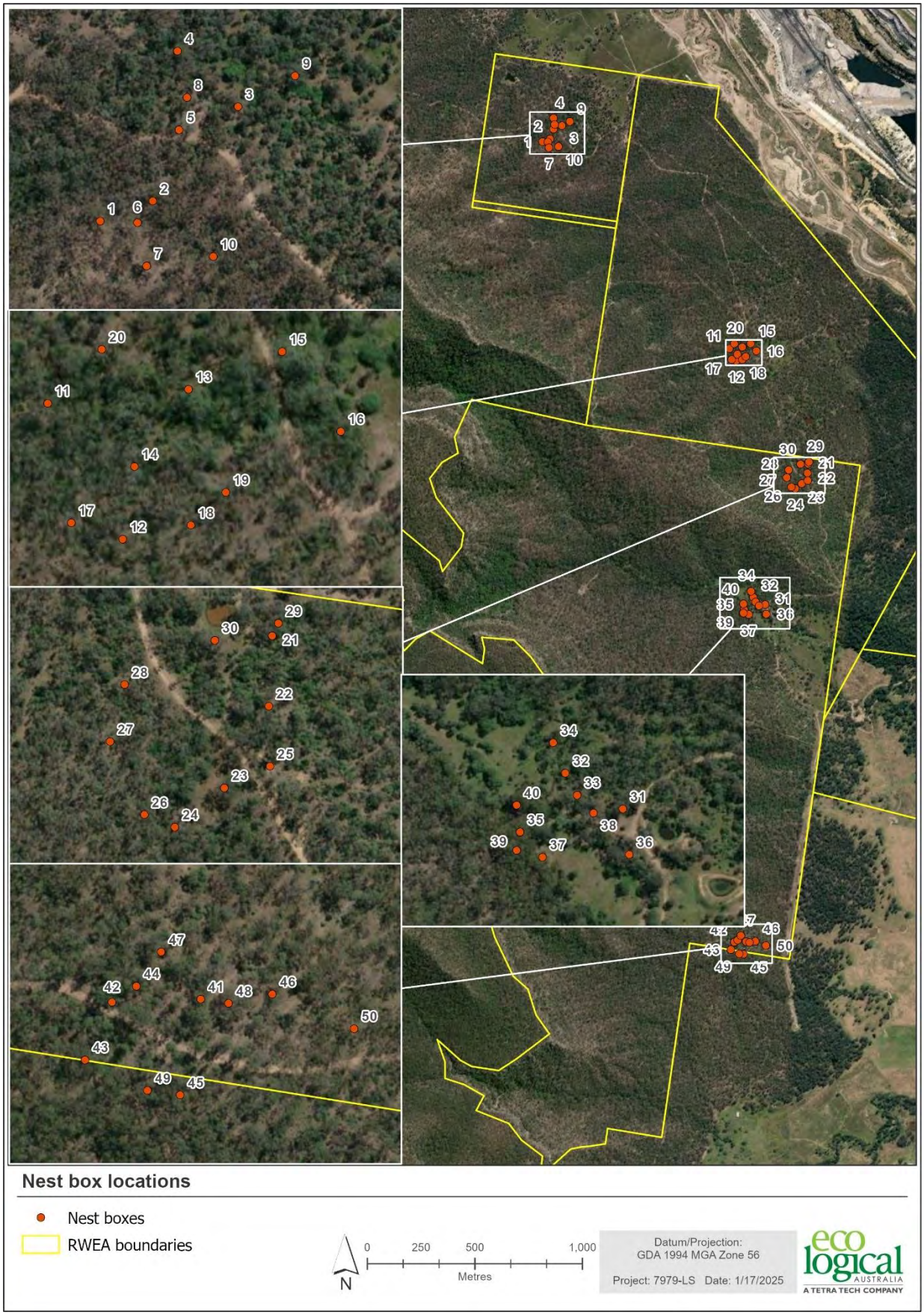


Figure 8: Nest box locations

Table 14: Results of nest box monitoring in 2024

Nest box ID	Nest box condition	Evidence of use? (excluding invertebrates)	Box condition and field observation notes
1	Good	Yes	Leaves in base
2	Good	Yes	Chewed around entrance
3	Good	Yes	Leaves at base. Heavily chewed entrance
4	Good	Yes	Fresh leaf nest at base
5	Good	--	--
6	Good	--	Faded from sun
7	Good	Yes	Signs of previous use. Fur around entrance/scratches on tree
8	Good	Yes - currently occupied	1x Trichosurus vulpecula (Brushtail Possum)
9	Good	Yes	Fresh leaves and chewed entrance
10	Good	--	--
11	Poor	Yes - currently occupied	1x Trichosurus vulpecula (Brushtail Possum), Lid on ground
12	Good	--	--
13	Good	--	--
14	Good	--	--
15	Good	--	Mud wasp nest
16	Could not relocate	--	--
17	Good	--	--
18	Good	--	Insect nest inside
19	Good	--	--
20	Good	--	--
21	Good	Yes	Entrance slightly chewed
22	Good	--	Filled with spider webs
23	Good	--	--
24	Good	Yes	Chewing around entrance and on inside
25	Good	--	Spider webs inside

Nest box ID	Nest box condition	Evidence of use? (excluding invertebrates)	Box condition and field observation notes
26	Good	Yes	Chewing
27	Good	Yes	Chewing and fresh leaves at base
28	Good	--	--
29	Good	Yes - currently occupied	1x Trichosurus vulpecula (Brushtail Possum)
30	Good	--	--
31	Good	--	Faces west
32	Good	--	--
33	Good	--	Spider webs inside
34	Good	Yes	Leaf nest - possibly feathertail glider or phascogale?
35	Good	Yes	chewing around entrance, scratches on bark, grey gum
36	Good	Yes	Contains old leaves and old mud wasp nest
37	Good	--	Spider/grub silk covering inside of box at top
38	Good	--	Cobwebs
39	Good	--	--
40	Good	--	--
41	Good	Yes - currently occupied	1x Chalinolobus gouldii (Gould's Wattled Bat)
42	Good	--	Unidentified Spider
43	Good	--	Small mud wasp nest
44	Good	--	--
45	Good	--	Mud wasp nests at base
46	Good	--	Ant nest inside box
47	Good	--	--
48	Good	--	--
49	Good	--	Old mud wasp nest at base
50	Good	Yes	Chewing on entrance

2. Riparian condition assessment

2.1. Introduction

The riparian monitoring program is a requirement of the 2004 Development Consent conditions. The objective of the monitoring program is to evaluate how the riparian environment is responding to management initiatives (such as cattle exclusion) and document any impacts arising from mine subsidence.

North Wambo Creek drains the mid and eastern sections of the North Wambo Underground Mine development area and flows south-east into Wollombi Brook, approximately 600 m south of the mine (Figure 9). North Wambo Creek has been highly disturbed both by historic and present grazing activities and by the NWCD. The North Wambo Creek diversion channels the creek around the open-cut mining operation, flowing downstream into Wollombi Brook.

Stony Creek drains from Mount Wambo in a north-east direction and meanders across the western boundary of coal lease (CL) 397 near the south-western boundary of the North Wambo Underground Mine and passes in a south-easterly direction through the existing underground development area of WCPL to join Wambo Creek. Wambo Creek then runs east to join Wollombi Brook. Much of the riparian zone along Wambo Creek has been disturbed by historic agricultural activities.

2.2. Methods

Field sampling for the riparian monitoring was undertaken in September and October 2023. The *Rapid Appraisal of Riparian Condition* method (RARC), developed by Jansen et. al. (2005) and used during the 2016 to 2020 monitoring, was utilised during the 2023 survey period. Using this method, an overall score is obtained at each monitoring site by examining the width of riparian vegetation, proximity to large patches of native vegetation, vegetation cover, debris (leaf litter, standing dead trees and fallen logs) and other features (native canopy and understory regeneration, tussock grasses and reeds on creek banks). Areas monitored were:

- North Wambo Creek
- (South) Wambo Creek
- Stony Creek.

Methods followed Jansen et. al. (2005) with four 40 m long cross-section transects sampled at each monitoring site (an approximate 500 m length of riparian zone). Three monitoring sites were measured along each creek. The location of monitoring sites and transects is illustrated in Figure 9 with photographs presented in Volume 2.

The three creeks and sample sites were compared in regard to the following sub-indices:

- *Habitat* - longitudinal continuity of canopy vegetation (> 5 m wide); width of riparian canopy vegetation; and proximity to nearest patch of native vegetation > 10 ha
- *Cover* - vegetation cover and structural complexity
- *Native* - dominance of native species versus exotic species
- *Debris* - leaf litter; standing dead trees; hollow-bearing trees; and fallen logs
- *Features* - other indicative features such as regeneration, presence of large native tussock grasses (e.g. *Austrostipa* spp.) and reeds.

The five sub-indices were assessed across the three separate reaches of each creek and were combined to create a Total Score. Site photos and scores from previous monitoring reports (ELA 2016-2021) were compared. Although not directly comparable due to differing site locations and methodologies, data and photos from Niche (2014d) and RPS (2009) were also reviewed.

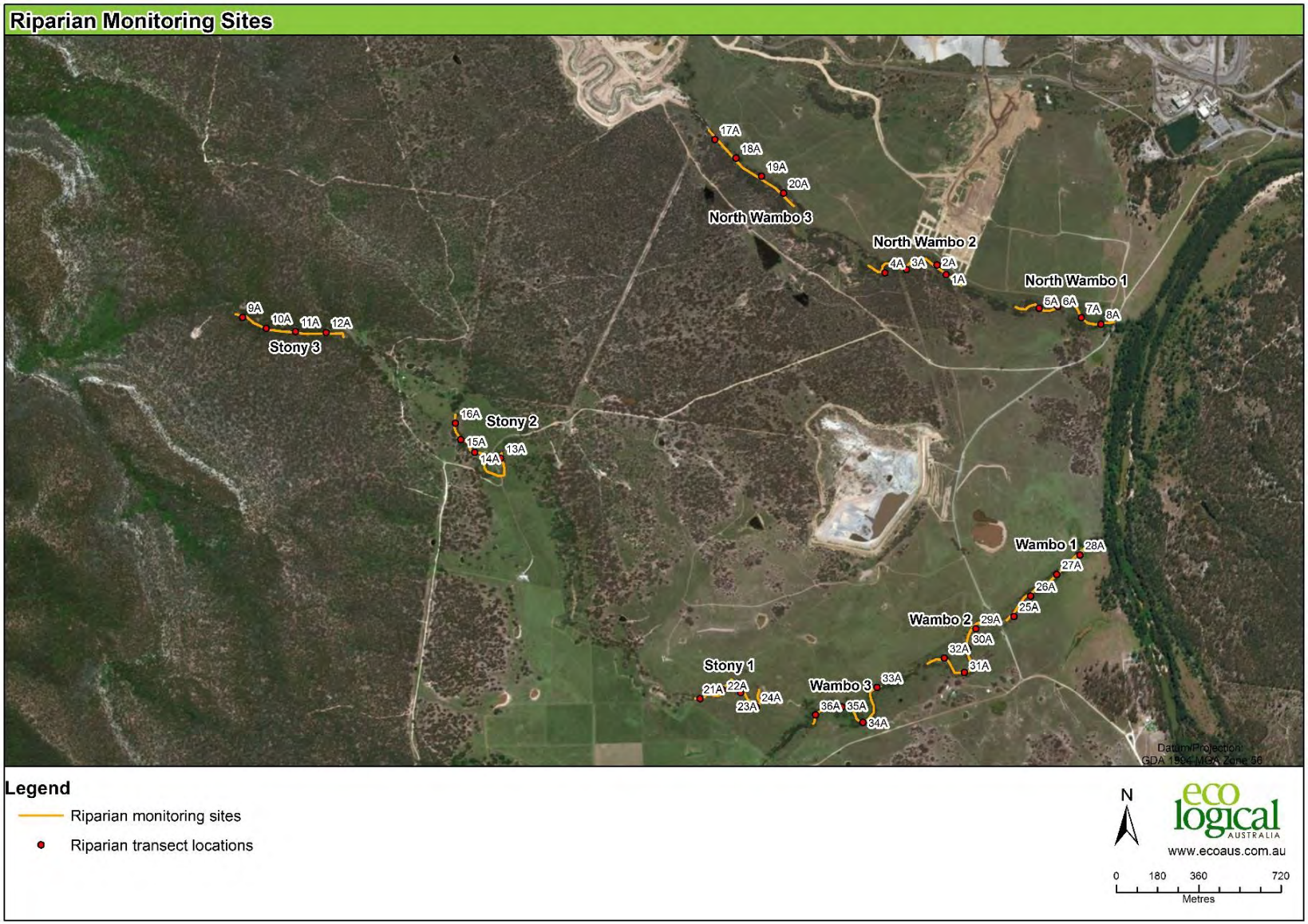


Figure 9: Location of riparian monitoring cross-sections and transects

2.3. Results

The results of the riparian condition monitoring are presented below, with raw data included in Volume 2.

The average total score for Stony Creek, North Wambo Creek and South Wambo were the highest recorded results compared to all years of data. North Wambo Creek and South Wambo Creek recorded an increase in the average total score compared to 2023. Stony Creek recorded decrease in the average total score compared to 2023, however it returned back to levels consistent with 2020-2022 (Figure 10).

South Wambo Creek remains the lowest scoring creek system based on the sub-indices measured, however has increased since 2022.

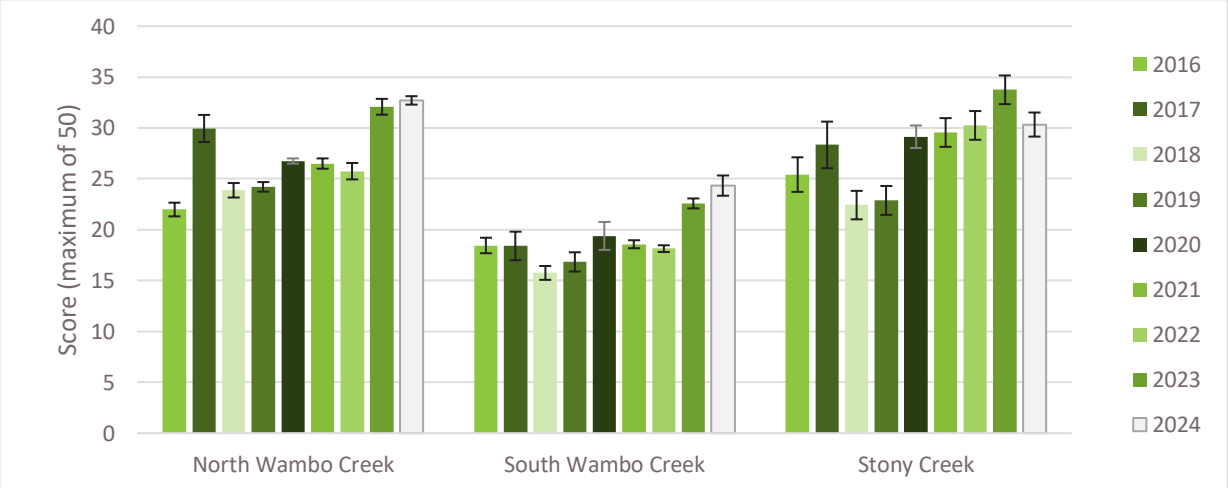


Figure 10: Average "Total Score" for North Wambo Creek, South Wambo Creek, and Stony Creek, from surveys in 2016 - 2024. Error bars represent the standard error of the mean.

2.3.1. North Wambo Creek

North Wambo Creek recorded higher scores for all sub-indices to previous years, consistent with 2023 results. This site has acceptable scores for habitat, cover and debris. There were no obvious signs of feral pigs at monitoring sites. Erosion control measures were observed to have been undertaken along North Wambo Creek in 2023, outside of monitoring sites.

2.3.2. South Wambo Creek

South Wambo Creek has consistently been the lowest scoring site. However, results from 2023 and 2024 were higher than 2016-2022.

The natives scores decreased slightly in 2024 at site 1 and 2, with a slight increase at site 3. Debris and features increased at all sites in 2024 compared to 2023.

Feral pigs and evidence of digging was observed within South Wambo Creek in 2024. Pig disturbance reduces the ground cover, regeneration, and destabilises the soils leaving these areas more prone to erosion, which may be attributable to the low scoring at South Wambo Creek in previous years.

No evidence of recent cattle grazing was recorded in this area. Grazing pressure reduces the ground cover and destabilises the soils leaving these areas more prone to erosion. In previous years cattle grazing had impacted riparian condition scores along South Wambo Creek.

Photograph 17: Location of pigs recorded and evidence of pigs at South Wambo Creek Site 35 in 2024.

2.3.3. Stony Creek

Stony Creek recorded minor decreases across most sub-indices excluding habitat features which increased slightly (average increase of 0.42) across the three monitoring locations.

The habitat score remained the same as in 2019-2023. The habitat score is controlled by features which change over longer periods of time such as canopy connectivity and proximity to large patches of native vegetation and has always remained at the maximum score at Stony Creek 3 where the site is within high condition native vegetation.

There remains large variability in the habitat sub-index between longitudinal transects at Stony Creek, which reflects the differences in vegetation and habitat features between the cleared lower reaches at Stony Creek 1 (Photograph 18) and the heavily forested upper reaches observed at Stony Creek 3 (Photograph 19).

It is unclear whether cattle have been excluded from the lower reaches of Stony Creek at Stony Creek 1. No evidence of recent cattle grazing was recorded. However, there was no fencing that would prevent cattle accessing the riparian area. In previous years cattle grazing had impacted riparian condition scores along lower reaches of Stony Creek.

Photograph 18: Stony Creek 1 predominately cleared vegetation (23a)

Photograph 19: Stony Creek 3 heavily forested vegetation (11a)

2.3.4. General observations

Overall scores at all creeks were similar to previous years and conditions were similar to 2021-2023, which had both received higher rainfall than previous years. Higher ground cover, containing a mix of native and exotic species remains present. The change in ground cover from 2019 to 2024 can be seen in Photograph 23 - Photograph 24.

No evidence of recent subsidence impacts was observed at North Wambo Creek, South Wambo Creek, or Stony Creek during the 2024 riparian condition survey.

Site scores from available past monitoring reports (Niche (2014) and RPS (2009)) show similar results for Stony Creek (particularly the upper reaches) being regarded as in good condition, North Wambo Creek as being either in good or moderate condition and South Wambo Creek being in moderate condition. General comparison of riparian area photos from 2024 with those from 2014 show that the riparian vegetation remains similar, with seasonal variation in ground cover in response to rainfall the most obvious change over time. Photo monitoring for the riparian creek assessment is provided in Section 5 of Volume 2.

Photograph 20: Transect 14 at Stony Creek 2 in 2019 showing drought impacted ground cover

Photograph 21: Transect 14 at Stony Creek 2 in 2021 showing high ground cover following higher rainfall

Photograph 22: Transect 14 at Stony Creek 2 in 2022 showing higher ground cover following higher rainfall in 2021 and 2022

Photograph 23: Transect 14 at Stony Creek 2 in 2023 showing high ground cover including exotic *Tagetes minuta* following dry conditions in 2023

Photograph 24: Transect 14 at Stony Creek 2 in 2024 showing a reduction of *Tagetes minuta*

2.4. Riparian condition conclusions and recommendations

Similar scores to the previous year for all creeks reflect the relatively stable climate conditions in 2024, following wetter conditions in 2020-2023, drought conditions from 2017-2019 and the reduction/exclusion of grazing from the riparian areas. Understorey vegetation cover remains high following higher rainfall in 2020-2023, although a high proportion of ground cover contribution is from exotic species.

Sub-indices relating to more permanent features such as habitat connectivity, tree canopy and logs and hollows remained similar.

Exclusion of cattle from riparian areas has been recommended in previous monitoring reports and no evidence of cattle grazing was recorded in 2024. Cattle should continue to be excluded from riparian areas to encourage tree regeneration and prevent erosion. Evidence of pigs were recorded at one location at Stony Creek. Pig activity in the creek lines may reduce tree regeneration, promote erosion and spread exotic plant species. There is an active pig control program at Wambo Coal Mine and this area should be considered for targeted pig management.

Plantings of trees in over-cleared riparian areas (that are unlikely to regenerate naturally even with cattle exclusion) will also be beneficial to riparian area and the surrounding environment.

3. North Wambo Creek Diversion

3.1. Introduction

North Wambo Creek Diversion (NWCD) vegetation establishment monitoring has previously been undertaken using the Landscape Function Analysis (LFA) methodology. In 2023, a new method replaced LFA to monitor vegetation establishment of the NWCD.

The rehabilitation objectives for the NWCD include:

- To establish pasture species consistent with the revegetation strategy
- Tree species established along creek lines consistent with the riparian zone
- Creek diversion stable and will not present a greater safety hazard than surrounding land
- Creek diversion able to shed water safely without causing excessive erosion, jeopardising landform integrity or increasing pollution of downstream watercourses
- All watercourses subject to subsidence impacts shall be hydraulically and geomorphologically stable, with riparian vegetation established that is the same or better than prior to commencement of mining.

Additional completion criteria for these rehabilitation areas are listed in the Mining Operations Plan (WCPL, 2015) and include ensuring that:

- Minimum 70% of area has a vegetative cover
- No single bare area >20m2
- Biometric monitoring confirms exotic cover <33%
- No tunnel or gully erosion is to be present
- Rill erosion is to be limited to <200 mm deep and/or <200 mm wide.

3.2. Methods

3.2.1. Vegetation establishment monitoring

Field sampling for the North Wambo Creek Diversion monitoring was undertaken in October 2023. The BMP outlines the method for monitoring vegetation establishment which requires approximately 60-90 1x1m^2 quadrats (three per zone across 20-30 zones).

Within each quadrat, the following data was collected in accordance with the BMP:

- Soil surface stability and potential for water infiltration including areas of potentially serious erosion.
- Soil fertility / plant health
- Native plant cover
- Native plant abundance (approximate count of individuals in ground, shrub and tree layers)
- Native species diversity
- Total soil surface cover (rocks, bare ground, organic litter and coarse woody debris)
- Threatening weed cover (only measuring exotic plant species which pose a threat to local biodiversity)
- The vegetation establishment monitoring results are compiled and used to rank the sites as ‘good’, ‘poor’, or ‘failing’.

At the time of surveying, large areas in the northern area of the NWCD had been reshaped, with revegetation actions not yet taken place, and these areas were excluded from monitoring.

Table 15: Vegetation establishment criterion and measurement

Criterion	Measurement
Soil surface stability and potential for water infiltration including areas of potentially serious erosion.	• High = no erosion evident, soil surface cover of 100% (including Rocks, coarse woody debris, perennial plants). Well-developed organic litter layer with evidence of decomposition • Medium = erosion limited to minor sheet erosion. Soil surface has >80% cover on slopes or >50% cover on flat ground. Perennial grasses, sedges and/or cryptogams (mosses, lichens) present, ground is rough with elevations/depressions of >1cm. Evidence of organic matter layer. Minor crusting • Low = erosion is active (check for deposited material, small rills). <80% total cover on slopes and 25-50% cover on flat ground. Soil heavily crusted or compacted. • Poor = active erosion, with active rills. <50% soil surface cover. Soil crusted or compacted. • Extremely poor = active erosion with many or large active rills, gullies or tunnelling. <10% soil cover
Soil fertility/plant health	• Good = All plants appear healthy • Poor = Plants show signs of stress and/or nutrient deficiencies (e.g.: stunting, discoloration, reduced leaf area)
Native plant cover	• High = >75% • Medium = 25-75% • Low = <25% • Absent = no native plant cover
Native plant abundance in Ground, Shrub and Tree layers	Ground layer abundance: • <5 individuals • 5-20 individuals • >20 individuals • Presence of shrubs • Presence of trees
Native species diversity	Record all native species observed on the site
Total soil surface cover (rocks, bare ground, organic litter and coarse woody debris)	• High = >90%cover • Medium= 50-90% cover • Low = 10-50% cover • Bare = soil surface is entirely bare
Threatening weed cover – only measuring exotic plant species which pose a threat to local biodiversity.	• High = >50% cover • Medium = 10-50% • Low = <10% • Absent = no threatening weeds present

3.2.2. Floristic monitoring

Floristic monitoring is undertaken using the BioMetric plots as described in Section 2. Two new sites were established within the NWCD in 2020 (Figure 2).

Floristic monitoring targets for the NWCD have been derived from the NWCD Revegetation Management Plan (Cumberland Plains Seeds 2019) and are based on a combination of Benchmark Values for River Red Gum/ River Oak riparian woodland wetland in the Hunter Valley and Narrow-leaved

Ironbark– Grey Box – spotted gum shrub grass open forest of the central and lower hunter. The exotic plant cover target has been modified to match the performance criteria for the NWCD from the Wambo Mining Operation Plan (WCPL 2015).

3.3. Results

3.3.1. Vegetation establishment monitoring

Twenty-five condition zones were identified along the North Wambo Creek Diversion across 69.65 ha (Figure 11; Figure 12; Figure 13). Locations of vegetation zones are shown in Figure 11 and Figure 13. Three plots were assessed within each zone, with a total of 75 plots surveyed across all zones.

Three zones were assessed to be in good condition (6.78 ha). The majority of the zones (13 zones; 27.17 ha) were assessed to be in moderate condition with reestablishment of vegetation cover, and two zones were moderate-good (8.37 ha). Six zones were regarded as low condition (18.35 ha) and one zone (5.72 ha) was considered to be failing to reestablish vegetation (Photograph 25 - Photograph 28).

Overall, results for 2024 were broadly similar to 2023, with most zones have a high cover of exotic grasses particularly *Chloris gayana* (Rhodes Grass) and *Setaria sphacelata* (African Pigeon grass), with a lower proportion of native grasses and forbs. The midstorey is variable across the site but is typically dominated by *Acacia* shrubs and young *Eucalyptus* trees scattered in some areas.

Cover of threatening weeds was generally low. Rhodes Grass, African Pigeon grass and *Cynodon dactylon* (Couch) were not considered to be threatening weeds due to their role in providing soil stabilisation during early phases of reestablishment.

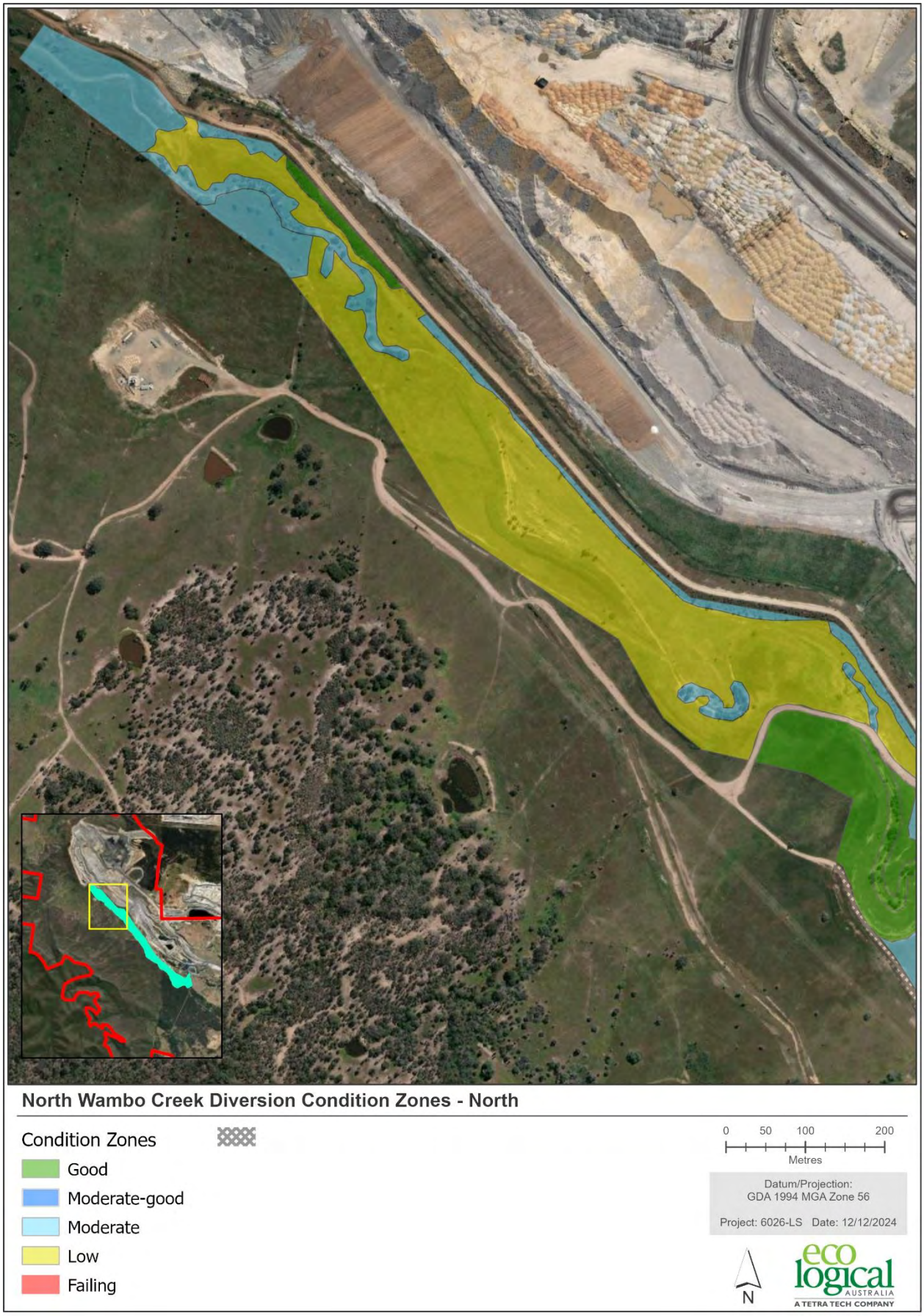


Figure 11: North Wambo Creek Diversion Condition Zones (North)

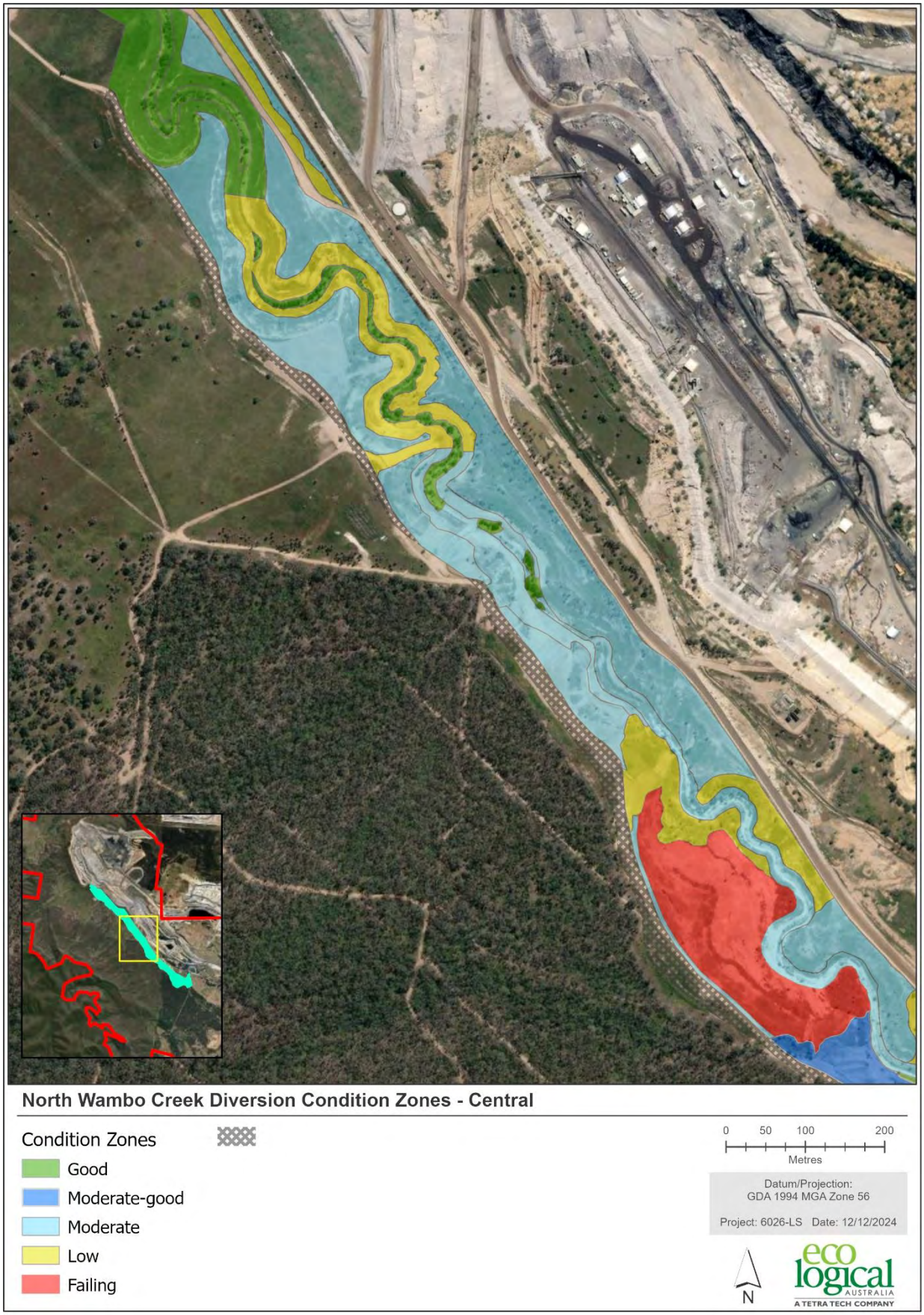


Figure 12: North Wambo Creek Diversion Condition Zones (Central)

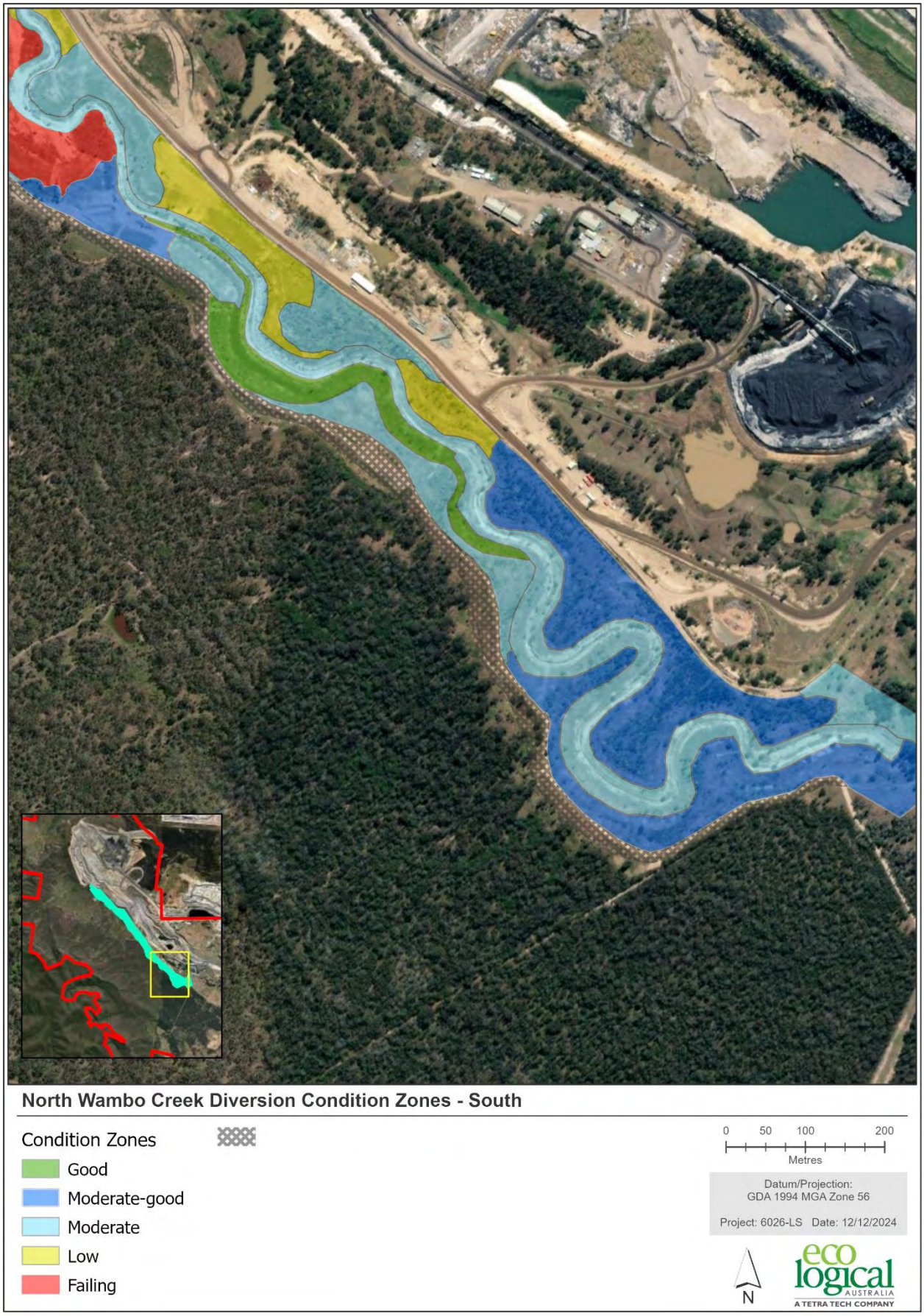


Figure 13: North Wambo Creek Diversion Condition Zones (South)

Photograph 25: High amount of native vegetation establishment assessed as “good” in 2024

Photograph 26: High amount of native vegetation establishment assessed as “good” in 2024

Photograph 27: Low amount of vegetation establishment assessed as “failing” in 2023

Photograph 28: Low amount of vegetation establishment assessed as "failing" in 2024

3.3.2. Floristic monitoring

Two floristic monitoring sites were established within the NWCD area in 2020 (Figure 2; Photograph 32; Photograph 37). Results of the 2020-2024 floristic monitoring are presented in Table 16.

Results in relation to the performance criteria were mixed. NGCG met the performance criteria target and overstorey regeneration (OR) was recorded at both sites.

Native species richness has decreased since 2021, however, was similar to 2020 levels and the target has not been reached. EPC was above the target, at the third highest level to date out of five monitoring events, however appears to be decreasing since 2022 which recorded the highest EPC.

Interrogation of floristic plot data suggests a significant proportion of the EPC is attributable to annual species such as *Lysimachia arvensis* (Scarlet Pimpernel), *Chloris gayana* (Rhodes grass) and *Setaria* spp. which is a similar result to 2022 monitoring. This is not an unexpected result, as the rehabilitation is still in early stages, and it is expected that exotic groundcover will decrease as shrub and tree cover develops. NOS and NMS targets were not met however these are likely to take longer to reach for these rehabilitation areas (e.g. 5-10 years).

These results represent the fifth floristic monitoring undertaken within the NWCD since the sites were established in 2020. Ongoing monitoring will provide further insights into the vegetation condition

and trajectory. Inclusion of additional monitoring sites and methods is likely to assist assessment of the vegetation condition and performance.

Table 16: Biometric scores for NWCD moniotring sites and performance criteria

PCT	Plot Name	NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	HBT	FL
Target: PCT 42: River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	NWCD1	11	0	2	60	0	0	85	0	1	75
	NWCD2	21	0	0	80	0	0	65	0	1	2
Average 2020		14.5	0	0	26	0	3	50	1	0	35
Average 2021		19	0.25	0.4	34.6	0.05	0.15	28.65	1	0	38.5
Average 2022		14	0	0	62	0	0	88	1	0	38.5
Average 2023		17.5	0	1	60	0	0	80	1	0	38.5
Average 2024		16	0	1	70	0	0	75	1	0	38.5
Performance criteria		>20	10-50	10-50	20-60	1-5	5-30	<33	1	-	-

It is important to note that significant soil remediation works have been undertaken at the NWCD from 2020-2024 and vegetation establishment is relatively young, with rehabilitation considered to be ongoing.

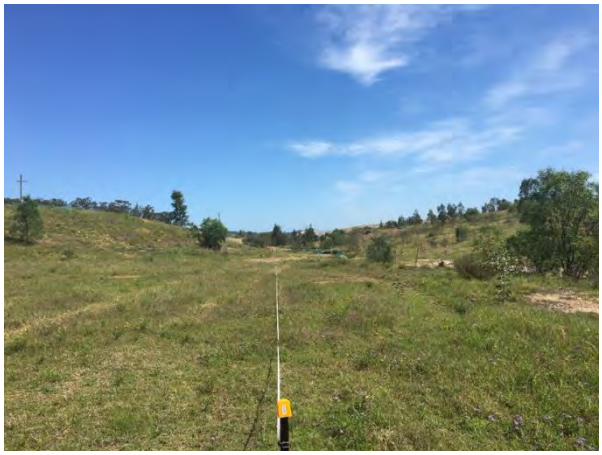
Photograph 29: NWCD1 in 2020

Photograph 30: NWCD1 in 2021

Photograph 31: NWCD1 in 2022

Photograph 32: NWCD1 in 2023

Photograph 33: NWCD1 in 2024 showing increased tree height and exotic groundcover persisting



Photograph 34: NWDC2 in 2020

Photograph 35: NWCD2 in 2021

Photograph 36: NWCD2 in 2022

Photograph 37: NWCD2 in 2023

Photograph 38: NWCD2 in 2024 showing *Calotis* lappulacea in the foreground

3.4. Conclusion and recommendations

3.4.1. Vegetation establishment monitoring

Overall, vegetation within the North Wambo Creek Diversion is in the early stages of reestablishment with high grass cover (mostly exotic grass species) and young shrubs and trees. One vegetation establishment area was identified to have "failed" in reestablishing vegetation, and remediation of this area is recommended in consultation with the appropriate, suitably qualified environmental engineering and land management contractors. Further monitoring is required for zones assessed as "low" condition, as they may improve over time, negating the need for management intervention. Zones assessed as "moderate" and "good" condition appear to be on a satisfactory trajectory and are expected to improve naturally as the vegetation matures over time.

As this method is based on assessment of three 1x1 m plots across large areas, there are limitations in the data that is collected. It is likely that the relatively small plots may not capture the extent of the conditions in each zone. However, the method is useful in providing documentation of the site walkover, identifying threatening weeds, areas of erosion and identifying zones that clearly require management intervention.

3.4.2. Floristic monitoring

Floristic monitoring resampled the two plots established in 2020 for the fifth time. Sites met targets for native ground cover of grasses and are showing good signs of native species diversity. Sites did not meet targets for shrub and canopy cover; however, these are expected to take longer to achieve. The sites also had high exotic plant cover which is not unexpected due to the high light environment of the early-stage rehabilitation, and high rainfall has likely favoured exotic grasses which have outcompeted native species.

Refinement of floristic monitoring plot locations and target values within the NWCD may be appropriate following additional remediation and revegetation works planned during 2020-2025 under the NWCD Management Plan (WCPL 2020). The original intention of the NWCD was to establish riparian vegetation, however analysis of soils and water flows has indicated that a combination of woodland and riparian vegetation is more appropriate (WCPL 2020). Additional monitoring to assist in identifying success or issues with early-stage revegetation was recommended in the NWCD Revegetation Management Plan (Cumberland Plains Seeds 2019). This monitoring was undertaken by Cumberland Plains Seeds in 2021 and is reported separately in the NWCD Monitoring Report (Cumberland plains Seeds 2021).

Additional floristic monitoring sites are likely to be required to fully characterise the vegetation performance along the NWCD. Floristic monitoring sites should be established across the full range of revegetation domains, i.e. if the final revegetation plan includes multiple target communities such as woodland, riparian areas and pasture. In areas of newly established revegetation additional monitoring methods may also assist in assessing success and provide data to guide future works, if required. This early-stage monitoring should be undertaken using the tailored vegetation establishment monitoring methods (Cumberland Plains Seeds 2020), before transitioning to BioMetric plot monitoring once vegetation has established.

4. South Bates Extension Underground Mine area

4.1. Floristic monitoring

4.1.1. Introduction

Floristic monitoring of the South Bates Extension underground mine area was added to the annual biodiversity monitoring program in 2020 and was continued in 2024. The purpose of this monitoring is to measure the current condition of vegetation in terms of floristics and habitat complexity and identify whether any adverse impacts from undermining are occurring through comparison with previous years (2020 - 2023). The results aim to provide direction for the management of these areas and to inform future monitoring programs.

4.1.2. Methods

Floristic monitoring is undertaken using the BioMetric plots as described in Section 2. The monitoring was undertaken by ELA ecologists Liam Scanlan and Mel Thurtell in September 2024.

Four new sites were established in 2020 to sample the two dominant PCTs in the South Bates Extension area (Table 17).

Data from two existing monitoring plots that are also within the South Bates Extension area were also used for analysis. Of the new sites, two were established outside of the approved mining area and are intended as reference sites. In 2023, three planned longwalls were re-orientated, resulting in the PCT 1603 reference site (SBX4-GB-C) now falling within an area that is planned to be undermined in the future (Figure 14). The reference site for PCT 1176 (SBX3-SG-C) will not be undermined in the future.

A summary of the monitoring sites is presented in Table 17 and site locations are shown on Figure 14.

Performance targets for the same communities within the RWEP areas have been adopted as an indication of good condition vegetation for reference. Reference sites outside of the approved mining area are used as a comparison for assessing seasonal variation factors.

Table 17: Floristic monitoring sites for the South Bates Extension Underground Mine

Plant Community Type (PCT)	TEC	Plot name	Type	Site age
PCT 1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	Listed BC Act, E: Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions, may also be listed as CE under the EPBC Act as Central Hunter Valley eucalypt forest and woodland, dependant on condition and landscape position	SBX2-GB-I	Impact	4 years
		SBX4-GB-C	Reference	4 years
PCT 1176: Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Listed BC Act, V: Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion, may also be listed as CE under the EPBC Act as Central Hunter Valley eucalypt forest and woodland, dependant on condition and landscape position	V10-A1	Impact	Existing
		V10-A2	Impact	Existing
		SBX1-SG-I	Impact	4 years
		SBX3-SG-C	Reference	4 years

Figure 14: Monitoring sites in the South Bates underground mining area

4.1.3. Results and discussion

Floristic data from sites within the South Bates Extension Underground Mine area indicate the vegetation and habitat features are overall, in a good, stable condition with most attributes meeting the performance criteria (Table 19).

Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest is represented by one reference and one impact plot (SBX2-GB-I and SBX4-GB-C). This impact plot was undermined in 2023, therefore this is the first monitoring period that it is considered to potentially show adverse impacts from undermining. All indices were within the performance criteria values for this community. NOS and NMS has shown some fluctuation since monitoring began however this is likely to represent natural variation within the community and is generally consistent between the impact and control plots.

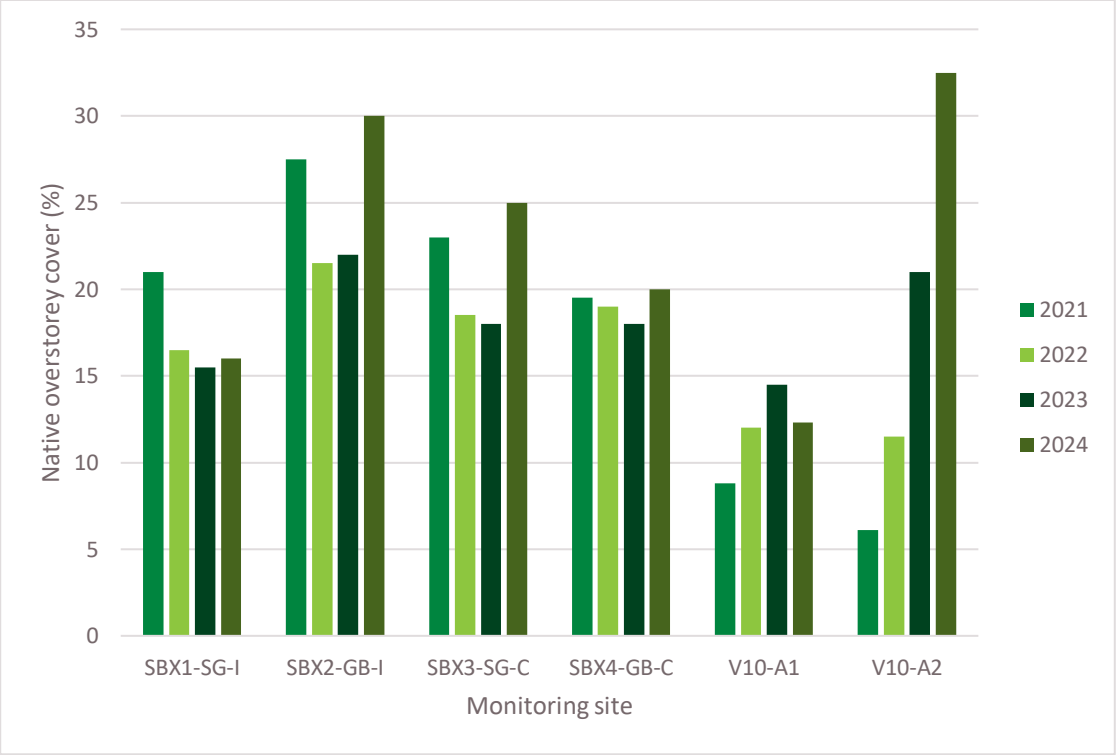


Figure 15: Native overstorey cover recorded for sites in the South Bates Extension underground mine area

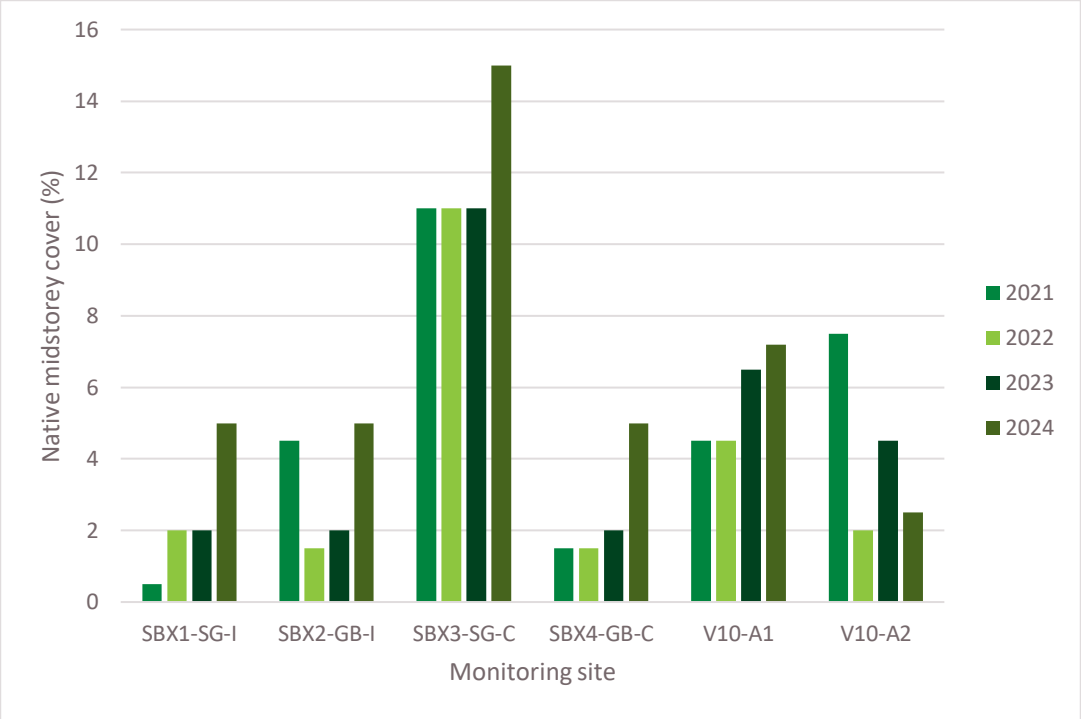


Figure 16: Native midstorey cover recorded for sites in the South Bates Extension underground mine area

Of the four sites within the Slaty Box - Grey Gum shrubby woodland, three (V10-A1, V10-A2 and SBX1-SG-I) have been undermined and one (SBX3-SG-C) acting as a current reference site.

NOS was below performance criteria at V10-A1 which was 2.7% cover below the lower end of the performance criteria range (Table 18). NMS was 2.5% cover below the lower end of the performance range at V10-A2 and 2% cover below the range for NGCO (Table 18).

NMS results for 2024 are overall consistent with previous monitoring results (Figure 15; Figure 16). Two sites were slightly below performance criteria for 1-2 indices, however, when compared to previous years, this relatively low amount of fluctuation is considered to be within the range of natural variation in response to environmental conditions.

4.1.4. Conclusions and recommendations

Floristic monitoring results for vegetation communities within the South Bates Extension underground reveal vegetation is in good condition, generally meeting performance targets. No evidence of mine subsidence impacting native vegetation condition were detected. Relatively minor changes since 2022 are likely related to rainfall levels in 2021 and 2022 and are expected to show some level of fluctuation in future conditions of higher or lower rainfall.

It is recommended monitoring continue in this area, including the use of reference sites to allow comparison including impacts of seasonal variation.

As the single existing control site for PCT 1603 - Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest is now planned to be undermined (SBX4-GB-C) it is recommended that a new floristic monitoring site is established in 2025, outside of undermining areas within PCT 1603.

Table 18: BioMetric scores from South Bates Extension floristic monitoring sites in 2024

Plant Community Type (PCT)	Plot Name	Site type	Mining status	NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	HBT	FL
PCT 1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	SBX2-GB-I	Impact	Undermining has occurred (2023)	36	30	5	75	40	10	0	1	1	12
	SBX4-GB-C	Reference	Outside mining area	42	20	5	85	30	20	0	1	1	48
Performance criteria				>25	10-40	5-10	15-50	5-10	5-40	<5	1	-	-
1176: Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	V10-A1	Impact	Undermining has occurred	34	12.3	7.2	46	2	2	0	1	0	28
	V10-A2	Impact	Undermining has occurred	28	32.5	2.5	28	28	0	0	1	0	12
	SBX1-SG-I	Impact	Undermining has occurred (2023)	25	16	5	36	40	2	0	0	0	35
	SBX3-SG-C	Reference	Outside mining area	40	25	15	18	36	10	0	0	0	20
Performance criteria				21	15-40	5-30	5-30	0-25	2-10	<5	1	-	-

4.2. Bird monitoring

4.2.1. Introduction

Bird monitoring of the South Bates Extension underground mine area was added to the annual biodiversity monitoring program in 2020 and continued in 2024. The purpose of this monitoring is to use bird diversity and abundance as an indicator of health of the local fauna populations and identify whether any adverse impacts from undermining are occurring. The results aim to provide direction to management of these areas and for the monitoring program in the future.

4.2.2. Methods

Bird monitoring survey methods are the same as described in Section 2. Surveys were undertaken by ELA ecologists Daniel McKenzie and Alex Yates from September – October 2023.

Four new bird monitoring sites (BP27-BP30) in the South Bates Extension Underground Mine area were established in 2020, and one existing bird survey site (BP26) is within the South Bates Extension Underground Mine area.

Of the new sites, two were established outside of the approved mining area (BP27 and BP28), intended as reference sites. In 2023, three planned longwalls were re-orientated, resulting in BP28 now falling within an area that is planning to be undermined in the future (Figure 14).

As of November 2023, BP26, BP29 and BP30 have been undermined, while BP27 and BP28 have not been undermined. This is the second monitoring year that BP29 and BP30 have been undermined.

As such, BP27 and BP28, and pre-2023 results for BP29 and BP30 can be considered baseline data for comparison of post-undermining conditions (Table 19).

Table 19: Bird monitoring sites within the South Bate Extension underground mine area

Site	Mining status	PCT
BP26	Undermining has occurred	1176: Slaty Box - Grey Gum shrubby woodland
BP27	Reference site (outside mining area)	1176: Slaty Box - Grey Gum shrubby woodland
BP28	Mining has not yet occurred	1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest
BP29	Mining has occurred (2023)	1176: Slaty Box - Grey Gum shrubby woodland
BP30	Mining has occurred (2023)	1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest

4.2.3. Results

The highest diversity of bird species and high abundance of individual birds was recorded at BP27 in 2024. BP29 recorded the lowest number of species on record for these sites with 7 species recorded.

When compared to the previous four years of monitoring, number of species recorded has been relatively stable with the exclusion of BP29 which decreased significantly in 2024. This is more similar to 2021 results when BP29 recorded 11 species and BP28 recorded 10 species.

Across all years and sites, the average number of species recorded is 18.04. In 2024, 3 out of 5 sites were within +/- 1.25 of their 2020-2023 averages. BP26 and BP29 were 10.25 and 9 species lower than their 2020-2023 average (Figure 17).

There have been larger fluctuations in the number of birds recorded, with the lowest being 18 at BP29 in 2022 and 2024, and the highest being 81 individuals at BP26 in 2022 (Figure 18). The average number of birds recorded across all sites for all years is 47.84. In 2024, BP27, BP28 and BP30 recorded 17.25-28.75 individuals higher than their averages from 2020-2023, while BP26 and BP29 recorded 19.75 and 16.25 individuals less than their averages from 2020-2023 respectively.

Grey-crowned Babbler was the only threatened bird species recorded across the monitoring sites in 2024, which was recorded at BP28. This is inconsistent with 2023 results, when Varied Sitella was recorded at BP29 and Grey-crowned Babbler was recorded at BP30.

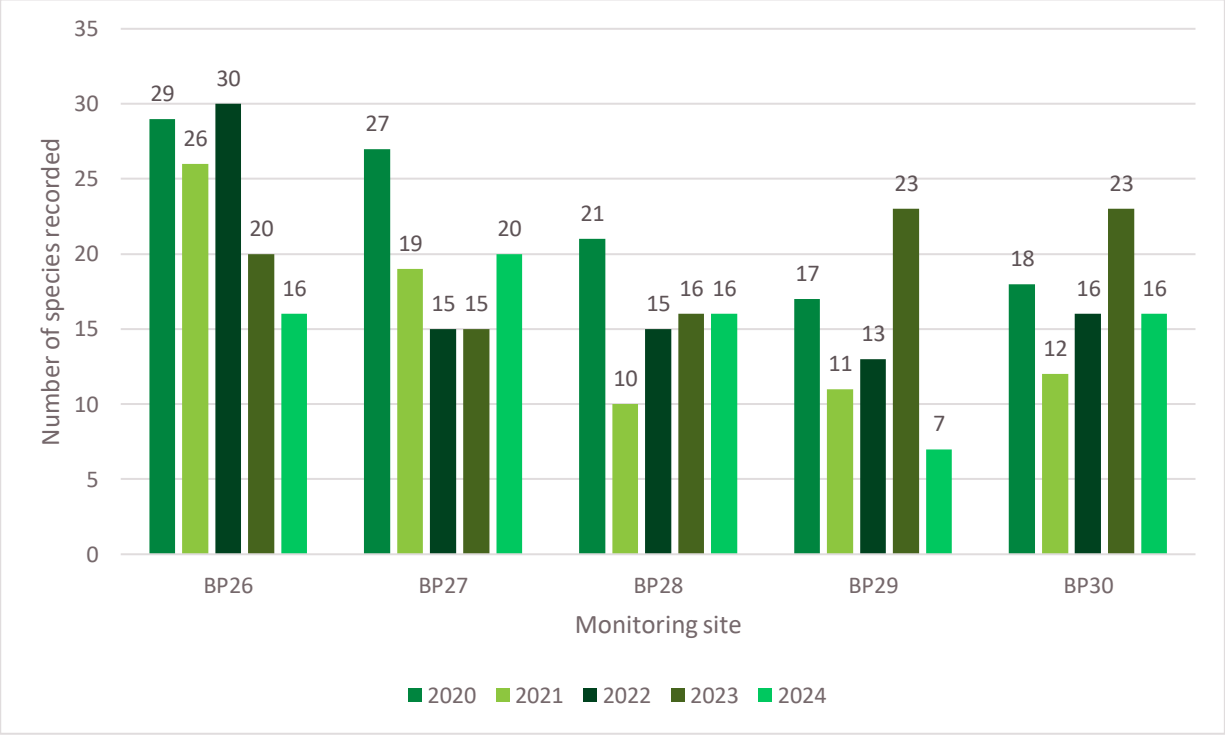


Figure 17: Number of species recorded for sites in the South Bates Extension underground mine area

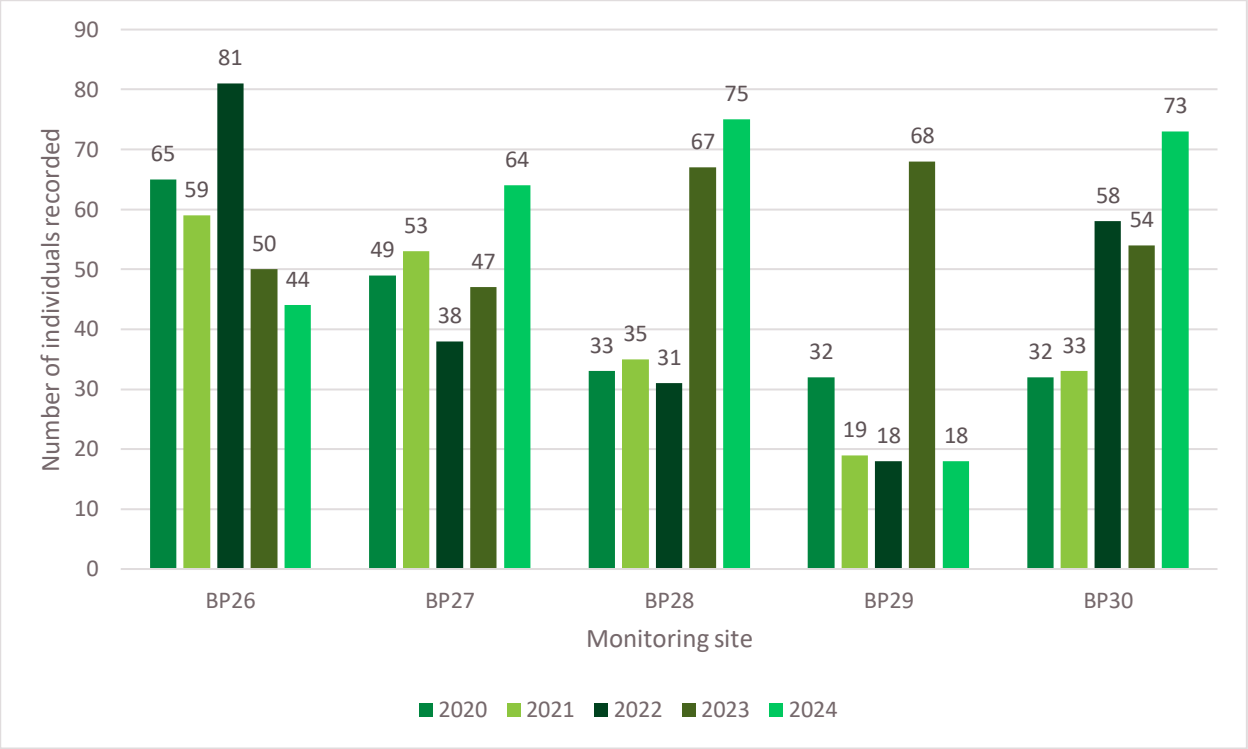


Figure 18: Number of birds recorded for sites in the South Bates Extension underground mine area

4.2.4. Conclusions and recommendations

Bird surveys recorded data at four sites established in 2020 and one existing site associated with the South Bates Extension underground mine area. Three of the five sites are located above an area which had been undermined to date.

All sites which have been undermined recorded a decrease in the number of species recorded, compared to results from 2023, and compared to the average results from 2020-2023. The two sites which have not been undermined showed a slight increase or remained stable in the number of species recorded.

Two out of three sites which have been undermined recorded a decrease in the total number of individual birds recorded. One undermined site, and two sites which have not been undermined to date, showed fairly high increases in the total number of individual birds recorded.

Continued monitoring is recommended in this area, including the use of reference sites to allow comparison including impacts of seasonal variation and development of long-term averages. Progress of underground mining activities should be correlated to site locations annually to ensure results are appropriately analysed as baseline, or impact once undermining progresses.

As the previous control site is now planned to be undermined (BP28) it is recommended that a new bird monitoring site is established in 2024, outside of undermining areas within PCT 1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest.

4.3. Groundwater Dependent Ecosystem monitoring

4.3.1. Introduction

Monitoring of GDEs is a new component to the annual biodiversity monitoring program initiated in 2019. The GDE Vegetative Assessment Report (Hunter Eco 2019) identified two likely GDEs in the area above the South Bates Underground Extension:

- River Oak riparian tall woodland
- M*elaleuca decora* low forest

The South Bates Underground Extension has the potential to impact groundwater in the vicinity of the two GDEs. Hunter Eco (2019) recommended the establishment of a GDE monitoring program including:

- Vegetation condition and extent assessed by aerial imagery and on-ground inspection over time
- Document tree height and diameter at breast height (DBH) of selected River Oak saplings and mature trees

4.3.2. Methods

GDE monitoring was undertaken by ELA ecologists Liam Scanlan and Mel Thurtell in September 2024. Several methods were used to monitor GDEs as described below.

4.3.2.1. Vegetation survey plots

Two vegetation monitoring plots (standard biometric plot 50 x 20 m – (refer to Section 2)), previously surveyed in 2019, 2020, 2021 and 2022, are located in each GDE (Figure 22). Vegetation structure and function data compliant with the Biodiversity Assessment Method (BAM) plot method (current standard method for ecological impact assessment) was also collected.

4.3.2.2. Photo monitoring points

At each photo monitoring plot, images were captured at 0, 90, 180, and 270 degrees, as well as one at the ground. A total of eight photo monitoring points were surveyed (Figure 22).

4.3.2.3. Tree measurements

Thirty *Casuarina cunninghamiana* trees (15 mature trees and 15 saplings) were selected for monitoring across the River Oak riparian tall forest GDE area along North Wambo Creek in 2019 (Figure 24). Each tree was permanently marked with a numbered metal tree tag and the DBH was measured. The point of DBH measurement (1.3m above the ground) was sprayed with paint so that the measurement location can be replicated during subsequent monitoring. In 2020, 2021, 2022, 2023 and 2024 the DBH for each tree was re-measured.

Crown extent was assessed for each tagged tree. Crown extent was assessed as the percentage of the assessable crown (all live and dead branches on the tree) in which there are live leaves. Two observers each recorded a crown extent estimate from opposite sides of the tree to the nearest 5%, and the average of the two scores was recorded.

4.3.2.4. Mapping of vegetation extent

Mapping the extent of the River Oak riparian tall woodland community along the upper reach of North Wambo Creek was completed in GIS at 1:1000 scale using georeferenced aerial imagery (NearMap 2022). Polygons were drawn with reference to Rapid Data Points (RDPs) and photos collected during the monitoring survey and using comparison to aerial imagery from 2019 (NearMap) when the community extent was first mapped in detail.

4.3.3. Results

The results of the GDE monitoring are presented below, with raw data and all photographs included in Volume 2.

4.3.3.1. Vegetation survey plots

Two monitoring plots were surveyed in *Melaleuca decora* low forest (Figure 22). BioMetric data from each plot is presented in Table 20.

The BioMeteric results from the *M. decora* low forest GDE indicated the community is in good condition, with the majority of scores such as average NPS remaining within the ranges of previous year's results. Between 2019 and 2021, NPS approximately doubled, likely as a result of the increased rainfall. NPS in River Oak riparian tall woodland has remained stable since 2021, and NPS in M. decora has shown minor fluctuations but remain stable with levels consistent to 2019-2020 results (Figure 19).

Table 20: BioMetric data for GDE monitoring plots in 2024

GDE	Plot Name	NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC
***M. decora* low forest**	GDE1	40	12	15	55	8	18	0
	GDE2	32	10	15	72	55	10	0
	Average	**36**	**11**	**15**	**63.5**	**31.5**	**14**	**0**
River Oak riparian tall woodland	GDE3	28	5	0	0	5	0	28
	GDE4	60	20	3	5	0	10	0
	Average	**48**	**12.5**	**1.5**	**2.5**	**2.5**	**5**	**14**

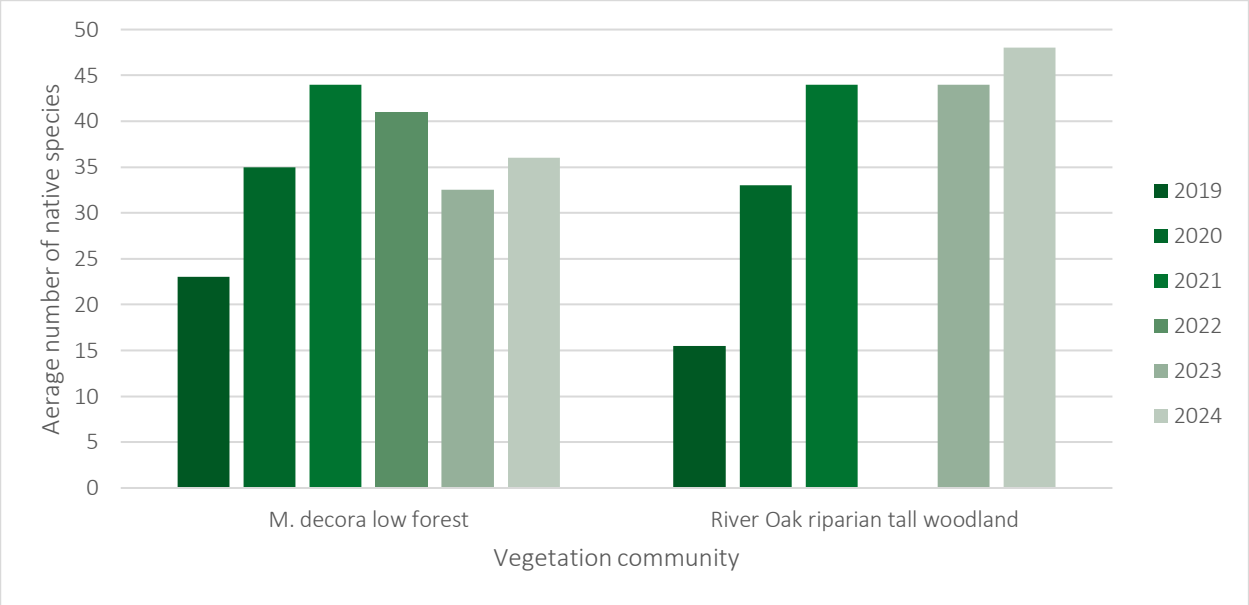


Figure 19: Average number of native species within each GDE over time from 2019-2024

Photograph 39: GDE P3 monitoring plot along North Wambo Creek in 2019

Photograph 40: GDE P3 monitoring plot along North Wambo Creek in 2022 in flooded conditions. Approximate location of transect shown in white.

Photograph 41: GDE P3 monitoring plot along North Wambo Creek in 2023

Photograph 42: GDE P3 monitoring plot along North Wambo Creek in 2024

4.3.3.2. Photo monitoring points

Review of images from photo monitoring points show GDE vegetation in good condition in 2024. A noticeable increase in ground cover vegetation was visible in both *Melaleuca decora* low forest and River Oak riparian tall woodland GDE communities in 2022 compared to site establishment in 2019 (Photograph 43 - Photograph 47). Ground cover vegetation appears to be stable while shrub cover appears to be increasing, likely influenced by annual rainfall and the absence of disturbance such as fire.

Photograph 43: GDE Photo monitoring point M2 (facing north) in *Melaleuca decora* low forest in 2019

Photograph 44: GDE Photo monitoring point M2 (facing northwest) in *Melaleuca decora* low forest in 2023

Photograph 45: GDE Photo monitoring point M2 (facing north) in *M. decora* low forest in 2024

Photograph 46: GDE Photo monitoring point M7 in River Oak riparian tall woodland in 2019

Photograph 47: GDE Photo monitoring point M7 in River Oak riparian tall woodland in 2022

Photograph 48: GDE Photo monitoring point M7 in River Oak riparian tall woodland in 2023

Photograph 49: GDE Photo monitoring point M7 in River Oak riparian tall woodland in 2024

4.3.3.3. Tree measurements

Individual tree measurements from 2024 are presented in Table 21. The average DBH for River Oak trees increased slightly in the saplings (1 cm increase) and in mature trees (2 cm increase) (Figure 20).

Four trees recorded very minor decreases in DBH compared to 2023, with an average decrease of 0.35 cm. Of these trees, two appear to have naturally shed a small amount of bark, and one has been bent over from high water flow, potentially resulting in inconsistency in the height that DBH has been recorded from.

Two individual adult trees (Trees 19 and 21) recorded lower DBH in 2023 than the previous year, and this is thought be to a result of a portion of bark falling away. In almost all cases, trees appear healthy, with the exception of Tree 19 and 24 which show signs of rot in the basal hollow.

The average canopy extent increased by 4% cover for saplings and decreased by 4% cover for mature River Oak trees (Figure 21). This low amount of change is within the range of observer variation.

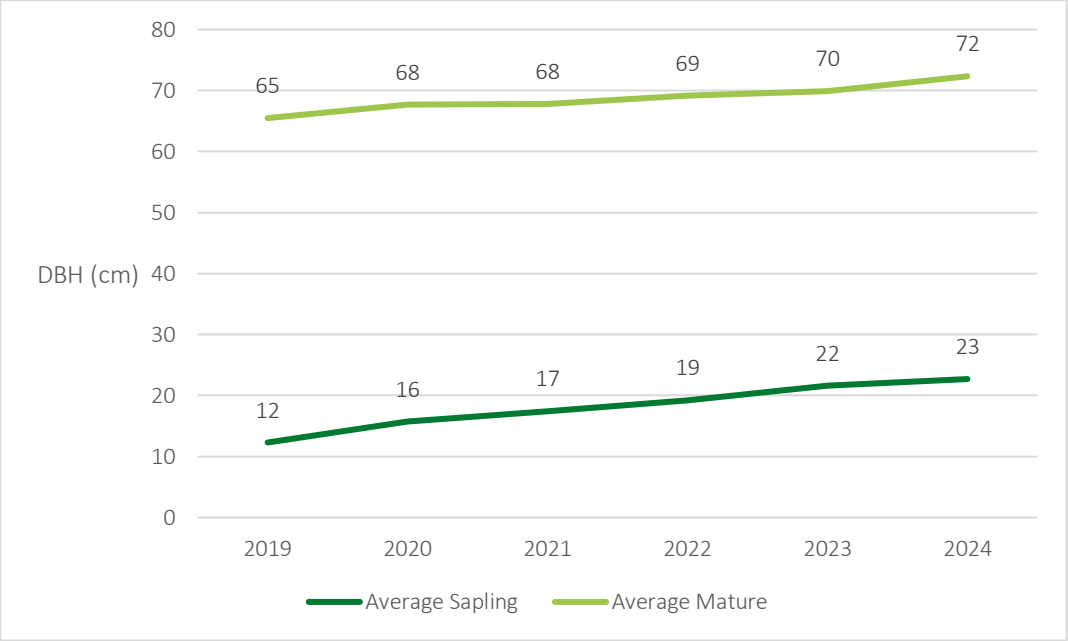


Figure 20: Change in DBH over time of measured trees within the GDE River Oak riparian tall woodland GDE

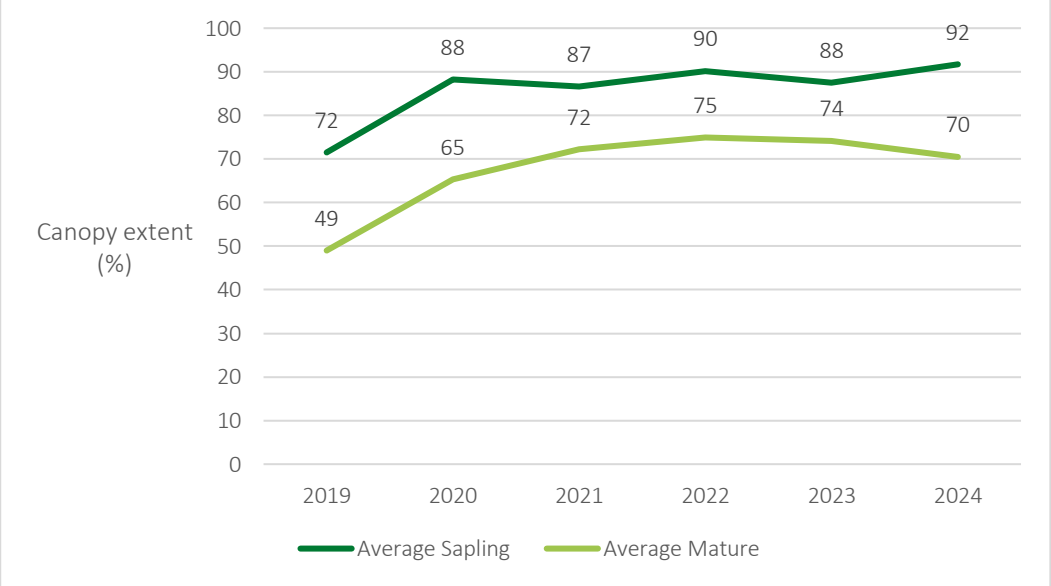


Figure 21: Change in canopy extent over time of measured trees within the GDE River Oak riparian tall woodland GDE

Table 21: River Oak tree monitoring results in 2024

Tree Tag No.	Age class	DBH (cm)	Canopy Extent (%)	Easting	Northing
1	Mature	79.6	87.5	306275	6395900
2	Mature	48.1	87.5	306164	6395894
3	Sapling	37.3	100	306090	6395881
4	Mature	88	94	306050	6395868
5	Mature	35.3	20	305952	6395693
6	Mature	106	72.5	305964	6395705
7	Sapling	29	77.5	305811	6395612
8	Sapling	20.9	100	305753	6395618
9	Mature	65	70	305785	6395619
10	Sapling	21.3	100	305529	6395440
11	Sapling	37.7	95	305470	6395438
12	Mature	67	95	305442	6395439
13	Sapling	10.3	67.5	305380	6395409
14	Mature	59.6	37.5	305379	6395410
15	Sapling	9.4	85	305573	6395454
16	Sapling	20.5	82.5	305587	6395457
17	Sapling	15.2	45	305593	6395493
18	Mature	114	42.5	305566	6395521
19	Mature	82.8	90	305571	6395591
20	Sapling	25	99	305607	6395612
21	Mature	118	95	305338	6395325
22	Mature	65.1	100	305307	6395248
23	Sapling	26.8	97.5	305264	6395213
24	Mature	55.1	60	305218	6395224
25	Sapling	31.5	90	305202	6395237
26	Mature	54	100	305171	6395235
27	Sapling	27.4	90	305038	6395194
28	Mature	47.4	75	305035	6395190
29	Sapling	18.9	90	305021	6395183
30	Sapling	9.4	65	305004	6395173

4.3.3.4. Mapping of River Oak riparian tall woodland vegetation extent

No change in extent of River Oak riparian tall woodland was observed in the field or observable in the aerial imagery. The total area of the GDE remains 5.07 ha (Figure 23).

4.3.4. Conclusions and recommendations

Ongoing monitoring of these sites is required to assess whether any impacts to GDEs occurs as a result of planned mining activities in this area.

Floristic monitoring recorded generally decreased scores for both GDEs surveyed. Drier conditions in 2022 after high rainfall in 2020 and 2021 is likely to be the major factor in these results and photo monitoring shows deceased vegetation cover since 2022, particularly in the understorey of both areas.

GDE tree monitoring within River Oak riparian tall woodland recorded tree growth and similar canopy extent (with a slight decrease), suggesting the health of the trees is mostly stable.

The River Oak riparian tall woodland remains approximately 200-300m from the closest mined portion of the South Bates Underground Extension mining area. As such, there may be no current impacts from undermining and the current data will serve as a baseline for reference once mining activities occur in the vicinity of the community. Variation in results between the drier years in 2019 and 2023 and wetter years in 2020, 2021 and 2022 is likely to be useful to understand the natural changes which occur in the community when attempting to determine whether any future changes observed are the result of mining impacts or natural variation.

No discernible change in the extent of the River Oak riparian tall woodland GDE was recorded. Changes to the extent of the community are likely to take place over the course of several years. The wetter years in 2020, 2021 and 2022 may have provided suitable conditions for the spread and germination of canopy and mid storey species which in the coming years may result in an increase in the extent of the community.

It is noted that due to the reorientation of three underground mining longwalls, twenty trees now fall outside of the planned underground mining area (trees 7-26) , while six trees (trees 1-6) fall within the new underground mining area, or close to the boundaries. It is recommended that additional trees are monitored within the new underground mining area. While less trees are required to be monitored in the area no longer planned for mining, monitoring of some trees should continue, to act as a reference condition, and to assess any detrimental affects of underground mining in the vicinity of the trees.

Monitoring should continue to assess for impacts to the *Melaleuca decora* low forest GDE and to continue collecting baseline and future impact data for the River Oak riparian tall woodland GDE. Several groundwater monitoring wells have been established in the vicinity of the GDE along North Wambo Creek and the data from these is also likely to assist with determining whether any impacts to GDEs are likely to occur.

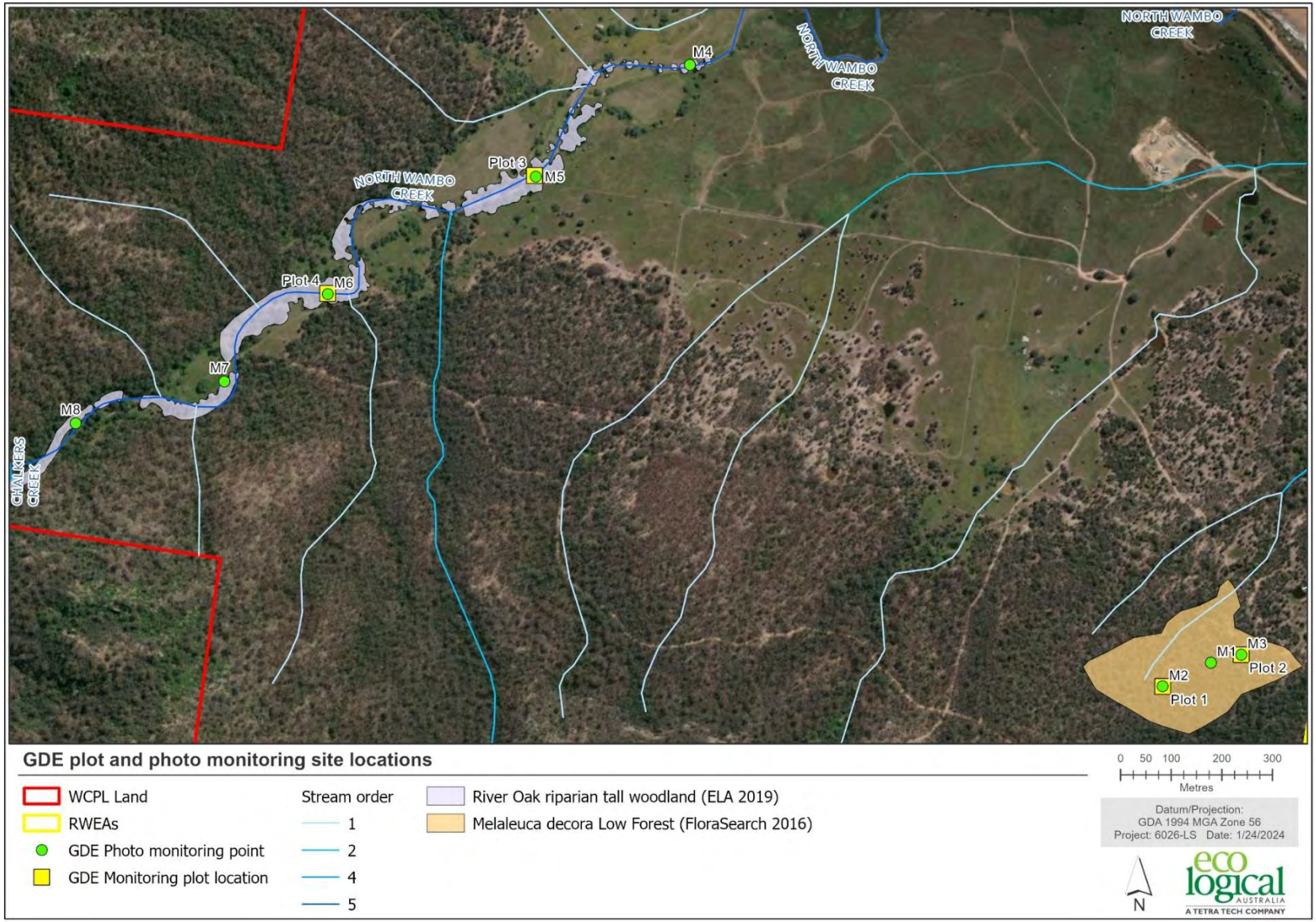


Figure 22: GDE monitoring site locations

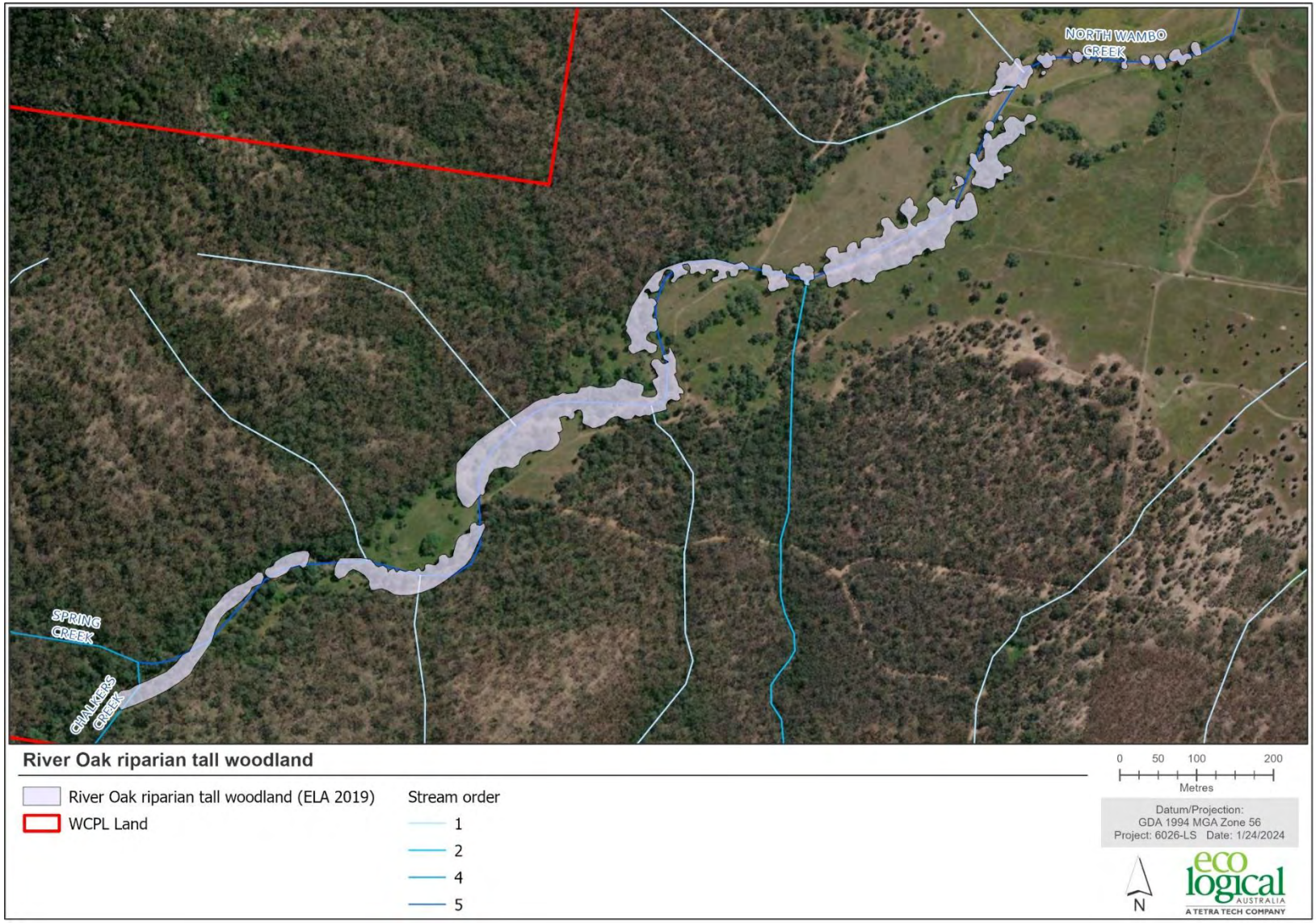


Figure 23: Extent of River Oak riparian tall woodland mapped in Spring 2019, unchanged from 2019-2024.

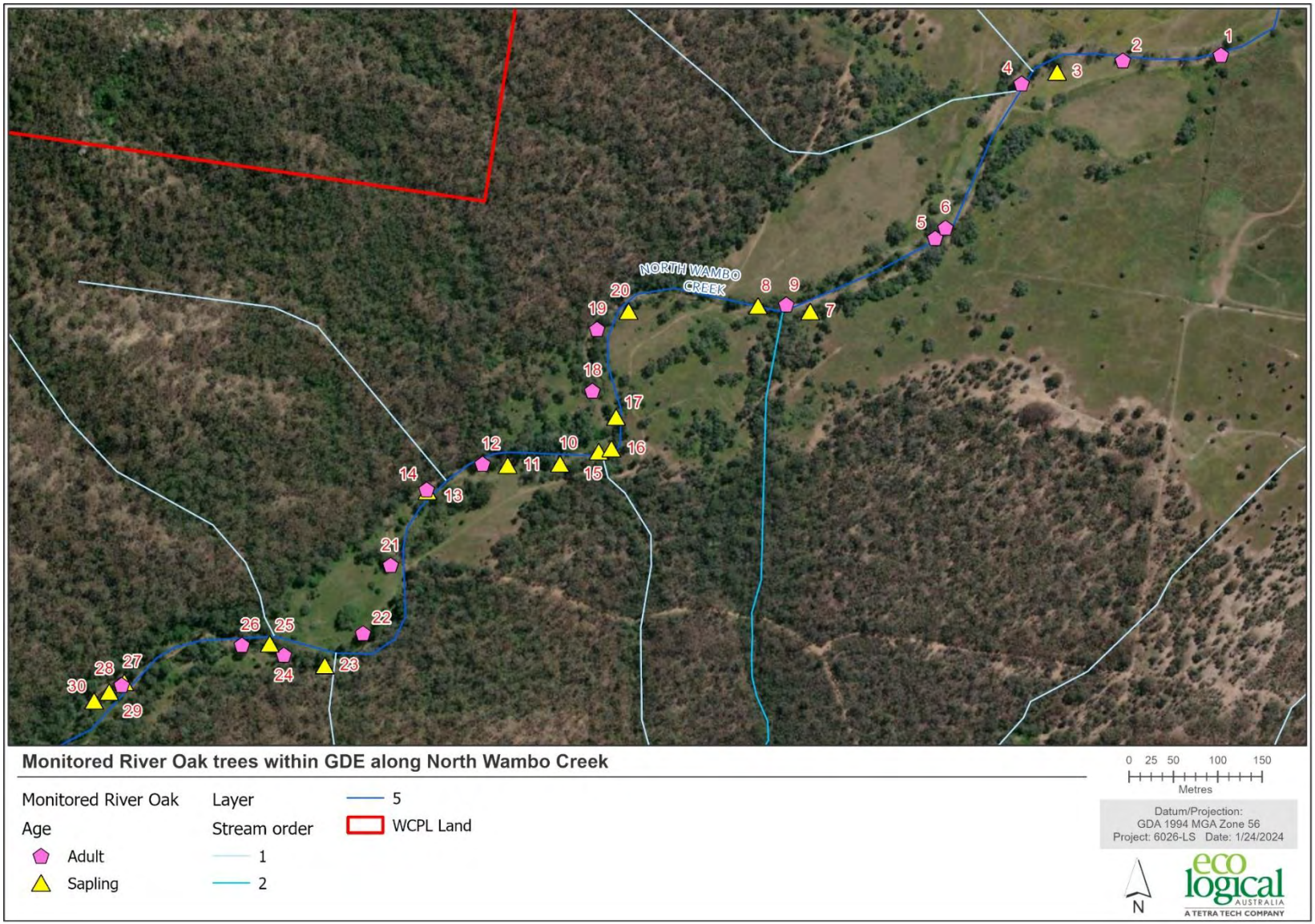


Figure 24: Monitored River Oak trees along North Wambo Creek

5. Mine subsidence observations and other management considerations

5.1. Subsidence observations

Subsidence cracks were noted near flora site V11-B1 as per recent years. These cracks appeared slightly larger in 2024, however the cracking was not having any observable significant impacts on vegetation at the current time, with the adjacent trees and shrubs showing no visible signs of stress or damage.

A previously unrecorded subsidence crack was observed at V6-B1c (Photograph 50).

Photograph 50: Subsidence cracks observed at V6-B1c in 2024.

5.1.1. Performance criteria and results

Performance criteria and findings during the 2024 monitoring for subsidence impacts are presented in Table 22 which is based on Table 12 in the *Wambo Coal Biodiversity Management Plan* (WCPL 2023). These performance criteria exclude any impacts and consequences of mining that occurred prior to February 2011 in accordance with Condition 22, Schedule 4, of Development Consent DA 305-7-2003.

Table 22: Subsidence performance measures, indicators and 2024 findings

Biodiversity feature	Performance measure	Performance indicator (WCPL 2023)	2024 findings
Wollemi National Park	Negligible subsidence impacts and environmental consequences	The performance indicators will be considered to have been exceeded if conventional vertical subsidence exceeds 20 millimetres (mm) or the limit of survey accuracy (whichever is greater) at the base of the Wollemi National Park escarpment. The performance indicators will be considered to have been exceeded if visual inspections identify cliff or rock face instability at the Wollemi National Park escarpment.	N/A - Vertical subsidence as the base of escarpment or cliff or rock face instability not inspected as part of the flora and fauna monitoring program in 2024.
Other species, populations or communities listed under the Biodiversity Conservation Act 2016 or Environmental Protection and Biodiversity Conservation Act 1999	Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences.	The performance indicator will be considered to have been exceeded if annual monitoring at flora monitoring sites V6-B1c and V11-B1 or bird monitoring sites (BP14, BP16, BP20, BP21) above Longwalls 11 to 16 indicate a statistically significant downward trend or change between monitoring periods not observed at analogue/reference sites.	Bird monitoring sites above longwalls do not show a downward trend or a decrease not observed at other reference sites (Figure 25). Subsidence cracks were recorded at V11-B1. No significant vegetation damage was observed at these sites. No significant effect of undermining was recorded. Vegetation at these sites and in the wider area remains in relatively good condition.
Warkworth Sands Woodland Community		The Warkworth Sands Woodland Community is absent from the South Bates Underground Mine area. Monitoring and performance indicators relevant to mine subsidence in the Warkworth Sands Woodland Community will be addressed in future revisions of the BMP prior to any extraction under the Warkworth Sands Woodland Community	Area not currently undermined – no subsidence observations.
White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community		The White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community is absent from the South Bates Underground Mine area. Monitoring and performance indicators relevant to mine subsidence in the White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community will be addressed in future revisions of the BMP prior to any extraction under the White Box, Yellow Box, Blakely's Red Gum	Area not currently undermined – no subsidence observations.

Biodiversity feature	Performance measure	Performance indicator (WCPL 2023)	2024 findings
		Woodland/Grassy White Box Woodland Community.	
Central Hunter Valley Eucalypt Forest and Woodland Ecological Community		Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences.	No additional observations of damage to this community beyond that described in the 2016 flora and fauna monitoring report (ELA 2016). Predominantly minor surface cracks observed.

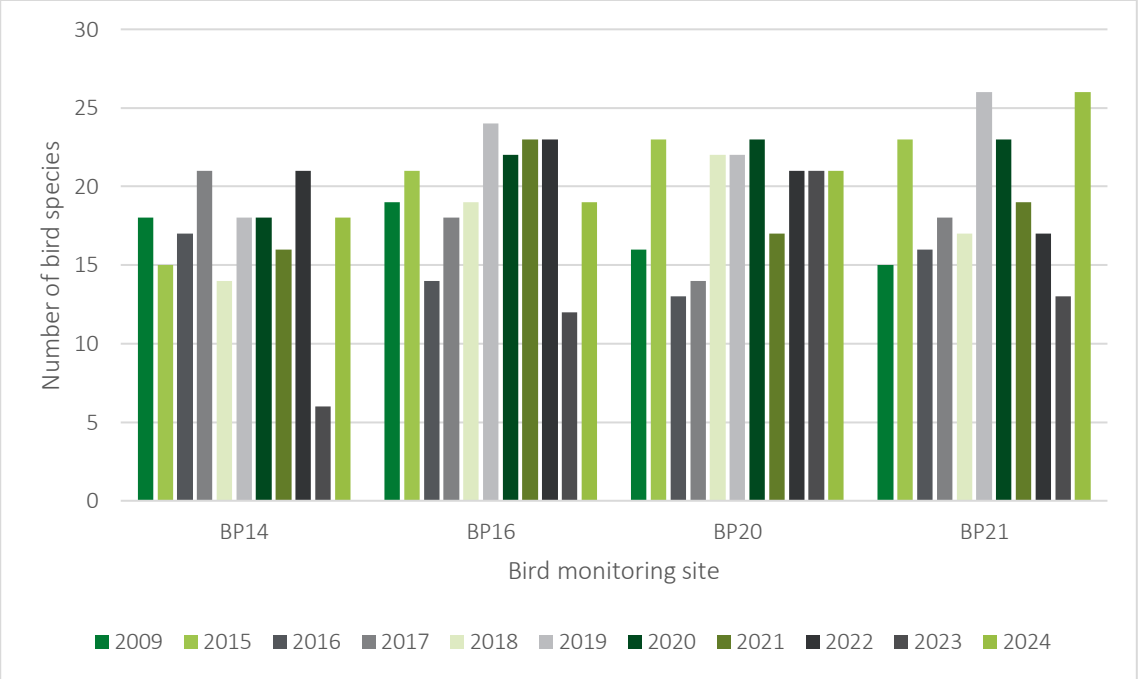


Figure 25: Total number of bird species recorded at sites located over longwalls 11 to 16 in 2009 and 2015-2024

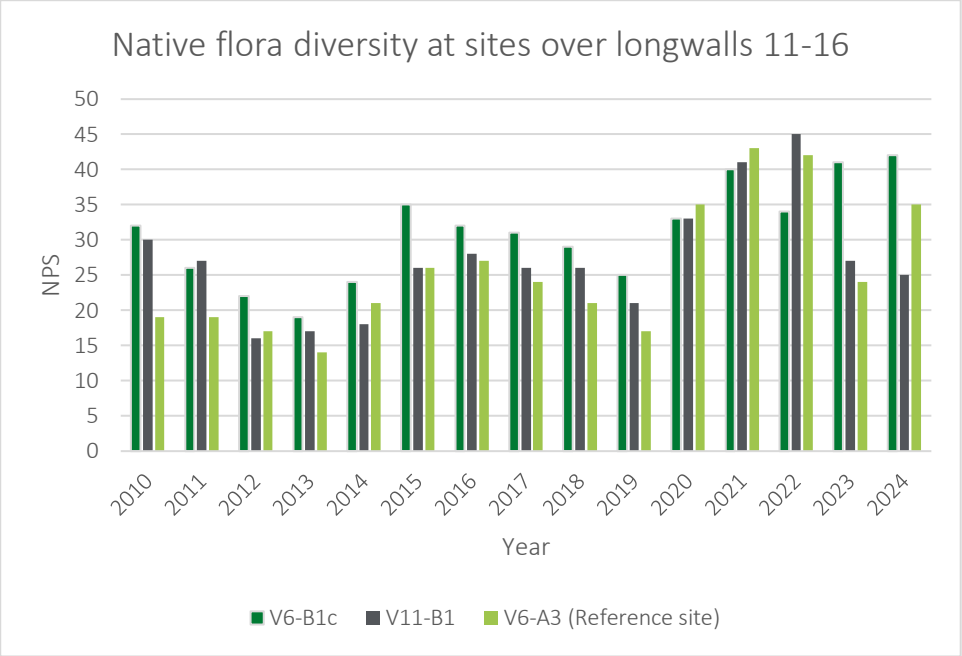


Figure 26: Average number of native flora species recorded at sites located over longwalls 11-16 and reference site 2010-2024

5.1.2. Conclusion and recommendations

Monitoring data or general observations do not indicate any exceedance of the performance criteria or any significant effects on biodiversity values at this stage, however future monitoring should continue to document and assess subsidence impacts across the site.

5.2. Weed issues

Environmental weeds impacted on RWEAs have been discussed in previous sections. Management of weeds across WCPL land should continue, particularly for priority weeds and Weeds of National Significance (WONS), to prevent their spread.

A targeted weed survey and update to Annual Weed Treatment Plan is scheduled for 2025, which will record weed issues in detail, incorporating the results of this monitoring program, and outline proposed strategy for weed treatment in 2024/2025 in detail.

Known priority weed infestations include:

- *Eragrostis curvula* (African Lovegrass) in RWEA A
- *Melinis repens* (Red Natal Grass) in RWEA A
- *Bryophyllum* sp. (Mother of Millions) in RWEA A
- *Solanum elaeagnifolium* (Silver-leaf Nightshade) in the general surface area

5.3. *Banksia integrifolia* dieback in RWEA A

The Rough-barked Apple - Narrow-leaved Ironbark - Blakely's Red Gum - Bull Oak - Coast Banksia woodland (in RWEA A) appears to be suffering from *Banksia integrifolia* die-off in the mid-storey, first observed in 2019. The Warkworth Sands Woodland of the Hunter Valley community is listed as a Critically Endangered Ecological Community under the *Environment Protection and Biodiversity*

Conservation Act 1999, therefore investigation is warranted to determine the cause of potential dieback.

This community occurs on sandy soils, and it is possible that this soil type does not retain moisture in subsurface layers as efficiently as other soil types and has therefore impacted vegetation during these dry years (2017-2019) and the higher rainfall to date has not been sufficient to recharge soil moisture levels. Alternatively, this vegetation community may require a longer period of time to see improvements in vegetation condition following more consistent rainfall.

It is noted that *Banksia integrifolia* is thought to be relatively high in resistance to *Phytophthora cinnamomi* die-back (McCredie et al. 1985), and this species is not listed as a species that is susceptible to infection by *P. cinnamomi* in "Infection of native plants by *P. cinnamomi* - key threatening process listing NSW Scientific Committee - final determination" (OEH 2002). Warkworth Sands Woodland is not listed as a threatened ecological community that is vulnerable to *P. cinnamomi* infestation (OEH 2002), however OEH (2002) also states that in some circumstances, *P. cinnamomi* may contribute to plant death where there are other stresses present (e.g. waterlogging, drought, and perhaps wildfire), and the Warkworth Sands Woodlands has been subjected to drought and flooding conditions in recent years.

5.3.1. Floristic and photo monitoring

Comparison of photo-monitoring sites between 2013 and 2024 monitoring show no major changes in vegetation over this period. Wetter conditions during 2022 are apparent in some photographs, with more green vegetative growth visible in the understorey, and increase in native ground cover, however, in general, no major changes in species composition or structure are apparent. As discussed previously, dry conditions were observed and reported (2017-2019). These observations correspond to the floristic data collected within biometric plots with higher ground cover scores recorded across most PCTs in 2022.

No Banksia cover was recorded in 2022, but low cover of *Banksia integrifolia* was recorded in 2023 in RWEA A monitoring plots V5B1 and V5B2. This observation suggests Banksia individuals may be recovering, or new plants may have germinated. Ongoing monitoring within these plots will provide additional data on the recovery or ongoing decline of this species locally.

In March 2024, *Banksia integrifolia* in RWEA A appeared to have successfully resprouted since dying back. New growth appeared healthy, and young flowers were present at the time of the site inspection when soil samples were collected (Photograph 51; Photograph 52; Photograph 53).

Photograph 51: Large flowering *Banksia integrifolia* in RWEA A

Photograph 52: *Banksia integrifolia* in RWEA A showing healthy growth amongst stems of dead mature Banksia trees

Photograph 53: Banksia integrifolia in RWEA A showing recent healthy growth

5.3.2. Pathogen detection tests

To assess these areas for Phytophthora and Pythium, and other fungal and bacterial plant pathogens, soil and plant tissue was collected on the 12 March 2024 by Liam Scanlan. Soil and plant tissue were collected following the NSW PlantClinic guidelines and sent to NSW PlantClinic (plant disease diagnostics at the Royal Botanic Garden Sydney) for analysis.

Phytophthora, Pythium and Plant Pathogen Detection tests were ordered from NSW PlantClinic. Results of the soil and plant tissue analysis were all negative for plant pathogens (Table 23).

Ongoing monitoring of Banksia integrifolia will be captured in annual biodiversity monitoring as part of the Wambo Annual Biodiversity monitoring program, and no further management actions are proposed.

Table 23: Summary of PlantClinic results

PlantClinic Ref.	Sample Type	Client Ref.	Service	Results
24.169.1	Banksia integrifolia	RWEA_A_Soil S1	PHY	(PHY): Negative; (Pythium): Negative
24.169.2	Banksia integrifolia	RWEA_A_Wood S2	PDI	(WDF): Negative; (Fungal detection): Negative,
24.169.3	Eucalyptus sp.	Mont_Soil S3	PHY	PHY): Negative; (Pythium): Negative
24.169.4	Eucalyptus sp.	Mont_Wood S4	PDI	(WDF): Negative; (Fungal detection): Negative,

6. Summary of recommendations

A summary of the management actions required and recommended to be undertaken by WCPL based on the results of the 2024 annual biodiversity monitoring program is provided in Table 24, with additional recommendations of ongoing monitoring provided in Table 25.

Table 24: Summary of management actions required.

Area/Feature	Performance criteria	Result	Action required
RWEA A and Rail Loop	Exotic plant cover limits within RWEA A and Rail Loop **Targets** • Rail Loop CT2: 15% • RWEA A A1: 60% • RWEA A A3: 20%	Exotic plant cover at CT2 (Rail Loop), and A1, and A3 (RWEA A) exceeded targets. **Results** • Rail Loop CT2: 16% • RWEA A A1: 76% • RWEA A A3: 34%	Conduct annual weed survey and review of weed management activities success. Update Annual Weed Treatment Plan. Continue weed management in RWEA A and Rail Loop in accordance with Updated Weed Treatment Plan – increased weed management effort is recommended. Planting of native trees in over-cleared riparian areas. Details to be included in the Updated Weed Management Plan.
RWEA A and Rail Loop	**Performance target:** • Exotic Plant Cover (<10%)	**Average exotic plant cover:** • PCT 42 sites within RWEA A was 51.7	Continue weed management in RWEA A and Rail Loop in accordance with Updated Weed Treatment Plan – continued increased weed management effort is recommended. Planting of native trees in over-cleared riparian areas. Details to be included in the Updated Weed Management Plan.

Table 25: Summary of additional recommendations

Monitoring type	Recommendation	Details
Subsidence cracking	WCPL inspect subsidence cracking in RWEA C and undertake remediation of large subsidence cracks if possible.	Very large cracks are present at site V11-B1 in RWEA C. However, no impacts to vegetation condition have been observed.
Vegetation monitoring – hazard reduction burn	WCPL investigate hazard reduction burn / ecological burn within RWEA areas.	The RWEA Conservation Agreement states that a fire management hazard reduction burn must be implemented between Years 1 – 10 of RWEA management. The high groundcover of shrubs, grasses and other within a number of communities in 2023-2024, following high rainfall in 2020-2022, indicates that a hazard reduction burn may be beneficial

Monitoring type	Recommendation	Details
Vegetation monitoring – RWEA A and Rail Loop	Planting of canopy species should be considered in RWEA A and Rail Loop, where natural regeneration is unlikely to occur in a reasonable timeframe (i.e. the open grassland areas of on the Wollombi Brook floodplain).	High exotic cover and low native cover has been recorded at some sites along Wollombi Brook and the Wollombi Brook floodplain in RWEA A and Rail Loop. Once established, these plantings may also reduce cover of exotic flora species in these areas.
North Wambo Creek Diversion monitoring	Inclusion of additional BioMetric monitoring sites in zones that have been identified as vegetation successfully established.	Inclusion of additional monitoring sites and methods is likely to assist assessment of the vegetation condition and performance.
South Bates Underground monitoring – floristic monitoring	Establish a new floristic monitoring site in 2025, outside of undermining areas within PCT 1603.	As the single existing control site for PCT 1603 - Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest is now planned to be undermined (SBX4-GB-C) it is recommended that a new floristic monitoring site is established in 2025, outside of undermining areas within PCT 1603.
South Bates Underground monitoring – bird monitoring	Establish a new bird monitoring site outside of undermining areas within PCT 1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest.	As the previous control site is now planned to be undermined (BP28) it is recommended that a new bird monitoring site is established in 2024, outside of undermining areas within PCT 1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest.
GDE Tree monitoring	It is recommended that additional trees are monitored within the new underground mining area. Tree height should be recorded to assist in relocating trees.	Due to the reorientation of three underground mining longwalls, twenty trees now fall outside of the planned underground mining area (trees 7-26) , while six trees (trees 1-6) fall within the new underground mining area, or close to the boundaries. While less trees are required to be monitored in the area no longer planned for mining, monitoring of some trees should continue, to act as a reference condition, and to assess any detrimental effects of underground mining in the vicinity of the trees.
GDE Tree monitoring	For trees that require ongoing monitoring, trees should be remarked with tree-friendly tags and paint. Tags may be removed from trees if they no longer require monitoring.	Numerous trees have lost their tags, or bark has grown over them which may damage the trees. Paint has faded on most trees.

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1. Introduction

This document provides raw data and photographs collected during Spring 2024 monitoring at the Wambo Coal Mine.

2. Flora monitoring

2.1 Monitoring data

Data collected during the 2024 floristic surveys are presented below in Table 1**,** Table 2 and Table 3**.**

Several abbreviations for measured attributes are used in tables throughout the following section. An explanation of these is provided below:

- NPS – the number of native plant species within 20 x 20 plot
- NOS (%) - projected native foliage cover of canopy
- NMS (%) – projected native mid-storey cover
- NGCG – native groundcover of grasses
- NGCS – native groundcover of shrubs
- NGCO – native groundcover of other plant types (sedges, herbs etc.)
- EPC – exotic plant cover
- OR – proportion of overstorey species regenerating over the whole vegetation zone
- HBT – number of hollow-bearing trees present in the 20 x 50 m vegetation plot
- FL – length of fallen logs >10 cm diameter
- LI (%) – leaf litter cover
- BS (%) – bare soil cover

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Table 1: Biometric plot data for remnant woodland areas

Plot Name	NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	HBT	FL (m)	LI	BS	Cryptogram
V1-A1	7	5.5	0	76	0	0	12	0	0	0	0	0	0
V1-A2	8	15.2	0	40	0	0	52	1	1	28	0	0	0
V1-B1	13	7.5	0	18	0	24	2	0	0	46	50	10	0
V1-B2	10	10.2	0	46	0	6	26	0	0	21	52	2	0
V1-B3	9	6	1.3	18	0	0	34.2	0	0	38	36	0	0
V2-A1	10	38	2.7	68	2	14	0	1	2	0	0	0	0
V2-B1	14	17.5	0	50	2	0	70	1	0	15	38	0	0
V2-B2	15	19.5	5.7	48	0	8	40	1	1	48	40	0	0
V3-B1	15	4.1	0	30	0	60	4	1	2	63	54	0	0
V5-B1	23	30.3	2.8	78	6	6	0	1	2	23	84	4	6
V5-B2	21	5.5	0	46	0	30	0	1	1	12	66	2	4
V5-B3	31	6	7	42	6	30	2	1	0	48	76	4	0
V5-B4	32	14	9	58	37	23	0	1	1	8	0	0	0
V6-A1c	35	12.4	15.9	52	10	34	0	1	3	53	72	10	0
V6-A3	35	26.7	1	36	14	16	0	1	0	12	86	0	0
V6-B1	25	9.1	5.5	44	4	0	10	1	2	71	70	4	0
V6-B1c	42	10.1	4.1	34	12	0	0	1	1	96	80	8	0
V6-B2	25	15.7	10.7	28	4	18	0	1	2	72	74	2	4
V6-B2c	30	28	2	42	26	0	0	1	0	24	0	0	0
V6-B3	29	14.3	5.2	76	8	10	0	1	3	42	96	0	0
V6-B4	14	20	10	75	24	30	4	1	0	6	0	0	0
V9-A1	29	13.8	3.8	40	12	0	2	1	1	18	0	0	0
V9-B1	36	16.5	29	54	14	16	0	1	3	89	78	6	0
V9-B2	34	30	8.3	22	36	4	0	1	0	63	84	24	0
V10-A1	34	12.3	7.2	46	2	2	0	1	2	33	92	6	0
V10-A2	28	32.5	2.5	28	28	0	0	1	1	9	64	20	0
V10-B1	48	44.5	28.5	46	4	40	1.5	1	0	72	94	6	0
V10-B3	24	35.1	5.1	22	26	2	0	1	4	38	90	12	0
V11-B1	25	9.4	6.2	22	36	0	0	1	2	66	84	10	0
V11-B2	33	9.1	16.6	42	2	24	0	1	3	72	98	2	2
V13-B1	44	7.8	32.5	20	2	46	0	1	2	72	84	6	0
V14-A1	47	9	49	50	0	38	0	1	0	11	44	8	0
V14-B1	26	9.5	33	44	4	8	0	1	0	60	40	2	2
V14-B2	44	19.7	22.2	78	8	40	0	1	1	45	72	14	0

Table 2: Biometric plot data for GDE, South Bates Extension and North Wambo Creek Diversion Plots

Plot name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	OR	HBT	FL	LI
GDE-P1	40	12	15	55	8	18	0	1	1	30	40
GDE-P2	32	10	15	72	55	10	0	1	1	20	32
GDE-P3	36	5	0	0	5	0	28	0	1	30	36
GDE-P4	60	20	3	5	0	10	0	0	1	45	60
SBX1-SG-I	25	16	5	36	40	2	0	0	0	35	25
SBX2-GB-I	36	30	5	75	40	10	0	1	1	12	36
SBX3-SG-C	40	25	15	18	36	10	0	0	0	20	40
SBX4-GB-C	42	20	5	85	30	20	0	1	1	48	42
NWCD1	11	0	2	60	0	0	85	0	1	75	11
NWCD2	21	0	0	80	0	0	65	0	1	2	21

Table 3: Flora species lists from RWEA monitoring plots

Scientific name	Common name	Exotic	V1 A1	V1 A2	V1 B1	V1 B2	V1 B3	V2 A1	V2 B1	V2 B2	V3 B1	V5 B1	V5 B2	V5 B3	V5 B4	V6A 1c	V6 A3	V6 B1	V6 B1c	V6 B2	V6 B2c	V6 B3	V6 B4	V9 A1	V9 B1	V9 B2	V10 A1	V10 A2	V10 B1	V10 B3	V11 B1	V11 B2	V13 B1	V14 A1	V14 B1	V14 B2
Abutilon oxycarpum	Straggly Lantern-bush	Native																														1			1
Acacia amblygona	Fan Wattle	Native															3		1		4			1	3	1	2			2	3				
Acacia binervia	Coast Myall	Native																	2							2	3	3							
Acacia decora	Western Silver Wattle	Native																											2						
Acacia decurrens	Black Wattle	Native		2											2																				
Acacia falcata	-	Native														1													1	2				1	
Acacia filicifolia	Fern-leaved Wattle	Native				2		1		2																									
Acacia implexa	Hickory Wattle	Native																			2														
Acacia longifolia	-	Native																													1				
Acacia longissima	Long-leaf Wattle	Native														1	1	1			2			1			1						2		
Acacia parramattensis	Parramatta Wattle	Native							2																										
Acacia salicina	Cooba	Native															1												2			1		1	
Acacia spp.	Wattle	Native							1																										
Acetosella vulgaris	Sheep Sorrel	Exotic		1				3	1																										
Adiantum aethiopicum	Common Maidenhair	Native																														1			1
Aira cupaniana	Silvery Hairgrass	Exotic					2																												
Ajuga australis	Austral Bugle	Native														1								1											
Allocasuarina luehmannii	Bulloak	Native											3	2			5	3	2	1	4	3	4		1	3	3	2			2				
Alternanthera denticulata	Lesser Joyweed	Native			1																														
Amyema cambagei	Needle-leaf Mistletoe	Native																									1								
Ancistrachne uncinulata	-	Native																				1									2	2				
Angophora floribunda	Rough-barked Apple	Native										3		3	3																				
Aristida jerichoensis	Jericho Wiregrass	Native																	1	2															
Aristida ramosa	Purple Wiregrass	Native							1	1				3		2	3	2		1	3		2			2			1	4	1			2		2
Aristida vagans	Threeawn Speargrass	Native										1			1			1	2			3			4	2	3	3	3	2	2				
Arthropodium milleflorum	Pale Vanilla-lily	Native																			1													4	
Arthropodium minus	Small Vanilla Lily	Native															1																1		
Arthropodium spp.	-	Native						1										1	1	1							1				1				
Asparagus asparagoides	Bridal Creeper	Exotic							1																										
Asparagus officinalis	Asparagus	Exotic							1	1			1																						
Asteraceae spp.	-	Native																													1				
Austrostipa ramosissima	Stout Bamboo Grass	Native							2															2								4			
Austrostipa scabra	Speargrass	Native														3		1	1								2	2		1					

Scientific name	Common name	Exotic	V1 A1	V1 A2	V1 B1	V1 B2	V1 B3	V2 A1	V2 B1	V2 B2	V3 B1	V5 B1	V5 B2	V5 B3	V5 B4	V6A 1c	V6 A3	V6 B1	V6 B1c	V6 B2	V6 B2c	V6 B3	V6 B4	V9 A1	V9 B1	V9 B2	V10 A1	V10 A2	V10 B1	V10 B3	V11 B1	V11 B2	V13 B1	V14 A1	V14 B1	V14 B2
Austrostipa scabra subsp. scabra	Rough Speargrass	Native																								2									3	
Austrostipa verticillata	Slender Bamboo Grass	Native														2												2				1				3
Banksia integrifolia	Coast Banksia	Native										1	2																							
Beyeria viscosa	Pinkwood	Native																	1							1						1				
Bidens pilosa	Cobbler's Pegs	Exotic			1	1	1			1			1			3				1		1				1		1					1		1	
Bossiaea ensata	Sword Bossiaea	Native															1																			
Brachychiton populneus	-	Native							2	1		2	2	1			1			2	1			1		1	1						4	2		
Brachyscome spathulata	-	Native															1															1	1			
Breynia oblongifolia	Coffee Bush	Native								1		3	2	2	1	2			1					1	2	1		1			1	2	1		2	
Briza maxima	Quaking Grass	Exotic						2																												
Briza minor	Shivery Grass	Exotic					1																													
Brunoniella australis	Blue Trumpet	Native														2	2			1	1	2		1		1	1	1				1	1	1		1
Bryophyllum delagoense	Mother of millions	Exotic											2																							
Bryophyllum spp.	-	Exotic										1																								
Bursaria spinosa	Native Blackthorn	Native													2	2			2					4	3	2	2	4		4	3	3			2
Callistemon pinifolius	Pine-leaved Bottlebrush	Native			1																										2				
Calotis cuneifolia	Purple Burr-Daisy	Native															1		1			1	1													
Calotis lappulacea	Yellow Burr-daisy	Native															2												1						1	
Cardamine paucijuga	-	Native																													1					
Cardiospermum grandiflorum	Balloon Vine	Exotic		2		1	1																													
Carex breviculmis	-	Native																										1					2			
Carex inversa	Knob Sedge	Native									4																									
Casuarina cunninghamiana	River Oak	Native	3	3	4	4	3																													
Cenchrus clandestinus	Kikuyu Gras	Exotic						2																												
Centipeda minima	Spreading Sneezeweed	Native			3						1																									
Cerastium fontanum	Mouse Ear Chickweed	Exotic		2																																
Cheilanthes distans	Bristly Cloak Fern	Native														3		1	1	1							1		1		1	1			1	
Cheilanthes sieberi subsp. sieberi	Rock Fern	Native						1		1				1	1			1		1				2	1	2	1		1					1	1		1
Chloris ventricosa	Tall Chloris	Native														4	1	2		3	2	2					2							1	2	1
Choretrum candollei	White Sour Bush	Native														2			3					2	2	2	2	1		2						
Chrysocephalum apiculatum	Common Everlasting	Native													1		1																			
Cirsium vulgare	Spear Thistle	Exotic	1				1				1																									
Cissus antarctica	Kangaroo Vine	Native																															1			
Cleistochloa rigida	-	Native																											1							

Scientific name	Common name	Exotic	V1 A1	V1 A2	V1 B1	V1 B2	V1 B3	V2 A1	V2 B1	V2 B2	V3 B1	V5 B1	V5 B2	V5 B3	V5 B4	V6A 1c	V6 A3	V6 B1	V6 B1c	V6 B2	V6 B2c	V6 B3	V6 B4	V9 A1	V9 B1	V9 B2	V10 A1	V10 A2	V10 B1	V10 B3	V11 B1	V11 B2	V13 B1	V14 A1	V14 B1	V14 B2
Clematicissus opaca	Pepper Vine	Native																																1		
Clematis aristata	Old Man's Beard	Native										1																	1				1			
Commelina cyanea	Native Wandering Jew	Native				1												1							1											2
Conyza bonariensis	Flaxleaf Fleabane	Exotic				1	1								1																				
Conyza spp.	-	Exotic	2	1					1				1			3							1										1	1		1	1
Conyza sumatrensis	Tall fleabane	Exotic					2																													
Correa reflexa	Common Correa	Native																										1								
Corymbia maculata	Spotted Gum	Native																						3	3	3			3				3			
Cotoneaster pannosus	-	Exotic										2																								
Crassula sieberiana	Australian Stonecrop	Native										1	1	1														1								
Cyanthillium cinereum	little ironweed	Native																	1										1					2		1
Cyclospermum leptophyllum	Slender Celery	Exotic		2		1	1	1	1	1				1																						1
Cymbonotus lawsonianus	-	Native																																1		
Cymbopogon refractus	Barbed Wire Grass	Native											1		3	1	2	2	4	3	4	2		3	2	3	3	2	3		2				2	
Cynanchum viminale	Caustic Vine	Native																	1																	
Cynodon dactylon	Common Couch	Native	3	1	3			4	4	2	2	2	3	3	1			2					1	2					3							2
Cyperus enervis	-	Native															1				2												1	3		1
Cyperus gracilis	Slender Flat-sedge	Native																				1														
Cyperus polystachyos	-	Native									1																									
Cyperus spp.	-	Native									2																									
Daucus carrota	-	Exotic																																		1
Daviesia genistifolia	Broom Bitter Pea	Native															3																			
Daviesia ulicifolia	Gorse Bitter Pea	Native																			1															
Denhamia silvestris	Narrow-leaved Orangebark	Native																								1										
Desmodium brachypodum	Large Tick-trefoil	Native																	2		1	1			1				1					2		1
Desmodium rhytidophyllum	-	Native																							1	1										
Desmodium varians	Slender Tick-trefoil	Native															2								2				3					2		3
Dianella caerulea	Blue Flax-lily	Native						1		1					3										3	1			2							2
Dianella longifolia	Blueberry Lily	Native													1		2		2								2						1	1		
Dianella longifolia var. longifolia	-	Native																			2			1				1	1							
Dianella revoluta var. revoluta	-	Native											1		2								1													
Dichondra repens	Kidney Weed	Native											1					1	1	1	1	1							2				2	2	1	2
Digitaria didactyla	Queensland Blue Couch	Native																1																		
Digitaria parviflora	Small-flowered Finger Grass	Native																				1			1	2										
Dodonaea triangularis	-	Native																												1						

Scientific name	Common name	Exotic	V1 A1	V1 A2	V1 B1	V1 B2	V1 B3	V2 A1	V2 B1	V2 B2	V3 B1	V5 B1	V5 B2	V5 B3	V5 B4	V6A 1c	V6 A3	V6 B1	V6 B1c	V6 B2	V6 B2c	V6 B3	V6 B4	V9 A1	V9 B1	V9 B2	V10 A1	V10 A2	V10 B1	V10 B3	V11 B1	V11 B2	V13 B1	V14 A1	V14 B1	V14 B2
Dodonaea viscosa subsp. cuneata	Wedge-leaf Hop-bush	Native														1	1		2					2	1				2						1	
Echinopogon caespitosus	Bushy Hedgehog-grass	Native													1																					
Echinopogon spp.	-	Native		1																																
Echium plantagineum	Patterson's Curse	Exotic		3			1																													
Ehrharta erecta	Panic Veldtgrass	Exotic	3	2	1	3	2	2	3	2	1		2		2			1																			
Einadia hastata	Berry Saltbush	Native												1													1									
Einadia nutans	Climbing Saltbush	Native											1						1				2											1	1	
Einadia polygonoides	Knotweed Goosefoot	Native																			1															
Einadia trigonos	Fishweed	Native							1				1																							
Eleocharis acuta	-	Native									1																									
Entolasia spp.	-	Native																									1									
Entolasia stricta	Wiry Panic	Native																						3							4					
Eragrostis benthamii	-	Native												2	1				2				2			1	2								2	
Eragrostis brownii	Brown's Lovegrass	Native												2				2					1		3		1	1		3					
Eragrostis curvula	African Lovegrass	Exotic					3	3	2				2		2			2				1		1												
Eragrostis elongata	Clustered Lovegrass	Native			3																		1													
Eragrostis leptostachya	Paddock Lovegrass	Native										1			3			2		2	2	2			2						1	2			2		
Eragrostis spp.	-	Native																						2												
Eremophila debilis	Amulla	Native															2			1	1	1						1						1		1
Eremophila longifolia	Emubush	Native																						1												
Eucalyptus blakelyi	Blakely's Red Gum	Native								4				1																						
Eucalyptus camaldulensis	River Red Gum	Native						3	3	4																										
Eucalyptus crebra	Narrow-leaved Ironbark	Native								1						4	4		3		4	1	1	4	3	3	3	3	3		3		3	1		3
Eucalyptus dawsonii	Slaty Gum	Native										1															3			3	1					
Eucalyptus moluccana	Grey Box	Native														2		3		3	3	3										2	3		3	
Eucalyptus punctata	Grey Gum	Native																										2								
Exocarpos strictus	Dwarf Cherry	Native						2	2	2			1	1											1											
Facelis retusa	-	Exotic		1				1				1		1																						1
Fimbristylis dichotoma	Common Fringe-sedge	Native																1	1					2			2									
Gahnia aspera	Rough Saw-sedge	Native																		2						1	2	2		2		2	2	1	2	1
Galenia pubescens	Galenia	Exotic							1																											
Galium propinquum	Maori Bedstraw	Native															2																1	2		1
Gamochaeta spp.	-	Exotic									1																									
Geijera parviflora	Wilga	Native																																1		
Geijera salicifolia	Brush Wilga	Native														1	1			1	1						1							1	3	3

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Scientific name	Common name	Exotic	V1 A1	V1 A2	V1 B1	V1 B2	V1 B3	V2 A1	V2 B1	V2 B2	V3 B1	V5 B1	V5 B2	V5 B3	V5 B4	V6A 1c	V6 A3	V6 B1	V6 B1c	V6 B2	V6 B2c	V6 B3	V6 B4	V9 A1	V9 B1	V9 B2	V10 A1	V10 A2	V10 B1	V10 B3	V11 B1	V11 B2	V13 B1	V14 A1	V14 B1	V14 B2
Geitonoplesium cymosum	Scrambling Lily	Native																														1				
Geranium solanderi	Native Geranium	Native																															1			
Glycine clandestina	Twining glycine	Native										1	1	1	1				1		2		1	1	2		1				1					
Glycine microphylla	Small-leaf Glycine	Native																							1				1						1	
Glycine tabacina	Variable Glycine	Native														1		1	1			2		1		1	1	1	1			1	2		2	
Goodenia hederacea	Ivy Goodenia	Native																	1							1		1			1					
Goodenia rotundifolia	-	Native																				1		2	2				2							
Grevillea montana	-	Native												2					2						1	2			1		2	3				
Hardenbergia violacea	False Sarsaparilla	Native																							1											
Heliotropium amplexicaule	Blue Heliotrope	Exotic		2		2	1	1	2	3		1		1	1			1			1															
Heterotheca grandiflora	Telegraph weed	Exotic					1																													
Hibbertia obtusifolia	Hoary Guinea Flower	Native										2	2	2	2																					
Hibiscus heterophyllus subsp. heterophyllus	Native Rosella	Native																														3				
Hibiscus sturtii	Hill Hibiscus	Native																	1																	
Hovea linearis	-	Native												2																						
Hydrocotle spp.	-	Native																																		1
Hypericum gramineum	-	Native																											1							
Hypochaeris radicata	Catsear	Exotic	1					1				2	1	2																						
Imperata cylindrica	Blady Grass	Native										4	4									3														
Indigofera australis	Australian Indigo	Native																						2	1											
Isolepis inundata	Club-rush	Native			3	1																														
Isopogon dawsonii	Nepean Conebush	Native												3																						
Jacksonia scoparia	Dogwood	Native										2																				2				
Jasminum volubile	-	Native																										1					1			
Juncus bufonius	Toad Rush	Native			2																															
Juncus polyanthemus	-	Native									4				1																					
Juncus spp.	-	Native					1						1																1			1			1	
Juncus usitatus	-	Native																1						1												
Lactuca sp.	Lettuce	Exotic		1																																
Laxmannia gracilis	Slender Wire Lily	Native													1		1	1	1					1												
Lepidosperma laterale	Variable Sword-sedge	Native																														2				
Leptospermum polyanthum	-	Native						1																												
Leptospermum spp.	Tea-tree	Native					2																													
Leucopogon muticus	Blunt Beard-heath	Native													1																1					
Lobelia purpurascens	-	Native			3				3									1				1			1				3			1	3			2
Lomandra filiformis	-	Native						2	2						2	1	1		1	2	1	2		2	2	1	1	3	2	1		1	1	1	2	2
Lomandra leucocephala	Woolly Mat-rush	Native													1	1			2		2		2			2					1					

Scientific name	Common name	Exotic	V1 A1	V1 A2	V1 B1	V1 B2	V1 B3	V2 A1	V2 B1	V2 B2	V3 B1	V5 B1	V5 B2	V5 B3	V5 B4	V6A 1c	V6 A3	V6 B1	V6 B1c	V6 B2	V6 B2c	V6 B3	V6 B4	V9 A1	V9 B1	V9 B2	V10 A1	V10 A2	V10 B1	V10 B3	V11 B1	V11 B2	V13 B1	V14 A1	V14 B1	V14 B2
Lomandra longifolia	Spiny-headed Mat-rush	Native			3	2						3	3	3																		2			
Lomandra multiflora	Many-flowered Mat-rush	Native										3	1	3	2		2		1						1	2	1		1	1					
Lomandra spp.	Mat-rush	Native													1																				
Ludwigia peploides	Water Primrose	Native									2																								
Lysimachia arvensis	Scarlet Pimpernel	Exotic		1	1			2	2		1	1						1									1						2	1	1
Lysimachia minima	Kause Chaffweed	Exotic	2			1	2			1																									
Macrozamia flexuosa	-	Native																						1											
Macrozamia reducta	-	Native																							2			1							
Maireana microphylla	Small-leaf Bluebush	Native														1																		2	
Marsdenia viridiflora	Native Pear	Native																	2																
Maytenus silvestris	Narrow-leaved Orangebark	Native																									1	1							
Medicago spp.	-	Exotic						1																											
Megathyrsus maximus	-	Exotic	4				2				1																								
Melaleuca decora	-	Native																3	2	3	3	3	2	3	2		4	3	3		3	2			
Melaleuca thymifolia	Thyme Honey-myrtle	Native									2																								
Melia azedarach	White Cedar	Native	1				2		1	2		2																					2	1		1
Melinis repens	Red Natal Grass	Exotic													2																				
Microlaena stipoides	Weeping Grass	Native				4	3	4		3		3	2	4										2				3			1	3	3		5
Modiola caroliniana	Red-flowered Mallow	Exotic	1																																
Notelaea longifolia	Large Mock-olive	Native																		1					1										
Notelaea microcarpa	Native Olive	Native														2								1		1			1		1				
Notelaea microcarpa var. microcarpa	-	Native				1			2	2		2	3	2	2		1			3	1				2	2		3	2				3	5	4	5
Notelaea venosa	Veined Mock-olive	Native																															2			
Olea europaea subsp. cuspidata	African Olive	Exotic					3		1				2							2																
Olearia elliptica	Sticky Daisy-bush	Native														2	2		3	2	2				3	3			3	2	2	4	1	2	2	3
Opercularia diphylla	Stinkweed	Native													1				1					1									1			
Oplismenus aemulus	-	Native					2																										3	2		
Oplismenus imbecillis	-	Native																										2							2
Opuntia aurantiaca	Tiger Pear	Exotic													1									1										1		1
Opuntia humifusa	Creeping Pear	Exotic												1																				1		
Opuntia stricta	Common Prickly Pear	Exotic								1		1	1		1		1		1	1	1	1	1	1	1		1				1	2			1
Oxalis perennans	-	Native						2				1																						1		
Oxalis chnoodes	-	Native				1	1		1		1		2	1	1																			1	1		1
Ozothamnus diosmifolius	Rice flower	Native																								1	3			1					

Scientific name	Common name	Exotic	V1 A1	V1 A2	V1 B1	V1 B2	V1 B3	V2 A1	V2 B1	V2 B2	V3 B1	V5 B1	V5 B2	V5 B3	V5 B4	V6A 1c	V6 A3	V6 B1	V6 B1c	V6 B2	V6 B2c	V6 B3	V6 B4	V9 A1	V9 B1	V9 B2	V10 A1	V10 A2	V10 B1	V10 B3	V11 B1	V11 B2	V13 B1	V14 A1	V14 B1	V14 B2
Pandorea pandorana	Wonga Wonga Vine	Native																													1				
Panicum effusum	Hairy Panic	Native																	1	2						1										
Panicum queenslandicum	Yadbila Grass	Native															1																	2		
Panicum simile	Two-colour Panic	Native																													2				2
Panicum spp.	Panicum	Native													2					2																
Paspalidium distans	-	Native																				1		2				1			1			1		
Pavonia hastata	-	Exotic		2		3	2		2	5			1																							
Pellaea falcata	Sickle Fern	Native																														1	1			
Persicaria decipiens	Slender Knotweed	Native			3																															
Persicaria lapathifolia	Pale Knotweed	Native			3																															
Persoonia linearis	Narrow-leaved Geebung	Native												3										1				1								
Petrorhagia nanteuilii	Proliferous Pink	Exotic						1																												
Phragmites australis	Common Reed	Native	4	2	4	1	2																													
Phyllanthus spp.	-	Native													1							1														
Pimelea latifolia	-	Native																														1				
Pimelea linifolia	Slender Rice Flower	Native										3		3	2																					
Plantago debilis	Shade Plantain	Native														1			1	1		1		1					1		1		1			
Plantago lanceolata	Lamb's Tongues	Exotic	2				1									1																				
Plantago varia	-	Native																											1							
Plectranthus spp.	-	Native																																		1
Polycarpon tetraphyllum	Four-leaved Allseed	Native										1																								
Pomaderris spp.	-	Native																										1								
Pomax umbellata	Pomax	Native																						1												
Psydrax odorata	Shiny-leaved Canthium	Native																						1		A	1		2	A						
Pteridium esculentum	Bracken	Native										2	4	2																						
Pullenia gunnii	Slender tick trefoil	Native												1		1			1						1							1	1	3			
Raphania rupestrum	-	Exotic	1	2																																
Rhytidosperma spp.	-	Native																			1		1				1									
Richardia humistrata	-	Exotic						2				3	2																							
Rumex brownii	Swamp Dock	Native		2							1																									
Rumex sagittatus	-	Native		2			1		3	1																										
Rytidosperma caespitosum	Ringed Wallaby Grass	Native																	2							1										
Salix spp.	-	Exotic	1		1																															
Santalaceae spp.	-	Native																							1										1	2
Schoenus apogon	Fluke Bogrush	Native																										1								
Scutellaria humilis	Dwarf Skullcap	Native												1		1													1			1	1	1	2
Sebaea ovata	Yellow Centaury	Native									1																									

Scientific name	Common name	Exotic	V1 A1	V1 A2	V1 B1	V1 B2	V1 B3	V2 A1	V2 B1	V2 B2	V3 B1	V5 B1	V5 B2	V5 B3	V5 B4	V6A 1c	V6 A3	V6 B1	V6 B1c	V6 B2	V6 B2c	V6 B3	V6 B4	V9 A1	V9 B1	V9 B2	V10 A1	V10 A2	V10 B1	V10 B3	V11 B1	V11 B2	V13 B1	V14 A1	V14 B1	V14 B2
Senecio madagascariensis	Fireweed	Exotic	2	1	1	1	2	1	1	1		1				1	1				1		1	1			1		1	1		1		1		1
Senecio quadridentatus	Cotton Fireweed	Native																				1														
Senecio spp.	Groundsel, Fireweed	Native																										1								
Senna barclayana	-	Native																											3		2	1				
Setaria parviflora	-	Exotic				2	3						1																							
Setaria spp.	-	Native								1																										
Setaria viridis	Green Pigeon Grass	Exotic		2					1																											
Sida corrugata	Corrugated Sida	Native														1	1		1										2			1	1	1	
Sida rhombifolia	Paddy's Lucerne	Exotic	1	1																						1									
Sigesbeckia orientalis	-	Native														1															1	1	1		1
Solanum brownii	Violet Nightshade	Native																							1								1		1
Solanum nigrum	Black-berry Nightshade	Native	1	1																															
Solanum prinophyllum	Forest Nightshade	Native																				1											1		
Solanum sp. Seedling	-	Unknown																														1			
Sonchus asper	Prickly Sowthistle	Exotic					1																												
Sonchus oleraceus	Common Sowthistle	Exotic	2	1	1				1	1		1	1									1		1			1					1			
Spartothamnella juncea	Bead Bush	Native												1		2				2					2						1	1	3	2	2
Sphaeromorphaea australis	Spreading Nut-heads	Native																															1		
Sporobolus creber	Slender Rat's Tail Grass	Native													1	2	1	2															2	2	
Sporobolus elongatus	Slender Rat's Tail Grass	Native															2																		
Stackhousia viminea	Slender Stackhousia	Native															1																		
Stephania japonica	Snake vine	Native	2			3																										1			
Swainsona galegifolia	Smooth Darling Pea	Native																															1		
Tagetes minuta	Stinking Roger	Exotic							1	1		1	1																						
Taraxacum officinale	Dandelion	Exotic								1																									
Themeda triandra	-	Native																							1										
Trema tomentosa	-	Native																										1		2	3				
Tricoryne elatior	Yellow Autumn-lily	Native													1																				
Verbena bonariensis	Purpletop	Exotic	1																	1			1									1			1
Verbena rigida	Veined Verbena	Exotic			1			1												1										1				1	
Vernonia cinerea	-	Native																		1	1		1												
Veronica plebeia	Trailing Speedwell	Native													1	1							1												
Veronica plebia	-	Native							1																										
Viola hederacea	Ivy-leaved Violet	Native	1								1																								

Scientific name	Common name	Exotic	V1 A1	V1 A2	V1 B1	V1 B2	V1 B3	V2 A1	V2 B1	V2 B2	V3 B1	V5 B1	V5 B2	V5 B3	V5 B4	V6A 1c	V6 A3	V6 B1	V6 B1c	V6 B2	V6 B2c	V6 B3	V6 B4	V9 A1	V9 B1	V9 B2	V10 A1	V10 A2	V10 B1	V10 B3	V11 B1	V11 B2	V13 B1	V14 A1	V14 B1	V14 B2
Vittadinia cuneata	-	Native														1		1		1							2			1						
Vittadinia sulcata	-	Native															1																		2	
Vulpia bromoides	Squirrel Tail Fesque	Exotic							2																											
Wahlenbergia communis	Tufted Bluebell	Native																											2							1
Wahlenbergia gracilis	Sprawling Bluebell	Native									1			1								1														
Wahlenbergia spp.	Bluebell	Native													1																					

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2.2 Floristic monitoring plot photographs

A photograph has been taken at the start and end of the 50 m central transect of each biometric monitoring plot. Plot photos for each respective vegetation type are presented below.

2.2.1 River Red Gum / River Oak riparian woodland wetland in the Hunter Valley

Plate 1: V1-A1 – start

Plate 2: V1-A1 – end

Plate 3: V1-A2 – start

Plate 4: V1-A2 – end

Plate 5: V1-B1 – start

Plate 6: V1-B1 – end

Plate 7: V1-B2 – start

Plate 8: V1-B2 – end

Plate 9: V1-B3 – start

Plate 10: V1-B3 – end

Plate 11: V2-A1 – start

Plate 12: V2-A1 – end

Plate 13: V2-B1 – start

Plate 14: V2-B1 end

Plate 15: V2-B2 – start

Plate 16: V2-B2 – end

Plate 17: V3-B1 – start

Plate 18: V3-B1 – end

2.2.2 Rough-barked Apple - Narrow-leaved Ironbark - Blakely's Red Gum - Bull Oak - Coast Banksia woodland on sands of the Warkworth area

Plate 19: V5-B1 – start

Plate 20: V5-B1 – end

Plate 21: V5-B2 – start

Plate 22: V5-B2 – end

Plate 23: V5-B3 – start

Plate 24: V5-B3 – end

Plate 25: V5-B4 – start

Plate 26: V5-B4 – end

2.2.3 Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter

Plate 27: V6-A1c – start

Plate 28: V6-A1c – end

Plate 29: V6-A3 – start

Plate 30: V6-A3 – end

Plate 31: V6-B1 – start

Plate 32: V6-B1 – end

Plate 33: V6-B1c – start

Plate 34: V6-B1c – end

Plate 35: V6-B2 – start

Plate 36: V6-B2 – end

Plate 37: V6-B2c – start

Plate 38: V6-B2c – end

Plate 39: V6-B3 – start

Plate 40: V6-B3 – end

Plate 41: V6-B4 – start

Plate 42: V6-B4 – end

Plate 43: V11–B1 – start

Plate 44: V11-B1 – end

Plate 45: V11-B2 – start

Plate 46: V11-B2 – end

2.2.4 Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter

Plate 47: V9-A1 – start

Plate 48: V9-A1 – end

Plate 49: V9-B1 – start

Plate 50: V9-B1 – end

Plate 51: V9-B2 – start

Plate 52: V9-B2 – end

Plate 53: V10-B1 – start

Plate 54: V10-B1 – end

2.2.5 Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion

Plate 55: V10-A1 – start

Plate 56: V10-A1 – end

Plate 57: V10-A2 – start

Plate 58: V10-A2 – end

Plate 59: V10-B3 – start

Plate 60: V10-B3 – end

2.2.6 White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley

Plate 61: V13-B1 – start

Plate 62: V13-B1 – end

2.2.7 Brush Wilga/Native Olive Shrubland

Plate 63: V14-A1 – start

Plate 64: V14-A1 – end

Plate 65: V14-B1 – start

Plate 66: V14-B1 – end

Plate 67: V14-B2 – start

Plate 68: V14-B2 – end

2.2.8 Groundwater Dependent Ecosystems

Plate 69: GDE P1 – start

Plate 70: GDE P1 – end

Plate 71: GDE P2 – start

Plate 72: GDE P2 – end

2.3 Floristic monitoring point photographs

2.3.1 RWEA Photo monitoring points

Plate 73: A1 – 2013

Plate 74: A1 – 2024

Plate 75: A2 – 2013

Plate 76: A2 – 2024

Plate 77: A3 – 2013

Plate 78: A3 – 2024

Plate 79: A4 – 2013

Plate 80: A4 – 2024

Plate 81: B1 – 2013

Plate 82: B1 – 2024

Plate 83: B2 – 2013

Plate 84: B2 – 2024

Plate 85: C1 – 2013

Plate 86: C1 – 2024

Plate 87: C2 – 2013

Plate 88: C2 – 2024

Plate 89: CT1 – 2013

Plate 90: CT1 – 2024

Plate 91: CT2 – 2013

Plate 92: CT2 – 2024

Plate 93: D1 – 2013

Plate 94: D1 – 2024

2.3.2 South Bates Extension plot photos

Plate 95: SBX1-SG-I – 2024

Plate 96: SBX2-GB-I – 2024

Plate 97: SBX3-SG-C - 2024

Plate 98: SBX4-GB-C – 2024

2.3.3 Groundwater Dependent Ecosystems

Plate 99: GDE M1 – 2024

Plate 100: GDE M2 – 2024

Plate 101: GDE M3 - 2024

Plate 102: GDE M4 – 2024

Plate 103: GDE M5 – 2024

Plate 104: GDE M6 – 2024

Plate 105: GDE M7 - 2024

Plate 106: GDE M8 – 2024

2.3.4 North Wambo Creek Diversion plot photos

Plate 107: NWCD1 – 2024

Plate 108: NWCD2 – 2024

3. Groundwater Dependent Ecosystem Tree Monitoring

3.1 GDE Trees photographs

Plate 109: GDE Tree 1 - 2024

Plate 110: GDE Tree 2 - 2024

Plate 111: GDE Tree 3 - 2024

Plate 112: GDE Tree 4 - 2024

Plate 113: GDE Tree 5 - 2024

Plate 114: GDE Tree 6 - 2024

Plate 115: GDE Tree 7 - 2024

Plate 116: GDE Tree 8 - 2024

Plate 117: GDE Tree 9 – 2024

Plate 118: GDE Tree 10 – 2024

Plate 119: GDE Tree 11 – 2024

Plate 120: GDE Tree 12 – 2024

Plate 121: GDE Tree 13 – 2024

Plate 122: GDE Tree 14 - 2024

Plate 123: GDE Tree 15 – 2024

Plate 124: GDE Tree 16 - 2024

Plate 125: GDE Tree 17 – 2024

Plate 126: GDE Tree 18 - 2024

Plate 127: GDE Tree 19 – 2024

Plate 128: GDE Tree 20 - 2024

Plate 129: GDE Tree 21 – 2024

Plate 130: GDE Tree 22 – 2024

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Plate 131: GDE Tree 23 – 2024

Plate 132: GDE Tree 24 – 2024

Plate 133: GDE Tree 25 – 2024

Plate 134: GDE Tree 26 – 2024

Plate 135: GDE Tree 27 – 2024

Plate 136: GDE Tree 28 – 2024

Plate 137: GDE Tree 29 – 2024

Plate 138: GDE Tree 30 - 2024

5. Riparian condition assessment

5.1 Riparian condition data

Table 4: 2024 Riparian condition scores

Site	Habitat	Cover	Natives	Debris	Features	Total
Maximum Score	**11**	**12**	**9**	**10**	**8**	**50**
North Wambo 1	3.25	7.75	5.25	7.5	4	30
North Wambo 2	5	8	4.5	5.25	4.25	34.37
North Wambo 3	4	9.75	6.5	7.5	4.75	33.75
Wambo 1	2.25	6.75	3.5	5	4	21.5
Wambo 2	1.75	6.75	3	5.75	4.25	21.5
Wambo 3	9.5	6.75	2.5	6.5	4.75	30
Stony Creek 1	1	8	5	6	4.75	24.75
Stony Creek 2	4	8.5	5.25	6.75	4.25	28.75
Stony Creek 3	6	10.75	7.75	7.75	5.25	37.5

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5.2 Riparian condition assessment photographs

5.2.1 North Wambo Creek

Plate 139: North Wambo Creek 1 - 8a (2024)

Plate 140: North Wambo Creek 1 - 7a (2024)

Plate 141: North Wambo Creek 1 - 6a (2024)

Plate 142: North Wambo Creek 1 - 5a (2024)

Plate 143: North Wambo Creek 2 – 1a (2024)

Plate 144: North Wambo Creek 2 - 2a (2024)

Plate 145: North Wambo Creek 2 - 3a (2024)

Plate 146: North Wambo Creek 2 - 4a (2024)

Plate 147: North Wambo Creek 3 – 20a (2024)

Plate 148: North Wambo Creek 3 - 19a (2024)

Plate 149: North Wambo Creek 3 - 18a (2024)

Plate 150: North Wambo Creek 3 - 17a (2024)

5.2.2 Wambo Creek Riparian condition assessment

Plate 151: Wambo Creek 1 – 28a (2024)

Plate 152: Wambo Creek 1 - 27a (2024)

Plate 153: Wambo Creek 1 – 26a (2024)

Plate 154: Wambo Creek 1 - 25a (2024)

Plate 155: Wambo Creek 2 – 29a (2024)

Plate 156: Wambo Creek 2 - 30a (2024)

Plate 157: Wambo Creek 2 - 31a (2024)

Plate 158: Wambo Creek 2 - 32a (2024)

Plate 159: Wambo Creek 3 - 33a (2024)

Plate 160: Wambo Creek 3 – 34a (2024)

Plate 161: Wambo Creek 3 - 35a (2024)

Plate 162: Wambo Creek 3 - 36a (2024)

5.2.3 Stony Creek Riparian condition assessment

Plate 163: Stony Creek 1 – 24a (2024)

Plate 164: Stony Creek 1 - 23a (2024)

Plate 165: Stony Creek 1 - 22a (2024)

Plate 166: Stony Creek 1 - 21a (2024)

Plate 167: Stony Creek 2 – 13a (2024)

Plate 168: Stony Creek 2 - 14a (2024)

Plate 169: Stony Creek 2 - 15a (2024)

Plate 170: Stony Creek 2 - 16a (2024)

Plate 171: Stony Creek 3 – 12a (2024)

Plate 172: Stony Creek 3 - 11a (2024)

Plate 173: Stony Creek 3 - 10a (2024)

Plate 174: Stony Creek 3 - 9a (2024)

6. Bird monitoring

6.1 Winter and spring bird monitoring data

An outline of bird monitoring data for winter and spring 2024 is presented in Table 5 below.

Table 5: Species and total count of individual birds recorded over two site visits during spring 2024 surveys

Scientific name	Common name	BP01	BP02	BP03	BP04	BP05	BP06	BP07	BP08	BP09	BP10	BP11	BP12	BP13	BP14	BP15	BP16	BP17	BP18	BP19	BP20	BP21	BP22	BP23	BP24	BP25	BP26	BP27	BP28	BP29	BP30
Tachybaptus novaehollandiae	Australasian Grebe																										**3**				**1**
Gymnorhina tibicen	Australian Magpie						2											1	1	2											
Corvus coronoides	Australian Raven	1		4	1		1		3					1			1	3	3	1		1		3	1	1	1	1			
Geopelia humeralis	Bar-shouldered Dove																	2	2					1							
Manorina melanophrys	Bell Miner								16			4																3			
Coracina novaehollandiae	Black-faced Cuckoo-shrike	3				1	4			5			1			1		1	1	1					2				2		1
Elanus axillaris	Black-shouldered Kite			1																											
Macropygia phasianella	Brown cuckoo-dove								1																						
Acanthiza pusilla	Brown Thornbill								2	1			4		5		4			2	1	2	4					4	2	6
Climacteris picumnus	Brown Treecreeper							4																							
Melithreptus brevirostris	Brown-headed Honeyeater	2									2	5	5			5	1					4					9	5			2
Acanthiza reguloides	Buff-rumped Thornbill				2	12	2						2			10	2	2	2	2				5	5				12		6
Edolisoma tenuirostris	Cicadabird																				1										
Artamus cyanopterus	Dusky Woodswallow									8																					
Platycercus eximius	Eastern Rosella											1						4	4												
Acanthorhynchus tenuirostris	Eastern Spinebill								1																						
Psophodes olivaceus	Eastern Whipbird								3	3		5									4	1						1			
Eopsaltria australis	Eastern Yellow Robin											2	3				2				1	5				2			1		1
Cacomantis flabelliformis	Fan-tailed Cuckoo							1					1	1																	
Pachycephala pectoralis	Golden Whistler									2		1									3	1									
Cracticus torquatus	Grey Butcherbird				1									1													1		2		

Scientific name	Common name	BP01	BP02	BP03	BP04	BP05	BP06	BP07	BP08	BP09	BP10	BP11	BP12	BP13	BP14	BP15	BP16	BP17	BP18	BP19	BP20	BP21	BP22	BP23	BP24	BP25	BP26	BP27	BP28	BP29	BP30
Rhipidura albiscapa	Grey Fantail			1	1	2				1		3		2						1	1	3	2	1	1			3			
Colluricincla harmonica	Grey Shrike-thrush		1						1	1	1	1	1			1		1	1		2					1	1				
Pomatostomus temporalis temporalis	Grey-crowned Babbler							1																		2			4		
Chalcites basalis	Horsfield's Bronze-Cuckoo																					1									
Microeca fascinans	Jacky Winter							1																							
Dacelo novaeguineae	Laughing Kookaburra														1	2					1				1			1			
Myiagra rubecula	Leaden Flycatcher								1			1																			
Meliphaga lewinii	Lewin's Honeyeater								3			3										1						2			
Grallina cyanoleuca	Magpie-lark																	2	2												
Dicaeum hirundinaceum	Mistletoebird							1																		2				3	2
Glossopsitta concinna	Musk Lorikeet										2																				
Falco cenchroides cenchroides	Nankeen Kestrel	1																													
Philemon corniculatus	Noisy Friarbird				2	1			3	2		2		5		2	2	1	1	3	6	2	5	1	2				2		2
Manorina melanocephala	Noisy Miner	5		5														4	4	6									5		
Oriolus sagittatus	Olive-backed Oriole								2	6				1		1					1			1	1	4		2		2	
Anas superciliosa	Pacific Black Duck																										1				
Geopelia striata	Peaceful Dove						1													1											
Cracticus nigrogularis	Pied Butcherbird	1			1											1		1	1												
Strepera graculina	Pied Currawong		1					1					1				2					2			1				4		
Porphyrio porphyrio	Purple Swamphen																	2	2												
Merops ornatus	Rainbow Bee-eater			2	2																										
Anthochaera carunculata	Red Wattlebird																								1						
Neochmia temporalis	Red-browed Finch	10					5									5		5	5	5								2			

Scientific name	Common name	BP01	BP02	BP03	BP04	BP05	BP06	BP07	BP08	BP09	BP10	BP11	BP12	BP13	BP14	BP15	BP16	BP17	BP18	BP19	BP20	BP21	BP22	BP23	BP24	BP25	BP26	BP27	BP28	BP29	BP30
Psephotus haematonotus	Red-rumped Parrot																	2	2												
Myiagra inquieta	Restless Flycatcher																											1			
Rhipidura rufifrons	Rufous Fantail																			2									2		
Pachycephala rufiventris	Rufous Whistler			2	1	2	3	6	9	7	5	7	4	7	3	6	11				3	5	2	2	4	6	5	10	4	4	9
Chalcites lucidus	Shining Bronze-Cuckoo		1					2																							
Zosterops lateralis	Silvereye	6		5	10						10	28	10	5	10						25	8	14				6	9	6		15
Chthonicola sagittata	Speckled Warbler												1			1				5											
Pardalotus punctatus	Spotted Pardalote									1	1	1				5	1											1			
Pardalotus striatus	Striated Pardalote	2	1		3				1			1		2	1		1	3	3		5	2			6			2			
Acanthiza lineata	Striated Thornbill													1														4			
Plectorhyncha lanceolata	Striped Honeyeater	1																4	4												
Cacatua galerita	Sulphur-crested Cockatoo		1																20				1								
Malurus cyaneus	Superb Fairy-wren	23	5	19		5	5				8	6	2	2		5		25	5	5			5	10	16		2	2			2
Menura novaehollandiae	Superb Lyrebird								1																					1	1
Daphoenositta chrysoptera	Varied Sittella								4														9								
Malurus lamberti	Variegated Fairy-wren					4	2				4				4		5					9									
Aquila audax	Wedge-tailed Eagle	1							2			1					2			1							1				
Smicrornis brevirostris	Weebill				7	2	7							8	12		4					16							15	2	4
Hirundo neoxena	Welcome Swallow	1																													
Sericornis frontalis	White-browed Scrubwren											1					1	5	5		5										
Nesoptilotis leucotis	White-eared Honeyeater		1								4																				1
Egretta novaehollandiae	White-faced Heron																										1				

Scientific name	Common name	BP01	BP02	BP03	BP04	BP05	BP06	BP07	BP08	BP09	BP10	BP11	BP12	BP13	BP14	BP15	BP16	BP17	BP18	BP19	BP20	BP21	BP22	BP23	BP24	BP25	BP26	BP27	BP28	BP29	BP30
Melithreptus lunatus	White-naped honeyeater								6																			2			
Ptilotula penicillata	White-plumed Honeyeater							2															5			8	3				
Gerygone olivacea	White-throated Gerygone			1				1		2				1												1	1				
Cormobates leucophaea	White-throated Treecreeper							1	3			1			3		1				1	2	1					1	1		1
Corcorax melanorhamphos	White-winged Chough			5			5											5	5	5				6		3	4				
Rhipidura leucophrys	Willie Wagtail	1		3				2	2	1		3						3	3		2			1	2	3	3				
Acanthiza nana	Yellow Thornbill		6	21	2	2	2						2		6	2	6			5	4		5	5				3	5		8
Caligavis chrysops	Yellow-faced Honeyeater		2	8	15	8	1		10	1	27	7	10	13	3	6	10					15	5				2	9	6	4	12
Acanthiza chrysorrhoa	Yellow-rumped Thornbill																			5											
Zanda funerea	Yellow-tailed Black-Cockatoo								10									1	1							1					
Lichenostomus melanops	Yellow-tufted Honeyeater									11																					

Bold denotes threatened species

APPENDIX F

SURFACE WATER MONITORING DATA SUMMARY

Site	Date	pH	EC (µS/cm)	TSS (mg/L)	Comments
SW01	5 January	7.53	957	<5	Suspended fines
SW01	28 February	7.10	962	<5	Suspened fines
SW01	28 March	7.55	936	<5	Suspended fines
SW01	5 April	7.07	989	7	Suspended fines
SW01	7 May	7.0	667	22	Significantly higher water level. Suspended fines
SW01	3 June	6.4	474	8	Suspened fines. pH checked
SW01	29 July	7.4	584	<5	Suspended fines
SW01	28 August	7.48	605	29	pH checked. Changes to sampling point. Susp fines/solids
SW01	27 September	7.22	767	<5	Suspended fines
SW01	29 October	7.63	744	<5	-
SW01	21 November	7.55	800	<5	-
SW01	17 December	7.59	902	<5	Suspended fines
SW02	5 January	7.57	866	<5	Suspended fines
SW02	28 February	7.47	899	<5	Suspended fines
SW02	28 March	7.52	882	<5	Suspended fines
SW02	5 April	7.28	921	<5	Suspended fines
SW02	7 May	7.00	626	7	High water level
SW02	3 June	6.8	472	11	-
SW02	29 July	7.4	548	5	Suspended fines. Ph checked
SW02	28 August	7.49	640	<5	Suspended fines
SW02	27 September	7.40	702	<5	Suspended fines
SW02	29 October	7.53	800	<5	Suspended fine/solids. pH checked
SW02	21 November	7.63	779	<5	Suspended fines. pH checked
SW02	17 December	7.62	852	<5	Suspended solids & solids, grass seeds
SW03	5 January	-	-	-	-
SW03	28 February	-	-	-	Pool/insufficient
SW03	28 March	-	-	-	-
SW03	5 April	7.97	2360	73	EC and pH checked
SW03	7 May	7.0	545	10	High water level
SW03	3 June	6.9	472	8	
SW03	29 July	7.3	555	<5	-
SW03	28 August	7.42	639	<5	Low water levels. Suspended fines
SW03	27 September	7.36	720	<5	
SW03	29 October	7.47	770	5	
SW03	21 November	7.35	693	6	
SW03	17 December	7.63	898	6	Suspended solids & solids, pH checked
SW04	5 January	-	-	-	-
SW04	28 February	-	-	-	-
SW04	28 March	-	-	-	Pool/No flow
SW04	5 April	-	-	-	Dry
SW04	7 May	-	-	-	Dry
SW04	3 June	-	-	-	Dry
SW04	29 July	-	-	-	Dry
SW04	28 August	-	-	-	Dry
SW04	27 September	-	-	-	Dry

Site	Date	pH	EC (µS/cm)	TSS (mg/L)	Comments
SW04	29 October	-	-	-	Dry
SW04	21 November	-	-	-	Dry
SW04	17 December	-	-	-	Dry
SW05	5 January	-	-	-	No flow. Photos taken
SW05	28 February	-	-	-	Dry
SW05	28 March	-	-	-	Dry
SW05	5 April	7.54	342	-	Suspended fines/seeds
SW05	7 May	-	-	-	No Flow
SW05	3 June	-	-	-	Pool/No Flow
SW05	29 July	-	-	-	Pool/No Flow
SW05	28 August	-	-	-	-
SW05	27 September	-	-	-	-
SW05	29 October	-	-	-	Dry
SW05	21 November	-	-	-	Dry
SW05	17 December	-	-	-	Dry
SW06	5 January	-	-	-	No flow. Photos taken
SW06	28 February	-	-	-	Dry
SW06	28 March	-	-	-	Dry
SW06	5 April	-	-	-	Dry
SW06	7 May	7.1	211	<5	Suspended fines/solids. High water level
SW06	3 June	7.0	291	<5	-
SW06	29 July	7.1	333	<5	pH checked
SW06	28 August	7.05	330	<5	Orange suspension fines
SW06	27 September	6.98	350	<6	Suspension orange fines
SW06	29 October	-	-	-	Dry
SW06	21 November	-	-	-	Dry
SW06	17 December	-	-	-	Dry
SW07	30 January	-	-	-	No flows. Photos taken
SW07	28 February	-	-	-	Pool
SW07	28 March	-	-	-	Pool/no flow
SW07	5 April	7.53	683	18	Susp fines
SW07	7 May	7.0	259	6	High Water Level
SW07	3 June	6.9	291	7	-
SW07	29 July	7.1	683	<5	-
SW07	28 August	7.23	710	<5	Susp fines
SW07	27 September	7.13	687	<5	No Flow
SW07	29 October	7.36	707	<5	No Flow
SW07	21 November	7.53-	779	7	Pool/No flow. Sups. Fines and solids
SW07	17 December	-	-	-	Maintenance required. Unsafe to sample
SW08	30 January	-	-	-	No safe access. Photos taken
SW08	28 February	-	-	-	Dry
SW08	28 March	-	-	-	Dry
SW08	5 April	-	-	-	Unsafe access due to soft ground
SW08	7 May	-	-	-	Unsafe access due to soft ground
SW08	3 June	-	-	-	No access on track

Site	Date	pH	EC (µS/cm)	TSS (mg/L)	Comments
SW08	29 July	8.1	2030	<5	Susp fines
SW08	28 August	8.04	2580	<5	Susp fines/solids
SW08	27 September	-	-	-	No access. Track too wet
SW08	29 October	-	-	-	Dry
SW08	21 November	-	-	-	Dry
SW08	17 December	-	-	-	Dry
SW27a	30 January	-	-	-	No flow. Photos taken
SW27a	28 February	-	-	-	Dry
SW27a	28 March	-	-	-	Dry
SW27a	5 April	7.56	531	154	Susp fines
SW27a	7 May	-	-	-	No flow
SW27a	3 June	7.1	1150	19	Dry
SW27a	29 July	-	-	-	Dry
SW27a	28 August	-	-	-	Dry
SW27a	27 September	-	-	-	Dry
SW27a	29 October	-	-	-	Dry
SW27a	21 November	-	-	-	Dry
SW27a	21 December	-	-	-	Dry
SW27a	17 December	-	-	-	Dry
SW32a	5 January	-	-	-	No Flow. Photos taken
SW32a	28 February	-	-	-	Dry
SW32a	28 March	-	-	-	Dry
SW32a	5 April	-	-	-	Pool/no flow
SW32a	7 May	-	-	-	No flow
SW32a	3 June	-	-	-	Poo/no flow
SW32a	29 July	-	-	-	Dry
SW32a	28 August	-	-	-	Dry
SW32a	27 September	-	-	-	Dry
SW32a	29 October	-	-	-	Dry
SW32a	21 November	-	-	-	Dry
SW32a	21 December	-	-	-	Dry
SW32a	17 December	-	-	-	Dry
SW39	5 January	-	-	-	No Flow. Photos taken
SW39	28 February	-	-	-	Dry
SW39	28 March	-	-	-	Dry
SW39	5 April	-	-	-	Pool/no flow
SW39	7 May	-	-	-	No flow
SW39	3 June	-	-	-	Pool/no flow
SW39	29 July	-	-	-	No flow/pool
SW39	28 August	-	-	-	Dry
SW39	27 September	-	-	-	Dry
SW39	29 October				Dry
SW39	21 November				Dry
SW39	21 December				Dry
SW39	17 December	-	-	-	Dry

Site	Date	pH	EC (µS/cm)	TSS (mg/L)	Comments
SW40	5 January	-	-	-	No Flow. Photos taken
SW40	28 February	-	-	-	Pool
SW40	28 March	-	-	-	Pool
SW40	5 April	-	-	-	Pool/No flow
SW40	7 May	6.8	529	11	Significantly higher water level
SW40	3 June	7.2	478	8	Suspended fines
SW40	29 July	-	-	-	No flow
SW40	28 August	-	-	-	No access
SW40	27 September	-	-	-	Pool
SW40	29 October	-	-	-	No Flow. No access
SW40	21 November	-	-	-	Pool/No flow
SW40	17 December	-	-	-	No Flow
SW41	5 January	-	-	-	Pool. Photos taken
SW41	28 February	-	-	-	Dry
SW41	28 March	-	-	-	Dry
SW41	5 April	-	-	-	Pool/No flow
SW41	7 May	7.2	216	95	
SW41	3 June	7.1	100	26	High water level
SW41	29 July	-	-	-	Pool
SW41	28 August	-	-	-	Pool
SW41	27 September	-	-	-	Pool
SW41	29 October	-	-	-	Pool
SW41	21 November	-	-	-	Pool/No Flow
SW41	17 December	-	-	-	Dry
US FM1	5 January	-	-	-	Dry. Photos taken
US FM1	28 February	-	-	-	Dry
US FM1	28 March	-	-	-	Dry
US FM1	5 April	-	-	-	Dry
US FM1	7 May	7.3	558	<5	Dry
US FM1	3 June	7.3	541	<5	Dry
US FM1	29 July	7.5	716	<5	Dry
US FM1	28 August	-	-	-	Pool
US FM1	27 September	-	-	-	Dry
US FM1	29 October	-	-	-	Dry
US FM1	21 November	-	-	-	Dry
US FM1	17 December	-	-	-	Dry

APPENDIX G

ANNUAL STREAM FLOW MONITORING REPORT

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25 February 2025

Commercial-in-Confidence

Nicole Dobbins
Environmental Advisor
Wambo Coal Pty Ltd
ABN: 13 000 668 057
PMB 1
Singleton NSW 2330

Dear Nicole

Report on stream flow events along North Wambo, South Wambo and Stoney Creeks for the period 1 January to 31 December 2024.

Please find contained within this report a summary of probable flow events which occurred along North Wambo, South Wambo and Stony Creeks from and inclusive of 1 January to 31 December 2024.

1.0 Locations, Configurations and Observations

The flow monitoring network now comprises of eleven flow monitoring stations. These flow monitoring stations are distributed along the following creeks: -

- North Wambo Creek has five flow monitoring stations;
- South Wambo Creek has three flow monitoring stations, and;
- Stony Creek has two monitoring stations with an additional flow monitoring station located on a major tributary to Stony Creek.

Details of the location (**Table 1, Table 2, Figure 1** and **Figure 2**), configuration (**Table 3**) and observations (**Table 4**) for each flow monitoring station are provided below.

Table 1 Flow Station Locations

Station ID	Location	Easting	Northing
FM1	North Wambo Creek adjacent to the mine	307014	6396139
USFM1	North Wambo Creek upstream of mine	305257	6395201
FM2	Midway along old North Wambo Creek diversion	308217	6395056
FM3	Midway along new North Wambo Creek diversion	309226	6393663
FM4	North Wambo Creek upstream of the confluence of Wollombi Brook	311906	6392160
FM15	South Wambo Creek upstream of the confluence of Wollombi Brook	311561	6391008
FM16	South Wambo Creek upstream of washout of Wambo Mine Road	311279	6390673
FM9(17)	South Wambo Creek downstream	308653	6389125
FM12	Stony Creek upstream of proposed area to be mined	307711	6392744
FM14	Major tributary of Stony Creek upstream of proposed area to be mined	307723	6392242
FM13	Stony Creek downstream of proposed area to be mined	309651	6390785

Table 2 Atmospheric Pressure Correcting Station Locations

Station ID	Location	Easting	Northing
PM2	Midway along old North Wambo Creek diversion at Flow Station FM2 data logging housing	308196	6395042
PM6	South Wambo Creek upstream of washout of Wambo Mine Road inside the data logger housing for old Flow Station FM6	311253	6390711
PM8	Stony Creek upstream on the old Flow Station FM8 infrastructure	307996	6392278
PM7	Stony Creek downstream on the old Flow Station FM7 infrastructure	309400	6391443

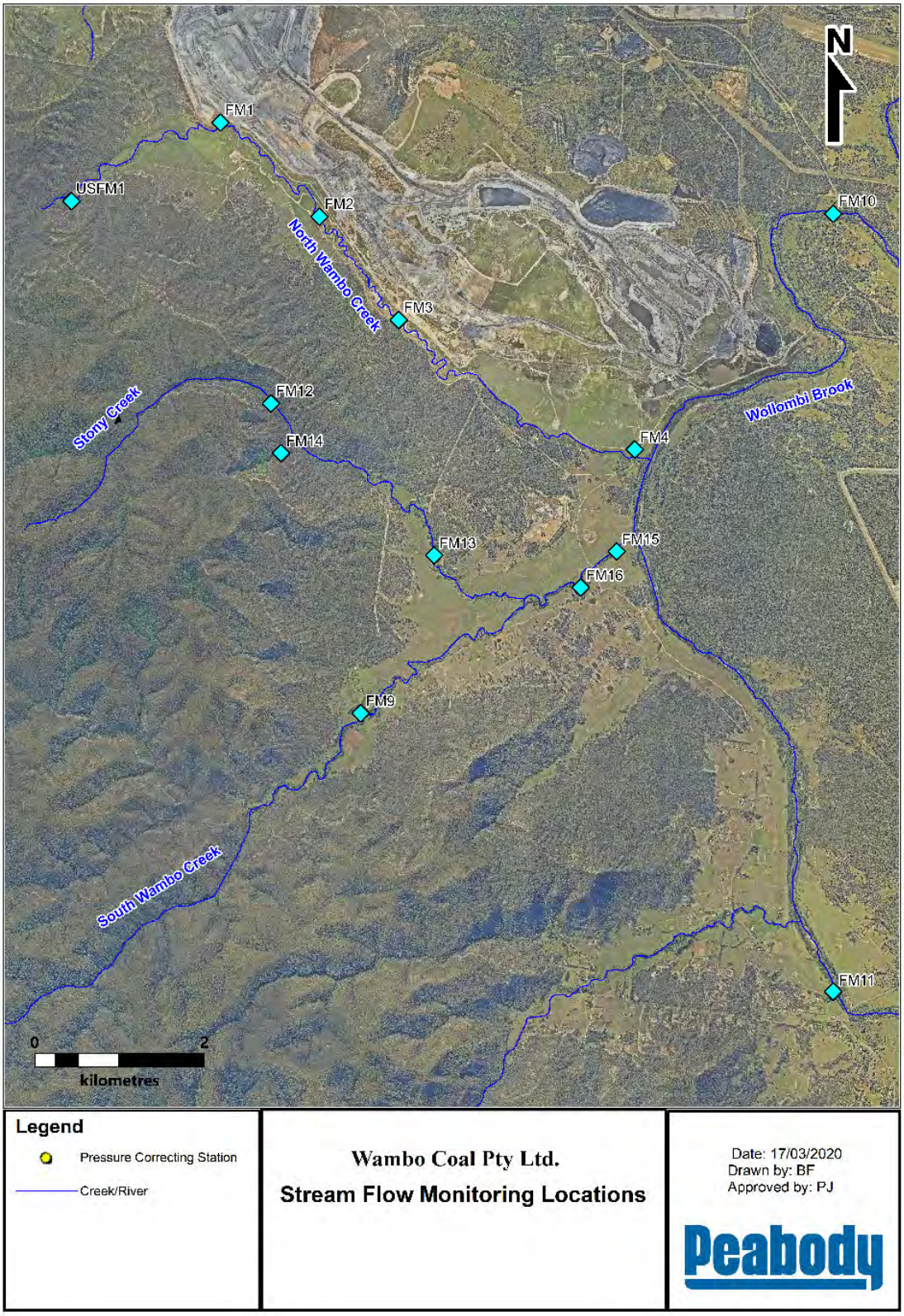

Figure 1 Stream Flow Locations

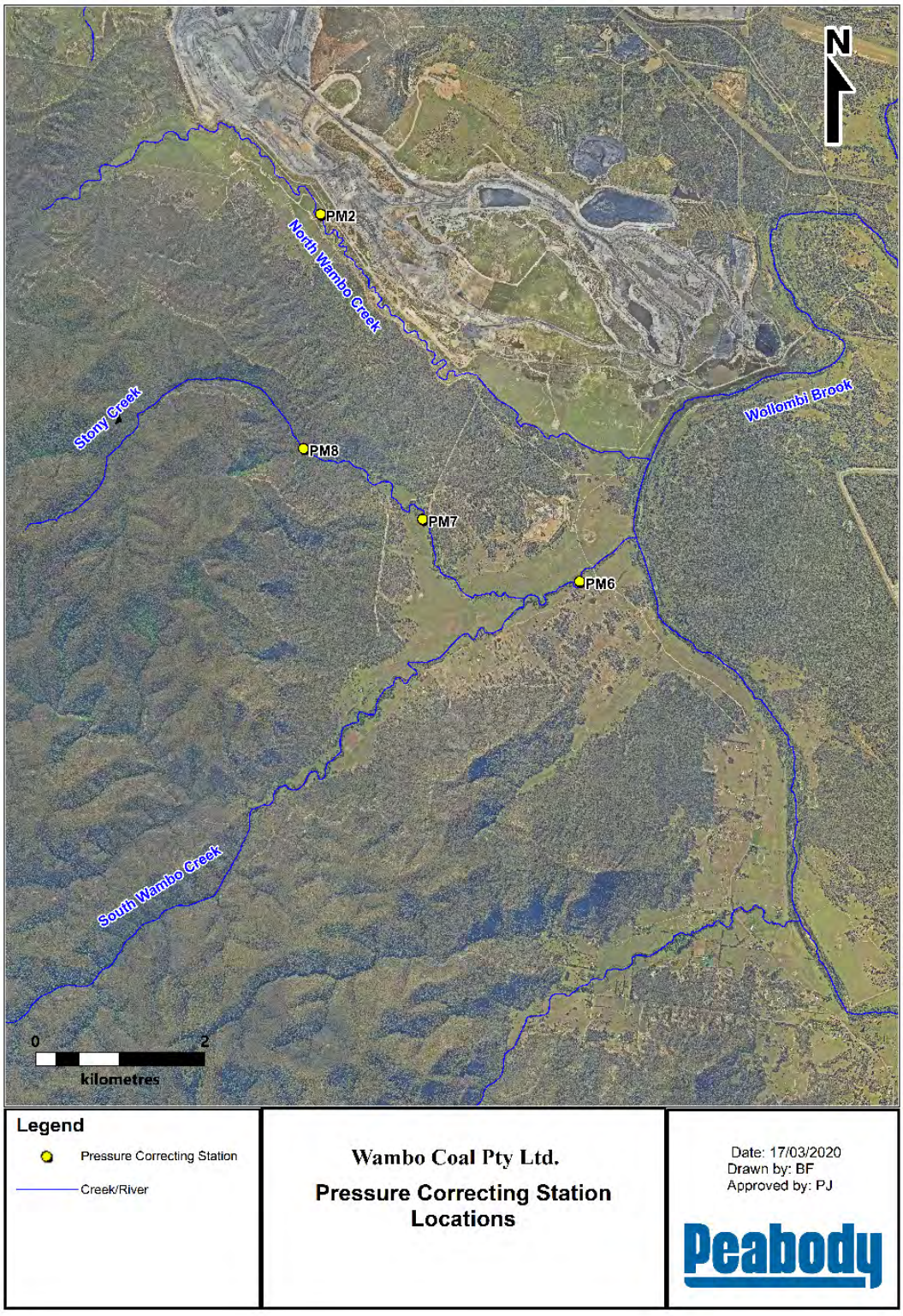

Figure 2 Pressure Correcting Station Locations

Table 3 Monitoring Location Equipment Configurations

Station ID	Equipment	Corresponding Correction Station
FM1	Campbell Scientific (CSA) CS451 SDI-12 pressure transducer connected to a CSA CR800 series data logger, powered by a 12-volt lead acid battery with solar charging. Data is logged hourly. A backup Insitu Rugged TROLL 100 absolute pressure sensor logging data at 10-minute intervals is also installed.	**PM2**
USFM1	Insitu Rugged TROLL 100 absolute pressure sensor. Data is logged at 10-minute intervals. It was found	**PM2**
FM2	CSA CS450 SDI 12 pressure transducer connected to a CSA CR200X series data logger, powered by a 12-volt lead acid battery with solar charging. Data is logged at 10-minute intervals. A backup Insitu Rugged TROLL 100 absolute pressure sensor logging data at 10-minute intervals is also installed.	**PM2**
FM3	CSA CS450 SDI 12 pressure transducer connected to a CSA CR200X series data logger, powered by a 12-volt lead acid battery with solar charging. Data is logged at 10-minute intervals. A backup Insitu Rugged TROLL 100 absolute pressure sensor logging data at 10-minute intervals is also installed.	**PM2**
FM4	CSA CS450 SDI 12 pressure transducer connected to a CSA CR200X series data logger, powered by a 12-volt lead acid battery with solar charging. Data is logged at 10-minute intervals. A backup Insitu Rugged TROLL 100 absolute pressure sensor logging data at 10-minute intervals is also installed.	**PM2**
FM15	Insitu Rugged TROLL100 absolute pressure sensor which has been configured to record data at 10-minute intervals.	**PM6**
FM16	Insitu Rugged TROLL100 absolute pressure sensor which has been configured to record data at 10-minute intervals.	**PM6**
FM9	Insitu Rugged TROLL100 absolute pressure sensor which has been configured to record data at 10-minute intervals.	**PM6**
FM12	Insitu Rugged TROLL100 absolute pressure sensor which has been configured to record data at 10-minute intervals	**PM8**
FM14	Insitu Rugged TROLL100 absolute pressure sensor which has been configured to record data at 10-minute intervals	**PM8**
FM13	Insitu Rugged TROLL100 absolute pressure sensor which has been configured to record data at 10-minute intervals	**PM7**
PM2	Insitu Rugged BaroTROLL. Data is logged at 10-minute intervals	N/A
PM6	Insitu Rugged BaroTROLL. Data is logged at 10-minute intervals	N/A
PM8	Insitu Rugged BaroTROLL. Data is logged at 10-minute intervals	N/A
PM7	Insitu Rugged BaroTROLL. Data is logged at 10-minute intervals	N/A

Table 4 Monitoring Location General Observations

Station ID	Observations
FM1	Originally located at the top of North Wambo Creek upstream of surface water monitoring site SW04; re-located approximately 300 to 400m further downstream in December 2017 – downstream of surface water monitoring site SW04. This flow station was fully re-established on 21 June 2023. The main pressure sensor recorded date throughout 2023.
USFM1	New station installed on North Wambo Creek during December 2017; located approximately 1 kilometre upstream of the original site of FM1. It was found that the sensor at this flow station had failed in the later part of 2023. A new sensor was installed 15 February 2024.
FM2	Located downstream from relocated Flow Station FM1 approximately midway along the old North Wambo Creek diversion. A backup pressure sensor was installed at this location in August 2020. Site was decommissioned while stream bank restoration work was being carried and was re-commissioned June to December 2023.
FM3	Originally located on North Wambo Creek between the old Wambo Underground Surface Infrastructure and the Open Cut Overburden: relocated in May 2013 to approximately midway along the new diversion of North Wambo Creek downstream of Flow Station FM2. A backup pressure sensor was installed at this location in August 2020. High flow events during 2022 resulted in the failure of the main pressure sensor. A new main pressure sensor was installed during June 2023.
FM4	Located at the Wambo Mine Road culvert which crosses North Wambo Creek upstream of the confluence of North Wambo Creek and Wollombi Brook. The flood event which occurred during July 2022 resulted in water entering the logger box destroying the 12V battery and the data logger. Both were replaced during the latter half of 2022.
FM15	Located on South Wambo Creek just upstream of the confluence of South Wambo Creek and Wollombi Brook; relocated to approximately 100 to 200m downstream in December 2016. High flow events in mid-2022 resulted the original site becoming non-ideal. The flow station was relocated on 21 June 2023 further upstream on South Wambo Creek GPS E 311561 N 6391008.
FM16	Located on South Wambo Creek approximately 200 to 300 metres up stream of the Single Lane Bridge. A new pressure sensor was installed on 18 May 2023 as the old sensor was approaching end of life.
FM 9(17)	Located approximately 2 kilometres upstream from its original location following a recommendation from Environmental Instrument Solutions' hydrographer. High flow events during the first half of 2022 washed away the sensor. The flow station was re-established on 18 May 2023. GPS E 308653 N 6389125.
FM12	Re-located during September 2018 approximately 50 metres downstream from its original location following a recommendation from Environmental Instrument Solutions' hydrographer
FM14	Installed in December 2015
FM13	Re-located during September 2018 approximately 50 metres upstream from its original location following a recommendation from Environmental Instrument Solutions' hydrographer. High flow events during 2021 washed away the sensor at this location. The flow station re-established in January 2022 approximately 100 to 200m further downstream of Stony Creek GPS E 309651 N 6390785
PM2	In November 2018 data collection it was identified that this BaroTROLL failed during October 2018. A replacement sensor was installed on 24 January 2019
PM6	A new BaroTROLL was installed on 18 May 2023 due to the old one was approaching end of life
PM8	N/A
PM7	N/A

2.0 Methodology

The results represent a theoretical flow and have been calculated using polynomial equations derived from theoretical flow rating curves. These theoretical flow curves were constructed from data received by AECOM from Wambo Coal and Environmental Instrument Solutions except for:

- The re-commissioned flow monitoring station FM2 on North Wambo Creek,
- Relocated Stony Creek Down FM13 flow monitoring station,
- Relocation of flow monitoring station FM15 on South Wambo and
- The relocation of the monitoring station FM9(17) on South Wambo Creek.

Theoretical flow curves generated by AECOM were utilised to calculate theoretical flow along North Wambo Creek, South Wambo Creek and Stony Creek and its tributary when probable flow events occurred.

The data for each theoretical flow rating curve has been generated from cross and long section surveys. From the surveys a cross sectional area and the wetted perimeter for various theoretical stream heights were derived.

From these derived values the hydraulic radius was calculated for each theoretical stream height. The hydraulic radius is calculated as follows:
Rh = A/P

Where:-

Rh = Hydraulic Radius

A = Calculated cross section area for a give stream height

P = Calculated wetted perimeter for a given stream height

The stream slope was calculated from the long section surveys and the Manning's coefficient of rugosity was determined from the conditions observed in the stream bed and surrounding flood plain.

These values were then entered into the Manning's equation and a theoretical stream velocity was calculated. The Manning's equation is as follows: -

$V = (Rh^{2/3} \times Sw^{1/2})/n$

Where: -

Rh = Hydraulic radius for a given stream height

Sw = Stream slope derived from the long section survey

n = Manning's coefficient of rugosity

The Manning's coefficient of rugosity was sourced from AS 3778.3.3 - 2001 *"Measurement of water flow in open channels, part 3.3: Velocity - area methods – Measurement by slope – area methods".*

The theoretical velocity, derived from the Manning's equation, was then multiplied by the calculated cross-sectional area for a given stream height to give a theoretical flow rate Q. The resultant theoretical flow rates were calculated for a series of stream heights and graphed to generate theoretical flow rating curves. **Appendix B** contains these theoretical flow rating curves for each Flow Monitoring Stations.

The data collected from each Flow Station was presented as a pressure reading in kPa. This pressure was converted to a stream height in metres using the following equation: -

Stream Height (m) = Stream Height (kPa) X 0.101972 (m/kPa)

The calculated stream height was then compared to the cease to flow point at each site. The cease to flow point was identified in conjunction with the long section surveys and represents a point in the reach/stream which the height of the stream must attain before it starts to flow.

The relative level of the cease to flow point was compared to the relative level of the sensor at each station. The difference in height between the cease to flow point and the sensor was calculated. This difference was used to screen the data collected from each station for probable flow events.

Once a flow event had been recognised at a flow monitoring station the resultant stream height was applied to the polynomial equation derived from theoretical flow rating curve, for that flow station, to give a theoretical stream flow rate for the identified flow event at the station. In some instances, more than one polynomial equation was required; see flow rating curves in **Appendix B**.

3.0 Results

Probable flow events for the period 1 January to 31 December 2024 for each flow station (including backup sensors) are presented in the following tables. An absence of a table of results for a flow station means that there were no probable flow events recorded for this period. All results displayed in respect to stream flow are theoretical and should be treated as such. Results have been rounded to a maximum of two significant figures.

- Upper North Wambo Creek – Flow Monitoring Station USFM1 (**Table 5)**;
- North Wambo Creek – Flow Monitoring Station FM2 and backup sensor FM2BU – Mid old creek diversion (**Tables 6** and **7**);
- North Wambo Creek midway along new diversion – Flow Monitoring Stations FM3 and backup sensor FM3BU - (**Tables 8** and **9**);
- North Wambo Creek – Flow Monitoring Station FM4 and backup sensor FM4BU – (**Tables 10** and **11**);
- South Wambo Creek downstream of the single lane bridge – Flow Monitoring Station FM15 (**Table 12**);
- South Wambo Creek upstream of the single lane bridge – Flow Monitoring Station FM16 (**Table 13**);
- South Wambo Creek upstream of surface water sampling site SW06 old Brossi Property - Flow Monitoring Station FM9(17) (**Table 14**);
- Stony Creek upstream of surface water sampling site SW08 and SW08b – Flow Monitoring Station FM12 (**Table 15**);
- Stony Creek Tributary upstream of surface water sampling site SW08 and SW08b – Flow Monitoring Station FM14 (**Table 16**).

Table 5 Flow Monitoring Station USFM1 Upper North Wambo Creek – Summary of Results – 1 January to 31 December 2024.

Flow Event No.	Start Date & Time	End Date & Time	Duration (Days)	Average Stream Height (m)	Maximum Stream Height (m)	Average Theoretical Flow Rate		Maximum Theoretical Flow Rate	
						m^3/s	ML/d	m^3/s	ML/d
1	5/04/2024 20:09	16/08/2024 2:29	132	0.12	0.44	0.018	1.5	1.0	91
2	16/08/2024 6:29	16/08/2024 8:59	0.1	0.0024	0.006	0.00035	0.03	0.00075	0.065
3	18/08/2024 8:29	30/08/2024 9:59	12	0.071	0.15	0.0038	0.33	0.029	2.5
4	31/08/2024 6:29	18/09/2024 20:19	19	0.06	0.097	0.00083	0.072	0.0047	0.41
5	19/09/2024 1:49	19/09/2024 15:59	0.59	0.018	0.035	0.0011	0.092	0.0012	0.1
6	20/09/2024 6:39	20/09/2024 13:49	0.3	0.0064	0.027	0.00068	0.059	0.0012	0.1
7	21/09/2024 5:59	21/09/2024 13:49	0.33	0.011	0.034	0.0009	0.078	0.0012	0.1

Table 6 Flow Monitoring Station FM2 North Wambo Creek – Summary of Results – 1 January to 31 December 2024.

Flow Event No.	Start Date & Time	End Date & Time	Duration (Days)	Average Stream Height (m)	Maximum Stream Height (m)	Average Theoretical Flow Rate		Maximum Theoretical Flow Rate	
						m^3/s	ML/d	m^3/s	ML/d
1	4/01/2024 17:00	4/01/2024 20:20	0.14	0.019	0.044	0.007	0.61	0.021	1.8
2	5/04/2024 19:10	6/04/2024 6:10	0.46	0.033	0.055	0.015	1.3	0.029	2.5
3	6/05/2024 7:10	6/05/2024 9:50	0.11	0.0035	0.007	0.00086	0.074	0.0018	0.16
4	1/06/2024 17:00	1/06/2024 21:10	0.17	0.0065	0.011	0.025	2.2	0.043	3.7
5	2/06/2024 3:00	2/06/2024 11:20	0.35	0.0041	0.0058	0.017	1.5	0.023	2.0

Table 7 Flow Monitoring Station FM2BU North Wambo Creek – Summary of Results – 1 January to 31 December 2024.

Flow Event No.	Start Date & Time	End Date & Time	Duration (Days)	Average Stream Height (m)	Maximum Stream Height (m)	Average Theoretical Flow Rate		Maximum Theoretical Flow Rate	
						m^3/s	ML/d	m^3/s	ML/d
1	4/01/2024 16:07	4/01/2024 22:37	0.27	0.021	0.058	0.0084	0.72	0.031	2.7
2	5/04/2024 19:27	6/04/2024 4:07	0.36	0.034	0.073	0.0062	0.53	0.046	4.0

Table 8 Flow Monitoring Station FM3 North Wambo Creek Mid New Diversion – Summary of Results – 1 January to 31 December 2024.

Flow Event No.	Start Date & Time	End Date & Time	Duration (Days)	Average Stream Height (m)	Maximum Stream Height (m)	Average Theoretical Flow Rate		Maximum Theoretical Flow Rate	
						m^3/s	ML/d	m^3/s	ML/d
1	4/01/2024 15:00	4/01/2024 23:10	0.34	0.052	0.17	0.04	3.5	0.21	18
2	20/02/2024 10:30	20/02/2024 12:40	0.09	0.022	0.049	0.012	1.0	0.029	2.5
3	6/05/2024 0:00	6/05/2024 10:40	0.44	0.015	0.039	0.0074	0.64	0.022	1.9
4	6/05/2024 14:10	6/05/2024 17:00	0.12	0.0027	0.0049	0.0012	0.1	0.0022	0.19
5	11/05/2024 18:30	12/05/2024 1:20	0.28	0.011	0.02	0.0051	0.44	0.0096	0.83
6	1/06/2024 7:00	1/06/2024 17:40	0.44	0.013	0.025	0.0059	0.51	0.013	1.1
7	1/06/2024 23:50	2/06/2024 6:30	0.28	0.0018	0.0041	0.0008	0.07	0.0018	0.16
8	27/07/2024 9:50	27/07/2024 13:40	0.16	0.0043	0.011	0.0019	0.17	0.0048	0.41
9	18/10/2024 19:30	18/10/2024 22:50	0.14	0.014	0.032	0.0066	0.57	0.017	1.4
10	19/10/2024 19:20	19/10/2024 22:40	0.14	0.017	0.037	0.0083	0.72	0.02	1.7
11	13/11/2024 15:10	13/11/2024 16:00	0.035	0.011	0.02	0.0049	0.42	0.0099	0.85

Table 9 Flow Monitoring Station FM3BU North Wambo Creek New Old Diversion – Summary of Results – 1 January to 31 December 2024.

Flow Event No.	Start Date & Time	End Date & Time	Duration (Days)	Average Stream Height (m)	Maximum Stream Height (m)	Average Theoretical Flow Rate		Maximum Theoretical Flow Rate	
						m^3/s	ML/d	m^3/s	ML/d
1	4/01/2024 15:39	5/01/2024 14:19	0.94	0.035	0.19	0.027	2.3	0.26	23

Flow Event No.	Start Date & Time	End Date & Time	Duration (Days)	Average Stream Height (m)	Maximum Stream Height (m)	Average Theoretical Flow Rate		Maximum Theoretical Flow Rate	
						m^3/s	ML/d	m^3/s	ML/d
2	6/01/2024 10:39	6/01/2024 16:49	0.26	0.024	0.054	0.013	1.1	0.033	2.8
3	9/01/2024 13:19	9/01/2024 15:59	0.11	0.014	0.025	0.0068	0.58	0.013	1.1
4	17/01/2024 17:59	17/01/2024 18:59	0.042	0.0044	0.0058	0.002	0.17	0.0026	0.22
5	17/01/2024 20:49	17/01/2024 21:59	0.049	0.0055	0.01	0.0025	0.21	0.0046	0.4
6	18/01/2024 10:09	18/01/2024 14:39	0.19	0.013	0.045	0.0061	0.53	0.026	2.2
7	18/02/2024 19:09	18/02/2024 23:29	0.18	0.009	0.033	0.0043	0.37	0.017	1.5
8	19/02/2024 13:09	19/02/2024 15:59	0.12	0.013	0.03	0.0061	0.53	0.015	1.3
9	20/02/2024 10:59	20/02/2024 21:49	0.45	0.018	0.056	0.0095	0.82	0.035	3.0
10	17/03/2024 12:19	17/03/2024 17:39	0.22	0.012	0.038	0.0057	0.49	0.021	1.8
11	18/03/2024 13:19	18/03/2024 18:09	0.2	0.016	0.041	0.0082	0.7	0.023	2.0
12	5/04/2024 3:09	6/04/2024 16:19	1.5	0.055	0.23	0.056	4.8	0.41	35
13	17/04/2024 21:09	18/04/2024 1:39	0.19	0.014	0.038	0.0067	0.58	0.02	1.8
14	18/04/2024 9:49	18/04/2024 15:39	0.24	0.016	0.03	0.0079	0.68	0.016	1.3
15	1/05/2024 3:29	3/05/2024 10:29	2.3	0.057	0.12	0.041	3.5	0.11	9.6
16	4/05/2024 18:09	12/05/2024 14:29	7.8	0.082	0.13	0.067	5.8	0.13	12
17	12/05/2024 17:59	13/05/2024 0:39	0.28	0.0042	0.009	0.0019	0.16	0.0041	0.35
18	13/05/2024 6:19	17/05/2024 12:39	4.3	0.055	0.1	0.037	3.2	0.089	7.7
19	28/05/2024 19:49	29/05/2024 11:49	0.67	0.011	0.026	0.005	0.43	0.013	1.1
20	1/06/2024 4:09	2/06/2024 11:19	1.3	0.017	0.051	0.0087	0.75	0.03	2.6
21	27/07/2024 8:39	27/07/2024 15:39	0.29	0.012	0.024	0.0058	0.5	0.012	1.0
22	5/08/2024 20:59	5/08/2024 23:29	0.1	0.0056	0.0098	0.0025	0.22	0.0045	0.39
23	14/08/2024 16:59	14/08/2024 18:49	0.076	0.0065	0.019	0.003	0.26	0.009	0.78
24	26/09/2024 9:59	26/09/2024 12:29	0.1	0.0058	0.016	0.0026	0.23	0.0076	0.65
25	26/09/2024 21:59	27/09/2024 0:09	0.09	0.0034	0.0075	0.0015	0.13	0.0034	0.29
26	30/09/2024 4:09	30/09/2024 6:29	0.097	0.0075	0.02	0.0035	0.3	0.0096	0.83
27	14/10/2024 21:49	15/10/2024 4:59	0.3	0.0087	0.021	0.004	0.35	0.01	0.88
28	16/10/2024 13:39	16/10/2024 19:29	0.24	0.0065	0.017	0.003	0.26	0.0078	0.68
29	18/10/2024 5:09	18/10/2024 9:29	0.18	0.0026	0.0097	0.0012	0.1	0.0044	0.38
30	18/10/2024 14:39	18/10/2024 17:19	0.11	0.0032	0.0068	0.0014	0.12	0.003	0.26
31	18/10/2024 20:09	20/10/2024 19:19	2.0	0.014	0.051	0.0067	0.58	0.03	2.6
32	13/11/2024 15:49	13/11/2024 18:49	0.13	0.018	0.047	0.0092	0.8	0.027	2.4
33	17/11/2024 21:09	18/11/2024 0:09	0.13	0.011	0.024	0.0052	0.45	0.012	1.0
34	18/11/2024 6:29	18/11/2024 17:49	0.47	0.02	0.047	0.01	0.87	0.027	2.3

Table 10 Flow Monitoring Station FM4 North Wambo Creek – Summary of Results – 1 January to 31 December 2024.

Flow Event No.	Start Date & Time	End Date & Time	Duration (Days)	Average Stream Height (m)	Maximum Stream Height (m)	Average Theoretical Flow Rate		Maximum Theoretical Flow Rate	
						m^3/s	ML/d	m^3/s	ML/d
1	6/04/2024 0:40	7/04/2024 0:50	1	0.12	0.4	0.48	41	2.2	190

Table 11 Flow Monitoring Station FM4BU North Wambo Creek – Summary of Results – 1 January to 31 December 2024.

Flow Event No.	Start Date & Time	End Date & Time	Duration (Days)	Average Stream Height (m)	Maximum Stream Height (m)	Average Theoretical Flow Rate		Maximum Theoretical Flow Rate	
						m^3/s	ML/d	m^3/s	ML/d
1	6/04/2024 0:25	6/04/2024 21:15	0.87	0.11	0.38	0.43	37	2.0	180

Table 12 Flow Monitoring Station FM15 South Wambo Creek Downstream of the Single Lane Bridge – Summary of Results – 1 January to 31 December 2024.

Flow Event No.	Start Date & Time	End Date & Time	Duration (Days)	Average Stream Height (m)	Maximum Stream Height (m)	Average Theoretical Flow Rate		Maximum Theoretical Flow Rate	
						m^3/s	ML/d	m^3/s	ML/d
1	6/04/2024 4:29	13/04/2024 4:59	7.02	0.31	0.98	1.5	130	12	1000
2	18/04/2024 5:29	30/04/2024 22:19	12.70	0.27	0.45	0.91	78	2.3	200
3	6/05/2024 7:19	22/07/2024 20:19	77.54	0.31	0.5	1.1	96	2.9	250
4	27/07/2024 22:19	1/08/2024 5:29	4.30	0.15	0.25	0.31	27	0.65	56
5	15/08/2024 12:09	21/08/2024 11:59	5.99	0.17	0.26	0.36	31	0.73	63

Table 13 Flow Monitoring Station FM16 South Wambo Creek Upstream of the Single Lane Bridge – Summary of Results – 1 January to 31 December 2024.

Flow Event No.	Start Date & Time	End Date & Time	Duration (Days)	Average Stream Height (m)	Maximum Stream Height (m)	Average Theoretical Flow Rate		Maximum Theoretical Flow Rate	
						m^3/s	ML/d	m^3/s	ML/d
1[1]	5/04/2024 22:00	30/04/2024 9:20	24.47	0.18	0.45	1.2	110	21	1800
2	24/05/2024 9:00	16/12/2024 10:40	206.07	0.1	0.21	0.14	12	1.2	110

[1] See note in Section 4.0 Recommendations

Table 14 Flow Monitoring Station FM9(17) South Wambo Creek Upstream of Surfacewater Monitoring Site SW06, Old Brossi Property – Summary of Results – 1 January to 31 December 2024.

Flow Event No.	Start Date & Time	End Date & Time	Duration (Days)	Average Stream Height (m)	Maximum Stream Height (m)	Average Theoretical Flow Rate		Maximum Theoretical Flow Rate	
						m^3/s	ML/d	m^3/s	ML/d
1	6/04/2024 0:48	10/04/2024 13:28	4.53	0.18	0.97	0.66	57	8.2	710
2	17/04/2024 21:48	25/04/2024 2:58	7.22	0.071	0.26	0.092	7.9	0.52	45
3	6/05/2024 5:58	22/05/2024 6:48	16.03	0.092	0.24	0.12	10	0.45	39

Flow Event No.	Start Date & Time	End Date & Time	Duration (Days)	Average Stream Height (m)	Maximum Stream Height (m)	Average Theoretical Flow Rate		Maximum Theoretical Flow Rate	
						m^3/s	ML/d	m^3/s	ML/d
4	22/05/2024 16:58	22/05/2024 21:18	0.18	0.0032	0.0069	0.0029	0.25	0.0062	0.54
5	1/06/2024 7:58	12/06/2024 10:38	11.11	0.035	0.092	0.034	2.9	0.098	8.5

Table 15 Flow Monitoring Station FM12 Stony Creek upstream of surface water sampling sites SW08 and SW08b – Summary of Results – 1 January to 31 December 2024.

Flow Event No.	Start Date & Time	End Date & Time	Duration (Days)	Average Stream Height (m)	Maximum Stream Height (m)	Average Theoretical Flow Rate		Maximum Theoretical Flow Rate	
						m^3/s	ML/d	m^3/s	ML/d
1	1/01/2024 0:08	3/01/2024 14:58	2.62	0.029	0.056	0.032	2.8	0.081	7.0
2	3/01/2024 16:48	4/01/2024 13:18	0.85	0.02	0.039	0.018	1.6	0.045	3.9
3	4/01/2024 15:08	19/01/2024 14:38	14.98	0.032	0.069	0.037	3.2	0.11	9.8
4	19/01/2024 18:38	20/01/2024 16:38	0.92	0.024	0.044	0.024	2.1	0.054	4.7
5	20/01/2024 19:48	22/01/2024 12:48	1.71	0.015	0.037	0.013	1.1	0.042	3.6
6	22/01/2024 18:18	23/01/2024 13:28	0.80	0.017	0.033	0.015	1.3	0.035	3.0
7	23/01/2024 18:18	30/01/2024 13:48	6.81	0.023	0.079	0.024	2.1	0.14	13
8	30/01/2024 18:58	31/01/2024 13:58	0.79	0.013	0.041	0.011	0.97	0.049	4.2
9	31/01/2024 20:38	1/02/2024 13:48	0.72	0.013	0.038	0.01	0.89	0.044	3.8
10	1/02/2024 21:08	2/02/2024 13:18	0.67	0.019	0.036	0.018	1.5	0.04	3.5
11	2/02/2024 21:18	3/02/2024 11:38	0.60	0.013	0.039	0.011	0.97	0.045	3.9
12	3/02/2024 23:08	4/02/2024 14:38	0.65	0.016	0.037	0.015	1.3	0.042	3.6
13	4/02/2024 22:58	5/02/2024 9:38	0.44	0.0046	0.015	0.0029	0.25	0.011	0.98
14	6/02/2024 2:58	6/02/2024 11:28	0.35	0.0051	0.017	0.0034	0.29	0.014	1.2
15	6/02/2024 15:38	12/02/2024 14:38	5.96	0.043	0.082	0.058	5.0	0.15	13
16	12/02/2024 17:48	13/02/2024 13:28	0.82	0.031	0.048	0.034	2.9	0.063	5.4
17	13/02/2024 16:58	14/02/2024 15:08	0.92	0.025	0.044	0.025	2.2	0.055	4.8
18	14/02/2024 19:58	16/02/2024 13:38	1.74	0.024	0.041	0.023	2.0	0.049	4.2
19	16/02/2024 19:58	17/02/2024 13:58	0.75	0.02	0.038	0.018	1.6	0.044	3.8
20	17/02/2024 19:18	18/02/2024 13:08	0.74	0.014	0.028	0.011	0.97	0.028	2.4
21	18/02/2024 17:58	21/02/2024 15:28	2.90	0.029	0.054	0.032	2.8	0.076	6.6
22	21/02/2024 17:48	22/02/2024 13:58	0.84	0.023	0.037	0.022	1.9	0.042	3.7
23	22/02/2024 19:58	23/02/2024 14:28	0.77	0.014	0.029	0.011	0.95	0.029	2.5
24	23/02/2024 21:58	25/02/2024 14:58	1.71	0.022	0.05	0.022	1.9	0.068	5.9
25	25/02/2024 18:38	26/02/2024 14:28	0.83	0.03	0.051	0.033	2.9	0.068	5.9
26	26/02/2024 17:08	28/02/2024 14:28	1.89	0.015	0.03	0.012	1.1	0.031	2.7
27	28/02/2024 21:38	29/02/2024 14:28	0.70	0.0085	0.019	0.006	0.52	0.015	1.3
28	1/03/2024 3:38	1/03/2024 11:38	0.33	0.0073	0.016	0.005	0.43	0.012	1.1
29	2/03/2024 1:58	2/03/2024 6:58	0.21	0.0082	0.014	0.0056	0.49	0.011	0.94

Flow Event No.	Start Date & Time	End Date & Time	Duration (Days)	Average Stream Height (m)	Maximum Stream Height (m)	Average Theoretical Flow Rate		Maximum Theoretical Flow Rate	
						m^3/s	ML/d	m^3/s	ML/d
30	2/03/2024 22:28	3/03/2024 13:28	0.63	0.013	0.027	0.01	0.88	0.026	2.3
31	3/03/2024 20:28	8/03/2024 15:28	4.79	0.026	0.068	0.029	2.5	0.11	9.6
32	8/03/2024 20:38	9/03/2024 15:58	0.81	0.022	0.042	0.021	1.9	0.05	4.3
33	9/03/2024 19:28	10/03/2024 15:08	0.82	0.023	0.044	0.023	2.0	0.055	4.8
34	10/03/2024 20:08	11/03/2024 14:58	0.78	0.024	0.042	0.024	2.1	0.05	4.3
35	11/03/2024 20:38	4/04/2024 0:48	23.17	0.054	0.12	0.085	7.3	0.28	25
36	6/04/2024 0:38	6/04/2024 7:58	0.31	0.053	0.13	0.1	8.7	0.37	32
37	23/04/2024 12:18	26/08/2024 13:08	125.03	0.11	0.23	0.32	27	0.98	85
38	26/08/2024 18:28	31/08/2024 12:48	4.76	0.022	0.057	0.023	2.0	0.084	7.2
39	31/08/2024 18:38	1/09/2024 13:08	0.77	0.016	0.03	0.014	1.2	0.03	2.6
40	1/09/2024 21:08	2/09/2024 12:48	0.65	0.013	0.025	0.011	0.92	0.024	2.1
41	2/09/2024 18:18	7/09/2024 10:48	4.69	0.046	0.098	0.069	6.0	0.21	18
42	8/09/2024 5:48	8/09/2024 9:48	0.17	0.0036	0.0092	0.0022	0.19	0.0062	0.53
43	8/09/2024 22:38	9/09/2024 13:48	0.63	0.017	0.037	0.015	1.3	0.041	3.6
44	9/09/2024 19:08	11/09/2024 14:08	1.79	0.024	0.048	0.025	2.1	0.063	5.5
45	12/09/2024 2:58	12/09/2024 8:28	0.23	0.0023	0.0082	0.0013	0.12	0.0054	0.47
46	13/09/2024 0:08	13/09/2024 13:08	0.54	0.016	0.032	0.014	1.2	0.034	2.9
47	13/09/2024 21:28	24/09/2024 12:48	10.64	0.051	0.11	0.082	7.1	0.25	21
48	25/09/2024 1:08	25/09/2024 6:58	0.24	0.0032	0.01	0.0019	0.17	0.0069	0.59
49	26/09/2024 22:48	27/09/2024 10:08	0.47	0.0082	0.014	0.0056	0.48	0.011	0.94
50	27/09/2024 20:58	28/09/2024 11:28	0.60	0.012	0.026	0.0096	0.83	0.025	2.2
51	4/10/2024 5:58	4/10/2024 8:28	0.10	0.0025	0.0045	0.0014	0.12	0.0027	0.23

Table 16 Flow Monitoring Station FM14 Stony Creek Tributary upstream of surface water sampling sites SW08 and SW08b – Summary of Results – 1 January to 31 December 2024.

Flow Event No.	Start Date & Time	End Date & Time	Duration (Days)	Average Stream Height (m)	Maximum Stream Height (m)	Average Theoretical Flow Rate		Maximum Theoretical Flow Rate	
						m^3/s	ML/d	m^3/s	ML/d
1	1/01/2024 0:08	3/01/2024 14:58	2.62	0.029	0.056	0.032	2.8	0.081	7.0
2	3/01/2024 16:48	4/01/2024 13:18	0.85	0.02	0.039	0.018	1.6	0.045	3.9
3	4/01/2024 15:08	19/01/2024 14:38	14.98	0.032	0.069	0.037	3.2	0.11	9.8
4	19/01/2024 18:38	20/01/2024 16:38	0.92	0.024	0.044	0.024	2.1	0.054	4.7
5	20/01/2024 19:48	22/01/2024 12:48	1.71	0.015	0.037	0.013	1.1	0.042	3.6
6	22/01/2024 18:18	23/01/2024 13:28	0.80	0.017	0.033	0.015	1.3	0.035	3.0
7	23/01/2024 18:18	30/01/2024 13:48	6.81	0.023	0.079	0.024	2.1	0.14	13
8	30/01/2024 18:58	31/01/2024 13:58	0.79	0.013	0.041	0.011	0.97	0.049	4.2

Flow Event No.	Start Date & Time	End Date & Time	Duration (Days)	Average Stream Height (m)	Maximum Stream Height (m)	Average Theoretical Flow Rate		Maximum Theoretical Flow Rate	
						m^3/s	ML/d	m^3/s	ML/d
9	31/01/2024 20:38	1/02/2024 13:48	0.72	0.013	0.038	0.01	0.89	0.044	3.8
10	1/02/2024 21:08	2/02/2024 13:18	0.67	0.019	0.036	0.018	1.5	0.04	3.5
11	2/02/2024 21:18	3/02/2024 11:38	0.60	0.013	0.039	0.011	0.97	0.045	3.9
12	3/02/2024 23:08	4/02/2024 14:38	0.65	0.016	0.037	0.015	1.3	0.042	3.6
13	4/02/2024 22:58	5/02/2024 9:38	0.44	0.0046	0.015	0.0029	0.25	0.011	0.98

A summary of total monthly rain fall data presented in **Table 17** below was derived from the Wambo Coal's Meteorological Station located next to the helicopter pad near the Mine Infrastructure Area.

Table 17 Monthly Total Rainfall Data at Wambo Coal Meteorological Station – 1 January to 31 December 2024.

Month	Wambo Coal's Meteorological Station Total Rainfall (mm)	Number of Days Rain Fell in the Month
January	71.0	9
February	103.8	10
March	28.4	5
April	153.6	14
May	78	20
June	55.4	14
July	33.6	9
August	38.6	14
September	44.4	6
October	49.6	13
November	57.0	11
December	7.2	7

A second rainfall monitoring station was installed at location FM2 during April 2021. Rainfall data for this monitoring location for 2024 is presented in **Table 18** below.

- There are partial monthly rainfall totals for January, February, July and August 2024 due to data loss from the monitoring station for the periods 24 to 31 January 2024, 1 to 23 February 2024, 31 July and 1 to 18 August 2024.
- Rainfall measurements at FM2 were consistent with those at the Wambo Coal Meteorological Station for all months where all data was available.

Table 18 Monthly Total Rainfall Data at FM2 location – 1 May to 31 December 2024

Month	FM2 Monitoring Location Total Rainfall (mm)	Number of Days Rain Fell in the Month
January (1 to 23)	74.6	11
February (24 to 29)	0.4	2
March	27.2	8
April	141.8	14
May	73.8	18
June	65.2	13
July (1 to 30)	36.2	13
August (18 to 30)	10.0	4
September	34.2	4
October	37.8	12
November	63.6	14
December	8.6	4

Daily rainfall data was used to cross reference the raw data collected from the Flow Monitoring Stations to help identify periods where a flow event may have occurred.

Appendix C contains, where theoretical flow events were recognised, annual graphical depictions of stream height and theoretical flow in conjunction with daily and cumulative rainfall.

The results presented in the above tables should be read with the following qualifying statements in mind: -

- All flow events represent a theoretical flow and have been derived from stream height data. The stream height data was then applied to polynomial equations derived from theoretical flow rating curves to give a theoretical flow. These theoretical flow rating curves were generated using cross and long section surveys in conjunction with the Manning's equation. These theoretical flow rating curves were constructed by AECOM in 2019, 2023 and 2024 on data provided by Environmental Instrument Solutions, SLR Consulting and AECOM;
- North Wambo, South Wambo and Stony Creeks are ephemeral and as such only flow after significant rainfall events, therefore the theoretical flow rating curves in **Appendix B** have not been calibrated/checked against actual physical measurements of flow using a current meter;
- Some flow events may have been overlooked due to, but not limited to, poor data quality, data missing, inconsistent data, sensor failure or loss, logger failure, power supply problems and changes to stream bed characteristics, and;
- The three flow monitoring stations installed on Stony Creek and its associated tributary have been positioned such as to be outside an underground mined area and designed to monitor stream flow and any associated effect of underground mining on stream flow. These stations were installed by AECOM on 7 December 2016 and replace flow monitoring stations 7 and 8.

4.0 Recommendations

During the period 1 January to 31 December 2024 some issues were identified with the flow monitoring network. The following outlines the issues, both general and flow station specific, and include recommendations designed to correct the issues and improve data quality.

- General issues and resultant recommendations:-
  - Sensor anchor points and sensor hosing anchors are showing signs of corrosion and in some cases have broken (see below for specific flow stations). Therefore, it is recommended

that a review of these anchor points take place with a view to replace any which show corrosion.

- Following the anchor point review/replacement a re-establishment of the sensor height with respect to the cease to flow point should determined at each flow station.
- Photos be taken at each flow station during data collection events. These photos can be used to provide a photographic history of each flow station. The photos should be review regularly to help identify any changes in the stream bed characteristics which could have an impact on stream flow especially after high flow events.

- Flow station specific issues and recommendations:-
  - Flow Station FM1 (North Wambo Creek):-
    - It was identified that the data logger and solar charging circuit were not working correctly at FM1. Ants had infested the data logger and the solar charging system has a unidentifiable faulty, possibly the solar regulator. The data logger was replaced with an AECOM data logger and a new battery was installed. The charging fault seemed to be corrected and at the next data collection event the fault was still evident.
    - It is recommended that the equipment in the data logger box be rationalised. This would involve the removal of all existing hardware including and the current data logger (CSA CR800) and be replaced with a data logger with a lower power consumption, for example a CSA CR300.
  - Flow Station FM4 (North Wambo Creek):-
    - The data logger at this flow station was replaced with an older spare data logger salvaged from another flow station following the July 2022 floods. Review of the data captured during 2024 revealed that the replacement data logger had developed an issue with its data storage capacity.
    - It is recommended that the current data logger should be replaced with a newer version, for example a CSA CR300.

Flow Station FM16 (South Wambo Creek):-

- During the April 2024 data collect it was identified that the sensor had been washed out of its housing and the main sensor anchor had broken. The sensor was located downstream from its housing but still above the cease to flow point. The sensor was removed from the flow station and reinstalled on 24 May 2024. No flow data was recorded for the period 30 April to 24 May 2024.
- As it is not known during which flow event prior to 30 April was the cause of the sensor being washed out of it housing. All flow data prior to this date should be viewed as an indication only of flow.

Following a recommendation from a third party consultant, and as Stony and South Wambo Creeks are ephemeral in nature and display submergent flow characteristics, that a flow recorded at a flow station may not equate to a flow at a surface water sampling location on the same creek.

Therefore, with reference to the following flow stations and corresponding surface water sampling sites, AECOM proposes that the above recommended photos taken at each flow station during data collection include additional photos taken at the corresponding surface water sampling sites.

- Stony Creek – Flow Station FM12 (Stony Creek Up) and corresponding surface water sampling sites SW08 and SW08b (both downstream of the flow station).
- South Wambo Creek – Flow Station FM9 (Brossi) and corresponding surface water sampling site SW06 (downstream of flow station).
- South Wambo Creek – Flow Station FM16 and corresponding surface water sampling site SW07 (upstream of the flow station).

These additional photos could include upstream and downstream photos taken at the surface water sampling site(s). Plus, any additional photos/videos which could help gain a greater understanding of flow characteristics within these two creek systems.

If you have any questions or require any clarification of aspects in this report, please contact us in the Singleton office.

Yours faithfully

per

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encl: Appendix A - Flow Station Field Sheets
Appendix B - Stream Theoretical Flow Rating and Profile Curves
Appendix C - Stream Height , Theoretical Flow and Rainfall Charts

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Addendum: Comparison of Flow Monitoring Data with the Surface Water Monitoring Plan (SWMPV2)

SWMPV2 states:

"Flow impact assessment criteria for the local mine site ephemeral creeks are based on the unexpected absence of flow in climatic situations when flows would be expected. The impact assessment criteria would be met if there was no flow recorded at the flow monitoring site either on the day or the day after the recorded rainfall was equal to or greater than the nominated amount. The resulting runoff generating rainfall values are given in Table 14" of the SWMPV2 which has been reproduced as **Table 19** below.

Table 19 Surface Water Flow Impact Assessment Condition

Watercourse and flow monitoring site	Daily rainfall when flow commenced on 80% of recorded occasions
North Wambo Creek – FM1*	100mm
South Wambo Creek – FM15	20mm
Stony Creek – FM13**	20mm

- *Revised Wambo SWMP V2 (approved 20 November 2020) removed North Wambo Creek performance indicator of 20mm daily rainfall at location FM4 replacing with performance indicator of rain event total of 100mm at location FM1 effective 21 November 2020.
- **No reliable data was collected from the sensor at FM13 during 2024.

Table 20 below lists the dates from 1 January to 31 December 2024 when 20mm or greater of 24 hour rainfall was recorded at the Wambo Coal's Meteorological Station located next to the helicopter pad near the Mine Infrastructure Area and corresponding flow events at flow monitoring sites FM15 and FM13.

Table 20 Dates of Daily Rainfall Greater than 20mm and Corresponding Flow Events

Date	24 hour Rainfall (mm)	Site FM15	Site FM13
4/1/2024	38.2	No flow event recorded	No flow event recorded
20/2/2024	27.0	No flow event recorded	No flow event recorded
4/4/2024	29.4	No flow event recorded	No flow event recorded
5/4/2024	84.6	Flow event recorded starting 6/4/2024	No flow event recorded
6/5/2024	22.4	Flow event recorded	No flow event recorded
1/6/2024	20.4	Continuation of previous flow event	No flow event recorded
26/9/2024	27.2	No flow event recorded	No flow event recorded

Table 21 below lists the periods from 1 January to 31 December 2024 when accumulated rainfall greater than 100mm was recorded at the Wambo Coal's Meteorological Station located next to the helicopter pad near the Mine Infrastructure Area and corresponding flow events at flow monitoring site FM1.

Table 21 Dates of Rain Event Rainfall Greater than 100mm and Corresponding Flow Events

Dates	Total Rainfall (mm)	Site FM1
1/1/2024 to 13/02/2024	113.2	No flow event recorded

Dates	Total Rainfall (mm)	Site FM1
14/02/2024 to 04/04/2024	125.2	No flow event recorded
05/04/2024 to 17/04/2024	108.0	No flow event recorded
18/04/2024 to 01/06/2024	108.8	No flow event recorded
02/06/2024 to 25/08/2024	107.0	No flow event recorded
26/08/2024 to 11/11/2024	108.4	No flow event recorded

Appendix A

Flow Station Field Sheets.

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Routine Quarterly Flow Station Downloads

AECOM

Project Number: 60726181

Client: Wambo

Sampled by: E·R & R·T / ER & RT

Collection Date: 24·07·24 / 31·7·24

Collection start time: 0830 / 0815

Collection finish time: 1505 / 1300

Flow Station No.	Location (Creek)	Date	Time	Logger Type	Solar Panel Output (V)	Battery(V)	Solar Panel Cleaned	Battery Replaced	Memory Used (%)	Battery Used (%)	Data Collected	Sensor Operating	Logger Operating	Stream Observations	Height of Water Above Sensor (mm)	Comments
Upstream old FM1	North Wambo	24.7.24	1410	RuggedTroll	-	-	-	-	21%	3%	Yes	Yes	Yes	Slow Flow	0 .50mm	Data wrap on
Old FM1	North Wambo	—	—	RuggedTroll	-	-	-	-	—	—	—	—	—	—	0	Data wrap on New logger
FM1 New Location	North Wambo	24.7.24	1430	CS-CR800	-	-	NO	NO	-	-	NO	NO	NO	DRY	0	* Need battery replaced.
FM1 New Location BU	North Wambo	24.7.24	1440	RuggedTroll	-	-	-	-	50%	8%	yes	yes	yes	DRY	0	Data wrap on New logger
FM2	North Wambo	31.7.24	1230	CS-CR200	22.2	13.5	Yes	NO	-	-		Yes	Yes	Pool	0	* Cold Cable.
FM2 BU	North Wambo	31.7.24	1240	RuggedTroll	-	-	-	-	—	—	—	—	—	—	0	Unable to access, high water level. ✓
BarroLogger NWC	North Wambo	31.7.24	1250	BaroTroll	-	-	-	-	100%	44%	Yes	Yes	Yes	-	-	Data wrap on New barrologger
FM3	North Wambo	31.7.24	1140	CS-CR200	13.4	13.4	Yes	NO	-	-	Yes	yes	yes	DRY	0 -	* Cold cabel / Black ends
FM3 BU	North Wambo	31.7.24	1200	RuggedTroll	-	-	-	NO	100%	31%	Yes	Yes	Yes	DRY	0	
FM4	North Wambo	31.7.24	1110	CS-CR200	-	13.3	-	-	-	-	—	—	—	—	0	Connection failure. Attempted w/ diff cards
FM4 BU	North Wambo	31.7.24	1120	RuggedTroll	-	-	-	-	100%	44%	Yes	Yes	Yes	DRY	0 —	Data wrap on New logger
FM12 SCUP	Stoney	31.7.24	0950	RuggedTroll	-	-	-	-	—	—	—	—	—	—	0	Data wrap on * Unable to access due to overgrown water
FM14 SCtrib	Stoney Ck Trubutary	31.7.24	0905	RuggedTroll	-	-	-	-	100%	22%	yes	yes	yes	DRY	0 -	Data wrap on
Stoney Ck Up Barro	Stoney	31.7.24	0935	BaroTroll	-	-	-	-	100%	22%	yes	yes	yes	-	-	Data wrap on
FM13 SCDown	Stoney	31.7.24	1025	RuggedTroll	-	-	-	-	100%	22%	Yes	Yes	Yes	DRY	0 —	Data wrap on
Stoney Ck Down Barro	Stoney	31.7.24	1045	BaroTroll	-	-	-	-	100%	22%	yes	yes	yes	-	-	Data wrap on
FM9 Brossi	South Wambo	24.7.24	1250	RuggedTroll	-	-	-	-	53%	9%	Yes.	Yes	Yes	Slow Flow	0 .200mm	Data wrap on
FM15 (FM5)	South Wambo	24.7.24	1140	RuggedTroll	-	-	-	-	-	-	—	—	—	—	0	Data wrap on No access pooling water photo taken
FM16 (FM6)	South Wambo	24.7.24	1150	RuggedTroll	-	-	-	-	53%	9%	Yes	Yes	Yes	Slow Flow	0 - .200mm	Data wrap on - Dec 2023
Barro Logger SWC	South Wambo	24.7.24	1210	BaroTroll	-	-	-	-	53%	9%	Yes	Yes	Yes	-	-	Data wrap on - Dec 2023

* 24·07·24 - Done with VW's.

* Data collected From Dec 2023

✓ proto taken.

Initial: LT

Routine Quarterly Flow Station Downloads

AECOM

R. Thompson & S Lambert.

Project Number: 60726181

Client: Wambo

Sampled by: E. Rizzo, R. Thompson, A. Endersby/

Collection Date: 23.4.24 / 24.4.24 / 30.4.24

Collection start time: ~~1020~~ 1000 / 1115 / 0820

Collection finish time: 1330 / 1410 / 1215

Flow Station No.	Location (Creek)	Date	Time	Logger Type	Solar Panel Output (V)	Battery(V)	Solar Panel Cleaned	Battery Replaced	Memory Used (%)	Battery Used (%)	Data Collected	Sensor Operating	Logger Operating	Stream Observations	Height of Water Above Sensor (mm)	Comments
Upstream old FM1	North Wambo	24.4.24	1255	RuggedTroll	-	-	-	-	12 %	1 %	Yes	Yes	Yes	Flowing	0	Data wrap on
Old FM1	North Wambo			RuggedTroll	-	-	-	-							0	Data wrap on New logger
FM1 New Location	North Wambo	24.4.24	1310	CS-CR800	2.72	0	Yes	No	-	-	NO	No	No	Dry	0	Would not connect - appears to have no power
FM1 New Location BU	North Wambo	24.4.24	1320	RuggedTroll	-	-	-	-	37 %	6 %	Yes	Yes	Yes	Dry	0	Data wrap on New logger
FM2	North Wambo	24.4.24	1350	CS-CR200	13.35	13.41	Yes	NO	-	-	Yes	Yes	Yes	Pooling	0	
FM2 BU	North Wambo		~~1340~~	RuggedTroll	-	-	-	-				~~Yes~~			0	
BarroLogger NWC	North Wambo	24.4.24	1340	BaroTroll	-	-	-	-	100 %	42 %		Yes		-	-	Data wrap on New barrologger
FM3	North Wambo	24.4.24	1210	CS-CR200	13.36	13.33	Yes	NO	-	-	Yes	Yes	Yes	~~Dry~~ Pooling	0	Slight pooling in creek
FM3 BU	North Wambo	24.4.24	1225	RuggedTroll	-	-	-	NO	100 %	29 %	Yes	Yes	Yes	Pooling	0	Slight pooling in creek
FM4	North Wambo	24.4.24	1135	CS-CR200	13.29	13.34	Yes	NO	-	-	Yes	Yes	Yes	Dry	0	
FM4 BU	North Wambo	24.4.24	1145	RuggedTroll	-	-	-	-	100 %	42 %	Yes	Yes	Yes	Dry	0	Data wrap on New logger
FM12 SCUP	Stoney	23.4.24	1140	RuggedTroll	-	-	-	-	100 %	19 %	yes	yes	yes	Slow	0 –	Data wrap on
FM14 SCtrib	Stoney Ck Trubutary	23.4.24	1030	RuggedTroll	-	-	-	-	100 %	19 %	Yes	Yes	Yes	Slow	0 –	Data wrap on
Stoney Ck Up Barro	Stoney	23.4.24	1235	BaroTroll	-	-	-	-	100 %	19 %	Yes	Yes	Yes	-	-	Data wrap on
FM13 SCDown	Stoney	30.4.24	0830	RuggedTroll	-	-	-	-	100%	20%	Yes	Yes	Yes	DRY	0	Data wrap on
Stoney Ck Down Barro	Stoney	30.4.24	0900	BaroTroll	-	-	-	-	100%	20%	Yes	Yes	Yes	-	-	Data wrap on
FM9 Brossi	South Wambo	30.4.24	1105	RuggedTroll	-	-	-	-	43%	7%		Yes	Yes	Mod Flow	0	Data wrap on Thick iron around casing
FM15 (FM5)	South Wambo Fm 16(6)	30.4.24	0930	RuggedTroll	-	-	-	-	43 %	7 %	Yes	Yes	Yes	Slowly flowing	0	Data wrap on ~~Unable to connect.~~
FM16 (FM6)	South Wambo Fm 15(5)	30.4.24	1030	RuggedTroll	-	-	-	-	-	-	-	-	-	-	0	Data wrap on Unable to access.
Barro Logger SWC	South Wambo	30.4.24	0950	BaroTroll	-	-	-	-	43 %	7 %	Yes	Yes	Yes	-	-	Data wrap on

24.4.24 - FM2 BU - Unable to collect due to deep pooling around logger in creek.

* 30.4.24 - Fm~~16~~15 (FM5) logger not in case, washed DS. casing bracket loose. ~~logger will not connect~~

30.4.24 - Fm~~16~~15 (FM5) - ~~Unable~~ Unable to collect due to deep water - photo taken.

30.4.24 - Fm2 BU - still Unable to collect due to deep pooling around logger

Initial: ER

Routine Quarterly Flow Station Downloads

AECOM

Project Number: 60726181

Client: Wambo

Sampled by: R. Thompson & E. Rizzo

Collection Date: 14.10.2024/24.10.24

Collection start time: 0800/0840

Collection finish time: 1350./1330

Flow Station No.	Location (Creek)	Date	Time	Logger Type	Solar Panel Output (V)	Battery(V)	Solar Panel Cleaned	Battery Replaced	Memory Used (%)	Battery Used (%)	Data Collected	Sensor Operating	Logger Operating	Stream Observations	Height of Water Above Sensor (mm)	Comments
Upstream old FM1	North Wambo	14.10.24	0920	RuggedTroll	-	-	-	-	31%	5%	Yes	Yes	Yes	DRY	0 —	Data wrap on
Old FM1	North Wambo	—	—	RuggedTroll	-	-	-	-	—	—	—	—	—	—	0 —	Data wrap on New logger
FM1 New Location	North Wambo	24.10.24	1200	CS-CR800					-	-					0	*New connection panel installed.
FM1 New Location BU	North Wambo	24.10.24	1300	RuggedTroll	-	-	-	-	59%	10%	Yes	Yes	Yes	DRY	0	Data wrap on New logger
FM2	North Wambo	14.10.24	1310	CS-CR200	13.42	13.52 ~~13.44~~	Yes	NO	-	-	Yes	Yes	Yes	POOL	0 -	
FM2 BU	North Wambo	24.10.24	1320	RuggedTroll	-	-	-	-							0	* Unable to download submerged in water
BarroLogger NWC	North Wambo	14.10.24	1300	BaroTroll	-	-	-	-	100%	45%	Yes	Yes	Yes	-	-	Data wrap on New barrologger
FM3	North Wambo	14.10.24	1000	CS-CR200	13.5	13.6	Yes	NO	-	-	Yes	Yes	Yes	DRY	0 —	
FM3 BU	North Wambo	14.10.24	1020	RuggedTroll	-	-	-	No	100%	33%	Yes	Yes	Yes	DRY	0 —	
FM4	North Wambo	14.10.24	0830	CS-CR200	13.4	13.5	Yes	No	-	-	Yes	Yes	Yes	DRY	0 —	
FM4 BU	North Wambo	14.10.24	0850	RuggedTroll	-	-	-	-	100%	45%	Yes	Yes	Yes	DRY	0 —	Data wrap on New logger
FM12 SCUP	Stoney	24.10.24	~~1010~~	RuggedTroll	-	-	-	-							0	Data wrap on ✱
FM14 SCtrib	Stoney Ck Trubutary	24.10.24	0920	RuggedTroll	-	-	-	-	100%	23%	Yes	Yes	Yes	DRY	0 —	Data wrap on
Stoney Ck Up Barro	Stoney	24.10.24	1000	BaroTroll	-	-	-	-	100%	23%	Yes	Yes	Yes	-	-	Data wrap on
FM13 SCDown	Stoney	24.10.24	1055	RuggedTroll	-	-	-	-	100%	23%	yes	yes	yes	DRY	0 —	Data wrap on
Stoney Ck Down Barro	Stoney	24.10.24	1035	BaroTroll	-	-	-	-	100%	23%	yes	yes	yes	~~DRY~~	- —	Data wrap on
FM9 Brossi ~~FM15~~ FM15	South Wambo	14.10.24	1220 ~~1150~~	RuggedTroll	-	-	-	-	56%	10%	Yes	Yes	Yes	DRY	0 —	Data wrap on
~~FM15 (FM5)~~ FM9	South Wambo	14.10.24	1150	RuggedTroll	-	-	-	-	62%	11%	Yes	Yes	Yes	very slow	0 0mm	Data wrap on
FM16 (FM6)	South Wambo	14.10.24	1115	RuggedTroll	-	-	-	-	62%	11%	yes	yes	yes	slow	0 . 15mm	Data wrap on
Barro Logger SWC	South Wambo	14.10.24	1120	BaroTroll	-	-	-	-	62%	11%	Yes	Yes	Yes	-	-	Data wrap on

Data collected from June 1st 2024.

✱ Unsafe access. Access issues previously discussed with client.

14.10.24 - 1330 can not download ↳ attempted. Submerged in water.
↳ 24.10.24 attempted again. still submerged.

Initial: MT

Routine Quarterly Flow Station Downloads

AECOM

Project Number: 60726181

Client: Wambo

Sampled by: S. McDonald, E. Riggo / ~~R. Thompson~~ R. Thompson

Collection Date: 16.01.2025 / 21.01.2025 / 23.1.25

Collection start time: 0855 / 0735 / 0850

Collection finish time: 1245 / 1240 / 1425

Flow Station No.	Location (Creek)	Date	Time	Logger Type	Solar Panel Output (V)	Battery(V)	Solar Panel Cleaned	Battery Replaced	Memory Used (%)	Battery Used (%)	Data Collected	Sensor Operating	Logger Operating	Stream Observations	Height of Water Above Sensor (mm)	Comments
Upstream old FM1	North Wambo	21.01.25	1020	RuggedTroll	-	-	-	-	40%	7%	Yes	Yes	Y	DRY	0 DRY	Data wrap on
~~Old FM1~~ Removed from Scope	North Wambo	—	—	RuggedTroll	-	-	-	-	—	—	—	—	—	—	0 —	Data wrap on New logger
FM1 New Location	North Wambo	21.01.25	1100	CS-CR800	12.7	12.6	Y	N	-	-	Y	Y	Y	DRY	0 DRY	
FM1 New Location BU	North Wambo	21.01.25	1050	RuggedTroll	-	-	-	-	68%	12%	Y	Y	Y	DRY	0 DRY	Data wrap on New logger
FM2	North Wambo	21.01.25	1130	CS-CR200	13.3	13.4	Y	Y	-	-	Y	Y	Y	Pool	0 300	
FM2 BU	North Wambo	21.01.25	1150	RuggedTroll	-	-	-	-	100%	35%	Y	Y	Y	Pool	0 300	
BarroLogger NWC	North Wambo	21.01.25	1200	BaroTroll	-	-	-	-	100%	48%	Y	Y	Y	-	-	Data wrap on New barrologger
FM3	North Wambo	21.01.25	0950	CS-CR200	13.4	13.3	Yes	NO	-	-	Yes	Yes	Yes	Pool	0 100	
FM3 BU	North Wambo	21.01.25	0930	RuggedTroll	-	-	-	NO	100%	35%	Yes	Yes	Yes	Pool	0 100	
FM4	North Wambo	21.01.25	0750	CS-CR200	13.6	13.5	Yes	NO	-	-	Yes	Yes	Yes	DRY	0 DRY	
FM4 BU	North Wambo	21.01.25	0800	RuggedTroll	-	-	-	-	100%	47%	Yes	Yes	Yes	DRY	0 DRY.	Data wrap on New logger
FM12 SCUP	Stoney	16.1.25	1050	RuggedTroll	-	-	-	-	100%	25%	yes	yes	yes	Pool	0 250	Data wrap on
FM14 SCtrib	Stoney Ck Trubutary	16.1.25	0955	RuggedTroll	-	-	-	-	100%	25%	Yes	yes	yes.	DRY	0 DRY	Data wrap on
Stoney Ck Up Barro	Stoney	16.1.25	1115	BaroTroll	-	-	-	-	100%	25%	yes	yes	yes	-	-	Data wrap on
FM13 SCDown	Stoney	21.01.25	0850	RuggedTroll	-	-	-	-	100%	25%	Yes	Yes	Yes	DRY	0 DRY	Data wrap on
Stoney Ck Down Barro	Stoney	21.01.25	0910	BaroTroll	-	-	-	-	100%	25%	Yes	Yes	Yes	-	-	Data wrap on
FM9 Brossi	South Wambo	23.1.25	0955	RuggedTroll	-	-	-	-	71%	13%	yes	yes	yes	Slow	0 250	Data wrap on
FM15 (FM5)	South Wambo	23.1.25	1035	RuggedTroll	-	-	-	-	68%	12%	yes	yes	yes	DRY	0 -	Data wrap on
FM16 (FM6)	South Wambo	23.1.25	1100	RuggedTroll	-	-	-	-	71%	13%	yes	yes	yes	DRY	0 -	Data wrap on
Barro Logger SWC	South Wambo	23.1.25	1115	BaroTroll	-	-	-	-	71%	13%	yes	yes	yes	-	-	Data wrap on

16.1.25 : Toughbook #2

Note FM12 logger no longer secured to anchor point. Will need to be re-established.

21.01.2025 #2. -TB.

23.1.25 Toughbook #1

Initial: RT

Appendix B

Stream Theoretical Flow Rating and Profile Curves.

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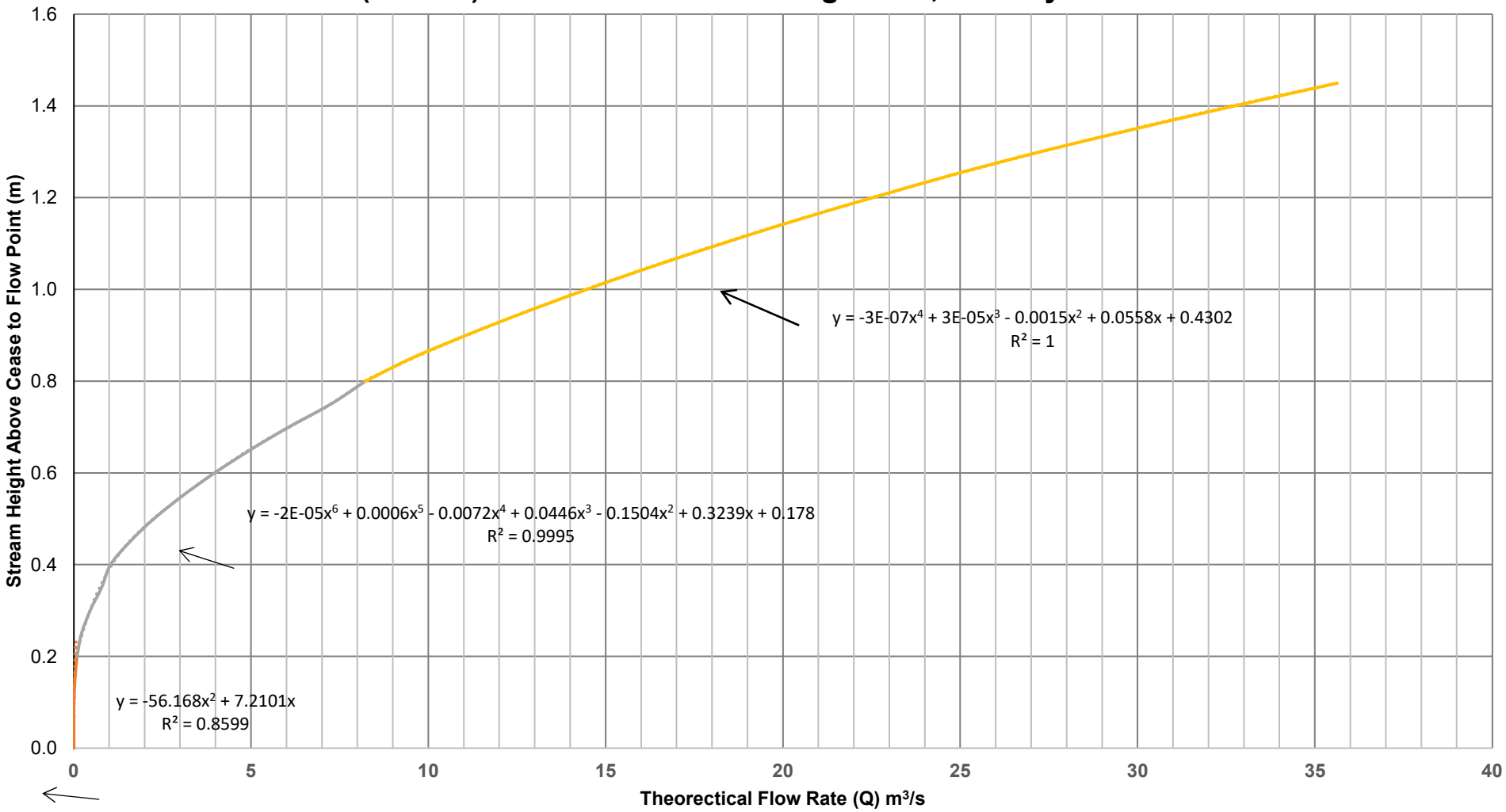
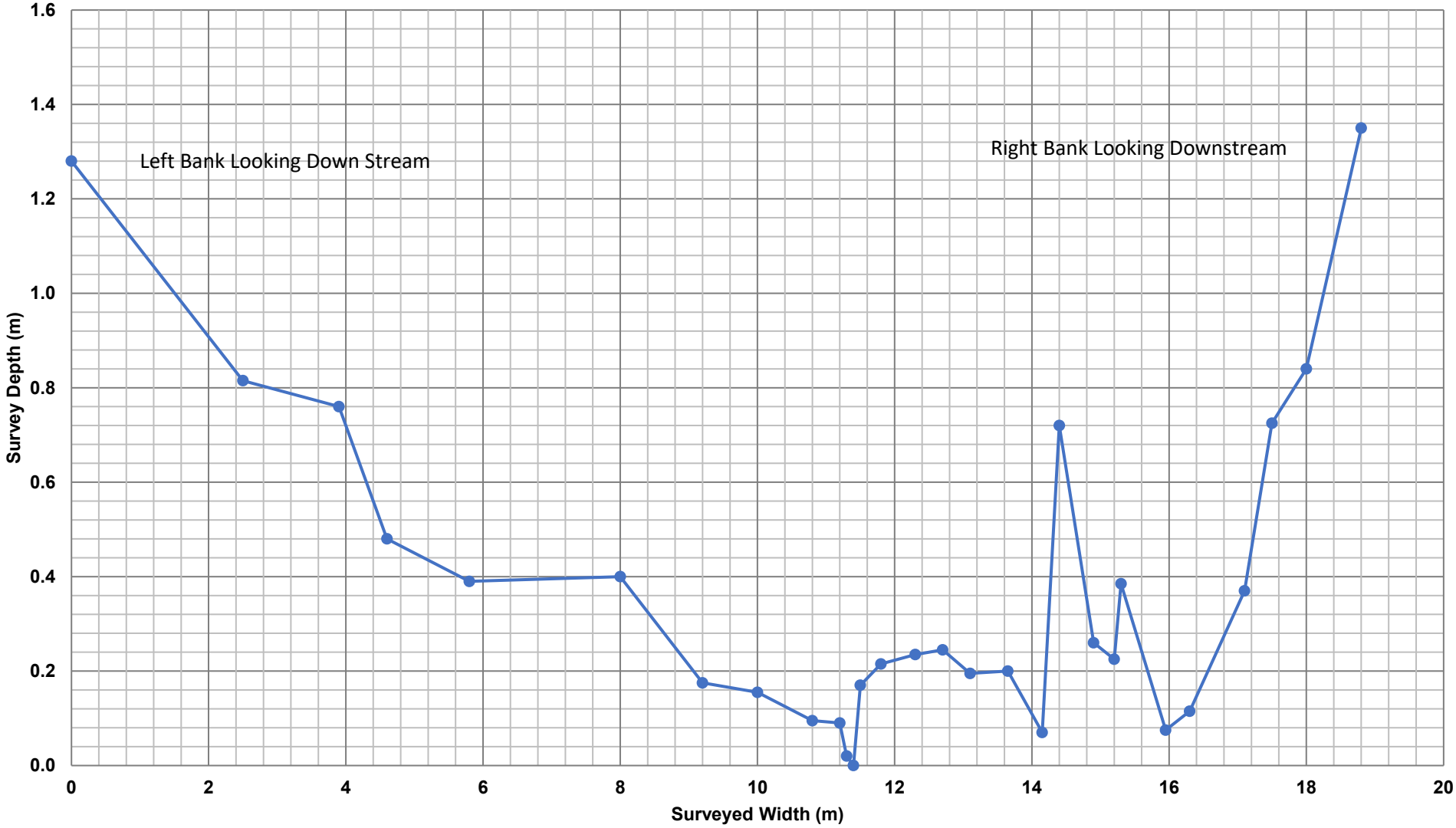
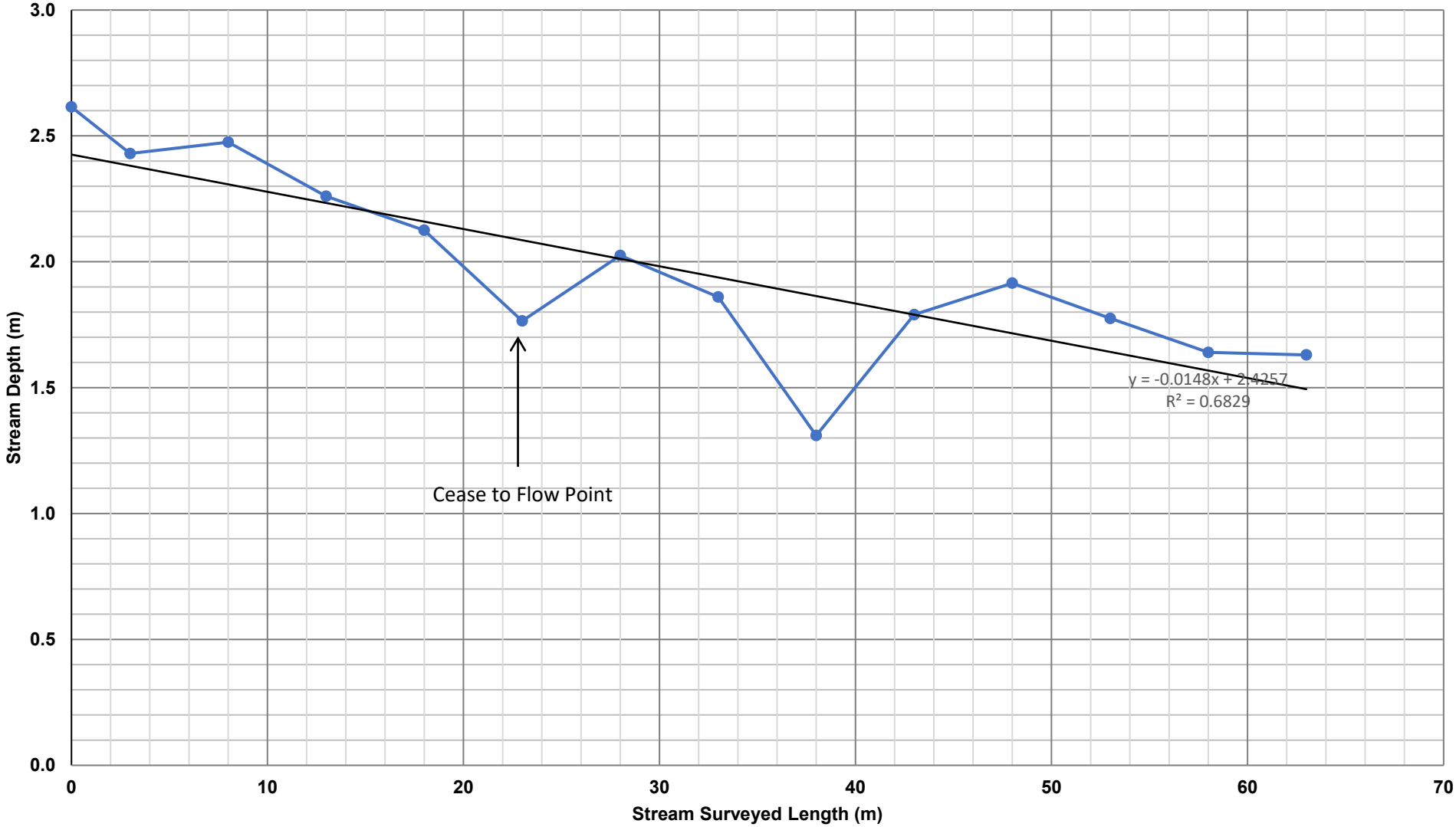
Flow Monitoring Station North Wambo Creek Upstream of Flow Monitoring Station 1 (USFM1) Theorectical Flow Rating Curve, January 2023



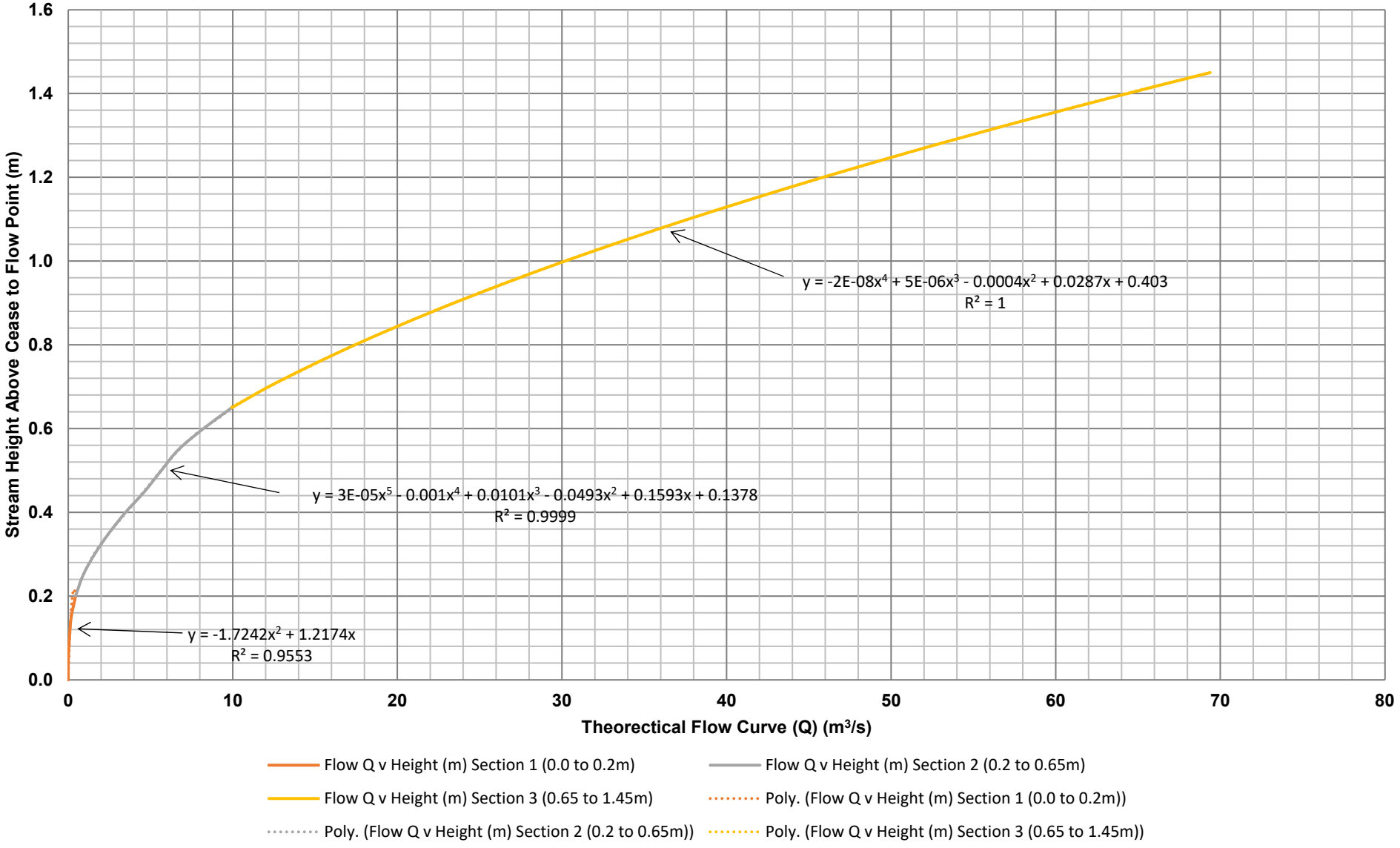
Flow Monitoring Station North Wambo Creek Upstream of Flow Monitoring Station 1 (USFM1) Cease to Flow Point Cross Section Survey February 2023



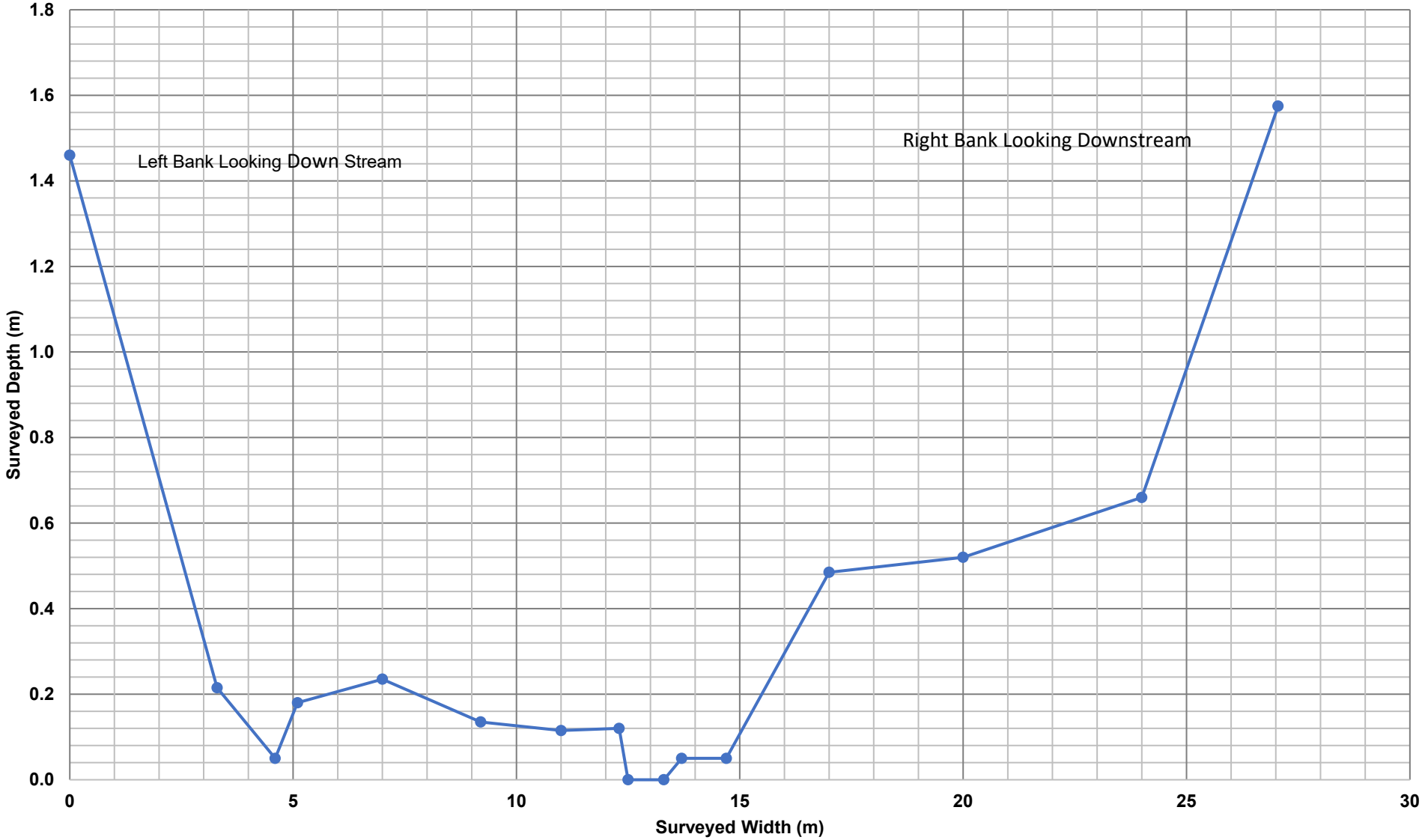
Flow Monitoring Station North Wambo Creek Upstream of Flow Monitoring Station 1 (USFM1) Long Section Profile Through Cease to Flow Point February 2023



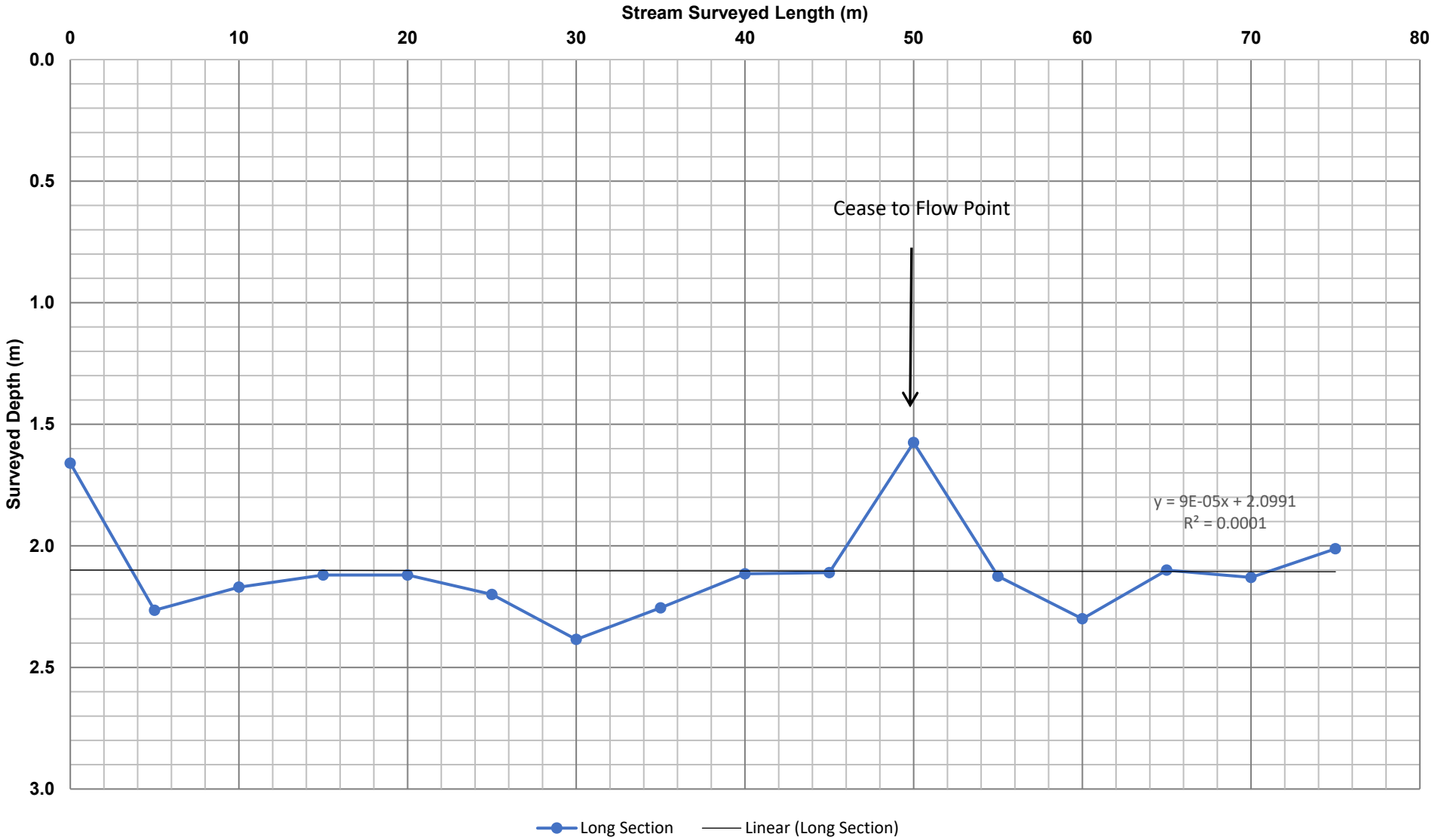
Flow Monitoring Station FM1 North Wambo Creek Theoretical Flow Rating Curve, February 2023



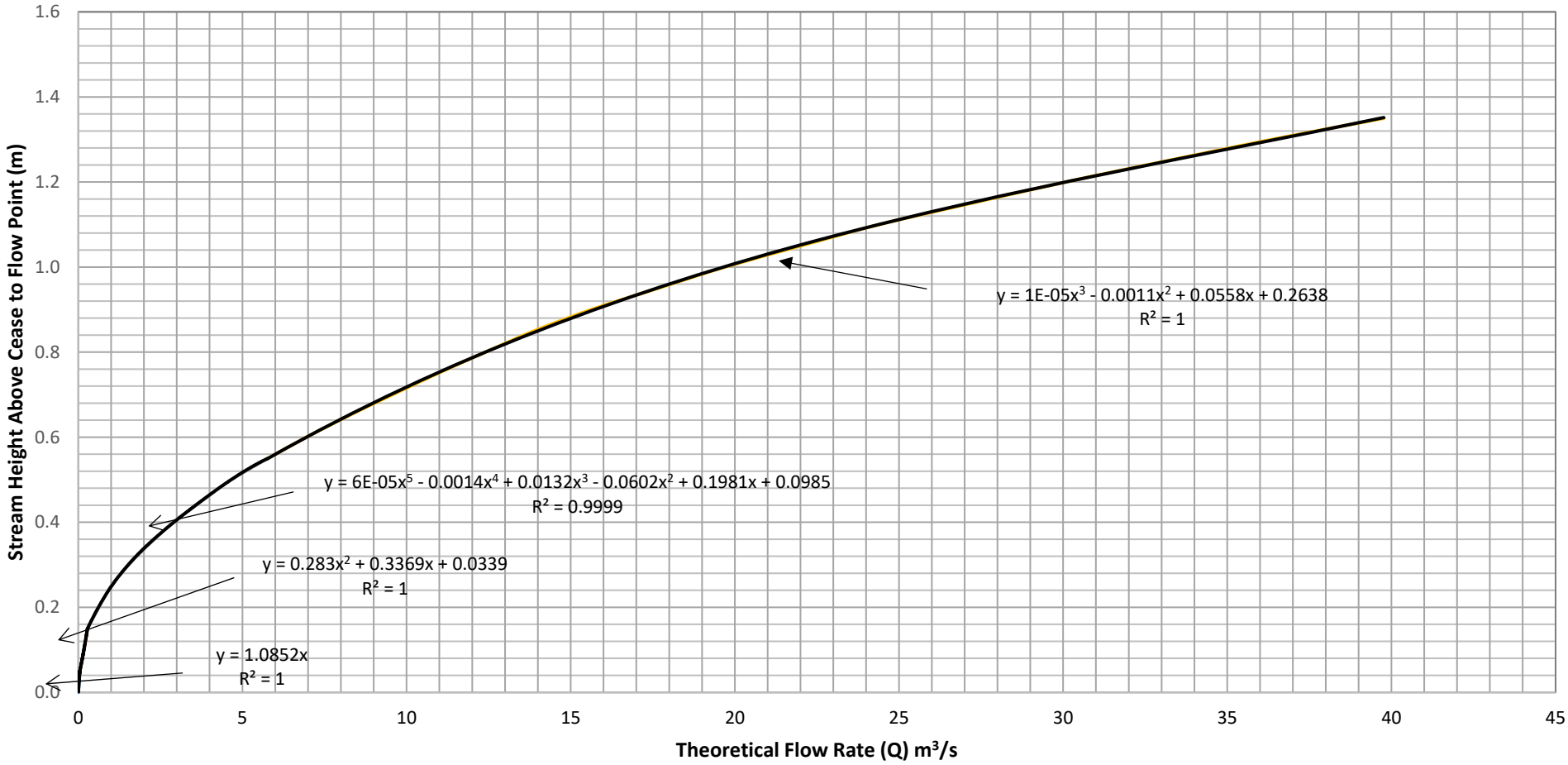
Flow Monitoring Station FM1 North Wambo Creek Cease to Flow Point Cross Section Survey, February 2023



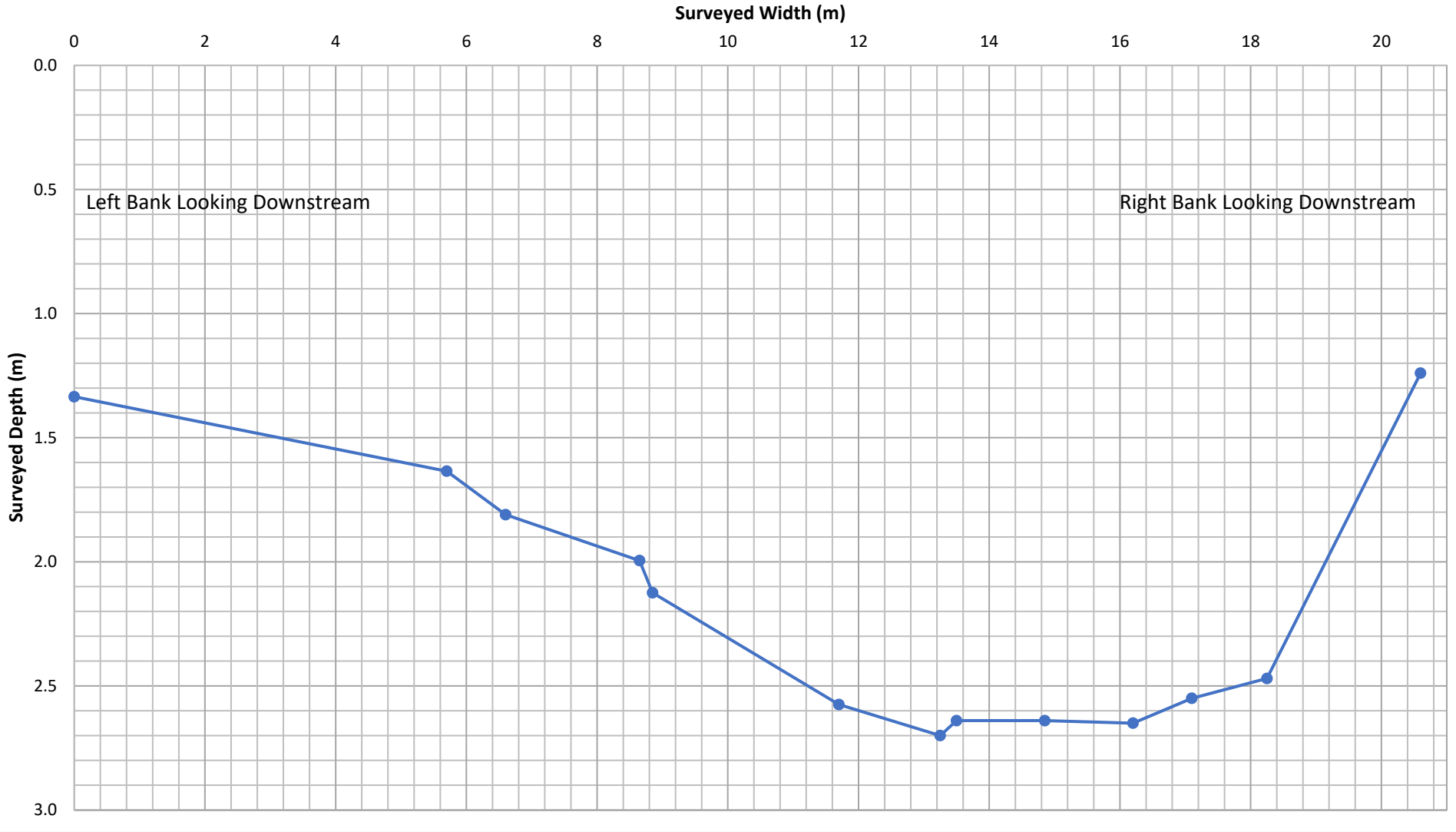
Flow Monitoring Station FM1 North Wambo Creek Long Section Profile Through Cease to Flow Point, February 2023



Flow Monitoring Station 2 North Wambo Creek Theoretical Flow Rating Curve, January 2024

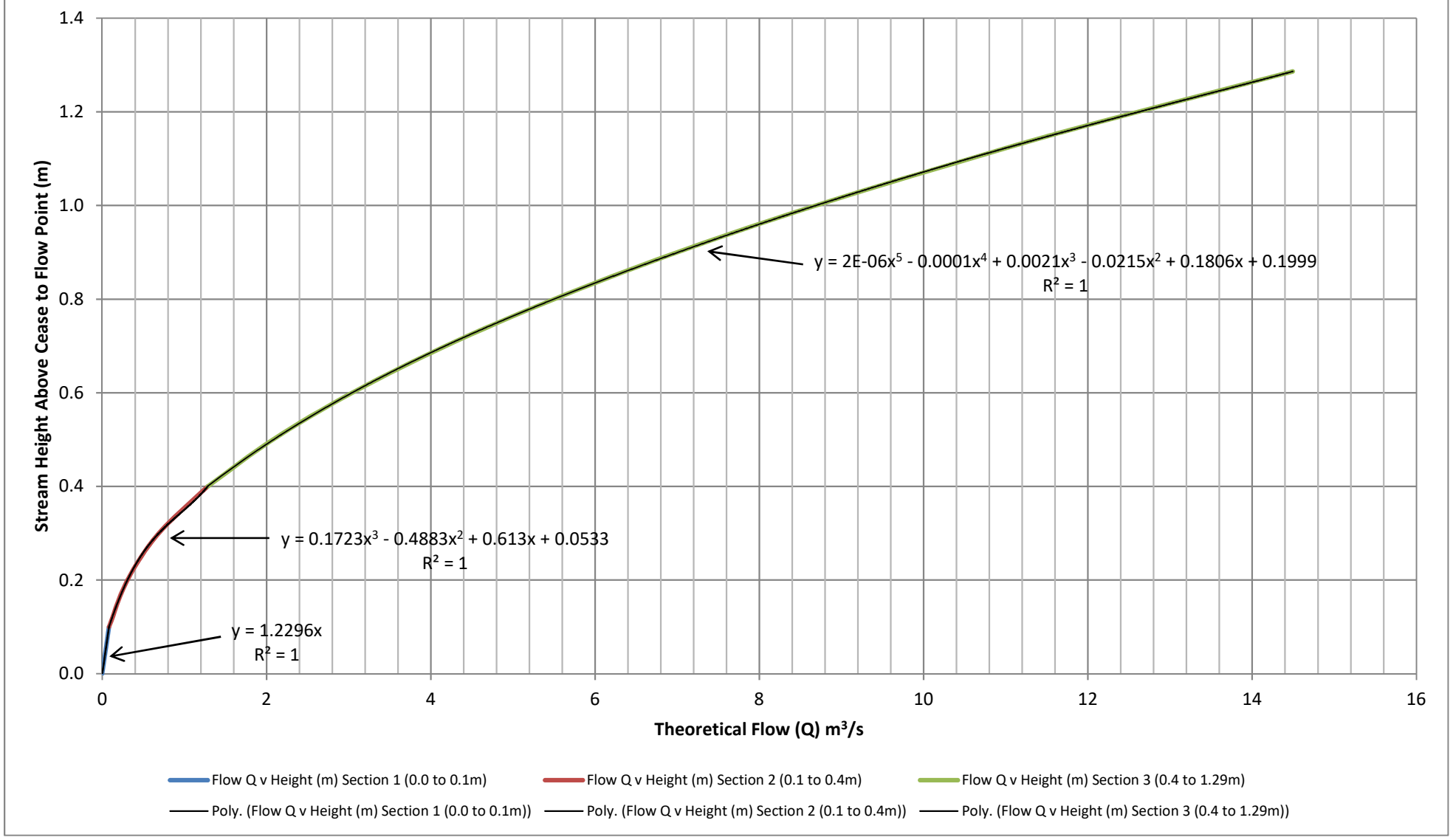


Flow Monitoirng Station 2 North Wambo Creek
Cease to Flow Point Crossection Survey
January 2024

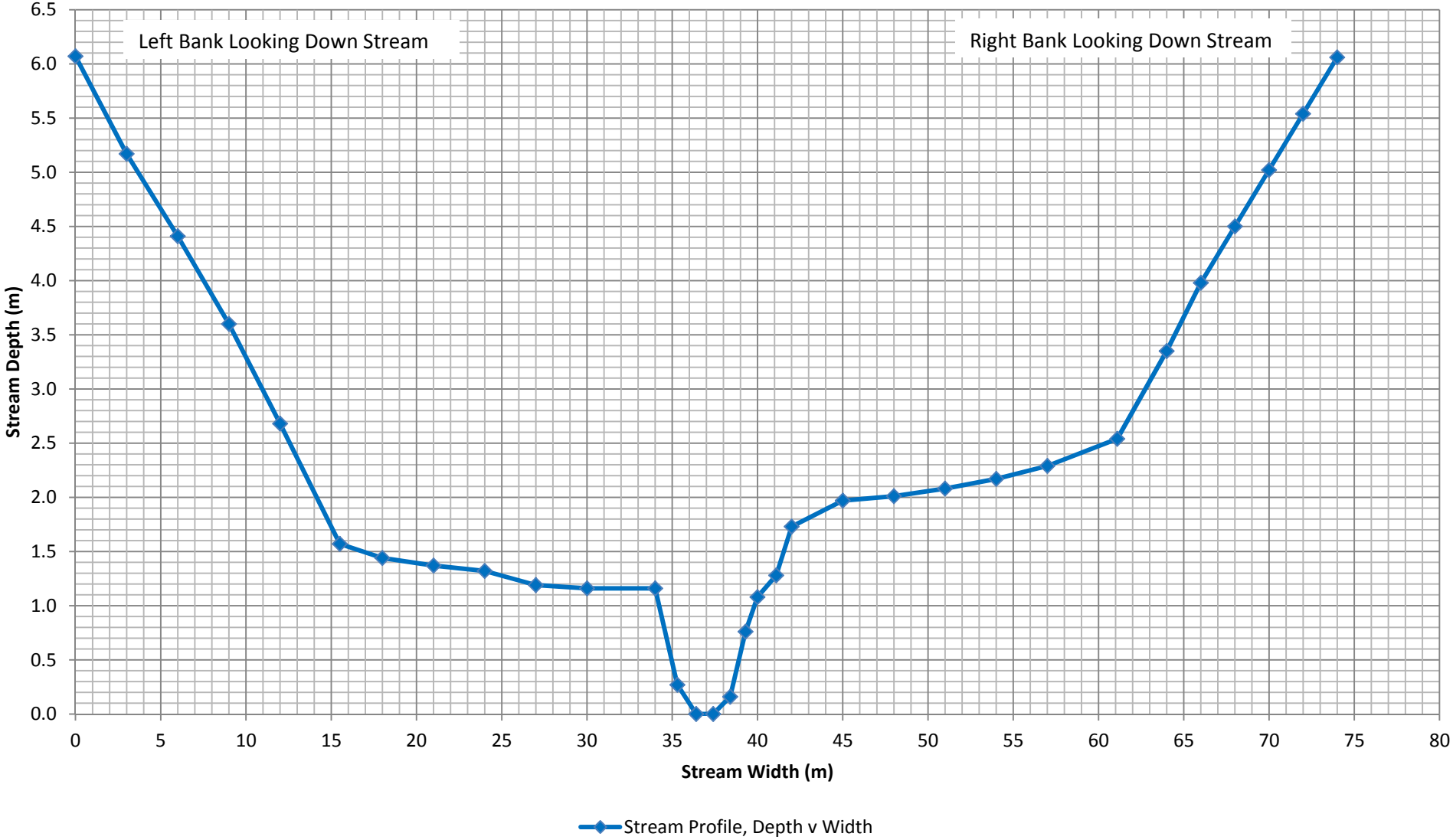


Flow Monitoring Station 2 North Wambo Creek Long Section
Profile Through Cease to Flow point
January 2024

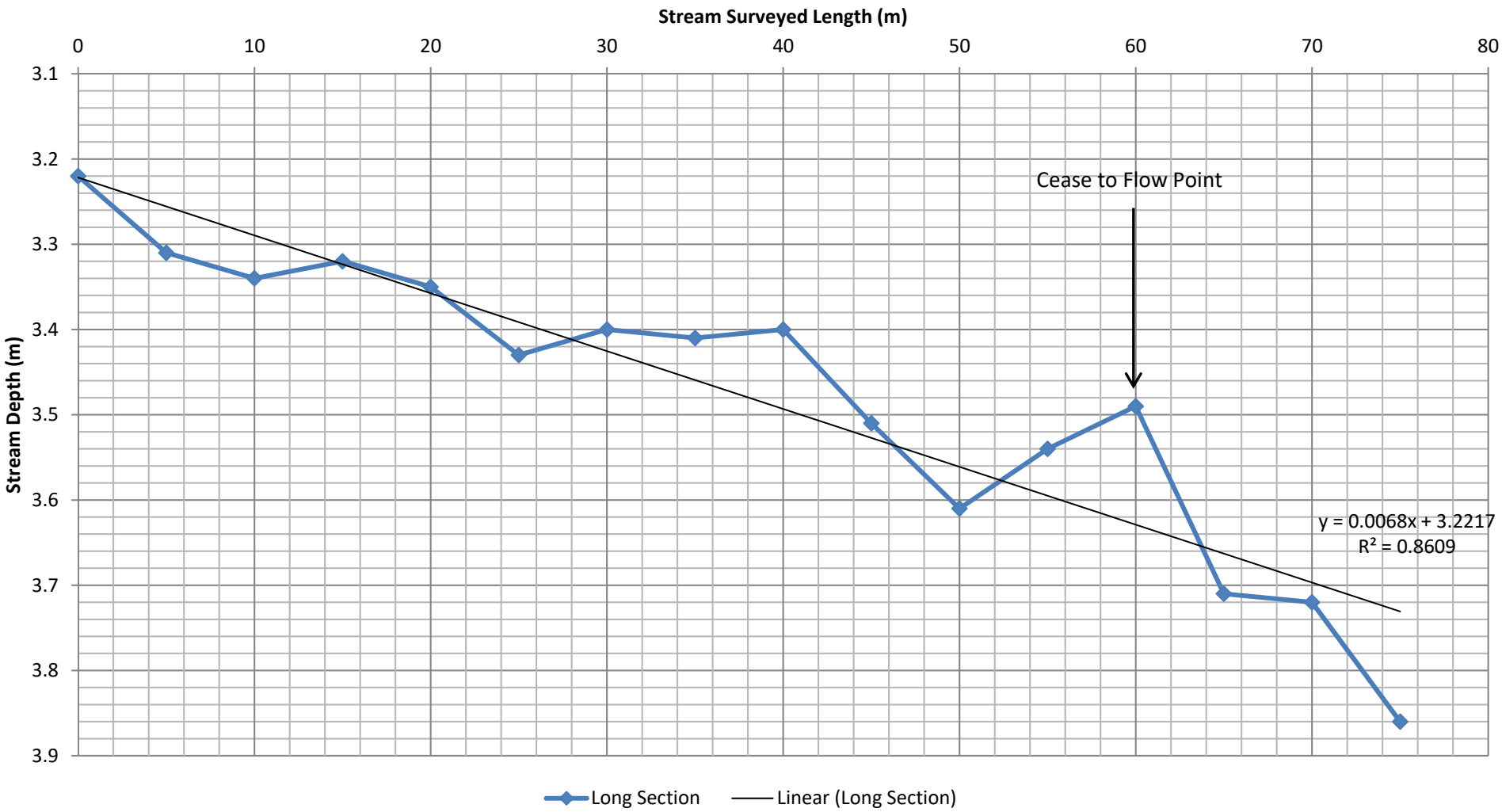
Flow Monitoring Station 3 North Wambo Creek Theoretical Flow Rating Curve, January 2018



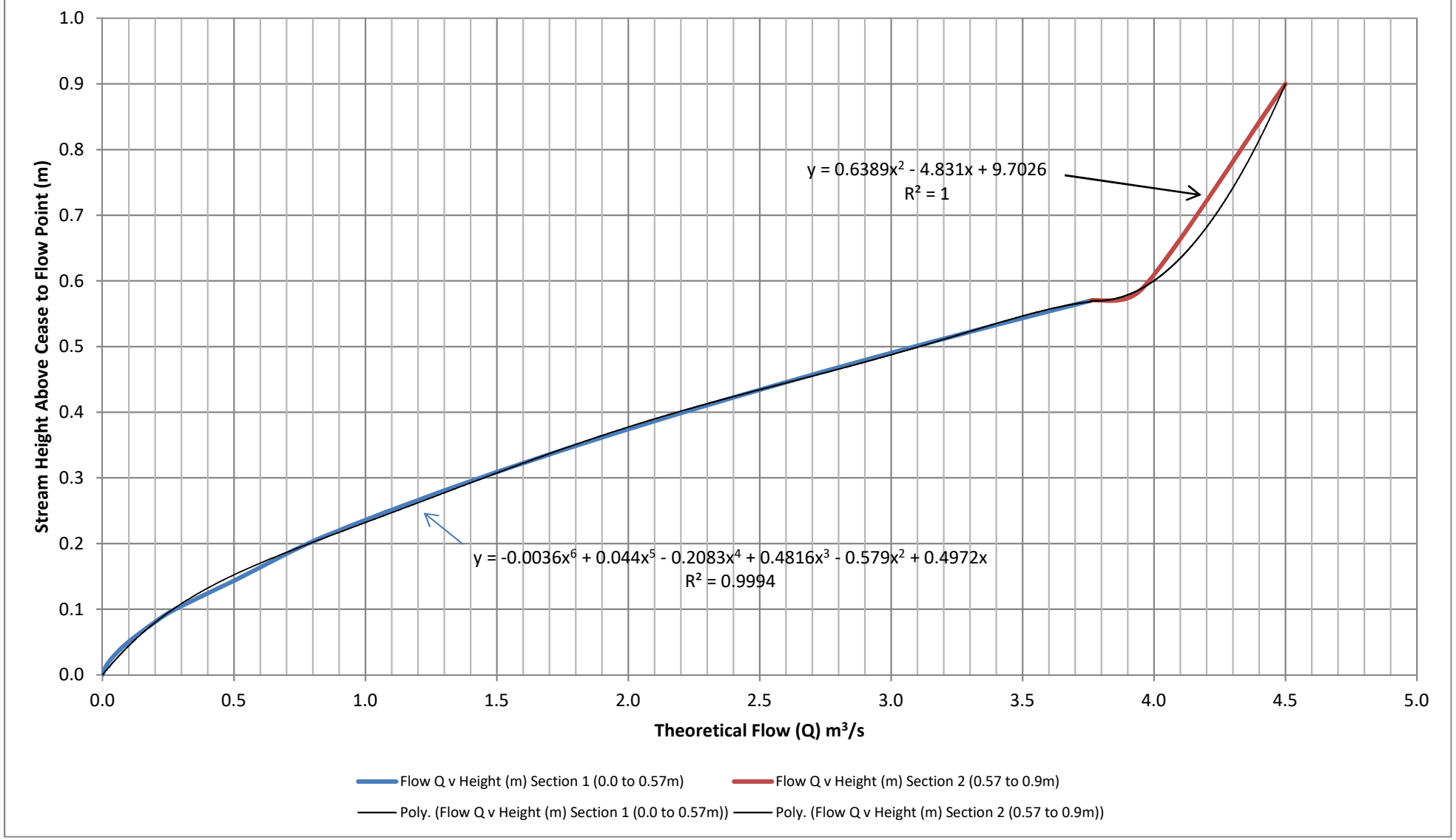
Flow Monitoring Station 3 North Wambo Creek Stream Bed Cross Section Profile, May 2013



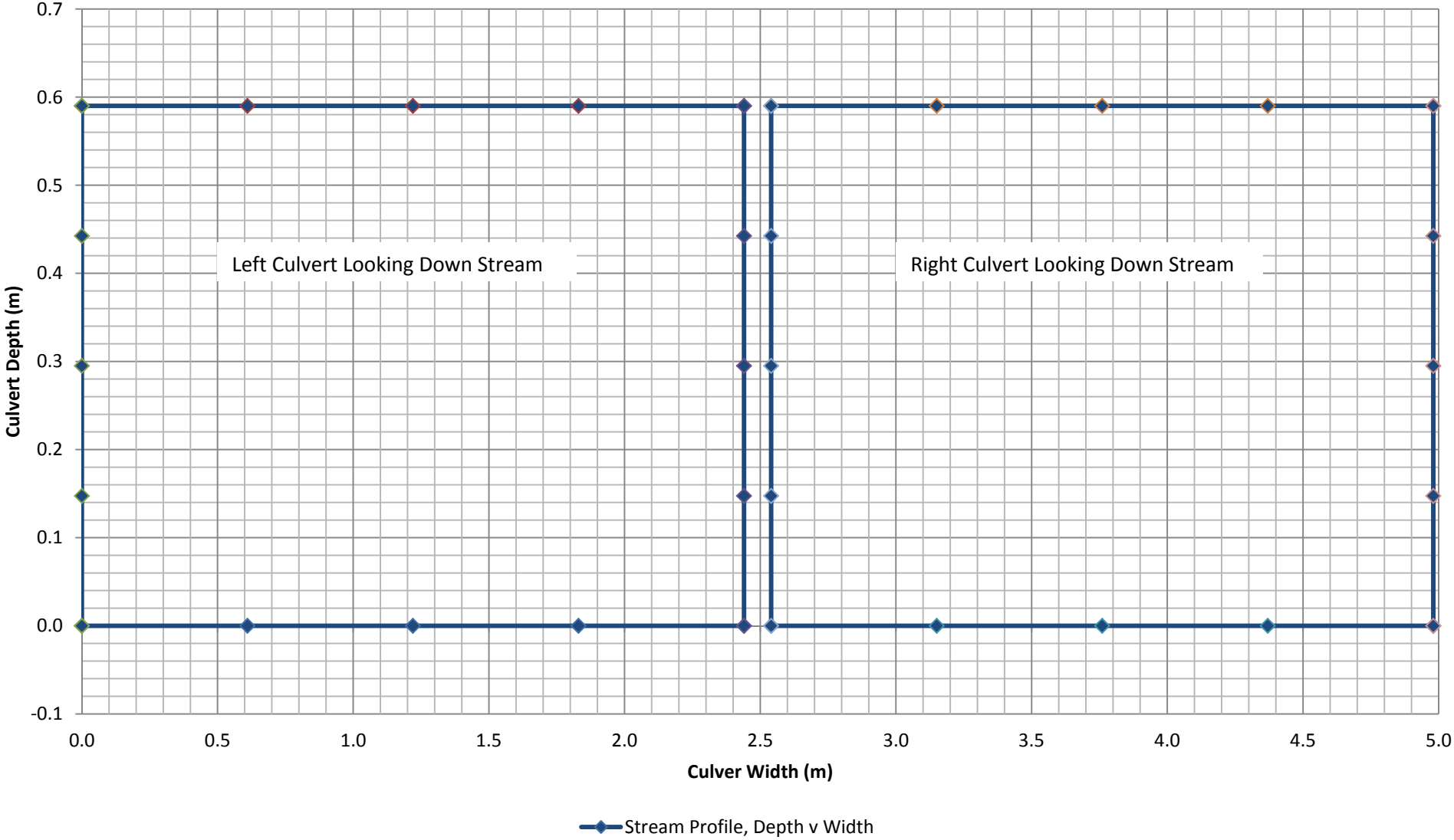
Flow Monitoring Station 3 North Wambo Creek Long Section Profile Through Cease to Flow Point January 2018



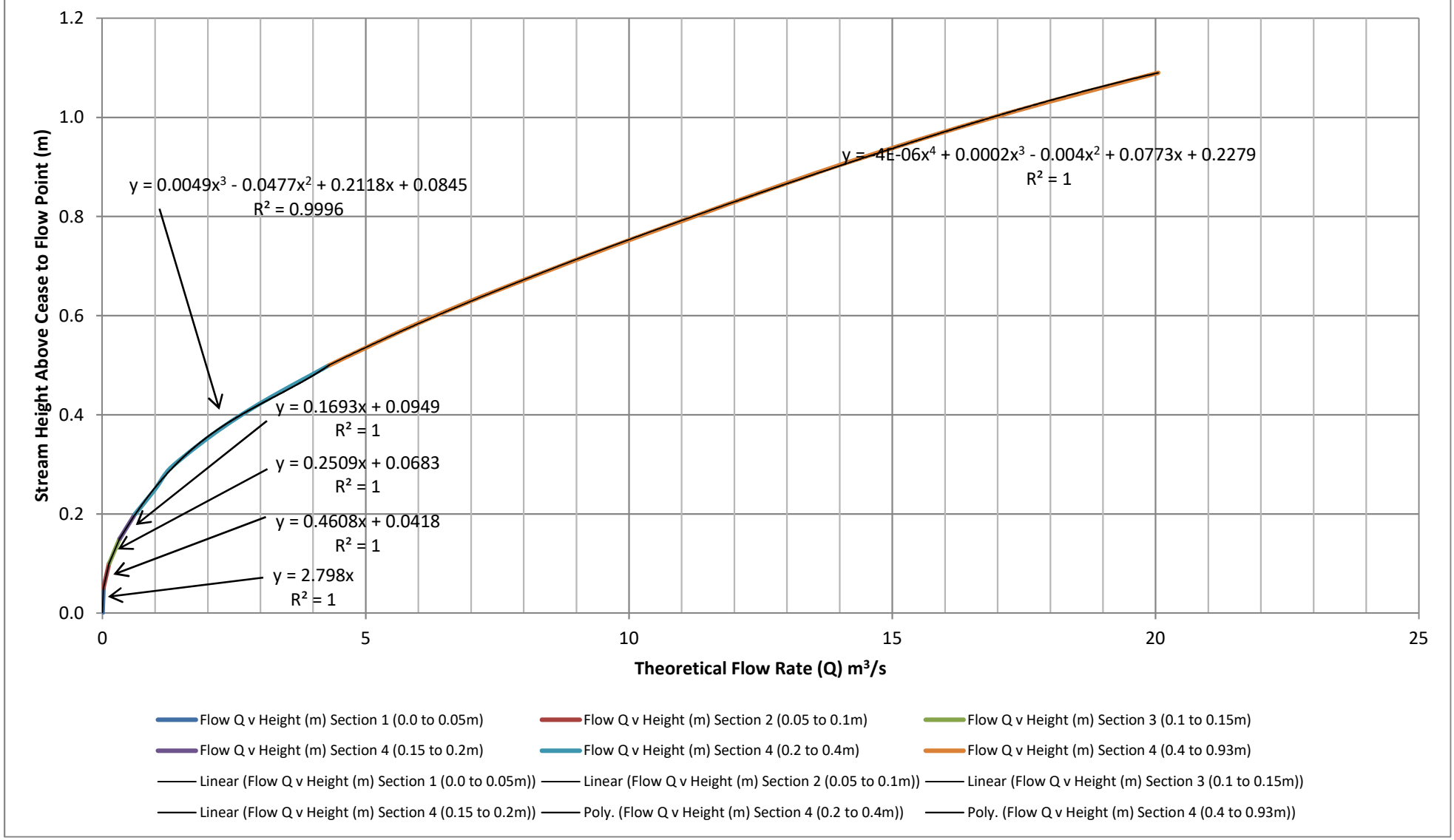
Flow Monitoring Station 4 North Wambo Creek Theoretical Flow Rating Curve, January 2018



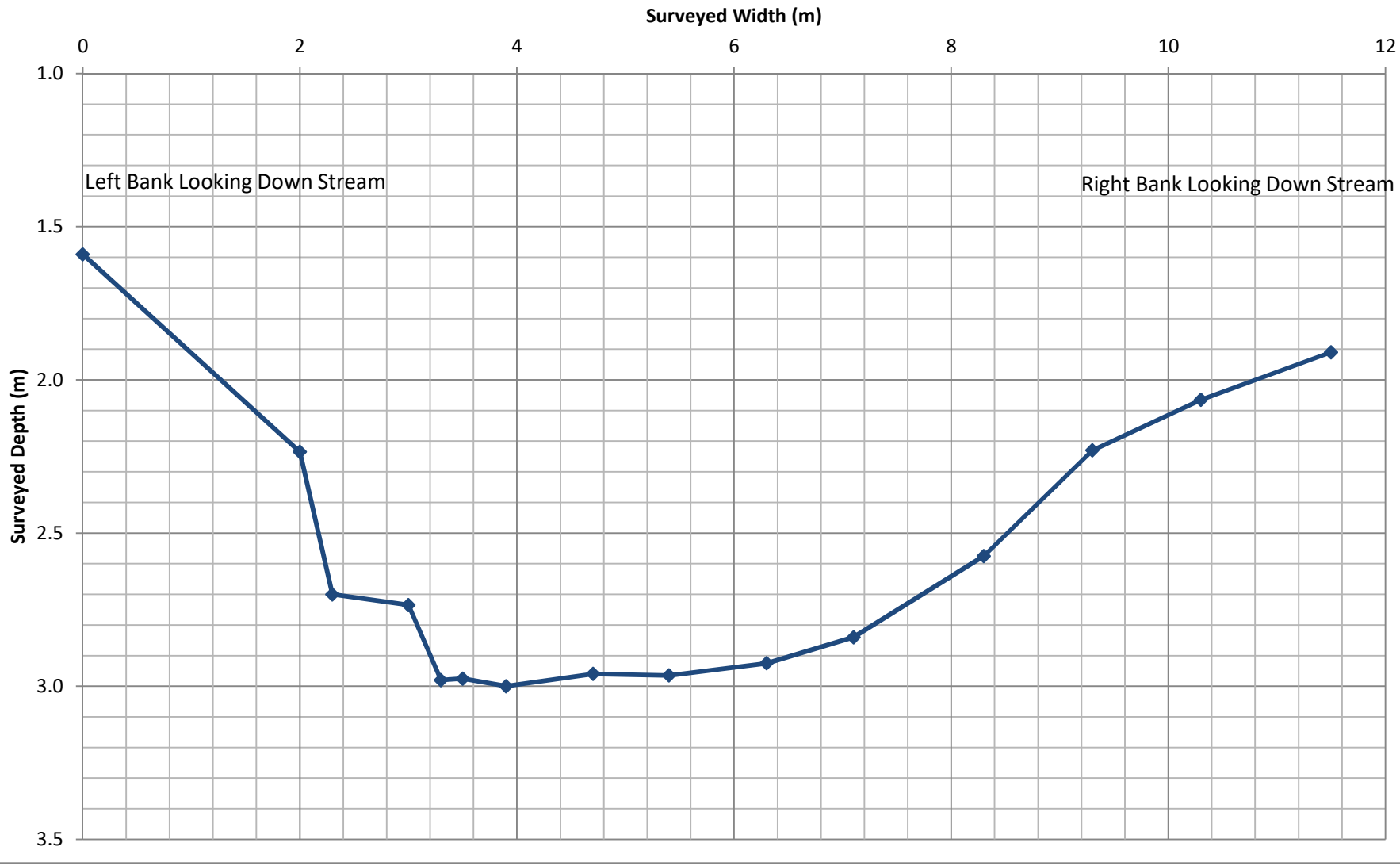
Flow Monitoring Station 4 North Wambo Creek Two Culverts Cross Section Profiles, May 2013



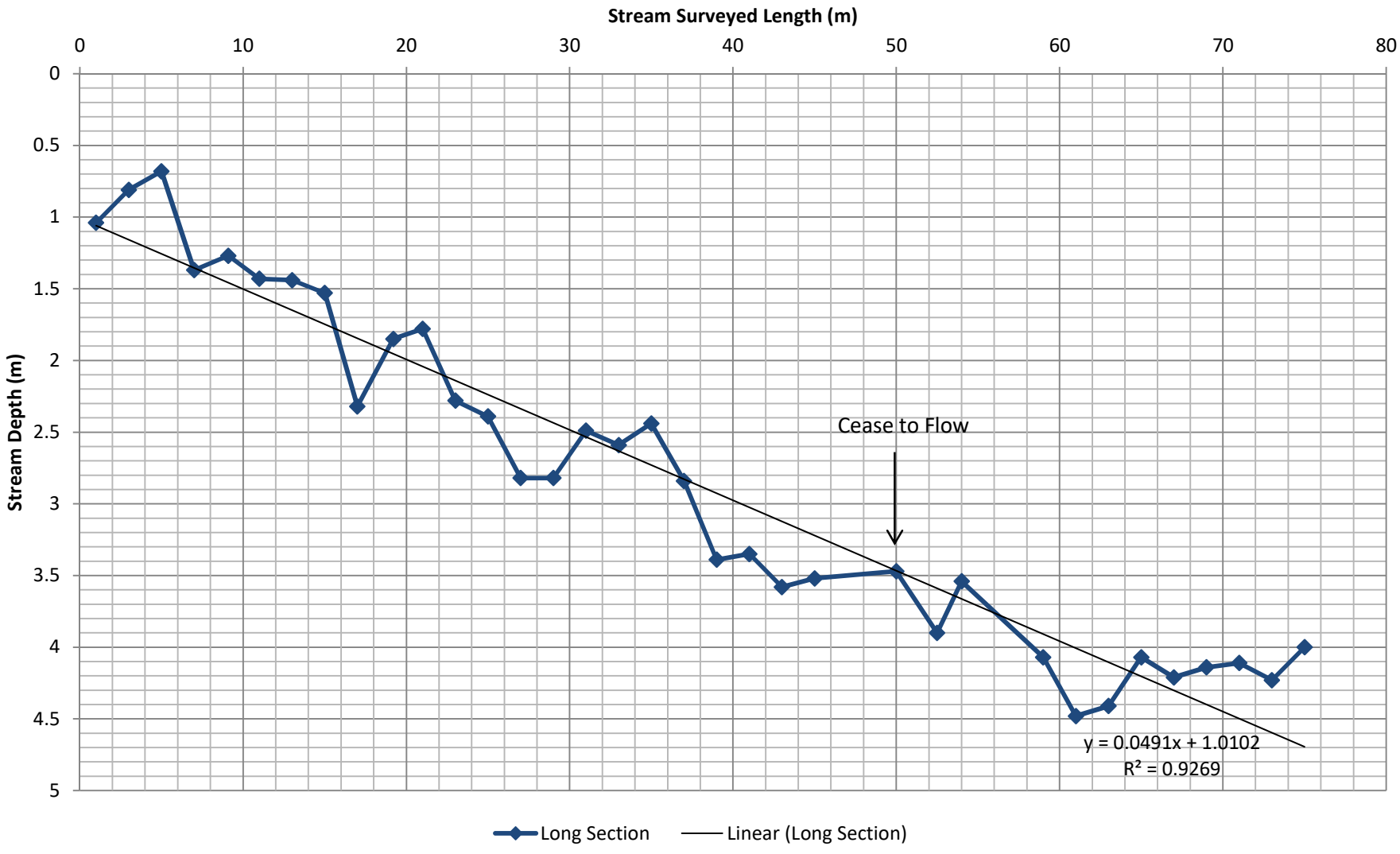
Flow Monitoring Station 12 Stoney Creek Up Theoretial Flow Rating Curve May 2019



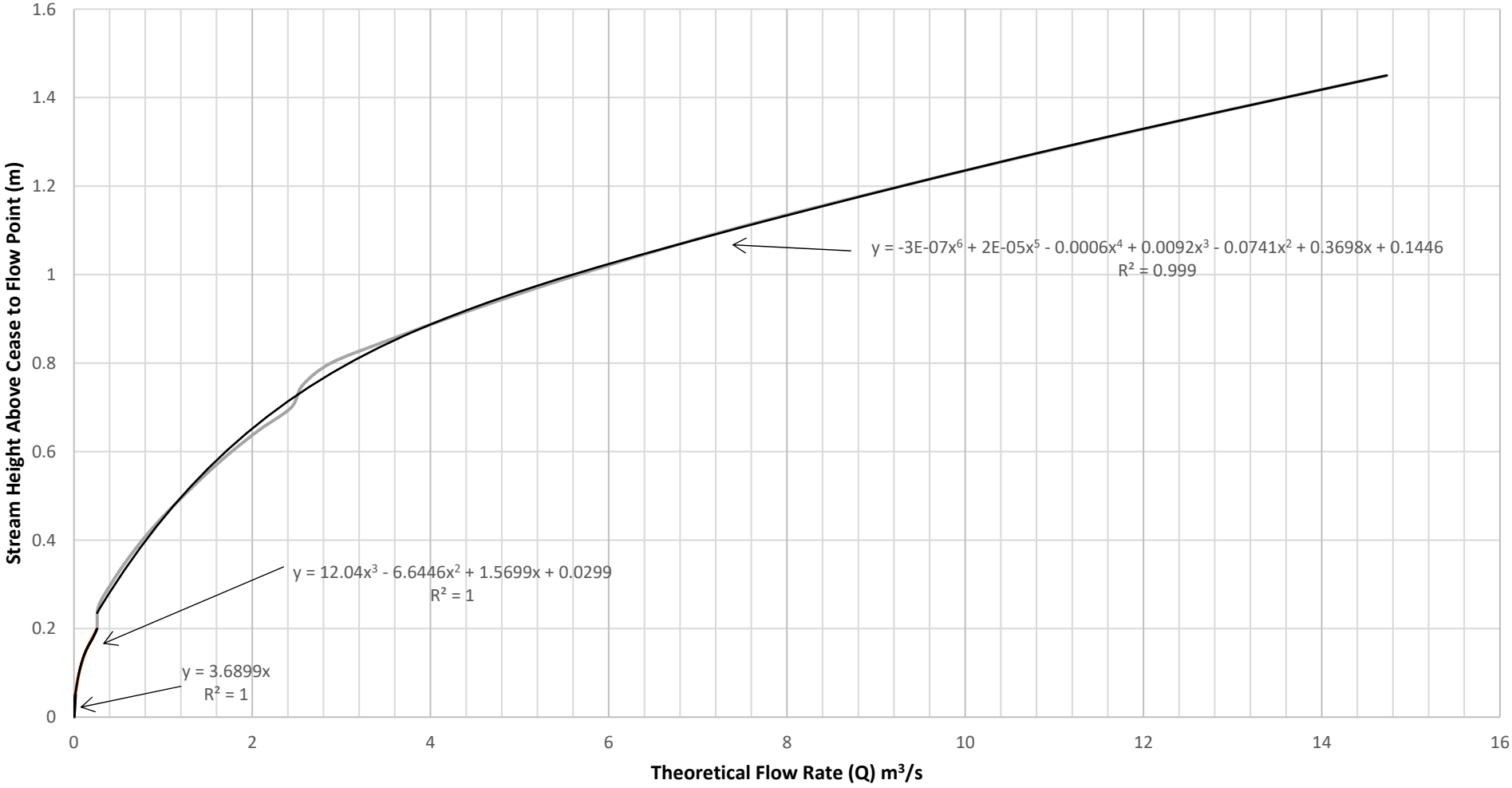
Flow Monitoring Station 12 Stoney Creek Up Flow Cease to Flow Point Cross Section Survey December 2018



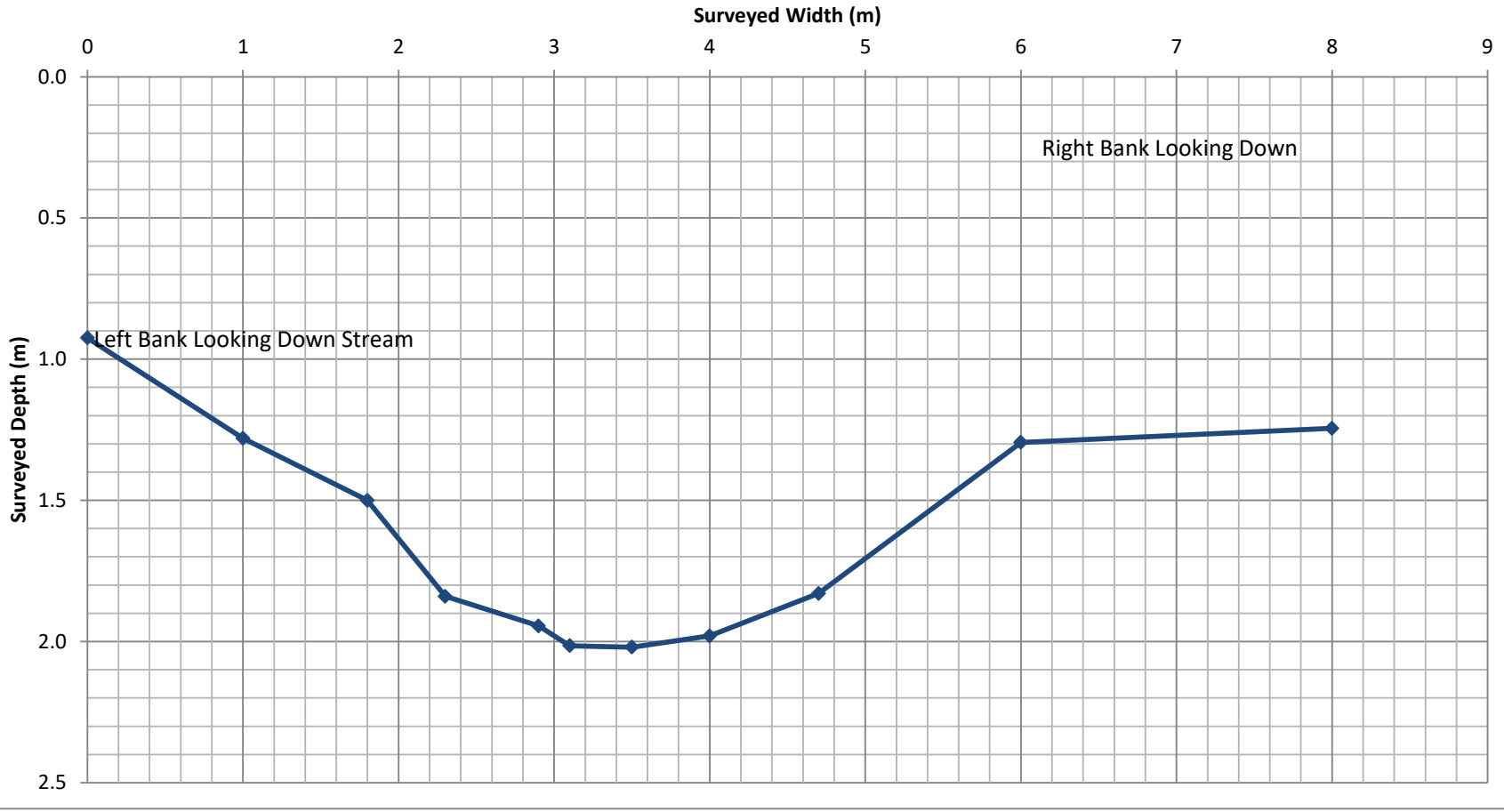
Flow Monitoring Station 12 Stoney Creek Up Long Section Profile Through Cease to Flow Point December 2018



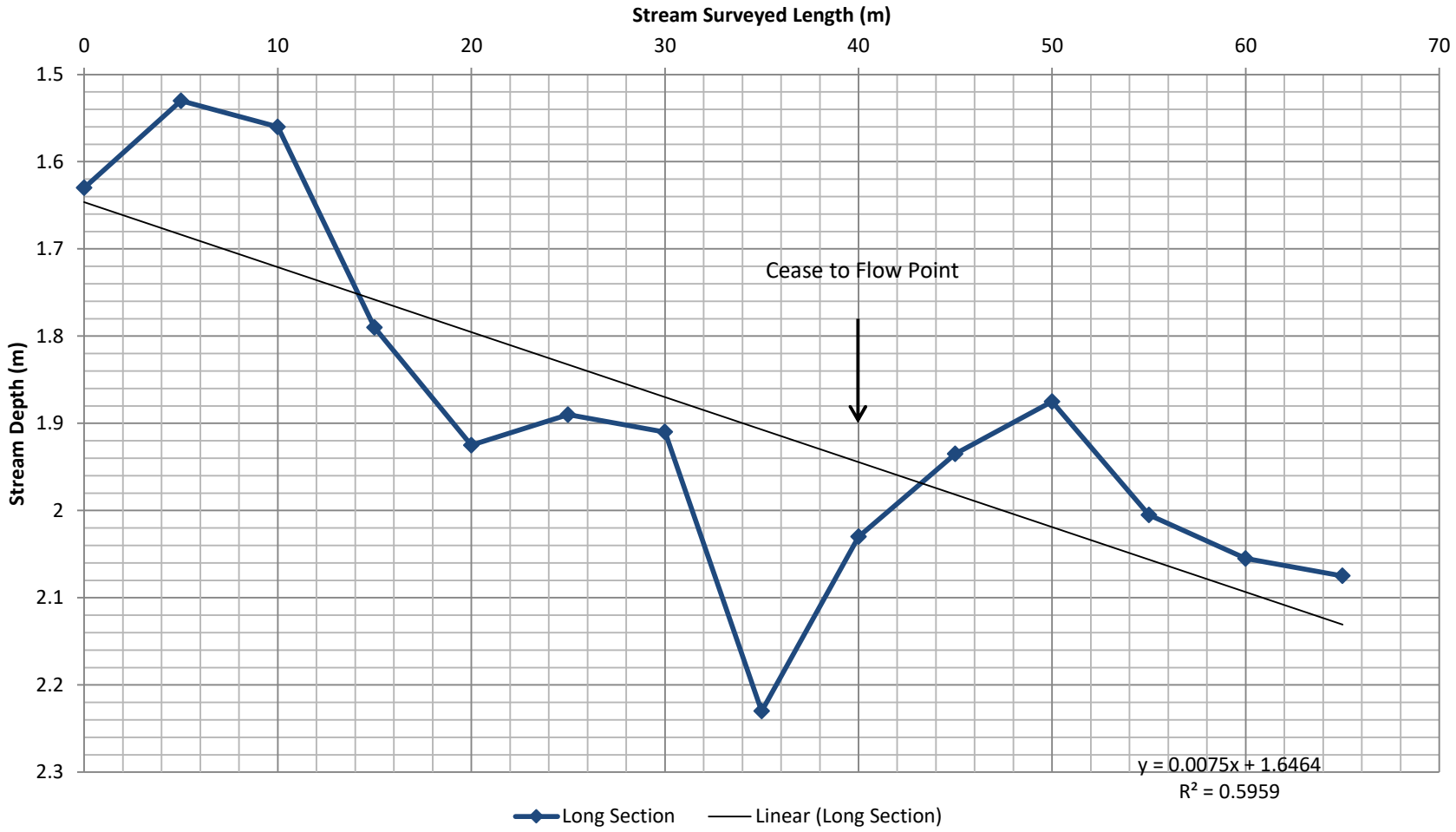
Flow Monitoring Station 13 Stoney Creek Down Theorectical Flow Curve
January 2022



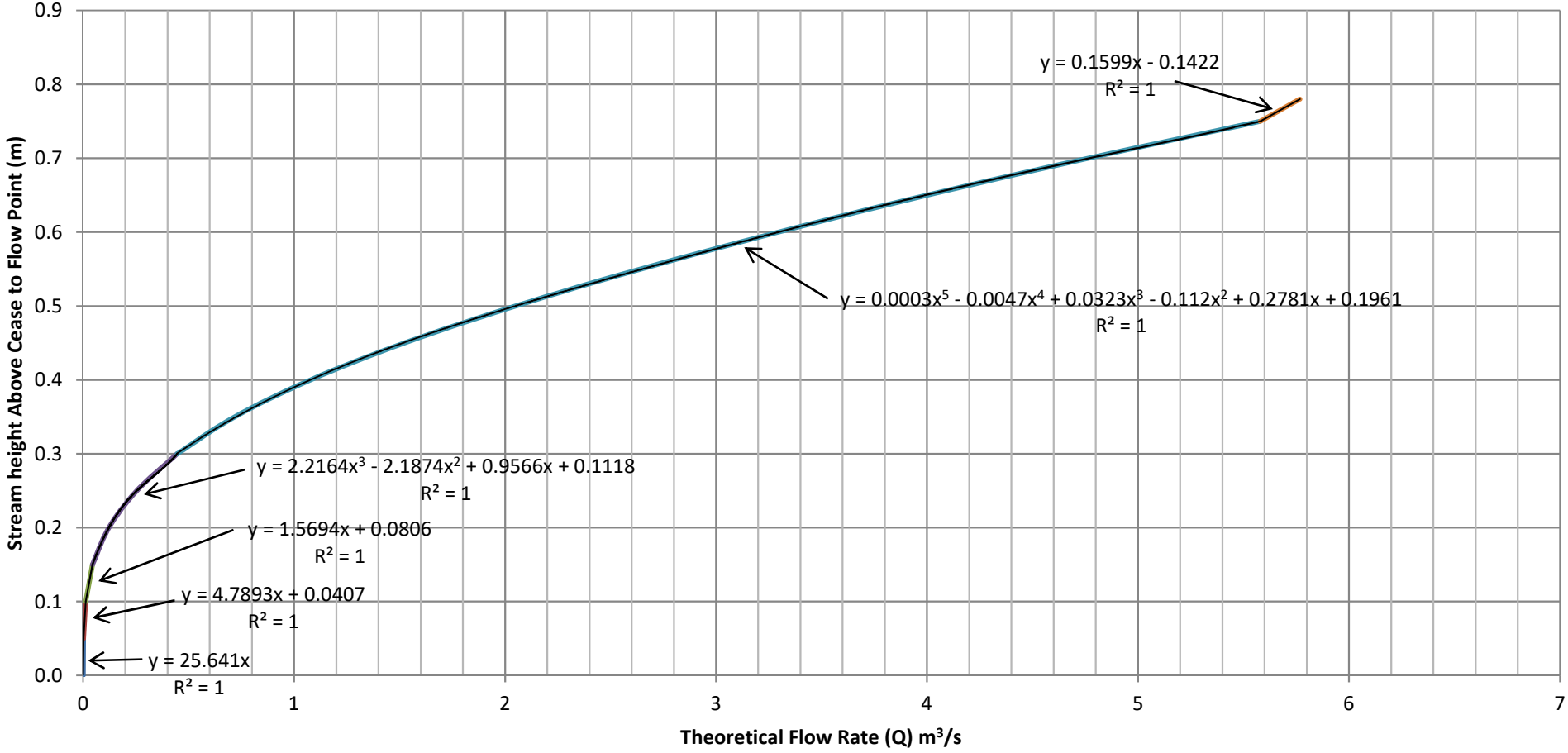
Wambo Coal
Stoney Creek Down Flow Station Re-Location Cease to Flow Point Cross Section Survey
January 2022



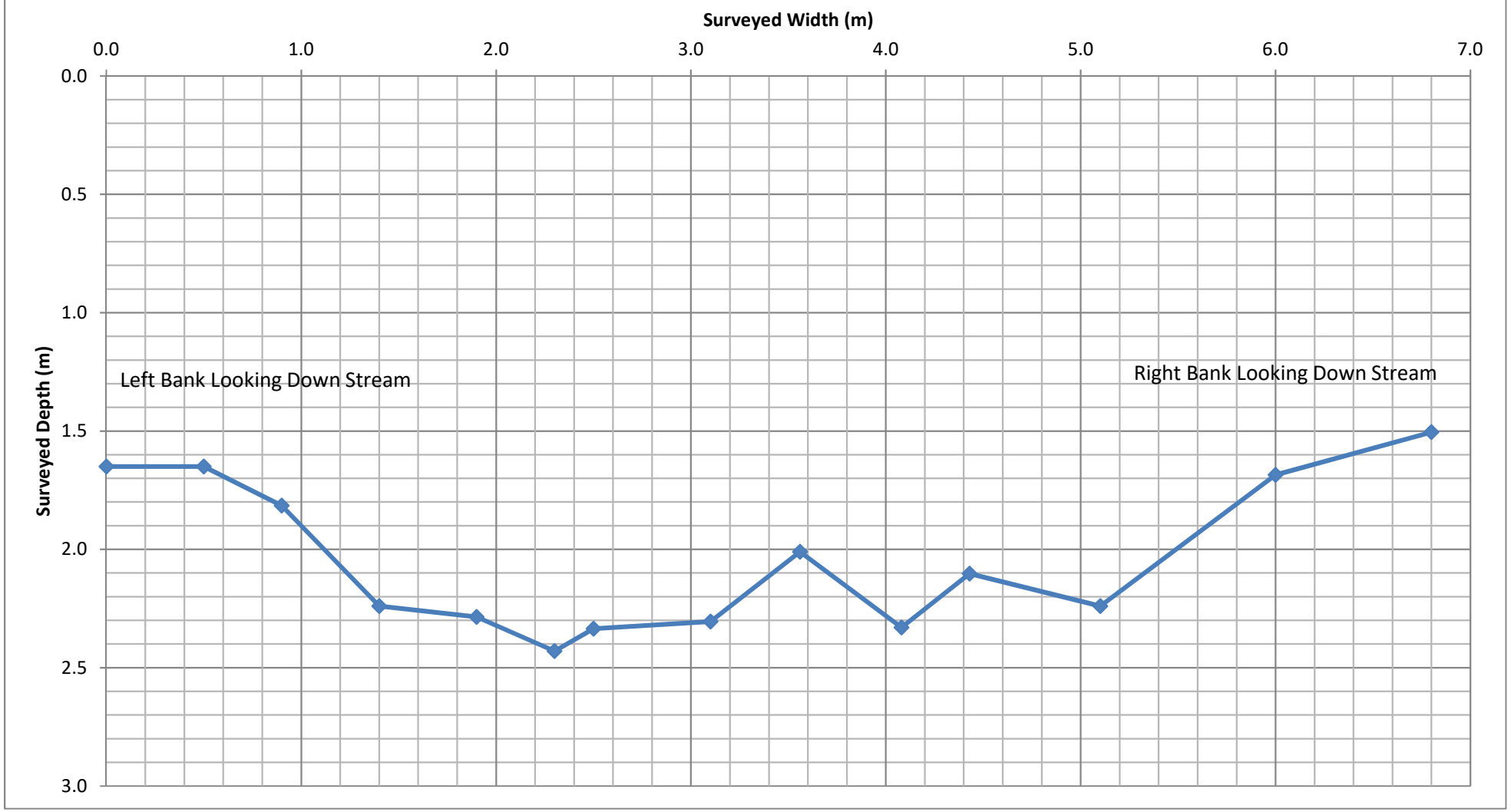
Wambo Coal
Stoney Creek Down Re-Location Long Section Profile Through Cease to Flow Point
January 2022



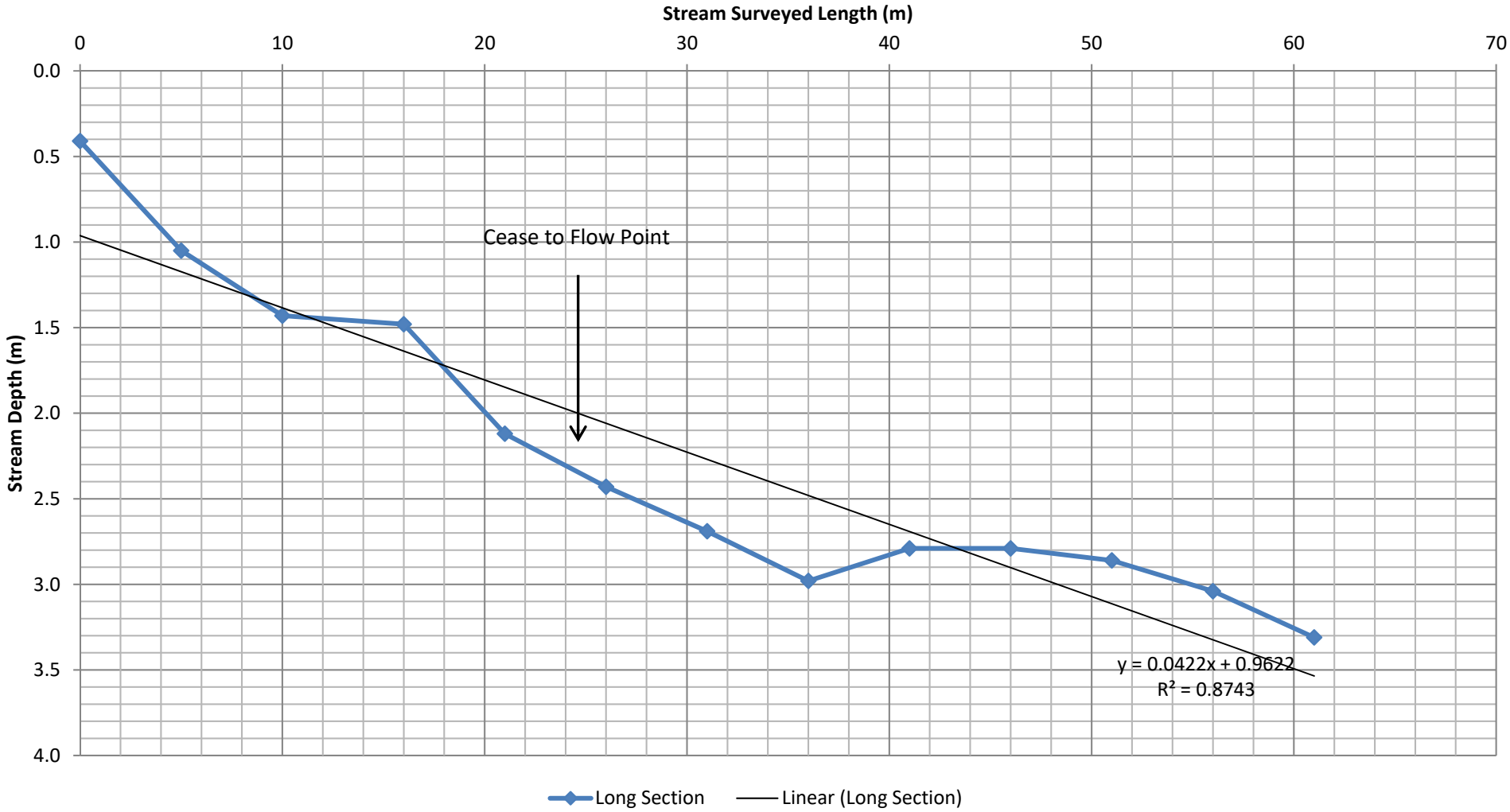
Flow Monitoring Station 14 Stoney Creek Tributary Theoretical Flow Rating Curve January 2018



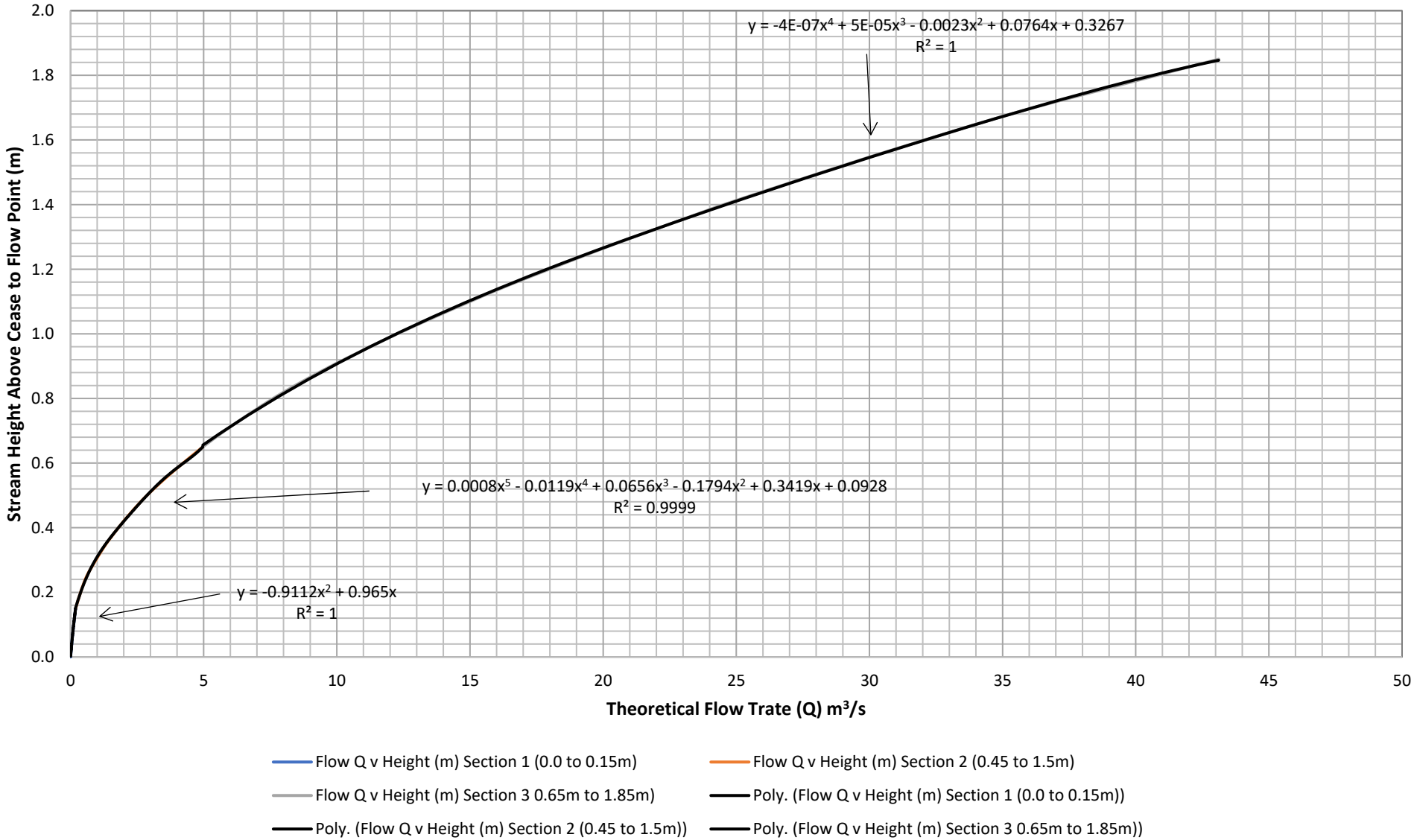
Flow Monitoring Station 14 Stoney Creek Tributary Cease To Flow Point Cross Section Survey December 2018

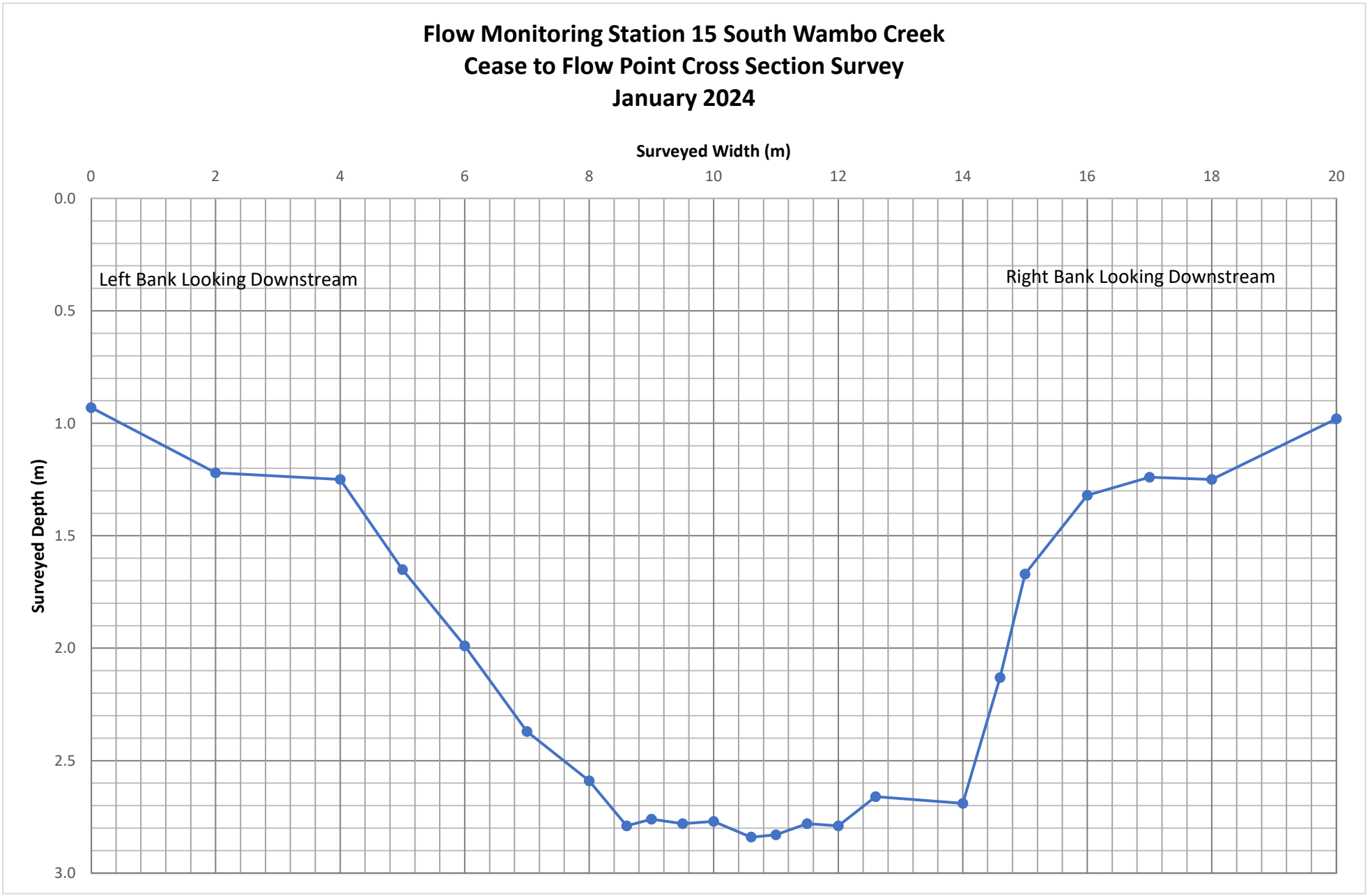


Flow Monitoring Station 14 Stoney Creek Tributary Long Section Profile Through Cease to Flow Point December 2018

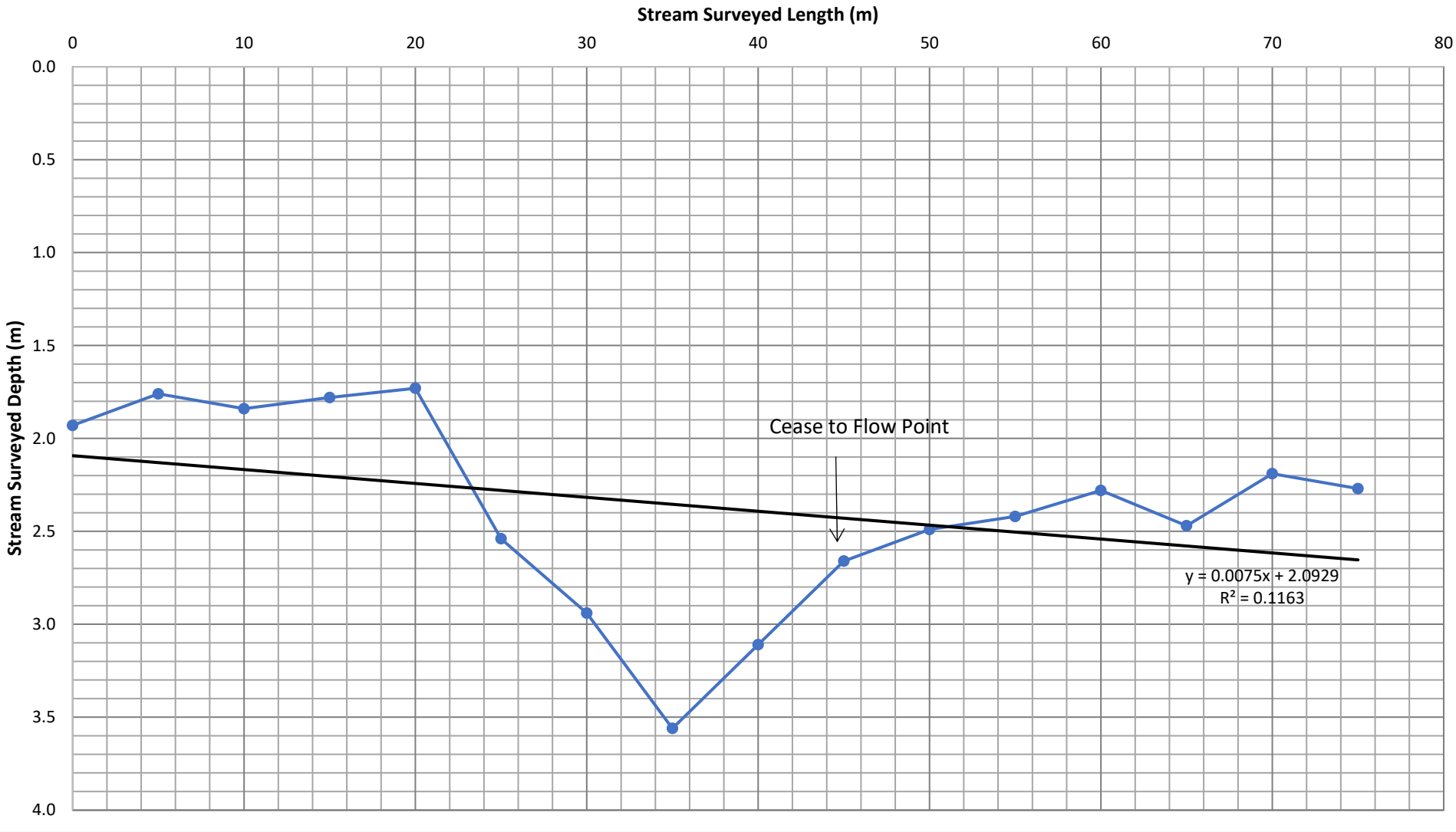


Flow Monitoring Station 15 South Wambo Creek Theoretical Flow rating Curve, January 2024

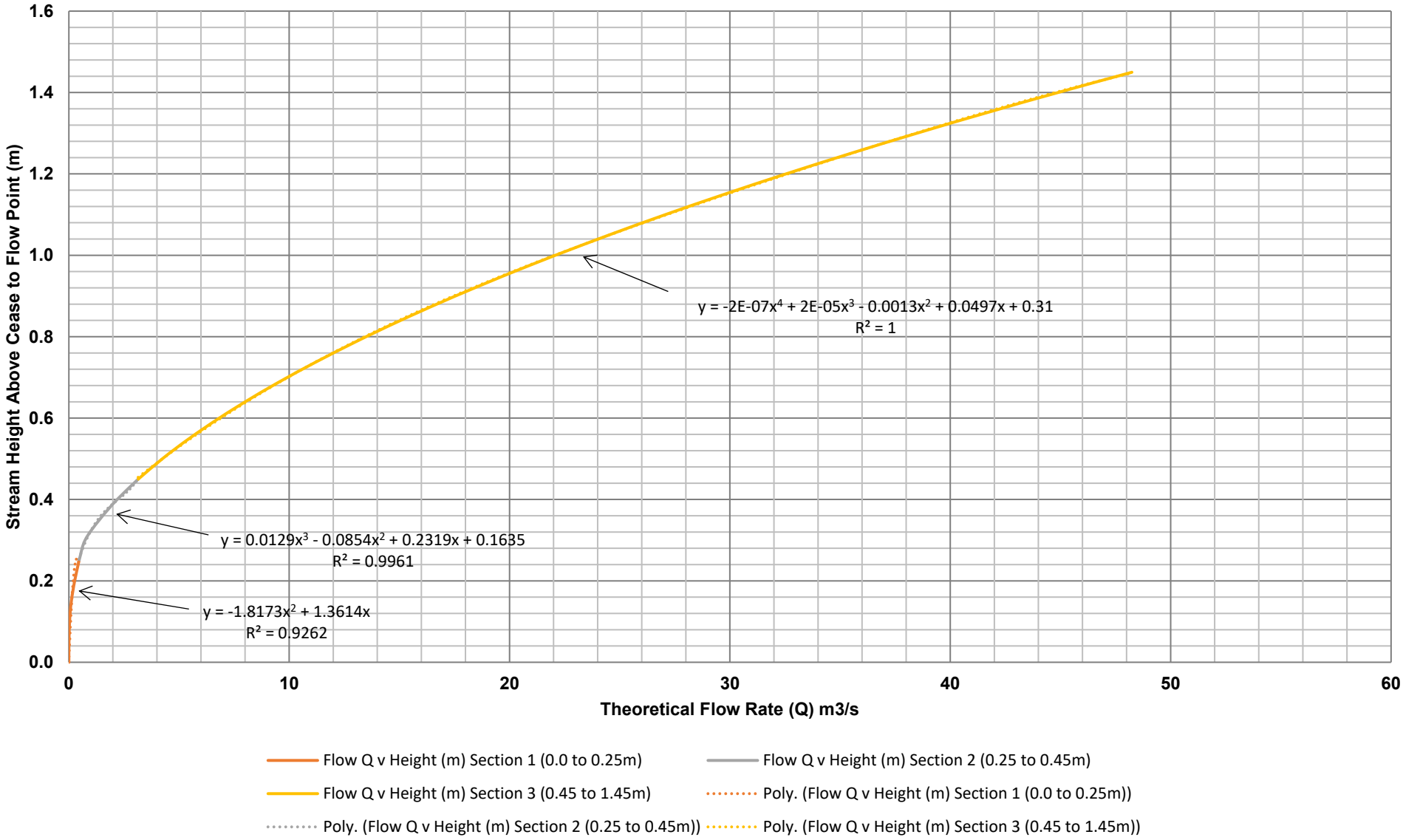



Flow Monitoring Station 15 South Wambo Creek
Cease to Flow Point Cross Section Survey
January 2024
Surveyed Width (m)
0
2
4
6
8
10
12
14
16
18
20
Surveyed Depth (m)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Left Bank Looking Downstream
Right Bank Looking Downstream

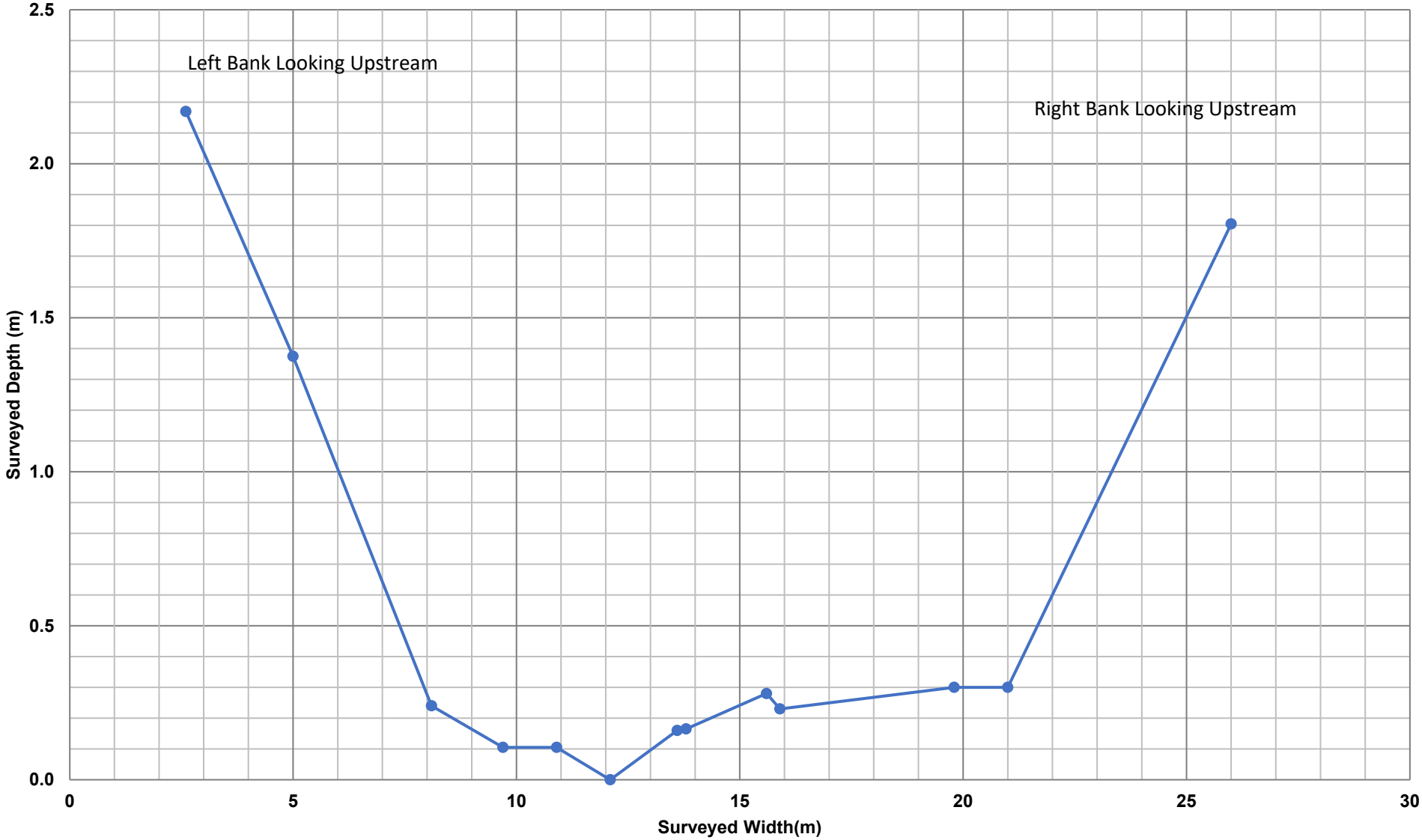
Flow Monitoring Station 15 South Wambo Creek Long Section
Profile Through Cease to Flow Point
January 2024



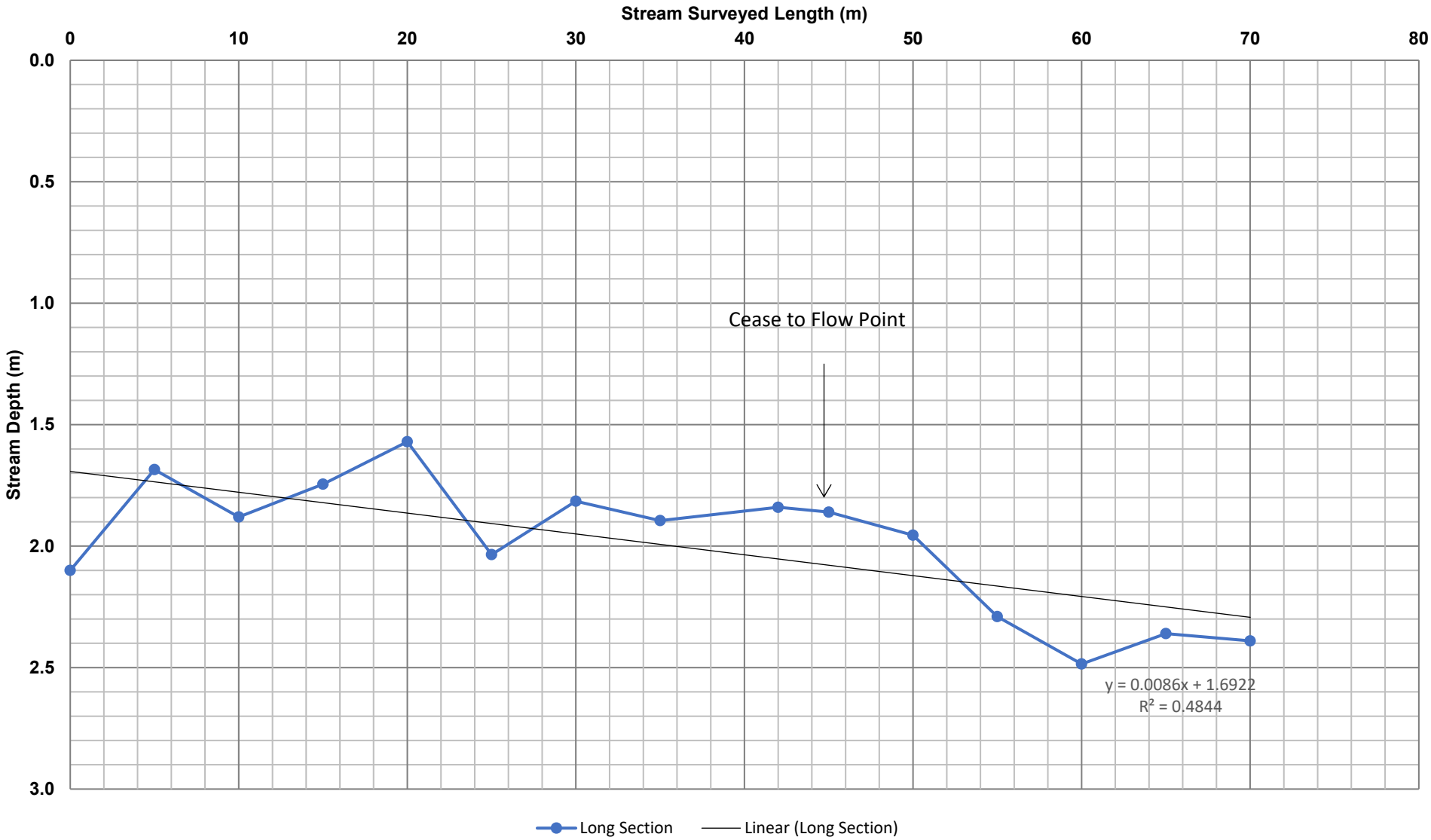
Flow Monitoring Station 16 South Wambo Creek Theoretical Flow Ratint Curve, February 2023



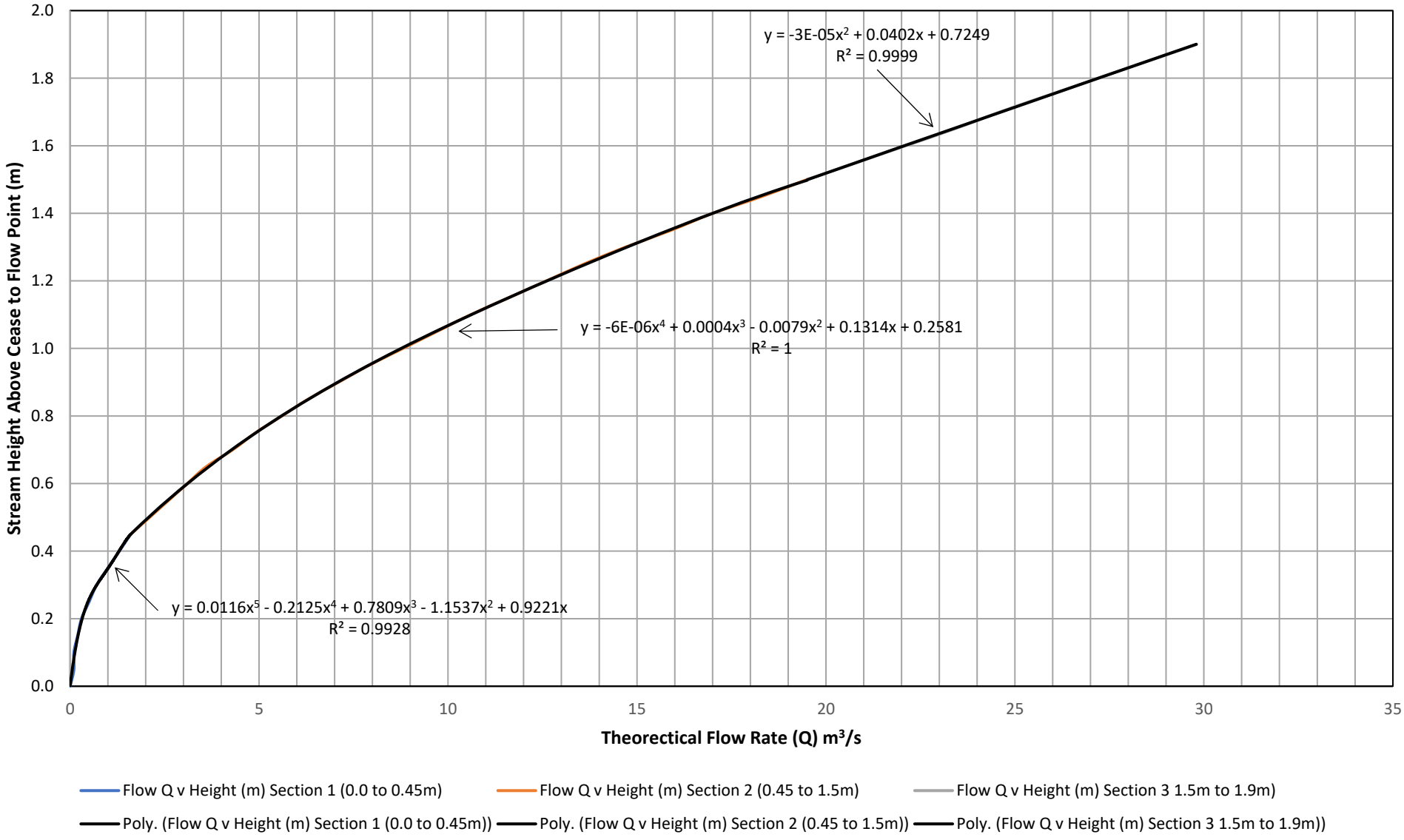
Flow Monitoring Station 16 South Wambo Creek Cease to Flow Point Cross Section Survey, February 2023



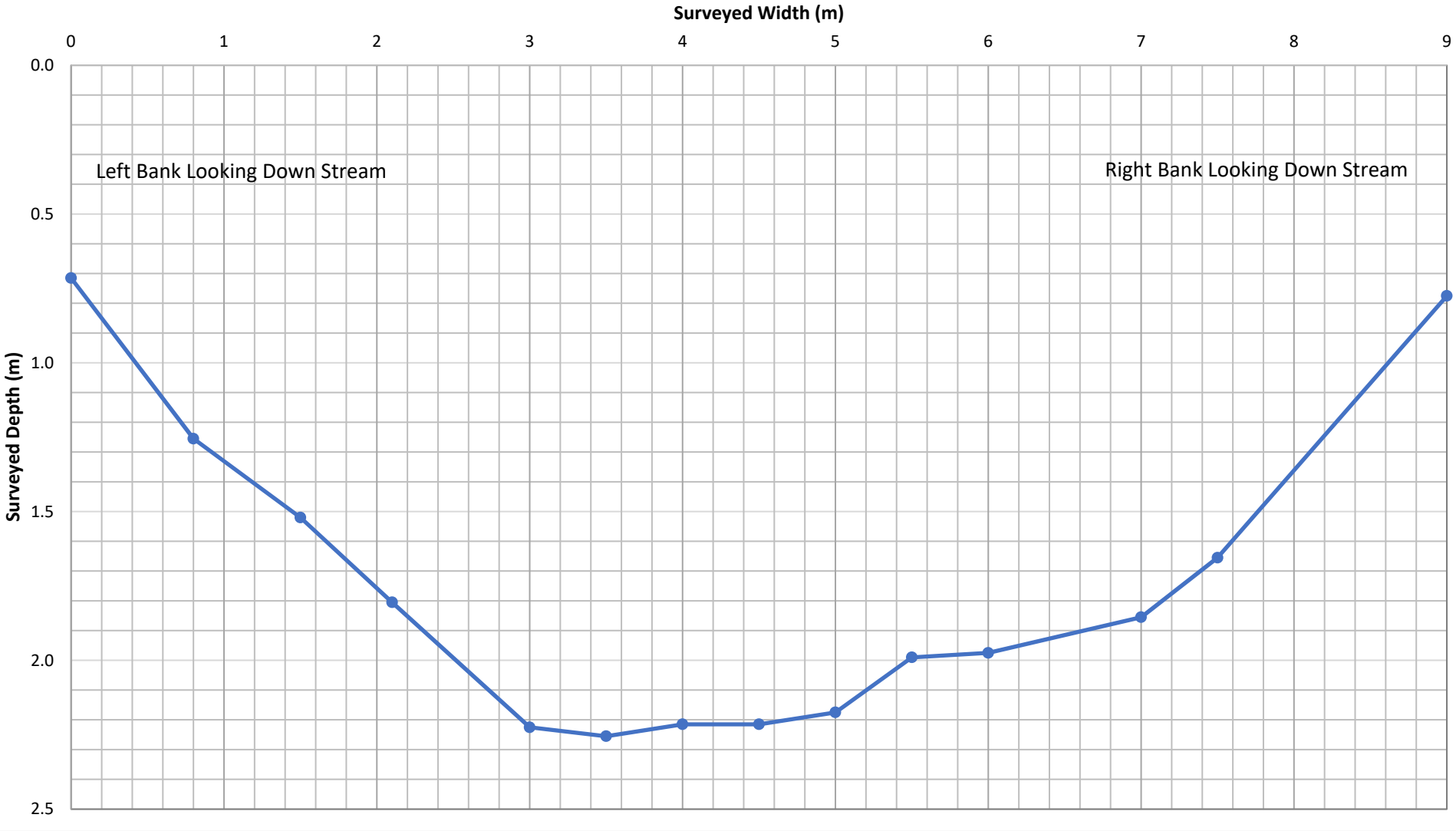
Flow Monitoring Station 16 South Wambo Creek Long Section Profile Through Cease to Flow Point, February 2023



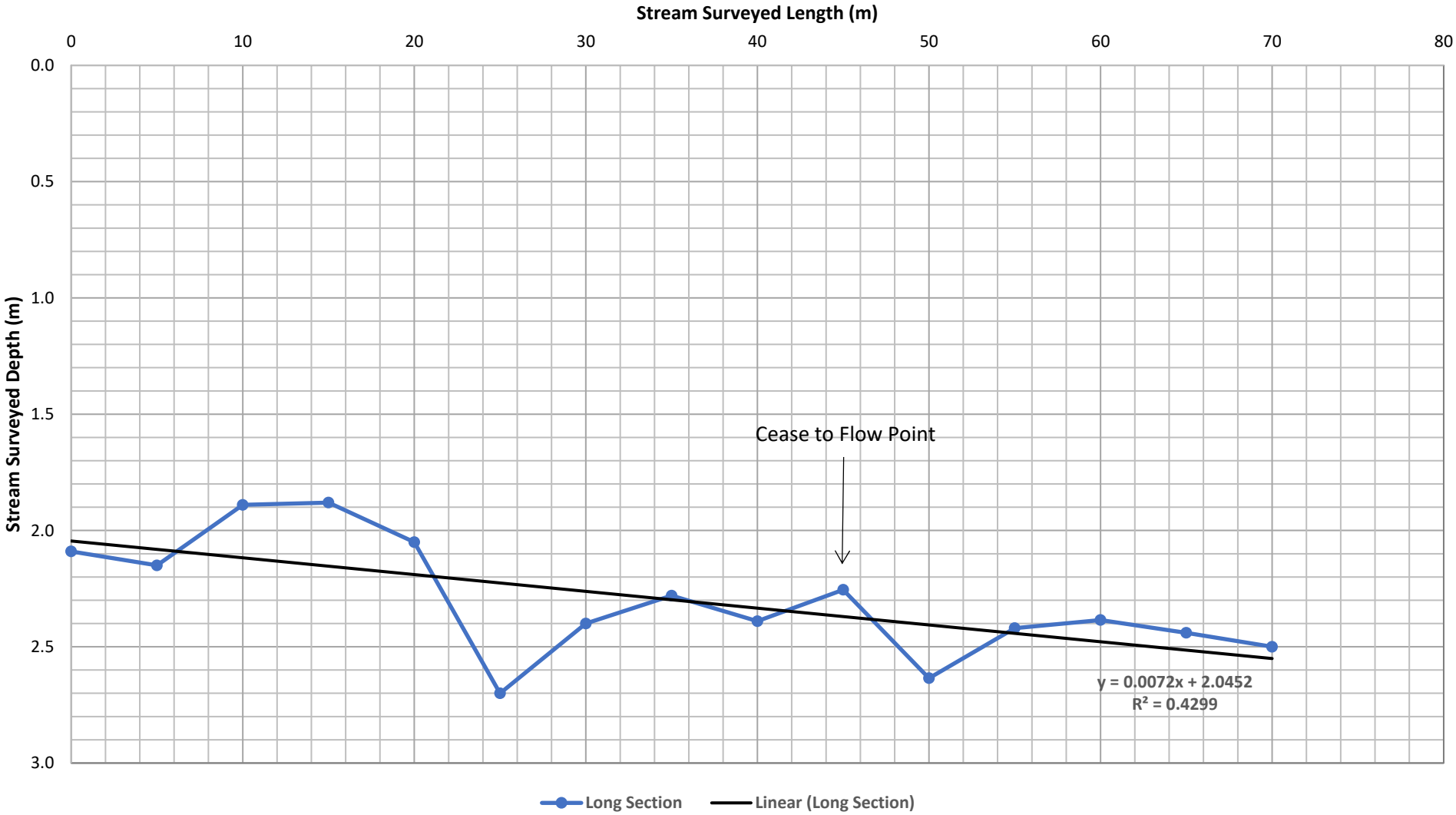
Flow Monitoring Station 17 (Brossi) South Wambo Creek Theoretical Flow Rating Curve, May 2023



Flow Montioring Station 17 (Brossi) South Wambo Creek
Cease to Flow Point Cross Section Survey
May 2023



Flow Monitoring Station 17 (Brossi) South Wambo Creek long Section
Profile Through Cease to Flow Point
May 2023



Appendix C

Stream Height Theoretical Flow and Rainfall Charts.

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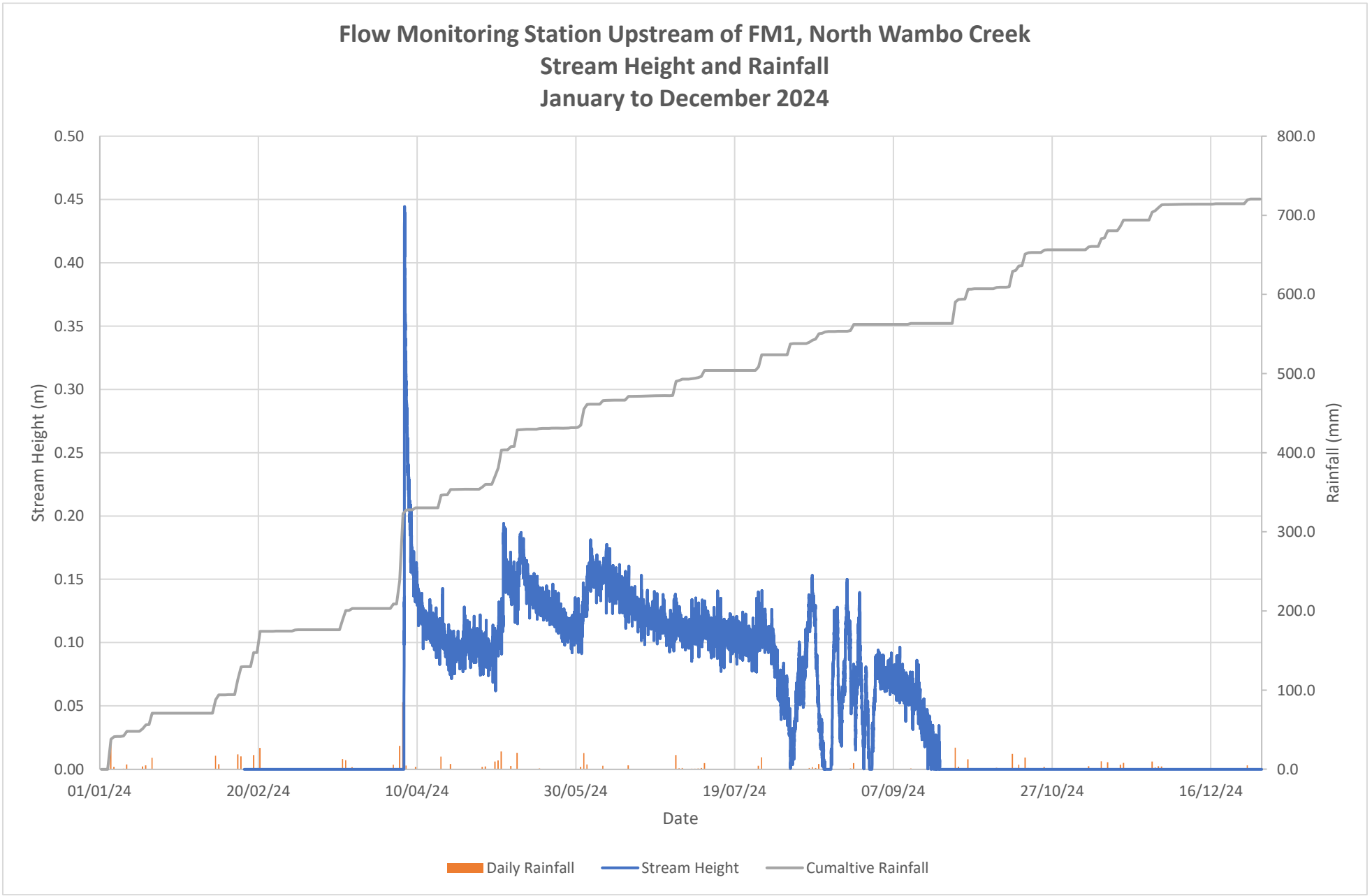
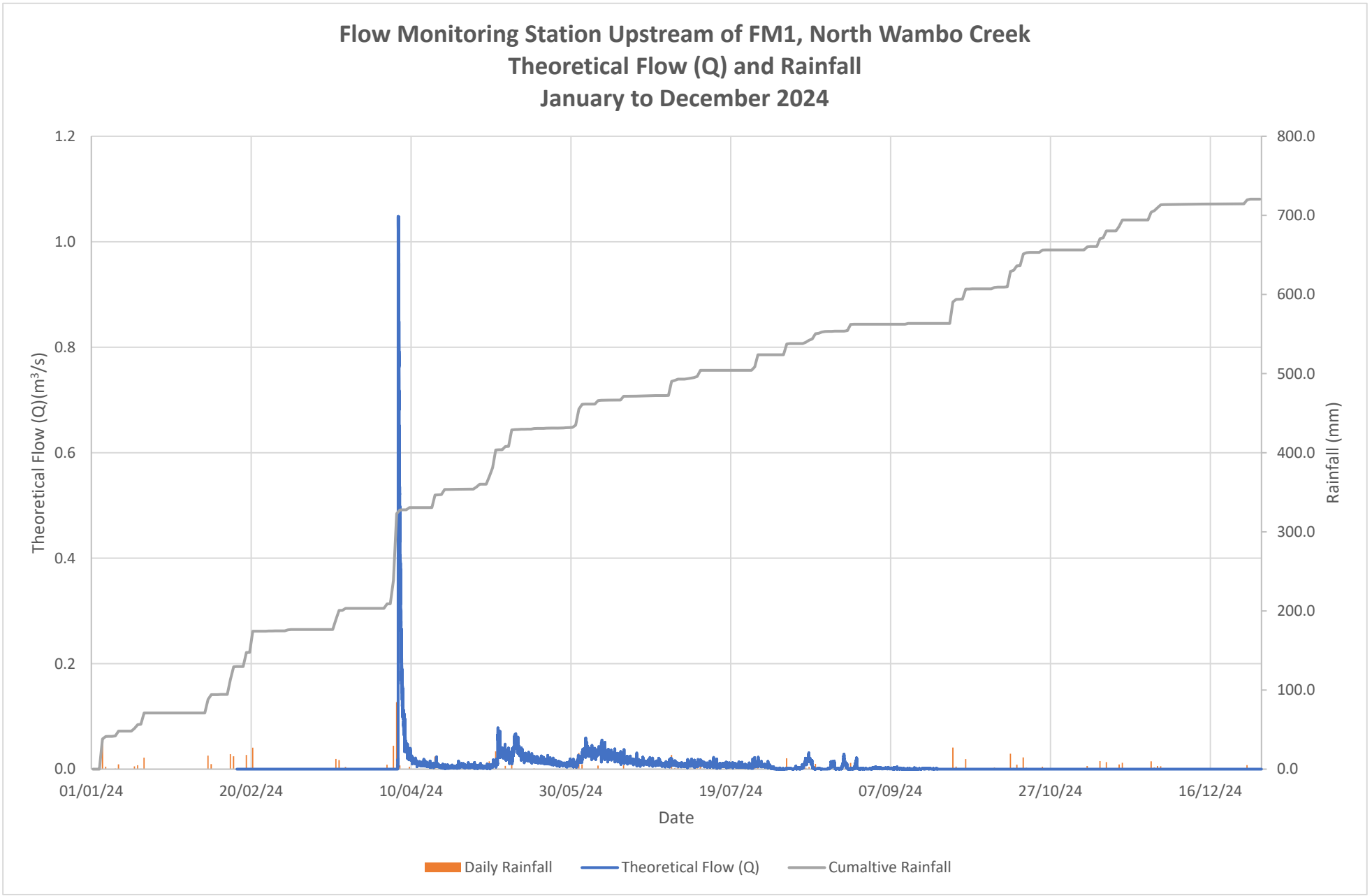
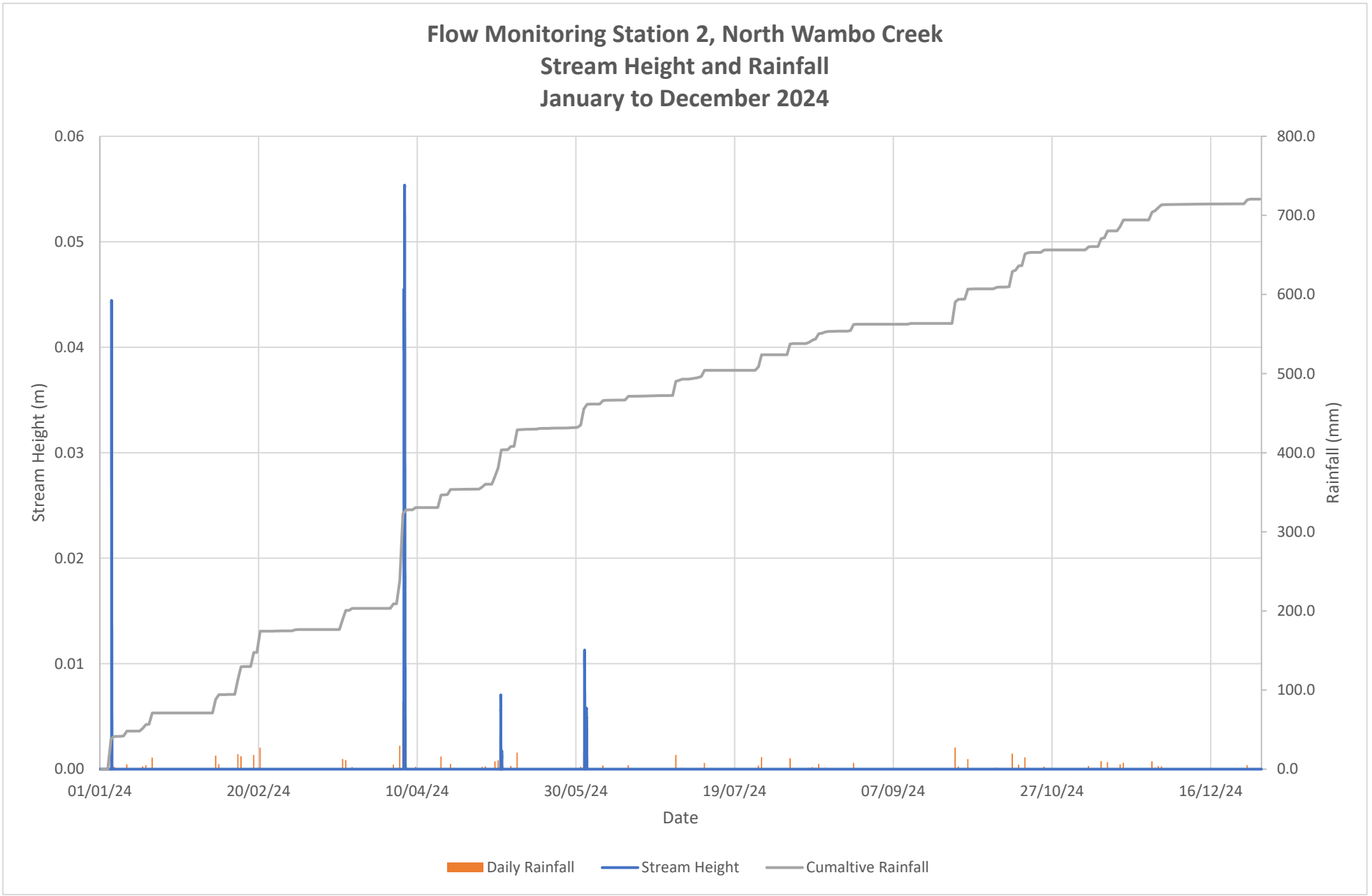
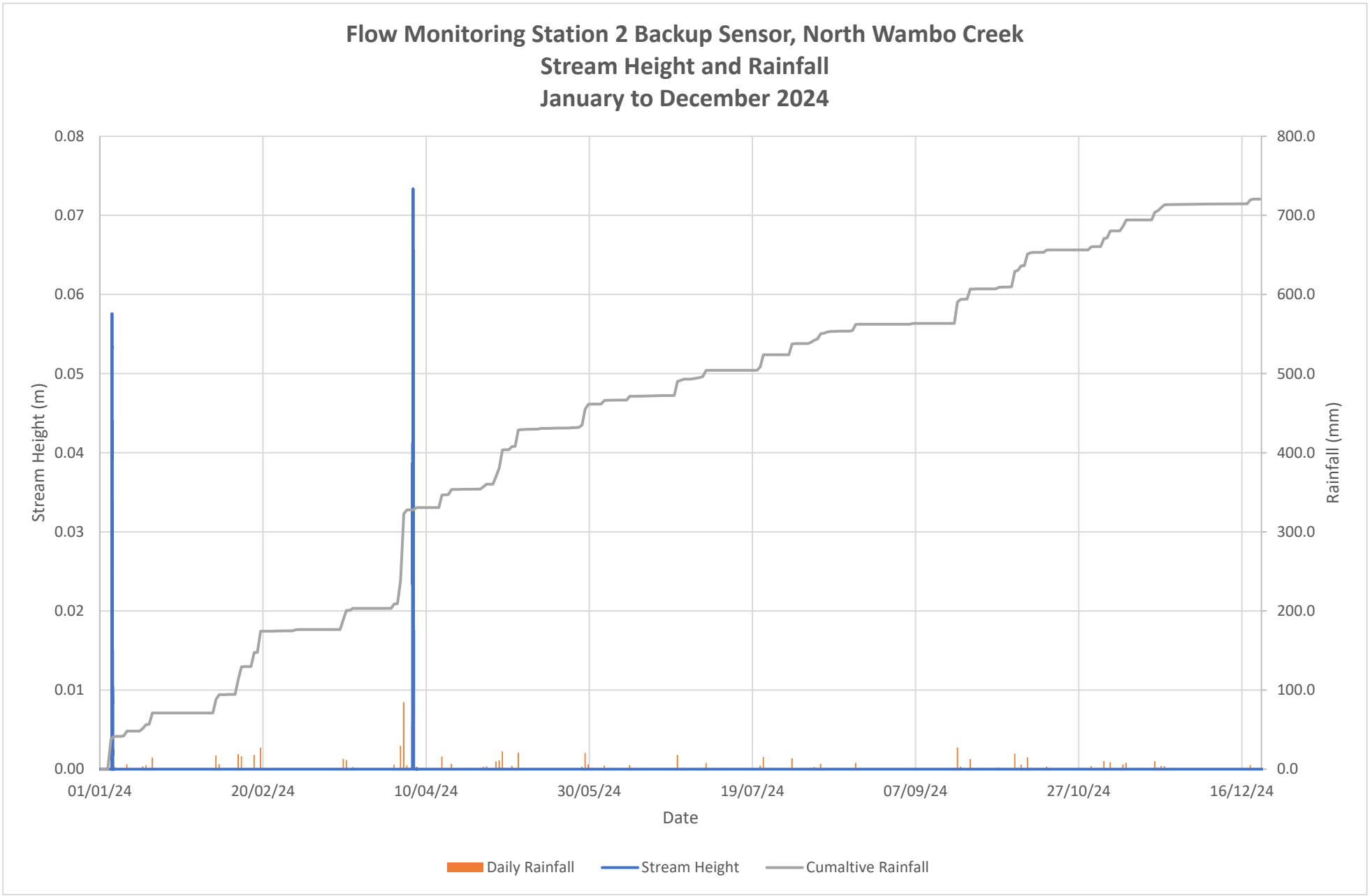
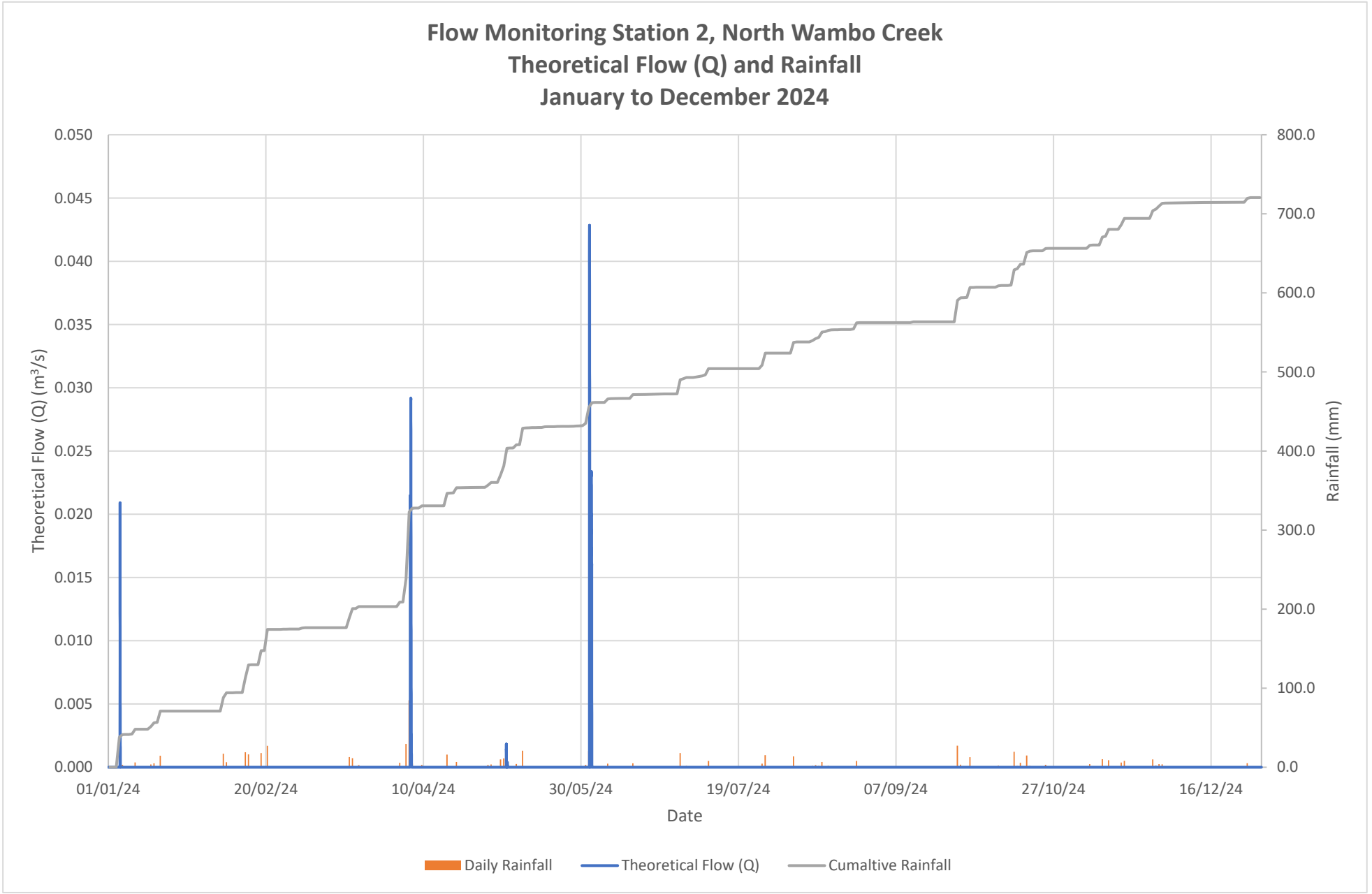
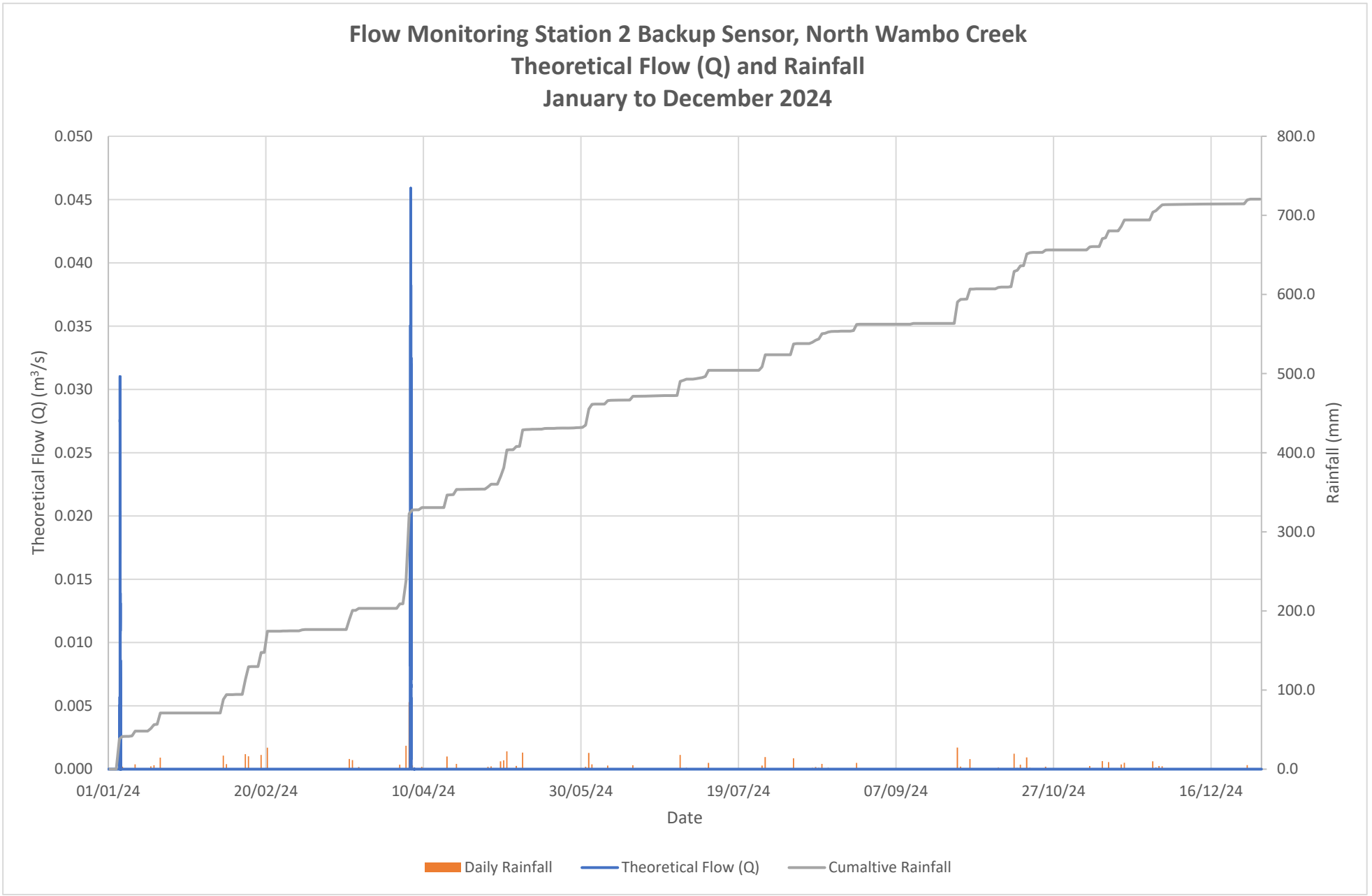

Flow Monitoring Station Upstream of FM1, North Wambo Creek
Stream Height and Rainfall
January to December 2024
Stream Height (m)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Rainfall (mm)
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
01/01/24
20/02/24
10/04/24
30/05/24
19/07/24
07/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Stream Height
Cumaltive Rainfall

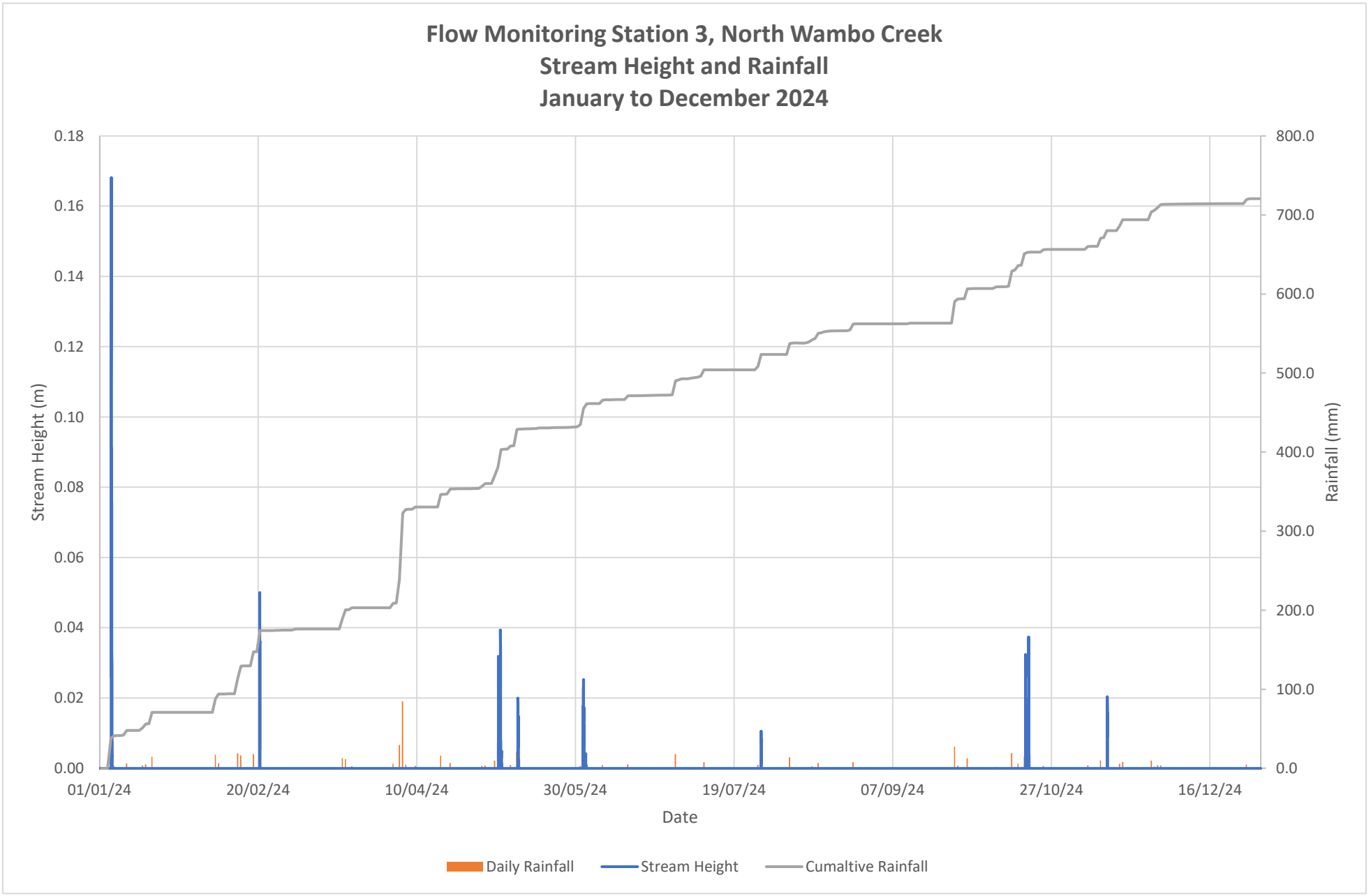

Flow Monitoring Station Upstream of FM1, North Wambo Creek
Theoretical Flow (Q) and Rainfall
January to December 2024
Theoretical Flow (Q)(m³/s)
Rainfall (mm)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
01/01/24
20/02/24
10/04/24
30/05/24
19/07/24
07/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Theoretical Flow (Q)
Cumaltive Rainfall

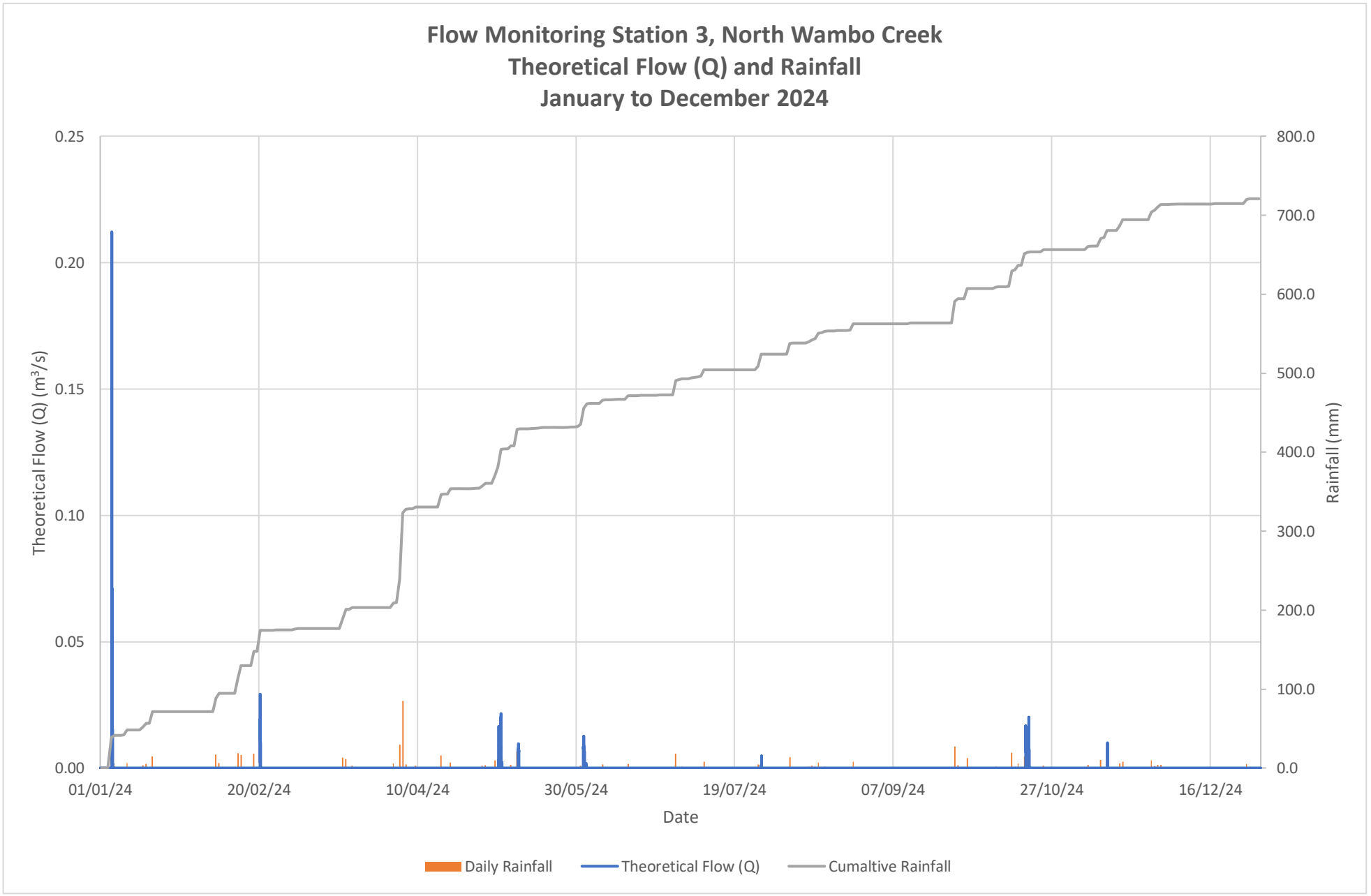

Flow Monitoring Station 2, North Wambo Creek
Stream Height and Rainfall
January to December 2024
Stream Height (m)
0.06
0.05
0.04
0.03
0.02
0.01
0.00
Rainfall (mm)
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
01/01/24
20/02/24
10/04/24
30/05/24
19/07/24
07/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Stream Height
Cumaltive Rainfall

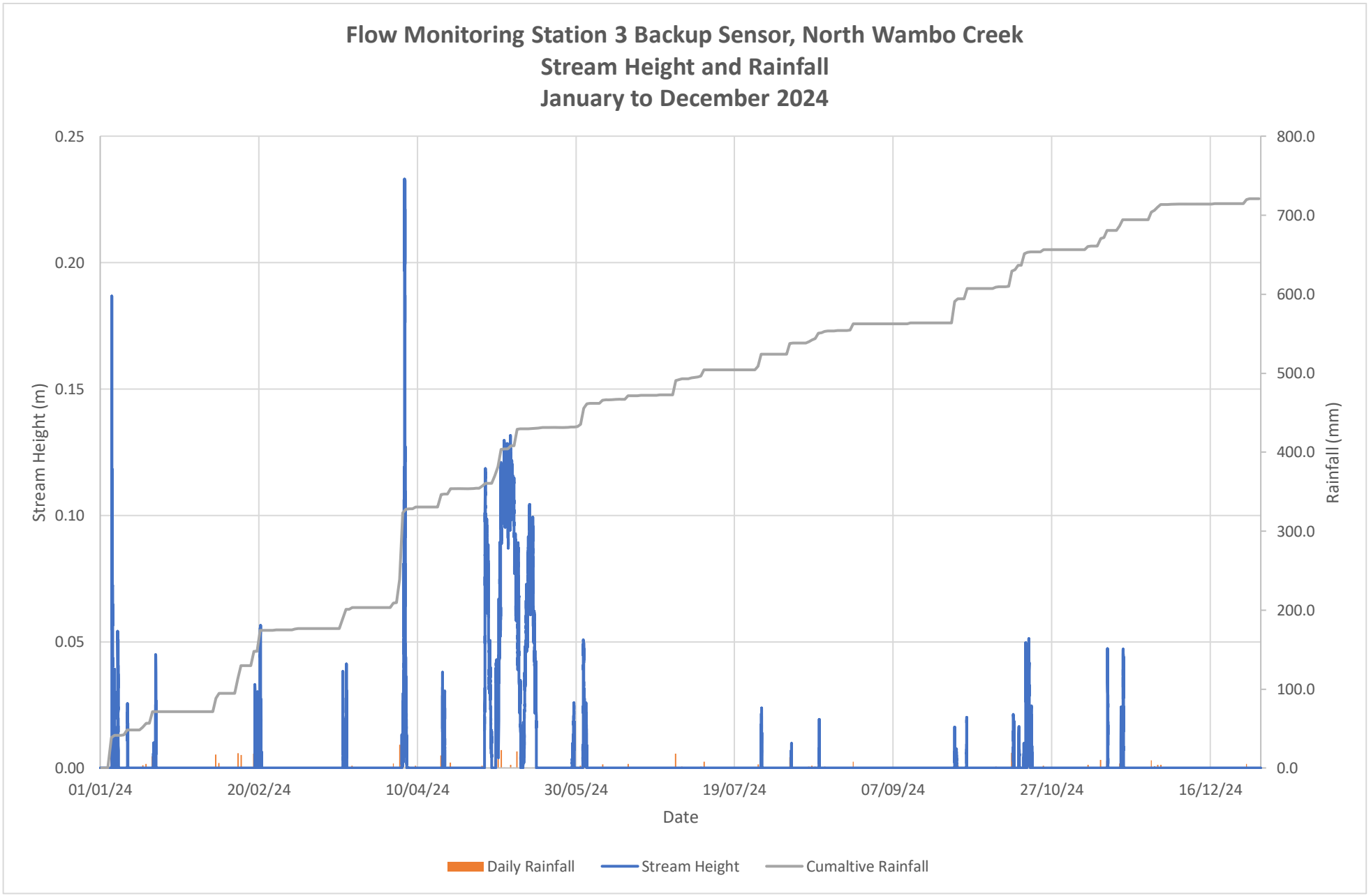

Flow Monitoring Station 2 Backup Sensor, North Wambo Creek
Stream Height and Rainfall
January to December 2024
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
Stream Height (m)
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Rainfall (mm)
01/01/24
20/02/24
10/04/24
30/05/24
19/07/24
07/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Stream Height
Cumaltive Rainfall

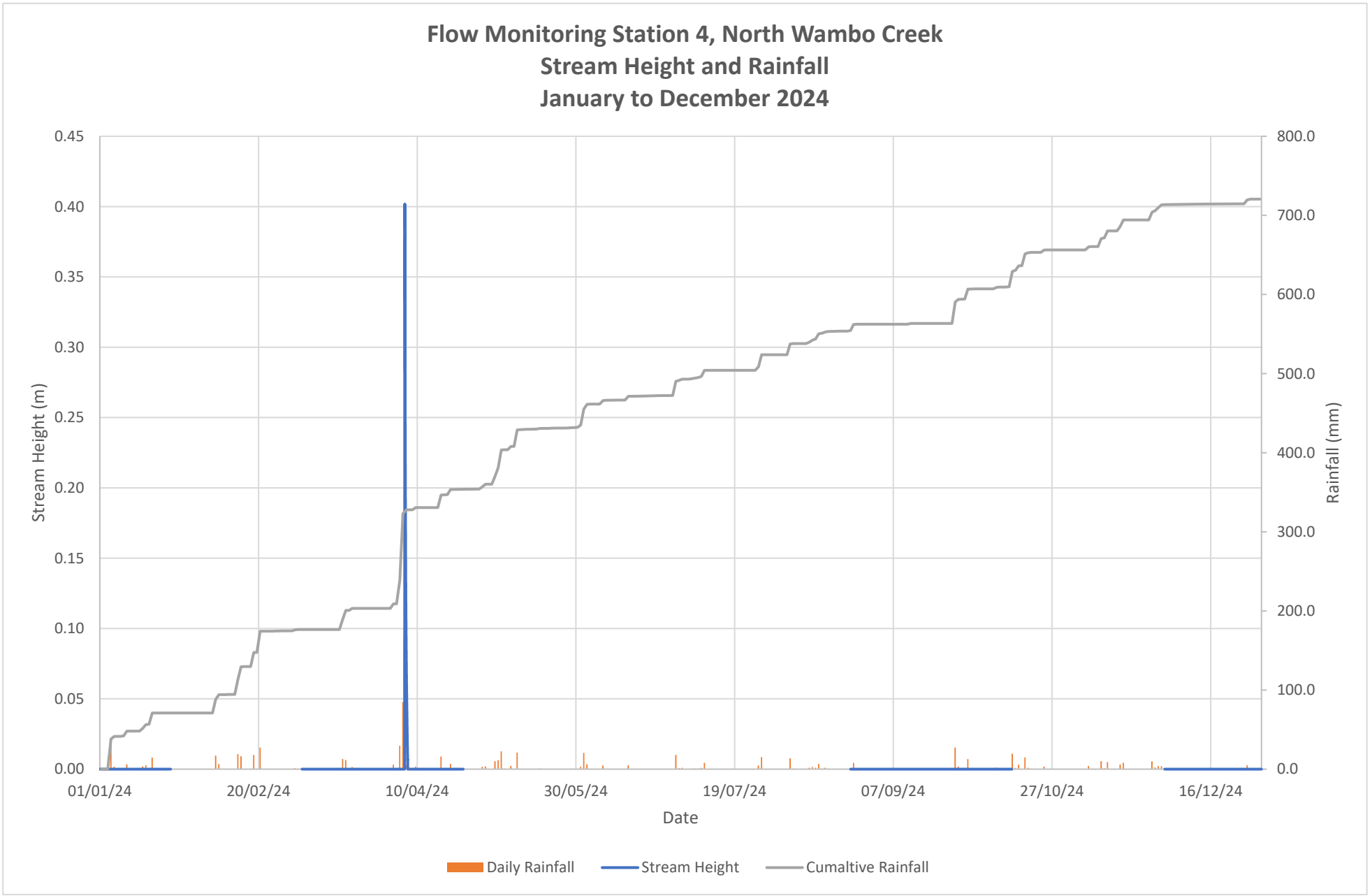

Flow Monitoring Station 2, North Wambo Creek
Theoretical Flow (Q) and Rainfall
January to December 2024
Theoretical Flow (Q) (m³/s)
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
Rainfall (mm)
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
01/01/24
20/02/24
10/04/24
30/05/24
19/07/24
07/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Theoretical Flow (Q)
Cumaltive Rainfall

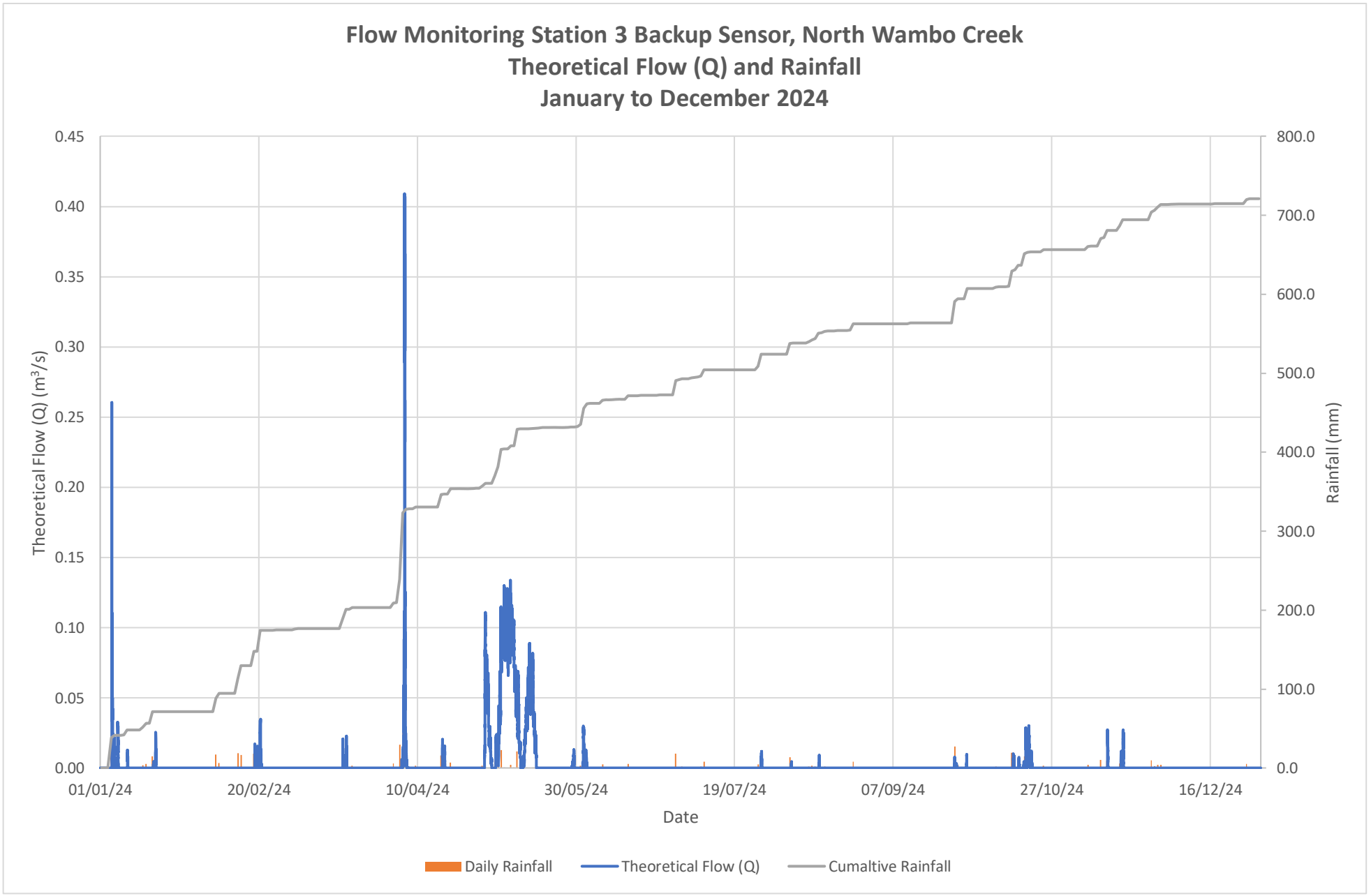

Flow Monitoring Station 2 Backup Sensor, North Wambo Creek
Theoretical Flow (Q) and Rainfall
January to December 2024
Theoretical Flow (Q) (m³/s)
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
Rainfall (mm)
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
01/01/24
20/02/24
10/04/24
30/05/24
19/07/24
07/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Theoretical Flow (Q)
Cumaltive Rainfall

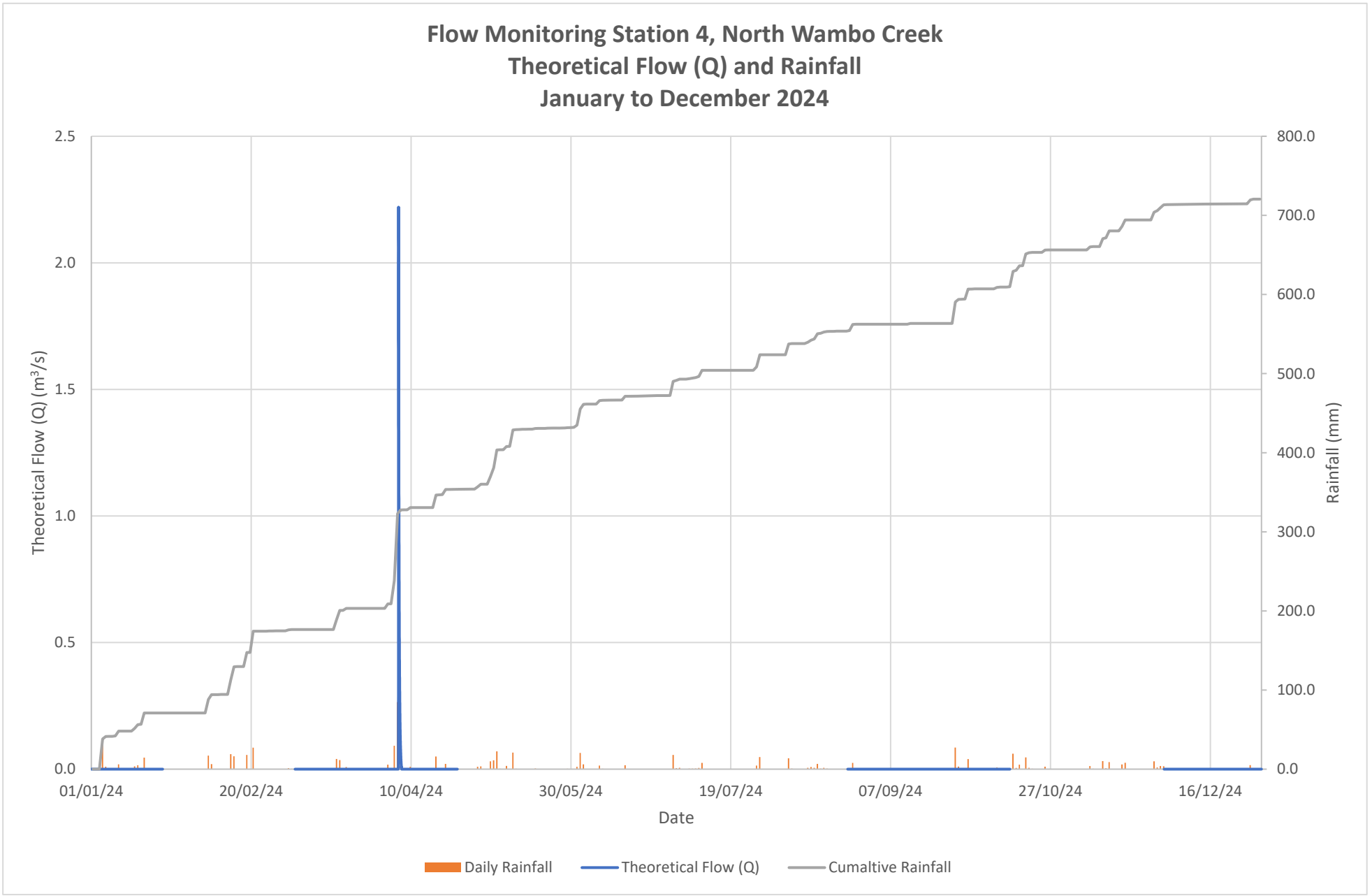

Flow Monitoring Station 3, North Wambo Creek
Stream Height and Rainfall
January to December 2024
Stream Height (m)
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Rainfall (mm)
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
01/01/24
20/02/24
10/04/24
30/05/24
19/07/24
07/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Stream Height
Cumaltive Rainfall

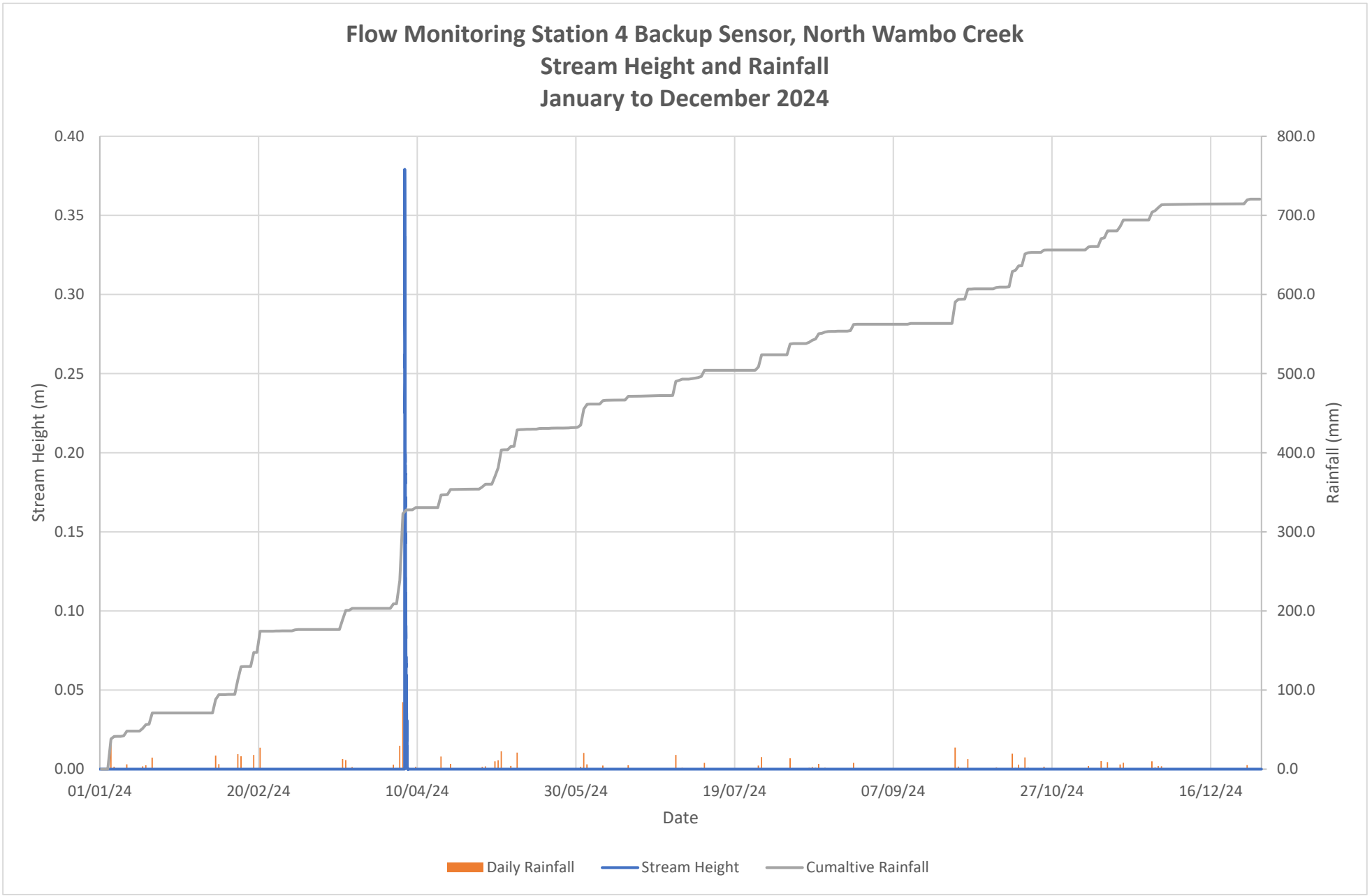

Flow Monitoring Station 3, North Wambo Creek
Theoretical Flow (Q) and Rainfall
January to December 2024
Theoretical Flow (Q) (m³/s)
Rainfall (mm)
0.25
0.20
0.15
0.10
0.05
0.00
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
01/01/24
20/02/24
10/04/24
30/05/24
19/07/24
07/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Theoretical Flow (Q)
Cumaltive Rainfall

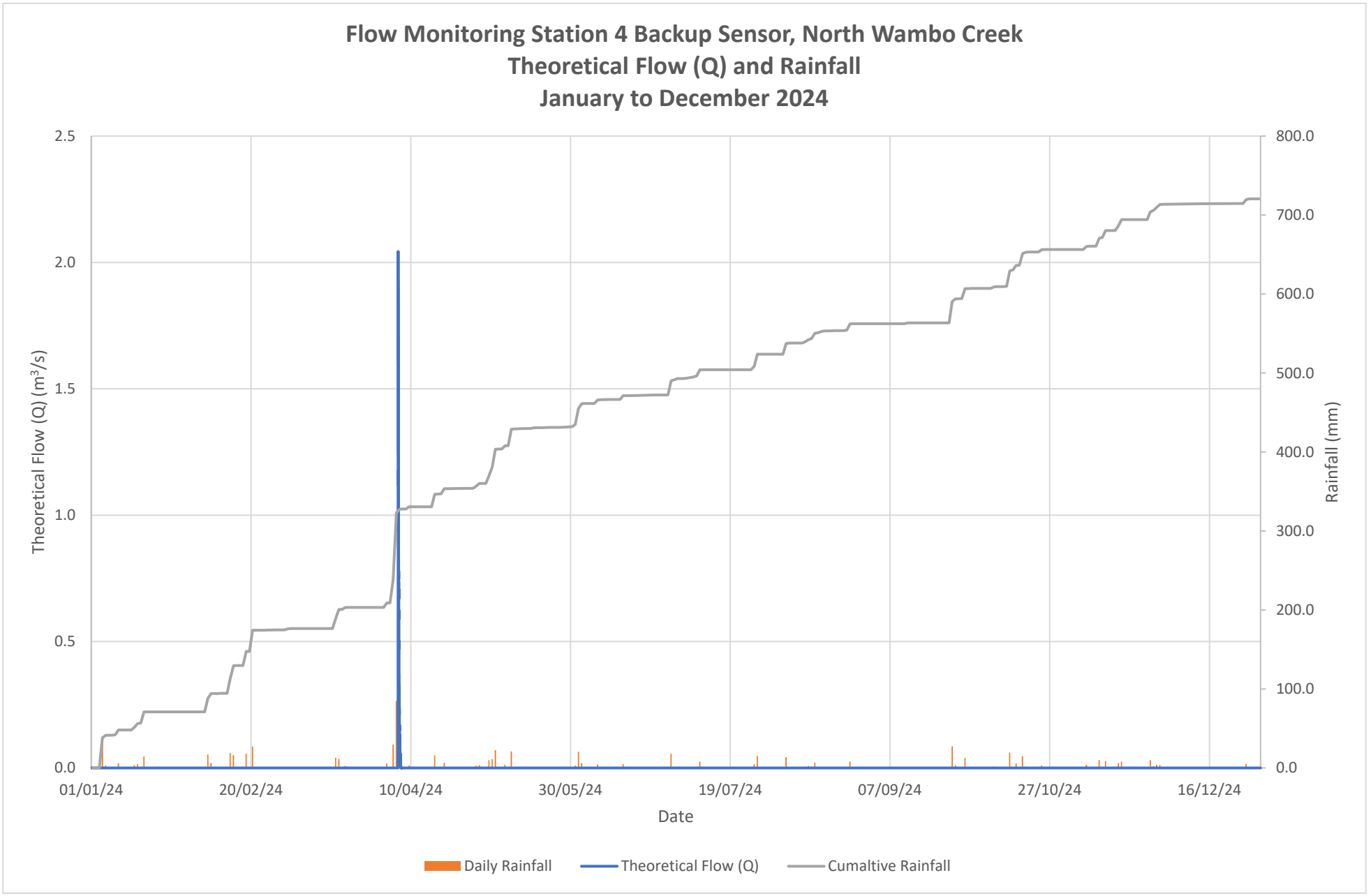

Flow Monitoring Station 3 Backup Sensor, North Wambo Creek
Stream Height and Rainfall
January to December 2024
Stream Height (m)
0.25
0.20
0.15
0.10
0.05
0.00
Rainfall (mm)
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
01/01/24
20/02/24
10/04/24
30/05/24
19/07/24
07/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Stream Height
Cumaltive Rainfall

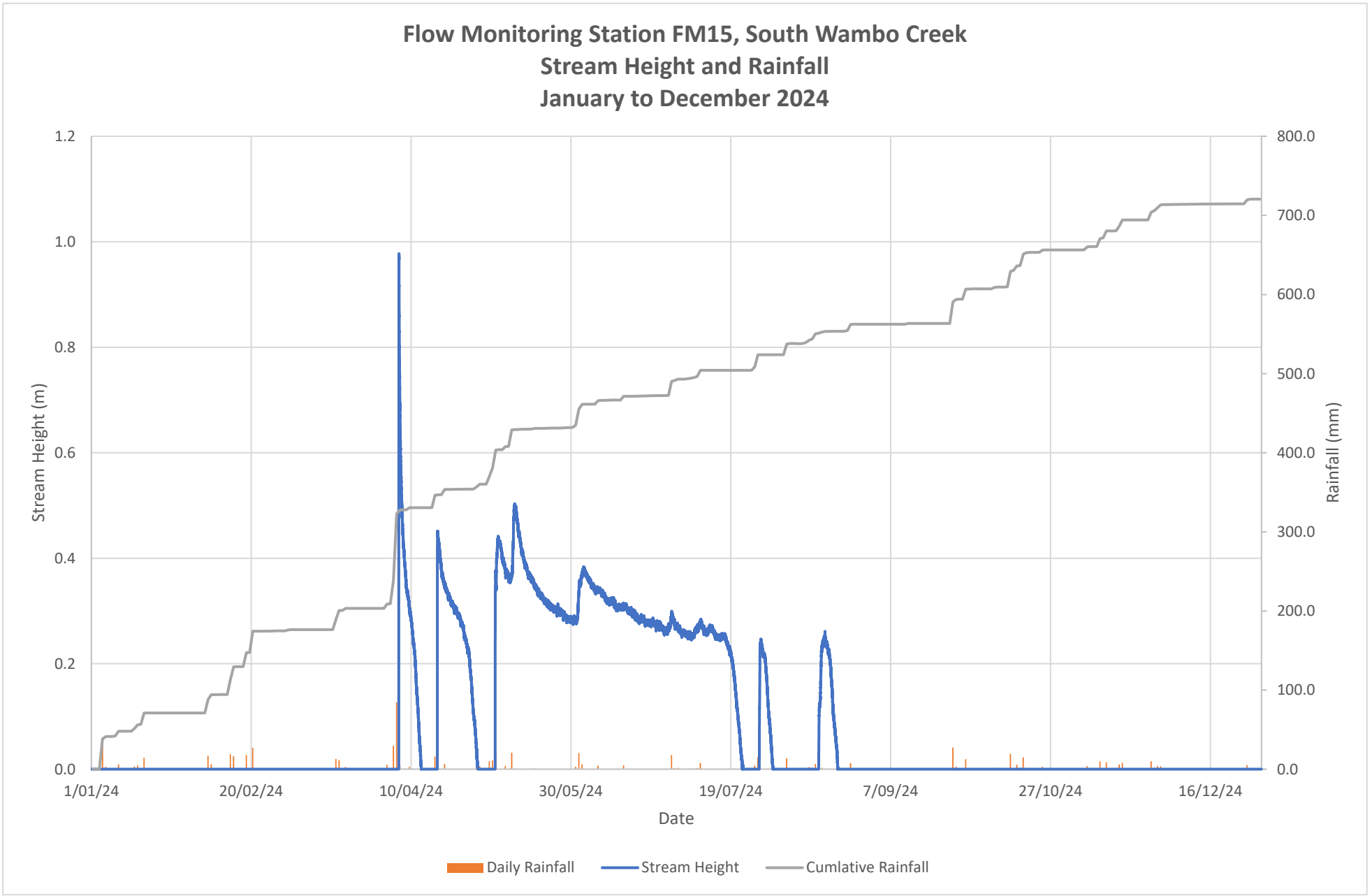

Flow Monitoring Station 4, North Wambo Creek
Stream Height and Rainfall
January to December 2024
Stream Height (m)
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Rainfall (mm)
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
01/01/24
20/02/24
10/04/24
30/05/24
19/07/24
07/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Stream Height
Cumaltive Rainfall

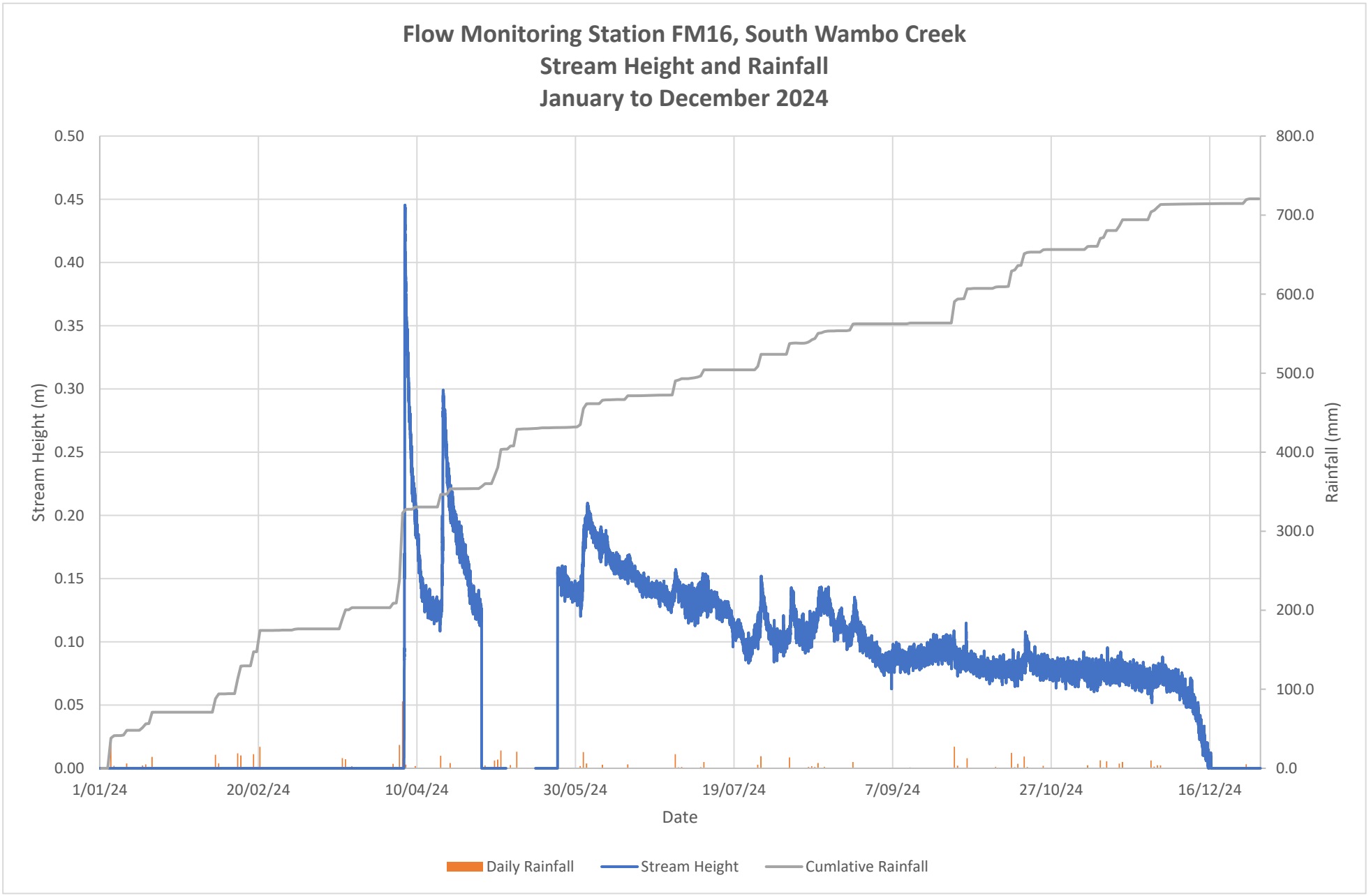

Flow Monitoring Station 3 Backup Sensor, North Wambo Creek
Theoretical Flow (Q) and Rainfall
January to December 2024
Theoretical Flow (Q) (m³/s)
Rainfall (mm)
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
01/01/24
20/02/24
10/04/24
30/05/24
19/07/24
07/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Theoretical Flow (Q)
Cumaltive Rainfall


Flow Monitoring Station 4, North Wambo Creek
Theoretical Flow (Q) and Rainfall
January to December 2024
Theoretical Flow (Q) (m³/s)
Rainfall (mm)
2.5
2.0
1.5
1.0
0.5
0.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
01/01/24
20/02/24
10/04/24
30/05/24
19/07/24
07/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Theoretical Flow (Q)
Cumaltive Rainfall


Flow Monitoring Station 4 Backup Sensor, North Wambo Creek
Stream Height and Rainfall
January to December 2024
Stream Height (m)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Rainfall (mm)
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
01/01/24
20/02/24
10/04/24
30/05/24
19/07/24
07/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Stream Height
Cumaltive Rainfall


Flow Monitoring Station 4 Backup Sensor, North Wambo Creek
Theoretical Flow (Q) and Rainfall
January to December 2024
Theoretical Flow (Q) (m³/s)
Rainfall (mm)
2.5
2.0
1.5
1.0
0.5
0.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
01/01/24
20/02/24
10/04/24
30/05/24
19/07/24
07/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Theoretical Flow (Q)
Cumaltive Rainfall


Flow Monitoring Station FM15, South Wambo Creek
Stream Height and Rainfall
January to December 2024
Stream Height (m)
Rainfall (mm)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
1/01/24
20/02/24
10/04/24
30/05/24
19/07/24
7/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Stream Height
Cumlative Rainfall


Flow Monitoring Station FM16, South Wambo Creek
Stream Height and Rainfall
January to December 2024
Stream Height (m)
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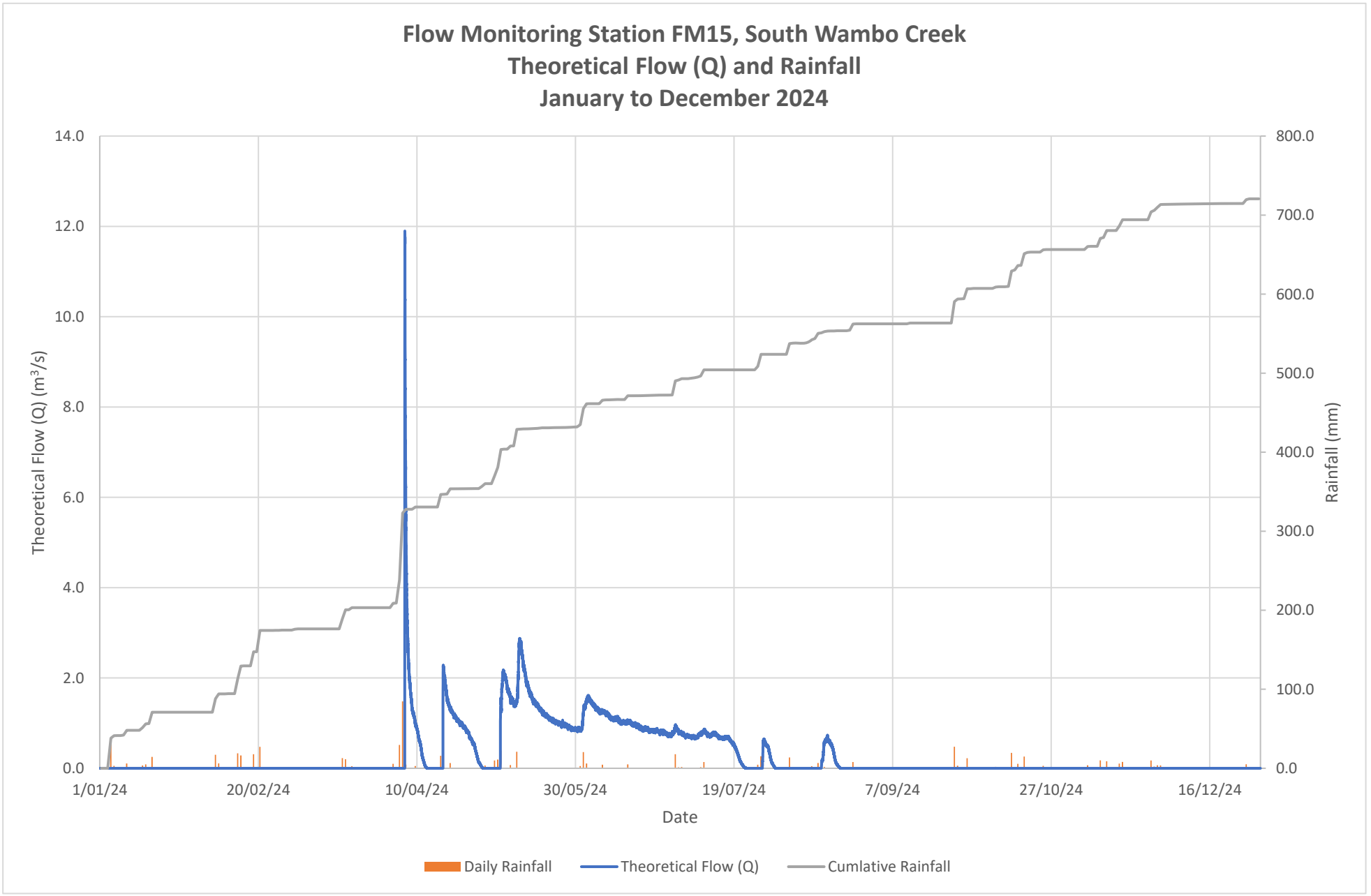
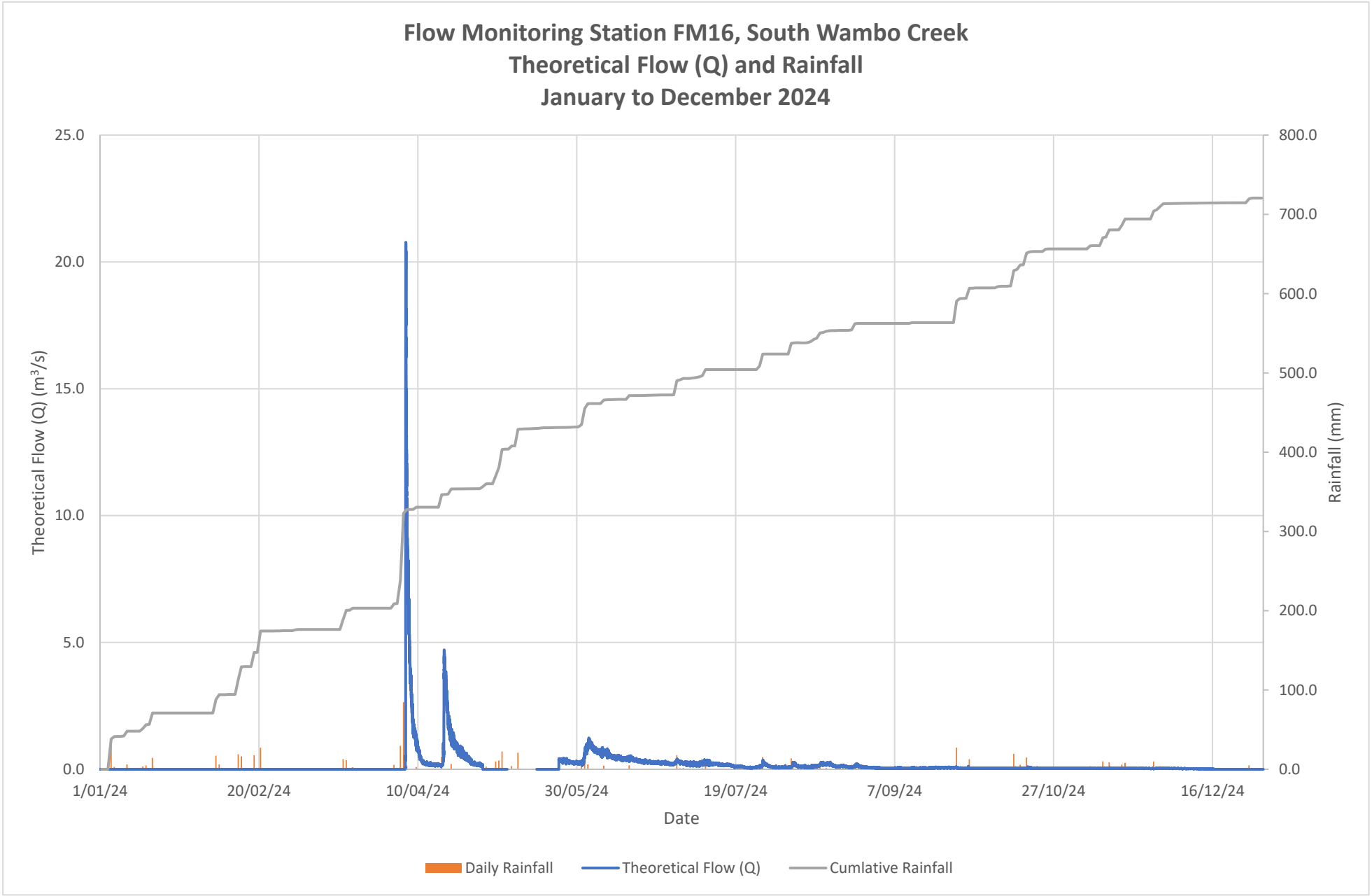
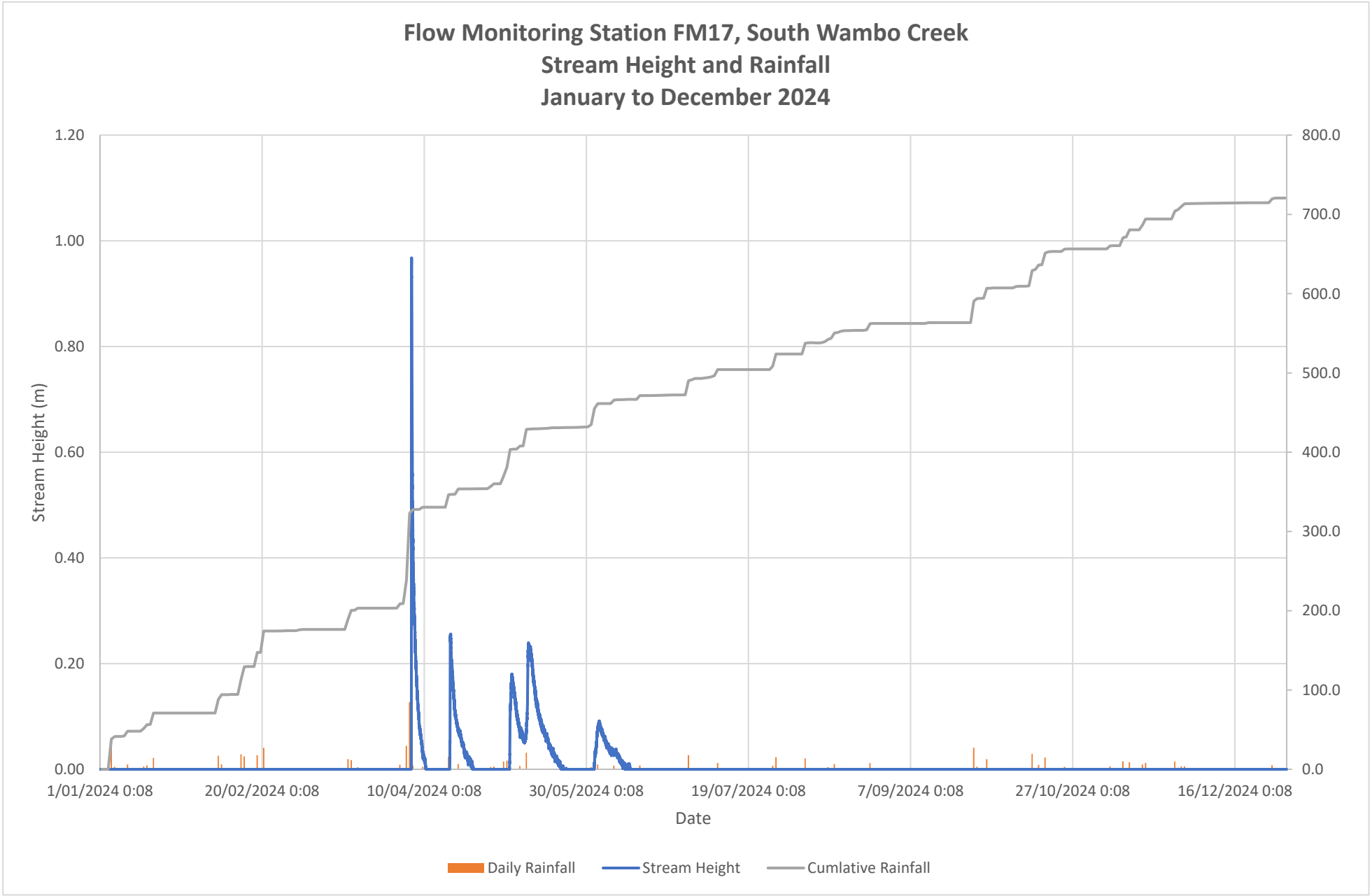
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Rainfall (mm)
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
1/01/24
20/02/24
10/04/24
30/05/24
19/07/24
7/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Stream Height
Cumlative Rainfall


Flow Monitoring Station FM15, South Wambo Creek
Theoretical Flow (Q) and Rainfall
January to December 2024
Theoretical Flow (Q) (m³/s)
Rainfall (mm)
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
1/01/24
20/02/24
10/04/24
30/05/24
19/07/24
7/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Theoretical Flow (Q)
Cumlative Rainfall


Flow Monitoring Station FM16, South Wambo Creek
Theoretical Flow (Q) and Rainfall
January to December 2024
Theoretical Flow (Q) (m³/s)
Rainfall (mm)
25.0
20.0
15.0
10.0
5.0
0.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
1/01/24
20/02/24
10/04/24
30/05/24
19/07/24
7/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Theoretical Flow (Q)
Cumlative Rainfall


Flow Monitoring Station FM17, South Wambo Creek
Stream Height and Rainfall
January to December 2024
Stream Height (m)
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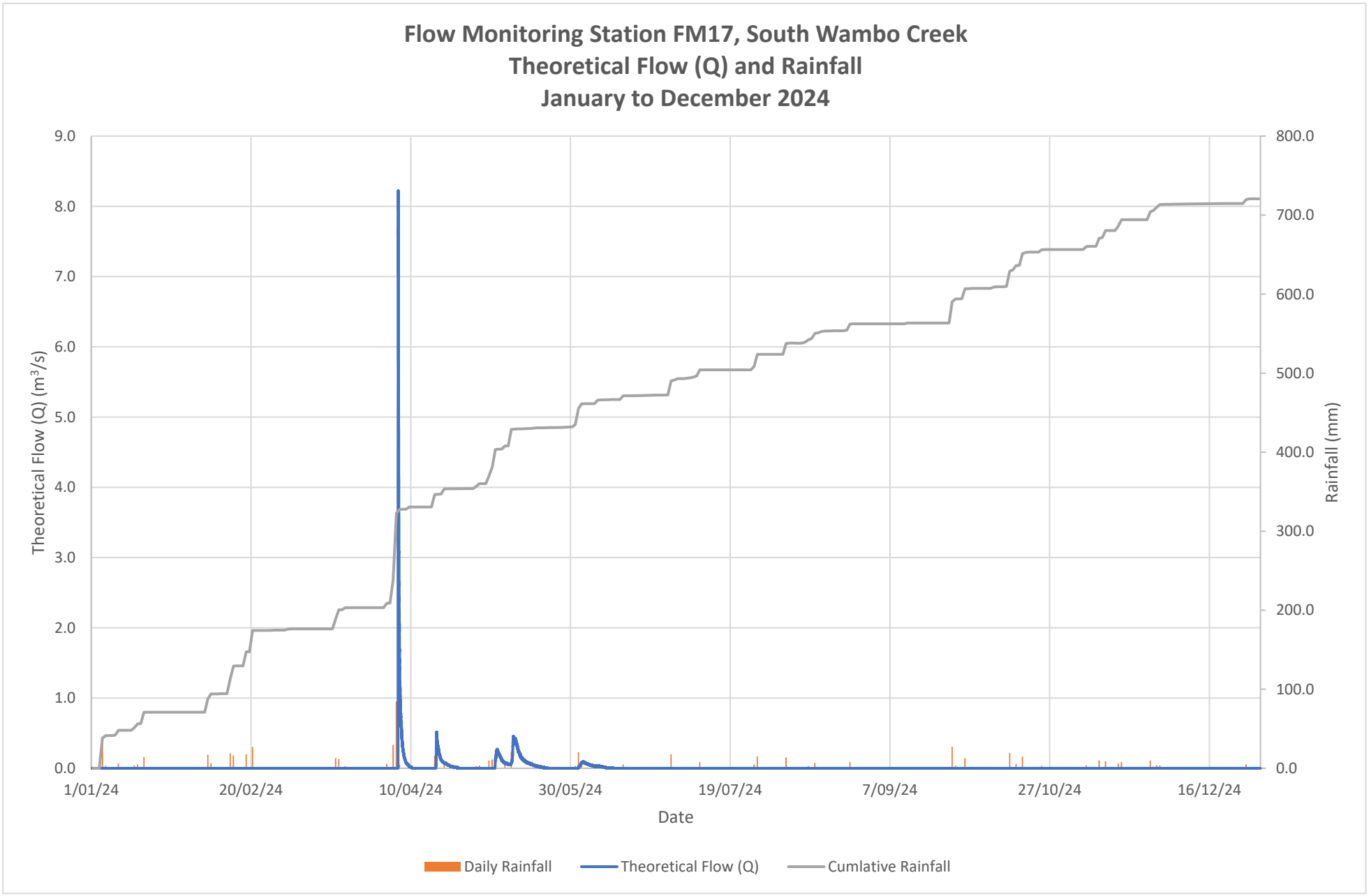
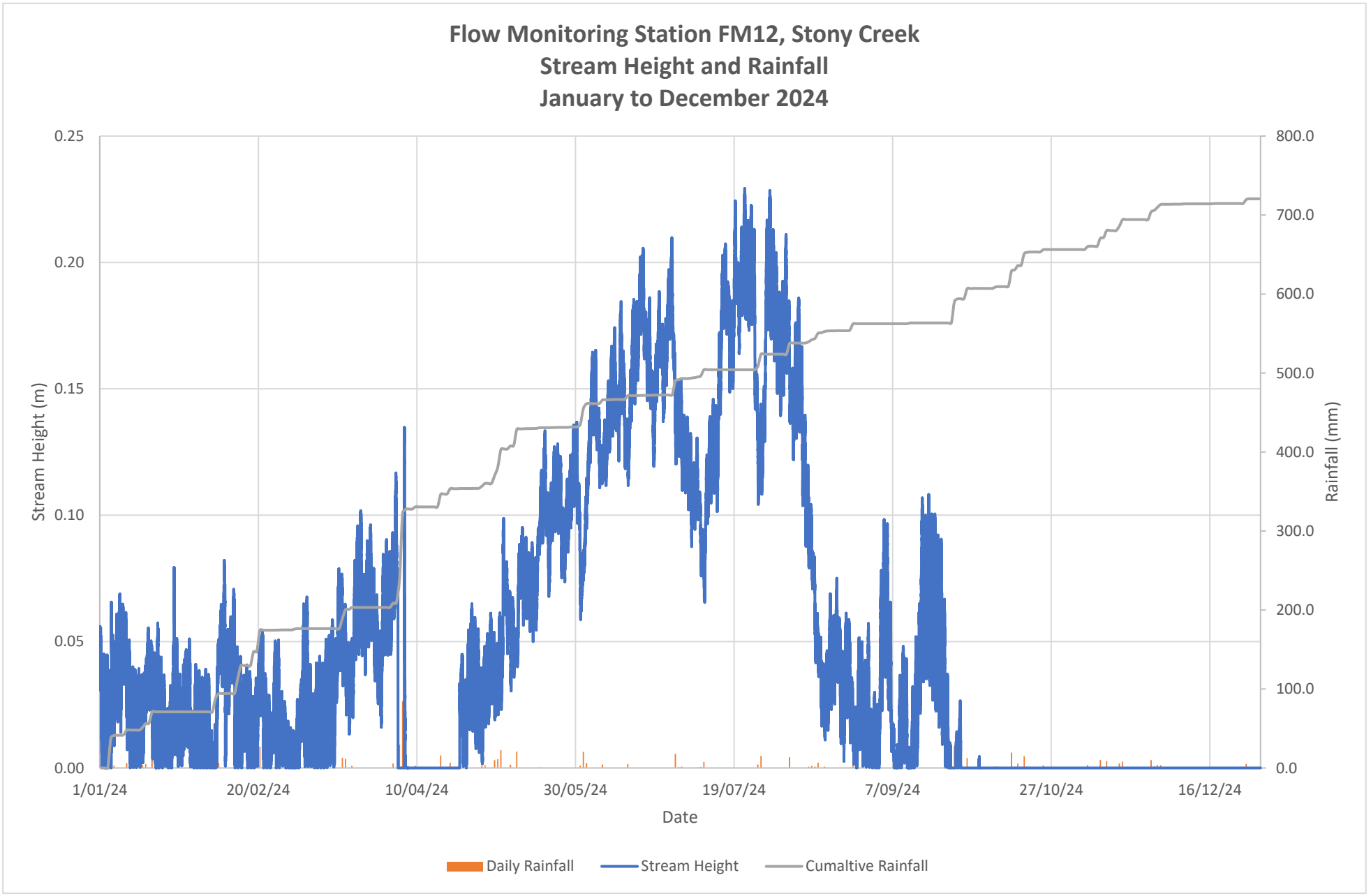
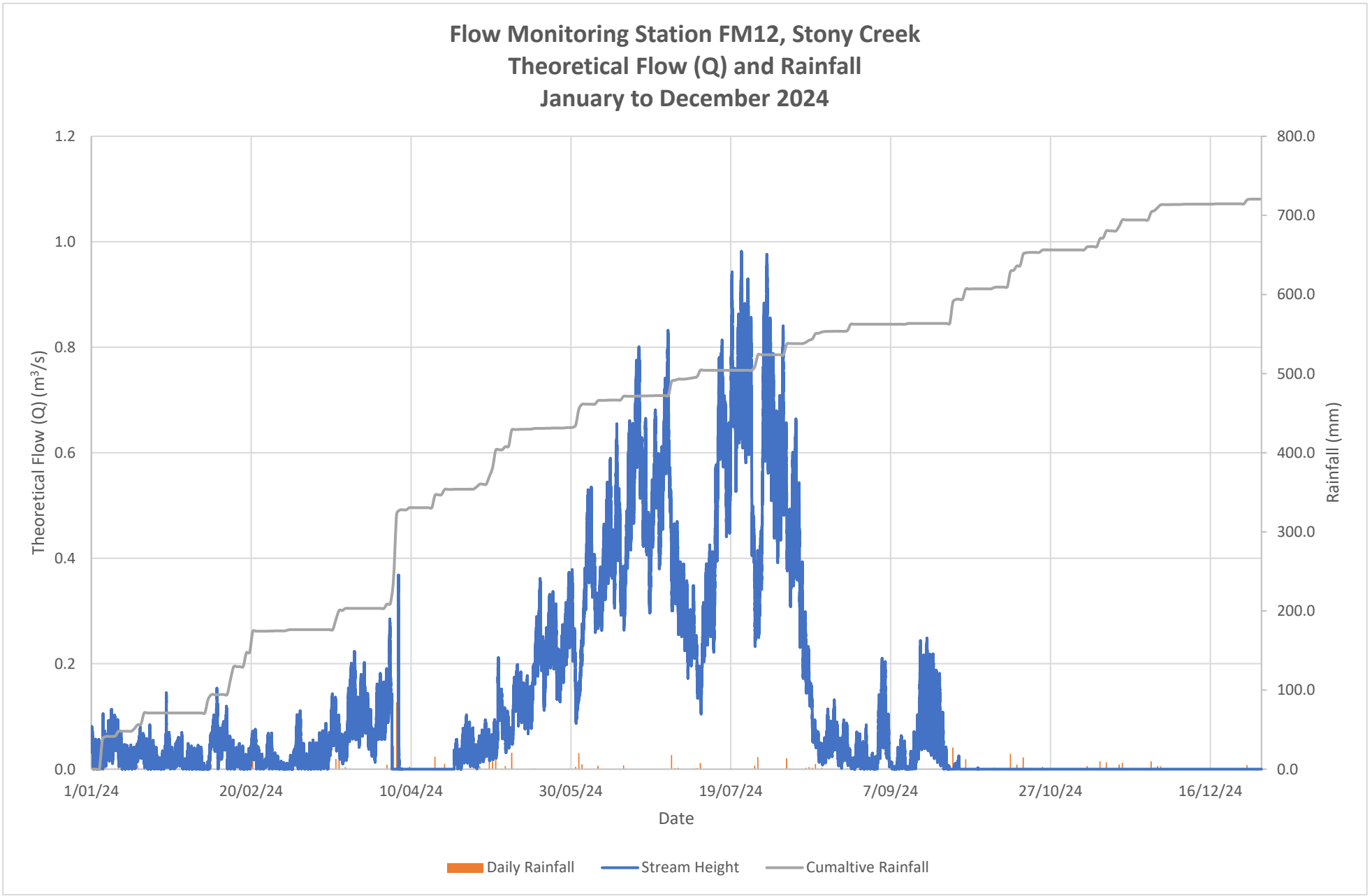
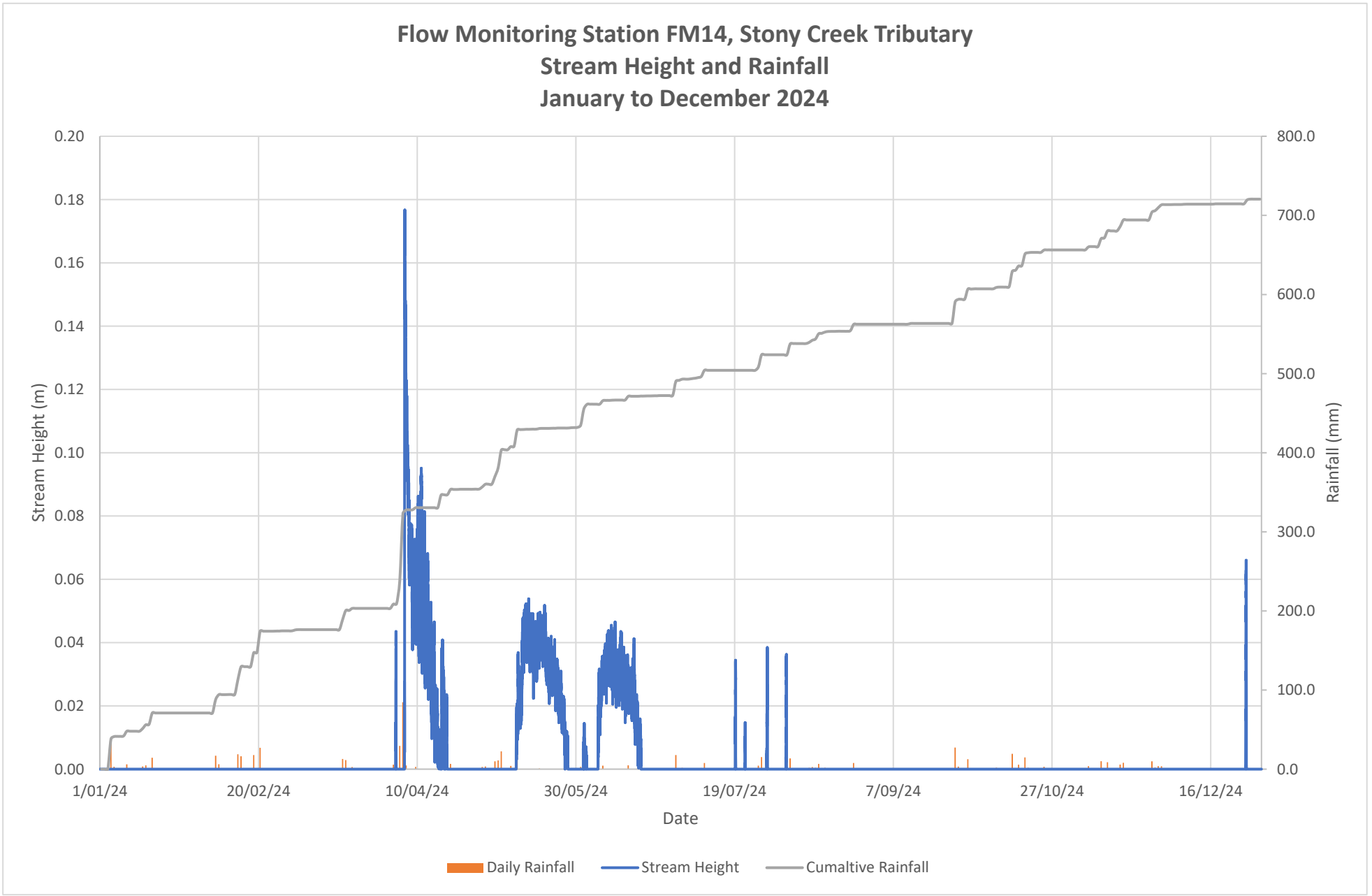
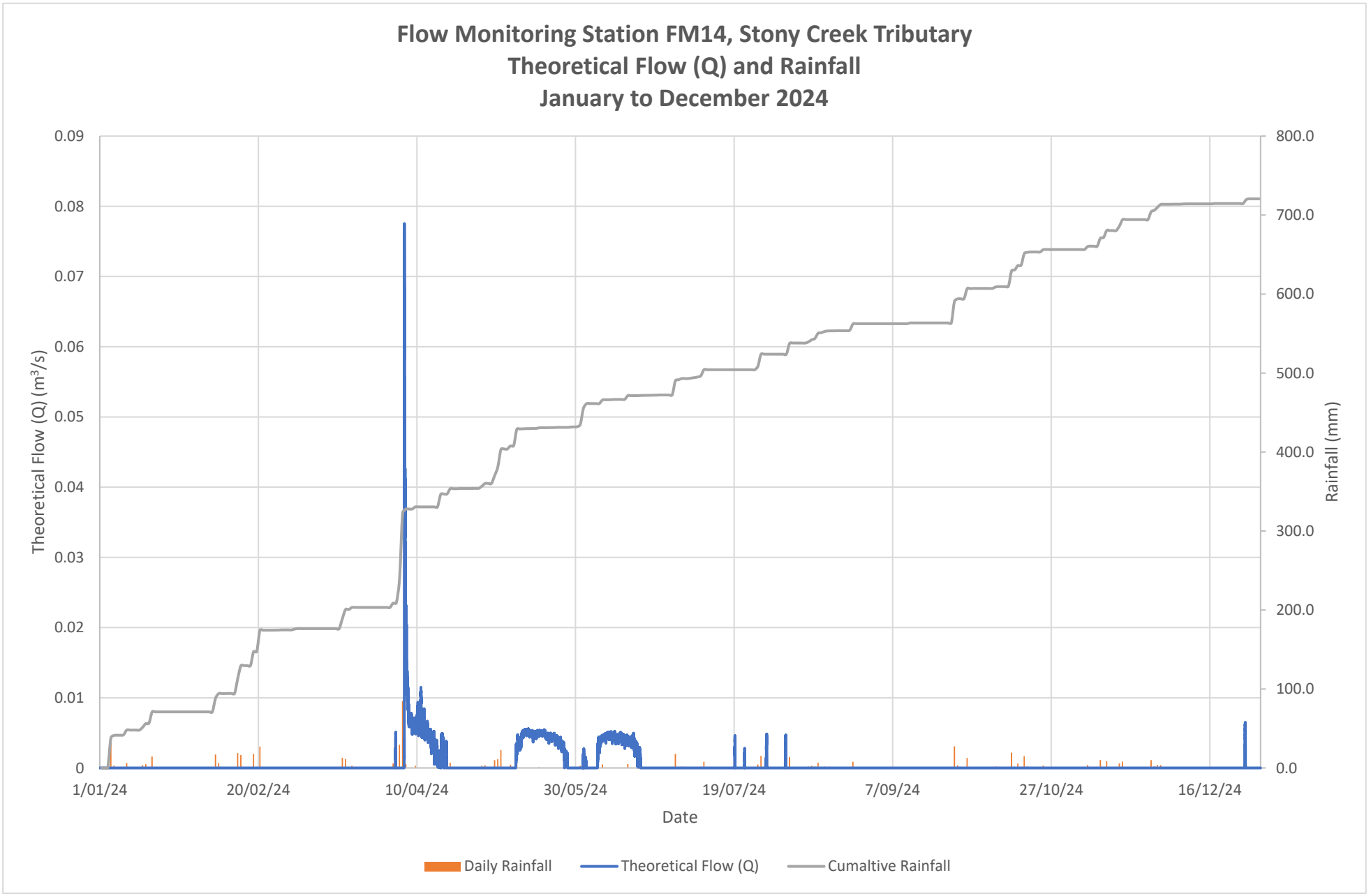
1.00
0.80
0.60
0.40
0.20
0.00
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
1/01/2024 0:08
20/02/2024 0:08
10/04/2024 0:08
30/05/2024 0:08
19/07/2024 0:08
7/09/2024 0:08
27/10/2024 0:08
16/12/2024 0:08
Date
Daily Rainfall
Stream Height
Cumlative Rainfall


Flow Monitoring Station FM17, South Wambo Creek
Theoretical Flow (Q) and Rainfall
January to December 2024
Theoretical Flow (Q) (m³/s)
Rainfall (mm)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
1/01/24
20/02/24
10/04/24
30/05/24
19/07/24
7/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Theoretical Flow (Q)
Cumlative Rainfall


Flow Monitoring Station FM12, Stony Creek
Stream Height and Rainfall
January to December 2024
Stream Height (m)
0.25
0.20
0.15
0.10
0.05
0.00
Rainfall (mm)
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
1/01/24
20/02/24
10/04/24
30/05/24
19/07/24
7/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Stream Height
Cumaltive Rainfall


Flow Monitoring Station FM12, Stony Creek
Theoretical Flow (Q) and Rainfall
January to December 2024
Theoretical Flow (Q) (m³/s)
Rainfall (mm)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
1/01/24
20/02/24
10/04/24
30/05/24
19/07/24
7/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Stream Height
Cumaltive Rainfall


Flow Monitoring Station FM14, Stony Creek Tributary
Stream Height and Rainfall
January to December 2024
Stream Height (m)
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Rainfall (mm)
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
1/01/24
20/02/24
10/04/24
30/05/24
19/07/24
7/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Stream Height
Cumaltive Rainfall


Flow Monitoring Station FM14, Stony Creek Tributary
Theoretical Flow (Q) and Rainfall
January to December 2024
Theoretical Flow (Q) (m³/s)
Rainfall (mm)
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
1/01/24
20/02/24
10/04/24
30/05/24
19/07/24
7/09/24
27/10/24
16/12/24
Date
Daily Rainfall
Theoretical Flow (Q)
Cumaltive Rainfall

APPENDIX H
ANNUAL GROUNDWATER MONITORING REPORT

Groundwater Annual Review - 2024

Wambo Coal Mine

Wambo Coal Pty Ltd

PMB1 Singleton, NSW, 233

Prepared by:

SLR Consulting Australia

SLR Project No.: 665.v10008.02031

27 March 2025

Revision: 2.0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1.0	12 March 2025	C.Scobie & A.Skorulis	A.Skorulis	D.Western
2.0	27 March 2025	C.Scobie & A.Skorulis	A.Skorulis	D.Western

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Wambo Coal Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

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1.0 Introduction

1.1 Overview

The Wambo Coal Pty Ltd (WCPL) operates an underground coal mine located approximately 20 kilometres (km) north-west of Singleton, New South Wales (NSW). As part of compliance with mine approval conditions, routine groundwater monitoring is conducted across WCPL, and the data reviewed monthly and analysed on an annual basis. This report presents the annual groundwater review for WCPL for the 2024 calendar year, developed in accordance with the approval conditions and requirements outlined within the GWMP (Peabody, 2023). The annual groundwater review is required to:

- Compare groundwater levels and quality to trigger levels. Groundwater levels are also compared to long term rainfall trends. Modelled groundwater levels are also compared to observed levels (Sections 4.1 and 4.2 of the WCPL Groundwater Management Plan (GWMP) (Peabody, 2023)).
- Assess the volume and quality of groundwater inflow to Open Cut Pits and Underground Workings (Section 6.1.2 GWMP). Estimated inflow volumes to underground workings are also compared to model predictions.
- Report against specific performance indicators developed for assessing groundwater impacts at North Wambo Underground (NWU), South Wambo Underground (SWU), and South Bates Extension (SBX) mine areas (Sections 4.3 and 4.4 GWMP).

1.2 Scope

This report addresses the following components of the Annual Review (AR) for WCPL for the 2024 calendar year:

1 Review hydrographs for relevant groundwater monitoring bores and VWPs and assess whether trends are due to climate variations, mining, or other influences. (**Sections 6.1 to 6.3**)

2 Assess Vibrating Wire Piezometer (VWP) data quality to assist with optimization of the monitoring network. (**Section 6.6**)

3 Assess shallow monitoring bores for compliance against the groundwater level and quality performance indicators (Tables 11 and 13 of the GWMP (Peabody, 2023). (**Section 6.5**)

4 Assess bores against relevant groundwater performance indicators defined for Development Consent DA305-7-2003 (as modified), and South Bates Extension (SBX) (Tables 14, and 16 of the GWMP [Peabody, 2023]). (**Section 6.5)**

5 Assess compliance with groundwater inflow assessment criteria and compliance with water licences (**Sections 8.0** and **9.0**).

6 Provision of recommendations (as required) **(Section 11.0**)

2.0 Wambo Underground Mine

The following section provides a description of WCPL operational activity that occurred in 2024 relevant to this annual groundwater review. The general site layout is presented in **Figure 1**.

2.1 Mine Operations

WCPL was granted development consent in February 2004 (DA 305-7-2003). The approved development described in the Project EIS and eighteen subsequent modifications extend the underground mine life until 31 August 2042. Under the most recent modification (Modification 19, determined 25 January 2023) current operations at the Wambo Mine include underground mining and coal processing and handling activities. Open cut mining activities are managed by the United Wambo Open Cut Project (UWOCP).

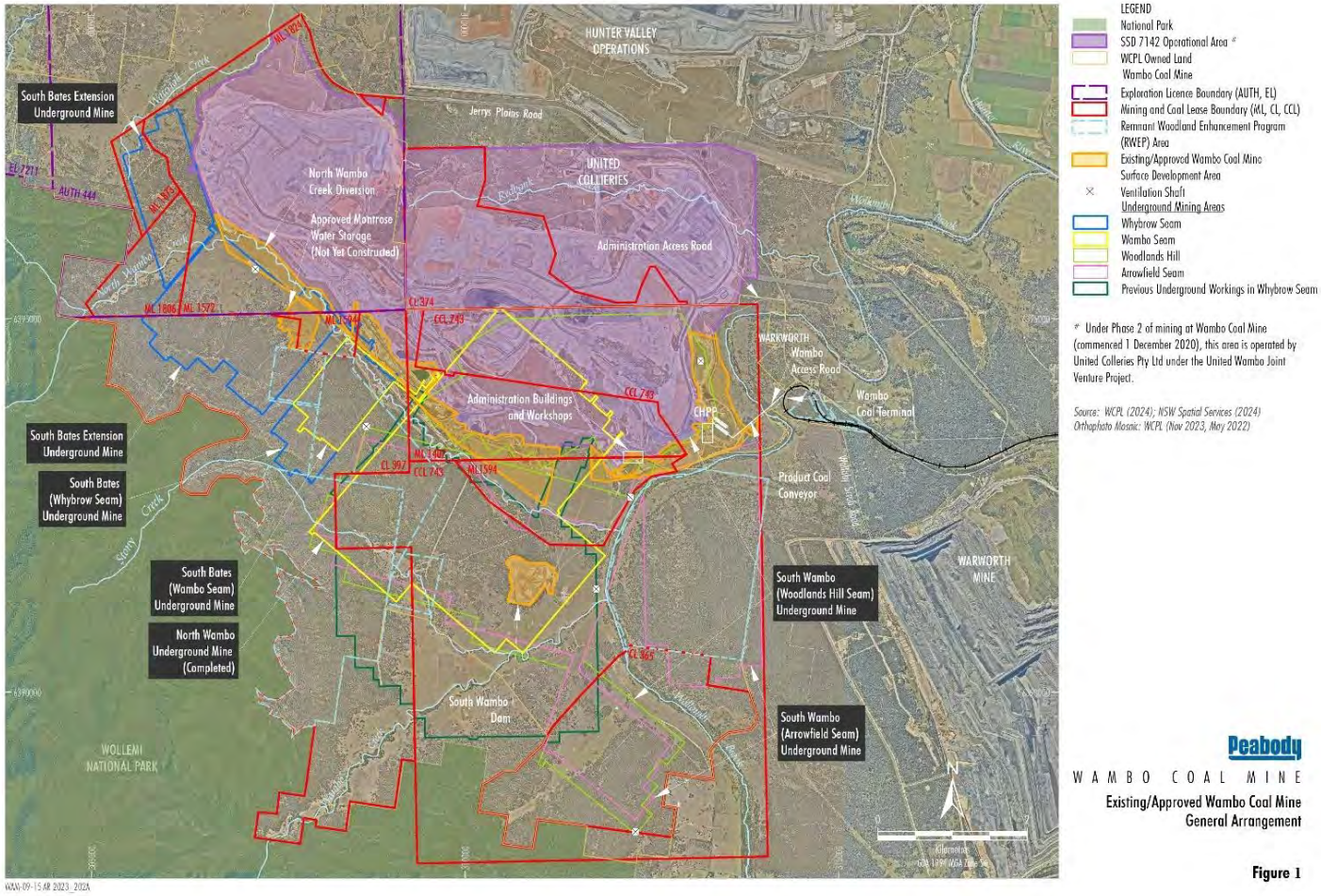
Table 1 presents a summary of mine areas across WCPL, approved mining timeframes and activities conducted during 2024. Mining was only active at South Bates Extension Underground during 2024.

Table 1 Summary of WCPL Activities

Mine Area	Seam Mined To	Approved Life of Mining	2024 Activities
North Wambo Underground (NWU)	Wambo Seam	2007 to 2015	Mining complete
South Bates Underground (SBU)	Wambo Seam and Whybrow Seam	2016 to 2018	Mining complete
South Bates Extension (SBX)	Whybrow Seam	2018 to 2025[1]	Mining of SBX longwalls: LW24a – January to June 2024 LW24b – July to October 2024 LW25 – commenced November 2024.
South Wambo Underground	Arrowfield and Bowfield Seam	To 2042	Construction of Stage 1 including wedgecut, surface laydown area for car park and equipment storage, water diversions and vegetation establishment.

[1] based on current Extraction Plan approvals.

Figure 1 Existing/ Approved Wambo Coal Mine General Arrangement



2.2 Site Groundwater Activity

Table 2 provides a summary of groundwater related site work undertaken at Wambo during 2024.

Table 2 2024 Groundwater Monitoring Network Updates and Maintenance

Description	Date	Detail of works completed
Site support works	8 February 2024	• Replace North Wambo Creek dataloggers • Download data from several VWPs • EC calibrations of loggers at Stony Creek
Monitoring well installations	3rd to 9th April 2024	• GW38a+b, GW39a+b+c installed downgradient of South Wambo Dam to monitor potential seepage.
Monitoring well installations	3rd to 18th April 2024	• Piezometers installed in the wall of South Wambo Dam for slope-stability and geotechnical purposes.
Monitoring network maintenance	1 June 2024	• EC Calibration at Stony Creek dataloggers
Monitoring network maintenance	15th and 16th August 2024	• Monitoring well development and inspection at wells near Wambo Creek and Wollombi Brook in response to recommendations from the 2023 Annual Review. • Wells developed include: P102, P106, P109, P206, PNWU-03a, PNWU-08b, PNWU-10a, BH3, GW15.
Monitoring network maintenance	19th September 2024	• Replaced VWP batteries • Check and correct VWP logging intervals at other locations.
Stony Creek inspection	18th and 19th September, and 1st October 2024	• Stony and Wambo Creek EC observations during site inspection. • Replacement of far-upstream datalogger to collect EC as well at stage height/ water level.
Monitoring network maintenance	13th November 2024	• VWP data downloads and troubleshooting/ training of Wambo staff. • Check private well (GW078477).

2.3 Groundwater Impacts

Groundwater impacts associated with the approved operations at WCPL have been progressively assessed for each mining area, including:

- Wambo Development Project Groundwater Impact Assessment (AGE, 2003);
- North Wambo Underground Mine Modification Groundwater Assessment (Heritage Computing, 2012);
- North Wambo Underground – Longwall 10A – Modification Assessment (HydroSimulations, 2014a);
- Wambo Coal Mine Open Cut Modification Groundwater Assessment (HydroSimulations, 2014b);
- South Bates Underground Mine Modification – Groundwater Assessment (HydroSimulations, 2015);
- South Wambo Underground Mine Modification Groundwater Assessment (HydroSimulations, 2016a):
- South Wambo Box Cut – Groundwater Assessment (HydroSimulations, 2016b);
- South Bates Extension Modification Groundwater Assessment (HydroSimulations, 2017); and
- Wambo Knowledge to inform NWC GDE Study (HydroSimulations, 2019).
- Groundwater Assessment in Support of South Bates Extension LW21-24 Extraction Plan for SBX LW21-24 EP (SLR, 2020), including an updated version of the HydroSimulations (2017a and 2019b) numerical groundwater model simulating approved mine activities.
- South Bates Extension LW24-26 Modification Groundwater Assessment (SLR, 2022c)
- Longwalls 24-26 Extraction Plan Groundwater Technical Report (SLR, 2023b)
- Longwalls 24-26 Updated Extraction Plan Groundwater Assessment Review (SLR, 2024b)

2.4 Groundwater Licensing

Under the *Water Act 1912* and *Water Management Act 2000*, adequate water licences are required for approval of the mine developments. Groundwater licenses held for the Wambo Mining Complex, consisting of Wambo Underground and United Wambo Open Cut are detailed in **Table 3**.

Table 3 Wambo Complex Groundwater Entitlement and Licences

Licence Number	WAL Expiry Date	Entitlement
Hunter Unregulated and Alluvial Water Sources (Lower Wollombi Brook Water Source)		
WAL23897[1,2]	Perpetuity	70 unit shares
WAL18437	Perpetuity	366.9 unit shares
WAL18455	Perpetuity	200 unit shares
WAL18549	Perpetuity	100 unit shares
North Coast Fractured and Porous Rock Groundwater Sources (Sydney Basin - North Coast Groundwater Source)		
WAL42373[1,3]	Perpetuity	1,549 unit shares
WAL41532 [1,2]	Perpetuity	98 unit shares
WAL41510	Perpetuity	300 unit shares
Notes: 1. WAL = water access licence, ML/year = megalitres per year. 2. Former licence number: For WAL 23897 = 20BL167737, WAL41532 = 20BL172156 3. 6 x WALs consolidated on 20/12/18		

3.0 Agency Correspondence

Table 4 Agency Correspondence in 2024

Background	Regarding	Recommendation	Action
Ref: DA305-7-2003-i-PA-91 *Agency:* DPHI *Date:* 20 December 2024	Waterfall Creek GW Bores	Provide further information by 21 February 2025 to demonstrate that the Waterfall Creek bores, GW40a, GW40b, GW41a and GW41b, were installed in accordance with DCCEEW Water Group's (previously DPE Water) recommendation.	Response provided to DPHI 20 February 2025.
		Provide an assessment of Waterfall Creek surface water and groundwater connectivity as recommended by NSW DCCEEW Water Group previously. Installation of water level loggers to monitor shallow groundwater levels and surface water levels simultaneously is required.	Response provided to DPHI 20 February 2025. Noting: • An additional shallow monitoring bore is scheduled for installation adjacent to GW40a and GW40b in Q2 2025. • A paired surface water-groundwater monitoring location is scheduled for installation at an additional location adjacent to the high potential GDE in Q2 2025.

4.0 Hydrogeological Setting

This section presents a brief summary of the hydrogeological setting for WCPL. This includes discussion on climate, terrain, drainage, geology, and groundwater bearing units.

4.1 Climate, Terrain, and Drainage

4.1.1 Climate

The climate of the Wambo region is temperate and characterised by hot summers and mild dry winters. Rainfall data is available from the Bureau of Meteorology (BoM), Bulga-South Wambo Station (Station: 0611191) which has been collecting data since 1959 and provides a useful dataset for assessing long term rainfall trends. **Table 5** provides the long term historical monthly average rainfall for WCPL and the 2024 monthly rainfall data. From the Bulga- South Wambo dataset, the long-term average annual rainfall is 675.8 mm. In 2024, the total rainfall was 699.4 mm indicating that the year experienced near average rainfall.

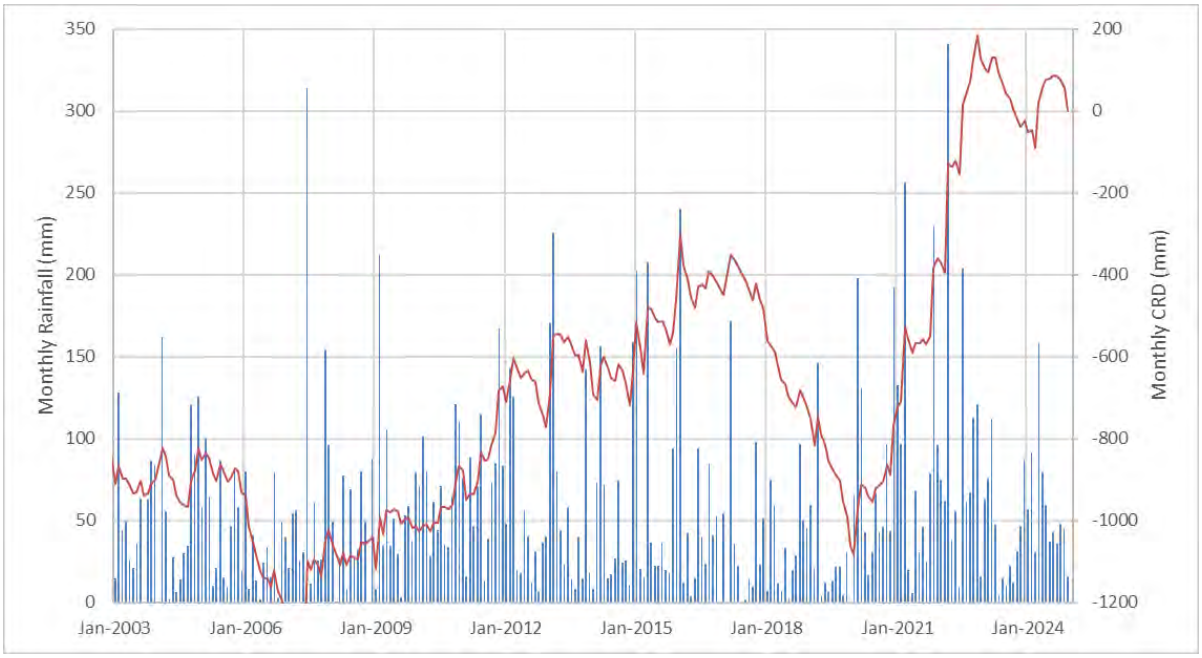
Table 5 Long Term Average and 2024 Climate Data

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Historical[1]	85.9	85.8	75.0	47.1	39.7	43.5	33.0	34.8	38.4	55.8	64.5	72.3	675.8
2024 Rainfall	56.8	91.2	30.4	158.4	79.4	59.4	37.2	42.4	35.9	47.9	44.4	16	699.4
Excess/deficit	-29.1	5.4	-44.6	111.3	39.7	15.9	4.2	7.6	-2.5	-7.9	-20.1	-56.3	23.6

[1] Based on Bulga South Wambo dataset August 1959 to December 2024

The cumulative rainfall departure (CRD) (**Figure 2**) graphically shows the rainfall trend relative to the long-term average. A positive (upward) slope in the CRD indicates periods of above average rainfall, while a negative (downward) slope indicates periods of below average rainfall. The CRD shows that early 2024 experienced a period of above average rainfall, followed by average and then below-average conditions to the end of the year.

Figure 2 Monthly Rainfall and CRD



4.1.2 Terrain and Drainage

WCPL is located in the Upper Hunter Valley region where landforms are characterised by gently sloping floodplains associated with the Hunter River and the undulating foothills, ridges and escarpments of the Mount Royal Range and Great Dividing Range. Elevations in the vicinity of WCPL range from approximately 60 metres Australian Height Datum (mAHD) at Wollombi Brook to approximately 400 mAHD on the nearest ridges of the hills immediately to the southwest of WCPL.

Wollombi Brook, situated immediately south-west of WCPL, flows north-east to its confluence with the Hunter River (**Figure 1**). Wollombi Brook drains an area of approximately 1,950 square kilometres (km^2) and joins the Hunter River some 4 km east of Wambo. The Wollombi Brook sub-catchment is bound by the Myall Range to the south-east, Doyles Range to the west, the Hunter Range to the south-west and Broken Back Range to the north-east (Hunter Catchment Management Trust, 2002).

The majority of lands within WCPL mining tenements drain via Wambo, Stony, North Wambo and Redbank Creeks to Wollombi Brook, while Waterfall Creek drains to the north-east directly to the Hunter River. These watercourses are generally characterised by ephemeral and semi-perennial flow regimes (Gilbert and Associates, 2003).

4.2 Geology

WCPL is situated within the Hunter Coalfield subdivision of the Sydney Basin, which forms the southern part of the Sydney-Gunnedah-Bowen Basin. The stratigraphy in the Wambo area comprises the Triassic Narrabeen Group, Permian coal measures, and more recent (Quaternary) alluvial deposits associated with major drainage pathways. Folding, faulting and igneous intrusions have affected the Permian sediments after deposition. The target Seams for WCPL underground mining lie within the Jerrys Plains Subgroup of the Wittingham Coal Measures.

Along the Wollombi Brook, Wambo Creek, North Wambo Creek (NWC), and Stony Creek thin Quaternary alluvial deposits unconformably overlie the Permian strata. The alluvial deposits comprise surficial fine-grained sediments (i.e. sands, silts, and clays). Along major watercourses (i.e. Wollombi Brook) the surficial sediments overly basal sands and gravels that are between 7 m to 20 m thick. **Table 6** presents a summary of site geology.

Table 6 Wambo Generalised Stratigraphy

Age	Stratigraphic Unit		Description
Cainozoic	Quaternary sediments - alluvium (Qa)	Surficial alluvium (Qhb)	Shallow sequences of clay, silty sand, and sand.
		Productive basal sands/gravel (Qha)	Basal sands and gravels along major watercourses (i.e. Hunter River).
	Silicified weathering profile (Czas)		Silcrete
	Alluvial terraces (Cza)		Silt, sand, and gravel
Jurassic	Volcanics (Jv)		Flows, sills, and dykes

Age	Stratigraphic Unit		Description
Permian	Whittingham Coal Measures	Jerrys Plains Sub-group (Pswj)	Coal bearing sequences interbedded with sandstone and siltstone. Coal seams (youngest to oldest) include Whybrow Seam, Redbank Creek Seam, Wambo Seam, Whynot Seam, Blakefield Seam, Glen Munro Seam, Woodlands Hill Seam, Arrowfield Seam, Bowfield Seam, Warkworth Seam, Mt Arthur Seam, Piercefield Seam, Vaux Seam, Broonie Seam and Bayswater Seam.

4.2.1 Groundwater Units

The hydrogeological regime of the Wambo area and surrounds comprises two main systems:

- Quaternary alluvial aquifers associated with Wollombi Brook, NWC, Wambo Creek, and Stony Creek; and
- Underlying Permian strata of generally low permeability and very low yielding sandstone and lesser siltstone, with low to moderately permeable coal seams which are the prime water-bearing strata within the Permian coal measures. Triassic strata, namely the Narrabeen Group, are present to the south-west of the North Wambo Underground Mine and underlie some areas of alluvium.

4.2.2 Alluvium

Groundwater flow within the shallow alluvial aquifers reflects local topography and the containment of alluvium within the low-lying drainage pathways. Evidence from temporal groundwater monitoring hydrographs (**Appendix B**) within the alluvium indicates that the shallow aquifer is responsive to rainfall recharge, and it is likely that the alluvium plays an important role in supplying recharge to the underlying Permian strata as well as, in places, contributing to baseflow of the perennial surface water features. In some areas upward or lateral flow may occur from the Permian and Triassic rock, but downward leakage seems to be the more common behaviour.

4.2.3 Permian Coal Measures

Prior to the commencement of mining operations in the region, the piezometric surface across the Wambo area most probably reflected the topography, with elevated water levels/pressures in areas distant from the major drainages and reduced levels in areas adjacent to the alluvial lands. Historical and ongoing open cut and underground mining within the Wambo area and adjoining mining operations have significantly altered the natural regime with a regional zone of depressurisation within the Permian coal measures.

The inter/overburden sediments have low permeability which is primarily is related to secondary porosity i.e. fracture / joint spacing and aperture. Permeability of the rock units generally decreases with depth of burial as the joints tighten and become less frequent.

The permeability of the coal measures is generally low, with rock mass permeabilities typically more than two orders of magnitude lower than the unconsolidated alluvial aquifers. The most permeable horizons are the coal seams, which commonly have hydraulic conductivity one to three orders of magnitude higher than the interburden comprising mudstones, siltstones, shales, and sandstone units.

The coal seams are generally more brittle and therefore more densely fractured than the overburden and interburden strata, which causes the higher permeability. Within the coal seams, groundwater flows predominantly through cleat fractures, although there is some evidence of structure-related fracturing, and this may play an important role in groundwater flow paths.

The impact of fault structures such as the Redmanvale Fault is not known with certainty. However, it is likely that groundwater flow dynamics are complex in the vicinity of these structures.

5.0 Groundwater Monitoring

5.1 Groundwater Monitoring Program

Groundwater monitoring is conducted at WCPL in accordance with the GWMP (Peabody, 2023). The purpose of the GWMP is to monitor and manage groundwater quality and levels to detect potential impacts on surrounding groundwater users, assess the performance of the mine against the performance indicators, and to ensure that relevant legislative and policy requirements are met.

The overall objective of the GWMP is to establish a program of data collection that can be utilised to assess potential impacts of mining activities on local groundwater resources. Groundwater levels are compared to background data, EIS predictions, and historical trends as a means of assessing any WCPL related drawdown impacts to local aquifers.

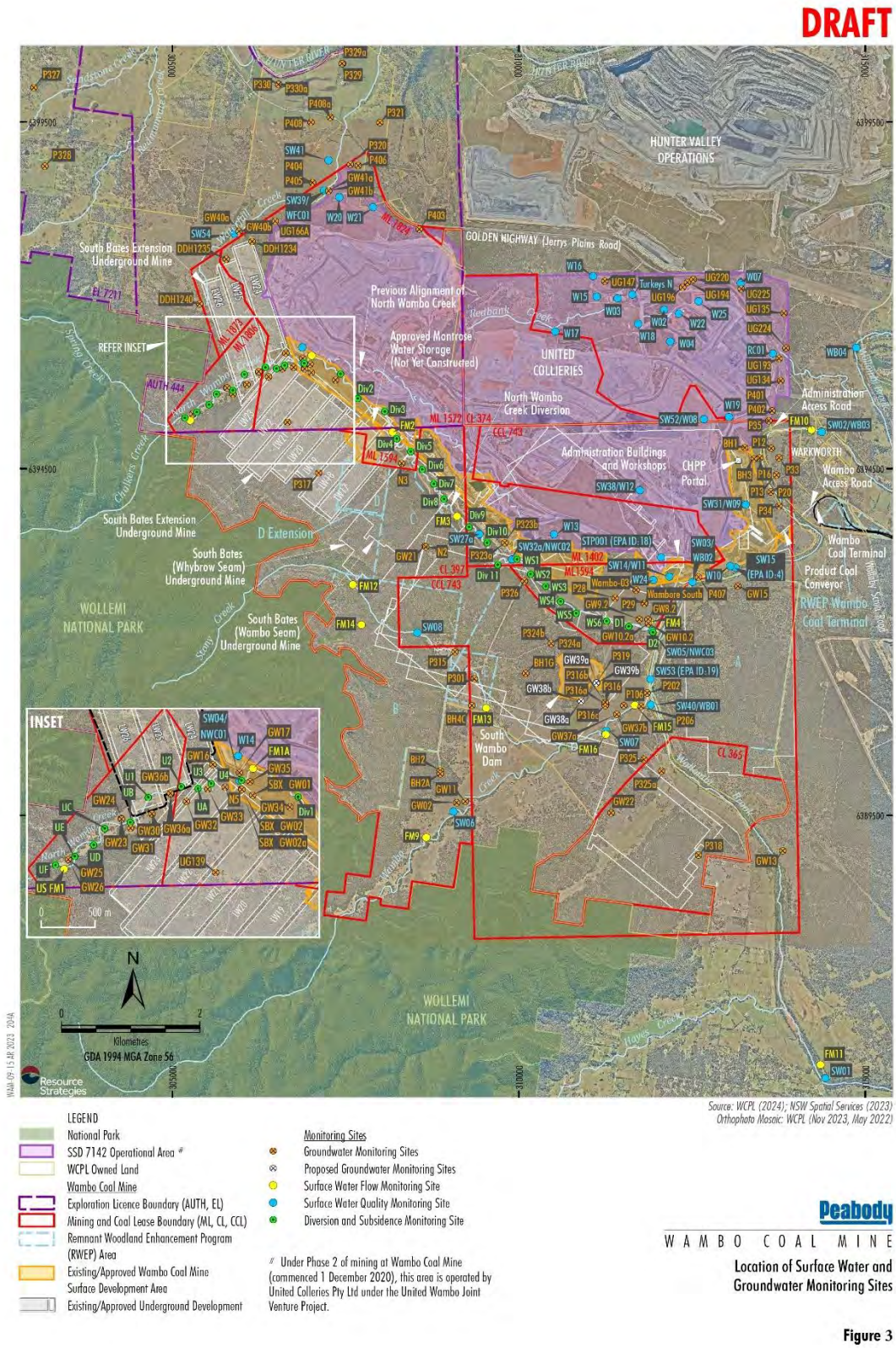
Ongoing groundwater monitoring requirements at WCPL are as follows:

- Groundwater monitoring above and in close proximity to mine workings;
- Monitoring of potential groundwater leakage from alluvial aquifers;
- Monitoring of groundwater inflows to underground and open cut mining operations; and

The monitoring programme at WCPL also assesses the quality of groundwater against background data and historical trends. Bi-monthly monitoring of groundwater levels, pH, and EC is undertaken at all standpipe bores included in the groundwater monitoring program. Comprehensive analysis of major ions is conducted at each standpipe bore annually.

Standpipe and vibrating wire piezometers within the current WCPL monitoring network are tabulated in **Appendix D** and shown on **Figure 3**.

Figure 3 WCPL Monitoring Network



5.2 Groundwater Monitoring Compliance Criteria

The annual groundwater monitoring data review is undertaken with reference to specific compliance criteria (trigger levels - **Table 7**), and an assessment of the data against specific performance criteria set out in groundwater (**Table 8** and **Table 9**).

5.2.1 Groundwater Trigger Levels

Trigger levels are used to initiate investigations into shallow (primarily alluvium) groundwater levels or groundwater quality at WCPL when they stray beyond anticipated bounds.
The trigger levels specified in the WCPL GWMP (Peabody, 2023), are based on statistical analysis of pre-mining (i.e. baseline) monitoring data.

Trigger levels for groundwater level, EC and pH are presented in **Table 7**. The trigger for groundwater levels and pH occurs when two consecutive bi-monthly observations exceed or fall below the maximum / minimum trigger levels. Triggers for EC occur when three consecutive bi-monthly observations (a 6-month period) exceed the specified trigger value.

As per the GWMP, several the bores (presented in Table 12 of the GWMP) are no longer assessed against groundwater trigger levels, namely: P106, P114, P116, P202, P206, P301, GW02, GW11, GW12, and GW13. Detailed justification for this is provided in Table 12 of the GWMP (Peabody, 2023).

Future updates to the GWMP could consider the development and inclusion of trigger levels at operationally relevant sites on North Wambo Creek (upstream of the diversion) and Waterfall Creek.

Trigger exceedances and analysis for the 2024 monitoring period are presented in **Section 6.4**.

Table 7 Groundwater Level and Groundwater Quality Trigger Levels (Peabody, 2023)

Bore	Monitoring	Minimum (10th percentile)		Maximum (90th percentile)		Groundwater Quality		
		Depth to Water (mbtoc)[4]	Level (mAHD)	Depth to Water (mbtoc)	Level (mAHD)	EC (µS/cm)	pH Min	pH Max
P301	Stony Ck Permian	N/A				9200	6.1	7.2
P315[1]	Stony Ck Alluv	N/A				552	6.0	7.4
GW08.2[2]	NWC (d/s) Alluv	ND				ND		
GW09.2[2]	NWC (d/s) Alluv	ND				ND		
GW10.2[2]	NWC (d/s) Alluv	ND				ND		
P109[3]	Wambo Ck Alluv	4.6	57.8	6.7	55.7	695	6.5	7.6
GW15	Wollombi Bk Alluv	10.4	52.0	11.1	51.3	730	6.7	7.2
P16	Wollombi Bk Alluv	7.1	50.4	7.8	49.7	10832	7.0	7.7
P20	Wollombi Bk Alluv	7.1	50.3	8.2	49.2	10625	7.0	7.6

Bore	Monitoring	Minimum (10th percentile)		Maximum (90th percentile)		Groundwater Quality		
		Depth to Water (mbtoc)[4]	Level (mAHD)	Depth to Water (mbtoc)	Level (mAHD)	EC (µS/cm)	pH Min	pH Max

N/A = Not applicable

[1]P315 was dry prior to NWU mining activity. Therefore, a specific depth to water trigger is not appropriate to indicate Wambo mining impacts. Data will be reviewed as part of the Annual Review to determine whether there are changes in groundwater level that can be attributed to Wambo mining activity.

[2]GW08.2, GW09.2 and GW10.2 have been installed as replacement bores to GW08 and GW09. Establishing trigger levels for these bores will be considered following the collection of baseline data and also informed by model predictions.

[3] Monitoring ceased at P109 in October 2023 and has not been assessed against trigger levels for 2024. Monitoring commenced at GW37b in 2024 and will be compared against historical data from P109.

[4]metres below top of casing (mbtoc)

5.2.2 Groundwater Performance Criteria

The current GWMP, published in November 2023 (Peabody, 2023) includes three sets of performance indicators relevant to groundwater (**Table 8** and **Table 9**), the first set are performance indicators relevant to general water management performance (GWMP – Table 14). The second and third sets are specific performance indicators to monitor the subsidence impact for North Wambo Underground (GWMP – Table 15) and South Bates Underground and Extension longwalls (GWMP – Table 16) respectively.

The NWU extraction plan is no longer current and has been superseded by the South Bates Underground Extraction Plan. Table 15 was updated from a previous version of the GWMP (2020) to indicate where the relevant performance indicators are now assessed, and which are no longer relevant and only performance indicators relevant to this annual review are considered.

An assessment of compliance with performance indicators relevant to groundwater (**Table 8** and **Table 9**) is presented in **Section 6.5**.

Table 8 Performance Indicators

Feature	Performance Indicator
Groundwater Management Performance Indicators	
Alluvial aquifers (including Wollombi Brook alluvium and excluding the NWC alluvium)	The performance indicators will be considered to have been exceeded if impacts exceed those predicted in the documents listed in condition A2c) (of DA305-7-2003), including: • A greater than negligible change in groundwater levels; • A greater than negligible change in groundwater quality; and • A greater than negligible impact to other groundwater users.
Groundwater dependent ecosystems	The performance indicators will be considered to have been exceeded if impacts exceed those predicted in the documents listed in condition A2c) (of DA305-7-2003), including: • Greater than negligible environmental consequences, beyond those predicted in the documents listed in condition A2c); and • Channel stability is not maintained or improved

Table 9 Subsidence Performance Indicators for Groundwater

North Wambo Underground Performance Indicators
• The performance indicators will be considered to have been exceeded if monitoring data suggests significant divergences away from the modelled groundwater.
South Bates Underground and South Bates Extension Underground Performance Indicators
• The performance indicators will be considered to have been exceeded if the groundwater levels in alluvial bores exceed the groundwater level criteria in the GWMP (Table 11 of the GWMP). • The performance indicators will be considered to have been exceeded if the groundwater quality in alluvial bores exceeds the groundwater quality criteria in the GWMP (Table 13 of the GWMP). • The performance indicators will be considered to have been exceeded if the impacts observed on riparian, aquatic or groundwater dependent ecosystems are beyond negligible.

6.0 Monitoring Results

A summary of the groundwater level data for each of the main water bearing units is provided below together with a review of electrical conductivity (EC) and pH (see **Appendix B** for plots). Performance against trigger levels prescribed in the GWMP (Peabody, 2023), is presented in **Section 6.4**.

Data from monitoring bores at key sites has been reviewed to identify potential impact:

- Alluvium (Section 6.1);
- Regolith – Weathered Shallow Strata (Section 6.2);
- Permian Coal Measures (Section 6.3).

SLR has reviewed the groundwater monitoring data collected in 2024 prior to the evaluation of groundwater level and quality trends. This included the review of field sampling sheets and communication with the contractor commissioned to collect the data. This review has found that groundwater data collected from the WCPL monitoring network in 2024 has been collected consistent the requirements of the GWMP (Section 6.1 - Peabody, 2023) and is suitable for the purposes of this annual review.

6.1 Alluvium

Table 10 summarises groundwater level and quality trends for Wambo alluvial monitoring locations.

Table 10 2024 alluvial groundwater trends

Alluvial Aquifer	Monitoring bores	2024 Groundwater Observations and Likely Causes
Wambo Creek Alluvium	Upstream GW02, GW11	2024 groundwater level observations at Wambo Creek alluvial monitoring locations responded to periods of above and below average rainfall consistent with previous years' observations. EC and pH observations remain generally stable and consistent with historical observations. Groundwater level, EC and pH observations at GW37a are generally consistent with historical observations for P106 and indicate the bore is likely a suitable replacement. Shallow South Wambo Dam monitoring wells GW38a and GW39a were dry for all 2024.
	Downstream P106, P316a, GW37a, GW38a, GW39a	
North Wambo Creek Alluvium	Upstream GW23, GW25	2024 groundwater level observations at North Wambo Creek alluvial monitoring locations generally responded to periods of above and below average rainfall consistent with previous years' observations. However, some muted responses to above average rainfall in April 2024 may be observed at Central-Upper North Wambo Creek monitoring locations. It is noted that nearby South Bates Extension (SBX) LW23 was completed in late 2023 and SBX LW24 was completed in 2024. Less recovery (lower groundwater levels), and faster rates of groundwater level decline after rainfall/ recharge events compared to pre-mining observations may indicate an effect due to mining at these nearby longwalls. Groundwater responses at Upstream and Central-Upper monitoring locations should continue to be evaluated for potential mining effects. EC and pH observations remain generally stable and consistent with historical observations.
	Central Upper (upstream of diversion) GW30, GW32, GW33, GW35, GW36b,	
	Downstream GW08.2, GW09.2, GW10.2	
Wollombi Brook Alluvium	P16, P20, GW15 and P325a	2024 groundwater level observations at Wollombi Brook alluvial monitoring locations responded to periods of above and below average rainfall consistent with previous years' observations. As has been reported in previous years, groundwater elevations at P16 are around 1 m lower than historical observations during similar rainfall/ climatic periods. This has been identified as a potential Glen Munro Pit mining effect and is discussed in more detail in **Section 6.4.3**. EC and pH observations remain generally stable and consistent with historical observations.
Stony Creek Alluvium/ Colluvium	P315	Fluctuations in P315 groundwater levels in response to rainfall events in 2024 are consistent with previous years' observations. EC was relatively stable in 2024 and lower than peak EC observations from 2023. All monitoring events during 2024 continue to exceed EC trigger value, with further detail in **Section 6.4.1**
Waterfall Creek Alluvium/ Colluvium	GW41a	Groundwater elevations at GW41a generally declined throughout 2024. Due to the short monitoring period at this location, it is difficult to evaluate whether the decline can be attributed to normal variation in response to climate or related to nearby open cut or underground mining. It is noted that only two surface water observations were made at the downstream Waterfall Creek monitoring location in 2024, while the midstream and upstream locations were dry. Flow events in Waterfall Creek are likely to be a key recharge mechanism for the alluvium, and it is possible that rainfall/ flow events of sufficient magnitude to recharge unconsolidated material at this location did not occur in 2024. EC and pH observations are reasonably stable throughout 2024.

6.2 Regolith – Shallow Weathered

Table 11 summarises groundwater level and quality trends for Wambo monitoring locations within regolith and shallow weathered strata.

Table 11 2024 groundwater trends in regolith/ shallow weathered strata

Regolith Aquifer	Monitoring bores	2024 Groundwater Observations and Likely Causes
Wambo Creek	P316b, GW37b	Groundwater elevations in the Wambo Creek regolith monitoring bores are lower than the peak elevations observed in 2021 and 2022 but continue to respond to periods of above and below average rainfall in 2024. EC observations show an inverse relationship to the rainfall trend (low rainfall related to higher EC observations) which is likely more pronounced at GW37b due to its closer proximity to Wambo Creek. pH observations were generally stable throughout 2024. Groundwater level, EC and pH observations at GW37b are consistent with historical observations for P109 and indicate the bore is likely a suitable replacement.
North Wambo Creek	Upstream GW24, GW26, Downstream GW10.2a Downstream GW10.2a	*Upstream of North Wambo Creek Diversion* 2024 observations at shallow Permian monitoring sites farthest upstream on North Wambo Creek (GW24, GW26) show similar responses to periods of above and below average rainfall as observed in the historical dataset. Monitoring locations further downstream appear to show a muted response to the period of above average rainfall in April 2024. This may indicate a mining effect from nearby SBX underground mining and is most pronounced at SBX-GW02a (standpipe), GW16 and GW17. Groundwater responses should continue to be evaluated for potential mining effects by comparing pre and post mining groundwater level responses to rainfall/ recharge events of similar magnitudes. The inverse trend between rainfall and EC observed in 2024 appears normal for shallow Permian monitoring wells in the Wambo area, and pH observations were generally stable. *Downstream of North Wambo Creek Diversion* 2024 groundwater levels are consistent with historical observations. EC and pH observations were stable throughout 2024.
Stony Creek	P301	2024 groundwater level observations at the Stony Creek shallow Permian monitoring location responds to periods of above and below average rainfall consistent with previous years' observations. EC and pH remained relatively stable at P301 in 2024.
Wollombi Brook	GW13	Groundwater level observations in 2024 show some response to above and below average rainfall, but also may be showing some effect of approaching open cut mining from nearby Mount Thorley- Warkworth. pH is stable in 2024, while EC observations declined from elevated levels in 2023 and early 2024 to values consistent with previous observations.
Waterfall Creek	GW41b, GW40a, GW40b	Groundwater elevation in 2024 declined by ~6 m at GW40a and GW40b in 2024 which is most likely caused by mining related drawdown associated with SBX LW24 extraction. Further downstream, groundwater elevation at GW41b declined by ~0.3 m in 2024 but also showed some response to the period of above average rainfall in April-June 2024. This may be normal response to climatic conditions at this location. It is difficult to evaluate pH and EC observations at these Waterfall Creek monitoring locations due to the short period of record. However, there are no apparent mining effects on groundwater quality in 2024.

6.3 Permian Coal Measures

Table 11 summarises groundwater level and quality trends for Wambo monitoring locations within Permian coal measures.

Table 12 2024 groundwater trends in Permian coal measures

Regolith Aquifer	Monitoring bores	2024 Groundwater Observations and Likely Causes
Wambo Creek Catchment	P202, P206, P316c	Groundwater elevations in 2024 at P202 and P316c followed the long-term rainfall trend, consistent with historical observations. Groundwater elevations at P206 declined by ~3m during 2024, continuing an overall declining trend that has been observed since late 2021 (~20 m total) that is not consistent with historical observations. Active mining is not occurring near P206; however, the decline may be related to changing storage levels in historical underground workings or other site activity. EC and pH observations in 2024 at Wambo Creek Permian all sites are consistent with historical observations.
North Wambo Creek Catchment	N2, N3 and N5 VWPs SBX-GW01 and SBX-GW02 VWPs	Groundwater elevations in upper three sensors at N5 declined by 5-10 m between late 2023 and early 2024, likely related to mining at SBX LW 22. Groundwater levels at these sensors are then generally stable throughout 2024. Groundwater elevations at the deepest sensor (N5 (1) in the Wambo Seam) has declined more gradually since early 2022 likely reflecting a general SBX mining impact as longwalls approach as well as below average rainfall. Upper three sensors are dry in N2, while the lower three show some SBX mining impact while maintaining some saturation. All five sensors at N3 have failed (since 2019) and this location should be considered for decommissioning. Data collected from SBX-GW01 and SBX-GW02 up to March 2024 indicates only the upper sensor (10 m above the Whybrow Seam in SBX-GW02) showed saturation above the sensor elevation at this time.
Wollombi Brook Catchment	GW22	Groundwater levels have remained stable but high in 2024 when compared to observations prior to 2021. pH and EC remained stable throughout 2024.

6.4 Trigger Level Exceedances

The trigger level exceedances for groundwater level and groundwater quality in 2024 are shown in **Table 13**.

Triggers for pH and EC occur when three consecutive bi-monthly observations (a 6-month period) exceed the specified trigger level (**Table 7**). Triggers for groundwater level occur when two consecutive bi-monthly observations (a 4-month period) exceed or fall below the specified trigger level (Peabody, 2023).

During 2024, groundwater levels in bore GW15 exceeded the maximum groundwater elevation trigger level, P16 exceeded the minimum groundwater elevation trigger level, and bore P315 exceeded the EC trigger. No bores exceeded the pH trigger guidelines in 2024.

Table 13 2024 Trigger Level Exceedances

Bore (Aquifer#)	Trigger Exceedances				
	Max GW Elevation 2 Consecutive (10th percentile) *	**Min GW Elevation 2 Consecutive (90th percentile) ****	**EC (3 Consecutive)**	**pH min (3 Consecutive)**	**pH max (3 Consecutive)**
P315 (SCA)	N/A	N/A	Yes (2021-2024)	No	No
P301 (SP)	N/A	N/A	No	No	No
GW15 (WBA)	Yes (2022-2024)	No	No	No	No
P16 (WBA)	No	Yes (2023-2024)	No	No	No
P20 (WBA)	No	No	No	No	No
GW08.2 (NWCA)	ND				
GW09.2 (NWCA)	ND				
GW10.2 (NWCA)	ND				

Aquifer: WCA = Wambo Ck alluvium; SCA = Stony Ck alluvium; WBA = Wollombi Brook alluvium; NWCA = North Wambo Ck alluvium; SP = shallow Permian.
ND = Not Defined – currently there is insufficient baseline data to develop appropriate trigger levels
*Minimum depth-to-water is equivalent to maximum groundwater level (mAHD)
**Maximum depth-to-water is equivalent to minimum groundwater level (mAHD)

6.4.1 P315 – Stony Creek Alluvium - EC

EC continued to be above the trigger level of 552 µS/cm for all 2024 with a minimum in April 2024 of 840 µS/cm and a maximum of 1,196 µS/cm in October 2024. This is considered an ongoing exceedance that was identified in 2021 and is a decrease compared to 2023 observations which is likely related to the period of above average rainfall in April 2024.

The following work was undertaken in 2024 to further assess the drivers of water quality change within Stony Creek and its alluvium:

- Ongoing monitoring of real-time level and quality of groundwater and surface water.
- Site inspections and monitoring network updates by SLR and WCPL staff in 2024 including the upgrade of the monitoring location established upstream South Bates Underground longwalls to include the collection of real-time EC alongside surface water level information.
- Completion of data review, with an update Report provided to the Department of Planning, Housing and Infrastructure (DPHI) in November 2024 (SLR, 2024c).
- The continuation of quarterly groundwater monitoring at private wells near to Stony Creek and Wambo Creek to help evaluate whether the observed change in at P315 may be influencing downstream groundwater receptors. It is noted that monitoring at these locations to date has not indicated a change in water quality due to the observed trigger exceedance.
- A survey of the monitoring instrumentation near the downstream continuous data logger was completed to compliment the data collected at the adjacent P319 shallow monitoring well.

An additional data review report will be completed in November 2025 that considers data collected in the previous year. If site conditions allow, the following points provide key objectives of this updated report:

- Evaluation of the hypothesis that subsidence induced fracturing may be driving Stony Creek water quality changes using surface water EC collected upstream of all underground mining operations within the Stony Creek catchment.
- Continued evaluation of whether the observed change in at P315 may be influencing downstream groundwater receptors such as nearby private wells.
- Comment on whether the stabilisation of EC observed at P315 in 2024 has continued in 2025, and whether this may reflect new baseline conditions at this location.

6.4.2 GW15 – Wollombi Brook Alluvium - Maximum Groundwater Elevation

GW15 is located 275 m east of the channel of Wollombi Brook and 1.5 km west of the advancing Warkworth Open Cut. Historical observations show a consistent correlation between CRD and groundwater level at GW15. Groundwater levels were above the minimum depth to water (max groundwater elevation) trigger level of 52.0 mAHD for the entirety of 2024 despite a decline of ~3 m throughout 2023 due to below average rainfall.

GW15 was re-developed/ purged in August 2024 consistent with recommendations from the 2023 Annual Review (SLR, 2024a). No significant thickness of sediment was removed during purging, the measured total depth of GW15 is consistent with its bore log (Parsons-Brinkerhoff, 2009), and depth to water observations in the monitoring rounds before, during, and after purging are also consistent. This indicates the GW15 has not been silted up by flooding in 2022 and likely functioning normally.

The maximum groundwater elevation exceedances coincide with ongoing elevated groundwater levels associated with above average rainfall in 2022 and not with WCPL or other nearby mining activity

6.4.3 P16 – Wollombi Brook Alluvium - Maximum Groundwater Level

Bore P16 is adjacent to Wollombi Brook, downstream (north) of underground mining at WCPL (**Figure 3**), less than 200 m east of Glen Munro Pit, and ~750 m from United-Wambo Joint Venture (UWJV) open cut mining in the United Pit. Groundwater levels at P16 have been below the minimum groundwater elevation trigger level (49.7 mAHD) in all 2024 observations. The minimum observation in 2024 occurred in February, at the end of the period of below average rainfall that occurred for much of 2023, before groundwater elevations increase in response to above average rainfall in April 2024.

Groundwater levels at P16 were previously below the groundwater elevation trigger from 2017 to 2021 and were associated with below average rainfall conditions and a mining effect from the excavation of the Glen Munro Pit that appears to have caused additional drawdown in the order of 1.2 m (SLR, 2021). The groundwater elevations below the trigger observed in 2024 are likely a continuation of this combined drier climatic conditions in 2023, an ongoing Glen Munro Pit mining effect, and potentially some effect from United Pit.

The numerical groundwater model rebuilt and recalibrated for the Modification 19 groundwater assessment (SLR, 2022c) captures the observed decline in groundwater level from 2017 to 2019 and following recovery in response to above average rainfall in 2020, to the end of the calibration period in December 2020 (Appendix A). Long-term average climatic and Wollombi Brook stage height conditions used from 2021-2024 do not provide representative conditions for those recently observed groundwater level responses at P16.

Updates of the model scheduled for 2025 will include more recent climate and operational mining data (Glen Munro Pit and United Pit) and will focus on matching observed responses to climate and mining in shallow and alluvial groundwater systems so that impacts and groundwater takes from these water sources are appropriately captured. The results from the contemporary groundwater model could also be used to revise trigger levels at P16 to reflect the influence of both approved impacts and climatic conditions.

6.5 Compliance with Groundwater Performance Criteria

The 2024 groundwater monitoring has been evaluated against the performance criteria, defined within the GWMP (Peabody, 2023). **Table 14**.

Table 15, and **Table 16** below provide an assessment of compliance with the performance criteria defined for general water management performance, and subsidence impacts for North Wambo Underground and South Bates Underground and Extension longwalls.

Table 14 Performance Indicators

Feature	Performance Indicator	2024 Performance Indicator Observations	Overall Compliance
Groundwater Management Performance Indicators			
Alluvial aquifers (including Wollombi Brook alluvium and excluding the NWC alluvium)	The performance indicators will be considered to have been exceeded if impacts exceed those predicted in the documents listed in condition A2c) (of DA305-7-2003), including: A greater than negligible change in groundwater levels.	Exceedances of the upper groundwater elevation (minimum depth to groundwater) trigger level at GW15 is related to antecedent above average rainfall conditions from 2022 and not a WCPL mining effect. See **Section 6.4.2**. Exceedances of the minimum groundwater elevation trigger level at P16 are related to below average and average rainfall conditions in 2023 and 2024, a likely a Glen Munro Pit mining effect and possible effect from United Pit. This WCPL mining effect does not exceed predicted impacts from contemporary groundwater model predictions (SLR, 2022c). See **Section 6.4.3** and **Appendix A**. Future updates to the numerical model should focus on capturing mining impacts at alluvial and shallow monitoring sites so that licensing obligations for WCPL continue to be appropriately quantified.	**Compliant**
	A greater than negligible change in groundwater quality	EC trigger exceedances continued to be observed at P315 in 2024 (up to 1,196 µS/cm vs a trigger level of 552 µS/cm). This trend was first observed in 2021. Groundwater and surface water quality in Stony Creek is subject to additional ongoing monitoring and investigation (including SLR, 2022a, 2023c, 2023e, 2024c), with an updated monitoring review report planned for delivery to DPHI) in November 2025. See **Section 6.4.1** for more details on this trigger level exceedance.	**Not Compliant (subject to further investigations)**
	A greater than negligible impact to other groundwater users.	Previous groundwater assessments for Wambo Coal predicted that some privately-owned bores may experience more than 2 m cumulative drawdown as a result of the approved operations (HydroSimulations, 2017a, 2019b and SLR, 2020a). No complaints have been made to Wambo Coal during the 2024 AR period in respect to groundwater or water. A registered monitoring bore program has continued in 2024 following inclusion in the updated GWMP (Peabody, 2023). The sites included in this program will be reviewed for groundwater level or quality impacts that are greater than negligible (**Section 6.6**) and comparison against model results will be considered in future annual reviews.	**Compliant**
Groundwater dependent ecosystems	The performance indicators will be considered to have been exceeded if impacts exceed those predicted in the documents listed in condition A2c) (of DA305-7-2003), including: Greater than negligible environmental consequences, beyond those predicted in the documents listed in condition A2c)	GW36a and GW36b were drilled in 2020 to monitor impacts at the River Oak GDE on North Wambo Creek. In 2024 observed depths to groundwater increased by ~3.5 m in response to a high rainfall event in April before declining to a level 7.5 mbtoc (GW36a or dry (GW36b). The River Oak GDE has been classified as a facultative groundwater dependant ecosystem (utilising opportunistic access to groundwater) (Hunter Eco, 2019) and would likely have had access to groundwater from 2020-2022 when depths to water were generally <3.5 mbtoc. Groundwater level trends in 2024 appear to be most strongly related to rainfall conditions and a limited number of flow events in North Wambo Creek (likely only in April 2024). This is likely normal for the North Wambo Creek alluvial groundwater system; however, future observations should continue to consider potential effects from SBX underground mining due to the proximity of LW23, LW25, and LW26 to the River Oak GDE. GW40a, GW40b (upstream), GW41a, and GW41b (downstream) were installed along Waterfall Creek in October 2023 to help understand shallow groundwater conditions in this location, the potential for groundwater interaction with the potential GDE identified in the Ecological (2022) Biodiversity Review for Modification 19 and identify any impacts from SBX mining. GW40a and GW40b are installed within the mapped GDE on Waterfall Creek. Observations at these locations during drilling and subsequently in 2024 indicate a depth to the regional water table that is likely deeper than is accessible by vegetation within the mapped GDE. Groundwater levels at GW40a and GW40b have declined in 2024 in response to SBX mining, but with initial depths to water of >20 m it is unlikely this will impact potentially groundwater dependent vegetation. A shallower well in this location (GW40c), as well as a paired surface water-groundwater monitoring location is planned for installation in early 2025 to help evaluate whether a perched aquifer that could support the mapped GDE exists in this location. Shallower depths to water (~8 mbtoc) were observed at GW41a and GW41b in 2024. However, this may still be deeper than is accessible by the mapped GDE on Waterfall Creek. These locations are ~1.5 km downstream of SBX mining and are closer to Montrose (Wambo) open cut (500 m) than SBX underground mining. Observations collected at these locations during a broader range of climatic conditions will help understand the potential for riparian vegetation on Waterfall Creek to access groundwater in this location. WCPL will update the GWMP in late 2025 to include water quality triggers for Waterfall Creek groundwater monitoring locations based on water quality data collected since their installation in October 2023. The review of monitoring data in the future will help evaluate the likelihood of groundwater interaction with the potential GDE at Waterfall Creek.	**Compliant –** noting limited monitoring data at the recently installed Waterfall Creek monitoring bores.

Table 15 North Wambo Underground Performance Indicators

North Wambo Underground Performance Indicators		
The performance indicators will be considered to have been exceeded if monitoring data suggests significant divergence from modelling predictions.	The modelling undertaken for the MOD19 groundwater assessment (SLR, 2022c) involved model rebuild, recalibration and peer review. The history-match of observed groundwater levels and trends have broadly improved in the updated model compared to previous assessments. Drawdown impacts at some alluvial sites are better captured in the SLR (2022c) modelling than previous versions (e.g. HydroSimulations, 2019b) and should better quantify licencing obligations for WCPL. See **Section 7.0**.	**Compliant** (further reviewed in MOD19 numerical modelling)

Table 16 South Bates Underground and South Bates Extension Underground Performance Indicators

South Bates Underground and South Bates Extension Underground Performance Indicators		
The performance indicators will be considered to have been exceeded if groundwater levels in alluvial bores exceed the groundwater level criteria in the GWMP (Table 11 of the GWMP).	Exceedances of the upper groundwater (minimum depth to water) level trigger at GW15 occurred in 2024. See **Section 6.4.2**. Exceedances of the minimum groundwater elevation trigger level at P16 occurred in 2024 See **Section 6.4.3**. Additional consideration of these trigger exceedances has been included in **Table 14**.	**Not Compliant** (trigger exceedance)
The performance indicators will be considered to have been exceeded if the groundwater quality in alluvial bores exceeds the groundwater quality criteria in the GWMP (Table 13 of the GWMP).	EC trigger exceedances continued to be observed at P315 in 2024 (up to 1,196 µS/cm vs a trigger level of 552 µS/cm). This trend was first observed in 2021. Groundwater and surface water quality in Stony Creek is subject to additional ongoing monitoring and investigation. See **Section 6.4.1**. for more details on this trigger level exceedance.	**Not Compliant** (see **Table 14**)
The performance indicators will be considered to have been exceeded if the impacts observed on riparian, aquatic or groundwater dependent ecosystems are beyond negligible.	GW36a and GW36b were drilled in 2020 to monitor impacts at the River Oak GDE on North Wambo Creek. In 2023 observed depths to groundwater declined by ~6 m and are now ~8 mbtoc. The River Oak GDE has been classified as a facultative groundwater dependant ecosystem (utilising opportunistic access to groundwater) (Hunter Eco, 2019) and would likely have had access to groundwater from 2020-2022 when depths to water were generally <3.5 mbtoc. Declining groundwater levels in 2024 appear to be most strongly related to below average rainfall conditions and a lack of flow events in North Wambo Creek. GW40a, GW40b (upstream), GW41a, and GW41b (downstream) were installed along Waterfall Creek in October 2023 to help understand shallow groundwater conditions in this location, the potential for groundwater interaction with the potential GDE identified in the	**Compliant**

South Bates Underground and South Bates Extension Underground Performance Indicators		
	Ecological (2022) Biodiversity Review for Modification 19 and identify any impacts from approaching SBX mining. Continued monitoring alongside the installation of additional groundwater and surface water-groundwater monitoring locations in 2025 will support the evaluation of whether SBX mining is impacting groundwater close to these GDEs.	

6.6 Private Bore Monitoring

Table 17 summarises groundwater level and quality observations for registered bores on private, non-mine owned land near WCPL.

Table 17 2024 groundwater trends at Private Bores

Location	Monitoring bores	2024 Groundwater Observations
Private bores south of WCPL	GW078574, GW078575, GW078576, GW078577	Depths to water were greater (lower) at these private wells at start and end of 2024, consistent with periods of below average rainfall. Shallower depths to water (high) were observed in June and September 2024 observations following the period of above average rainfall in April and May. Groundwater EC and pH observations are generally stable, although pH observations are lower at all locations at the end of 2024 compared to the beginning. Additional review of groundwater level and quality observations at these private bores was completed as part of ongoing assessment at Stony Creek (SLR, 2024c).
Private bores north of WCPL	GW078477, GW043225	Depths to water, EC and pH observations at GW043225 were stable in 2024. No observations were made at GW078477 during 2024. However, this private bore was accessed in November 2024 and evaluated to be suitable for future sampling if care was taken around out-of-use pumping infrastructure.

The GWMP (Table 18 - Peabody, 2023) provides a trigger action response plan (TARP) for impacts to private bores that is evaluated using the following criteria:

- A complaint is received from a private bore holder in relation to decreasing levels in a private bore; or
- Groundwater monitoring of private bores identifies a decreasing trend approaching 2 metres below the modelled statistical trends.

Table 18 provides an assessment of whether the TARP for impacts on private bores should be triggered considering 2024 observations.

Table 18 Private Bore TARP Review

Location	Monitoring bores	2024 Groundwater Observations
Private bores south of WCPL	GW078574, GW078575, GW078576, GW078577	Owner Complaint: No complaints have been received from the owner(s) of these private bores in 2024. Declining Trend: A declining trend outside of normal variation in response to climate is not observed in 2024.
Private bores north of WCPL	GW078477, GW043225	Owner Complaint: No complaints have been received from the owner(s) of these private bores in 2024. Declining Trend: A declining trend outside of normal variation in response to climate is not observed in 2024.

6.7 Vibrating Wire Piezometer Data Review

SLR has been undertaking periodic reviews of the WCPL VWP monitoring network, both on-site and of the downloaded data. The table included in **Appendix C** provides details on each of the VWP locations, and also provides a preliminary assessment of data quality collected at each of the sites for 2024. Key findings from the data quality assessment include:

- Unreliable data at VWP sites where sensors are within shallow overburden, Whybrow or Wambo seams. Sensors are dry or near-dry, likely associated with WCPL or regional mining activity. It is worth continuing to download from these sites while at least one of the sensors is collecting reliable data, and where recovery/ re-saturation is possible.
- As recommended in previous reviews, older sites and unlabelled sites which are no longer collecting reliable data should be considered for removal from monitoring network.
- Data was not collected/ download for the following sites in 2024: P325 (SW30), P328 (ELA5), SBX_GW01, SBX_GW02. This data is scheduled for download and data QA/QC in early 2025.

Discussion and assessment of VWP data has not been undertaken or presented in this report but could be considered for inclusion in future reporting for sites where the data quality is assessed as reliable. A summary of groundwater level observations from site VWPs are provided below:

- Most shallow VWP sensors (~10 m depth) are dry indicating greater depths to water table.
- Depressurisation associated with Wambo mining activity is observed within the Wambo and Whybrow seams and adjacent Permian Coal Measures in sites close to historical and current mining activity. This observed depressurisation is broadly consistent with current model predictions (SLR, 2022c).
- Deeper sensors, installed to monitor impacts of the Approved South Wambo Project, maintain significant pressure head in the absence of South Wambo Project mining activity.

7.0 Verification of Model Predictions

The most recent rebuild and recalibration of the Wambo Complex numerical groundwater model was undertaken for WCPL as part of the Groundwater Assessment in support of the South Bates Extension LW24-26 Modification (Mod19) (SLR, 2022c). This model is calibrated to observed groundwater levels to the end of December 2020 and underwent peer review (Appendix E of SLR, 2022c – HydroAlgorithmics, 2022) as part of the approvals process for MOD19. The peer review (HydroAlgorithmics, 2022) found the model to be *fit for purpose* where the model's purpose was defined by the objectives stated in SLR (2022c):

- *"assess the groundwater inflow to the mine workings as a function of mine position and timing;*
- *simulate and predict the extent of dewatering due to the Project and the level and rate of drawdown at specific locations;*
- *identify areas of potential risk, where groundwater impact mitigation/control measures may be necessary;*
- *estimate direct and indirect water take; and*
- *estimate post-mining recovery conditions."*

Detailed discussion of the revised model's performance (ability to represent groundwater level observations) is included in the Groundwater Modelling Technical Report (Appendix D of SLR, 2022c) completed for the MOD19 Groundwater Assessment.

Hydrographs presenting the modelled groundwater levels versus observed groundwater levels to the end of 2024 at Wambo monitoring sites are presented in **Appendix A**.

7.1 Recent Model Updates

It was identified in 2023 that there were differences between simulated and actual/ planned mining progression at the United Wambo Open Cut (UWOC) in SLR (2022c). The SLR (2022c) numerical model simulates the extent and depth of UWOC open cut progression as digitised in the AGE (2016) United Wambo Joint Venture EIS Groundwater Assessment, while actual recent and planned future forecast open cut progression will target a slightly smaller footprint with different timing to that indicated in AGE (2016).

Detailed pit progression files were provided by UWOC, and the following key differences are summarised in **Table 19.**

Table 19 Open cut mining updates

Mine Area	Approved Mining - AGE (2016)	Actual/ Proposed Mining
Montrose Pit	Mining to Warkworth Seam across entire Montrose Pit footprint. This mining commenced at the start of the UWOC Project (2021)	Current mining to Whynot Seam (to the end of 2023) which is ~200m shallower than the Warkworth Seam. Future mining to Bowfield Seam ~15m shallower than Warkworth Seam, focussing on the north-eastern area of the Montrose pit. Much of the current Montrose pit footprint will not be deepened.
United Pit	Mining to Vaux Seam across entire footprint	Future mining to target Vaux Seam in central area of United Pit. Proposed footprint does not extend as far west as previously modelled footprint.

Use of the approved mine plan (as per AGE, 2016) in the SLR (2022) groundwater assessment for Longwalls 24-26 was suitable for providing a conservative prediction of cumulative groundwater impacts due to approved underground and open cut mining at the Wambo Complex. However, updating the model to include a more accurate representation of mining will help calibrate future models to actual stresses on the groundwater system, and will likely provide more representative values of groundwater interception for the ongoing assessment of compliance with water licences.

The updated open cut progression replaced the approved mine plan (AGE, 2016) in the numerical groundwater model with no other changes. Key outcomes from this updated modelling are provided in the points below:

- Transient calibration statistics are consistent between the SLR (2022c), and updated model runs, with no change to the scaled root mean square error (6.0%), which is within the acceptable limits (i.e. 10%) recommended by the Australian groundwater modelling guidelines (Barnett et al., 2012).
- Due to the consistency in calibration statistics, and minor updates to the UWOC progression during the calibration period, groundwater level outputs from the SLR (2022c) model will continue to be used for comparison with observation data (see **Section 7.0** and **Appendix A**).
- Groundwater inflow predictions (**Section 8.0)** and the assessment of licence compliance for underground and open cut workings (**Section 9.0)** will be informed by the updated model.

7.2 Modelling Considerations

A key consideration for assessing modelled and observed groundwater levels during 2024 is that the transient historical period for the SLR (2022c) and updated (**Section 7.1**) groundwater modelling ended in December 2020. This means that above average rainfall conditions experienced in 2021 and 2022, the below average rainfall in 2023, or average rainfall conditions in 2024 will not be included and responses in predicted groundwater levels to recent climatic conditions are not expected.

The WCPL GWMP (Peabody, 2023 – Section 5.3) commits to periodic recalibration and independent peer review of the groundwater model every three years. This is scheduled for completion in 2025. Future updates of the model will include recent climatic conditions, contemporary groundwater level and flow observations, and updated mine progression (where relevant), to enable further assessment of model performance.

8.0 Inflow to Wambo Complex Mine Areas

Section 6.1.2 of the GWMP (Peabody, 2023) states that "Dewatering volumes and underground water levels will be recorded, and data will be incorporated into the site water balance and annual groundwater review on an annual basis to allow calculation of groundwater inflows including loss of groundwater from alluvium and to verify whether WCPL holds sufficient groundwater licence entitlements."

The assessment of licence compliance regarding the interception of groundwater is undertaken in **Section 9.0**.

8.1 Inflow to Underground Workings

SBX workings in the Whybrow Seam are currently being dewatered as part of WCPL underground mining operations. The current GWMP (Peabody, 2023) requires annual assessments for underground mine inflow against the peak simulated mine inflow from SLR (2022c) of 480.45 ML/yr. An exceedance of this predicted inflow by greater than 50% (i.e. an annual inflow of > 721 ML/yr) will require WCPL to:

- *Investigate if there is a change in the predicted take of water from the Lower Wollombi Brook Water Source from mining related activities;*
- *Where there is an increased take from the Lower Wollombi Brook Water Source, investigate any influence on low flow cease-to-pump criteria specified in the HUA WSP;*
- *Define the Mine inflow volume value triggering this response procedure;*
- *Submit a report summarising the assessment to DPE Water.*

Predictions of annual inflows are currently based on the groundwater model updated to incorporate as-mined and proposed future UWOC mining (see **Section 7.1**). This modelling predicted up to 299 ML/year inflow to the South Bates Extension and South Bates Underground mine areas over 2024.

While this number is lower than the '*greater than 50% exceedance*' criteria defined in the GWMP (Peabody, 2023) and does not require WCPL to undertake further action, it is recommended that future assessments compare underground dewatering volumes as a method to validate model predictions.

8.2 Inflows to Open-Cut Pits

Following Modification 16 (determined 28 August 2019) operations at the Wambo Mine include underground mining and coal processing and handling activities. Open cut mining activities have been managed by the United Wambo Open Cut Project since 1 December 2020. However, Wambo manages water across the whole Wambo mining complex, including open cut and underground workings.

Inflows to United Wambo Open Cut pits are currently based on predictions from the groundwater model updated to incorporate as-mined and proposed future UWOC mining (see **Section 7.1**). This modelling predicted up to 337 ML/year inflow into the UWOC pits over 2024.

9.0 Groundwater Licensing Review

Table 20 shows the predicted annual groundwater volumes required to be licensed for open cut and underground mining at the Wambo complex, for both alluvial and porous/fractured rock groundwater sources. These values are from for the groundwater model updated to incorporate as-mined and proposed future UWOC mining (see **Section 7.1**).

The component of flow between alluvium and underlying rock to be considered for alluvial groundwater licensing is an increased leakage from alluvium to Permian induced by Wambo Complex operations. Reduction in groundwater flow from Permian strata to alluvium has not been considered a component of alluvial licensing, as this reduction in Permian flow is considered licensable take from the North Coast Fractured and Porous Rock Groundwater Sources and is accounted for in predicted groundwater inflow to Wambo Complex mining operations.

Table 20 Complex Groundwater licensing summary

Water Sharing Plan	Management Zone/ Groundwater Source	Licensed Entitlement (ML/ year)	Predicted annual groundwater inflow volumes requiring Licensing (ML/year)
Hunter Unregulated and Alluvial Water Sources Water Sharing Plan 2009	**Lower Wollombi Brook Water Source**	736.9[1]	Av. 135 Max. 209 2024. 0[3]
	Jerrys Water Source	-	0
North Coast Fractured and Porous Rock Groundwater Sources ^^	**Porous Rock**	1,947[2]	Av. 714 Max. 1,110 2024. 636

^^ Porous Rock is the Sydney Basin - North Coast Groundwater Source, as defined in the *WSP for the North Coast Fractured and Porous Rock Groundwater Sources*, released 1 July 2016.

[1]Licence No. WAL23897, WAL18437, WAL18455, WAL18549.

[2]Licence No. WAL42373, WAL41532, WAL41510.

[3]It is noted that predicted take from the Lower Wollombi Brook Water Source in the updated model does not exceed 70ML (provided in WAL23897) until after 2028.

10.0 Summary

A summary of key findings from the review and analysis of WCPL groundwater data collected during 2024 is presented below:

- 2024 saw overall average rainfall conditions at Wambo which included a period of above average rainfall from April-June followed by below average conditions from October-December. This resulted in recharge (increasing groundwater levels) across shallow groundwater systems in early 2024 before declines are observed to the end of 2024 (**Section 4.1** and **Section 6.0**).
- Groundwater data has been collected from the WCPL monitoring network in 2024 consistent with the requirements of the GWMP (Section 6.1 - Peabody, 2023) and is suitable for the purposes of this annual review.
- It is noted that South Bates Extension (SBX) mining is currently occurring near North Wambo Creek and Waterfall Creek. Groundwater responses at nearby monitoring locations should be the focus for ongoing evaluation of potential mining effects.
- Bore GW15 breached the maximum groundwater elevation trigger level in 2024 (**Section 6.4.2**), although this exceedance is not related to WCPL mining activity and requires no further investigation.
- Bore P16 breached the minimum groundwater elevation trigger level in 2024 (**Section 6.4.3**), this is interpreted to result from on an ongoing Glen Munro Pit mining effect and average rainfall conditions in 2024.
- Further investigation at Stony Creek regarding the ongoing exceedance of the EC trigger level at P315 (**Section 6.4.1**) has been completed in 2024 and is ongoing.
- Non-compliances are recorded against general groundwater performance indicators (**Table 14**) relating to the EC trigger exceedance at P315. Non-compliances are recorded against South Bates Underground and South Bates Extension performance indicators (**Table 16**) relating to the EC trigger exceedance at P315, and depth to water trigger exceedance at P16.
- The data quality assessment undertaken on WCPL VWPs identifies arrays with failed sensors/ poor quality data which can be considered for exclusion from the monitoring program (**Appendix C**). Maintenance undertaken in 2024 has recommissioned and helped maintain several VWP monitoring locations (**Section 2.2**).
- Groundwater model performance (calibration statistics), for the model version updated in early 2024 to incorporate as-mined and proposed future UWOC mining (see **Section 7.1**) is consistent with the SLR (2022c) modelling for the Modification 19 groundwater assessment.
- The WCPL GWMP (Peabody, 2023 – Section 5.3) commits to periodic recalibration and independent peer review of the groundwater model every three years. This is scheduled for completion in 2025. Future updates of the model will include recent climatic conditions, contemporary groundwater level and flow observations, and updated mine progression (where relevant), to enable further assessment of model performance.
- Predicted inflow volumes for South Bates Underground and South Bates Extension mine areas are 299 ML for 2024, this is within assessment limits (**Section 8.1**).
- Predictions of take from alluvial and porous/ fractured rock water sources are within the limits of applicable licences (**Section 9.0**).

11.0 Recommendations

Following the 2024 annual review of groundwater data, the following recommendations have been made:

- VWP locations identified with persistent poor-quality data should be considered for inspection and removed from the monitoring network if they cannot be repaired (see **Appendix C**). These sites include:
  - N3 – no reliable data in recent years.
  - Older VWPs at Wambo that have not been providing reliable data for a number of years. These should be inspected and assessed for decommissioning.
- Other VWP locations did not have data downloaded in 2024 and should be prioritised for inspection and data collection in 2025:
  - P325 (SW30), P328 (ELA5), SBX_GW01, SBX_GW01
  - Monitoring should be undertaken at P106 and P109 on two occasions in 2025 to enable comparison with data collected at the GW37a,b replacement sites.
- It is noted that GW02 and GW11 are former landholder wells with pumping equipment installed/ nearby. Replacement monitoring-only sites are recommended prior to commencement of South Wambo mining.
- Consider revising groundwater level triggers at P16 to incorporate model predictions which capture the observed mining effect.
- Provide update of groundwater and surface water monitoring data at Stony Creek to DPHI in November 2025 as per SLR (2024c).
- The review of groundwater sampling field sheets and VWP data should continue throughout 2025 to enable as-needed repair of monitoring infrastructure and the continued collection of monitoring data. This should include a review of monitoring wells that are being sampled with HydraSleeves near Wambo Creek.
- Redevelopment and purging of GW13 should be undertaken in 2025 as per 2024 recommendations. It is understood that this is scheduled for Q1 2025. Sites P329a and P330a are also scheduled for purging/ development following review of comments in field sheets.
- The results from the contemporary groundwater model be used to revise trigger levels at P16 to reflect the influence of both approved impacts and climatic conditions.
- Future updates to the GWMP could consider the development and inclusion of trigger levels at operationally relevant sites on North Wambo Creek (upstream of the diversion) and Waterfall Creek.

12.0 References

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Appendix A Model Performance Hydrographs

Groundwater Annual Review - 2024

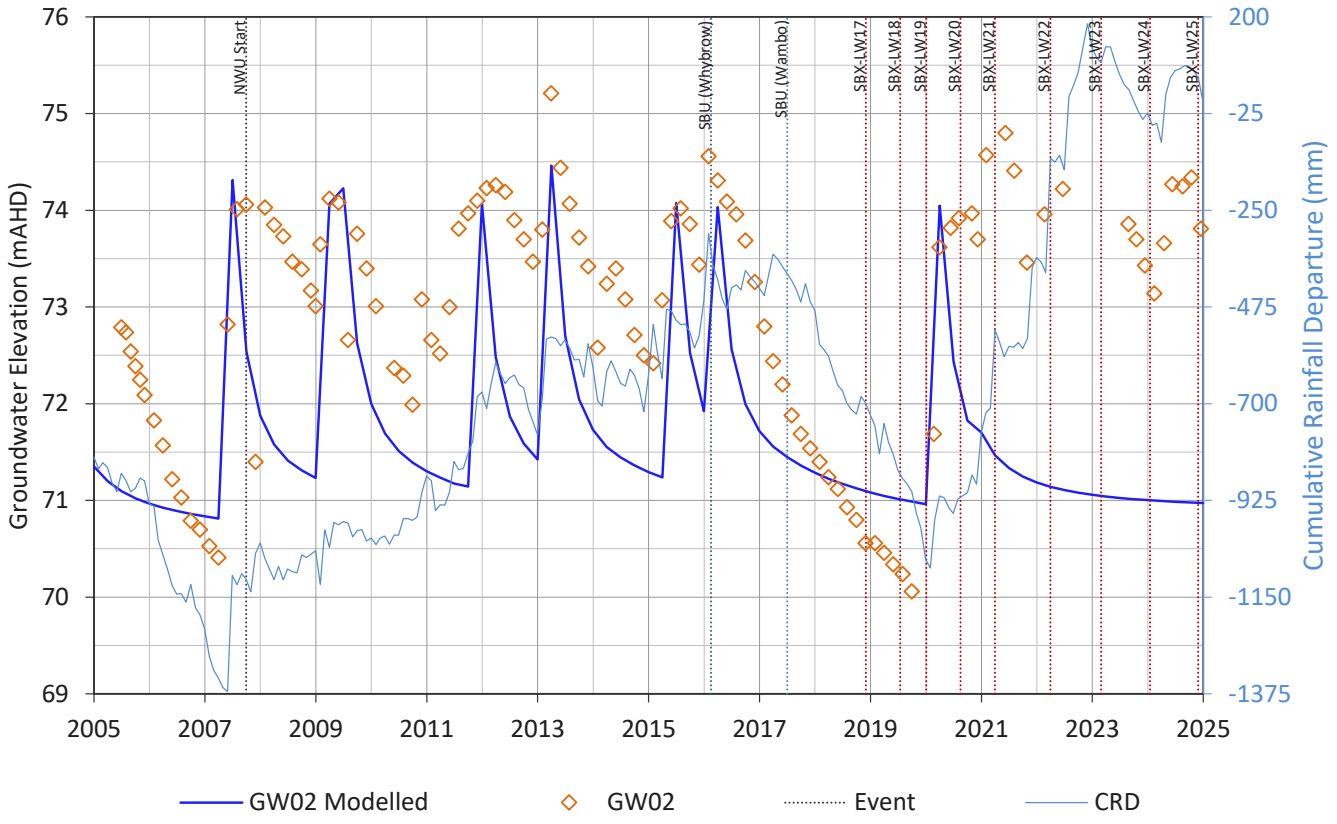
Wambo Coal Mine

Wambo Coal Pty Ltd

SLR Project No.: 665.v10008.02031

27 March 2025

GW02 Model Performance



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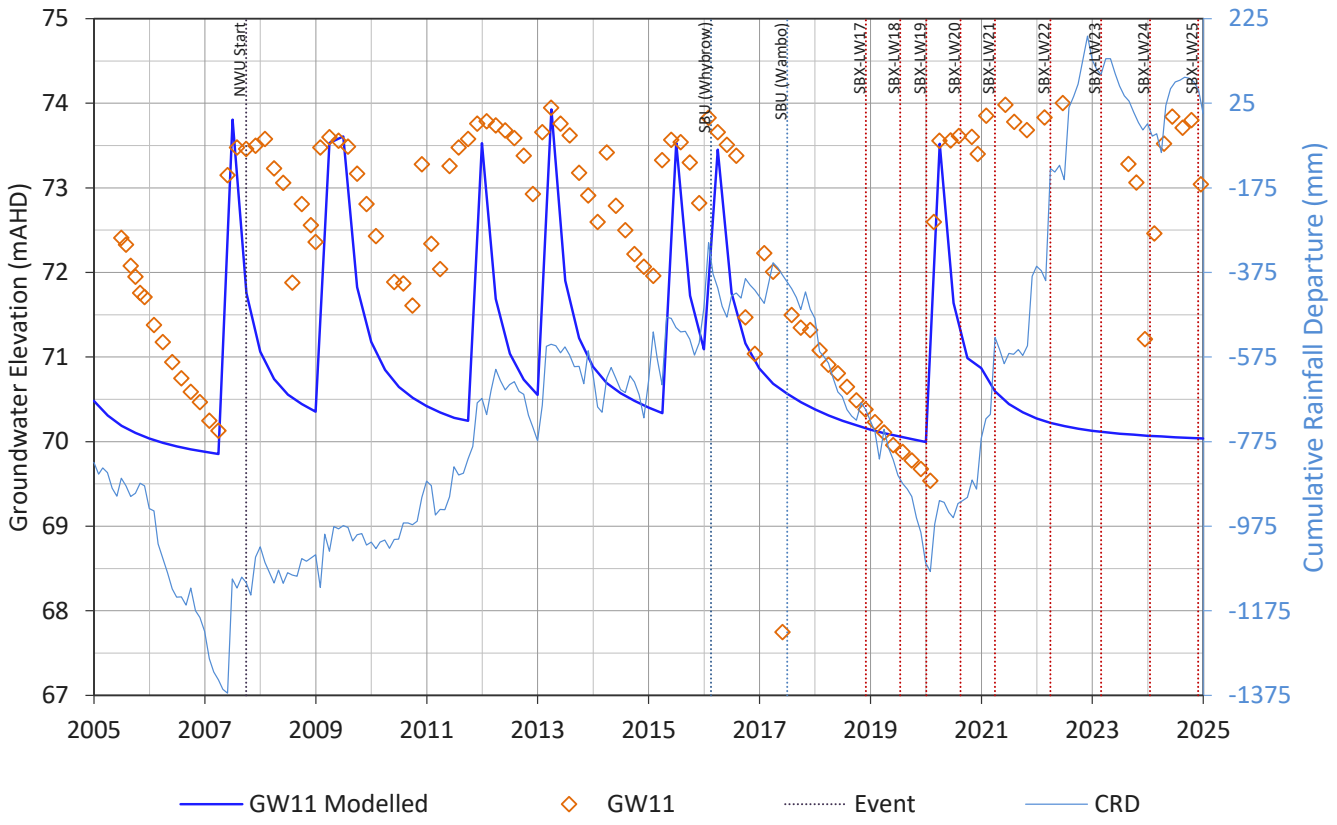

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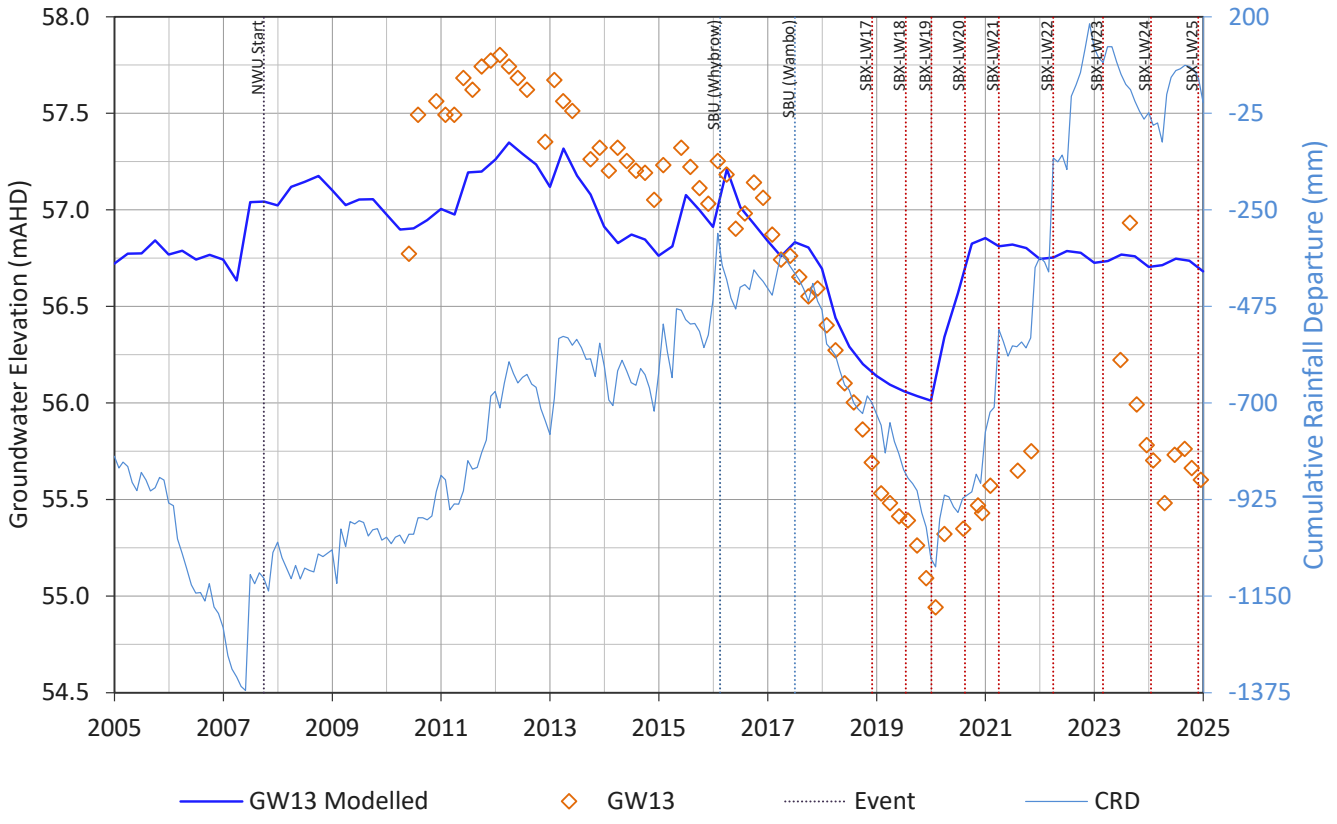

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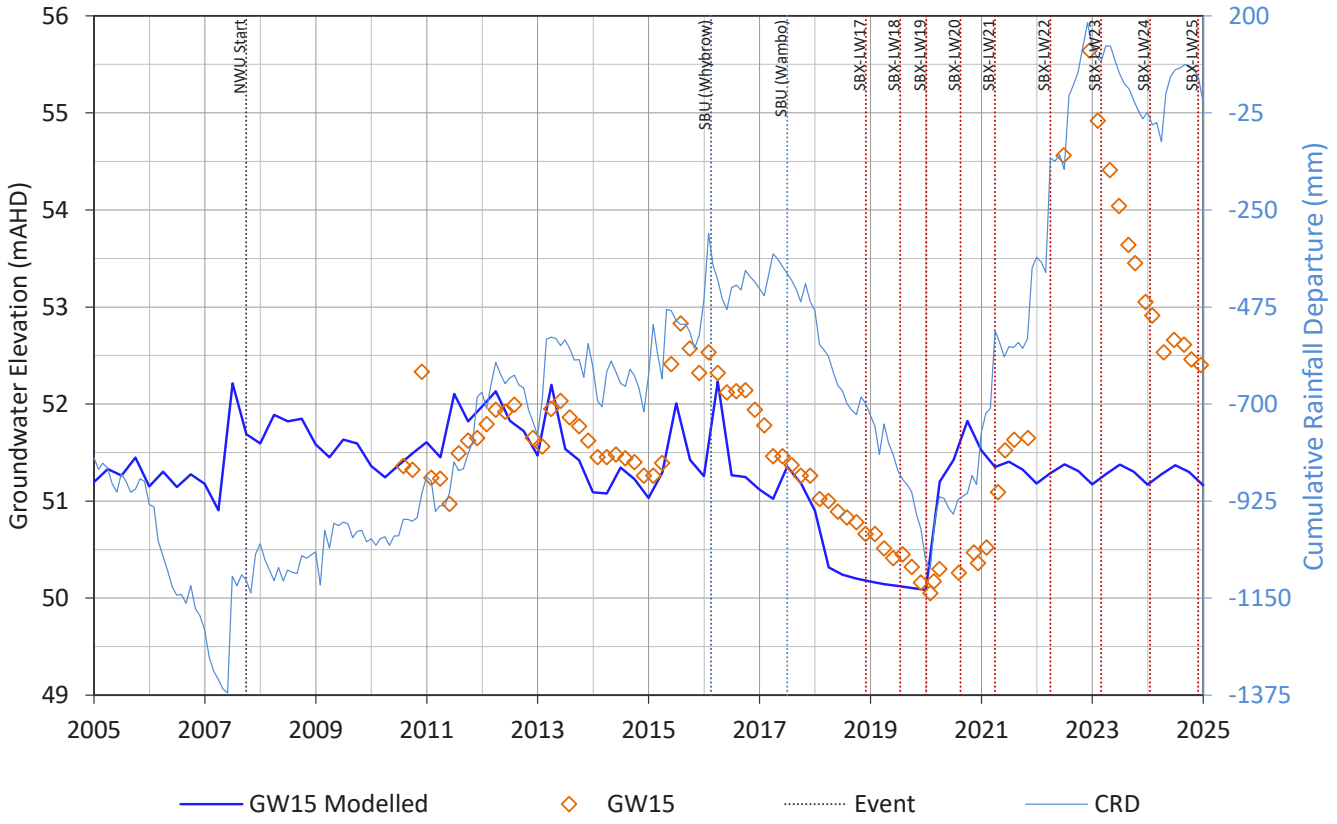
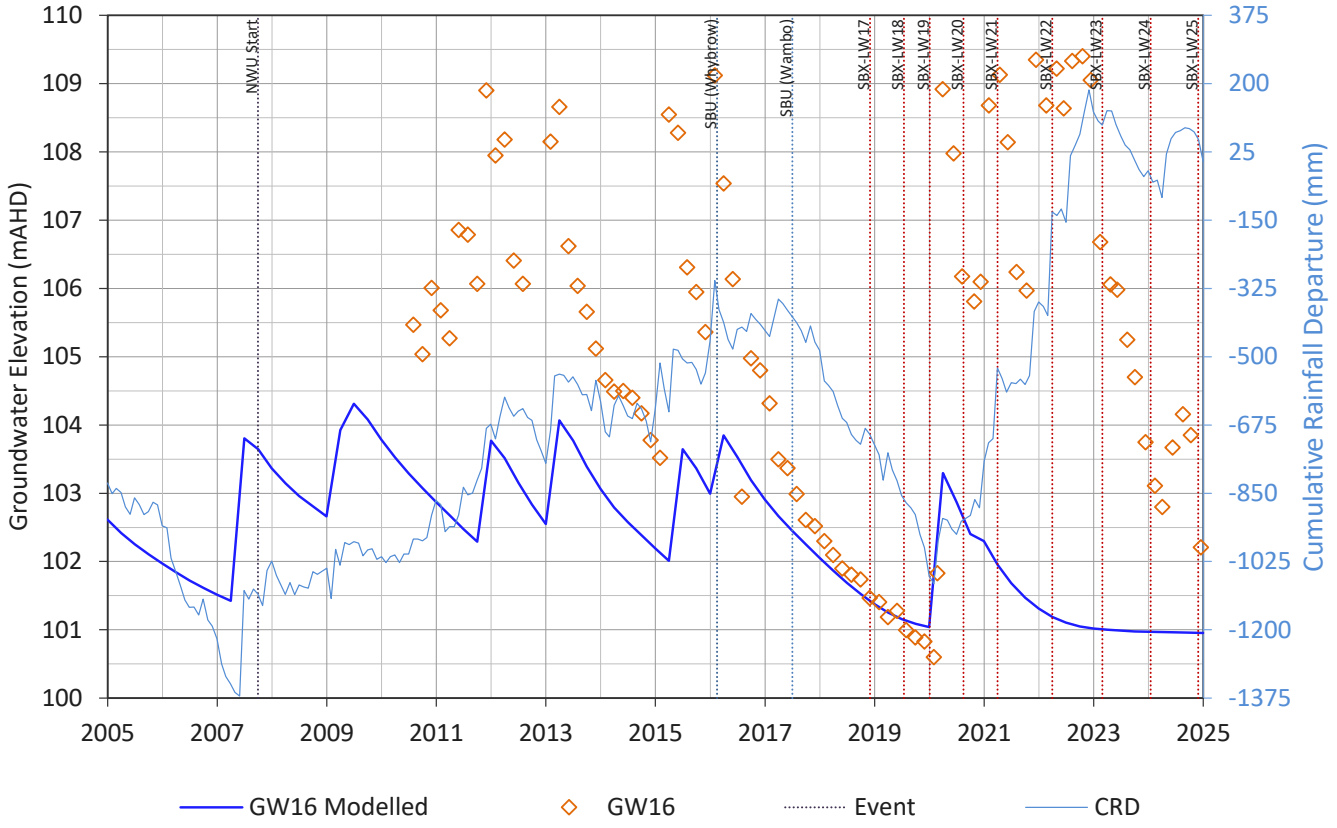


GW16 Model Performance



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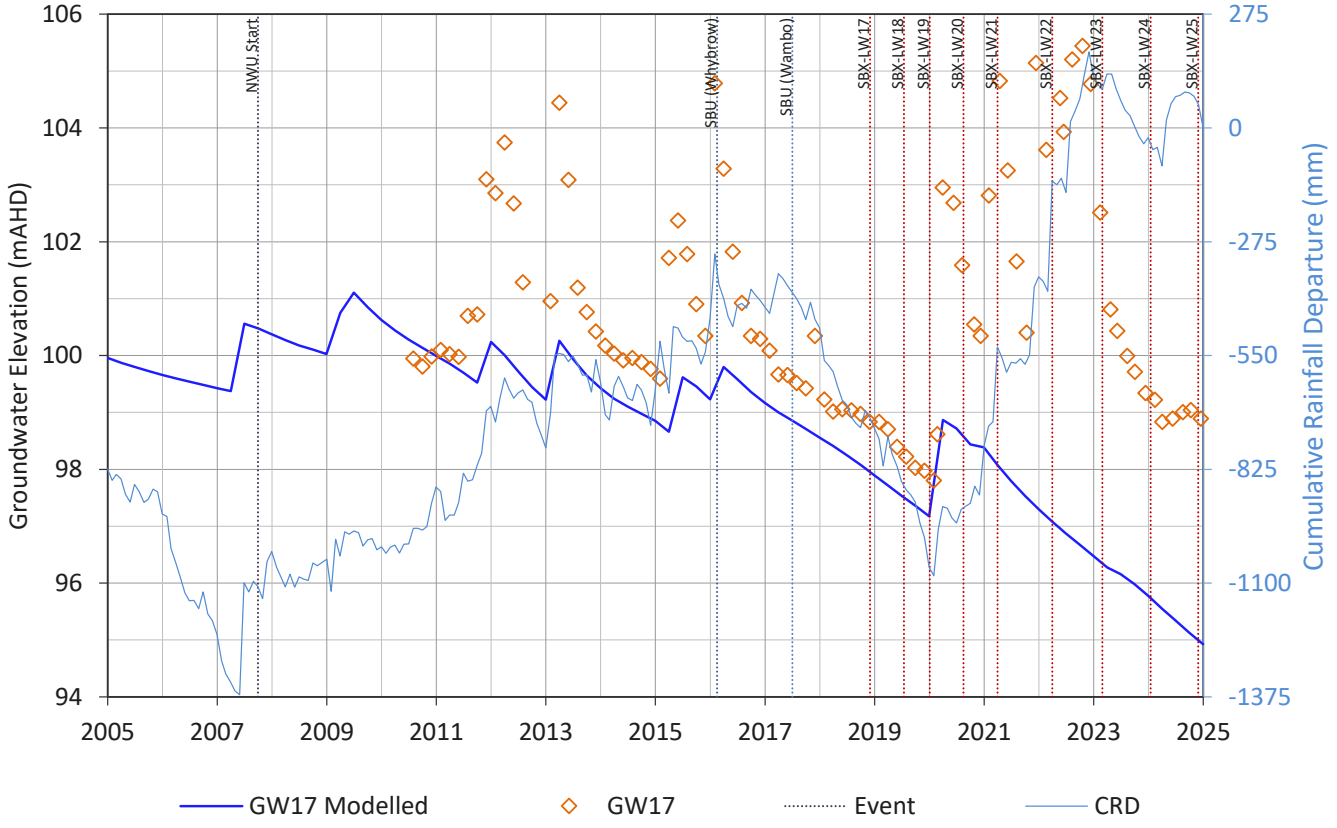
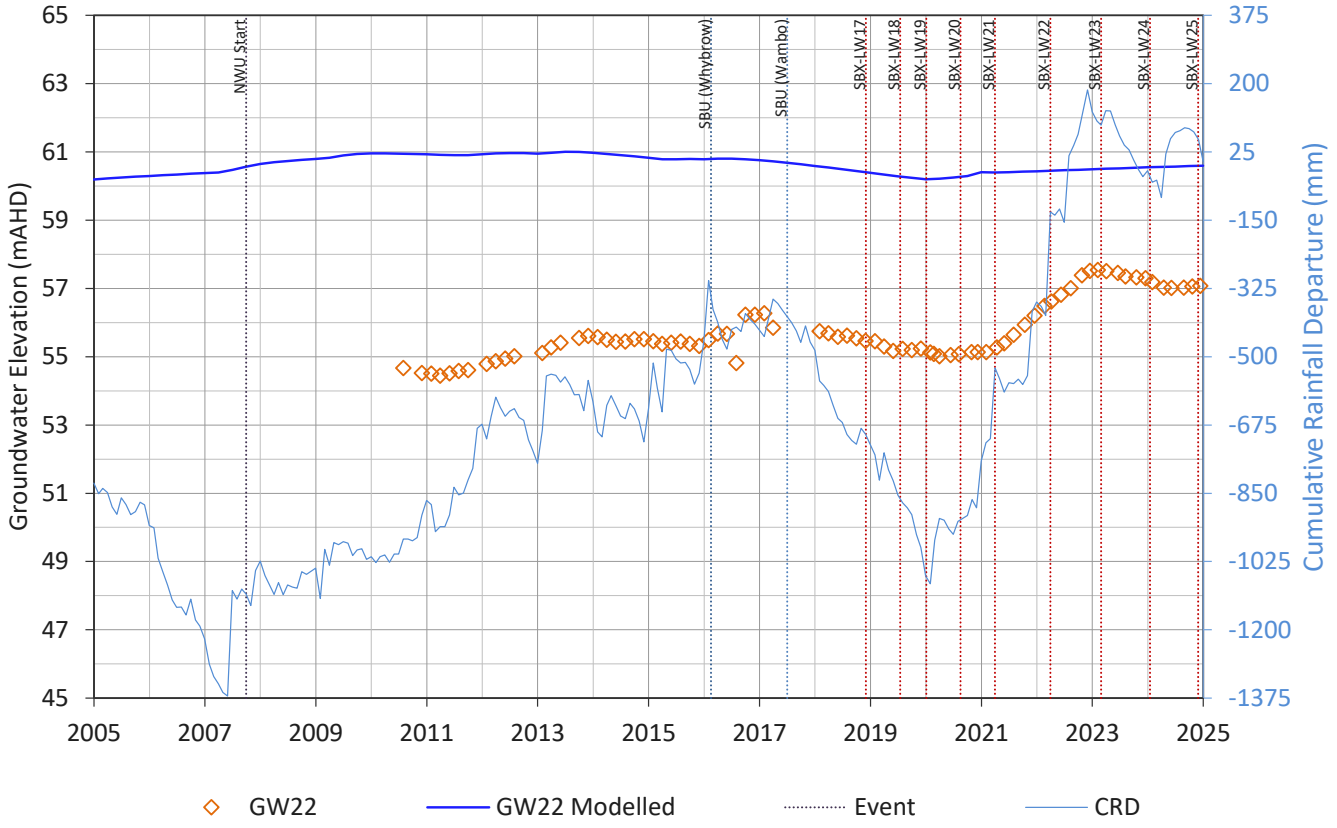


GW22 Model Performance



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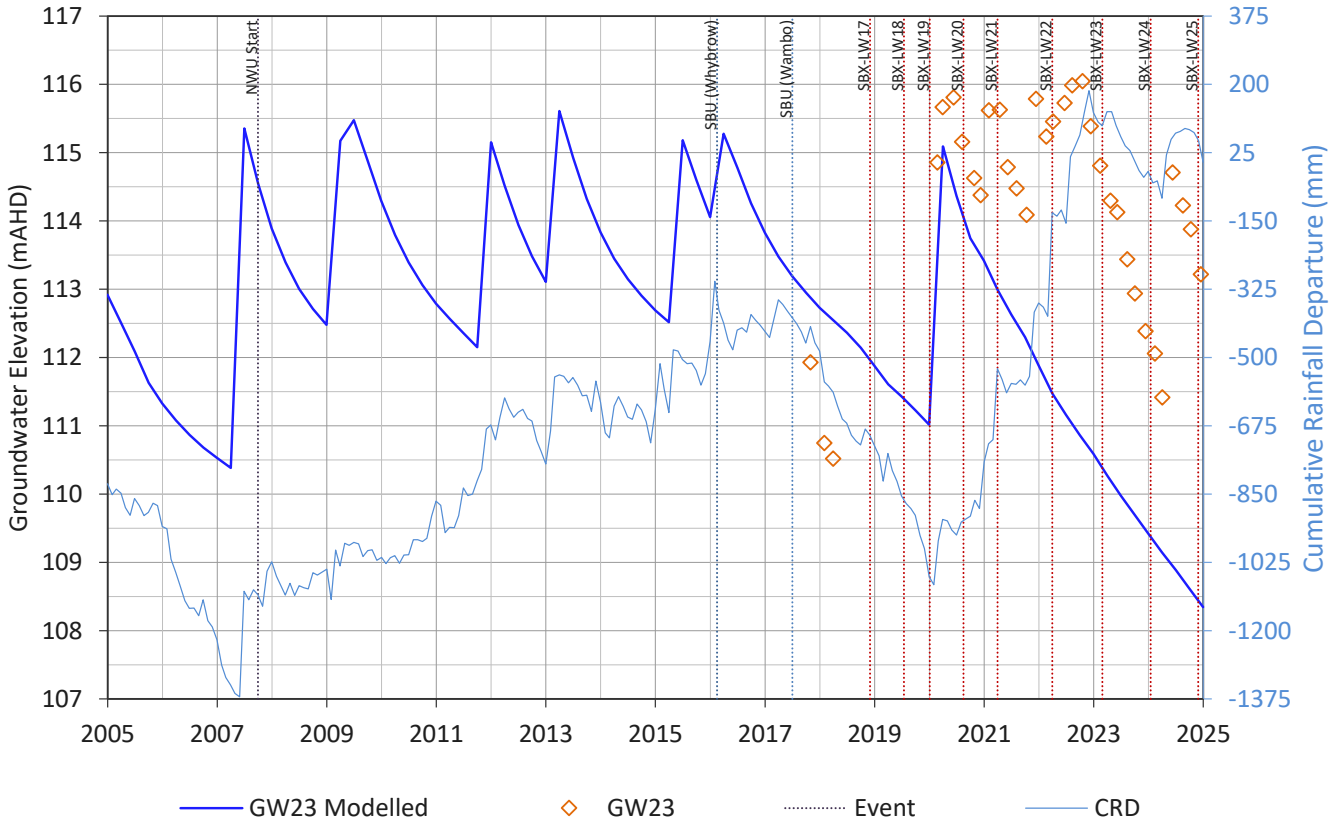

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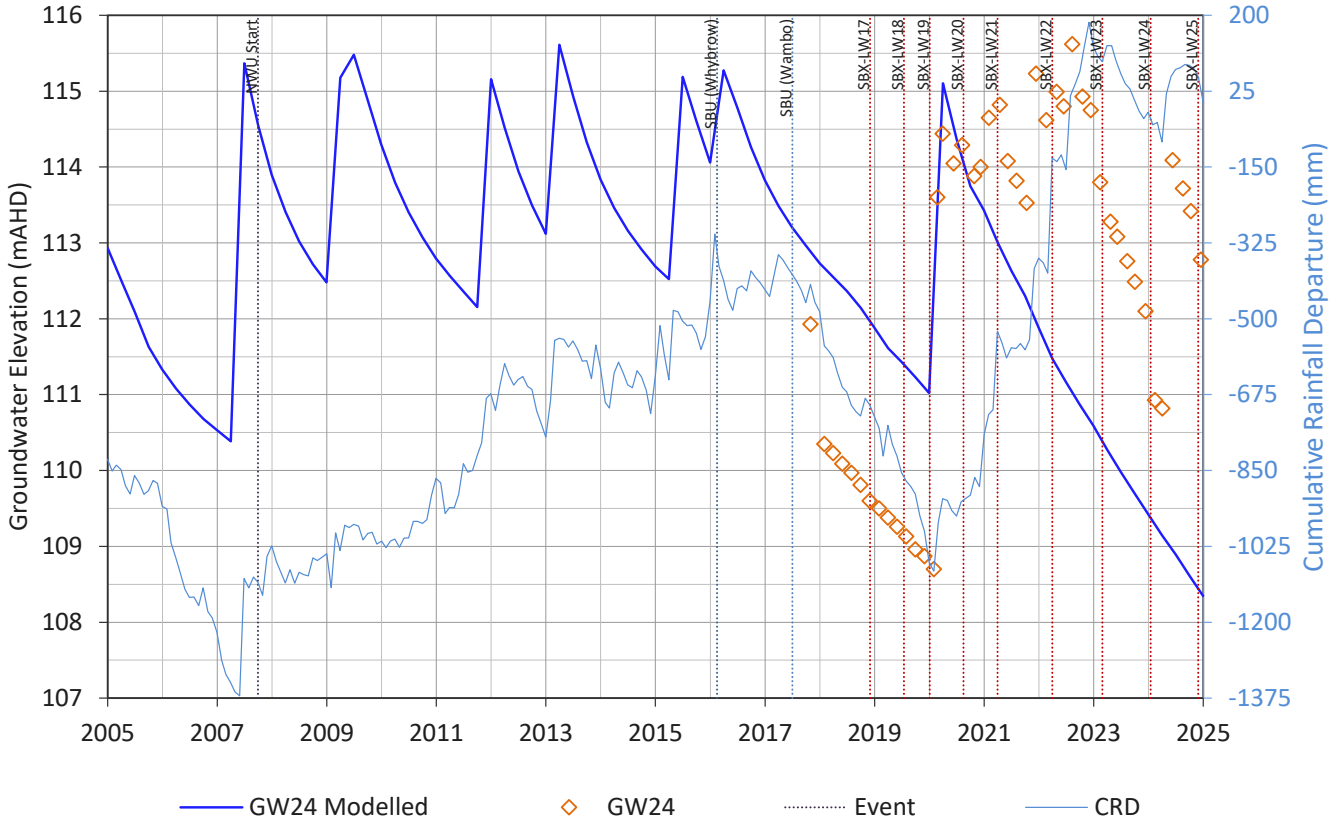

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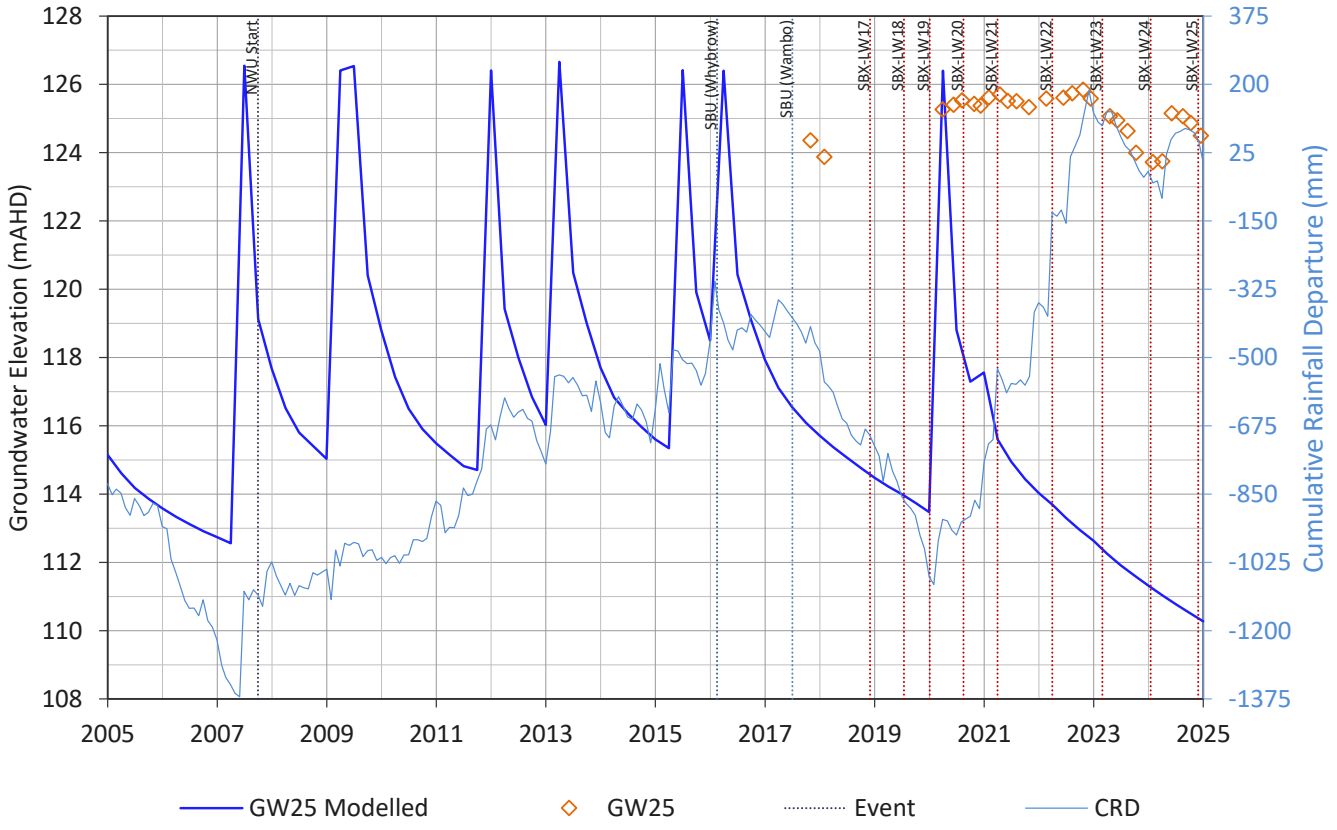

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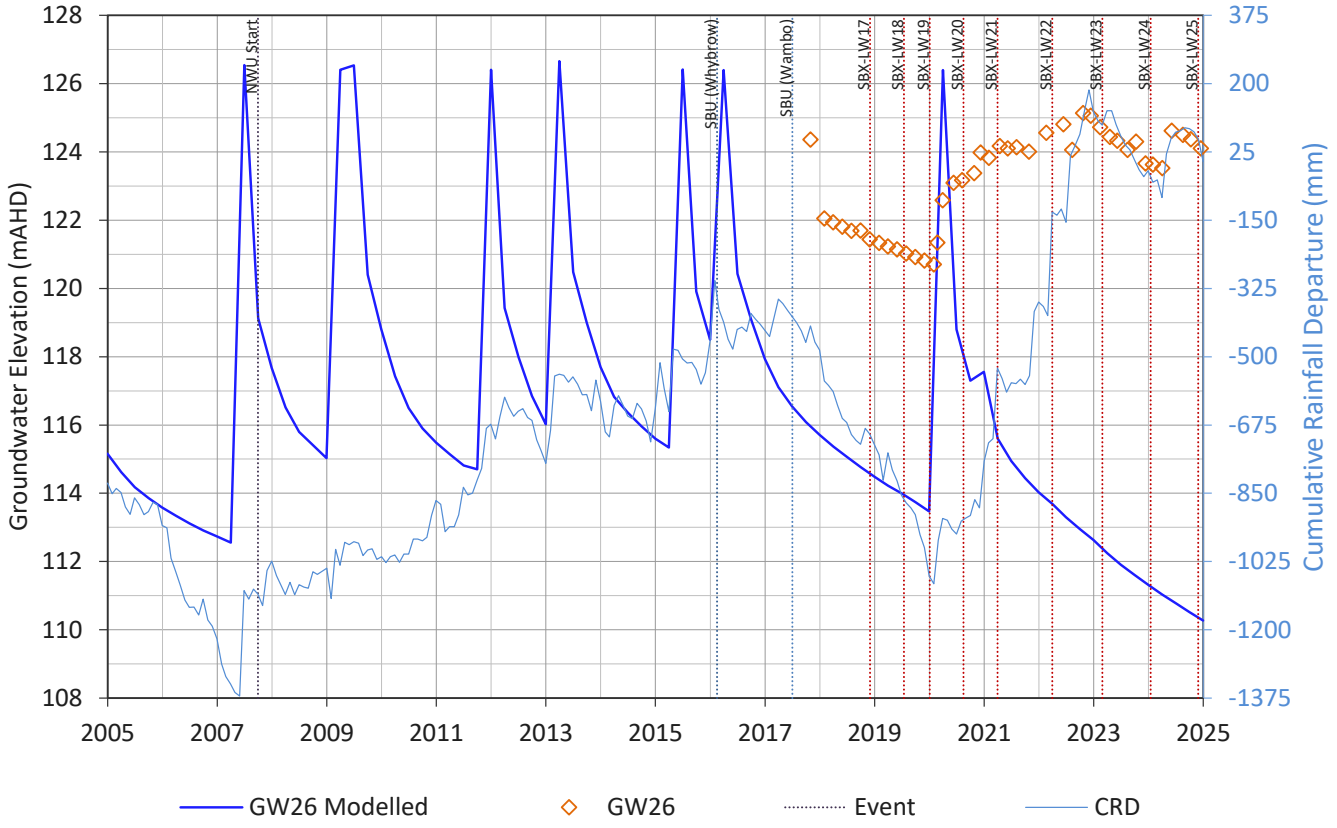
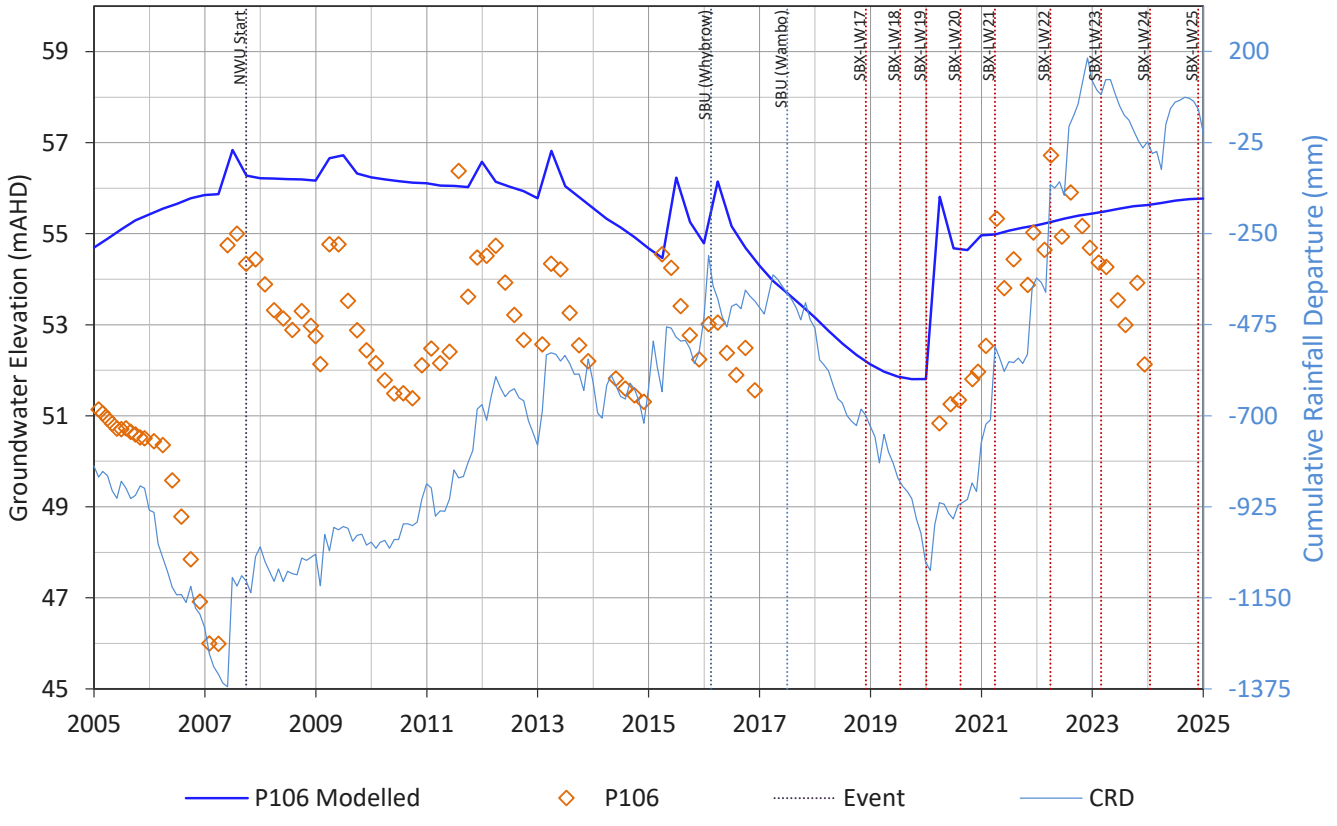
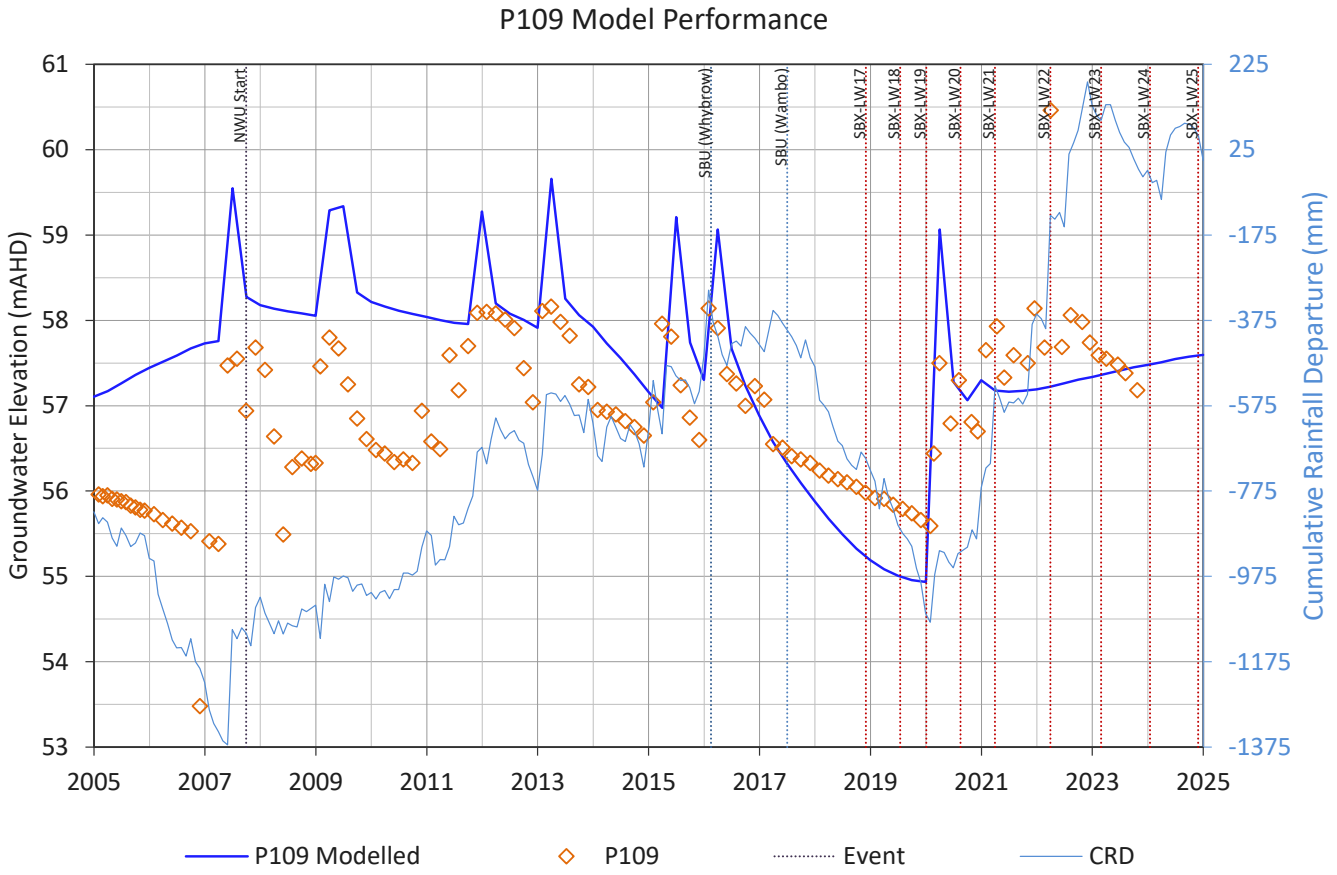
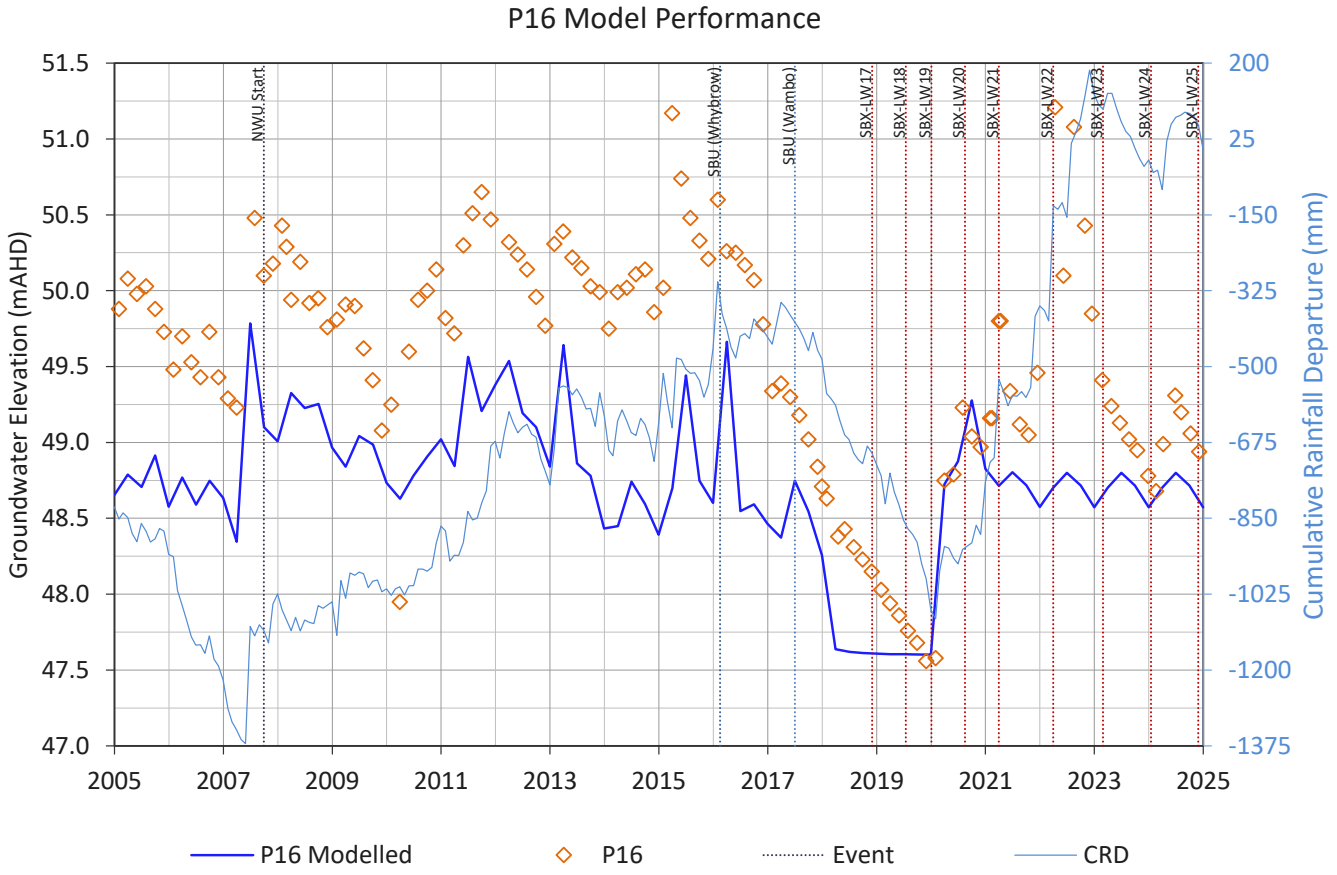


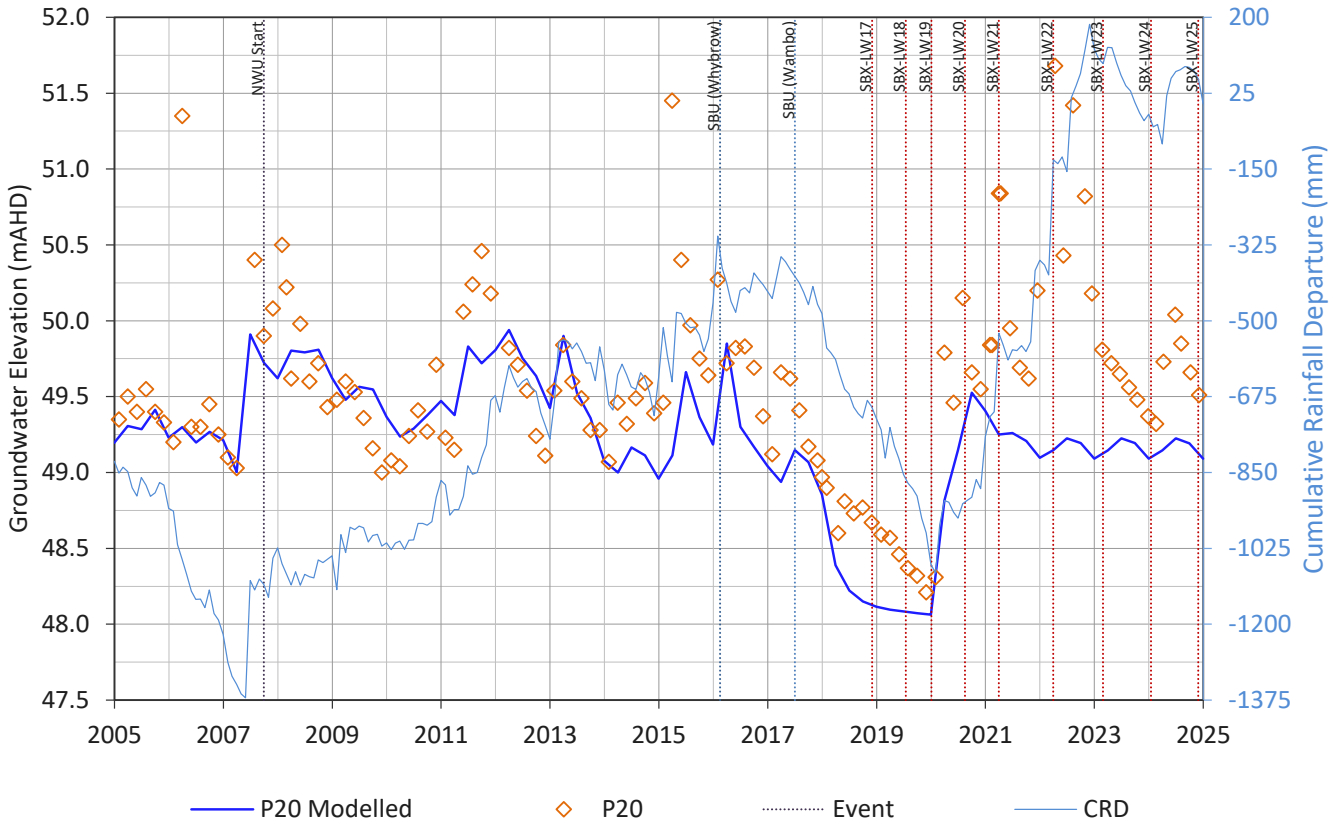
P106 Model Performance




P109 Model Performance
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P109 Modelled
P109
Event
CRD


P16 Model Performance
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P16 Modelled
P16
Event
CRD

P20 Model Performance



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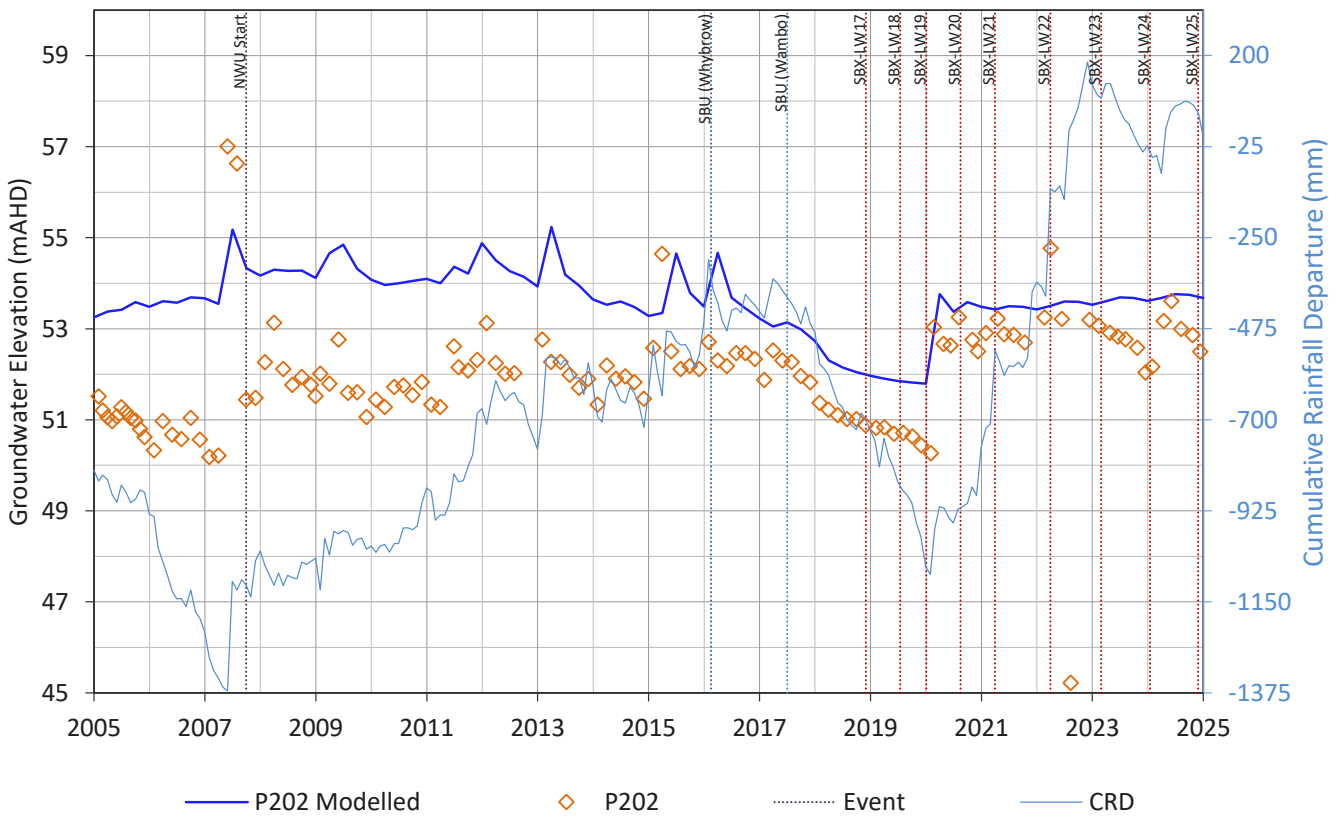

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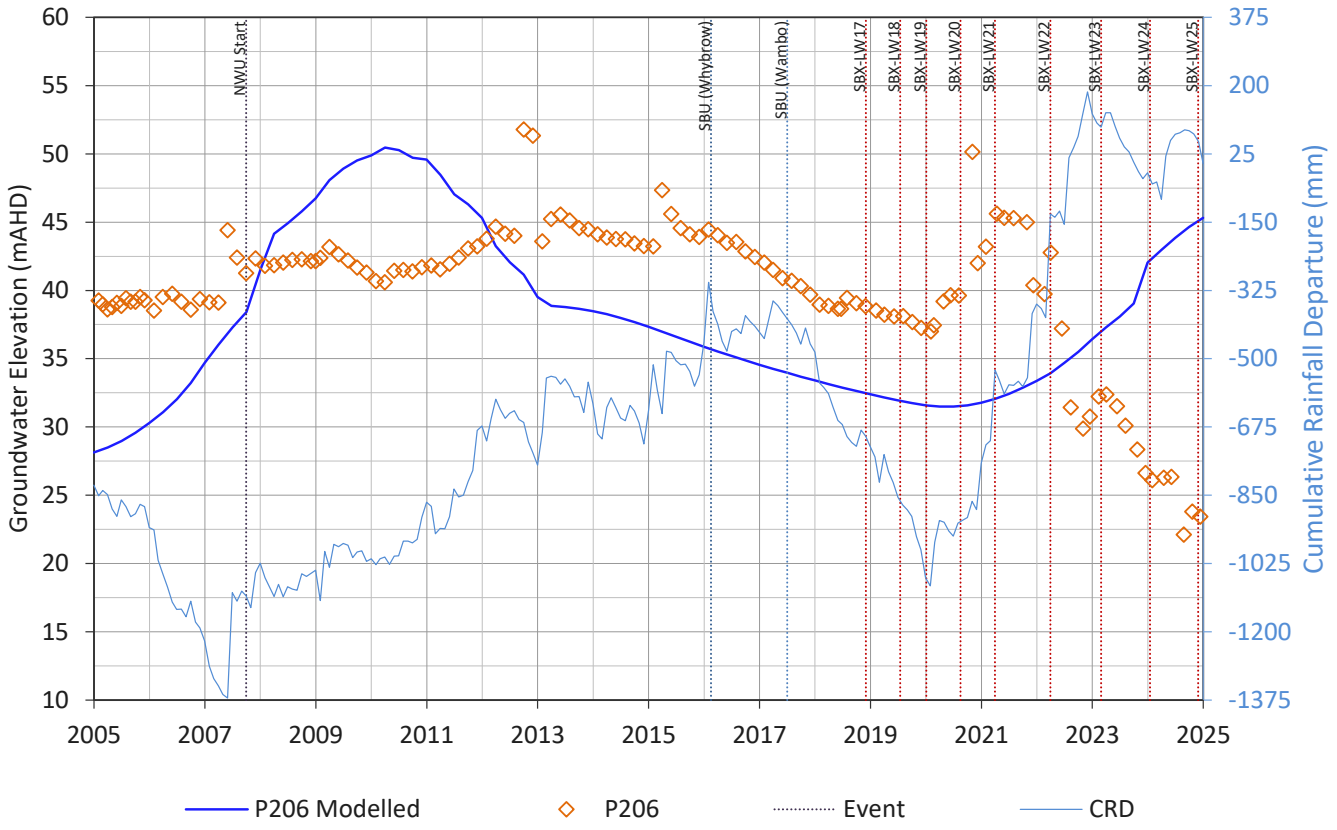

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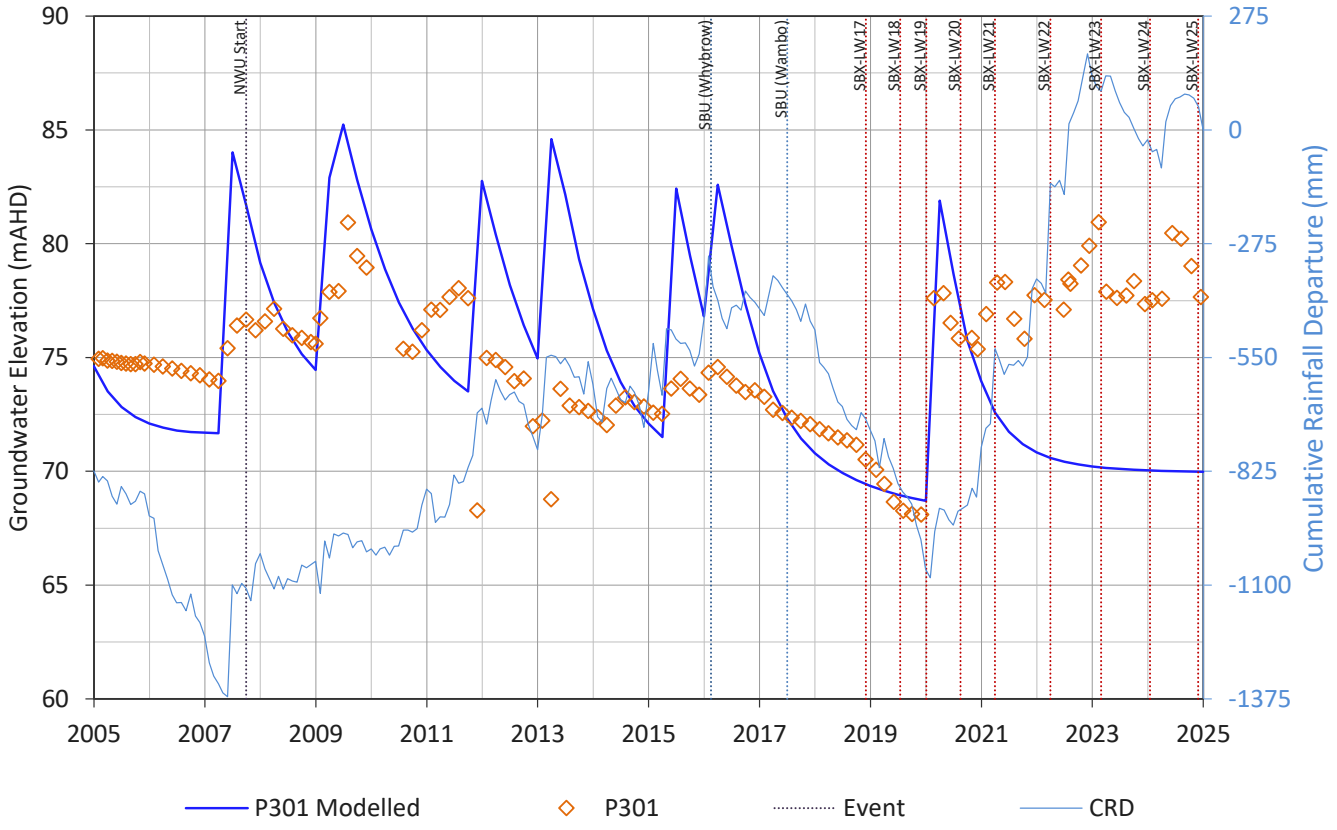
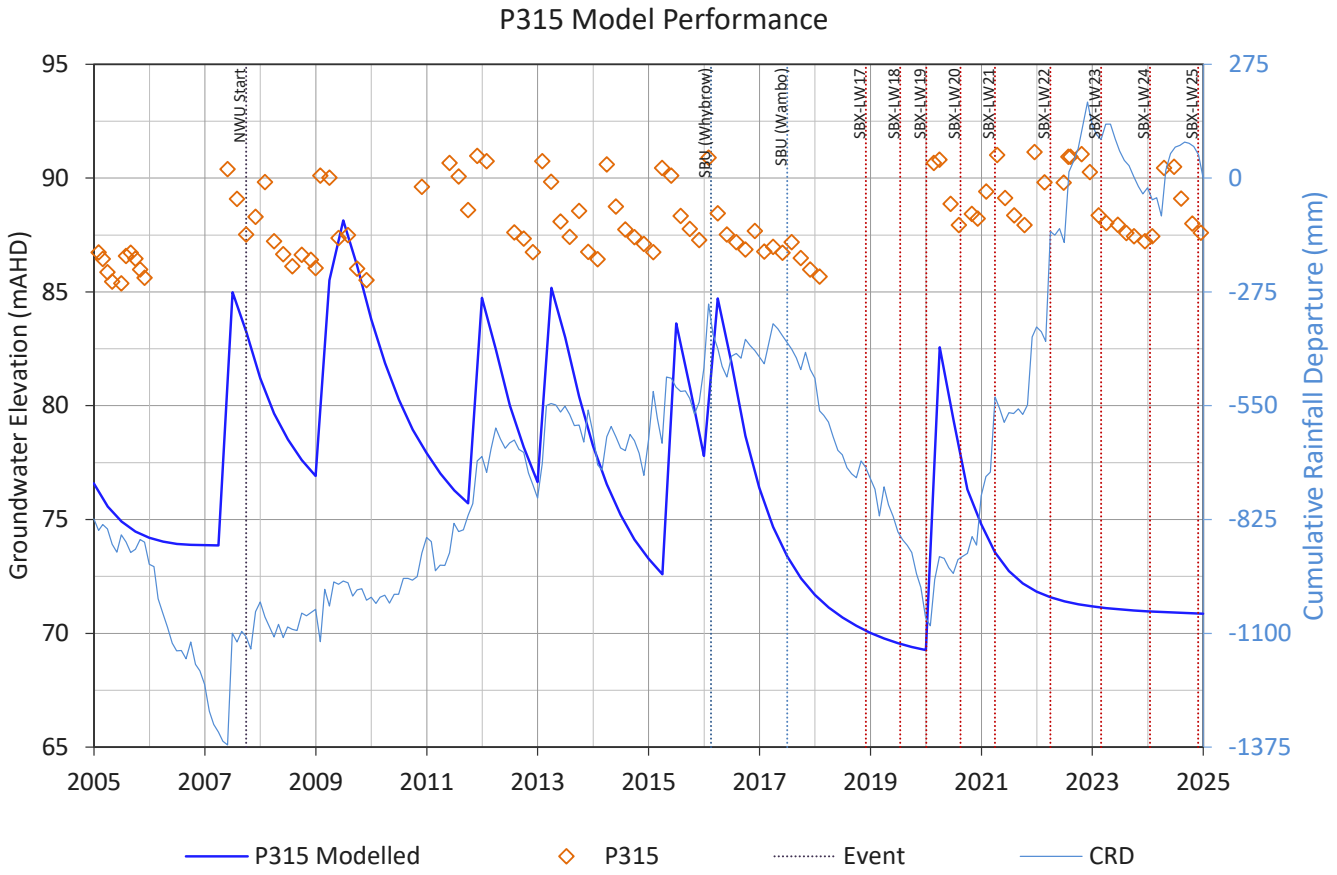
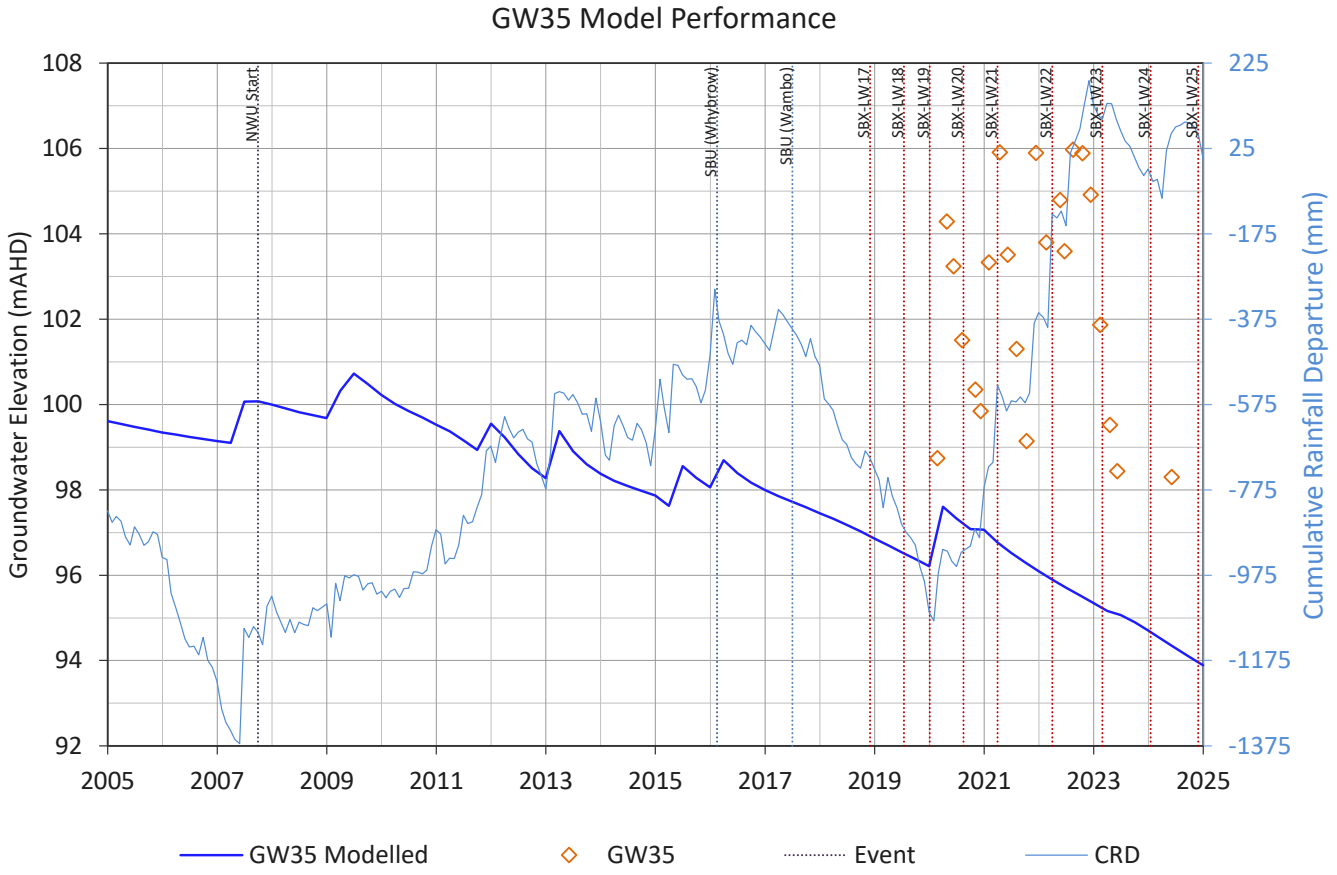
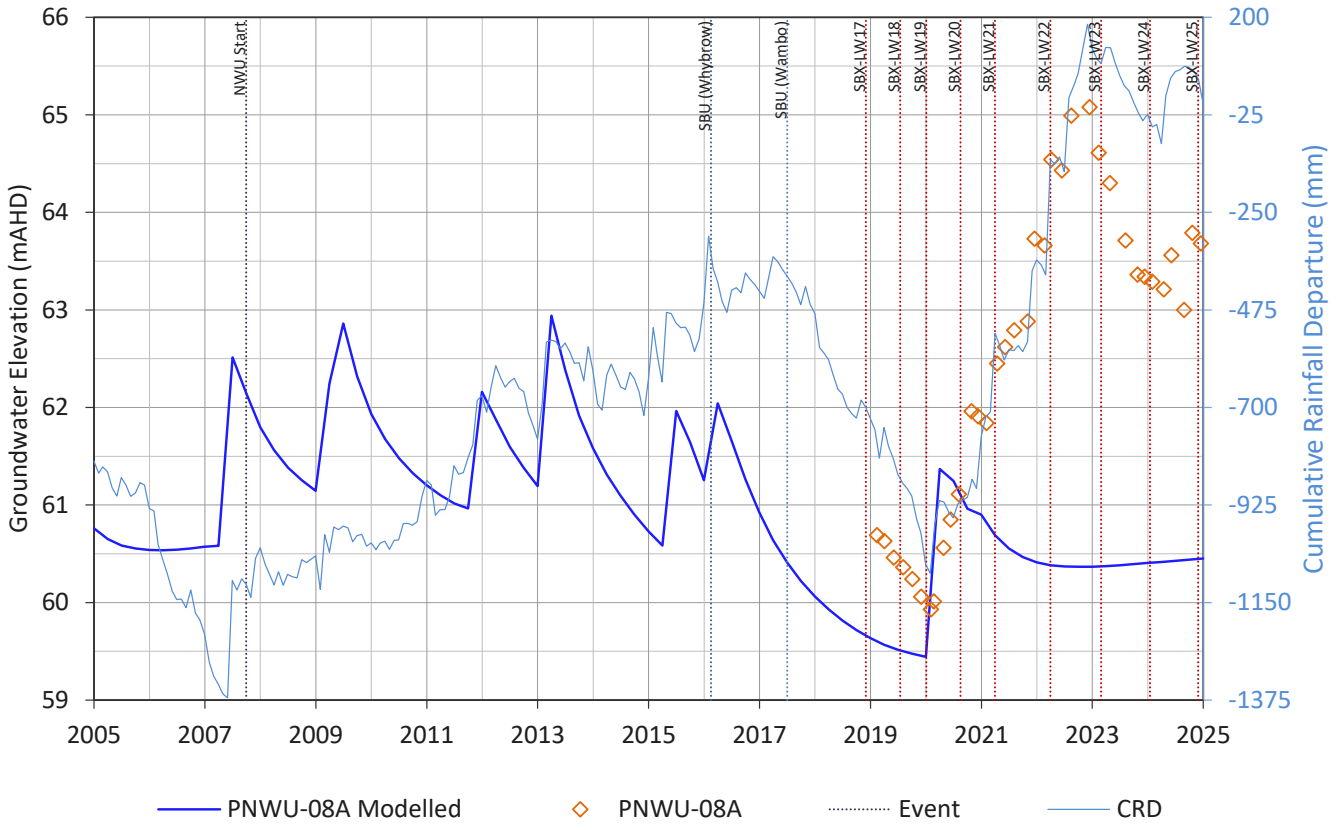


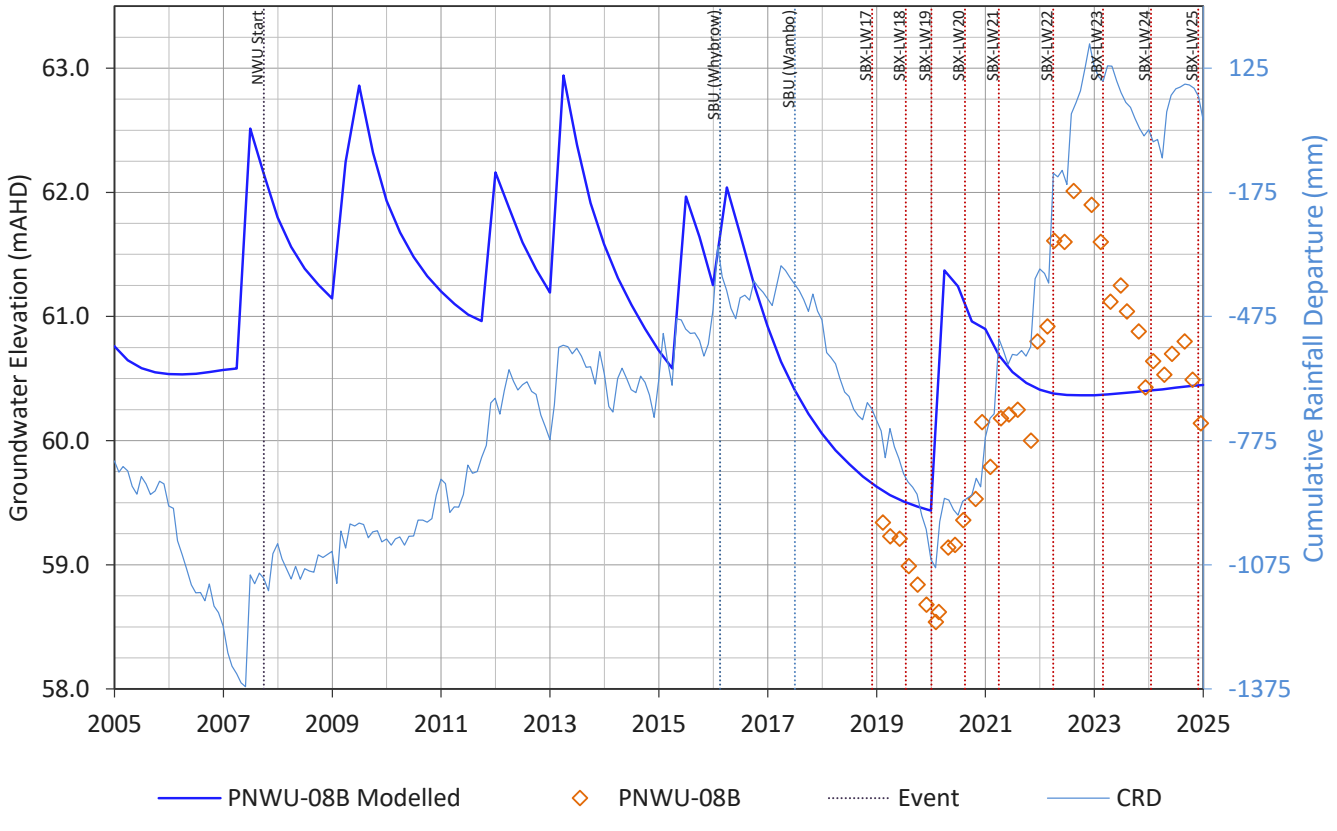

P315 Model Performance
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
95
90
85
80
75
70
65
275
0
-275
-550
-825
-1100
-1375
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P315 Modelled
P315
Event
CRD


GW35 Model Performance
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
108
106
104
102
100
98
96
94
92
225
25
-175
-375
-575
-775
-975
-1175
-1375
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW35 Modelled
GW35
Event
CRD

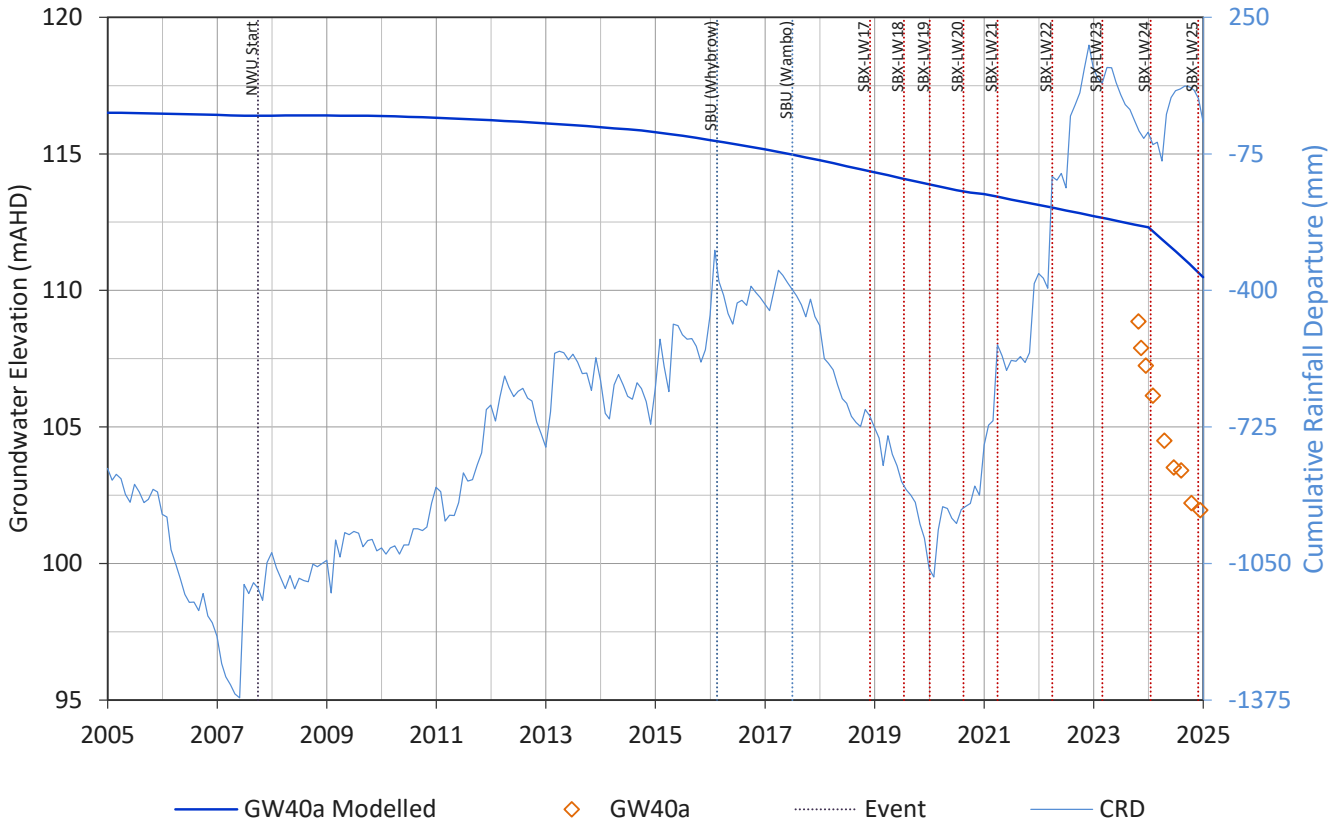
PNWU-08A Model Performance



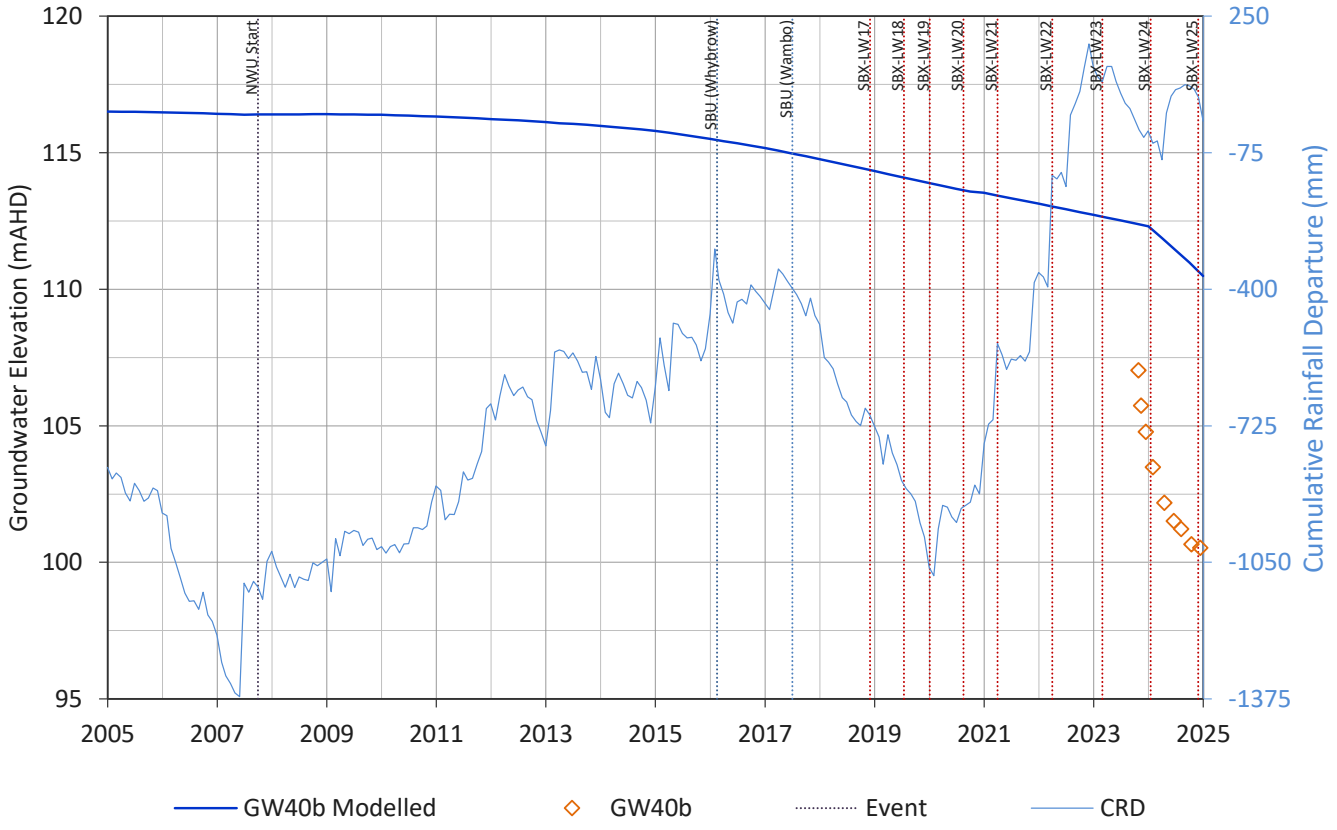
PNWU-08B Model Performance



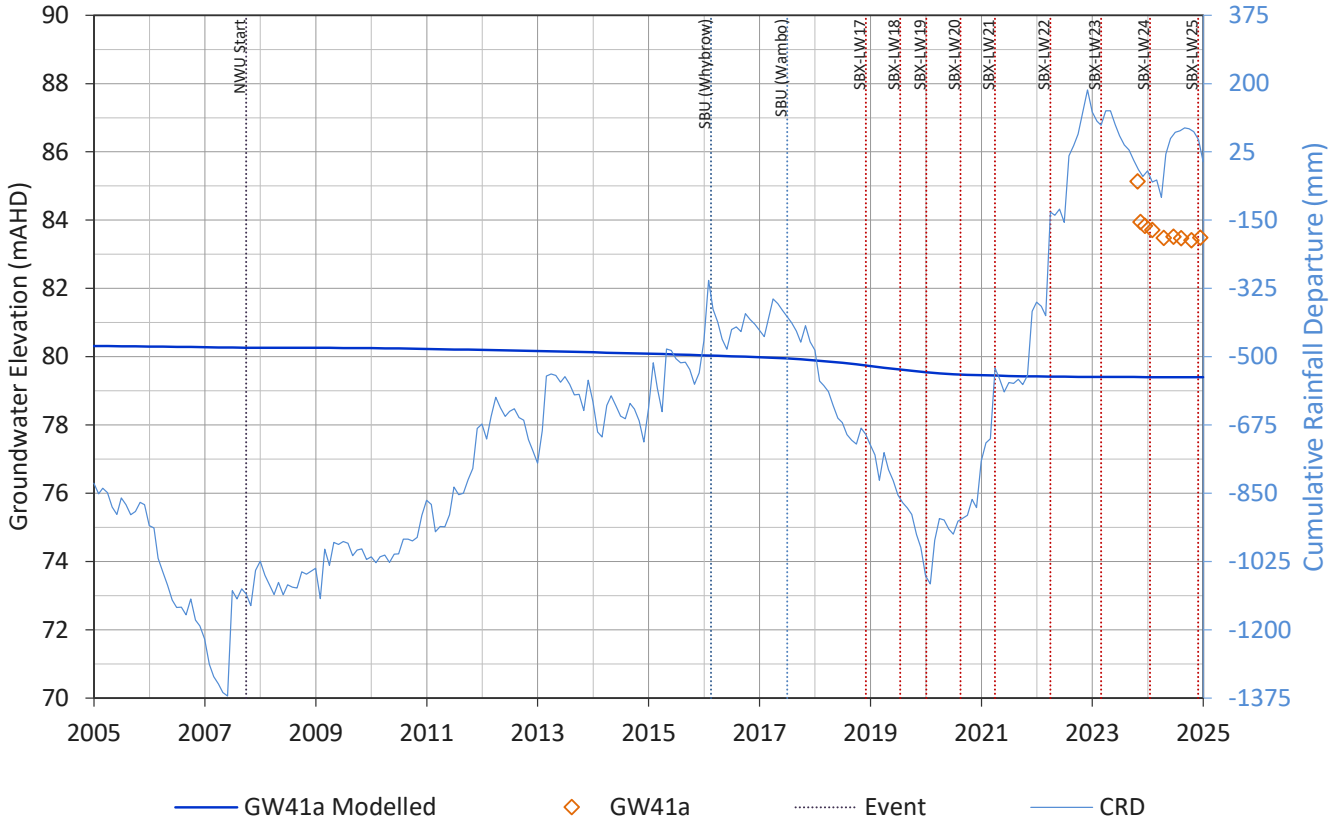
GW40a Model Performance



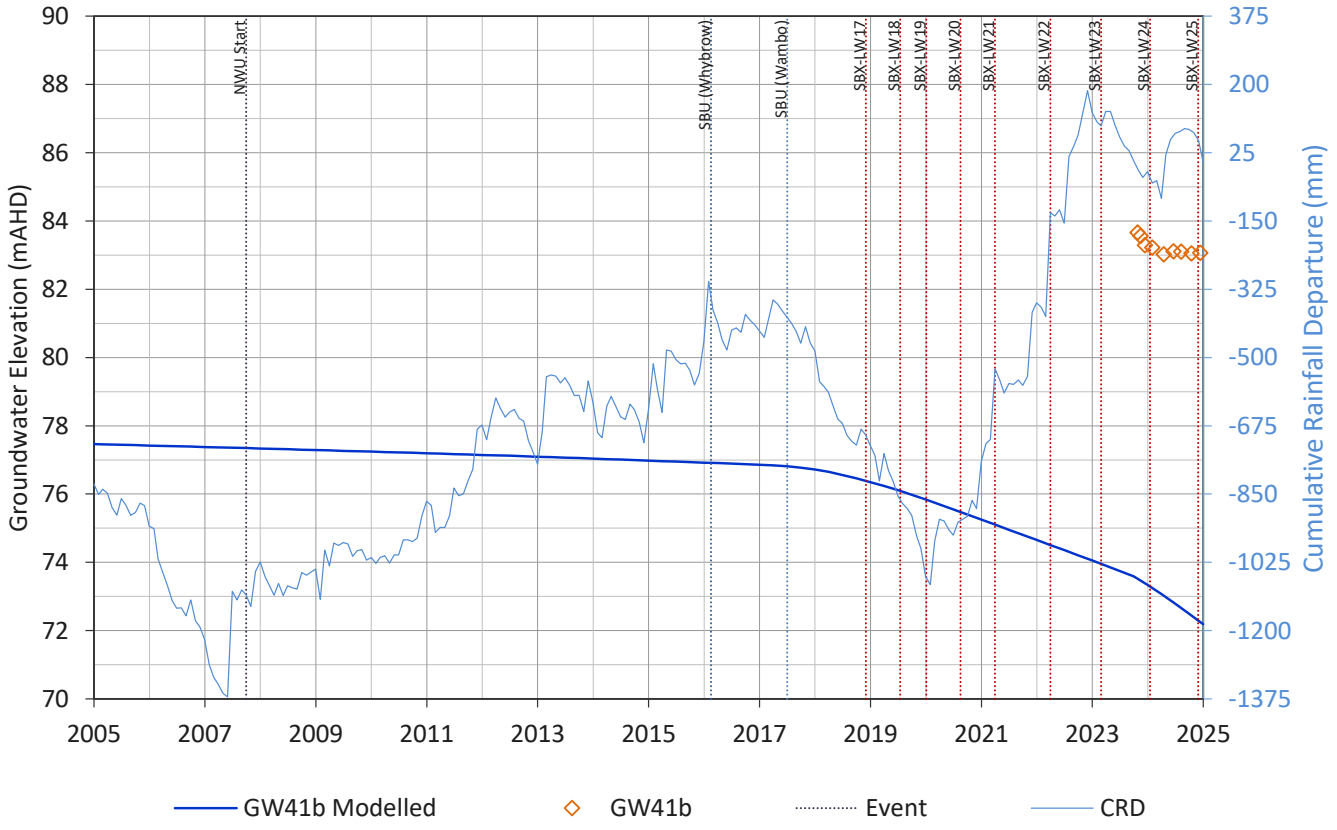
GW40b Model Performance



GW41a Model Performance



GW41b Model Performance



Appendix B Groundwater Level and Quality Hydrographs

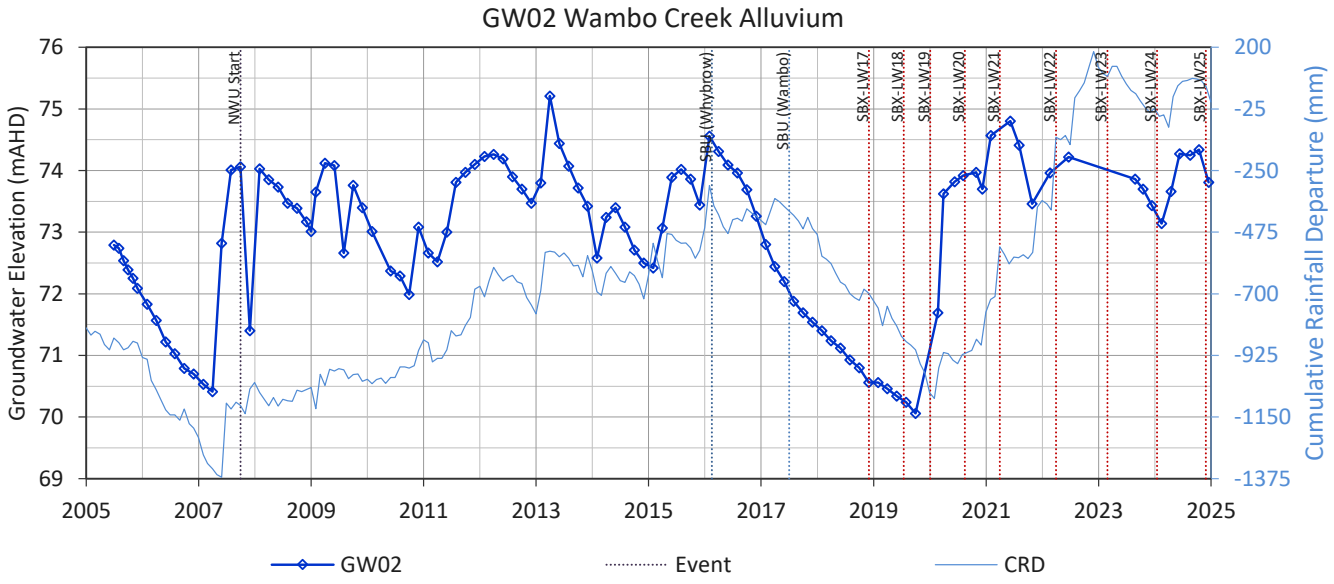
Groundwater Annual Review - 2024

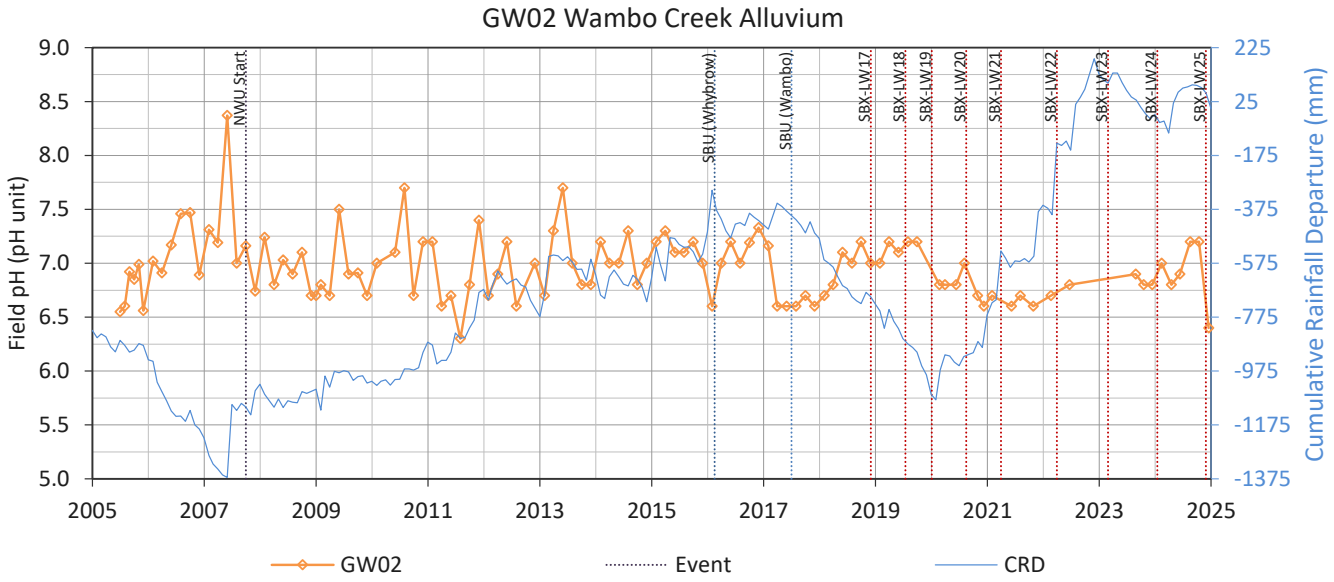
Wambo Coal Mine

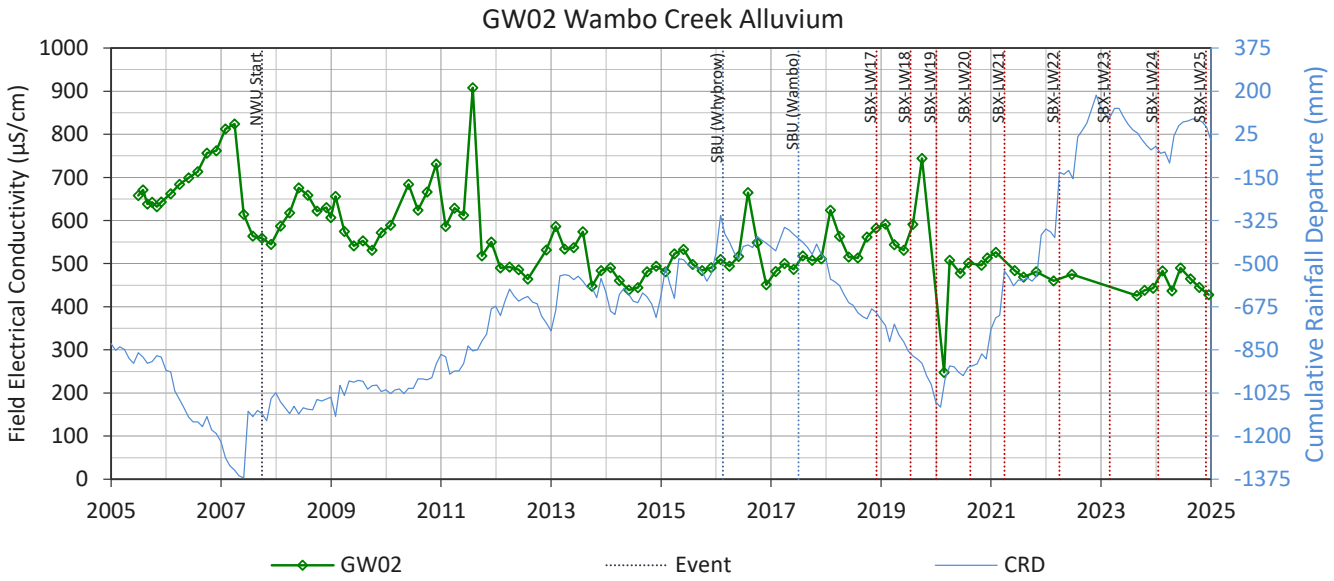
Wambo Coal Pty Ltd

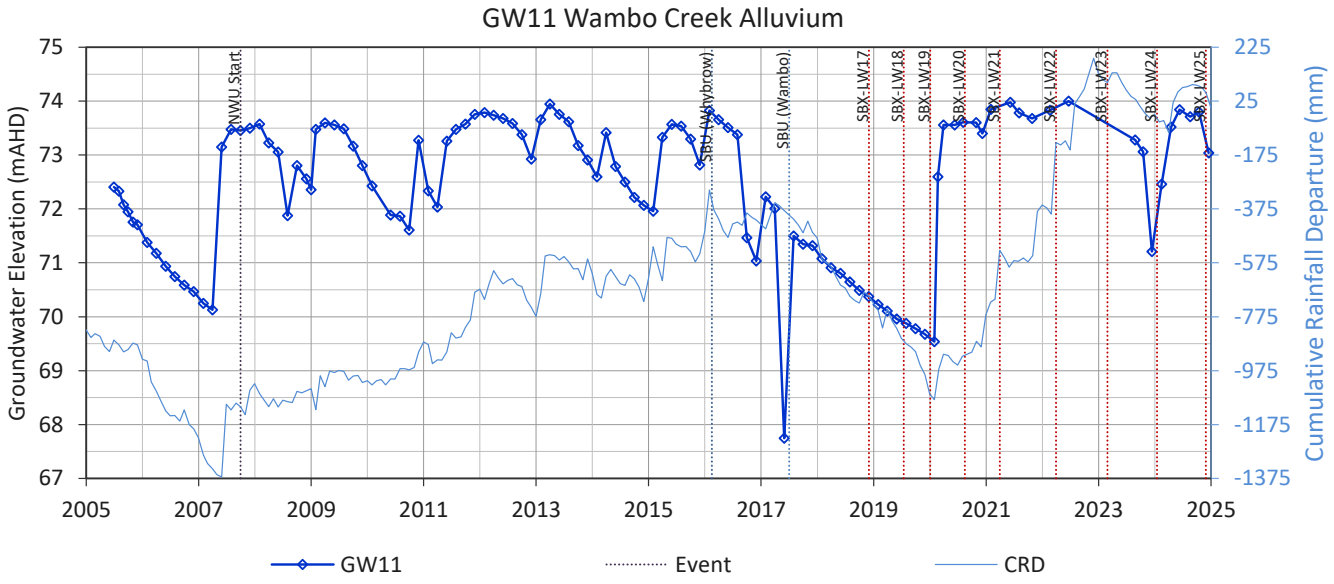
SLR Project No.: 665.v10008.02031

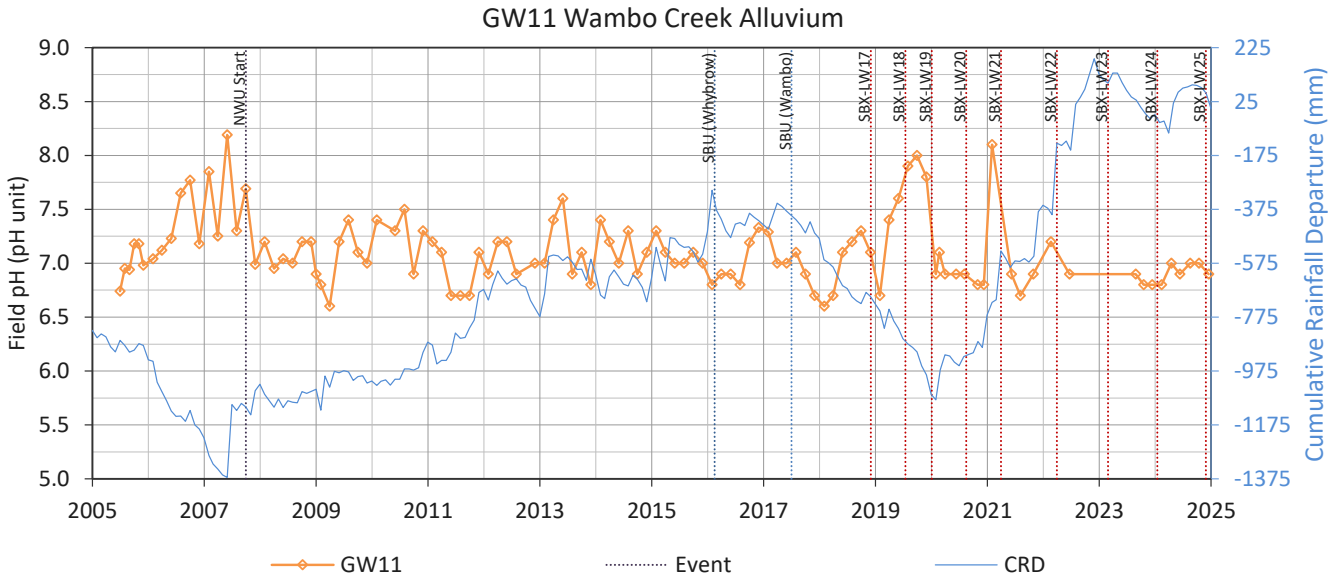
27 March 2025

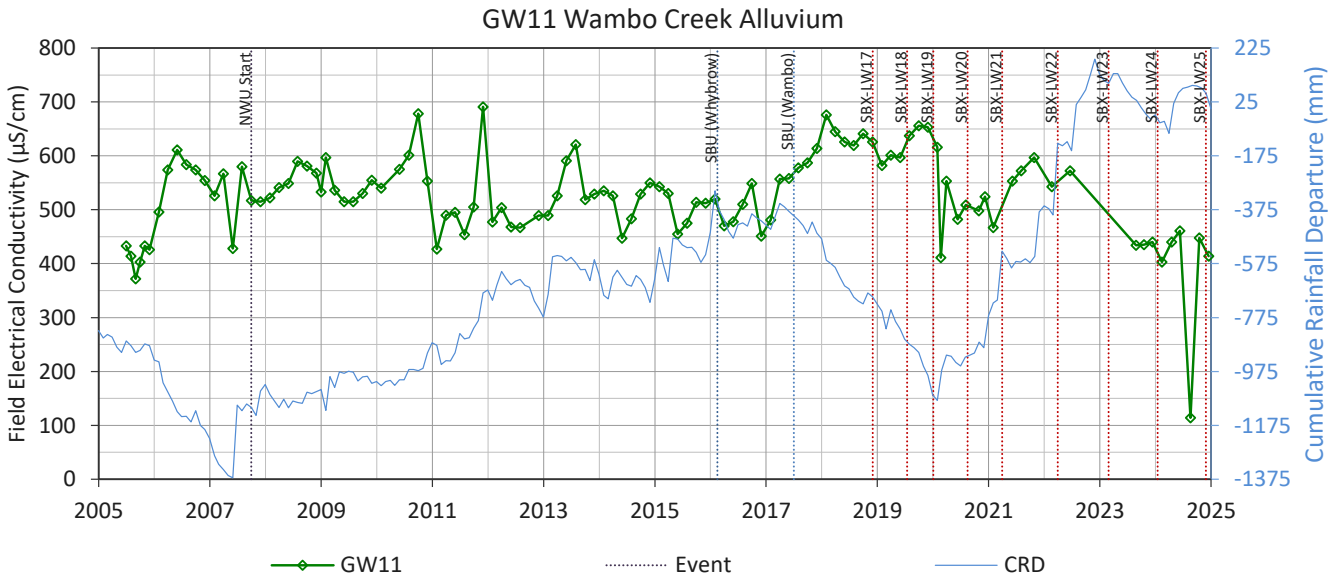

GW02 Wambo Creek Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW02
Event
CRD

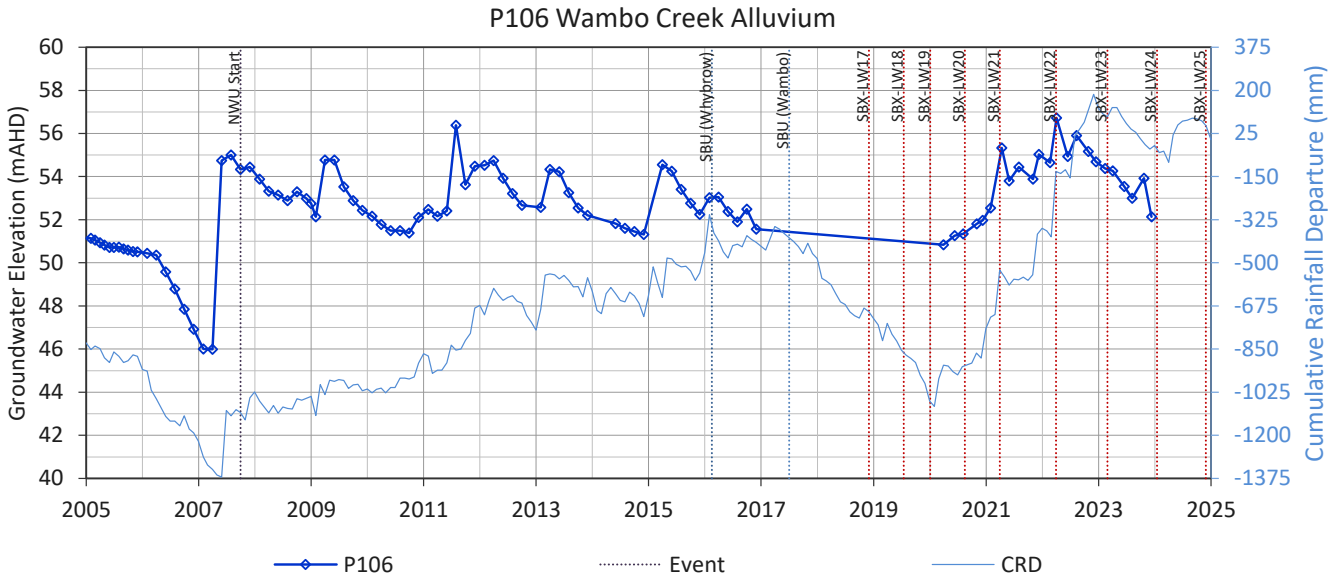

GW02 Wambo Creek Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW02
Event
CRD

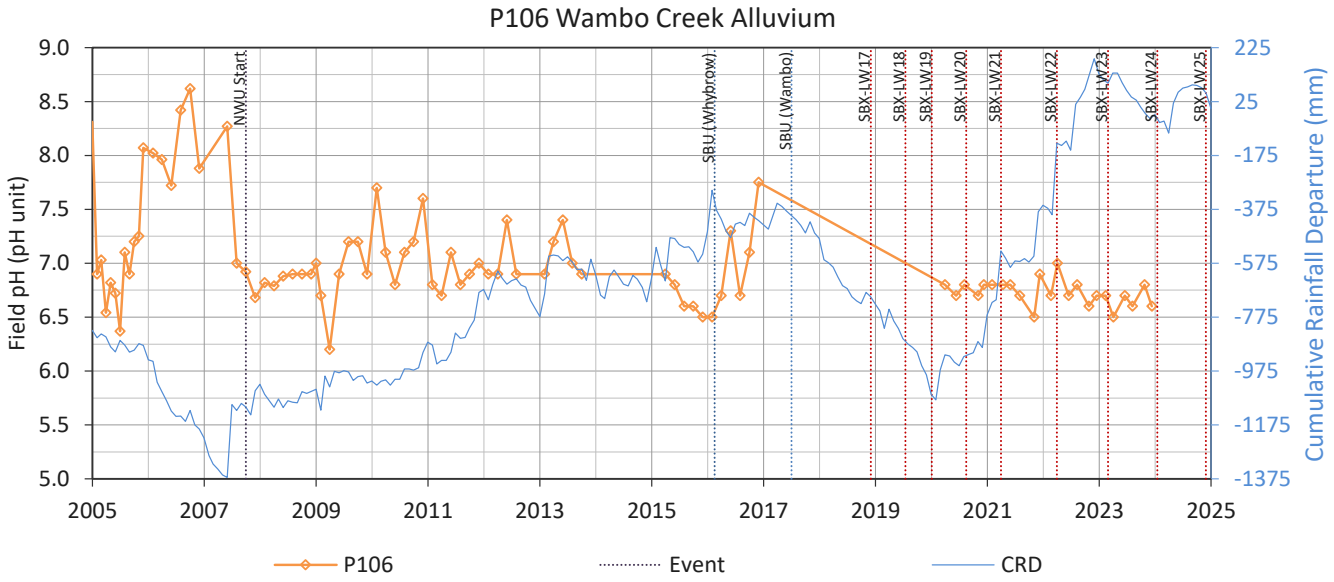

GW02 Wambo Creek Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW02
Event
CRD

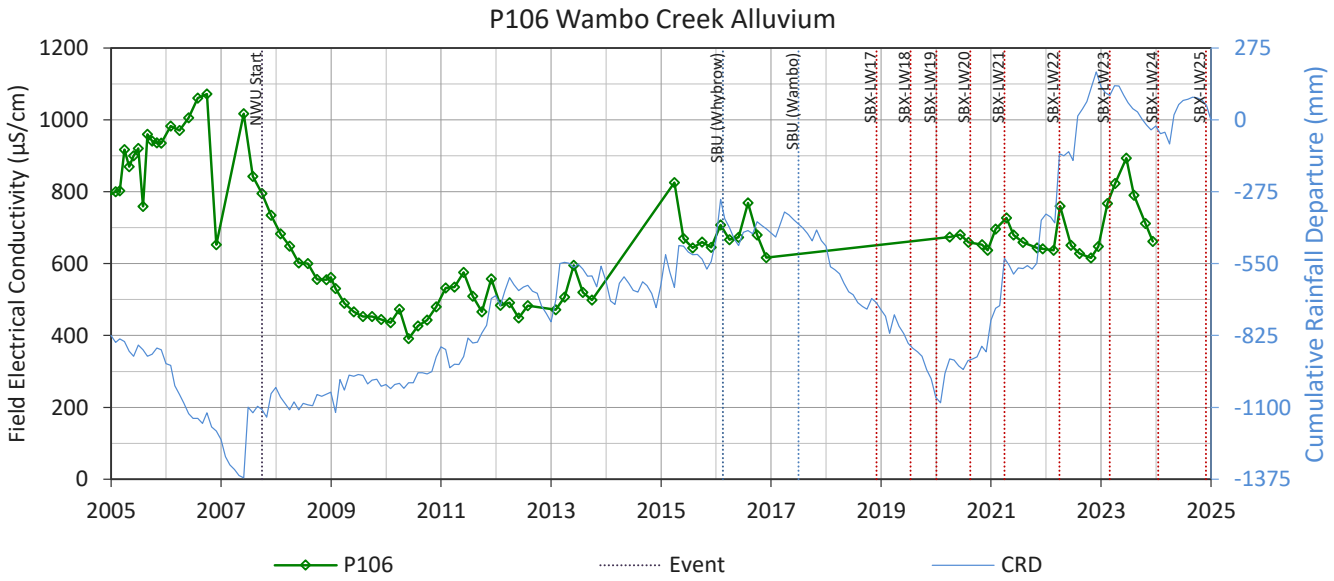

GW11 Wambo Creek Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW11
Event
CRD

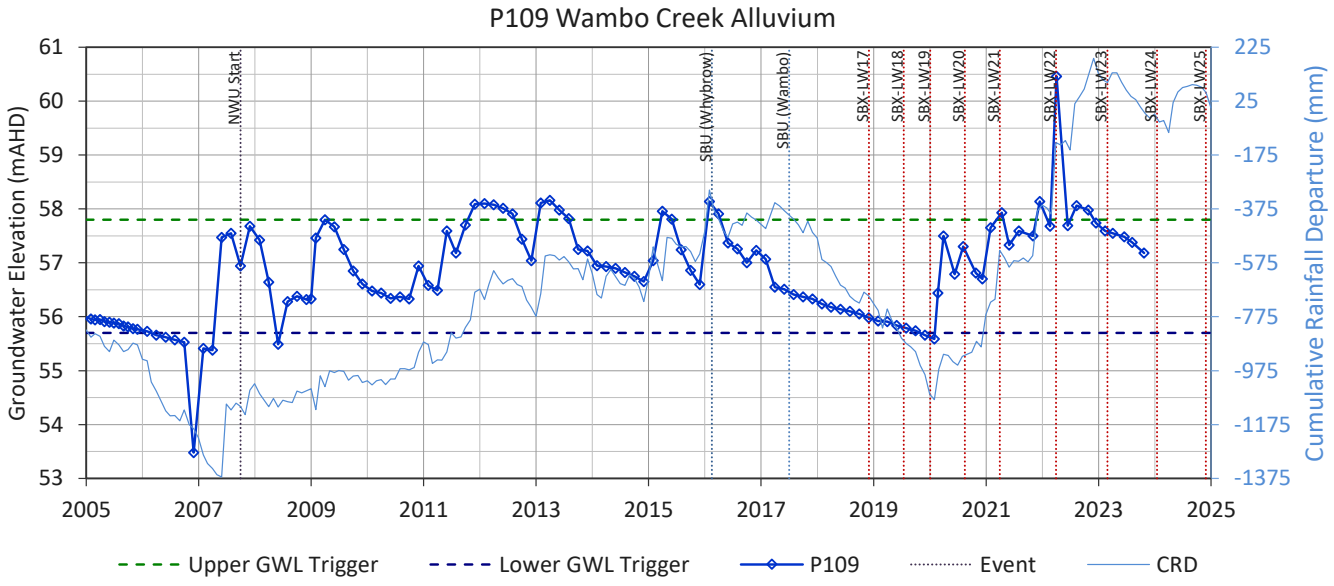

GW11 Wambo Creek Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW11
Event
CRD

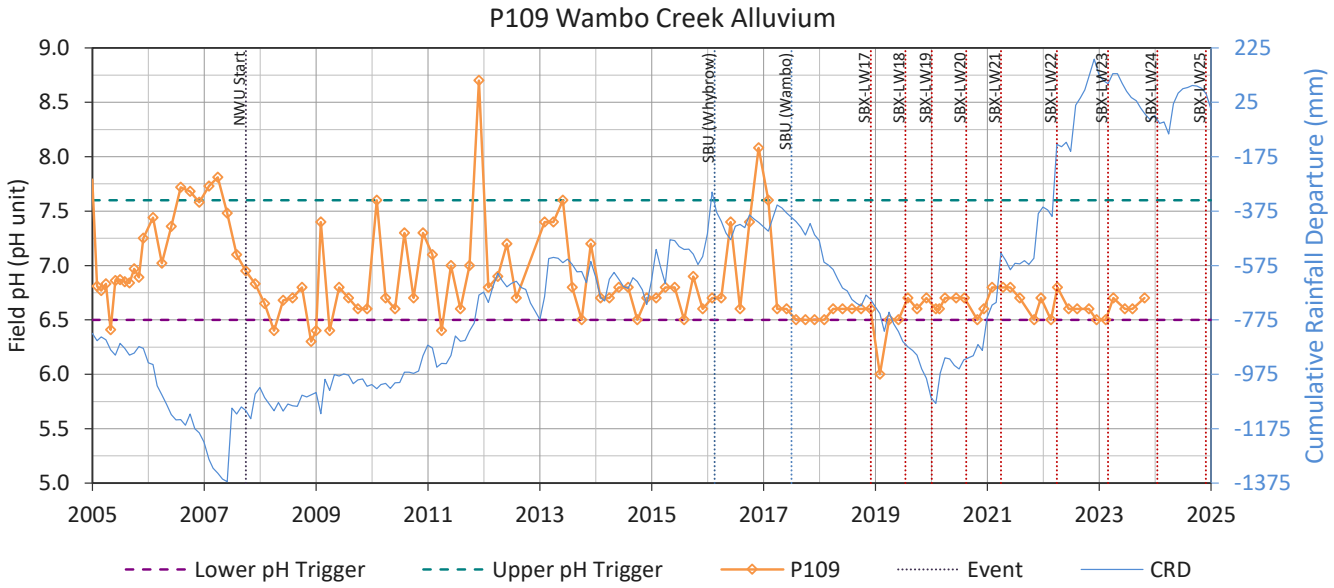

GW11 Wambo Creek Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW11
Event
CRD

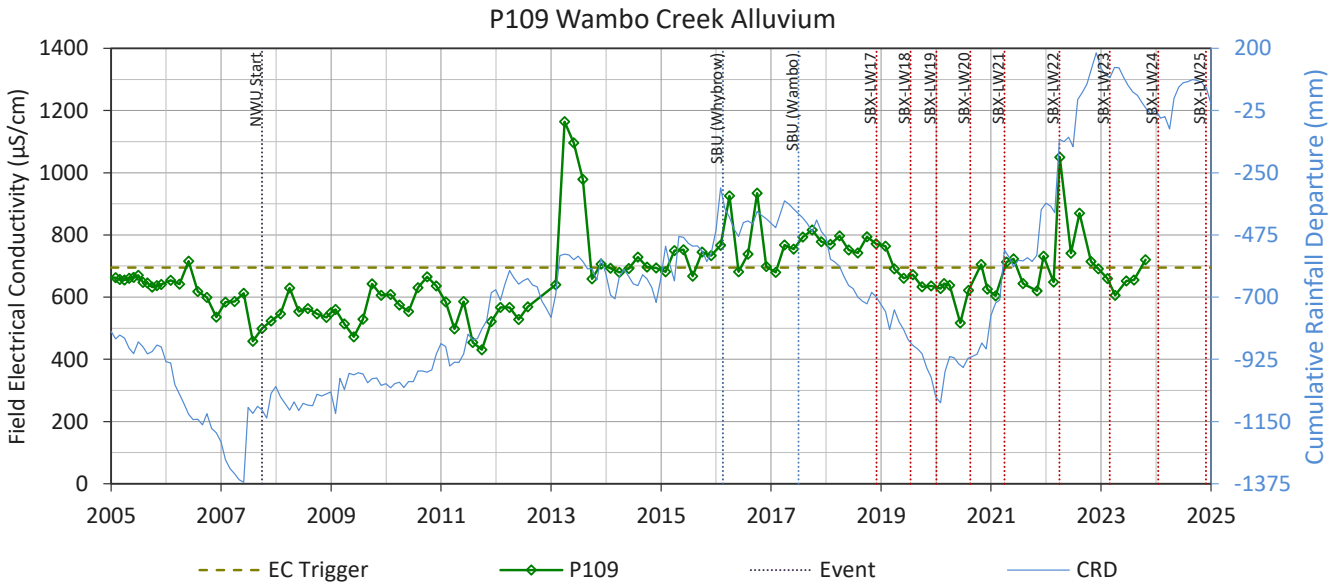

P106 Wambo Creek Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P106
Event
CRD

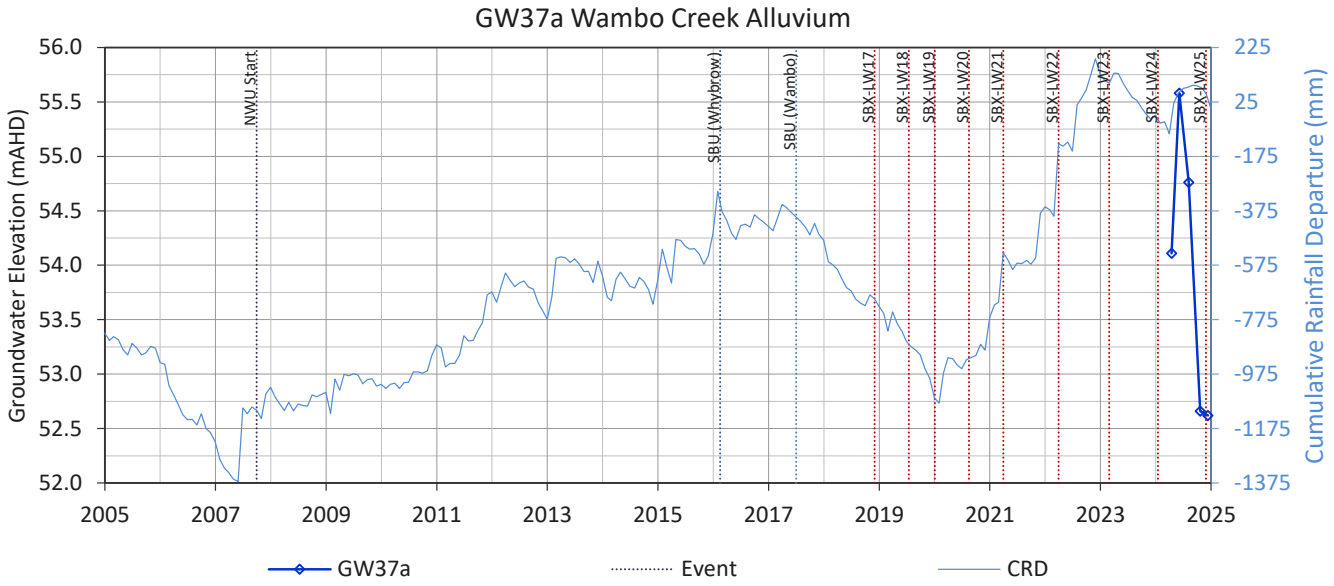

P106 Wambo Creek Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P106
Event
CRD

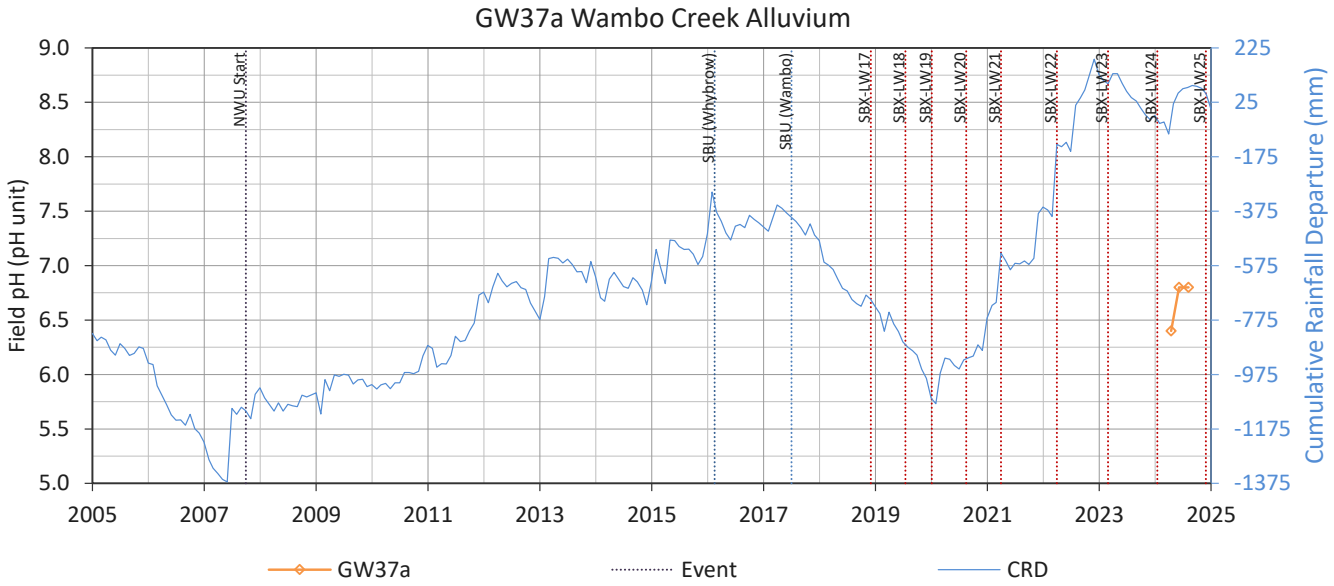

P106 Wambo Creek Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P106
Event
CRD

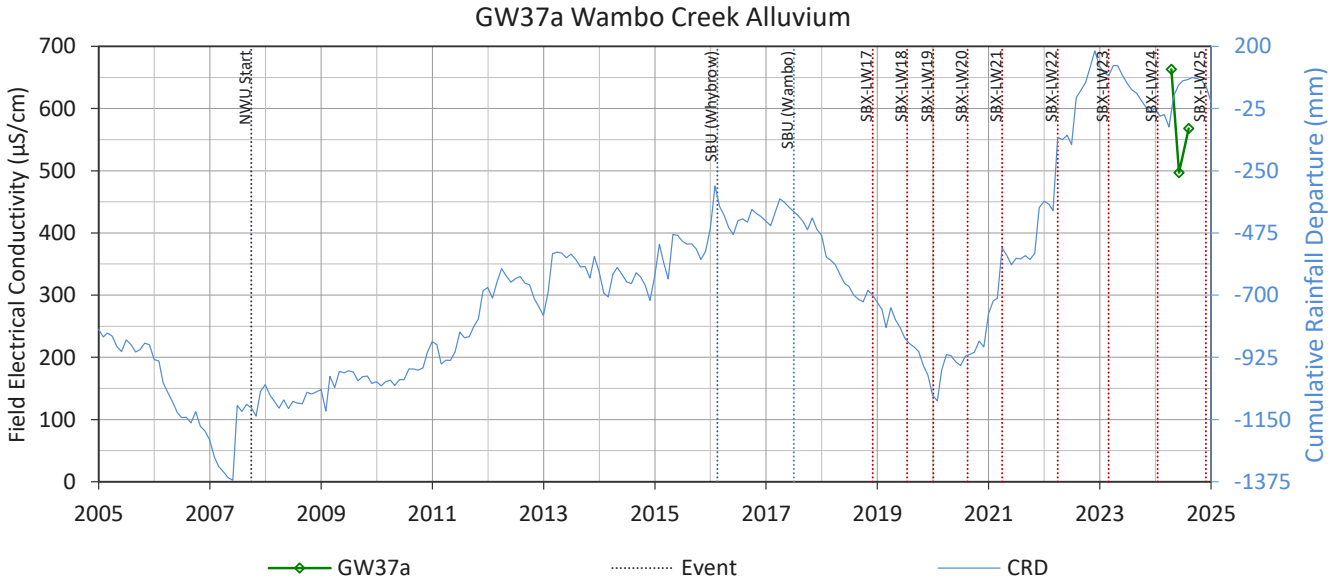

P109 Wambo Creek Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
Upper GWL Trigger
Lower GWL Trigger
P109
Event
CRD

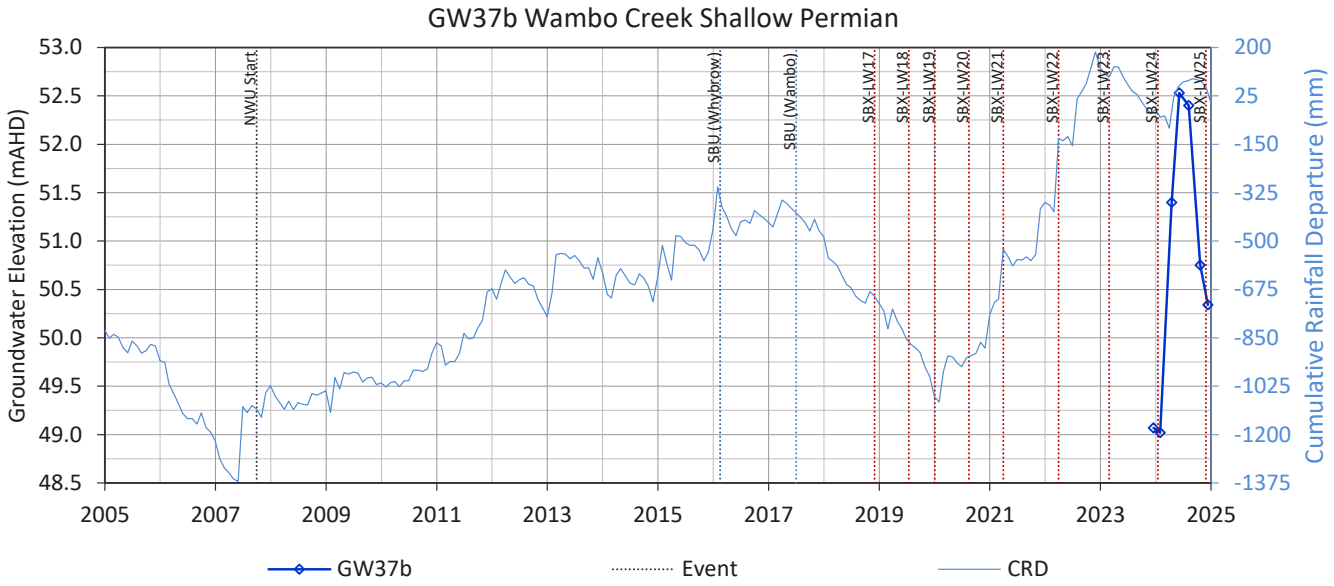

P109 Wambo Creek Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
Lower pH Trigger
Upper pH Trigger
P109
Event
CRD

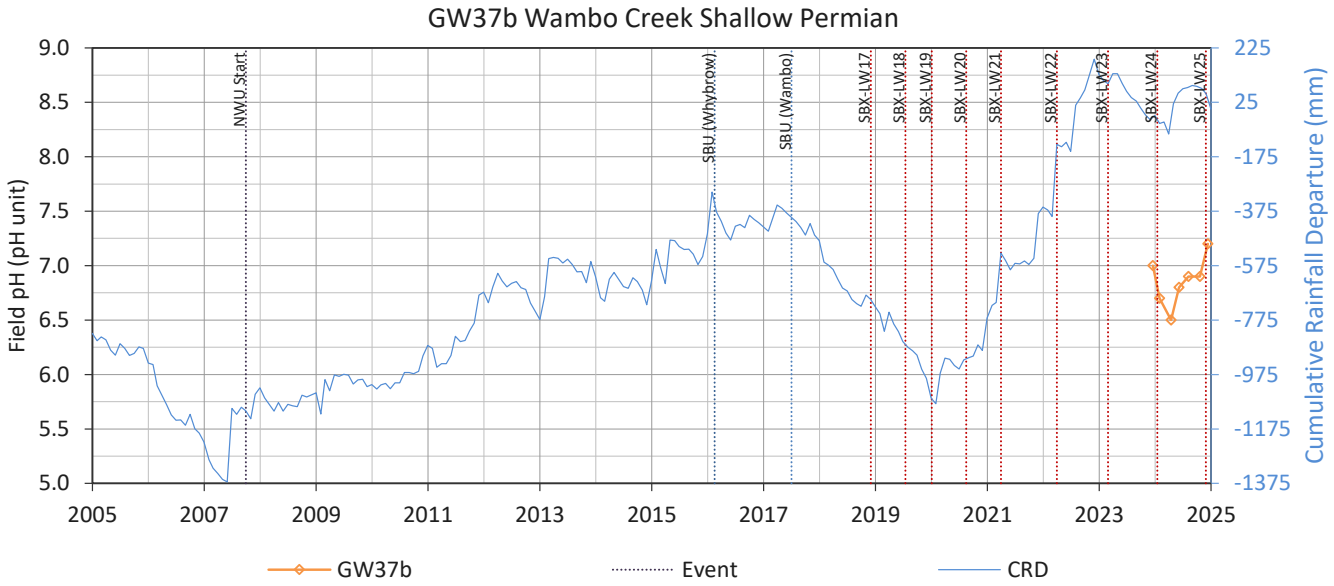

P109 Wambo Creek Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
EC Trigger
P109
Event
CRD

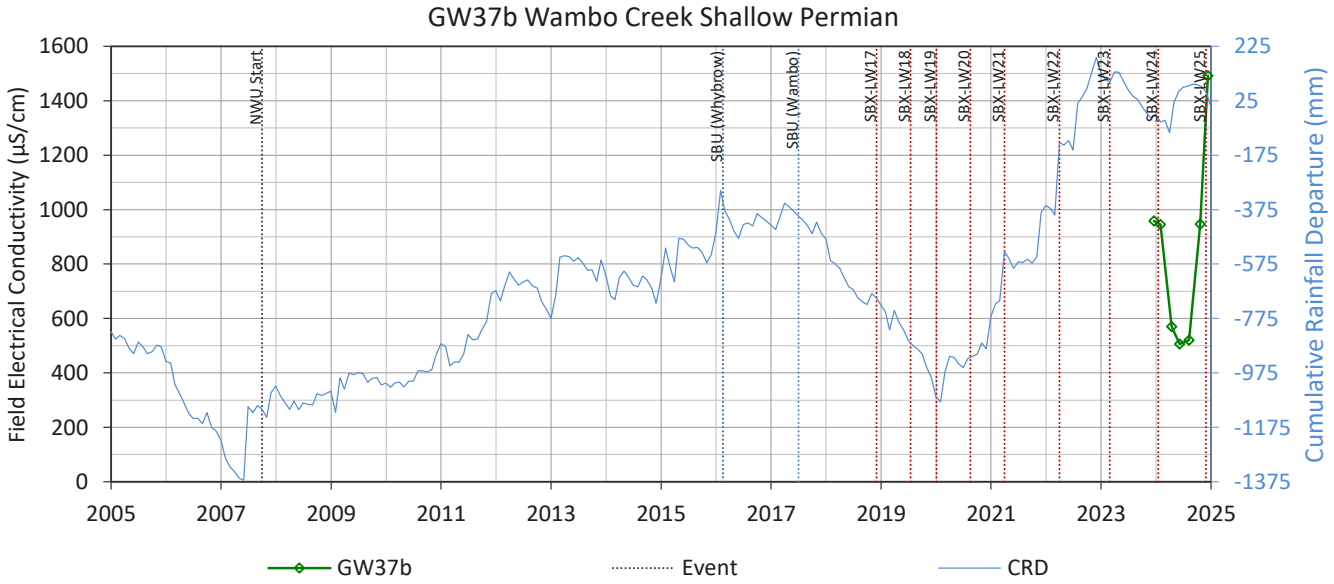

GW37a Wambo Creek Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW37a
Event
CRD

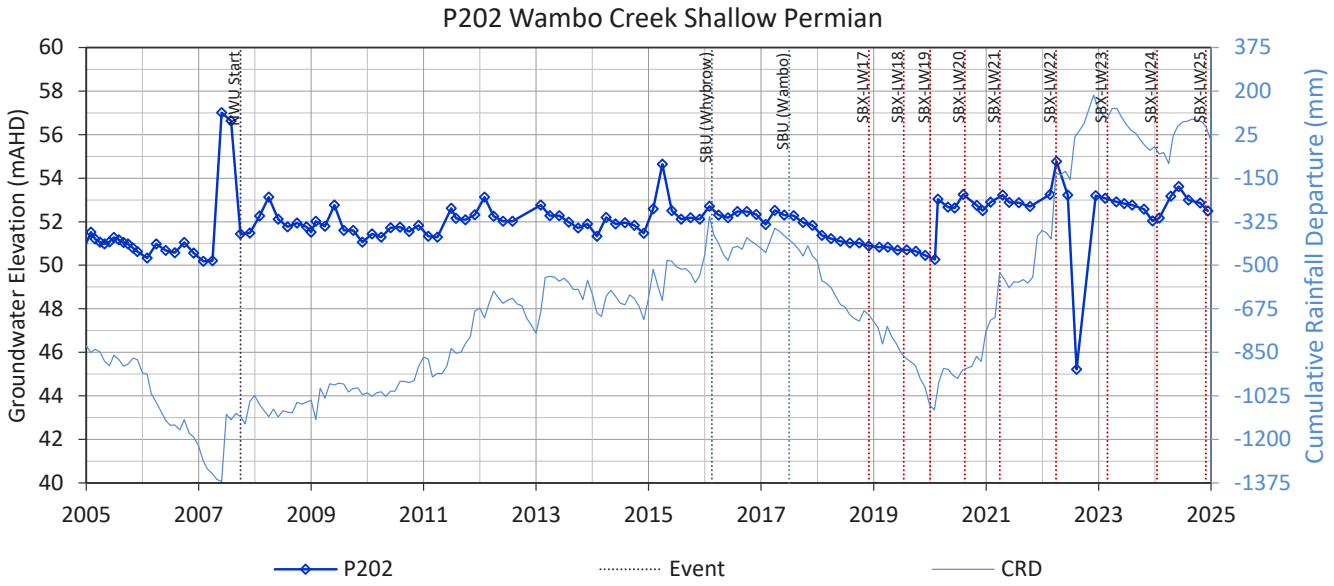

GW37a Wambo Creek Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW37a
Event
CRD

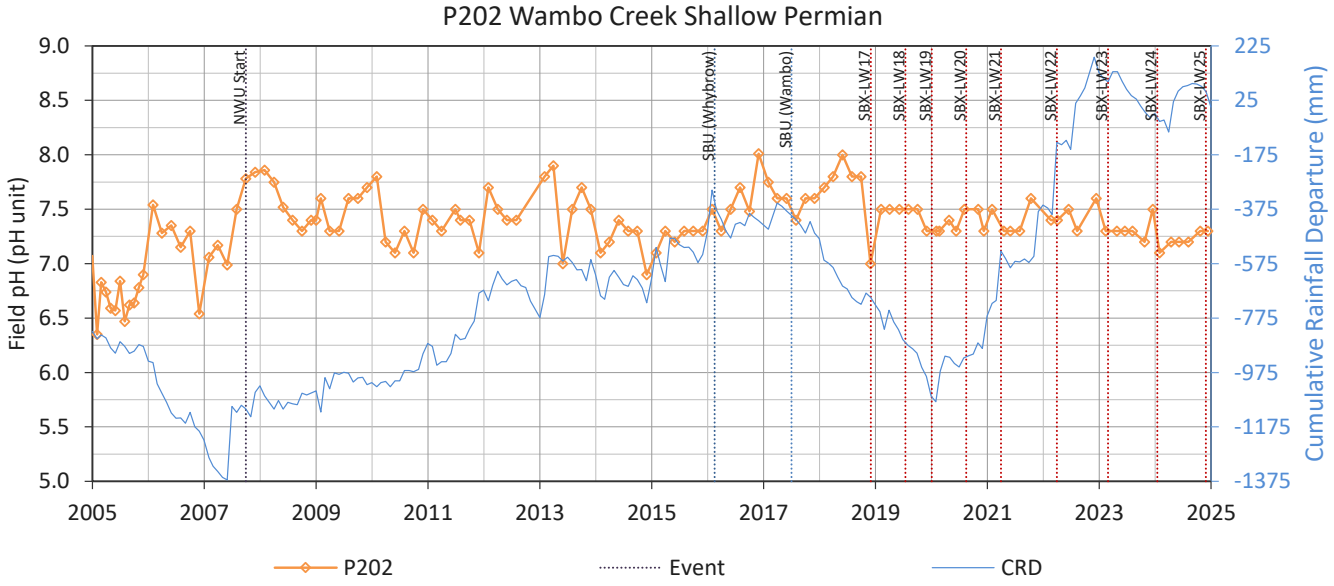

GW37a Wambo Creek Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW37a
Event
CRD

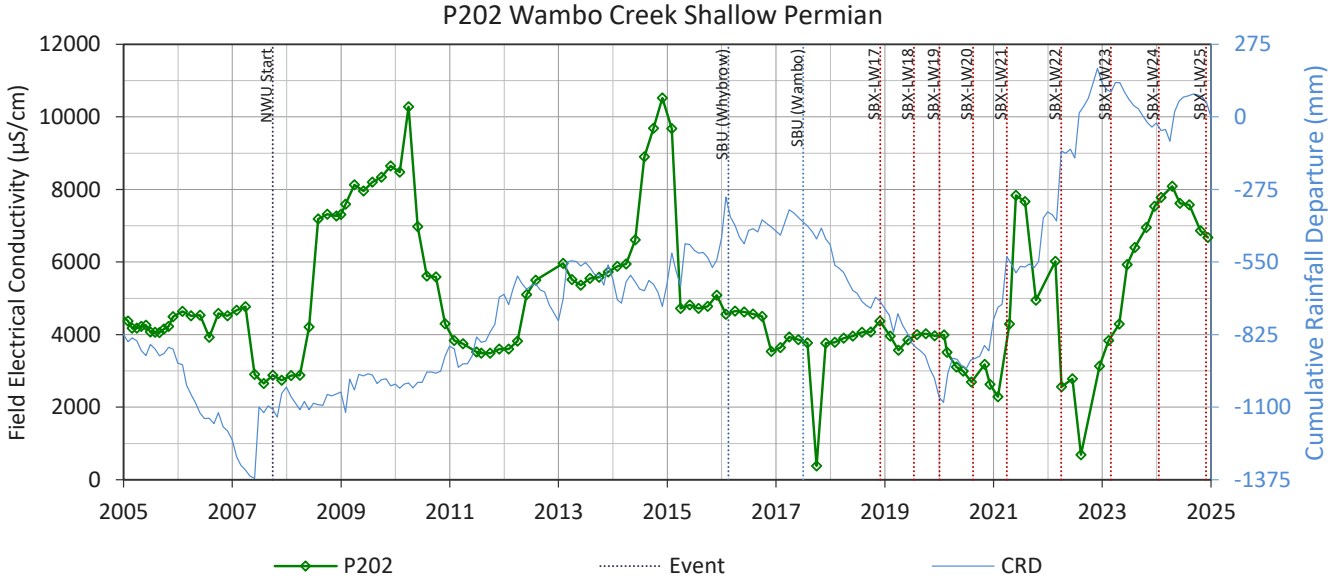

GW37b Wambo Creek Shallow Permian
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW37b
Event
CRD

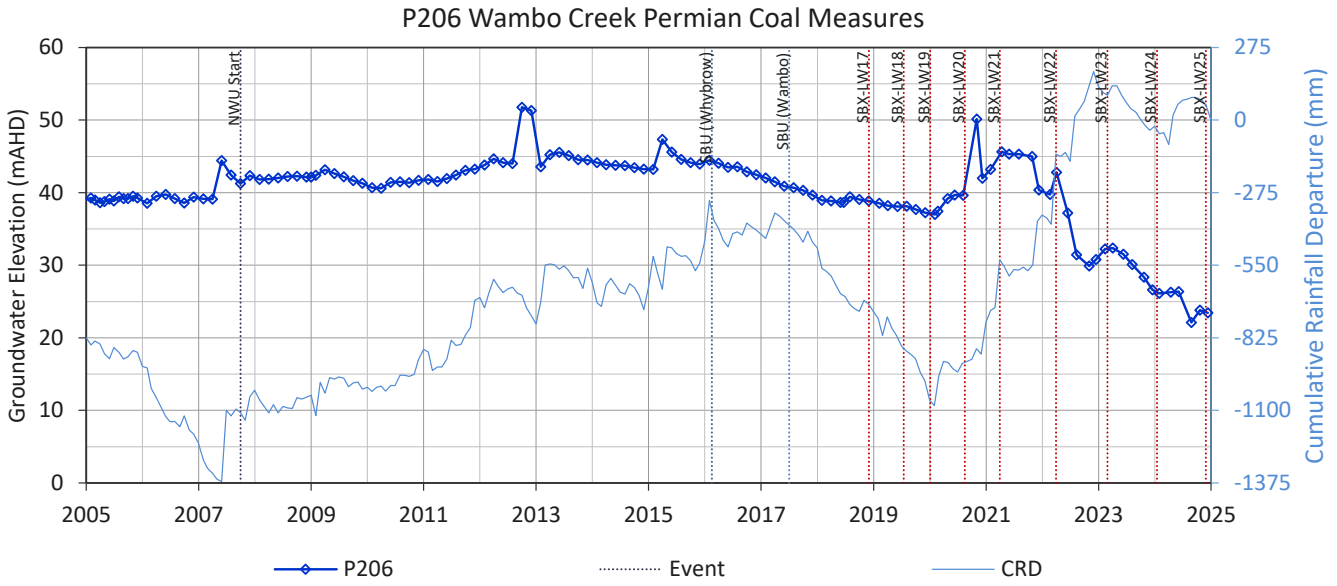

GW37b Wambo Creek Shallow Permian
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW37b
Event
CRD

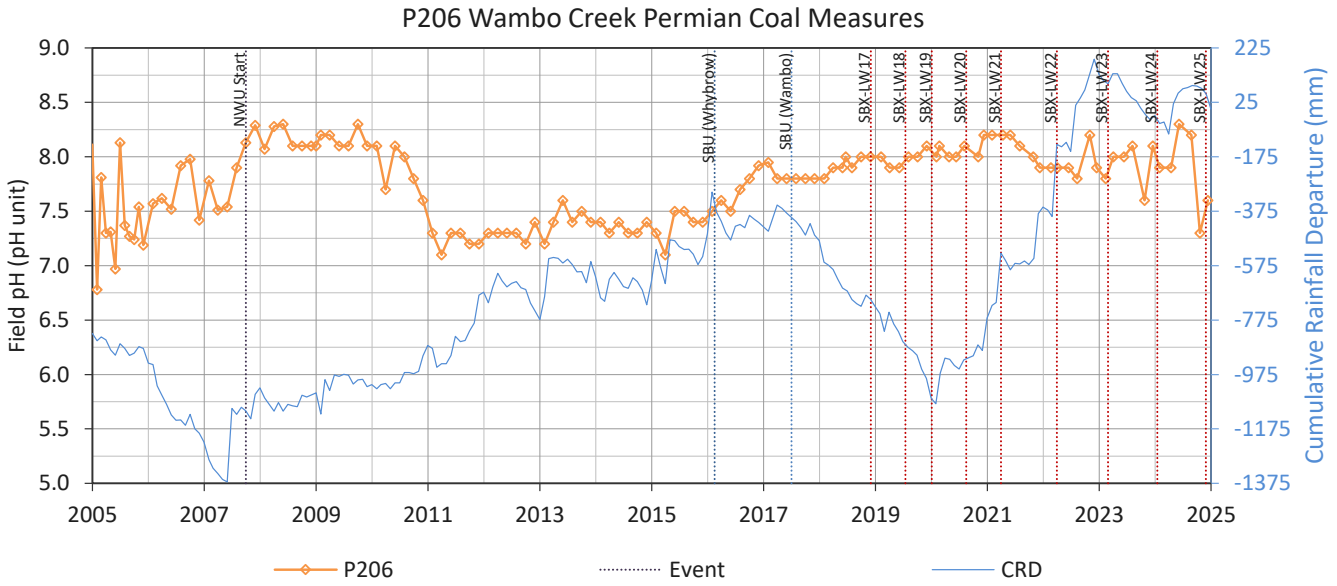

GW37b Wambo Creek Shallow Permian
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW37b
Event
CRD

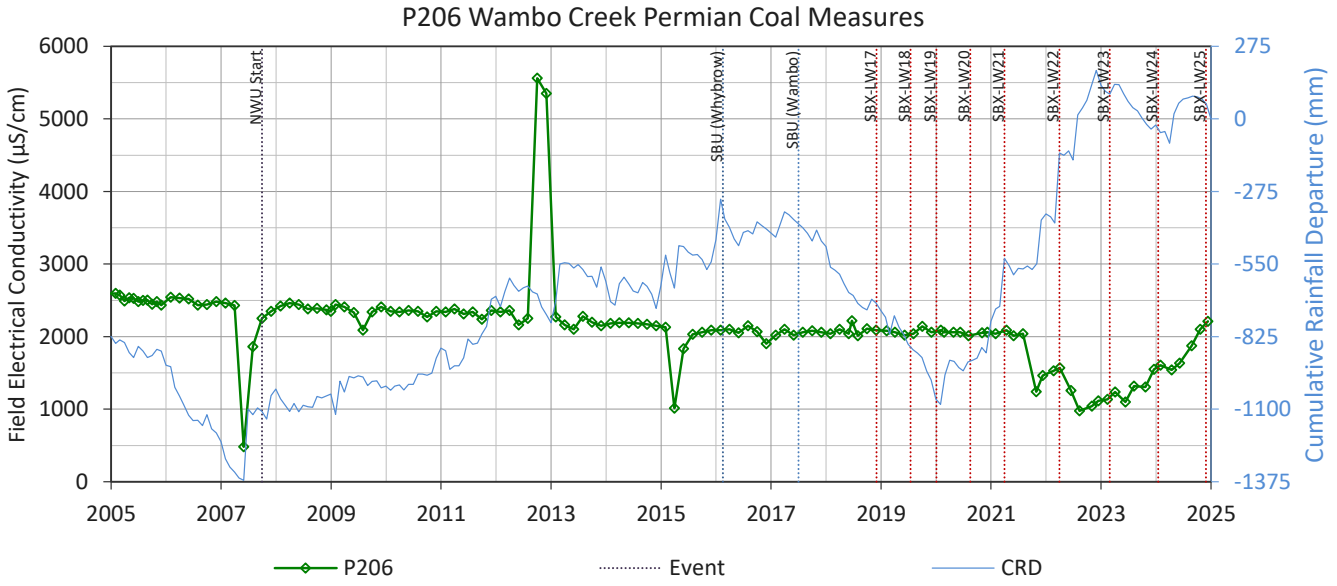

P202 Wambo Creek Shallow Permian
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P202
Event
CRD

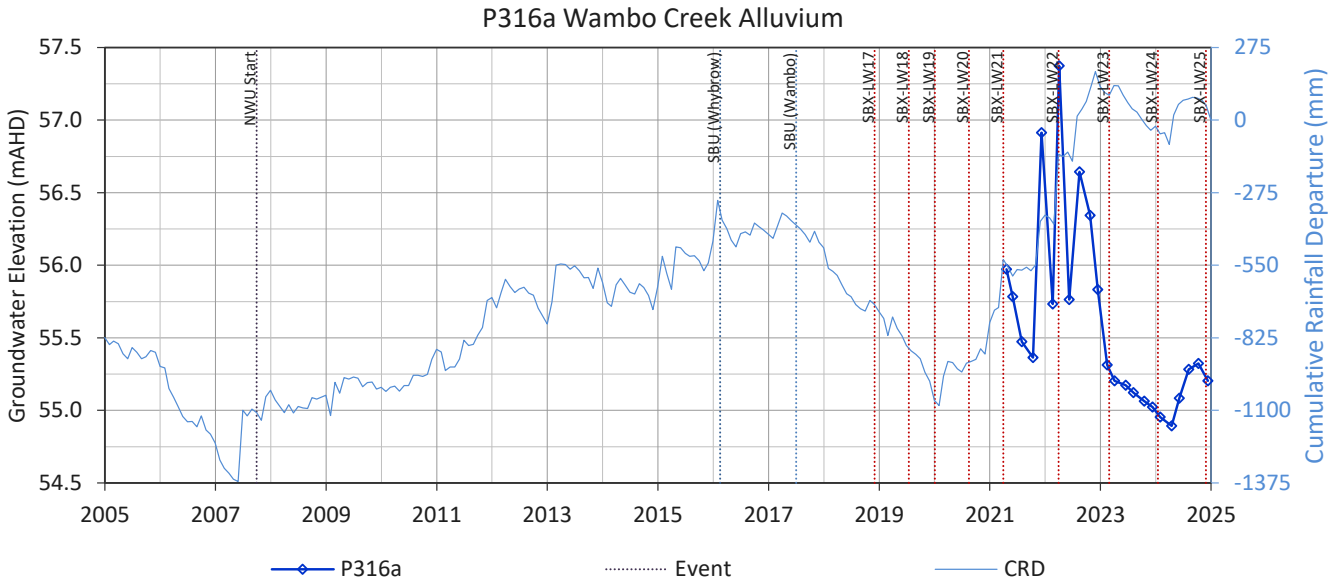

P202 Wambo Creek Shallow Permian
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P202
Event
CRD

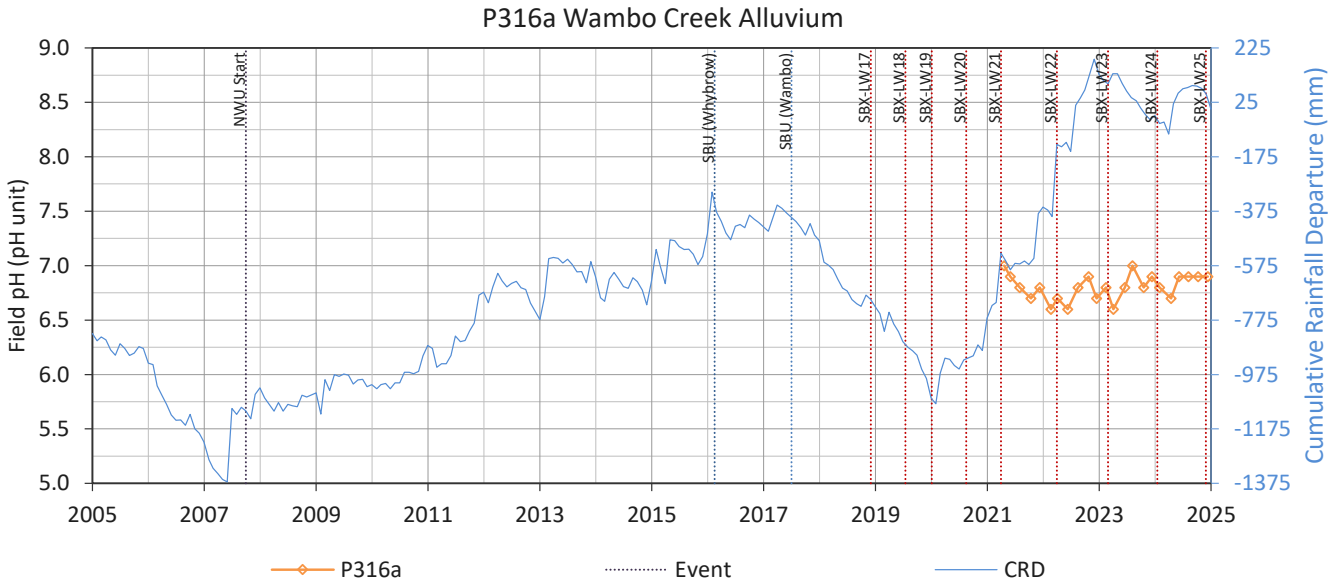

P202 Wambo Creek Shallow Permian
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P202
Event
CRD

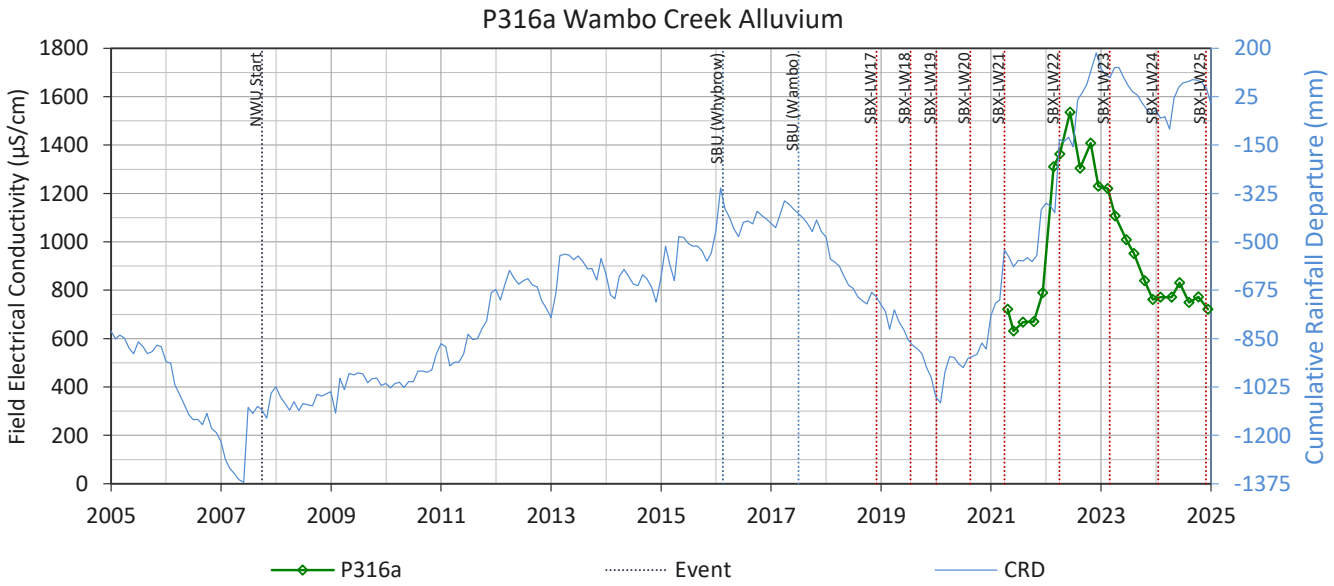

P206 Wambo Creek Permian Coal Measures
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P206
Event
CRD

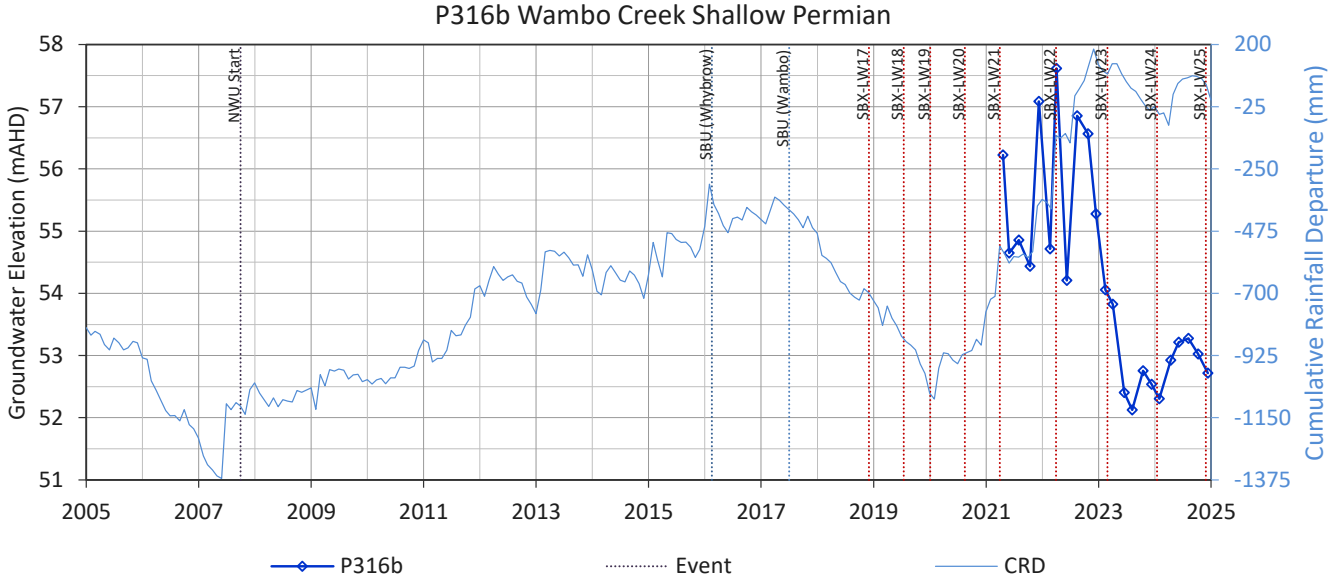

P206 Wambo Creek Permian Coal Measures
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P206
Event
CRD

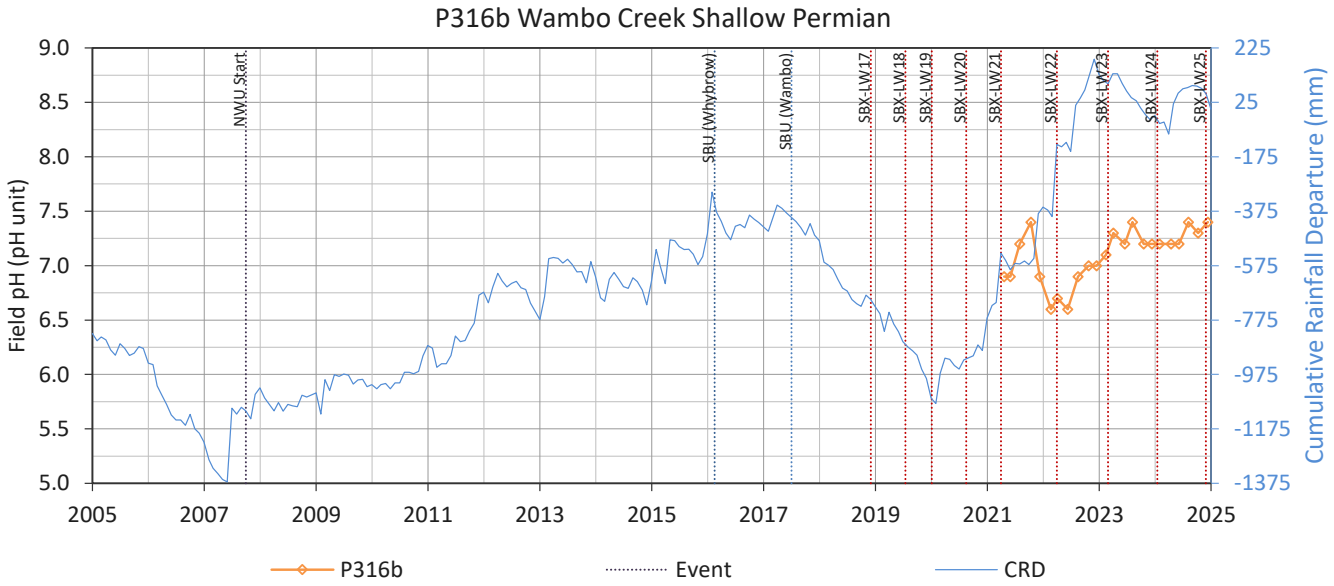

P206 Wambo Creek Permian Coal Measures
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P206
Event
CRD

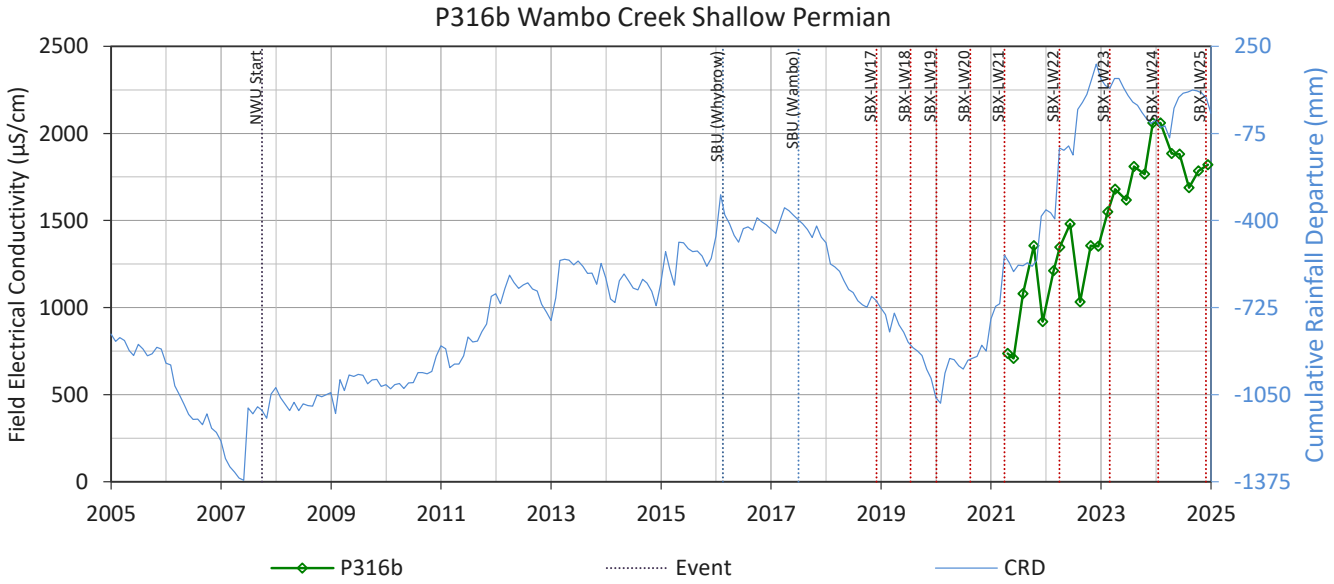

P316a Wambo Creek Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P316a
Event
CRD

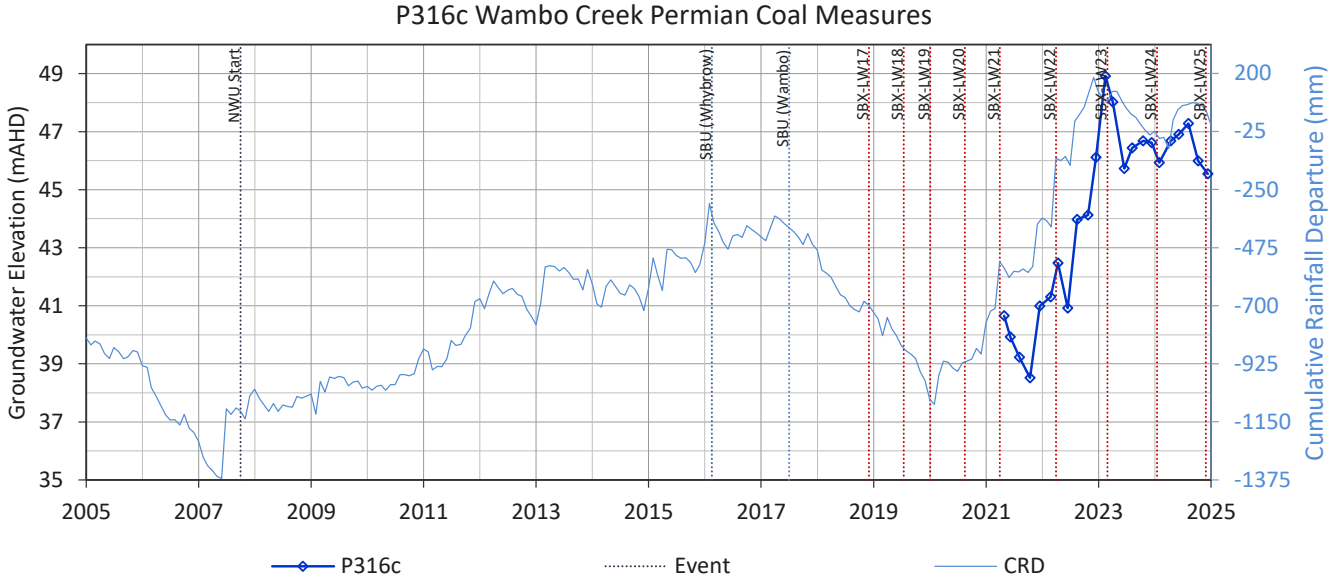

P316a Wambo Creek Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P316a
Event
CRD

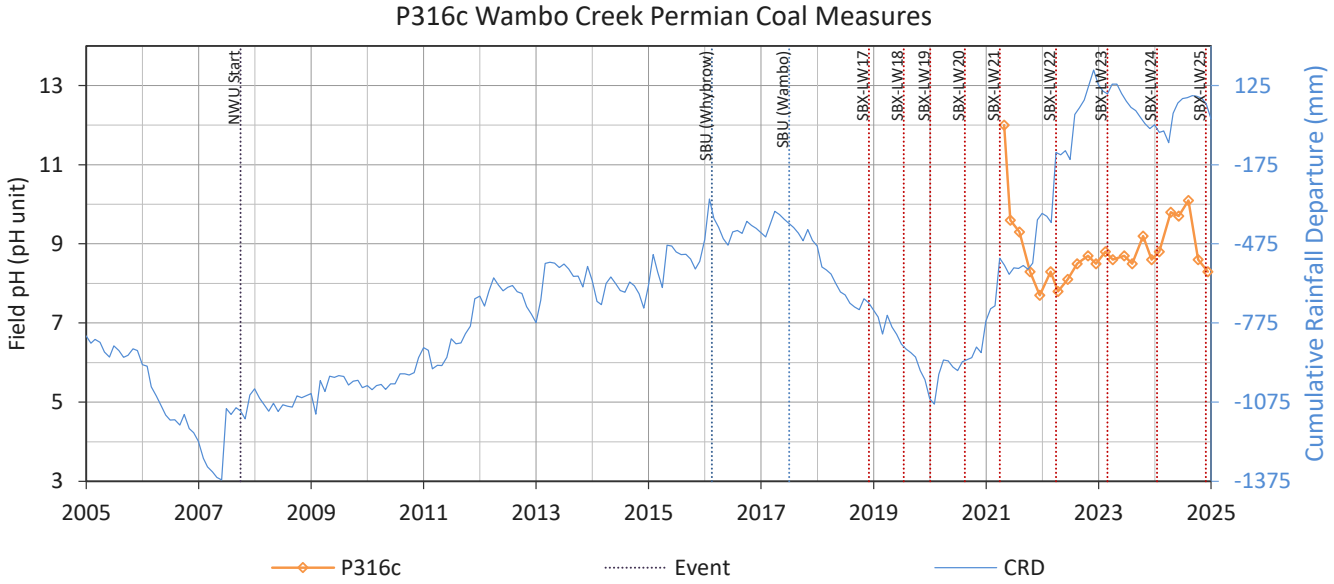

P316a Wambo Creek Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P316a
Event
CRD

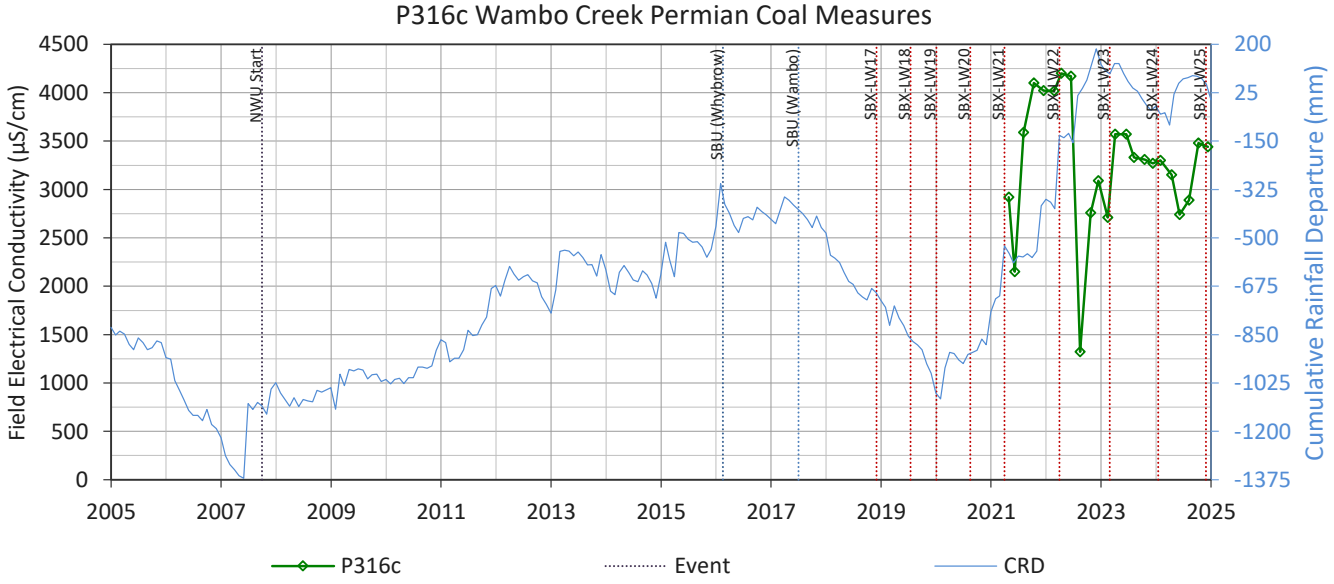

P316b Wambo Creek Shallow Permian
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P316b
Event
CRD

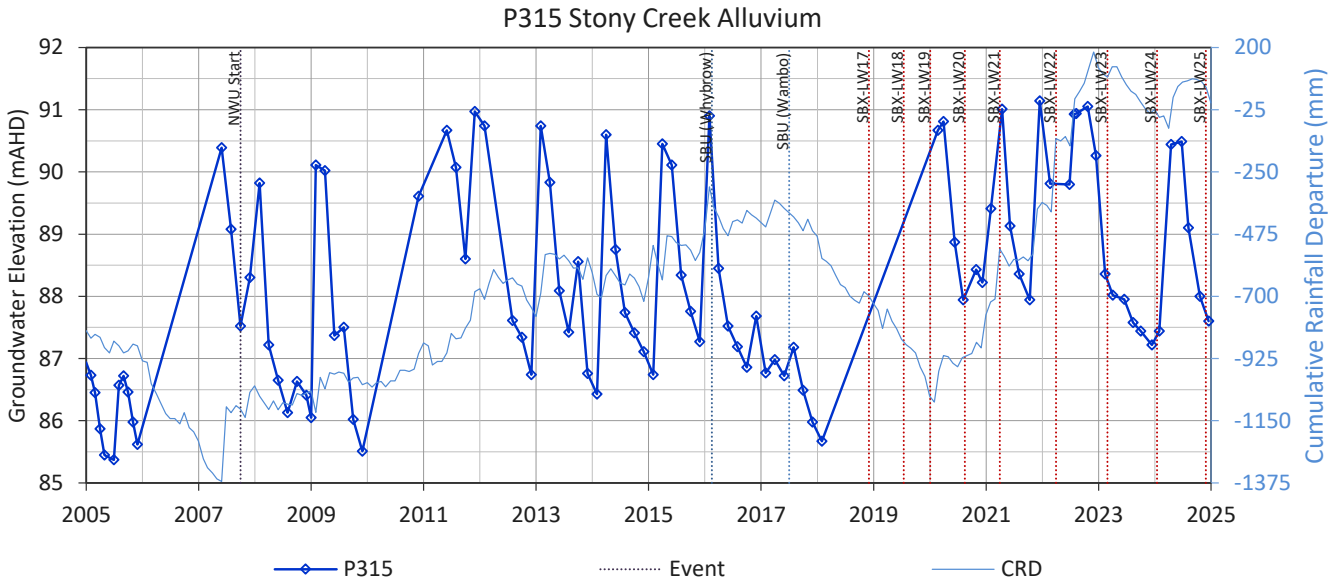

P316b Wambo Creek Shallow Permian
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P316b
Event
CRD

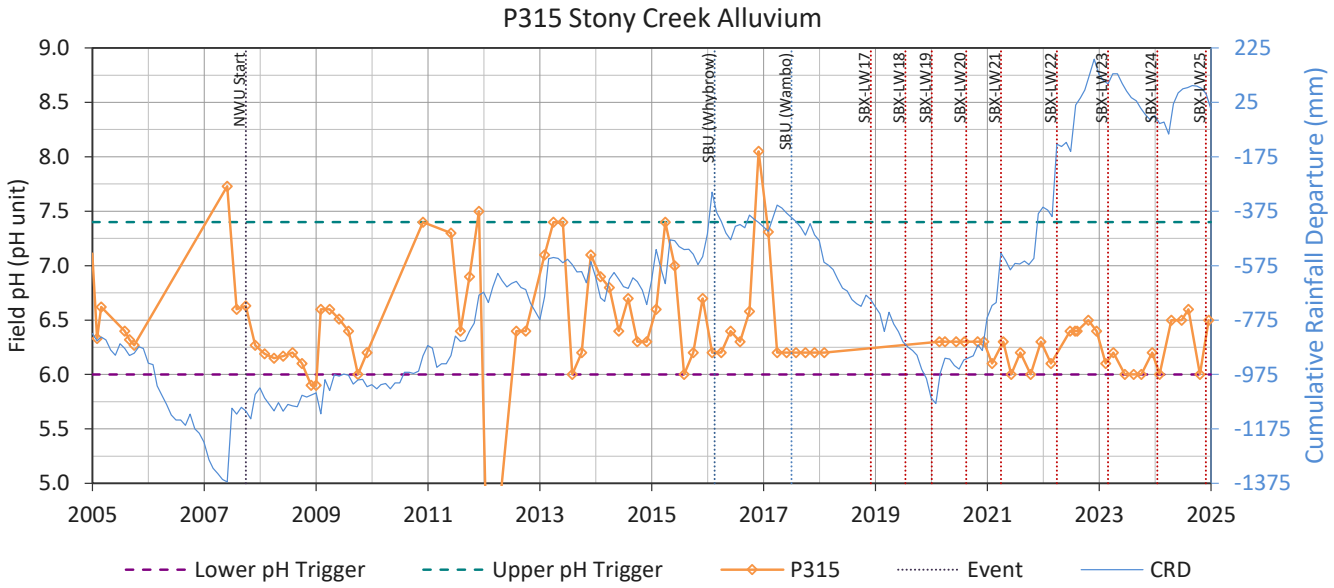

P316b Wambo Creek Shallow Permian
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P316b
Event
CRD

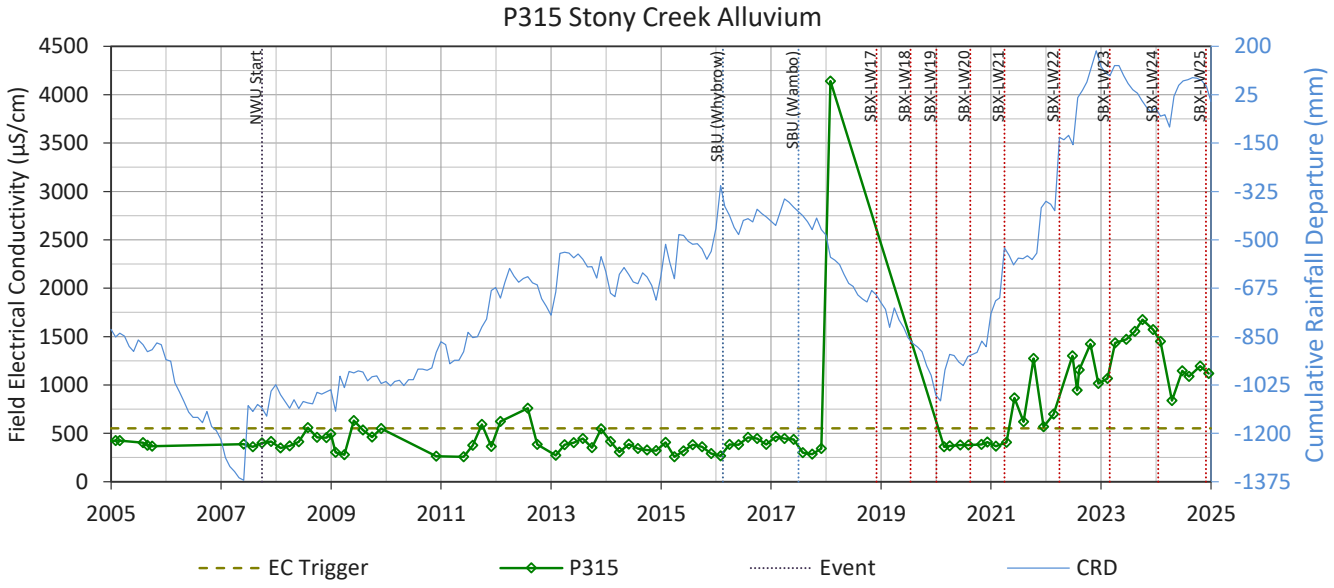

P316c Wambo Creek Permian Coal Measures
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P316c
Event
CRD

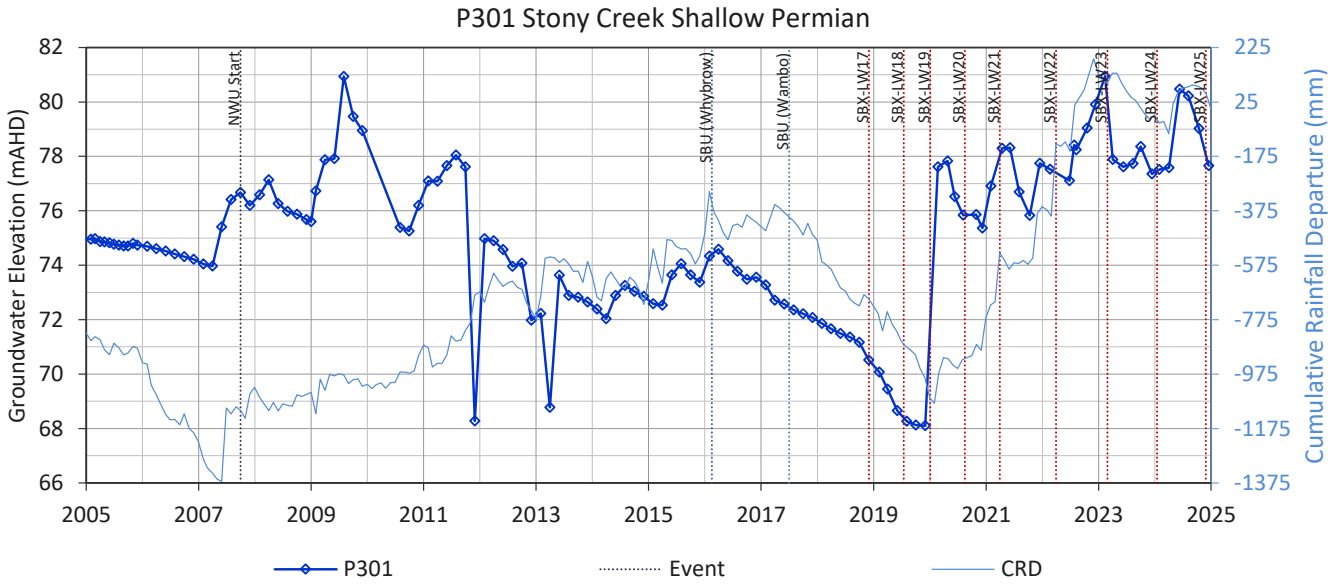

P316c Wambo Creek Permian Coal Measures
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P316c
Event
CRD

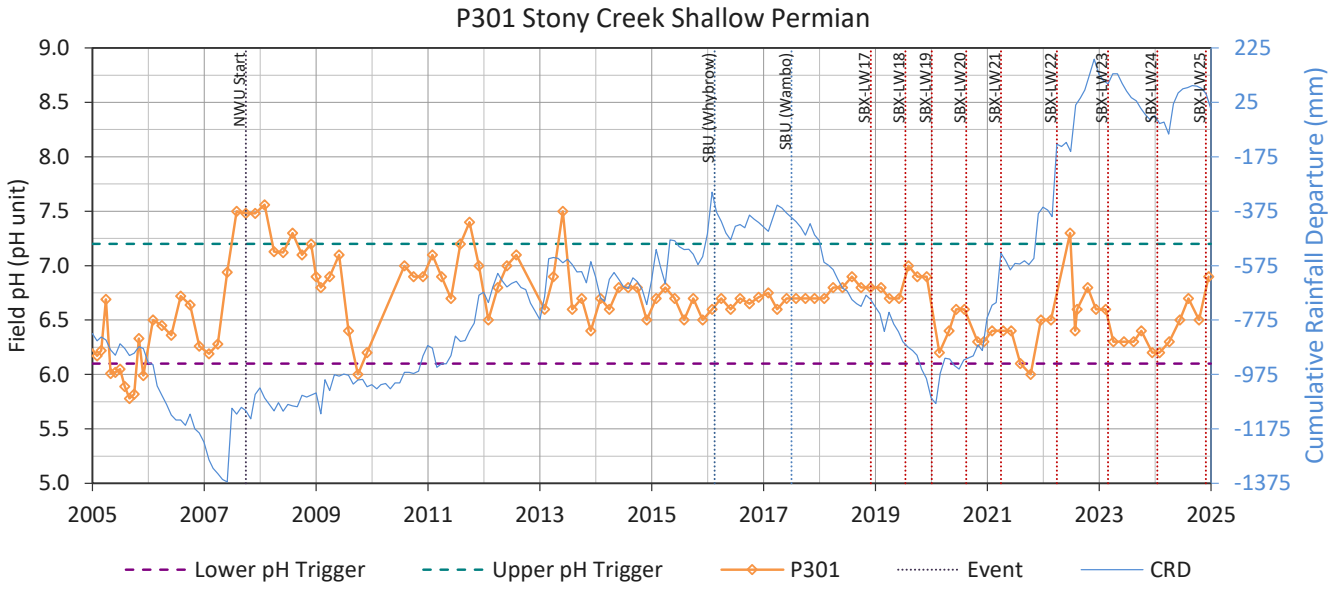

P316c Wambo Creek Permian Coal Measures
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P316c
Event
CRD

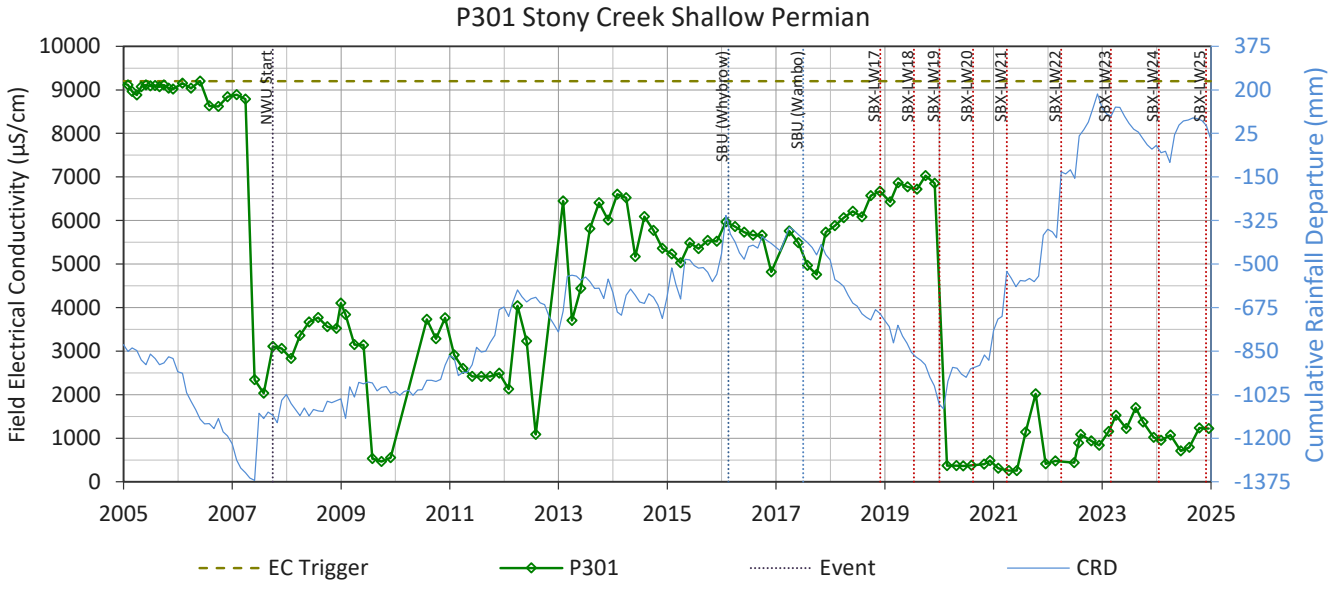

P315 Stony Creek Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P315
Event
CRD

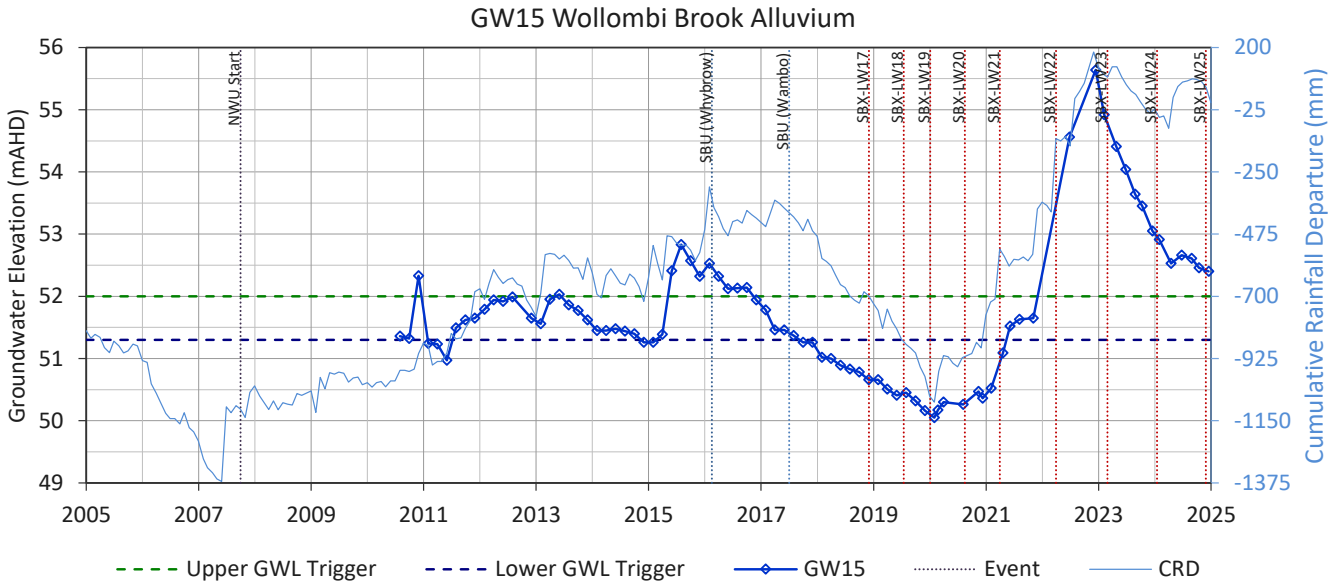

P315 Stony Creek Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
Lower pH Trigger
Upper pH Trigger
P315
Event
CRD

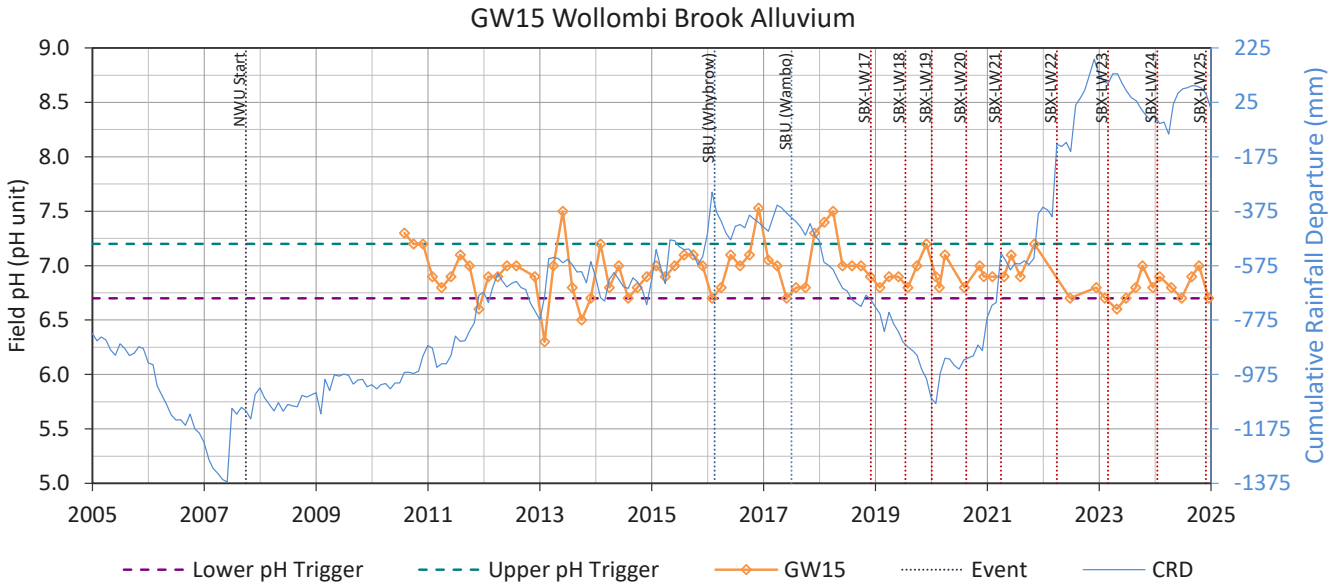

P315 Stony Creek Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
EC Trigger
P315
Event
CRD

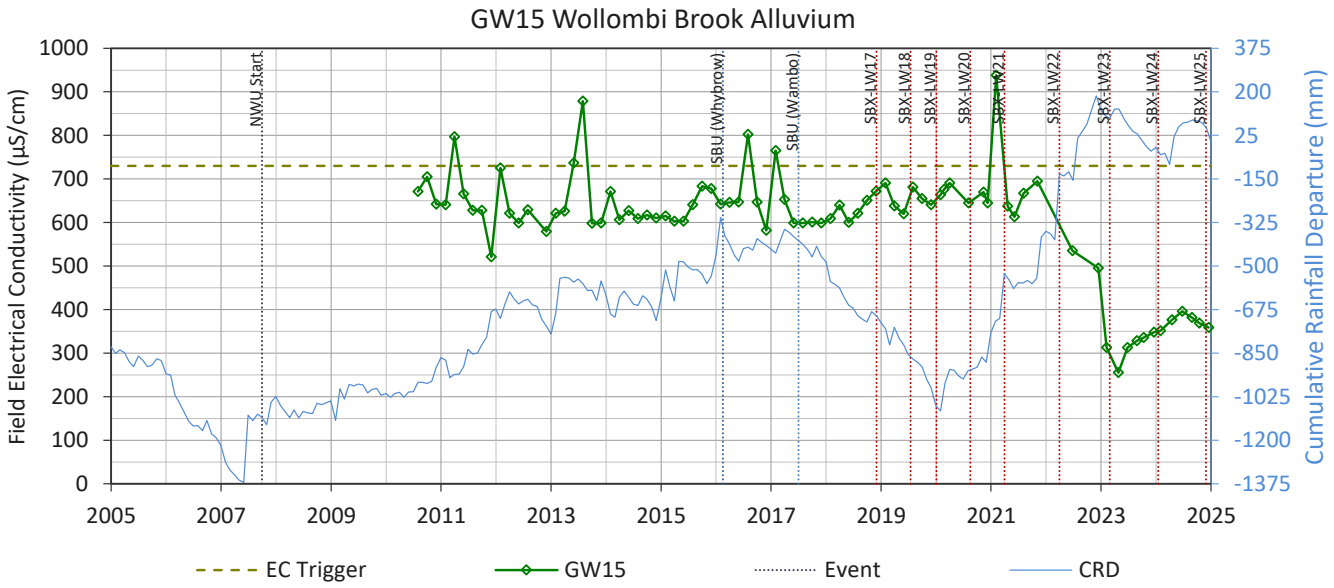

P301 Stony Creek Shallow Permian
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P301
Event
CRD

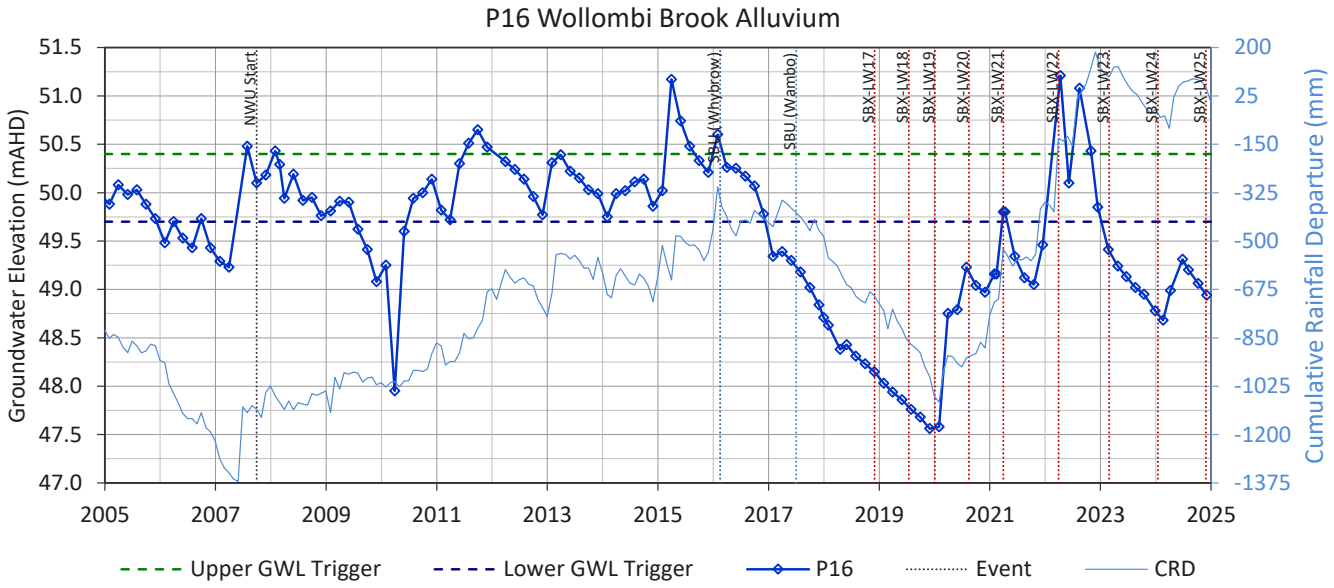

P301 Stony Creek Shallow Permian
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
Lower pH Trigger
Upper pH Trigger
P301
Event
CRD

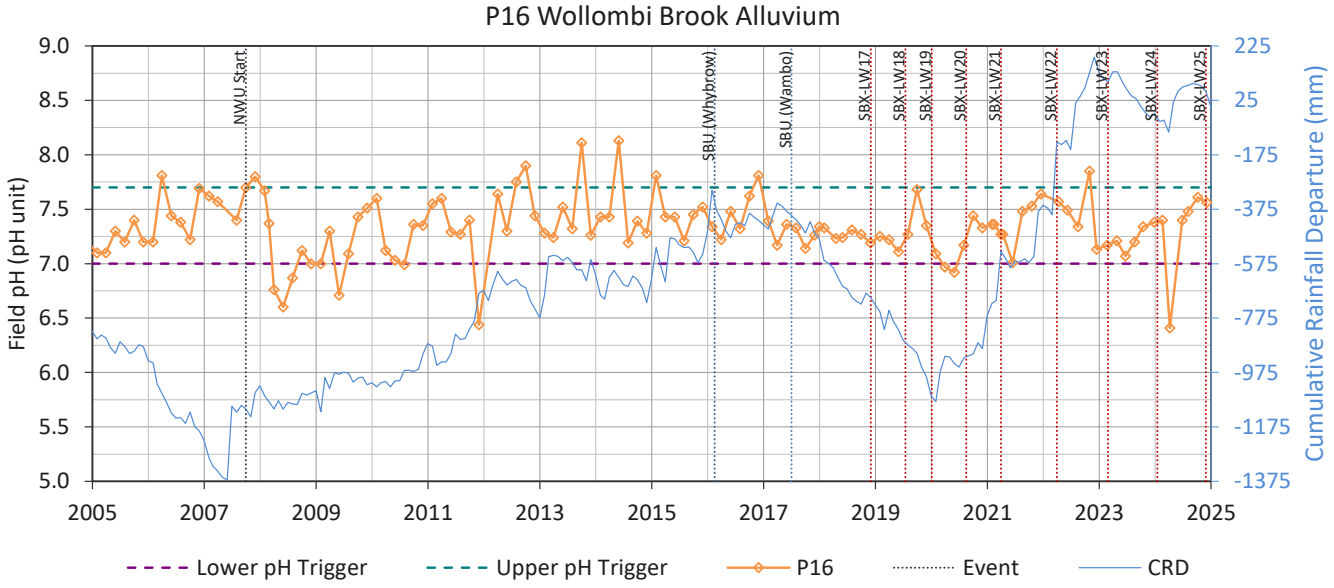

P301 Stony Creek Shallow Permian
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
EC Trigger
P301
Event
CRD

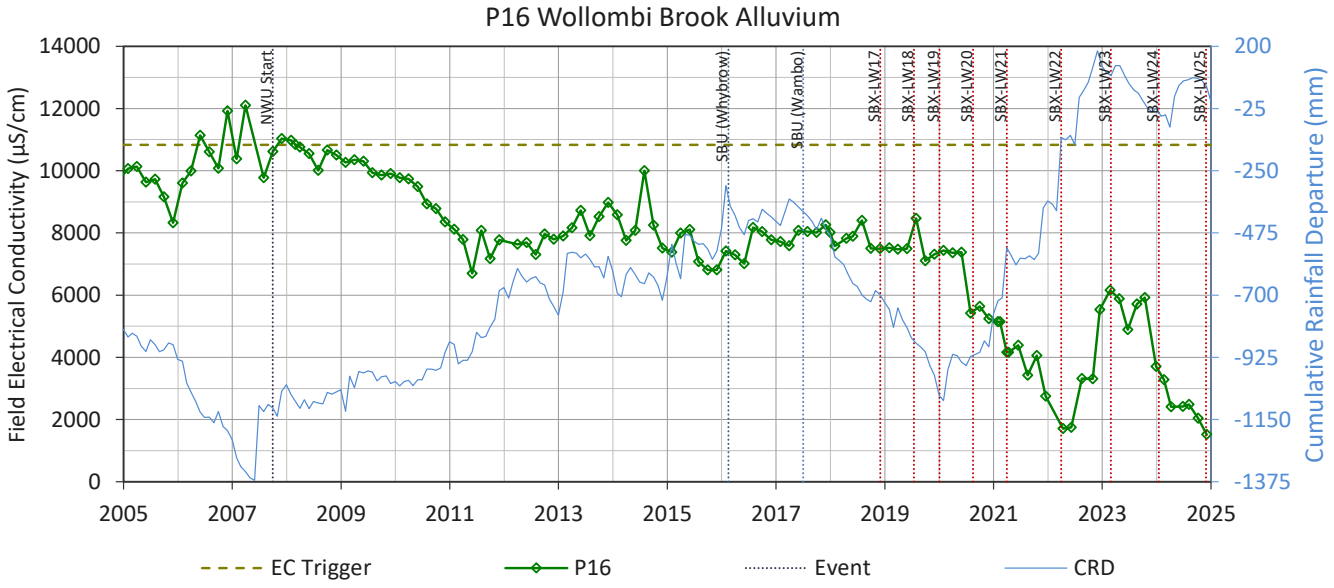

GW15 Wollombi Brook Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
Upper GWL Trigger
Lower GWL Trigger
GW15
Event
CRD

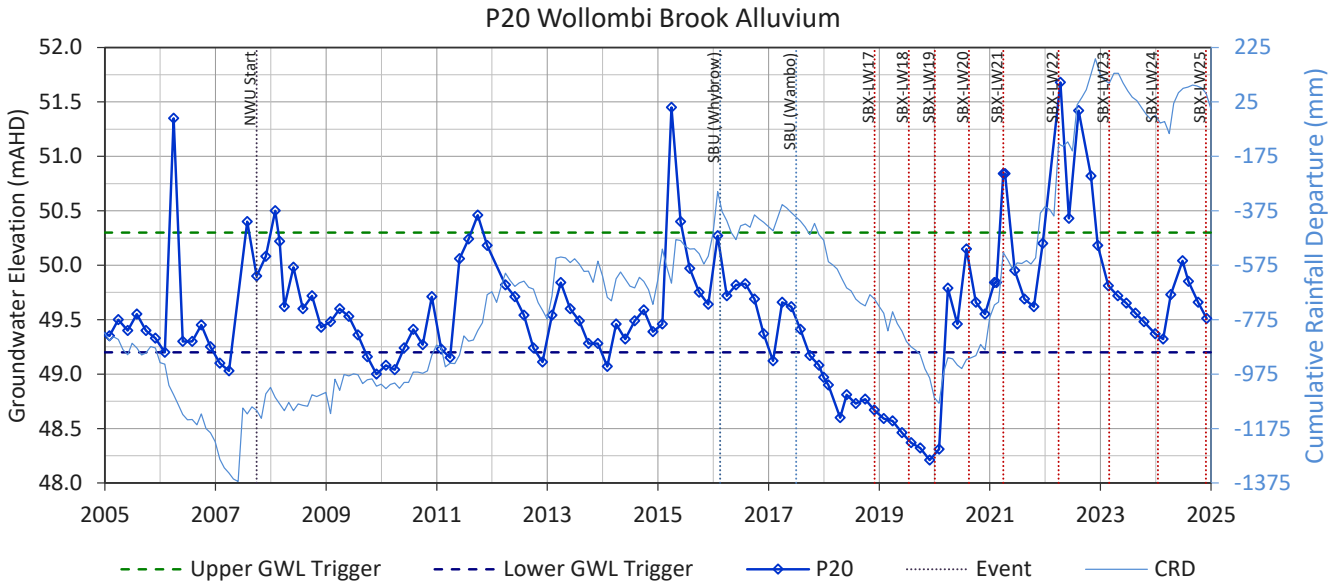

GW15 Wollombi Brook Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
Lower pH Trigger
Upper pH Trigger
GW15
Event
CRD

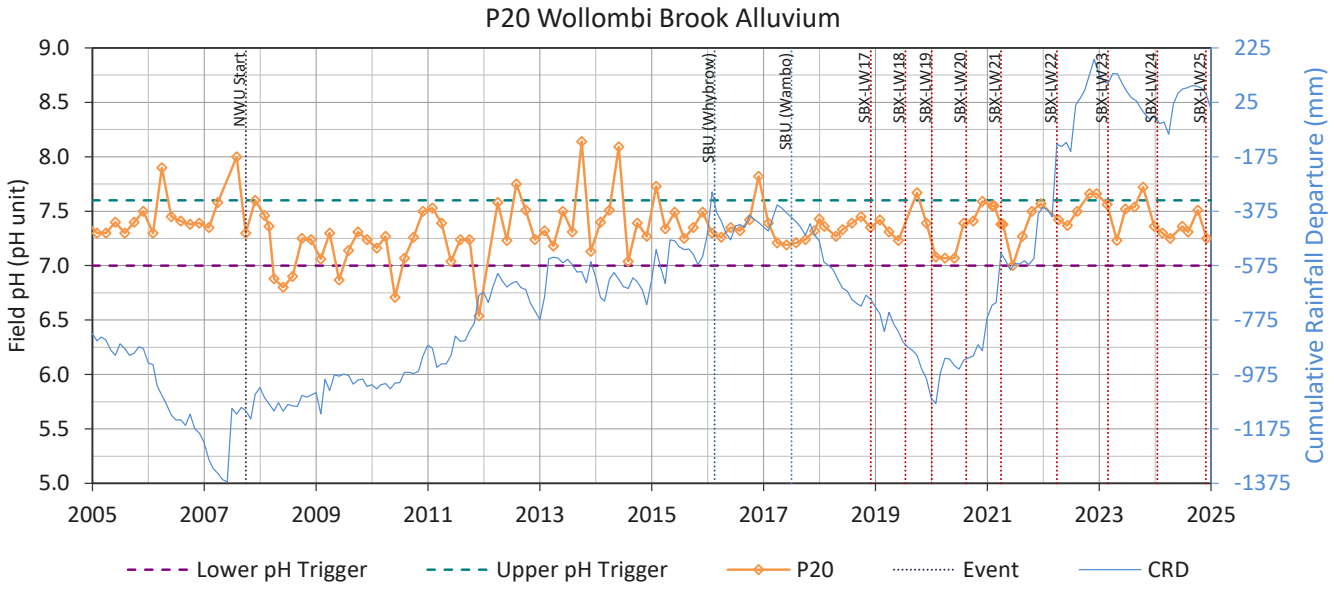

GW15 Wollombi Brook Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
EC Trigger
GW15
Event
CRD

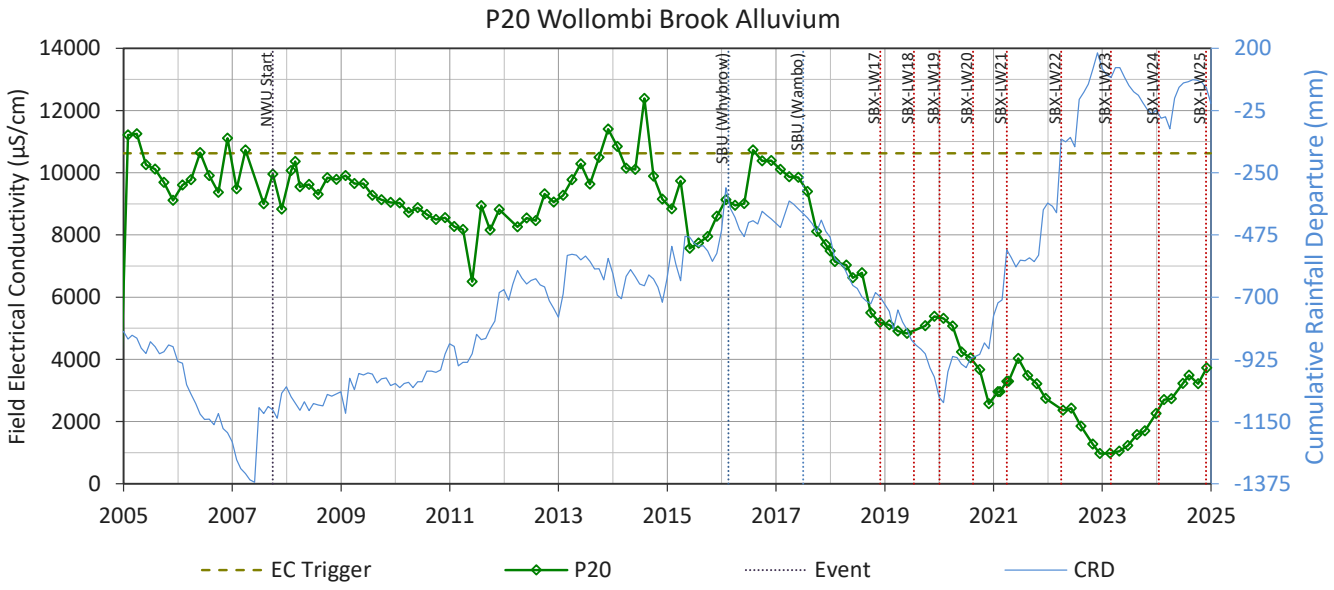

P16 Wollombi Brook Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
Upper GWL Trigger
Lower GWL Trigger
P16
Event
CRD

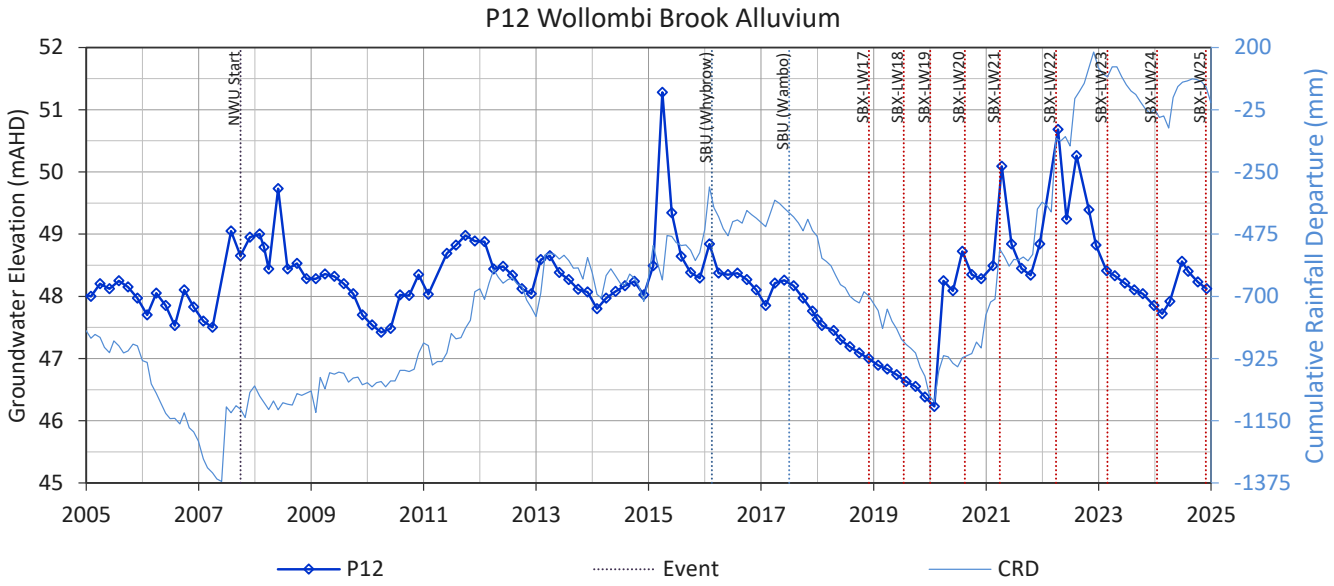

P16 Wollombi Brook Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
Lower pH Trigger
Upper pH Trigger
P16
Event
CRD

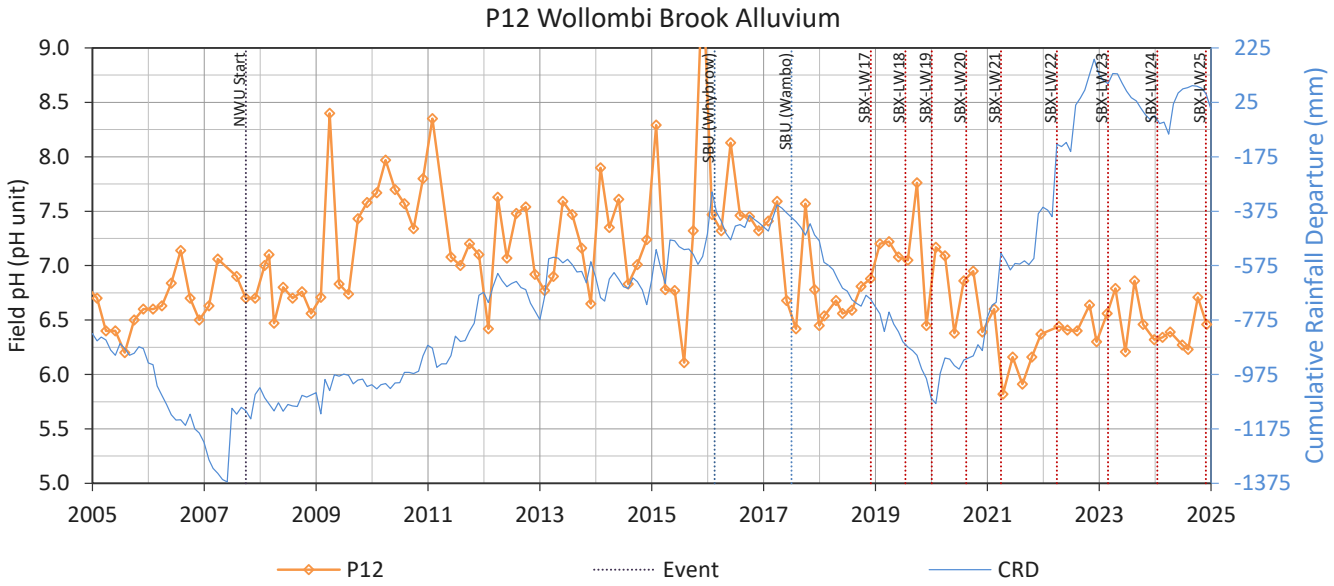

P16 Wollombi Brook Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
EC Trigger
P16
Event
CRD

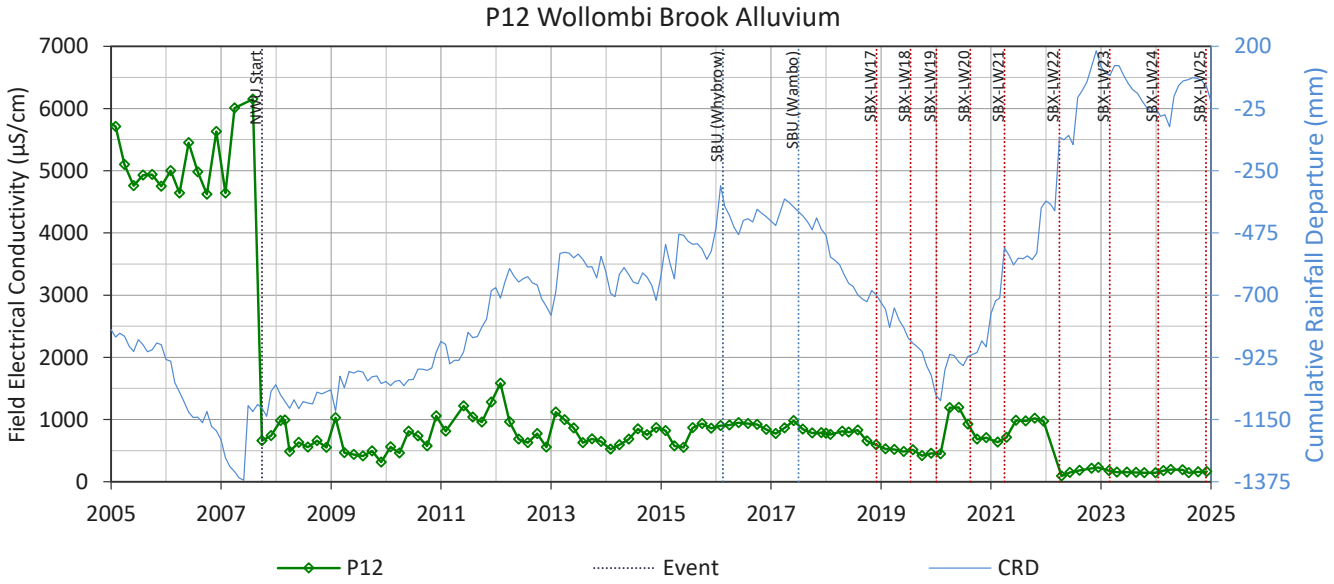

P20 Wollombi Brook Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
Upper GWL Trigger
Lower GWL Trigger
P20
Event
CRD

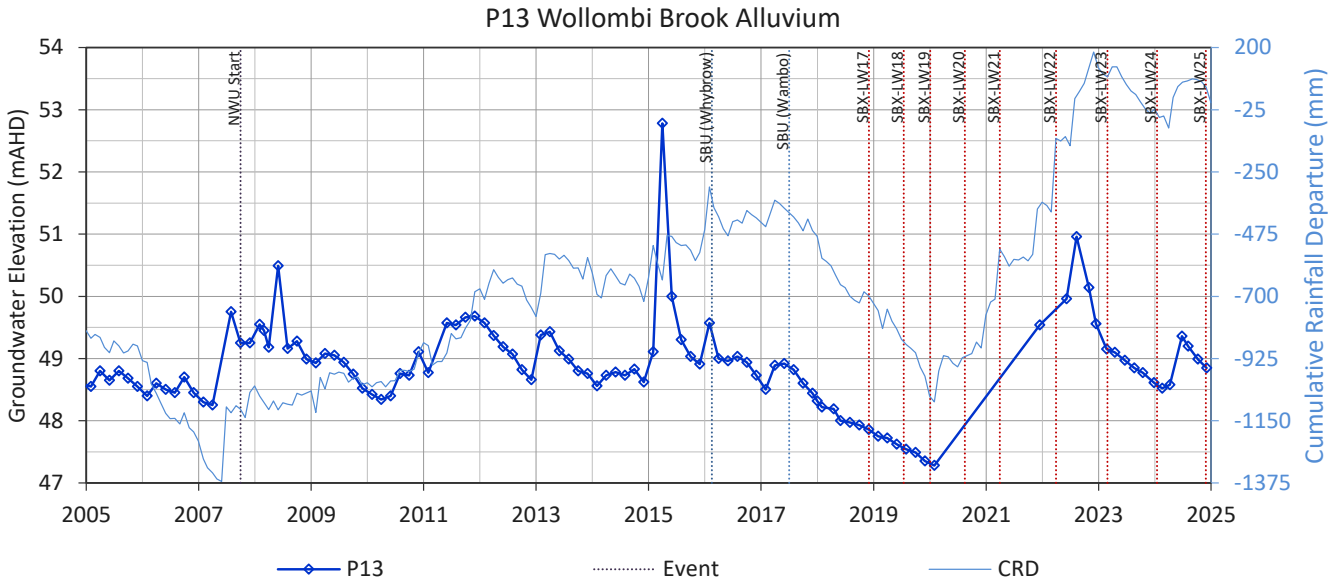

P20 Wollombi Brook Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
Lower pH Trigger
Upper pH Trigger
P20
Event
CRD

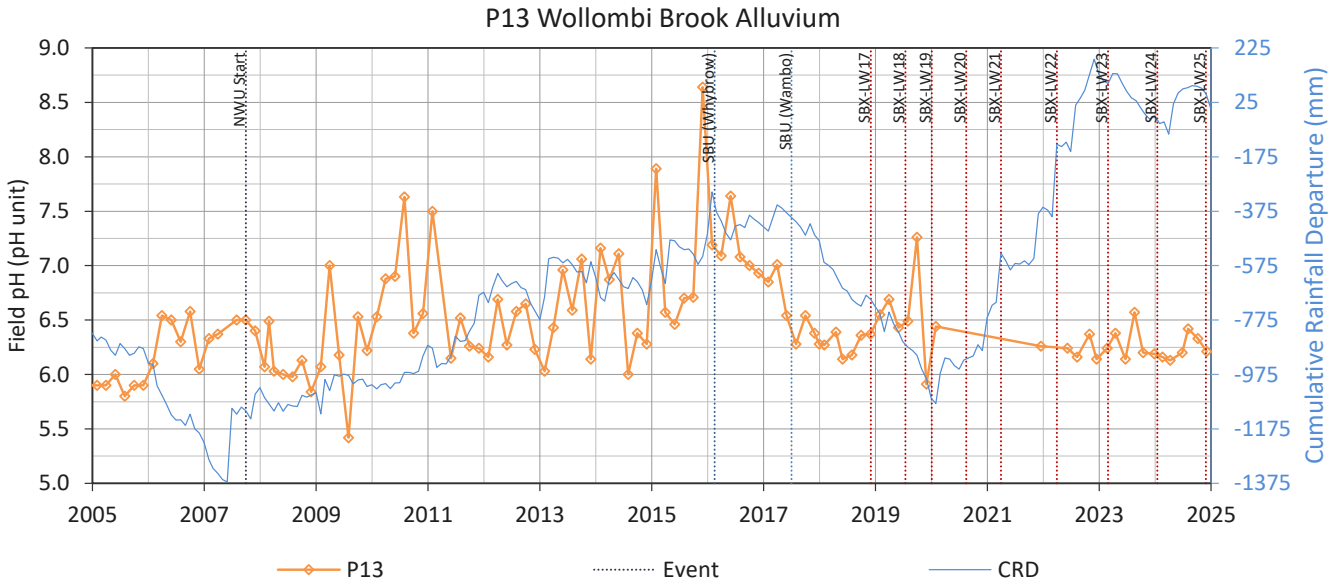

P20 Wollombi Brook Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
EC Trigger
P20
Event
CRD

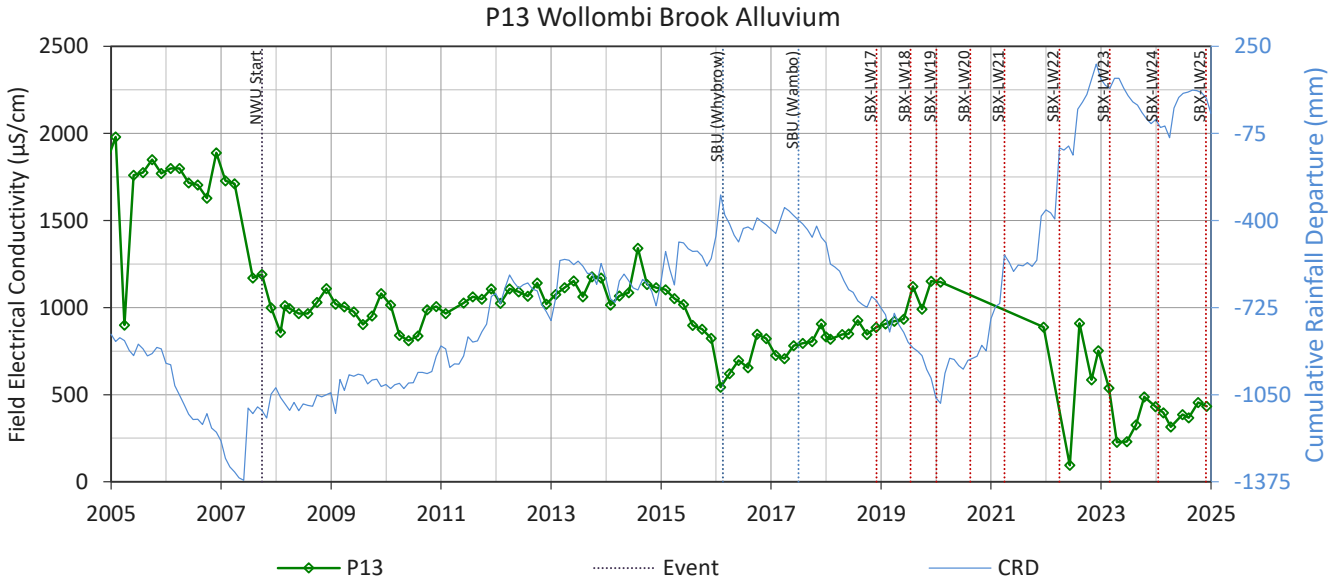

P12 Wollombi Brook Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P12
Event
CRD

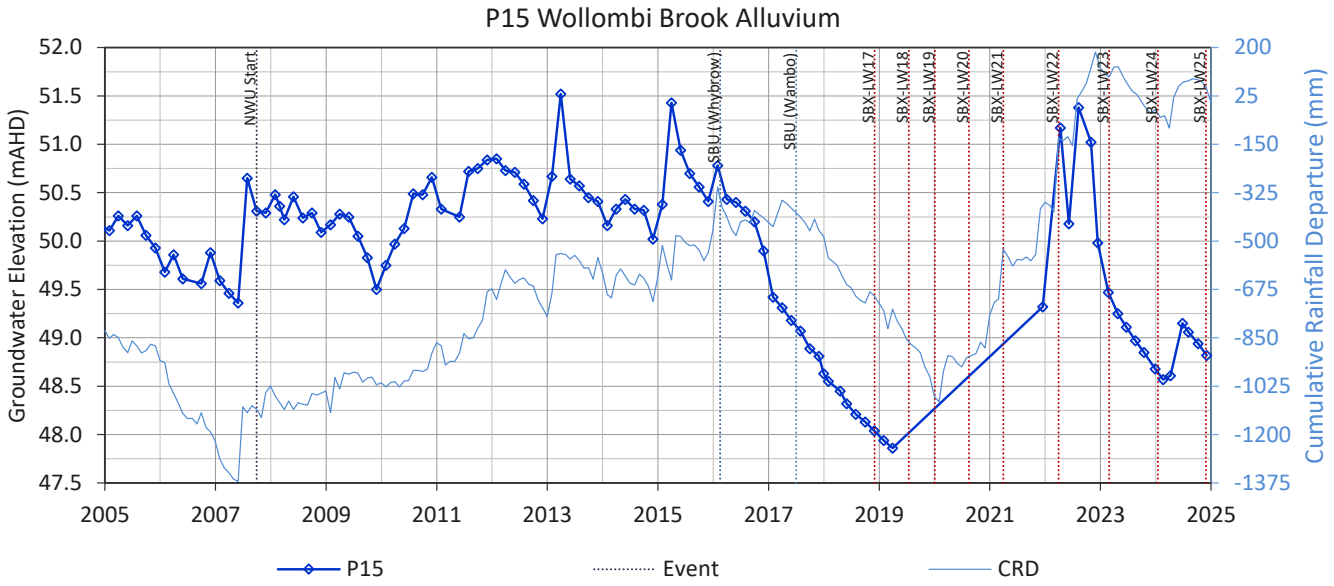

P12 Wollombi Brook Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P12
Event
CRD

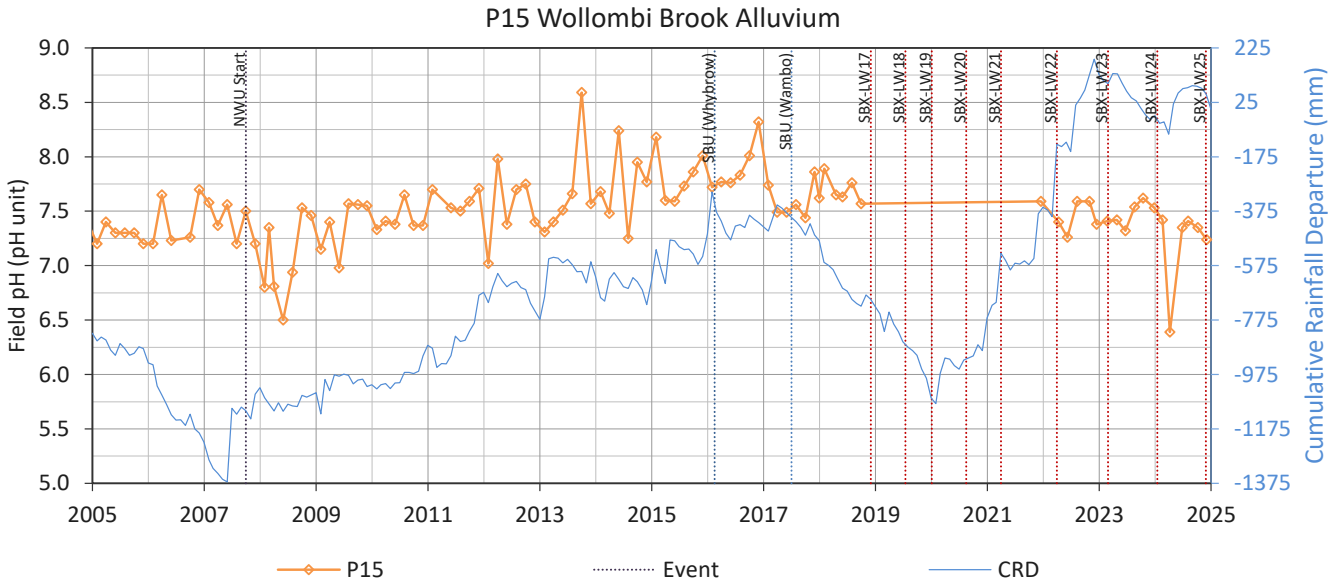

P12 Wollombi Brook Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P12
Event
CRD

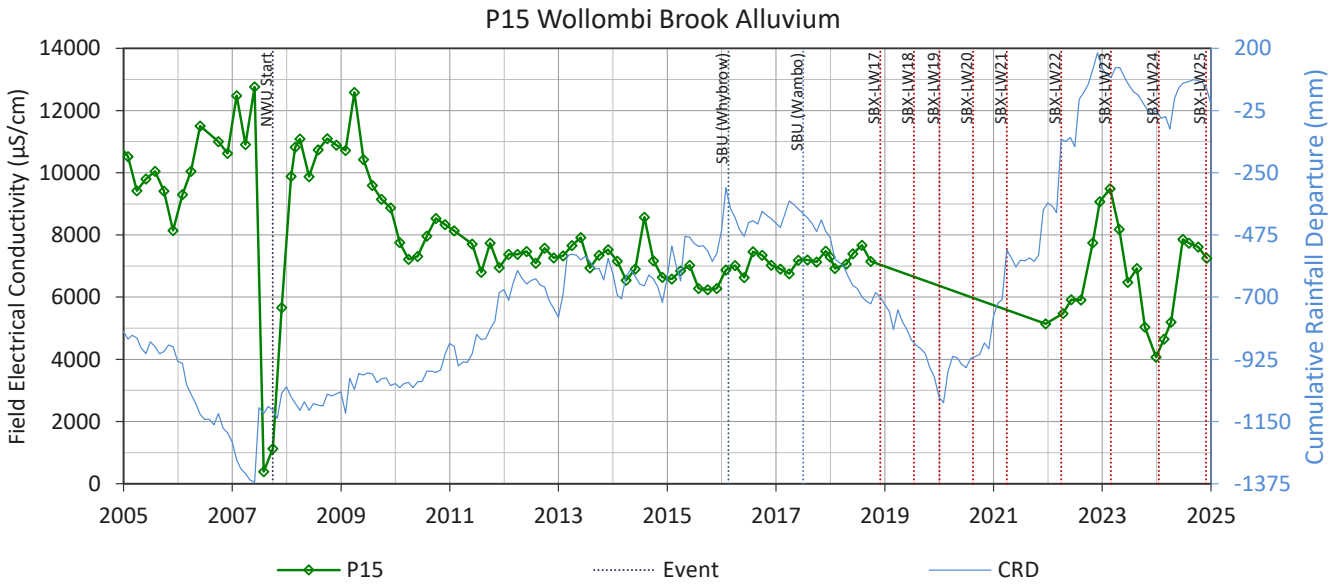

P13 Wollombi Brook Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P13
Event
CRD

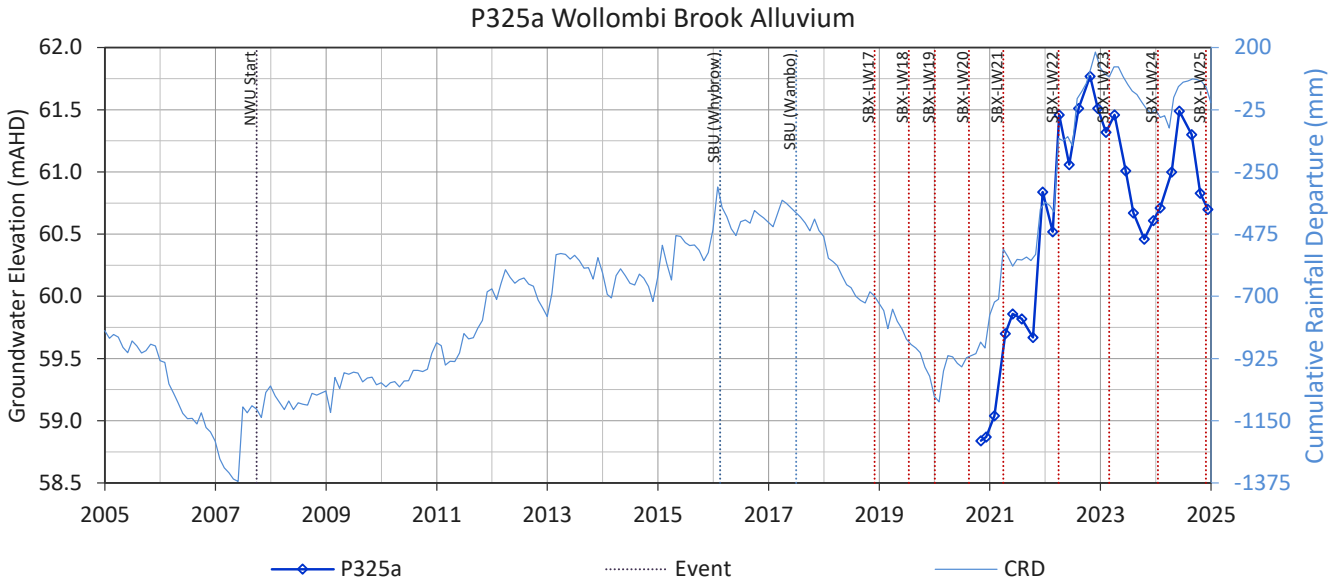

P13 Wollombi Brook Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P13
Event
CRD

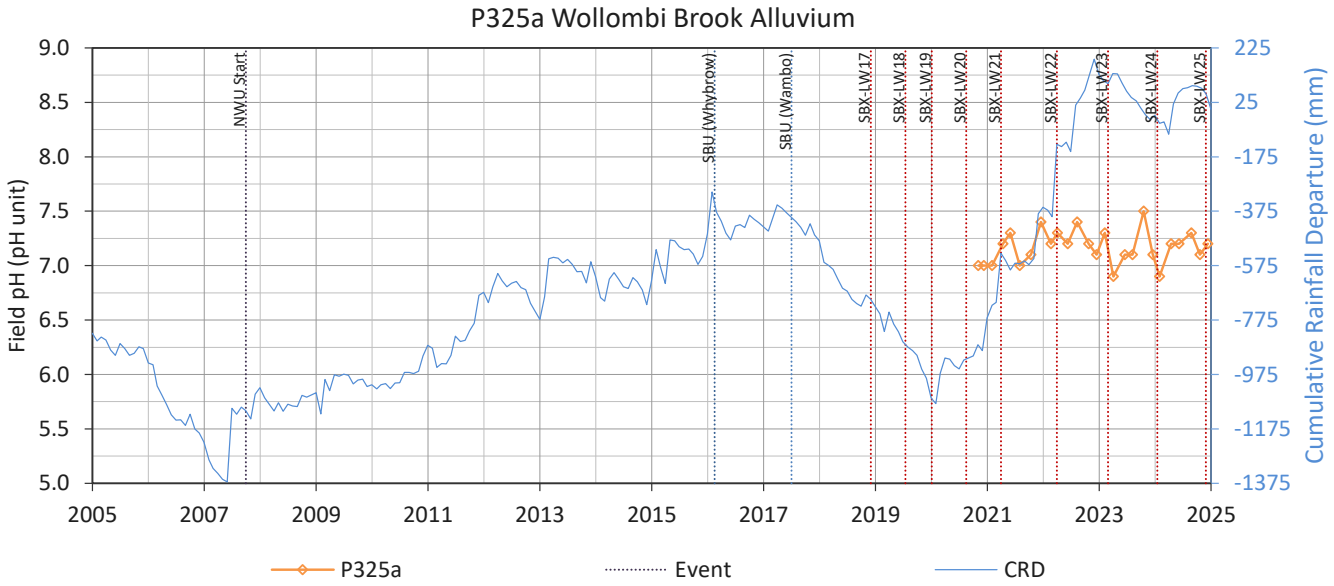

P13 Wollombi Brook Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P13
Event
CRD

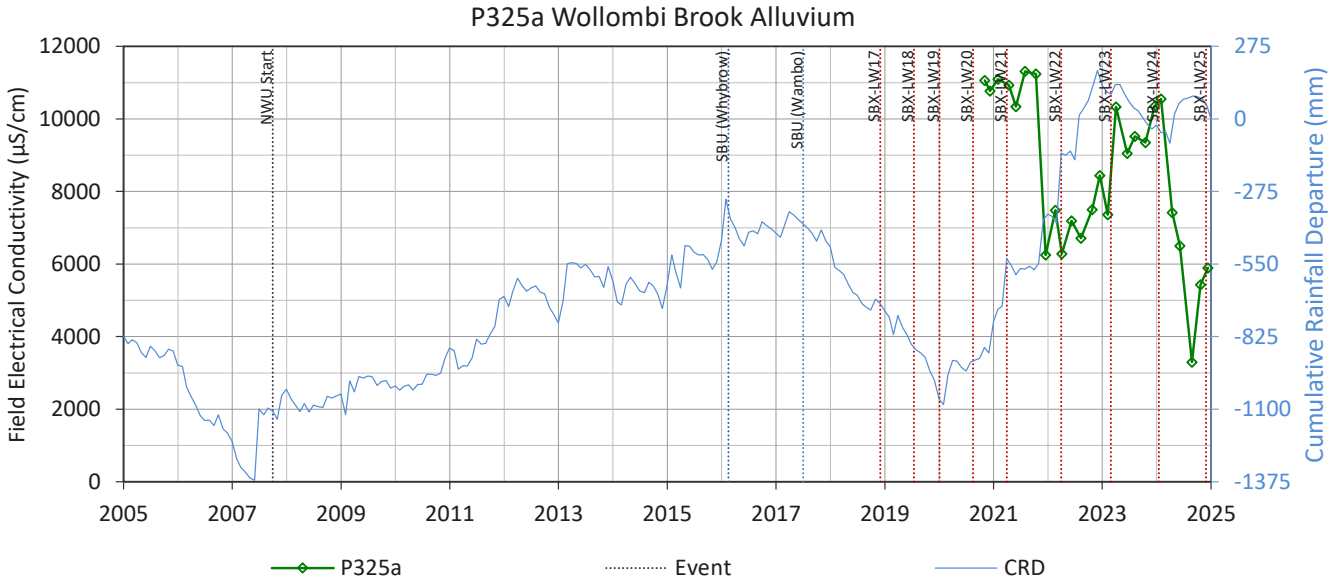

P15 Wollombi Brook Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P15
Event
CRD

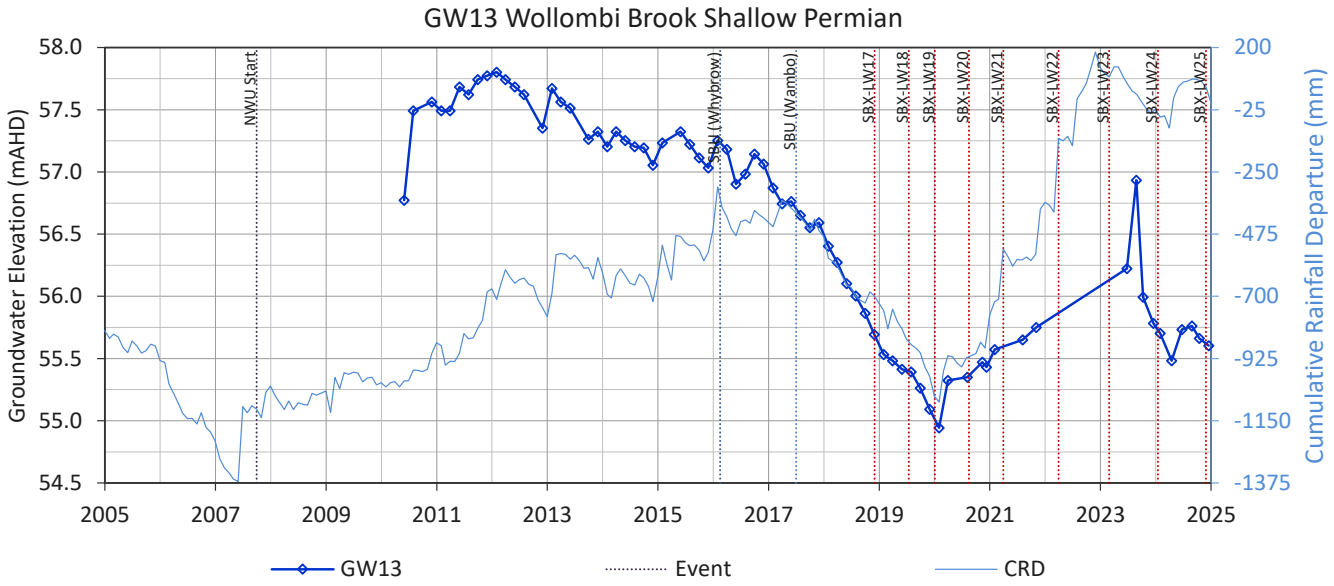

P15 Wollombi Brook Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P15
Event
CRD

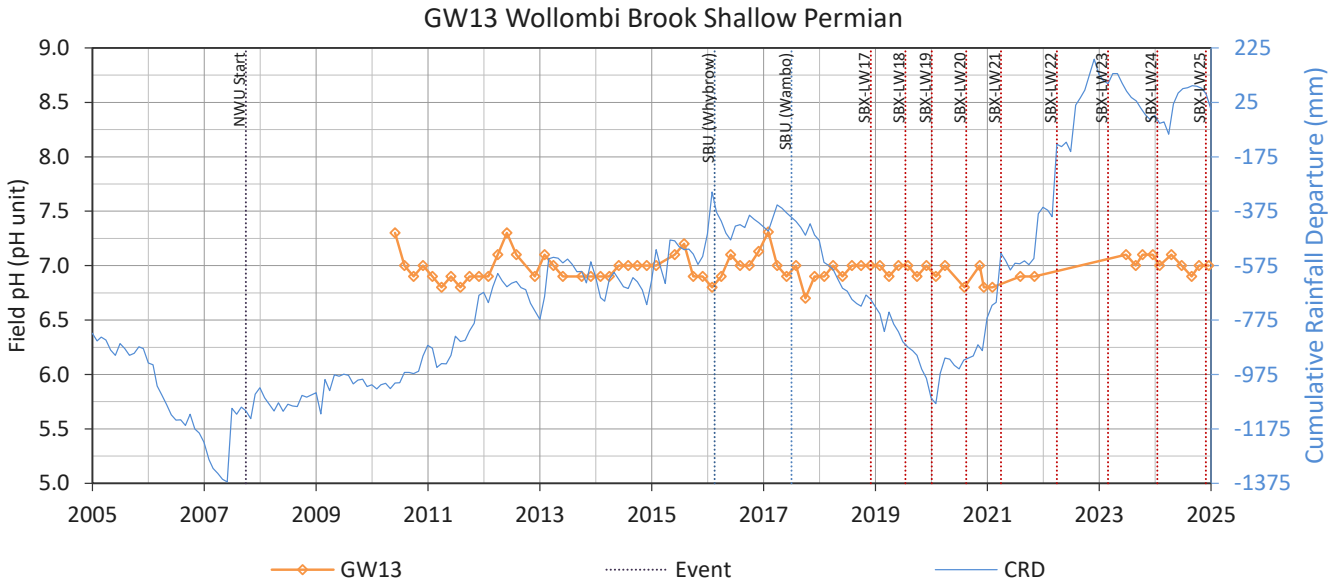

P15 Wollombi Brook Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P15
Event
CRD

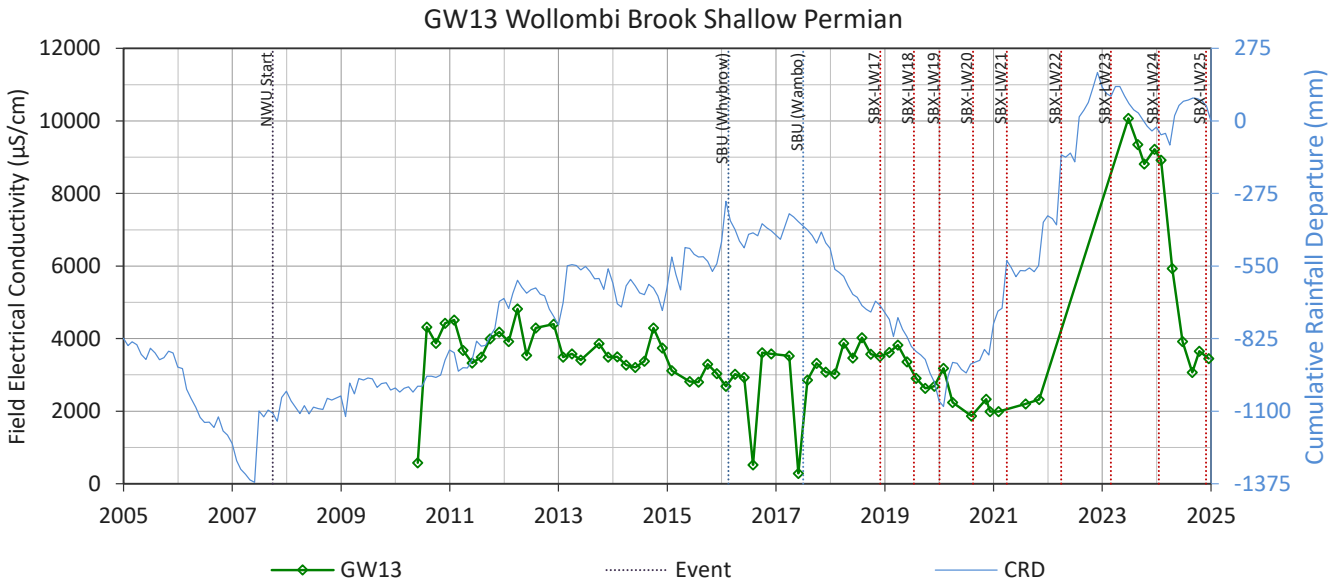

P325a Wollombi Brook Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P325a
Event
CRD

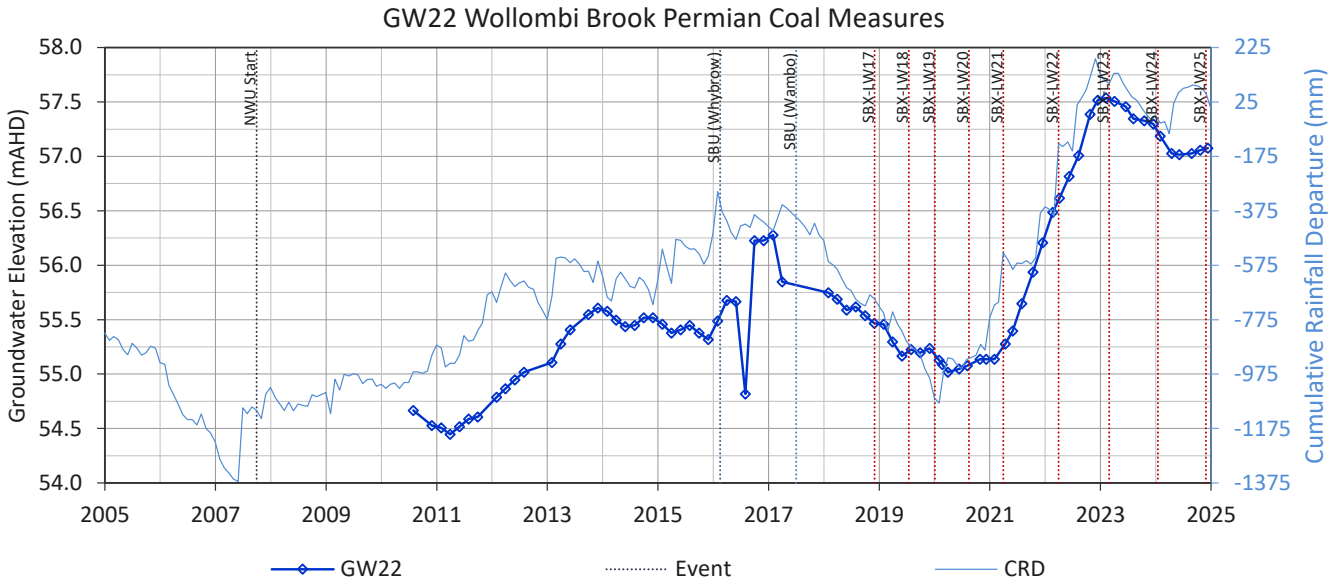

P325a Wollombi Brook Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P325a
Event
CRD

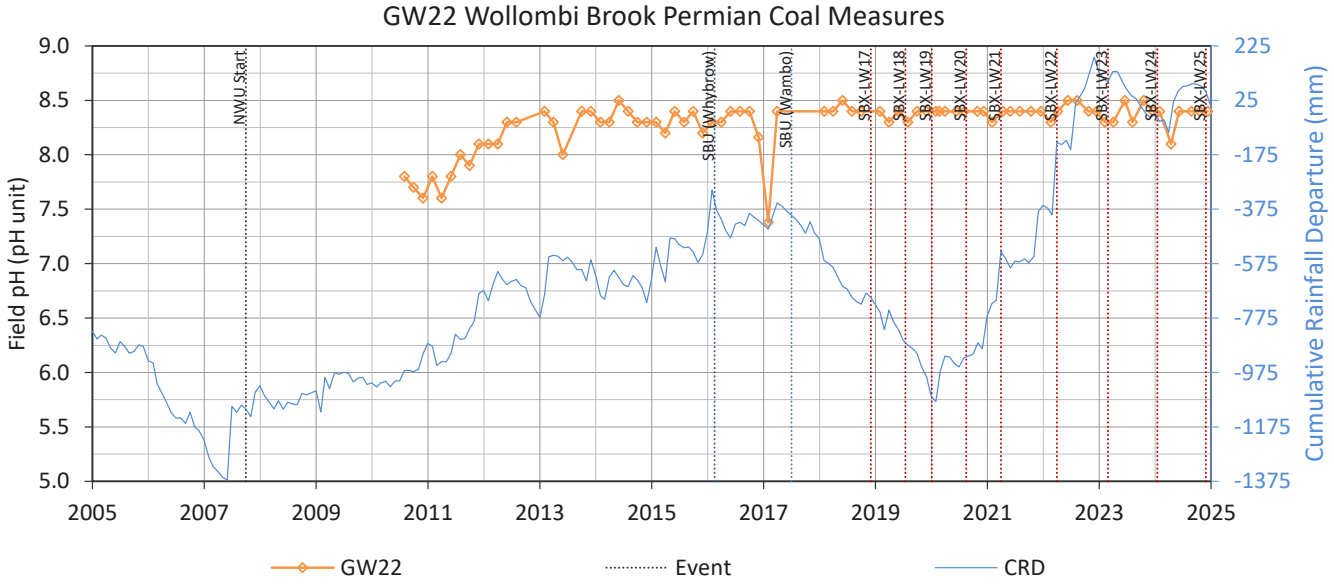

P325a Wollombi Brook Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P325a
Event
CRD

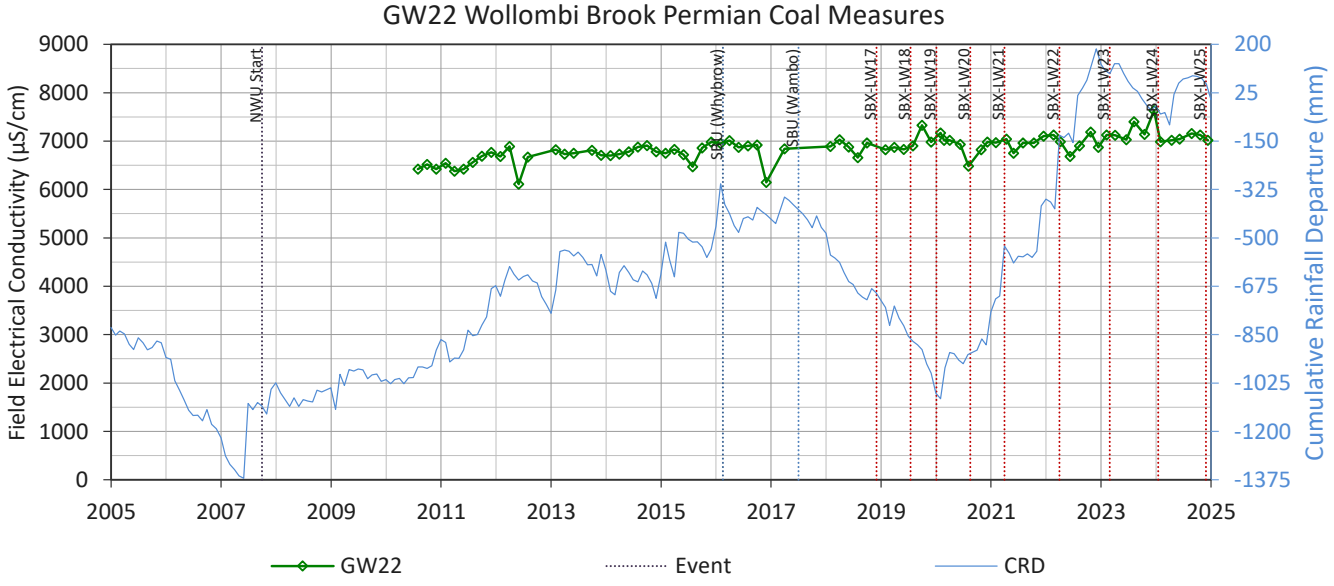

GW13 Wollombi Brook Shallow Permian
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW13
Event
CRD

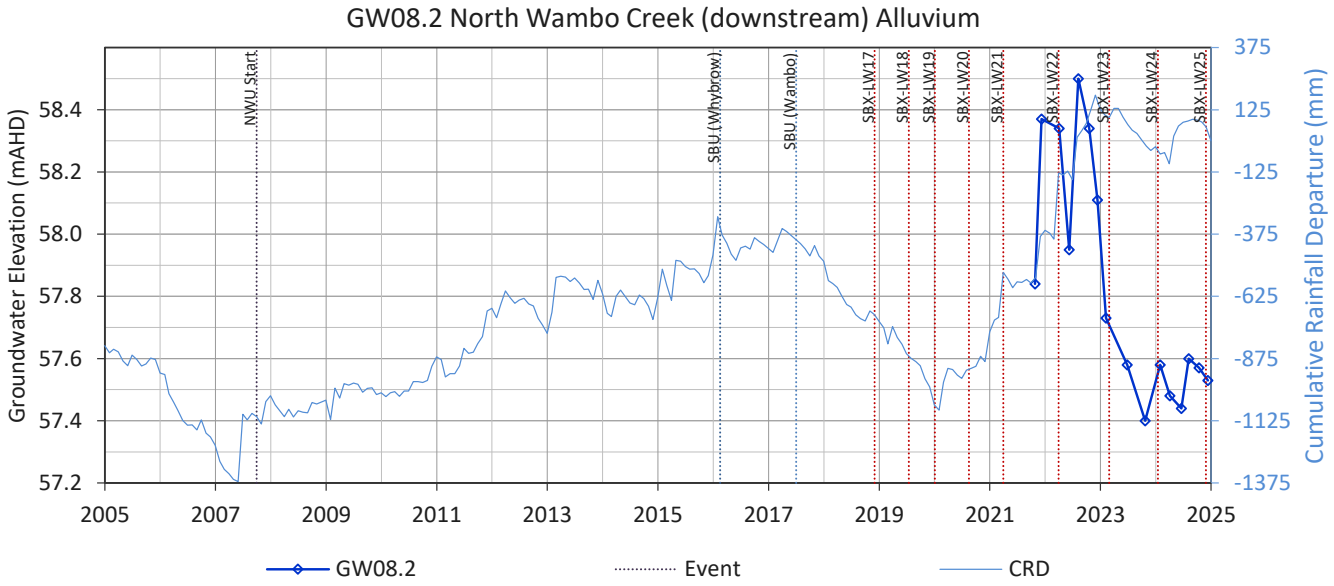

GW13 Wollombi Brook Shallow Permian
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW13
Event
CRD

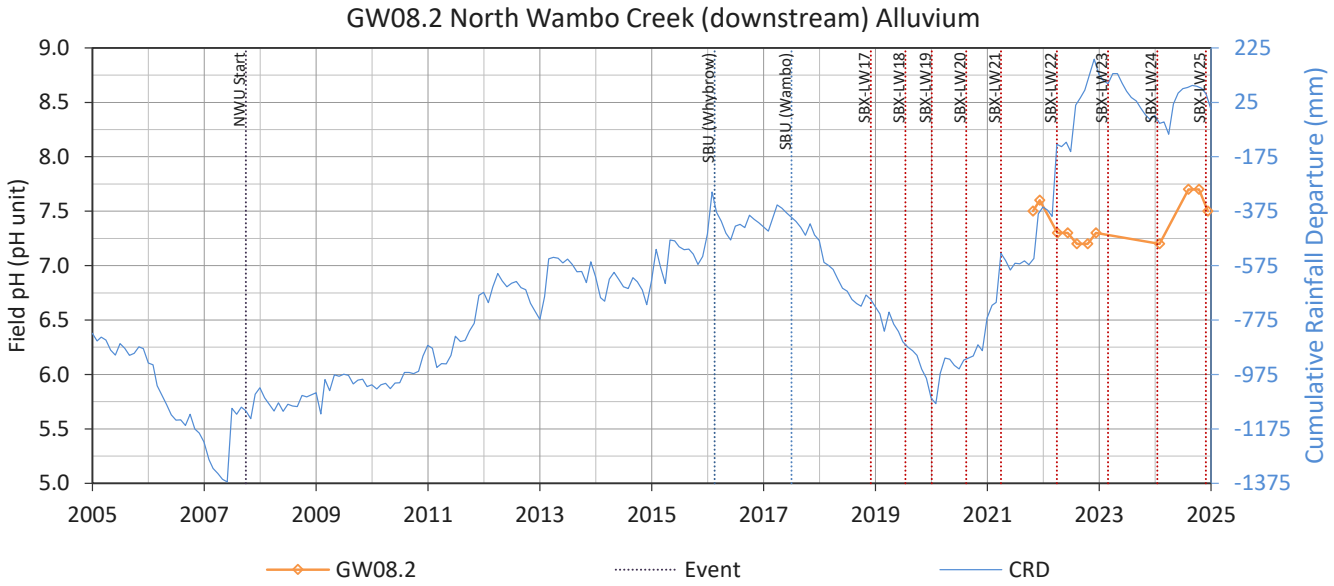

GW13 Wollombi Brook Shallow Permian
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW13
Event
CRD

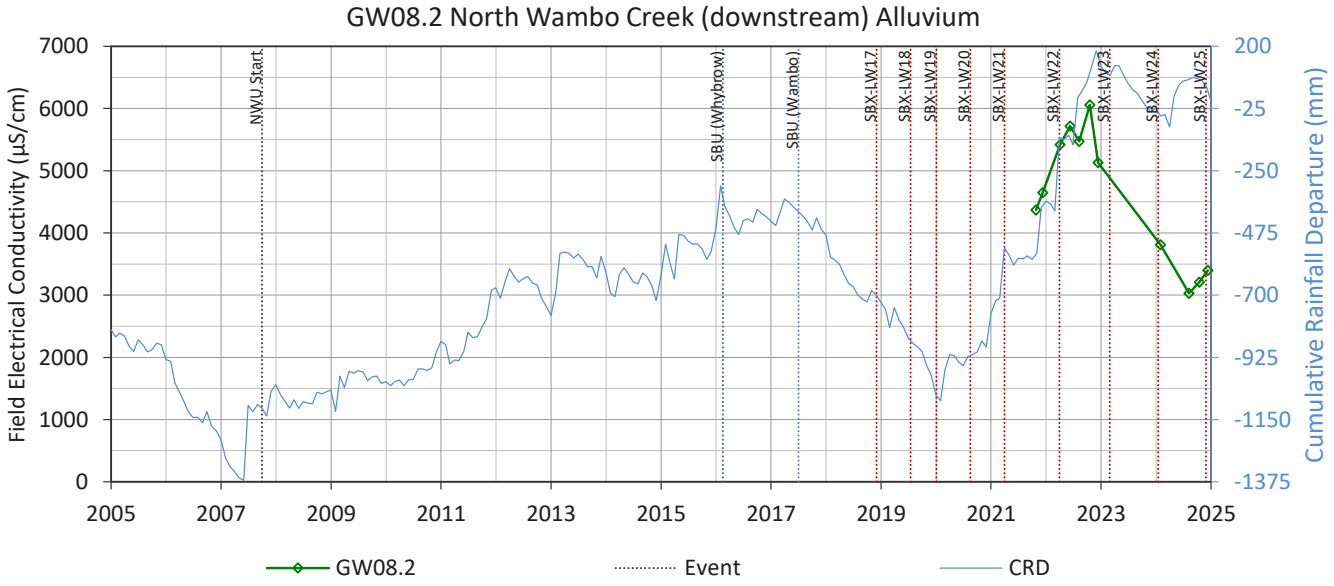

GW22 Wollombi Brook Permian Coal Measures
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW22
Event
CRD

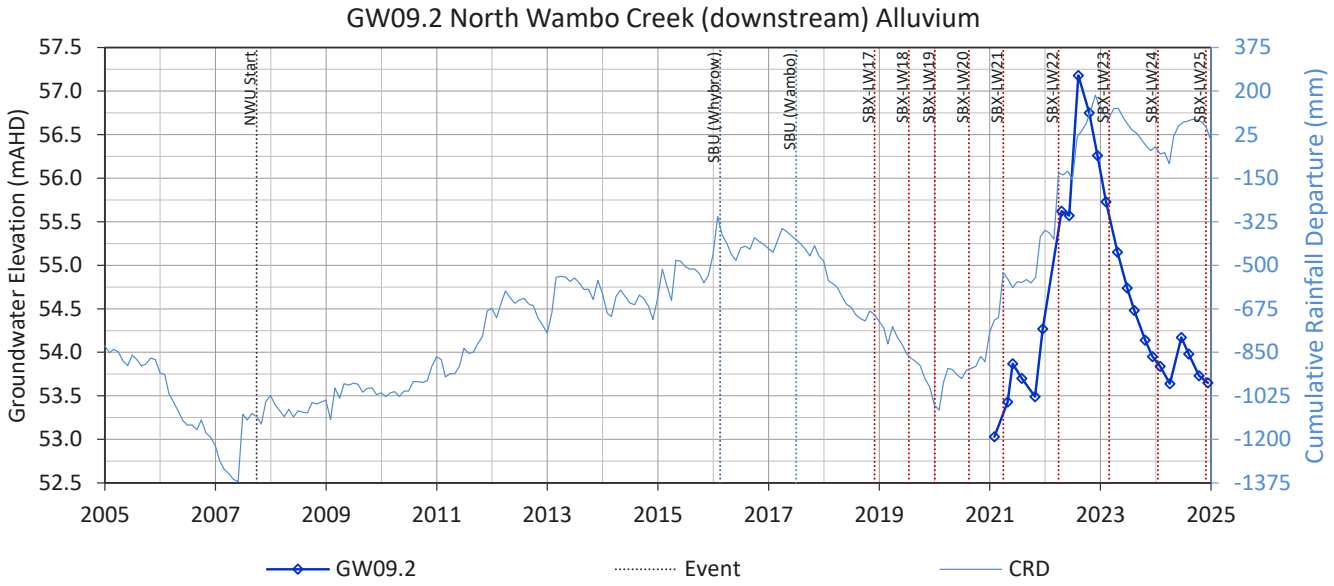

GW22 Wollombi Brook Permian Coal Measures
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW22
Event
CRD

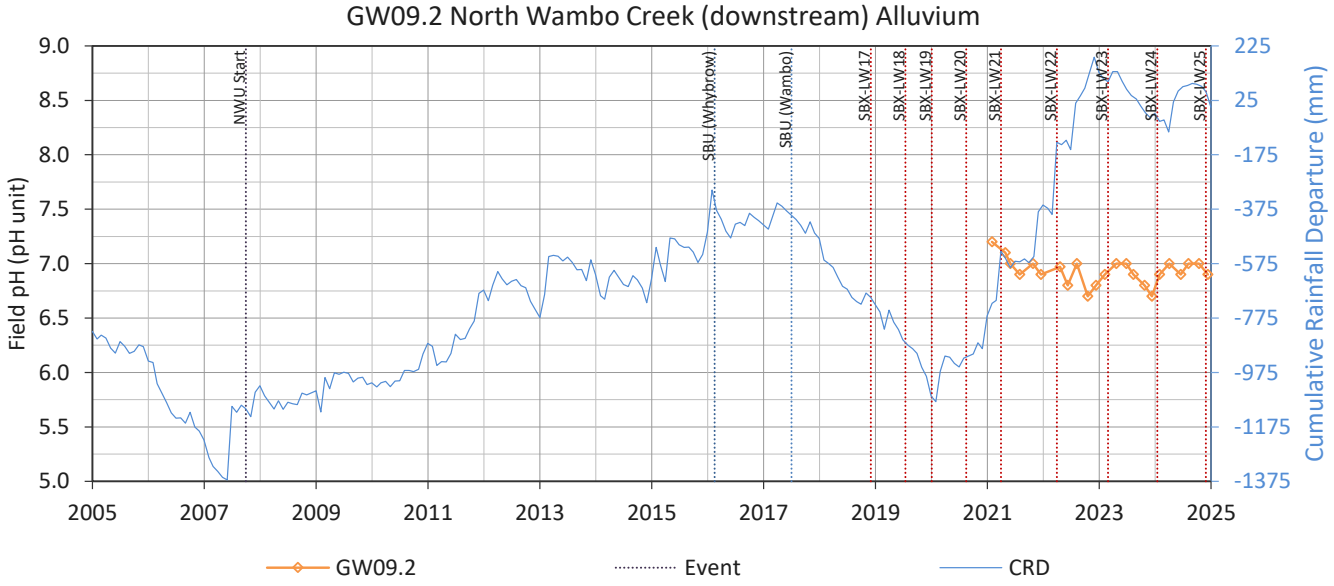

GW22 Wollombi Brook Permian Coal Measures
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW22
Event
CRD

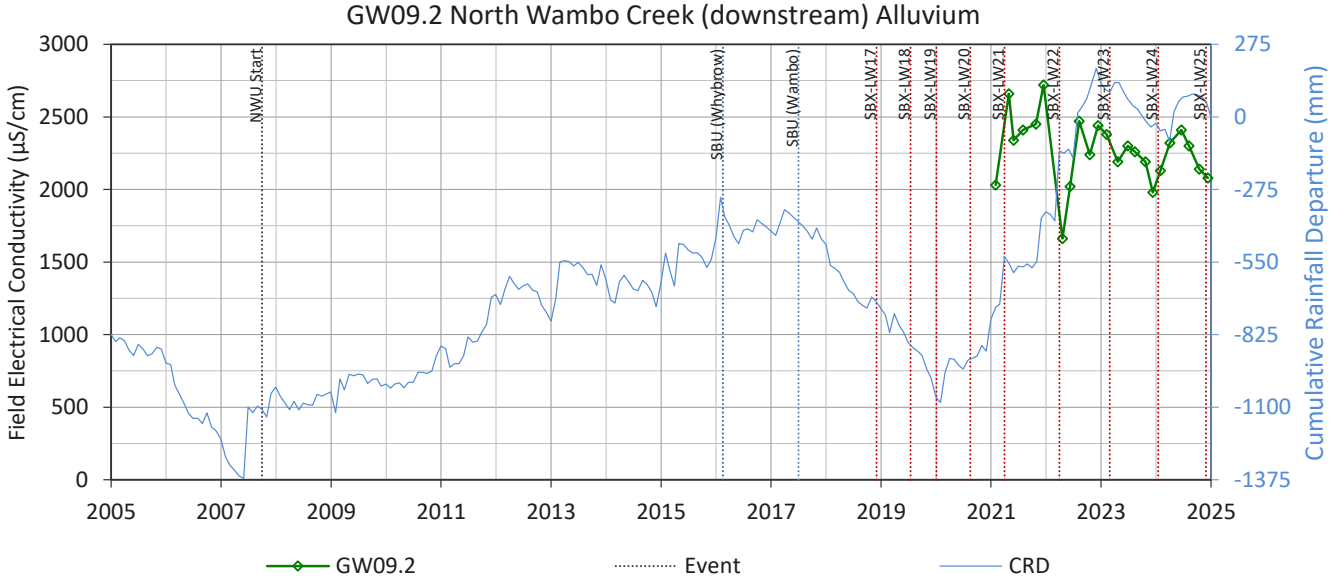

GW08.2 North Wambo Creek (downstream) Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW08.2
Event
CRD

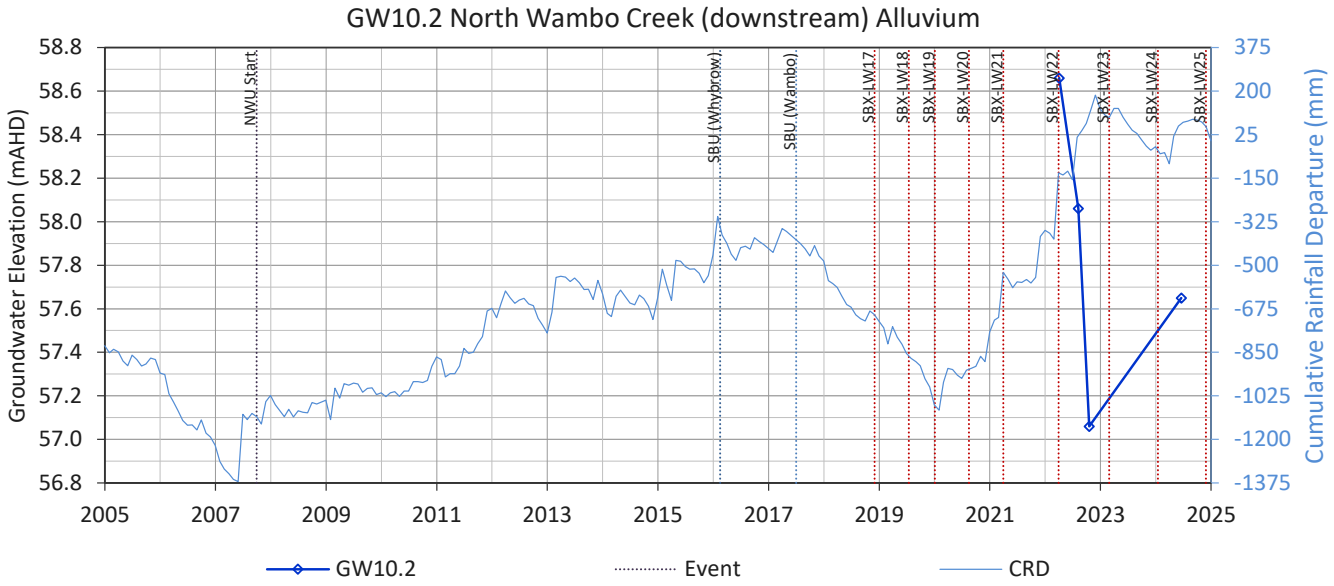

GW08.2 North Wambo Creek (downstream) Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW08.2
Event
CRD

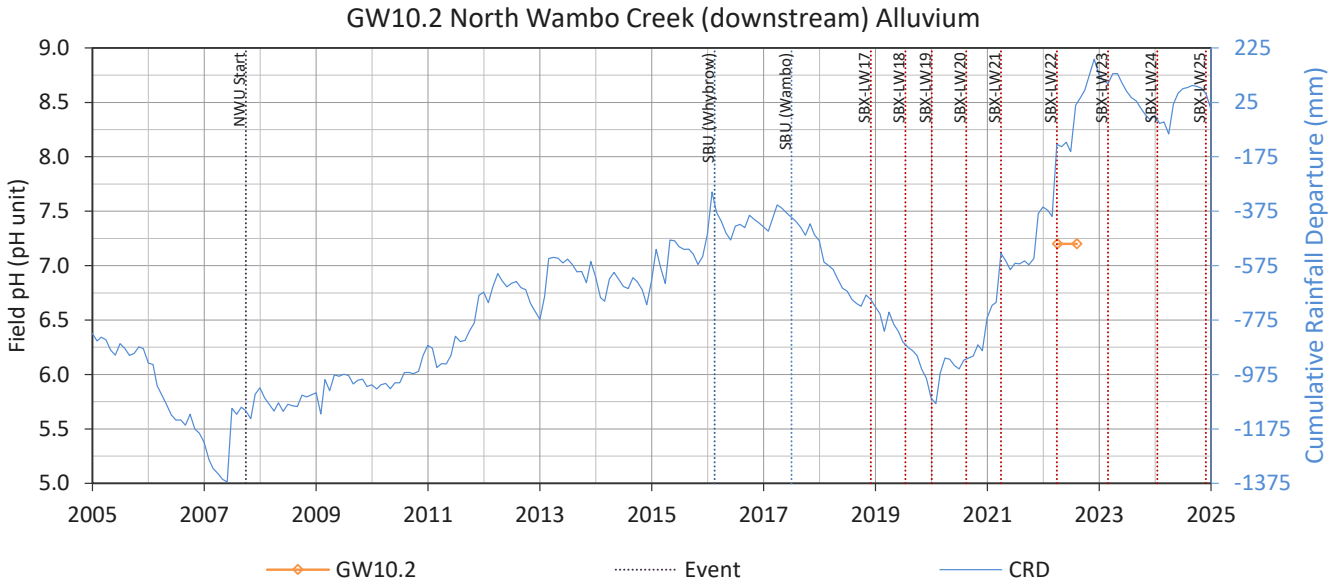

GW08.2 North Wambo Creek (downstream) Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW08.2
Event
CRD

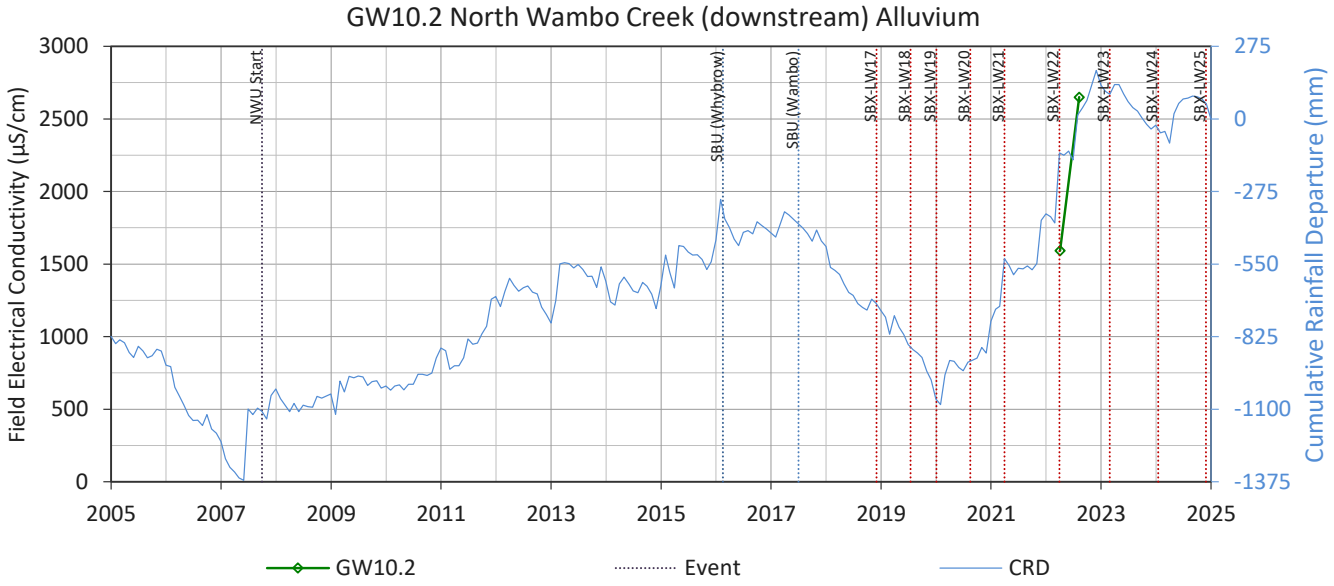

GW09.2 North Wambo Creek (downstream) Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW09.2
Event
CRD

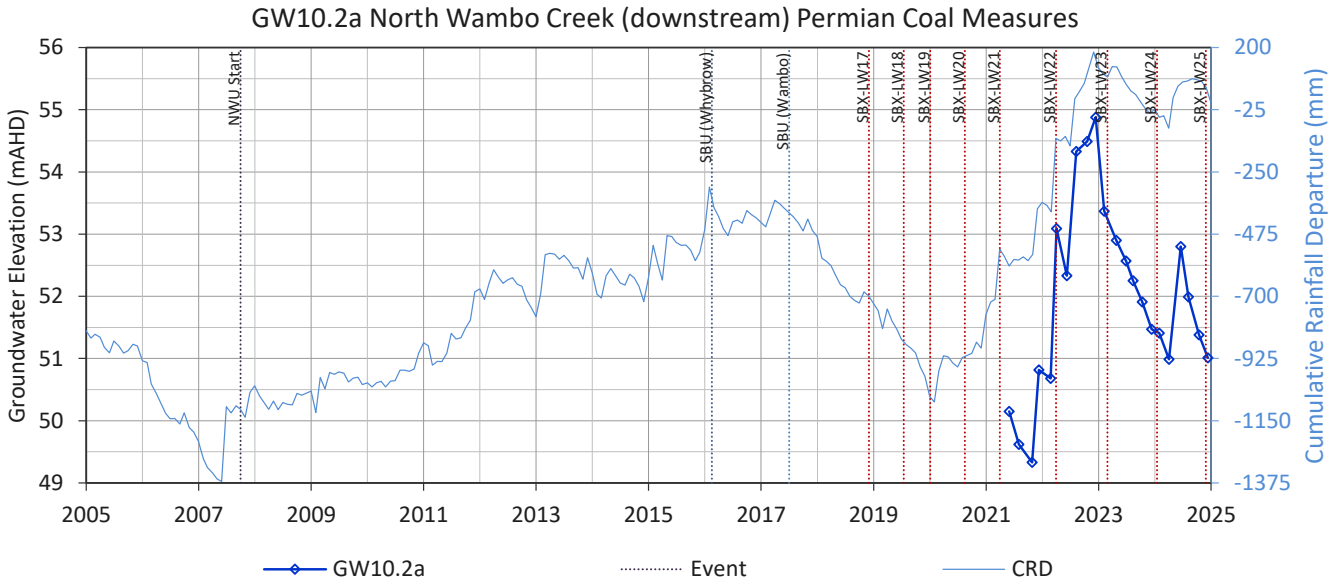

GW09.2 North Wambo Creek (downstream) Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW09.2
Event
CRD

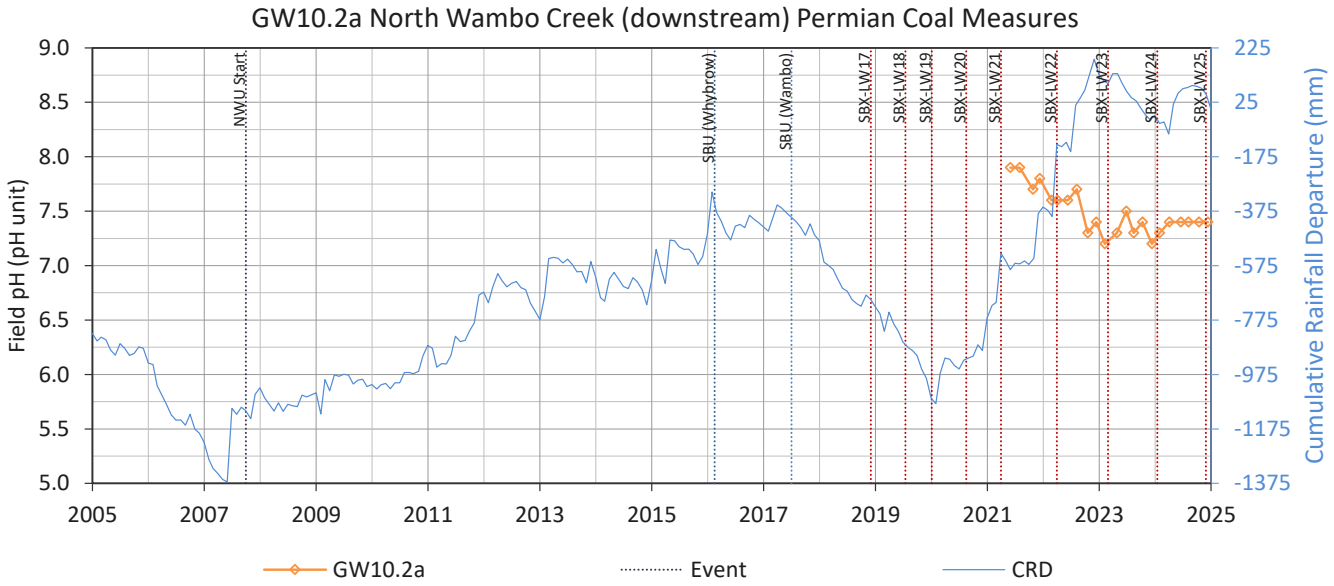

GW09.2 North Wambo Creek (downstream) Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW09.2
Event
CRD

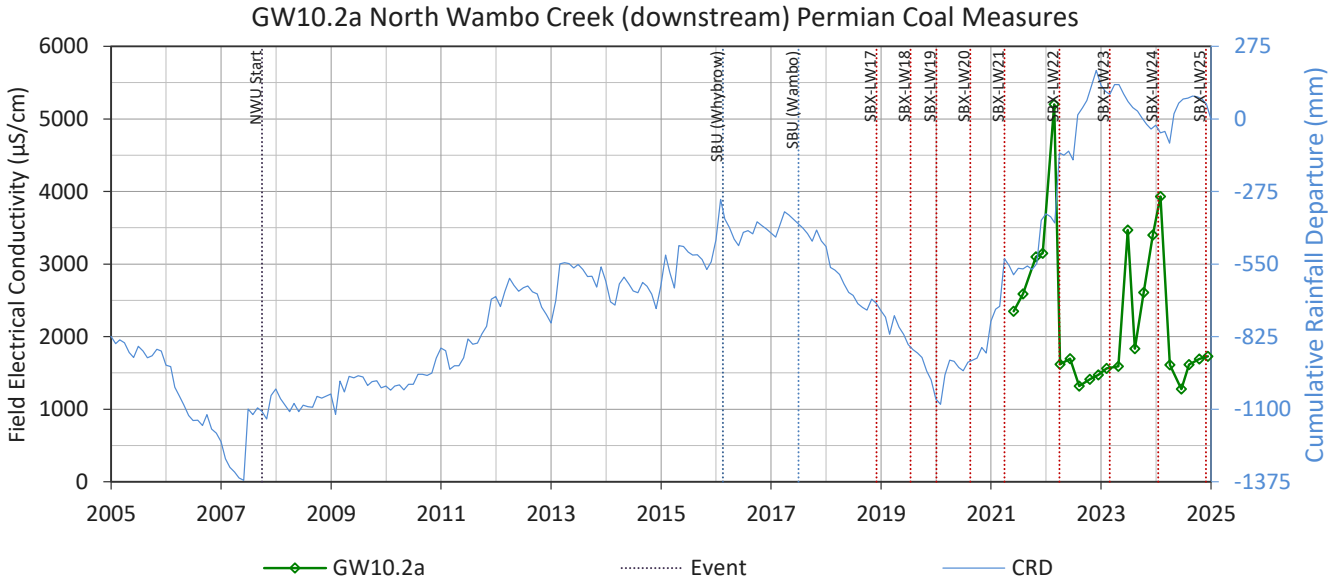

GW10.2 North Wambo Creek (downstream) Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW10.2
Event
CRD

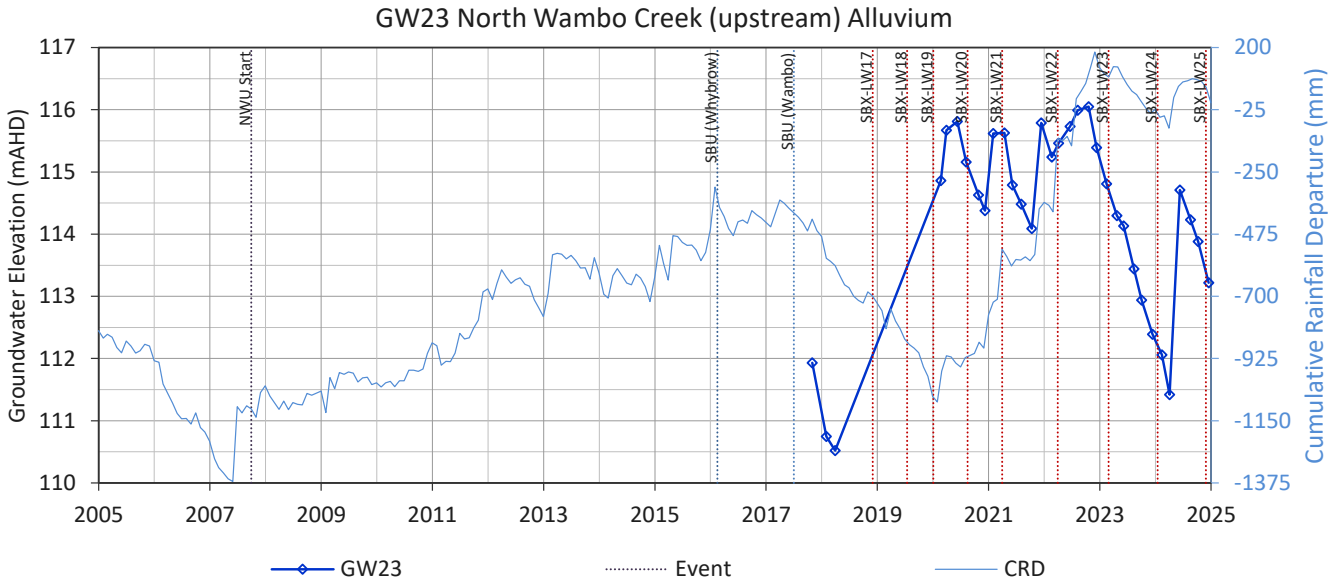

GW10.2 North Wambo Creek (downstream) Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW10.2
Event
CRD

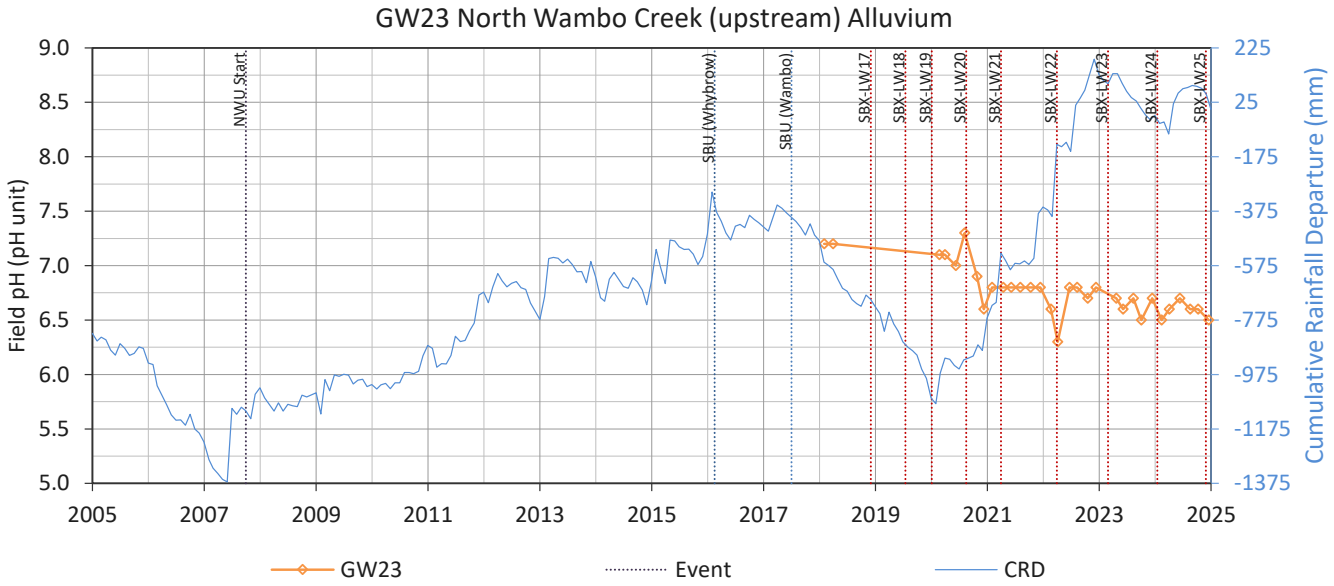

GW10.2 North Wambo Creek (downstream) Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW10.2
Event
CRD

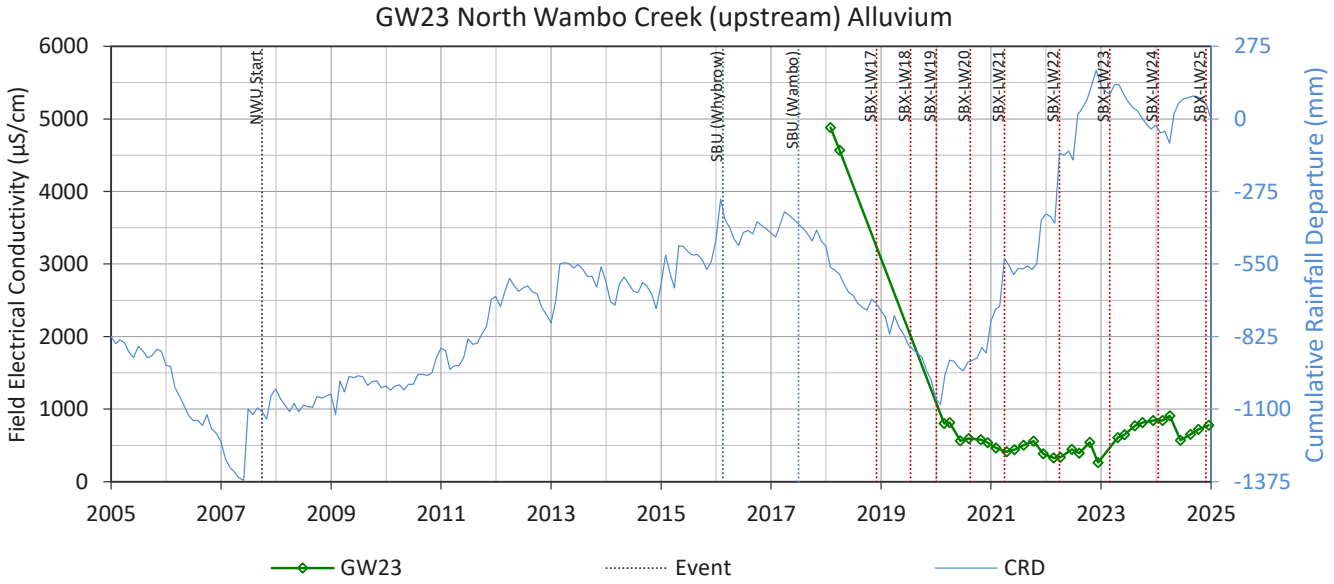

GW10.2a North Wambo Creek (downstream) Permian Coal Measures
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW10.2a
Event
CRD

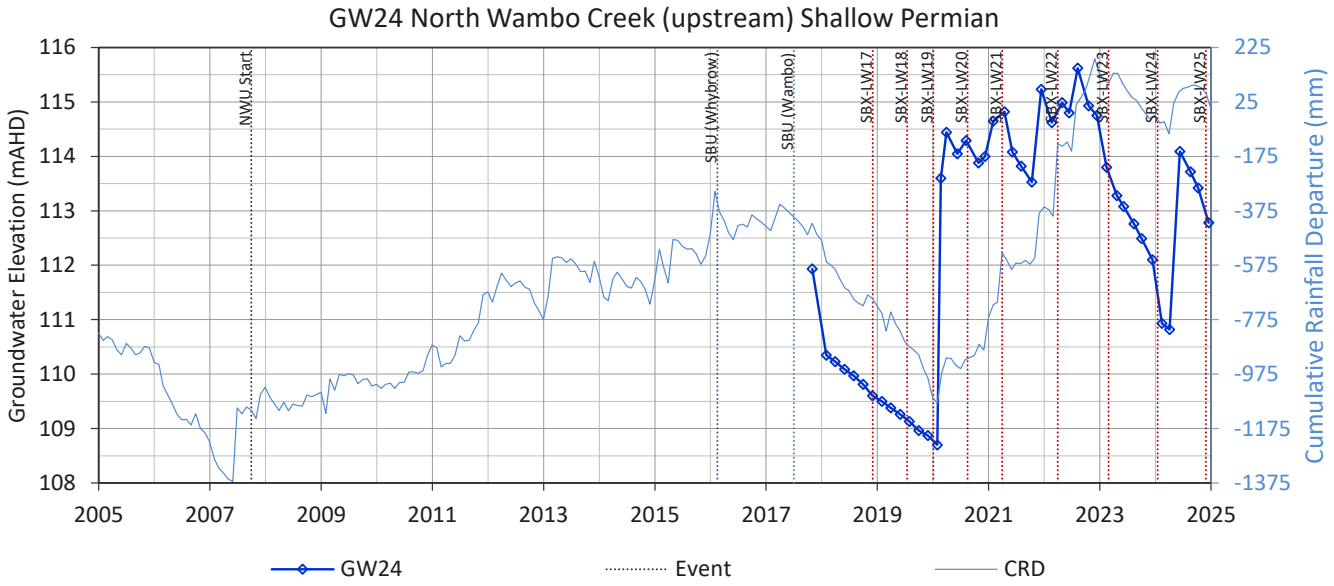

GW10.2a North Wambo Creek (downstream) Permian Coal Measures
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW10.2a
Event
CRD

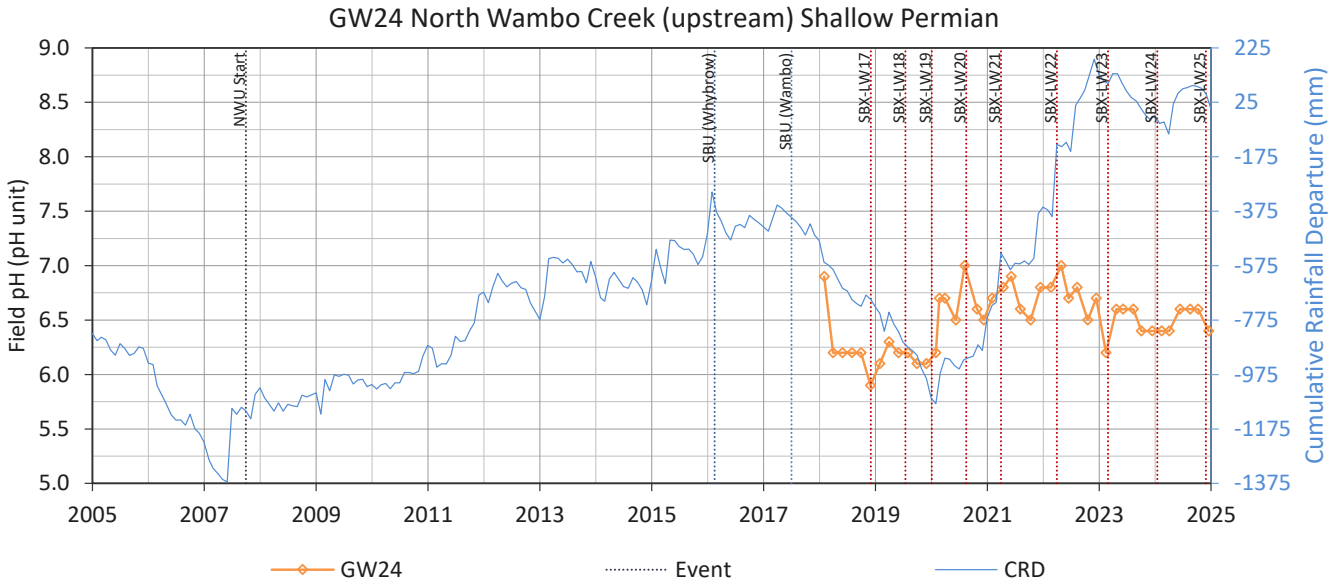

GW10.2a North Wambo Creek (downstream) Permian Coal Measures
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW10.2a
Event
CRD

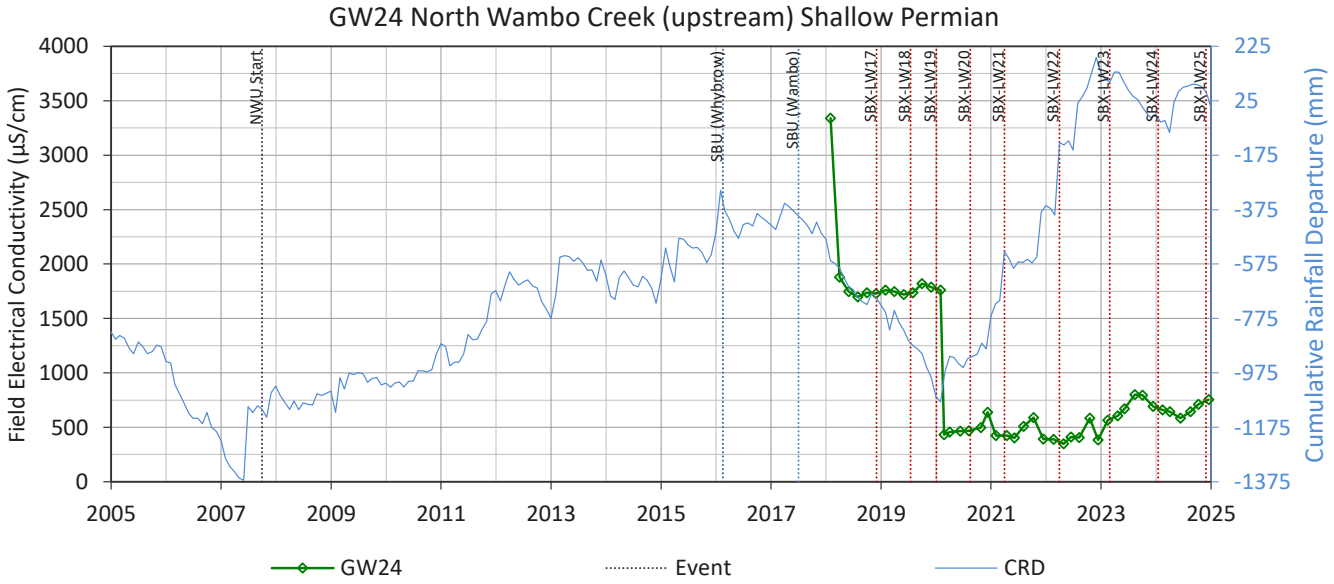

GW23 North Wambo Creek (upstream) Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW23
Event
CRD

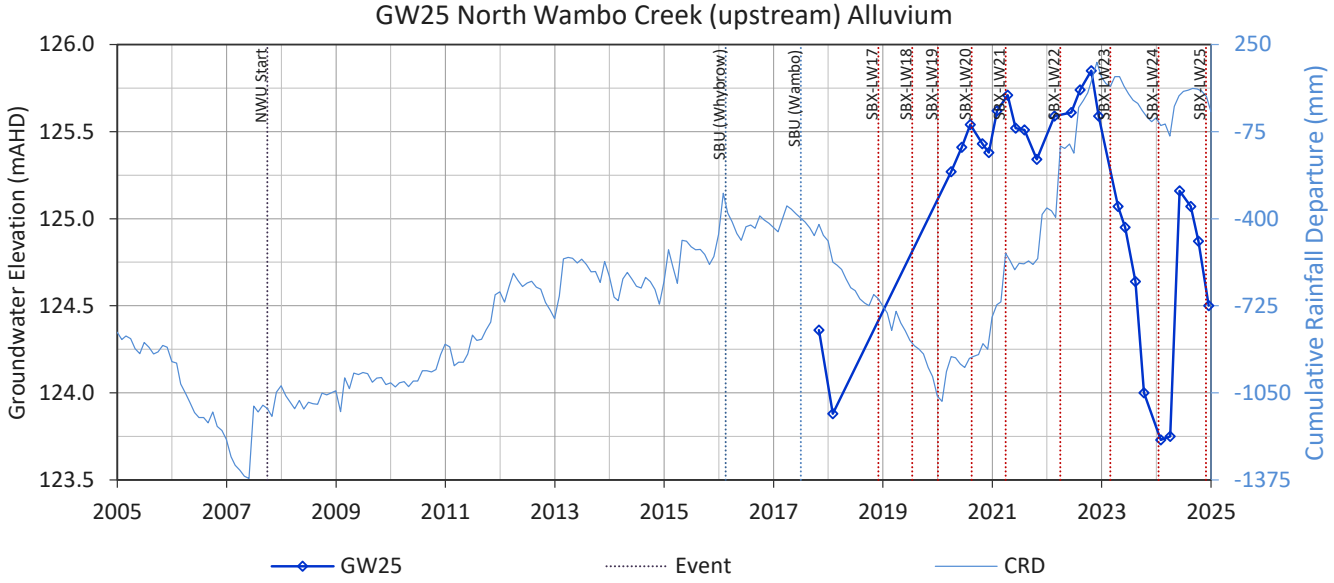

GW23 North Wambo Creek (upstream) Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW23
Event
CRD

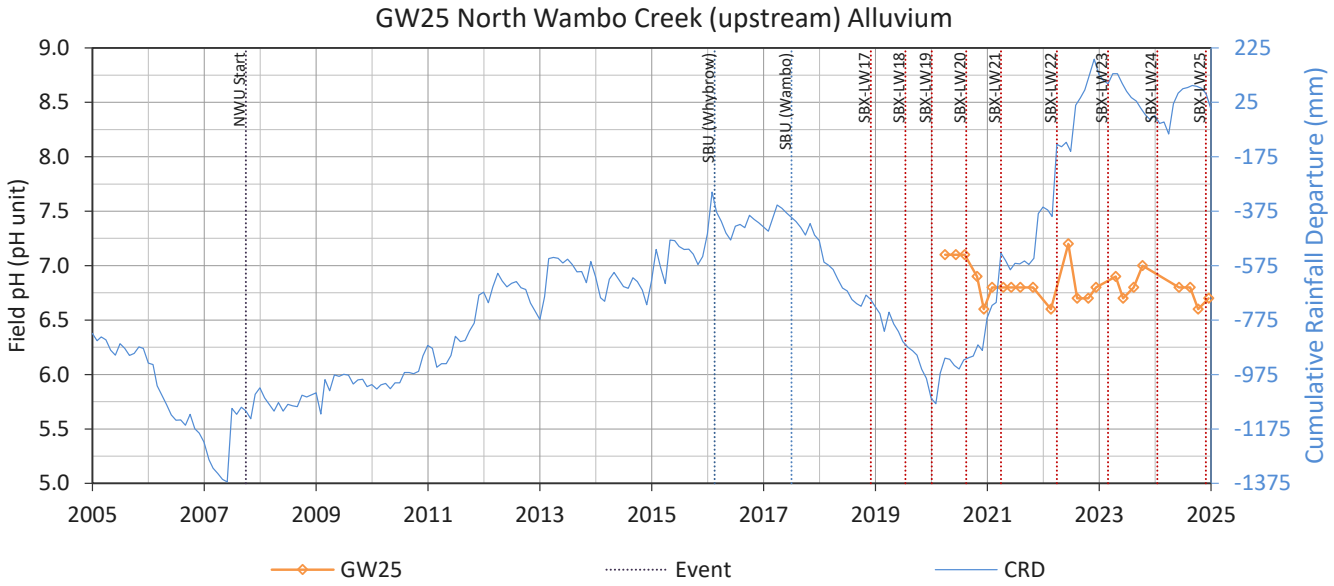

GW23 North Wambo Creek (upstream) Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW23
Event
CRD

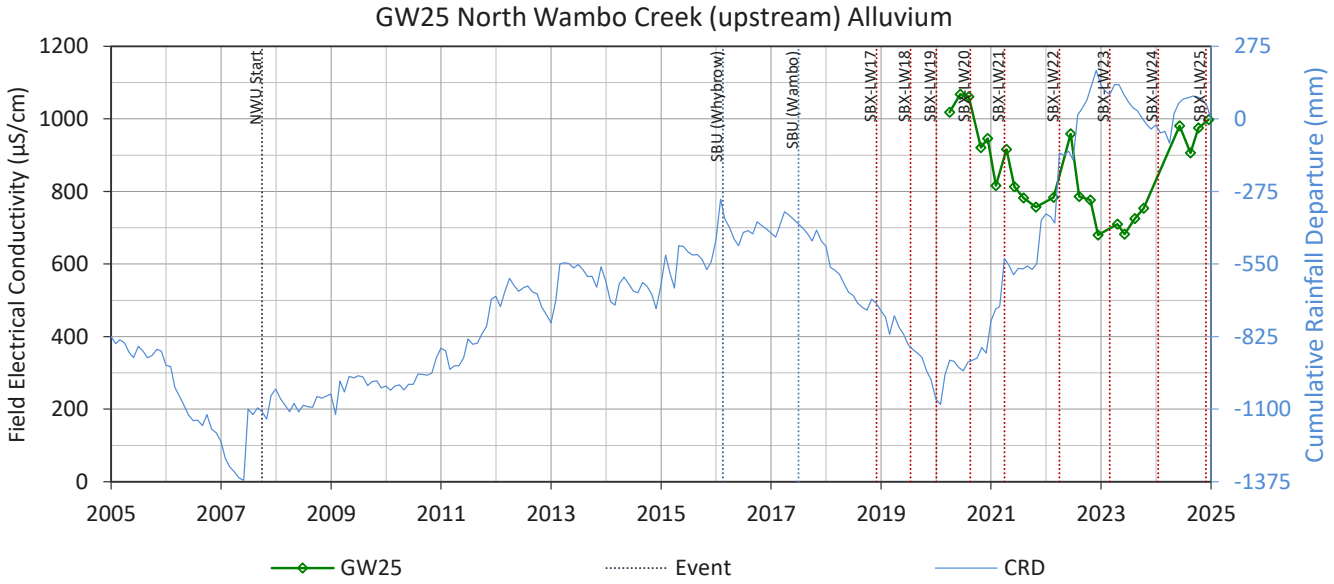

GW24 North Wambo Creek (upstream) Shallow Permian
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW24
Event
CRD

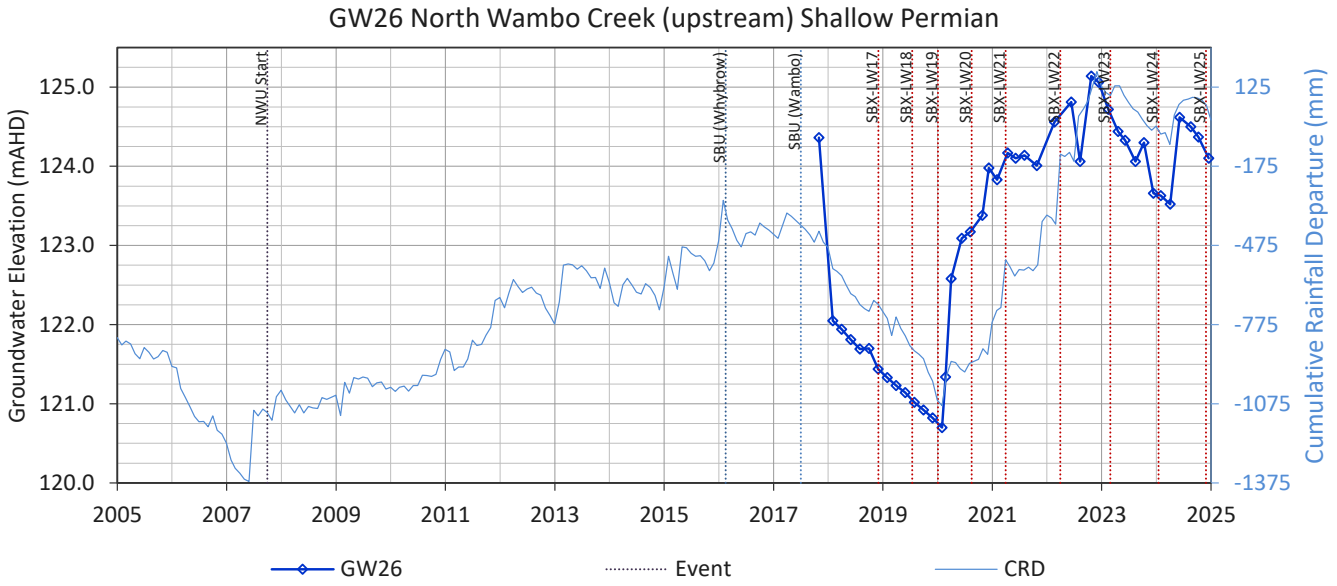

GW24 North Wambo Creek (upstream) Shallow Permian
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW24
Event
CRD

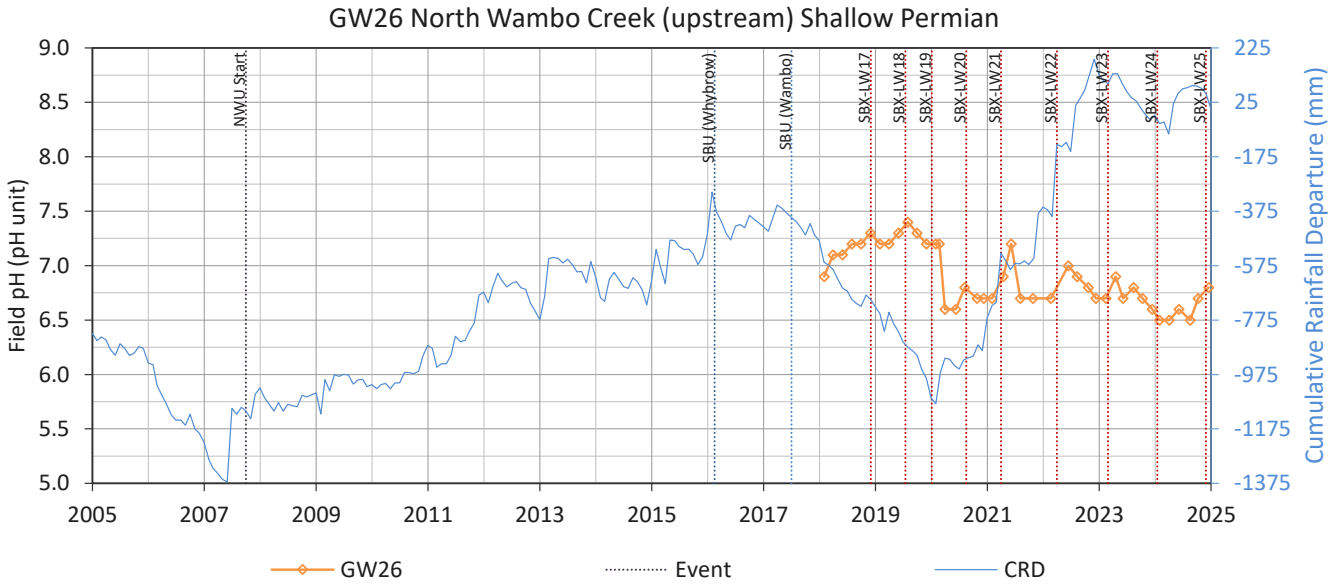

GW24 North Wambo Creek (upstream) Shallow Permian
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW24
Event
CRD

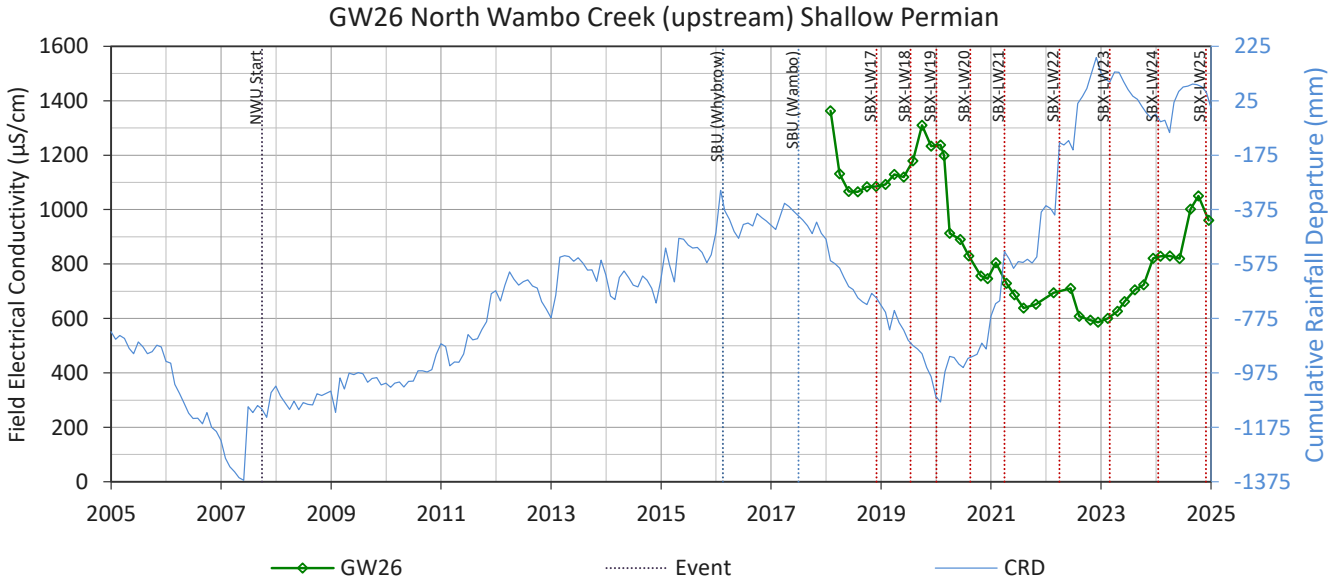

GW25 North Wambo Creek (upstream) Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW25
Event
CRD

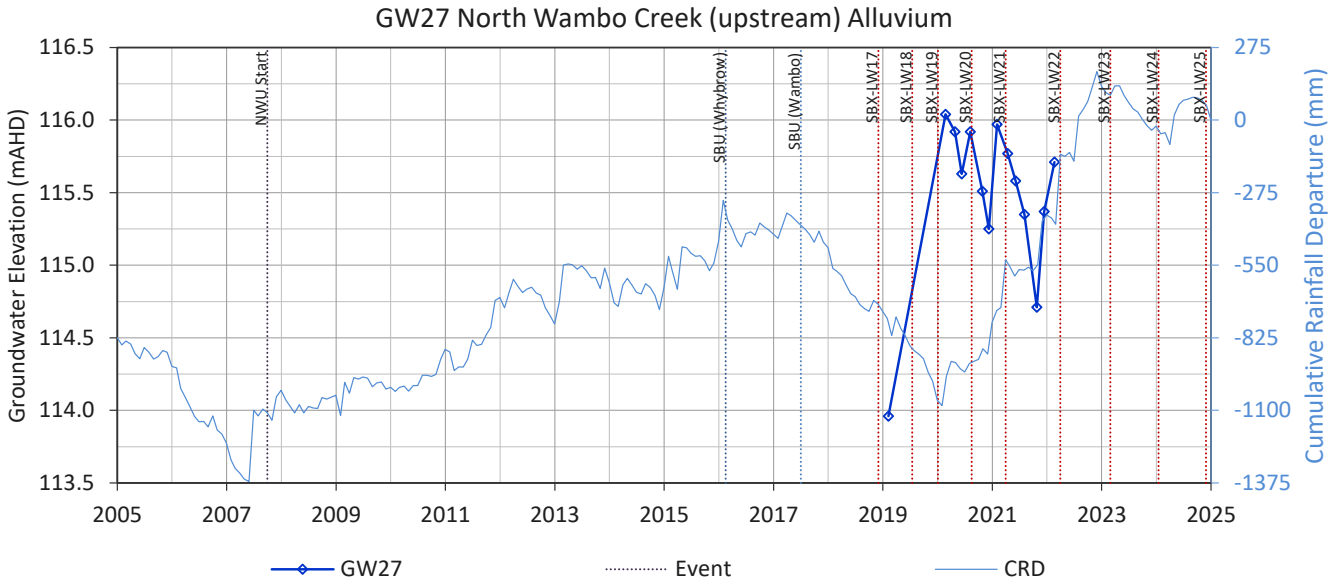

GW25 North Wambo Creek (upstream) Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW25
Event
CRD

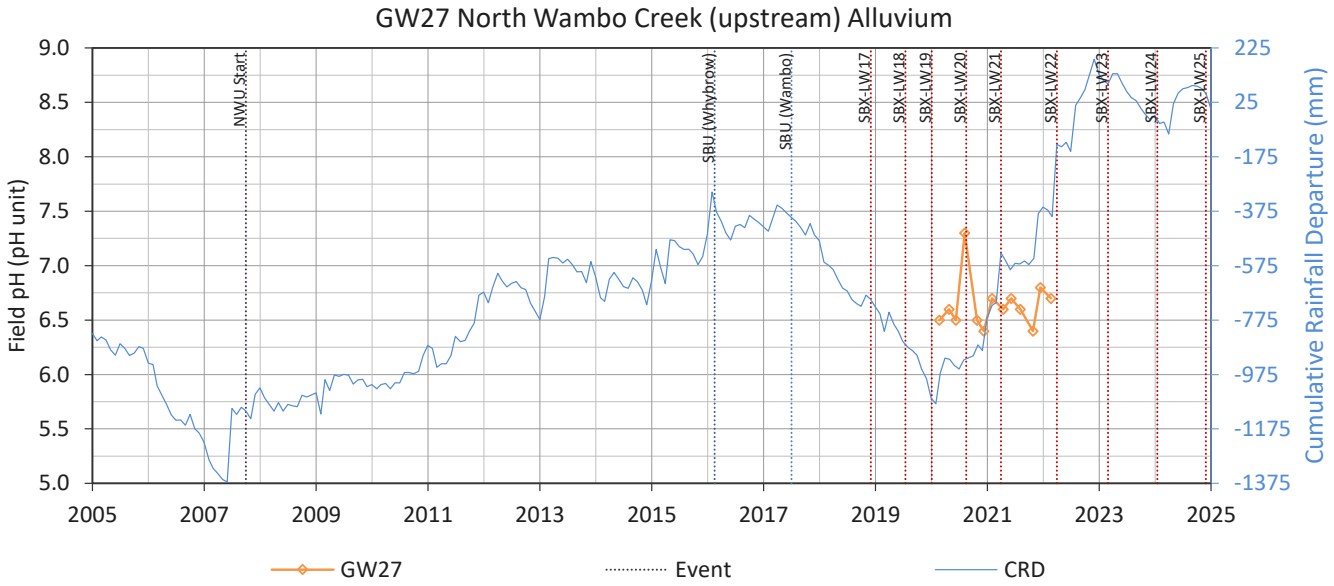

GW25 North Wambo Creek (upstream) Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW25
Event
CRD

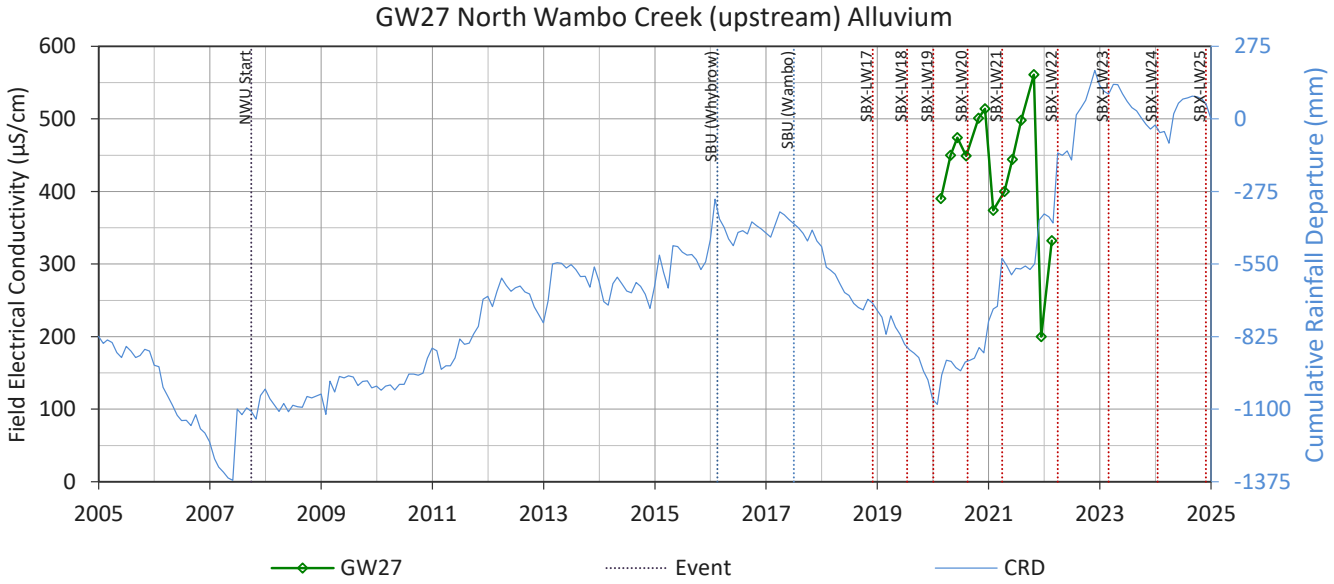

GW26 North Wambo Creek (upstream) Shallow Permian
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW26
Event
CRD

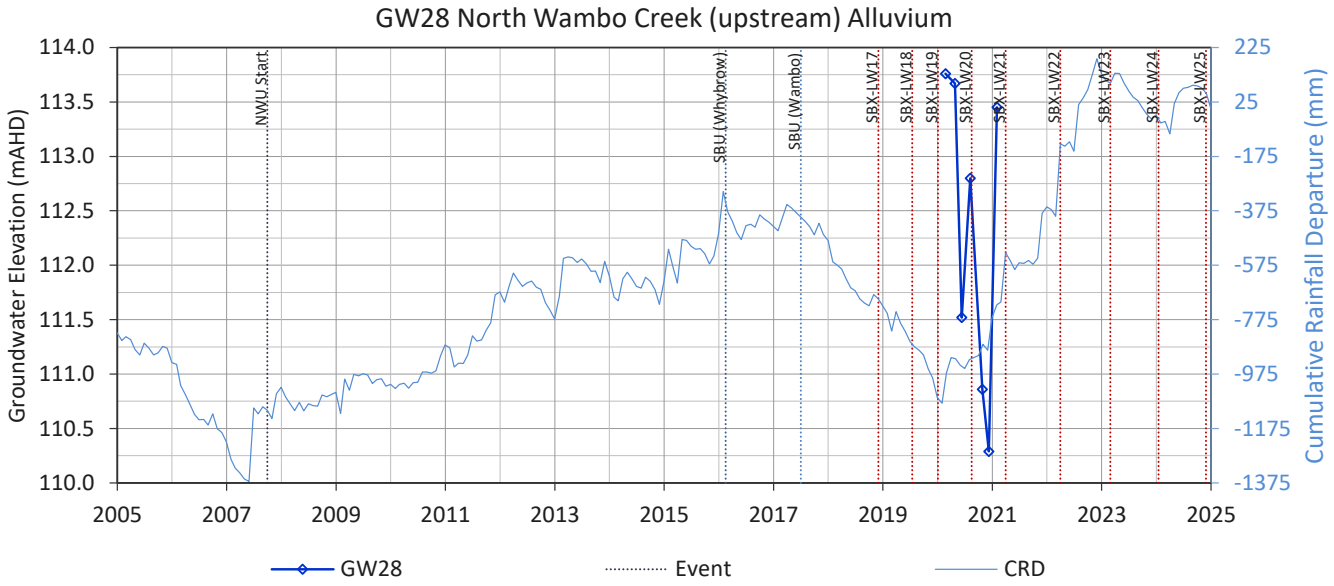

GW26 North Wambo Creek (upstream) Shallow Permian
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW26
Event
CRD

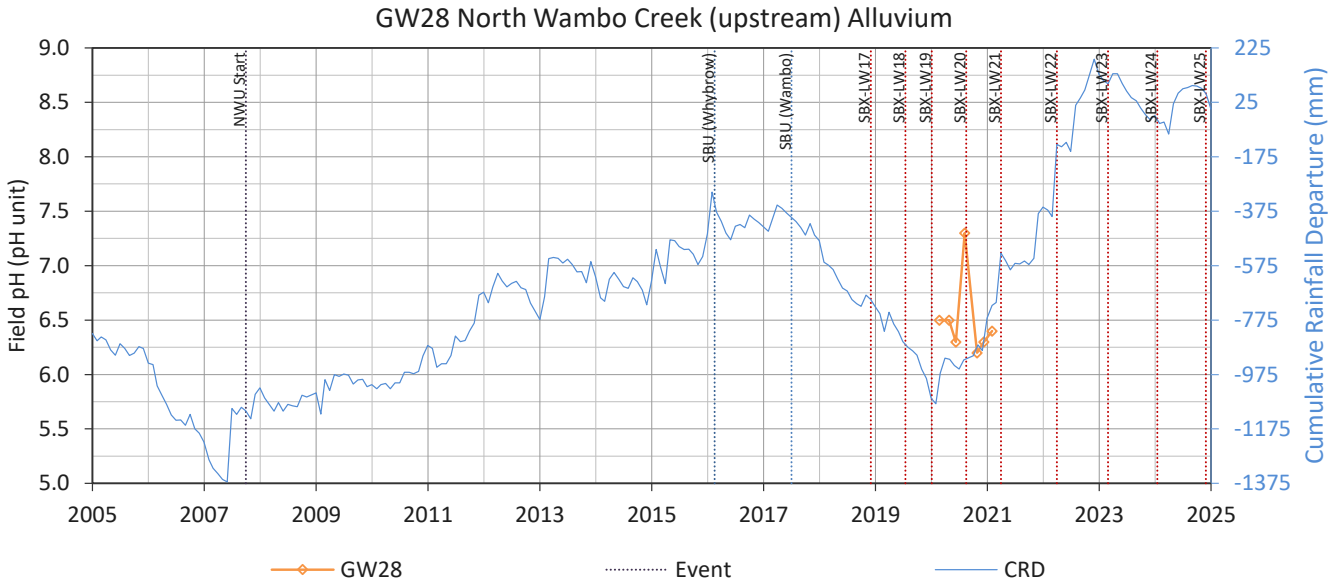

GW26 North Wambo Creek (upstream) Shallow Permian
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW26
Event
CRD

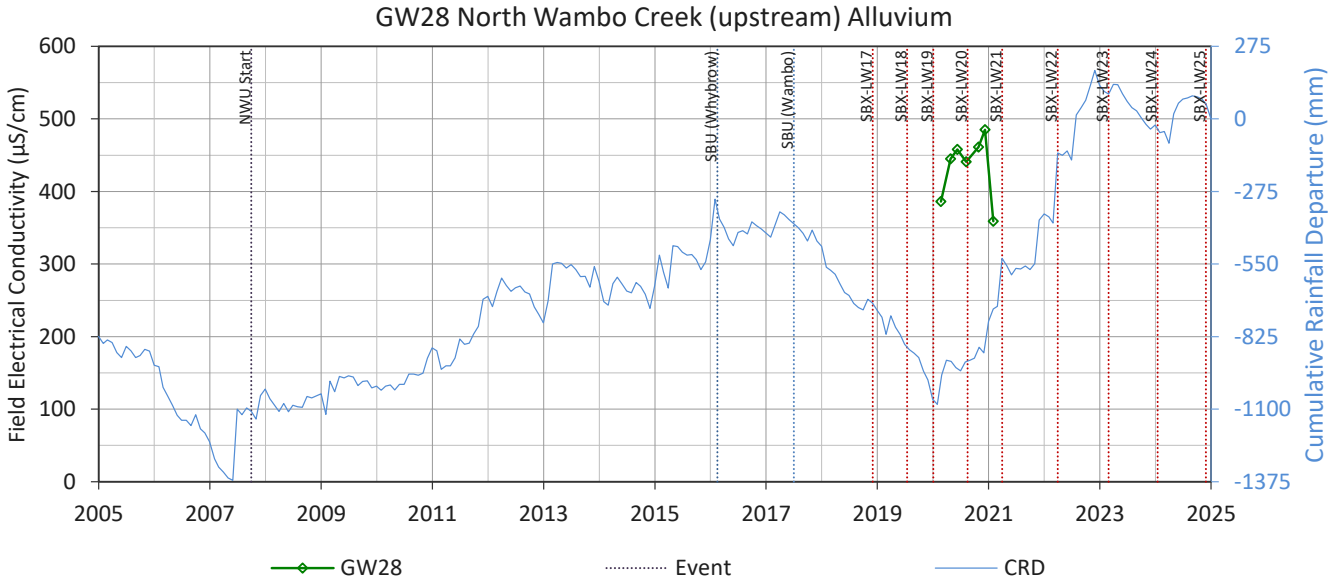

GW27 North Wambo Creek (upstream) Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW27
Event
CRD

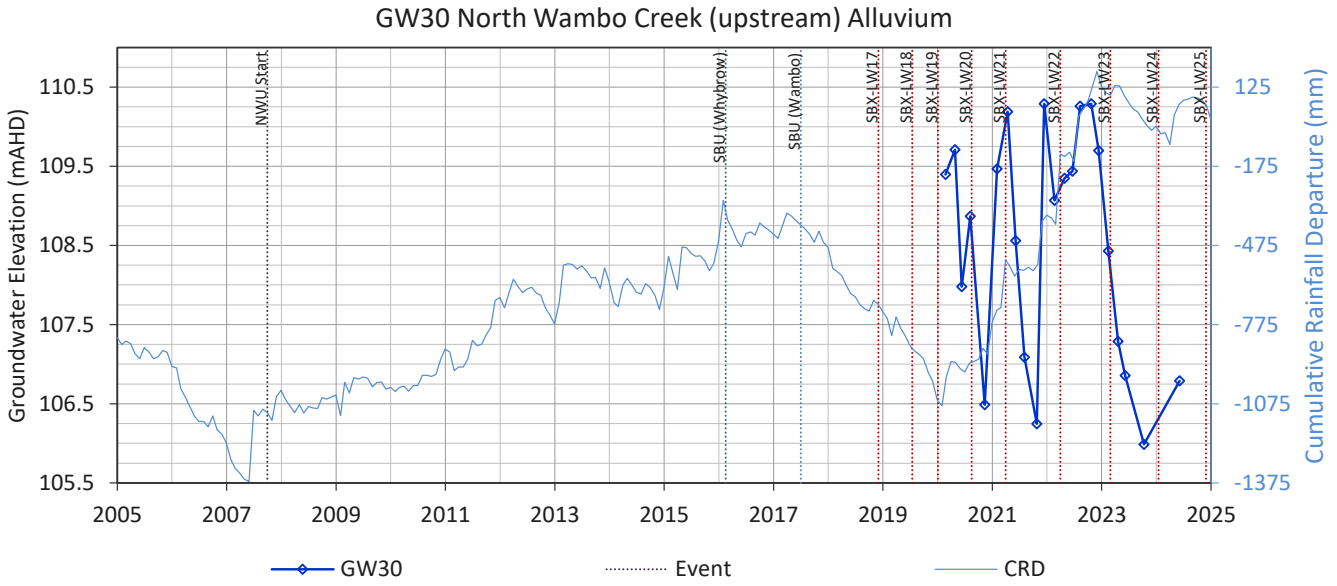

GW27 North Wambo Creek (upstream) Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW27
Event
CRD

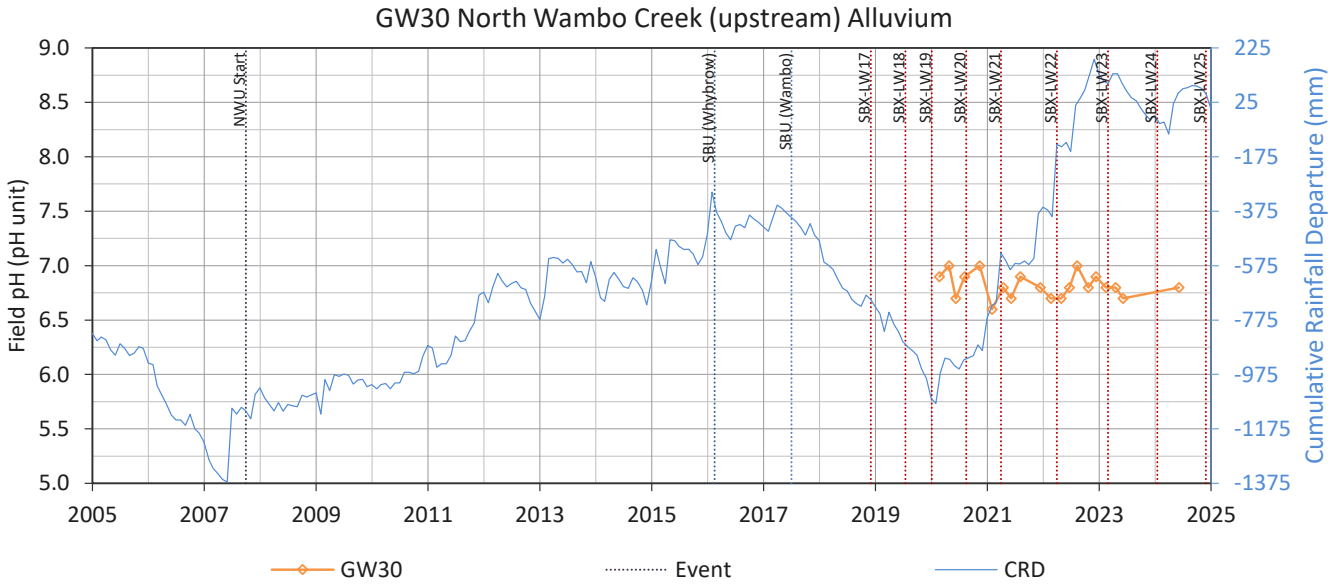

GW27 North Wambo Creek (upstream) Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW27
Event
CRD

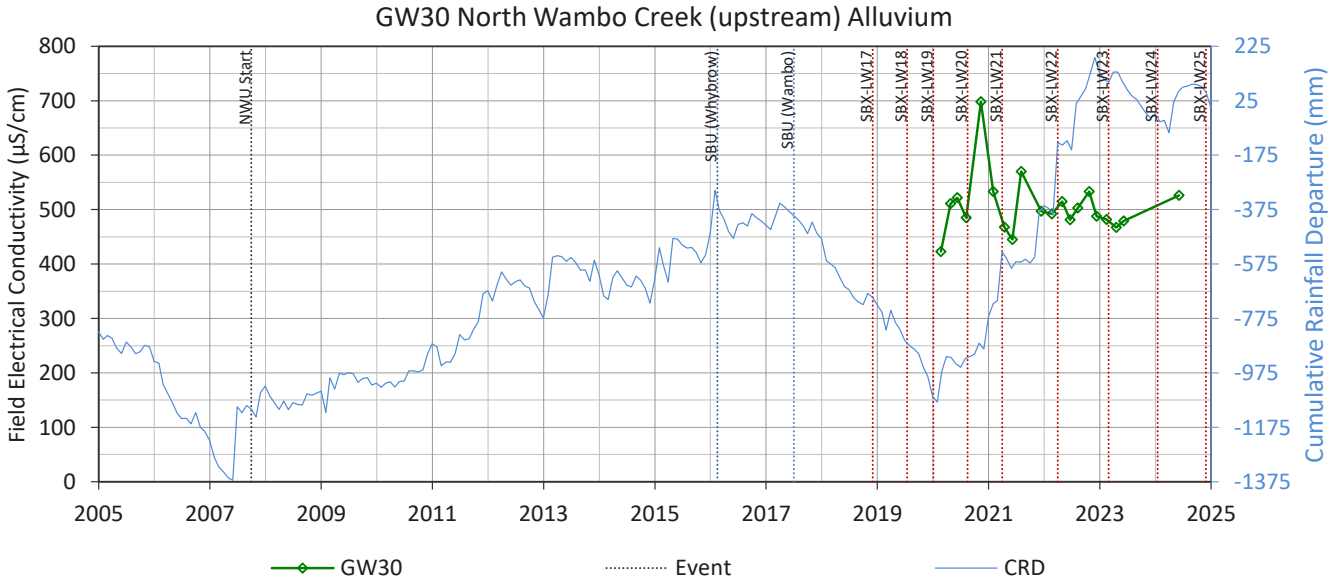

GW28 North Wambo Creek (upstream) Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW28
Event
CRD

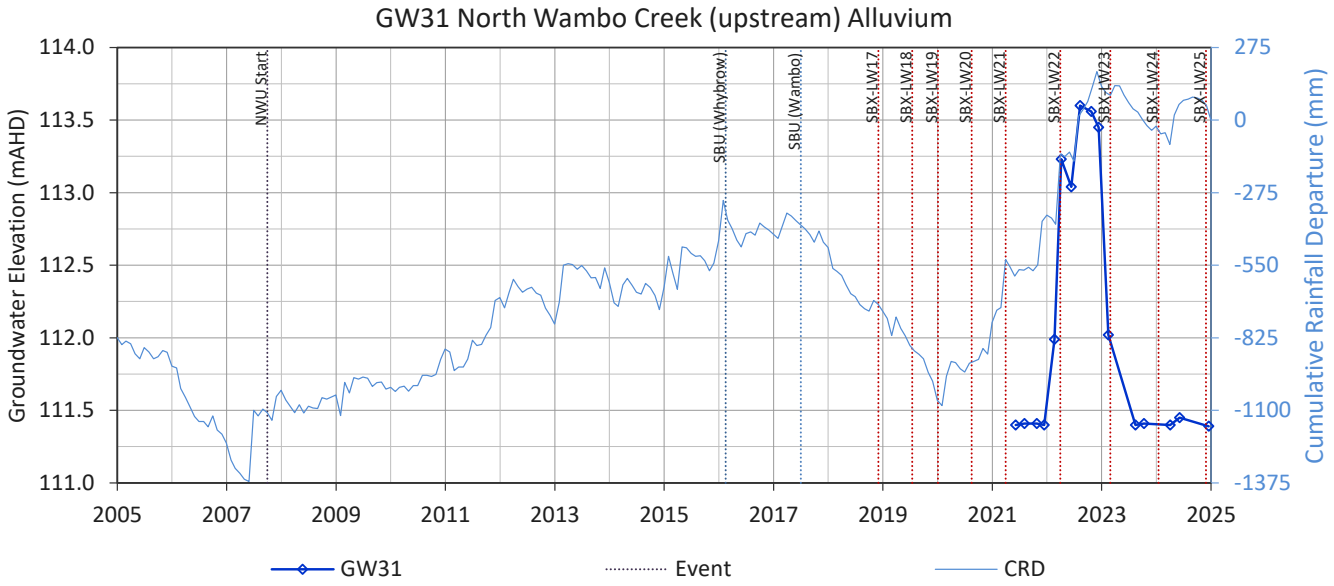

GW28 North Wambo Creek (upstream) Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW28
Event
CRD

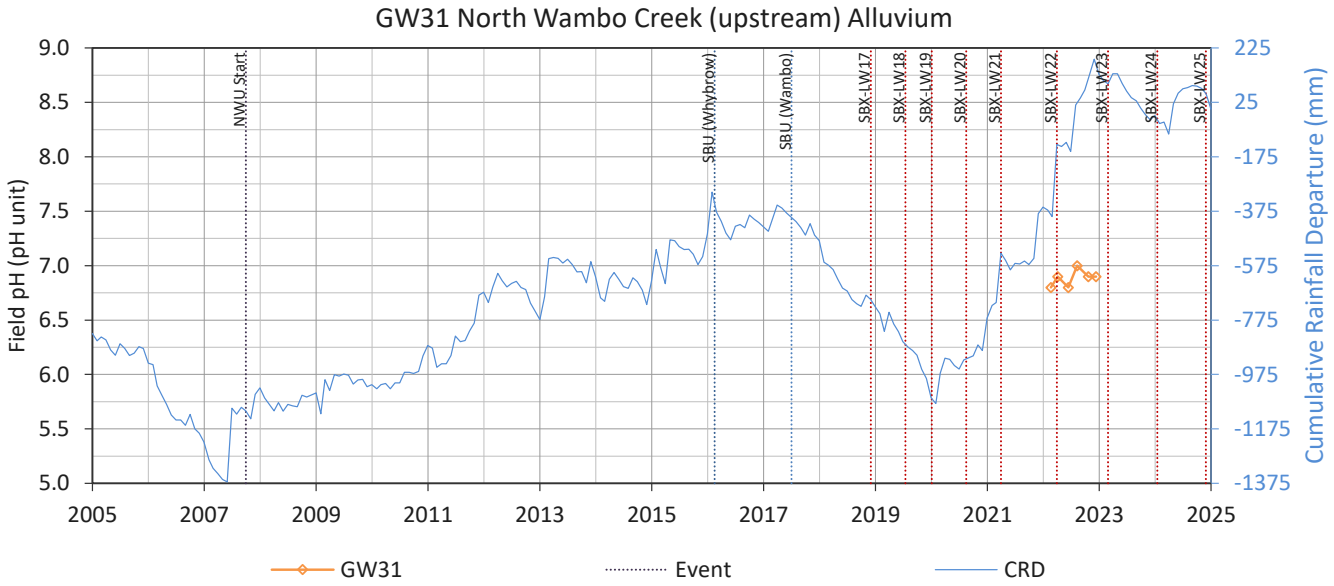

GW28 North Wambo Creek (upstream) Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW28
Event
CRD

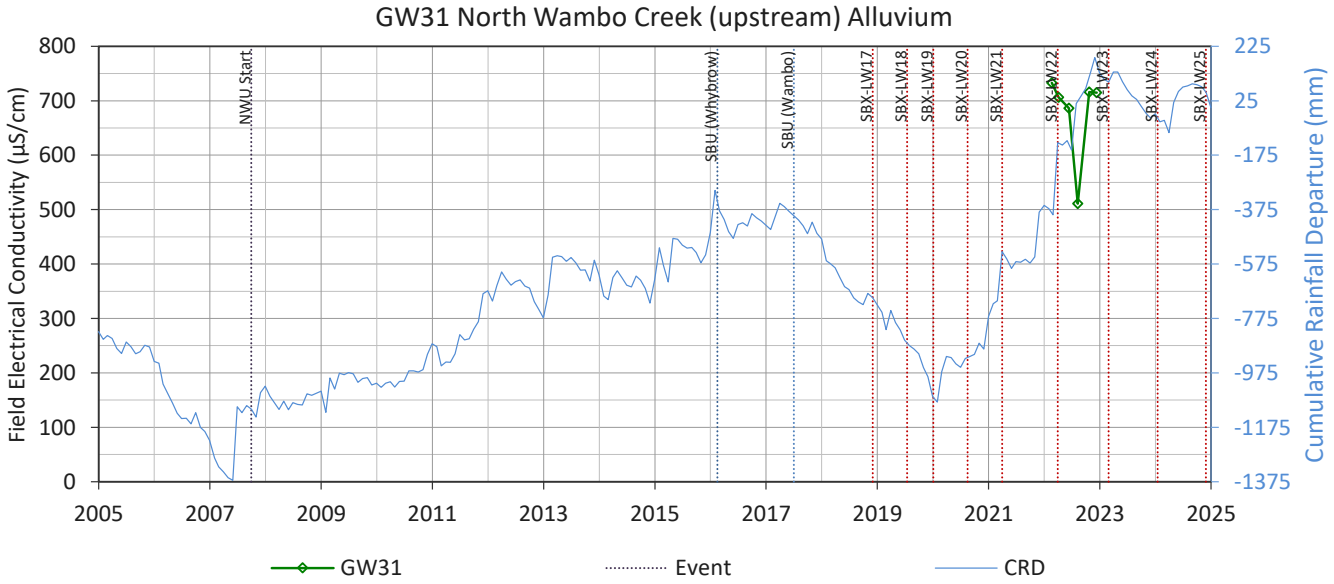

GW30 North Wambo Creek (upstream) Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW30
Event
CRD

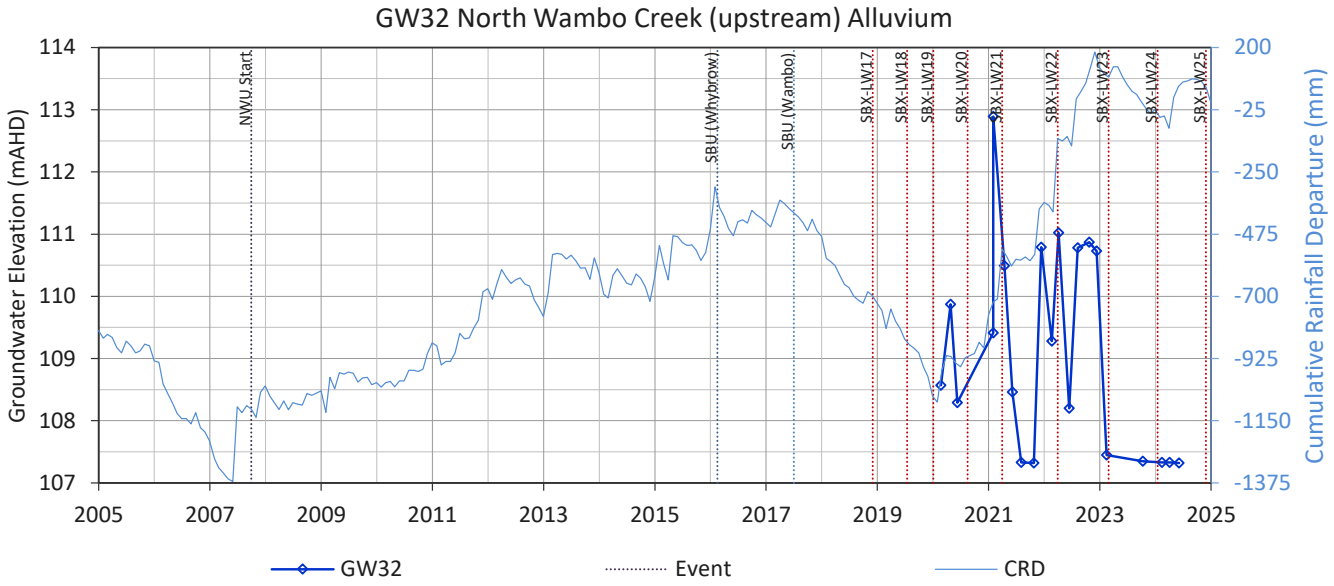

GW30 North Wambo Creek (upstream) Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW30
Event
CRD

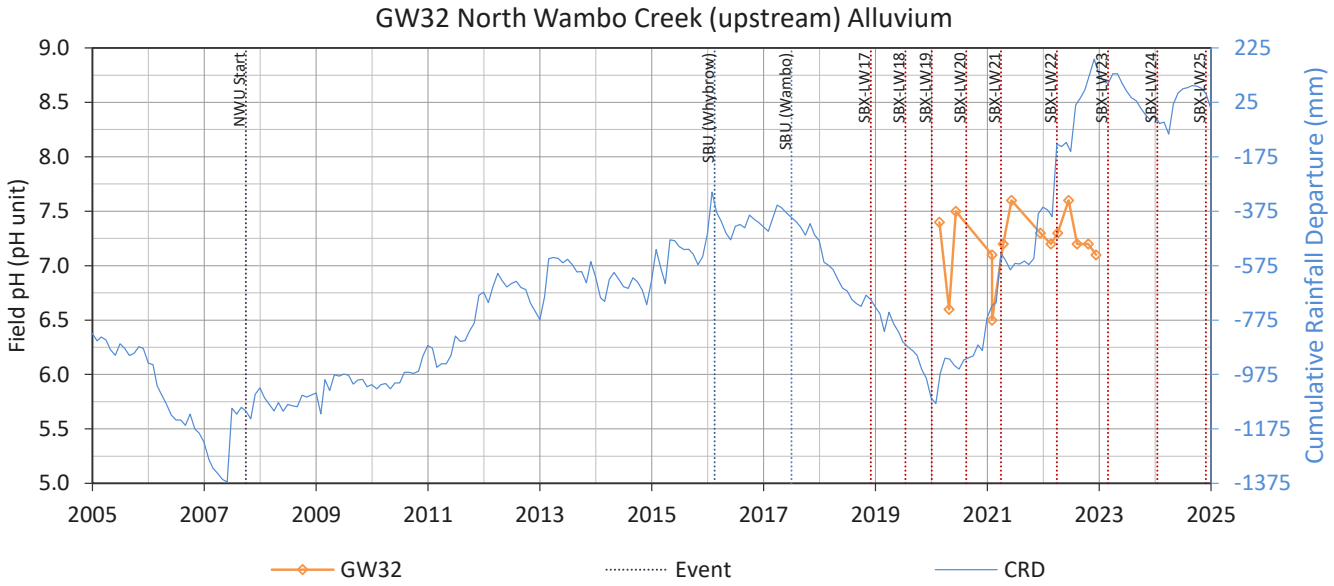

GW30 North Wambo Creek (upstream) Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW30
Event
CRD

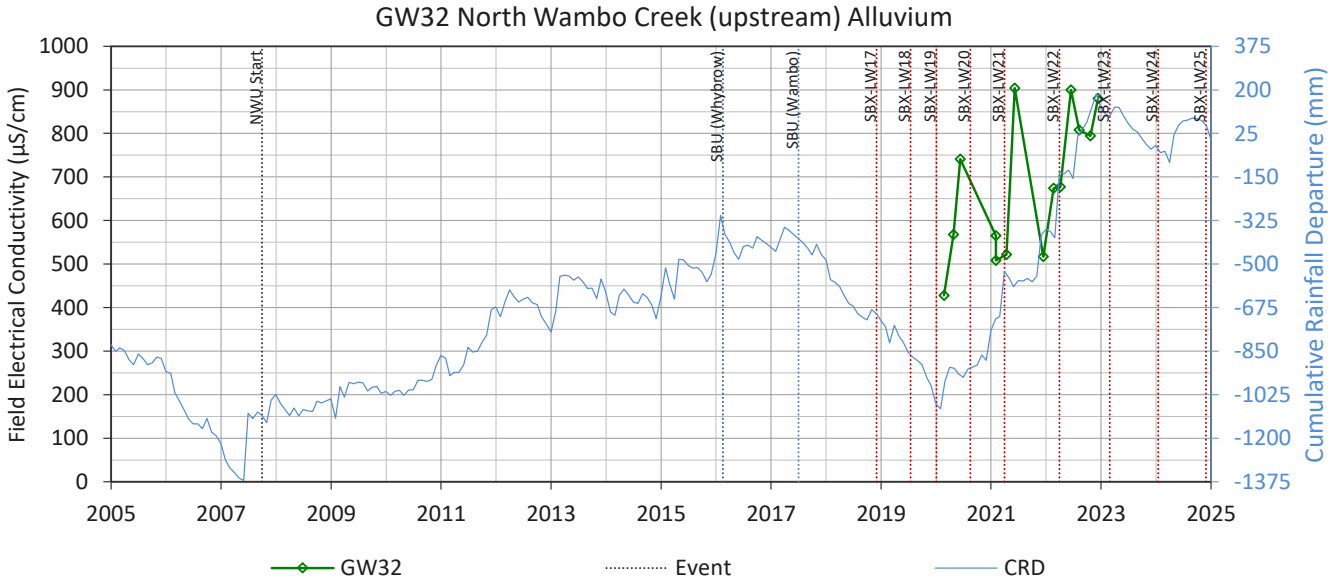

GW31 North Wambo Creek (upstream) Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW31
Event
CRD

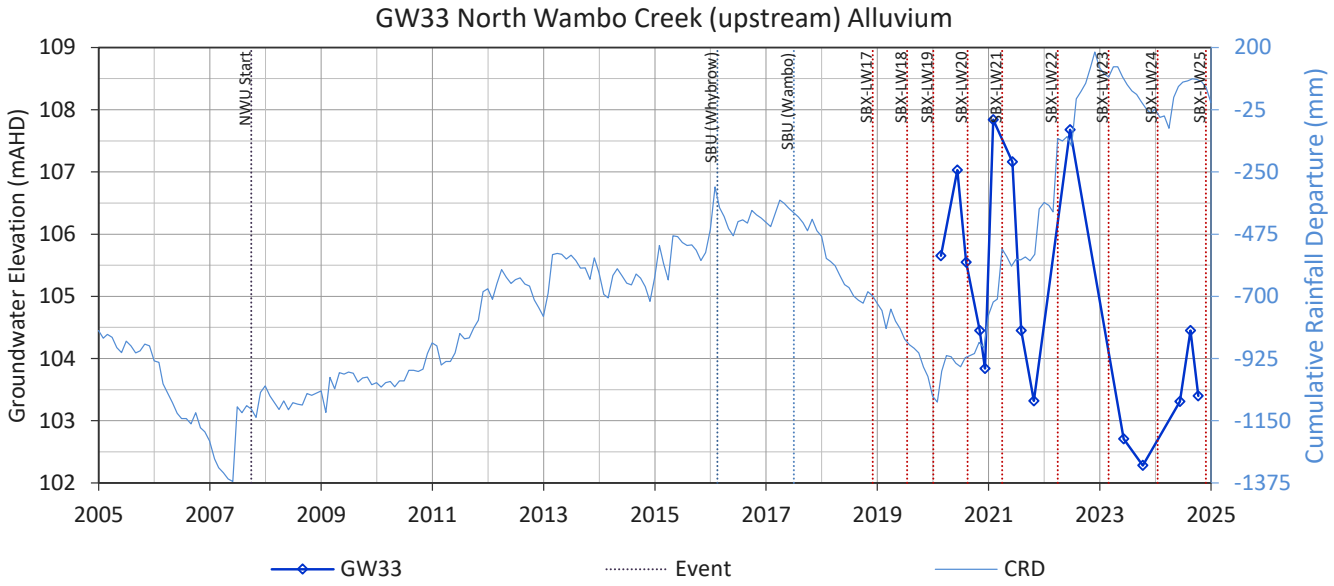

GW31 North Wambo Creek (upstream) Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW31
Event
CRD

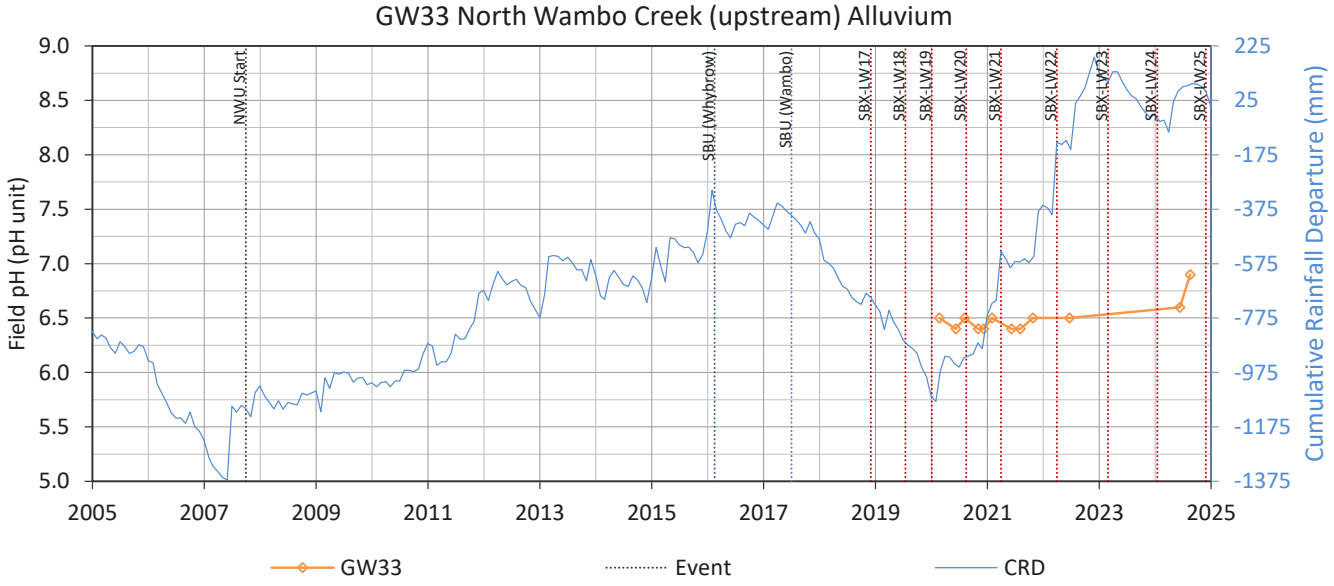

GW31 North Wambo Creek (upstream) Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW31
Event
CRD

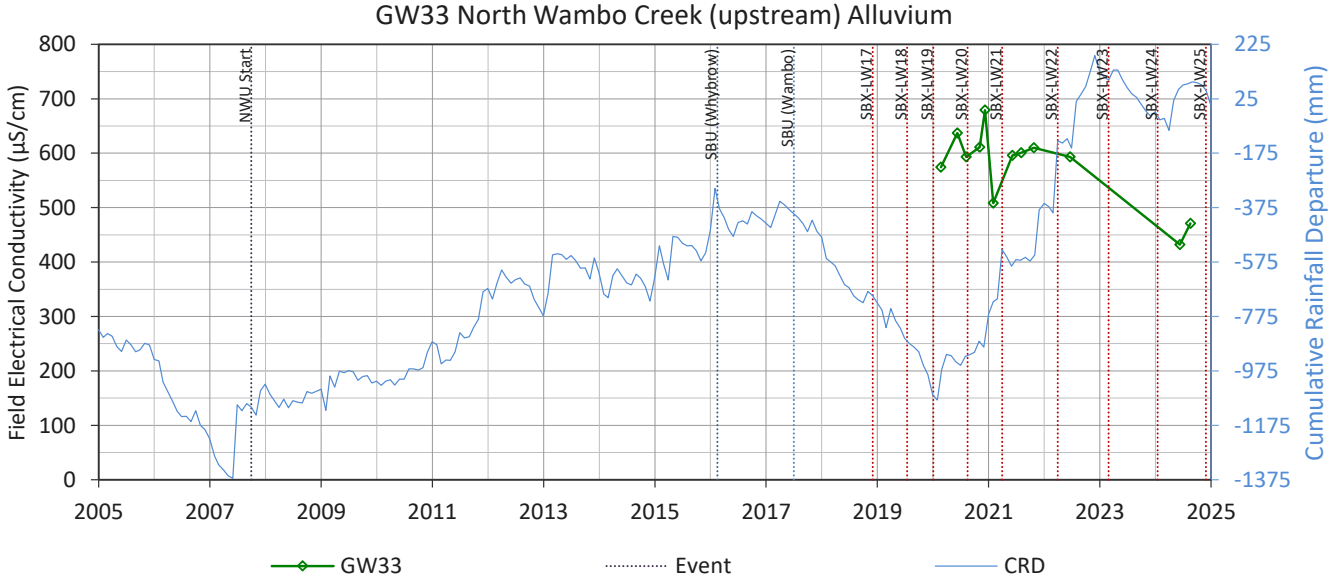

GW32 North Wambo Creek (upstream) Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW32
Event
CRD

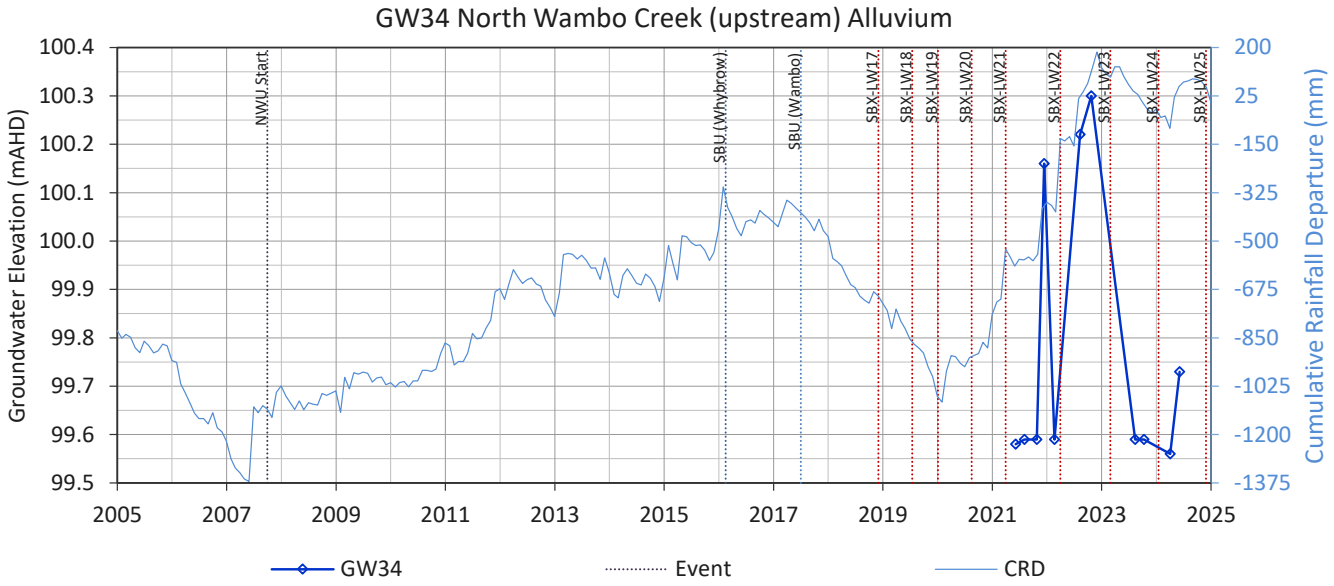

GW32 North Wambo Creek (upstream) Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW32
Event
CRD

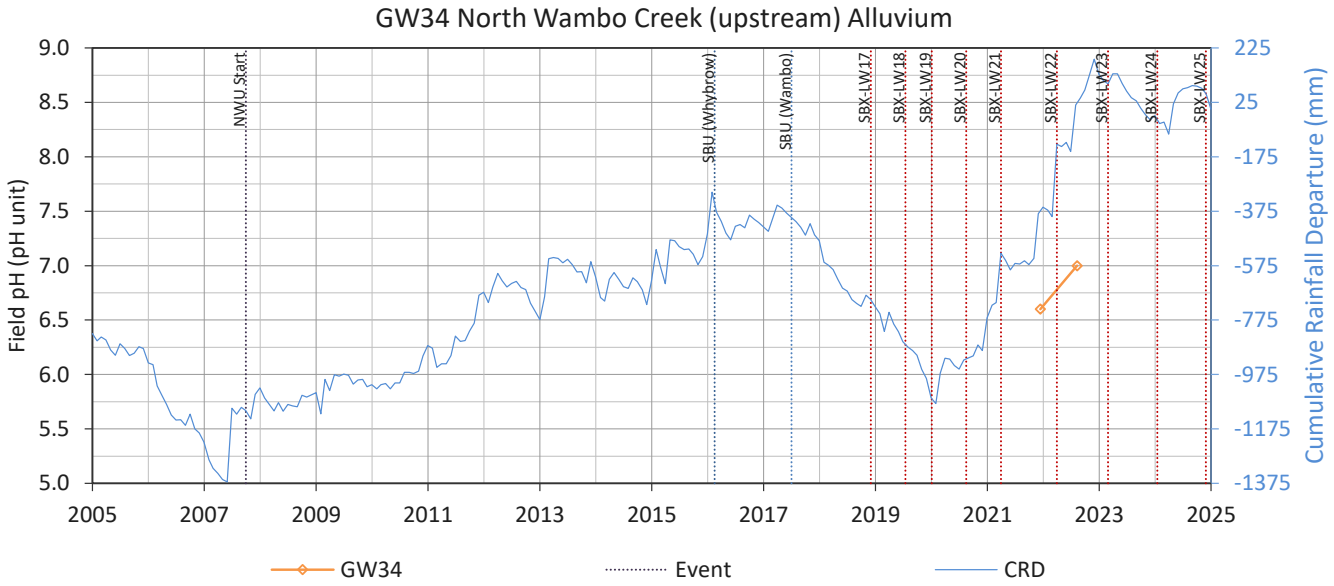

GW32 North Wambo Creek (upstream) Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW32
Event
CRD

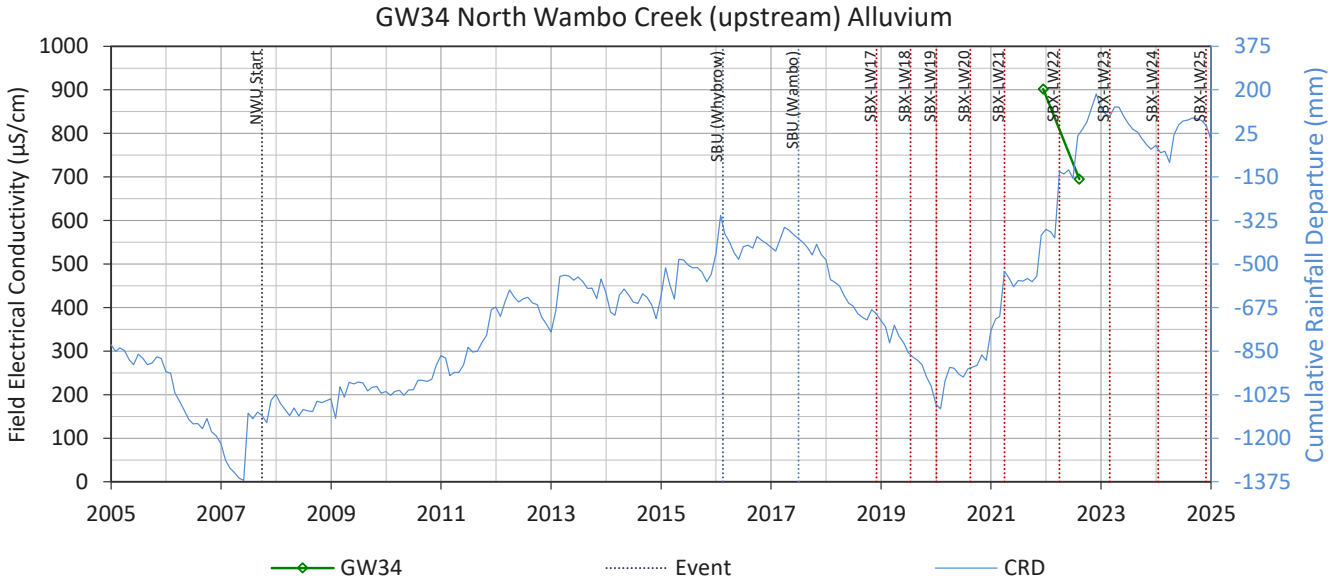

GW33 North Wambo Creek (upstream) Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW33
Event
CRD

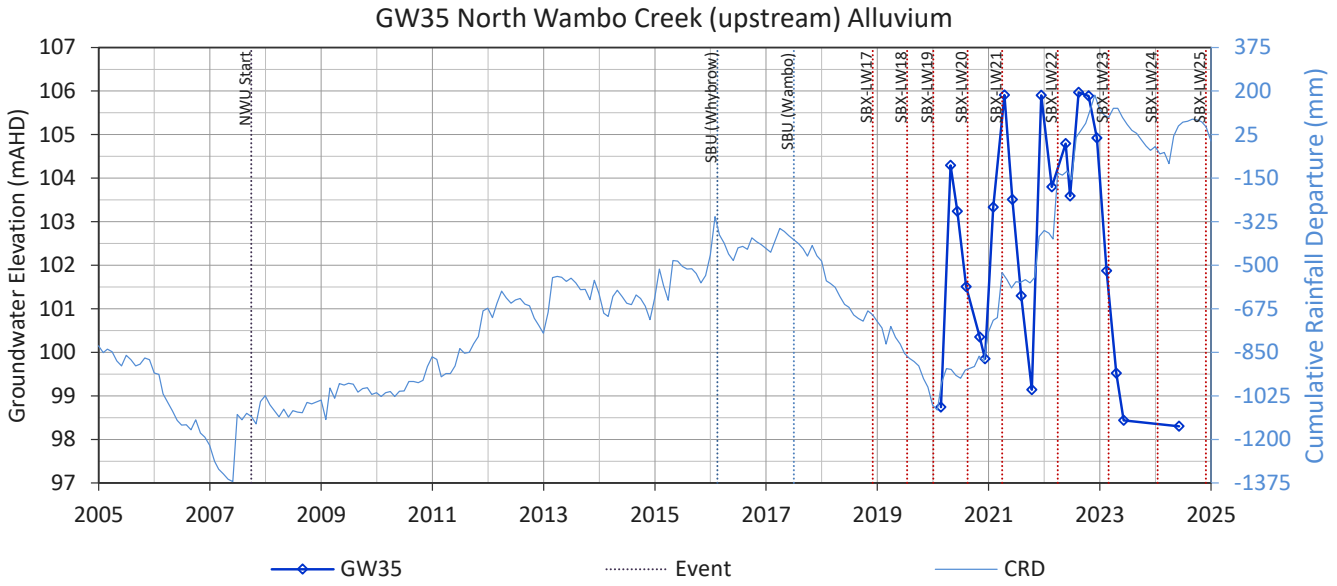

GW33 North Wambo Creek (upstream) Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW33
Event
CRD

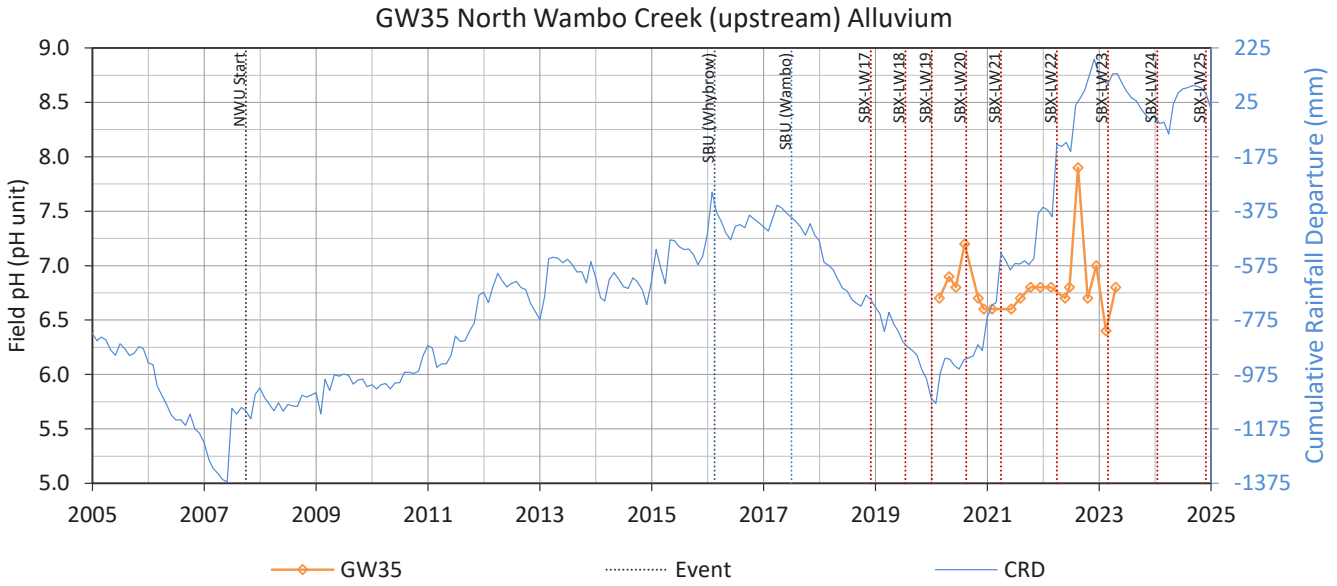

GW33 North Wambo Creek (upstream) Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW33
Event
CRD

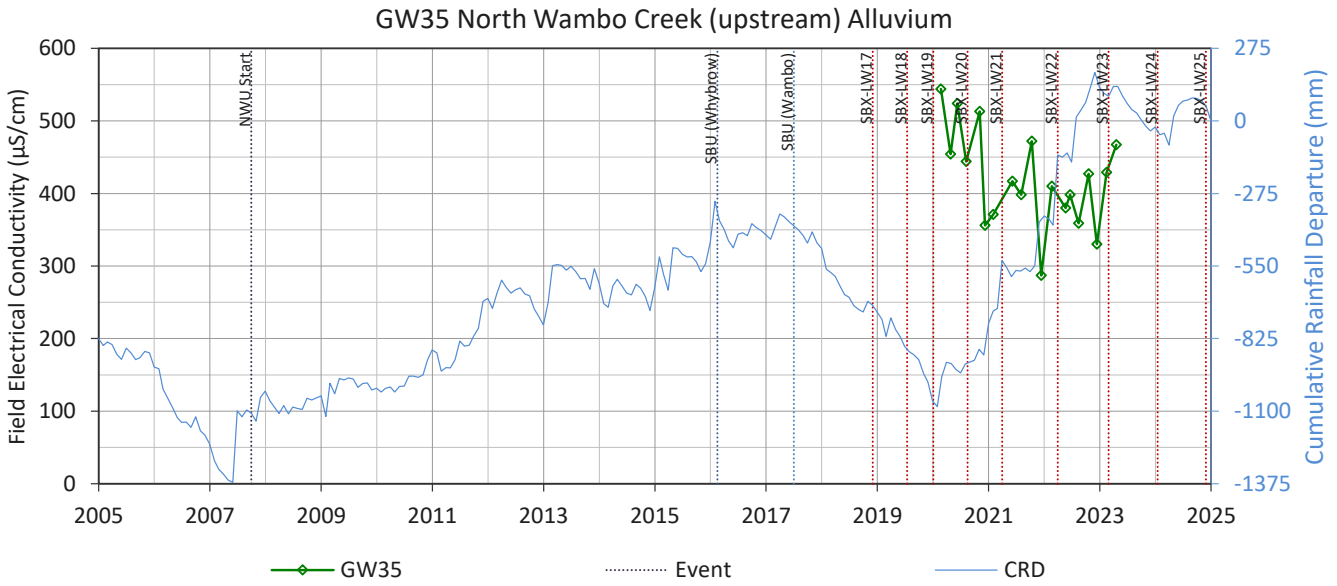

GW34 North Wambo Creek (upstream) Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW34
Event
CRD

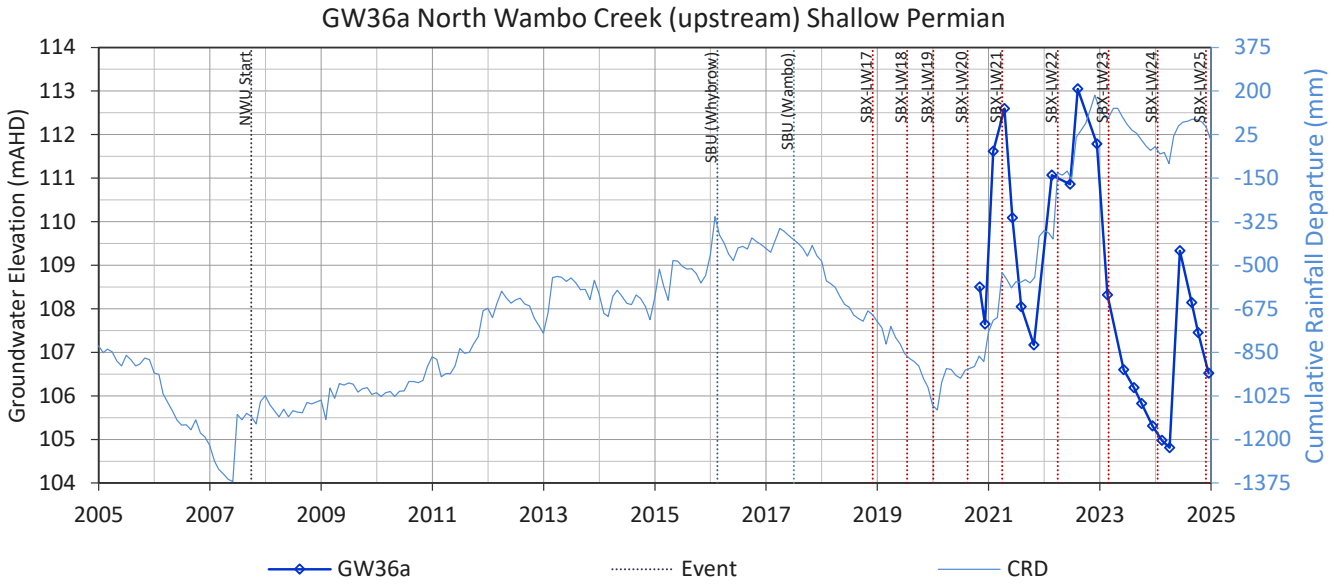

GW34 North Wambo Creek (upstream) Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW34
Event
CRD

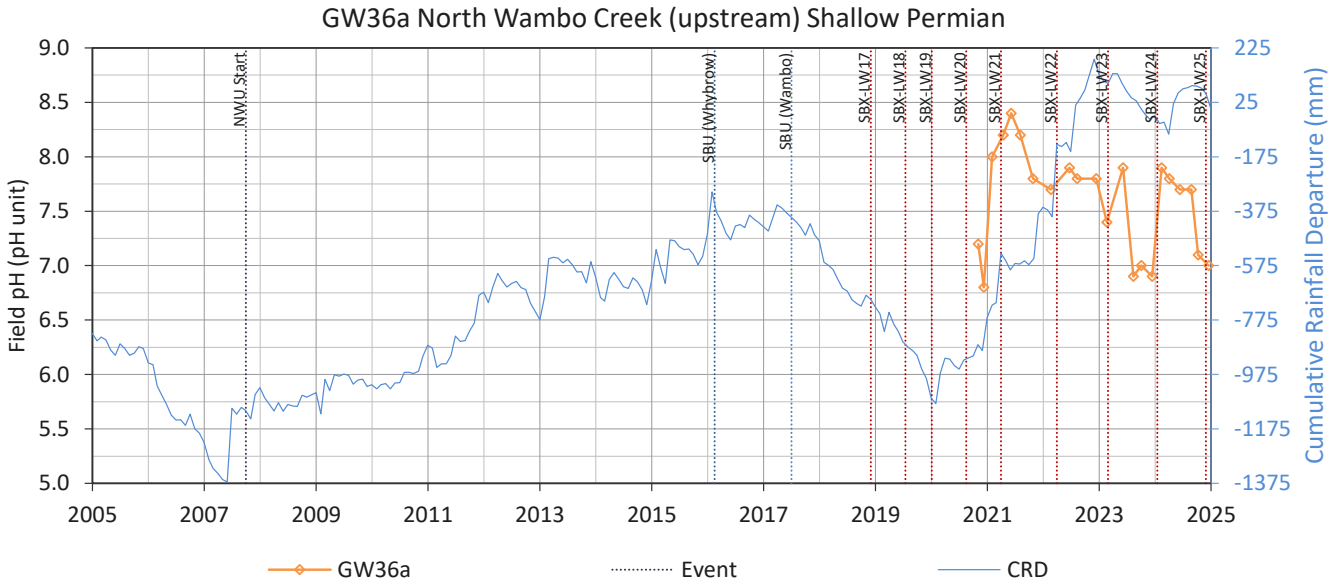

GW34 North Wambo Creek (upstream) Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW34
Event
CRD

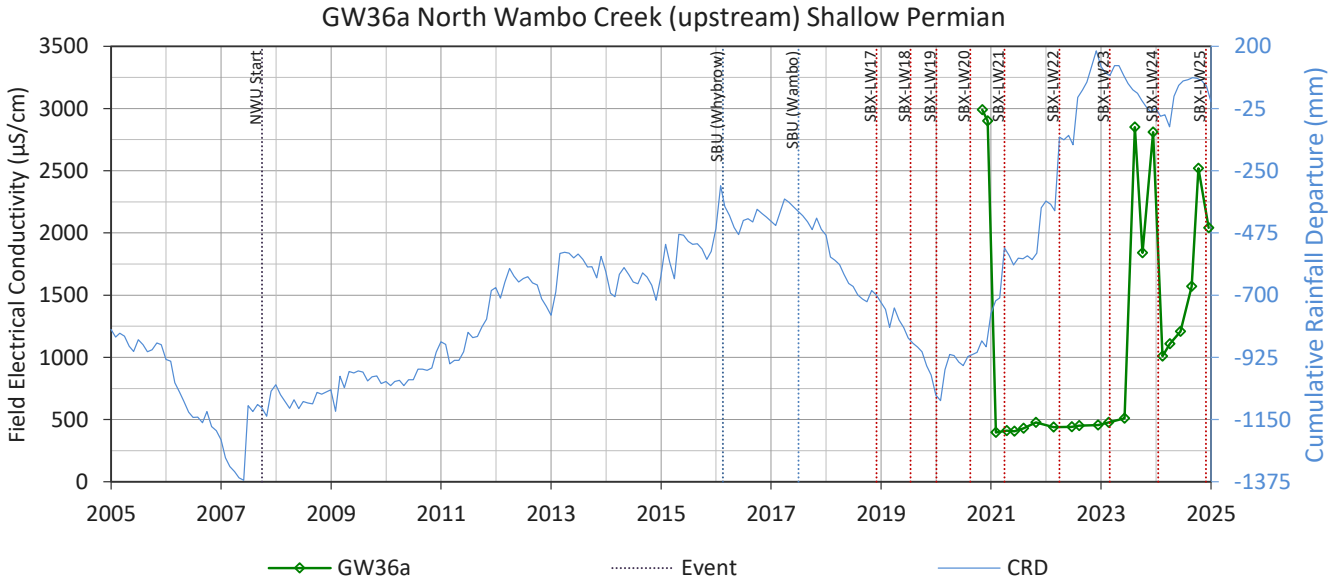

GW35 North Wambo Creek (upstream) Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW35
Event
CRD

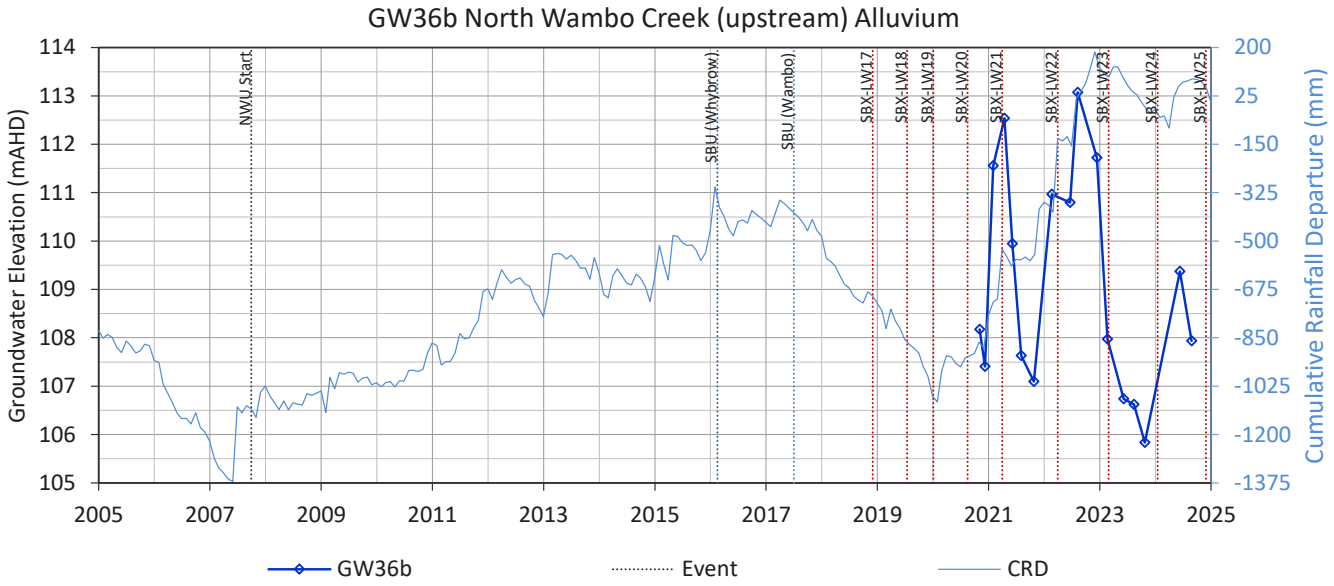

GW35 North Wambo Creek (upstream) Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW35
Event
CRD

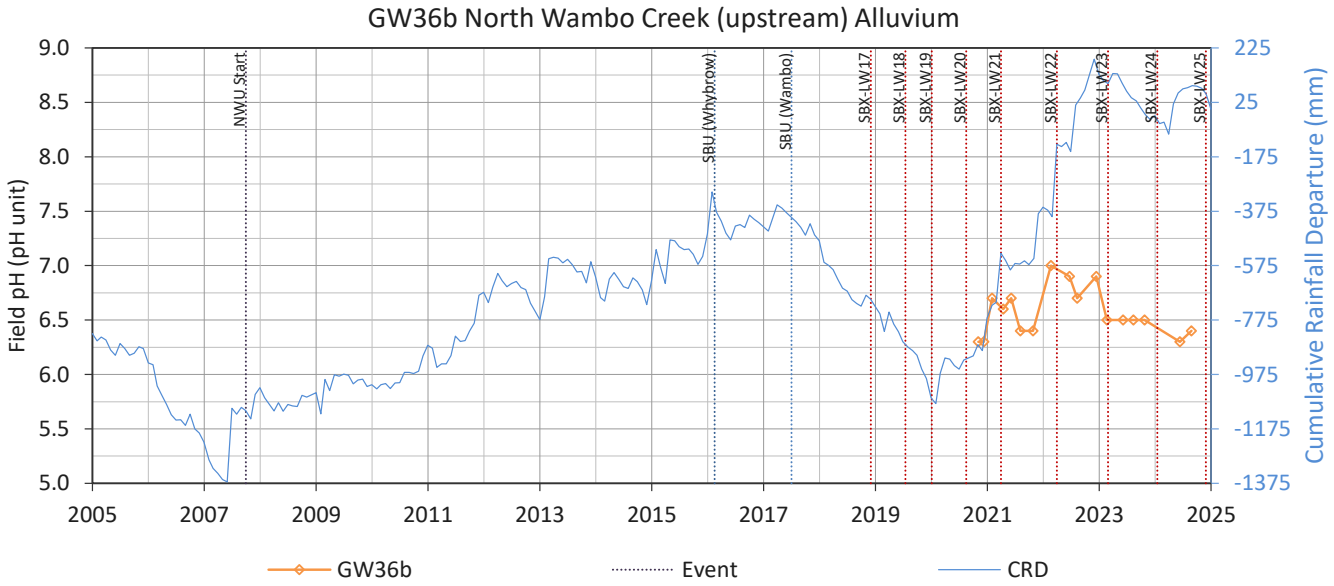

GW35 North Wambo Creek (upstream) Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW35
Event
CRD

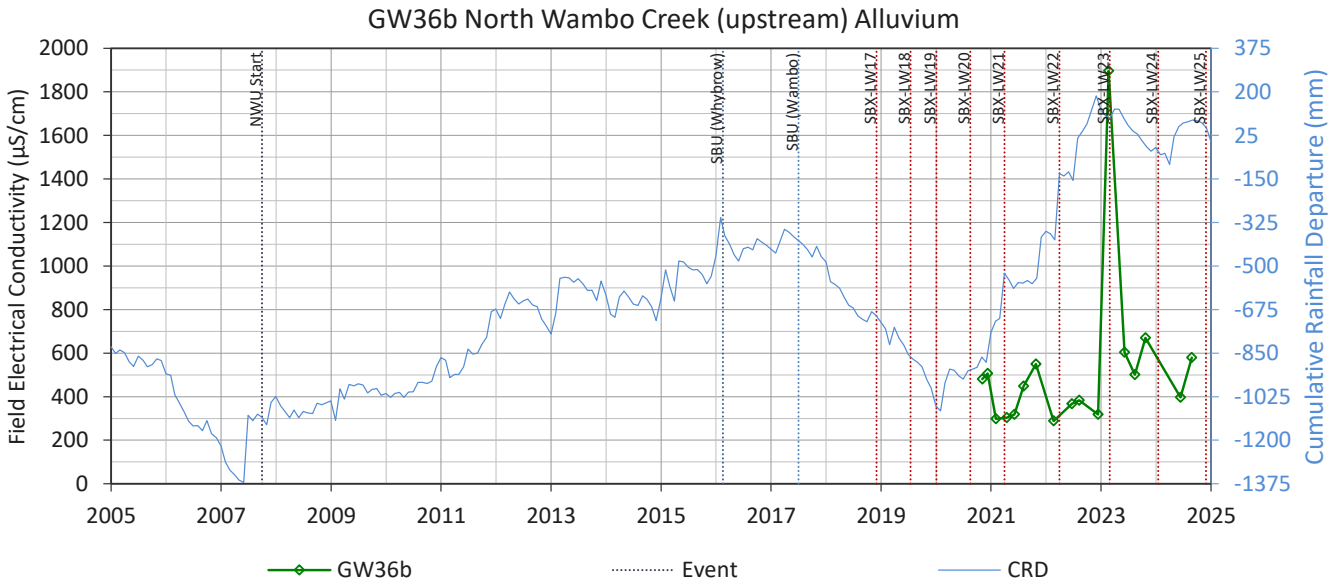

GW36a North Wambo Creek (upstream) Shallow Permian
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW36a
Event
CRD

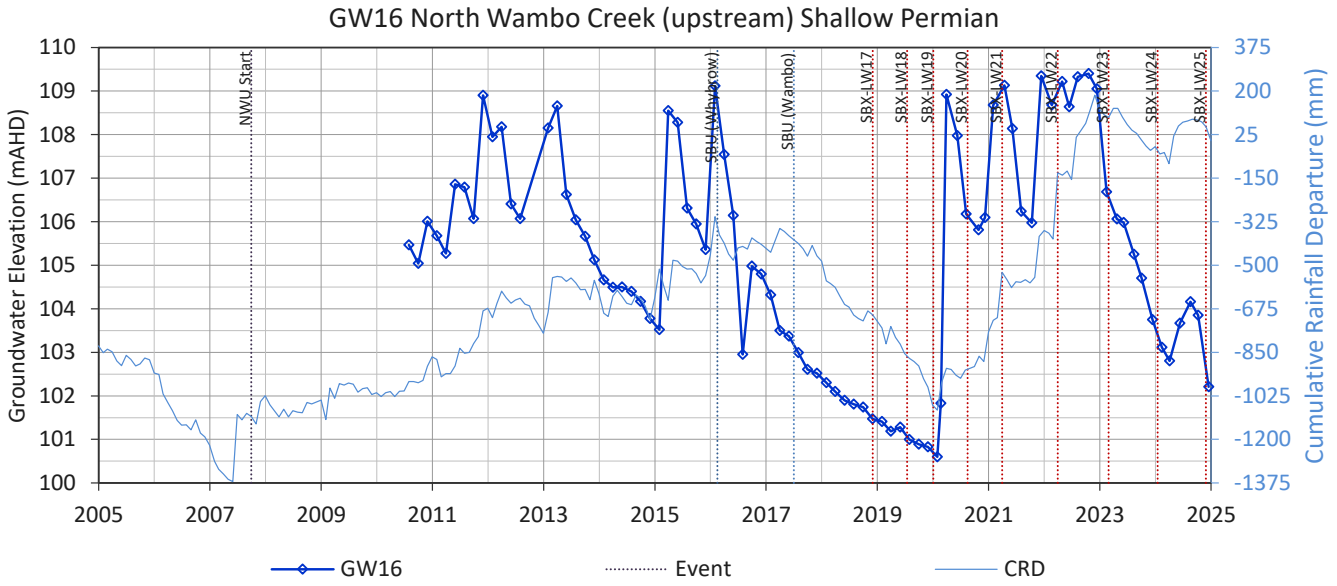

GW36a North Wambo Creek (upstream) Shallow Permian
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW36a
Event
CRD

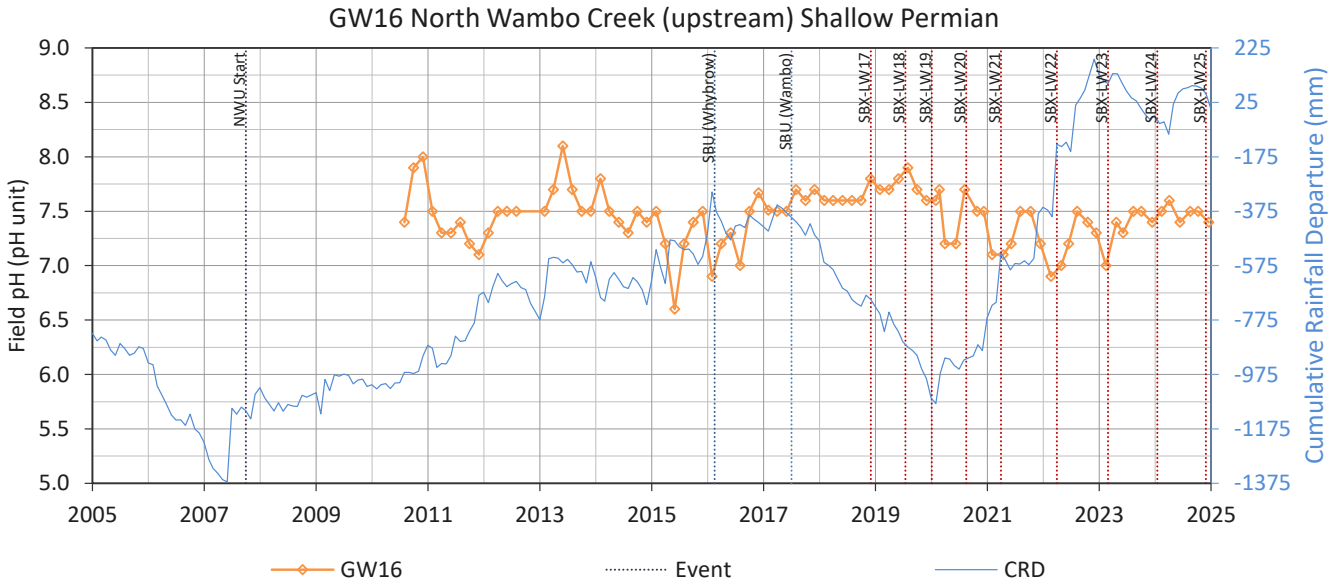

GW36a North Wambo Creek (upstream) Shallow Permian
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW36a
Event
CRD

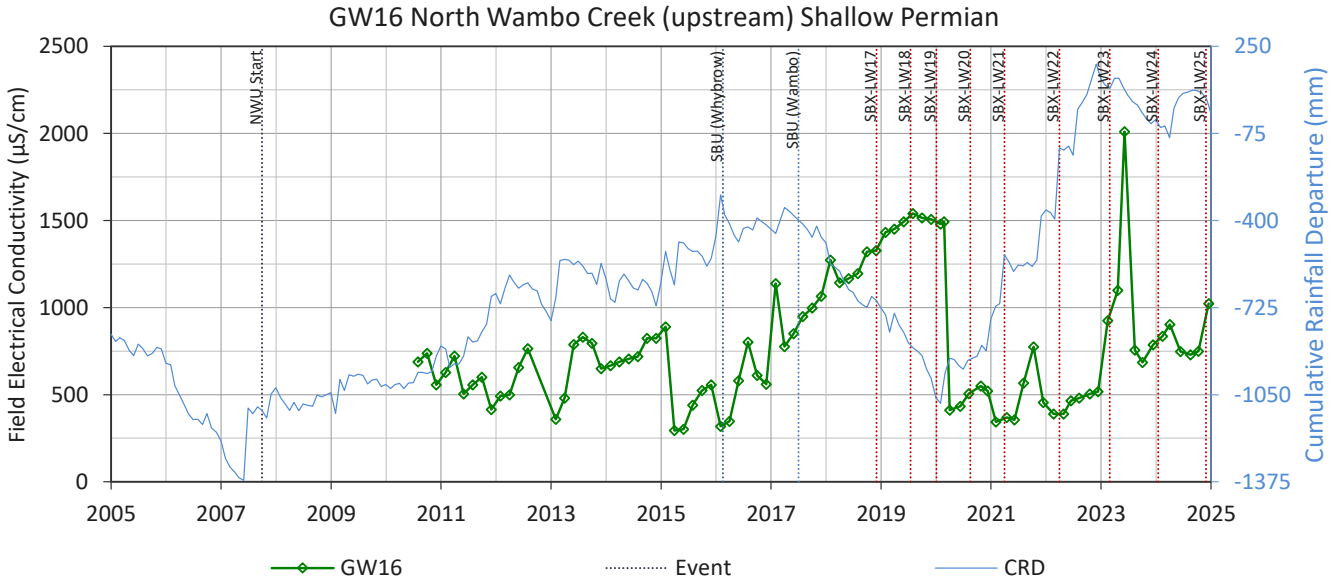

GW36b North Wambo Creek (upstream) Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW36b
Event
CRD

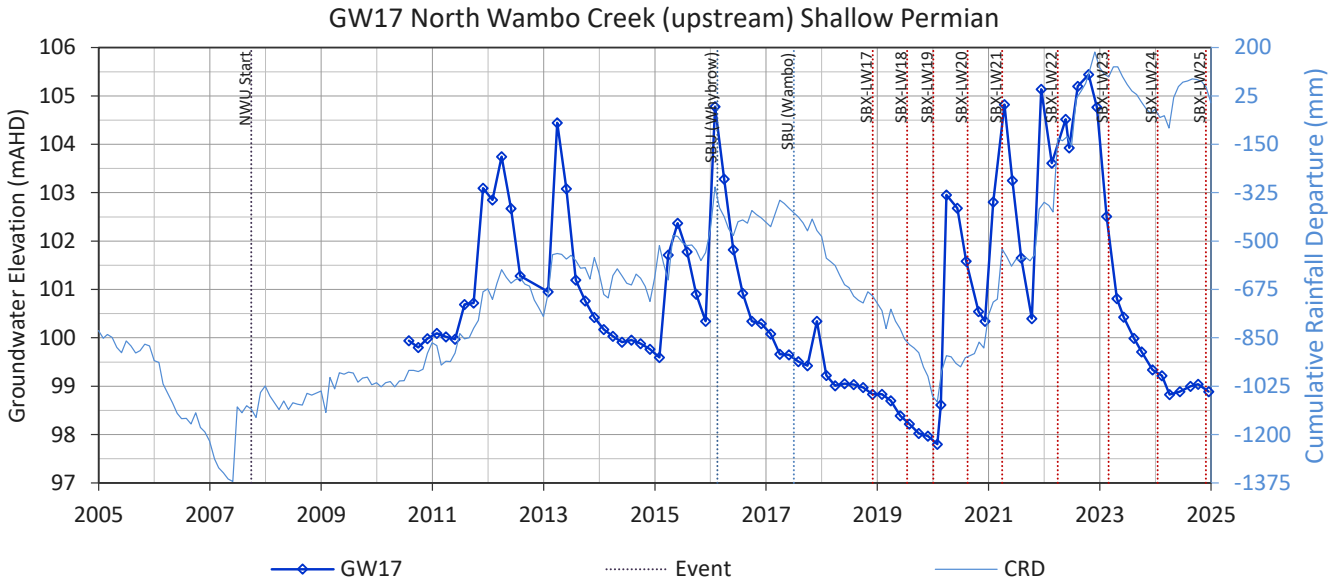

GW36b North Wambo Creek (upstream) Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW36b
Event
CRD

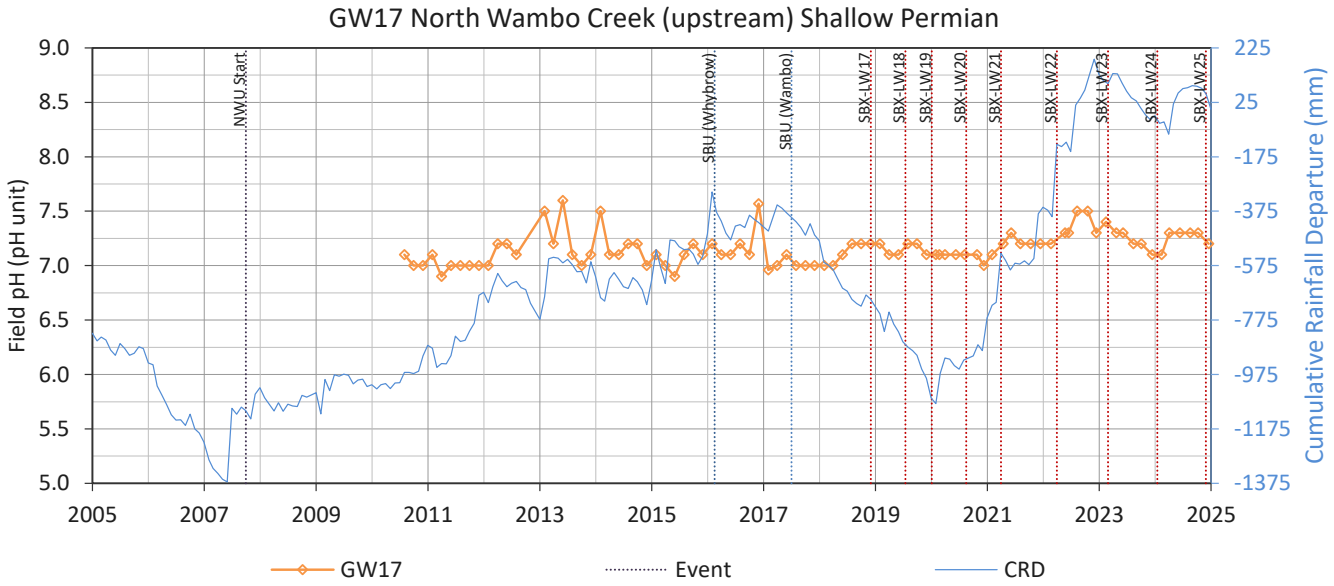

GW36b North Wambo Creek (upstream) Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW36b
Event
CRD

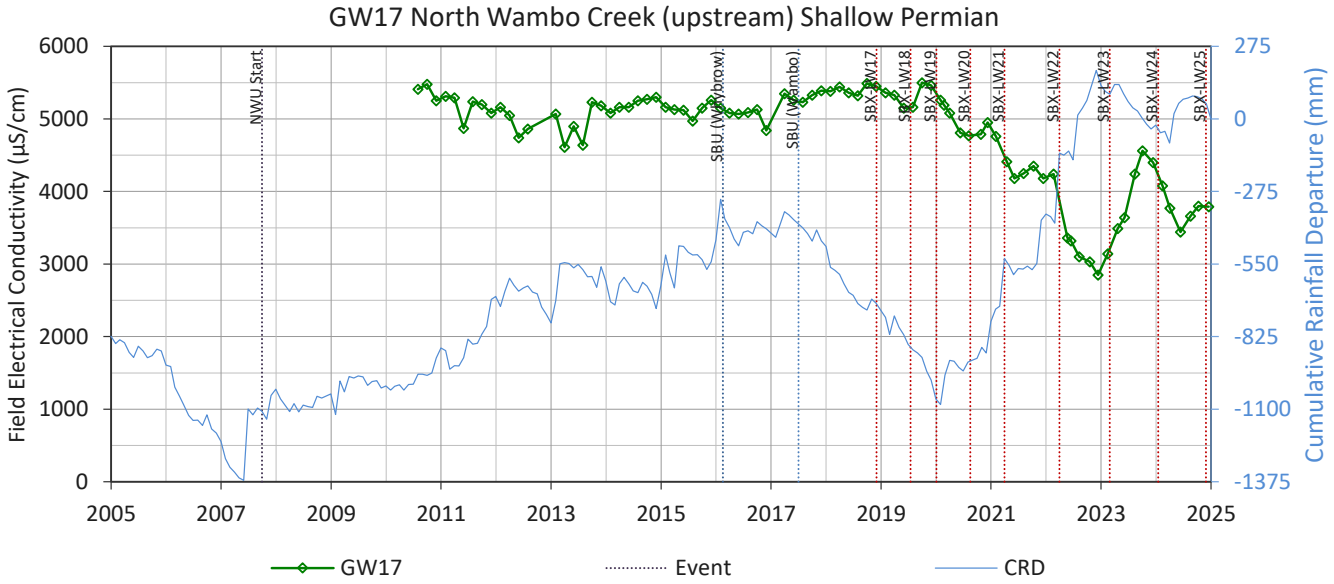

GW16 North Wambo Creek (upstream) Shallow Permian
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW16
Event
CRD

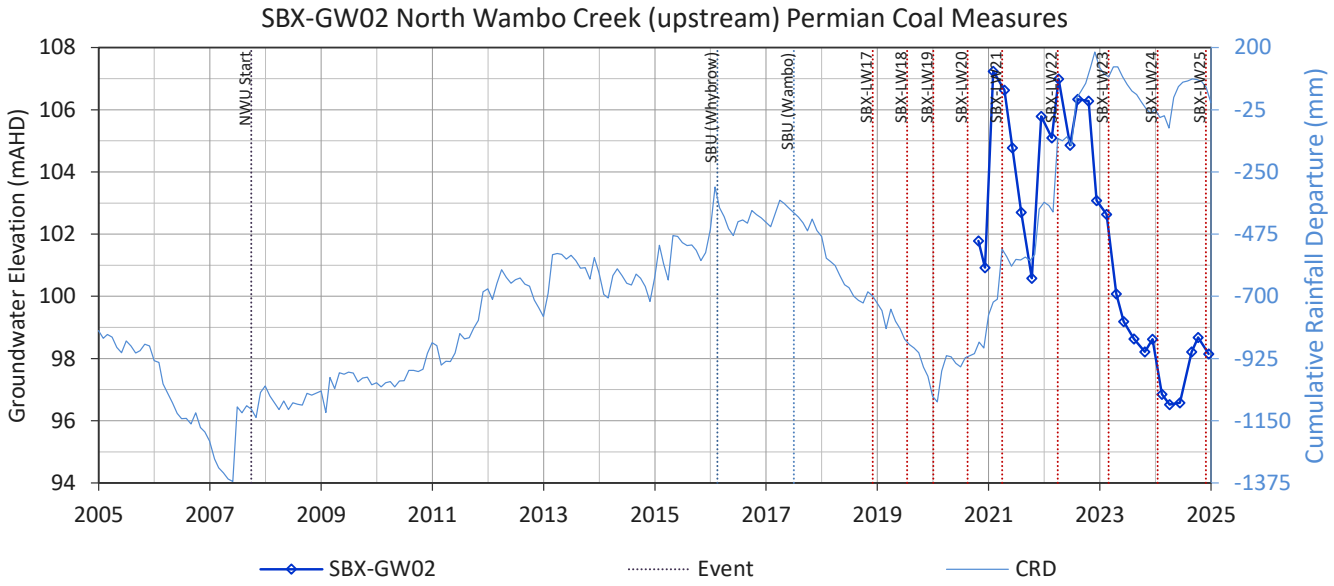

GW16 North Wambo Creek (upstream) Shallow Permian
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW16
Event
CRD

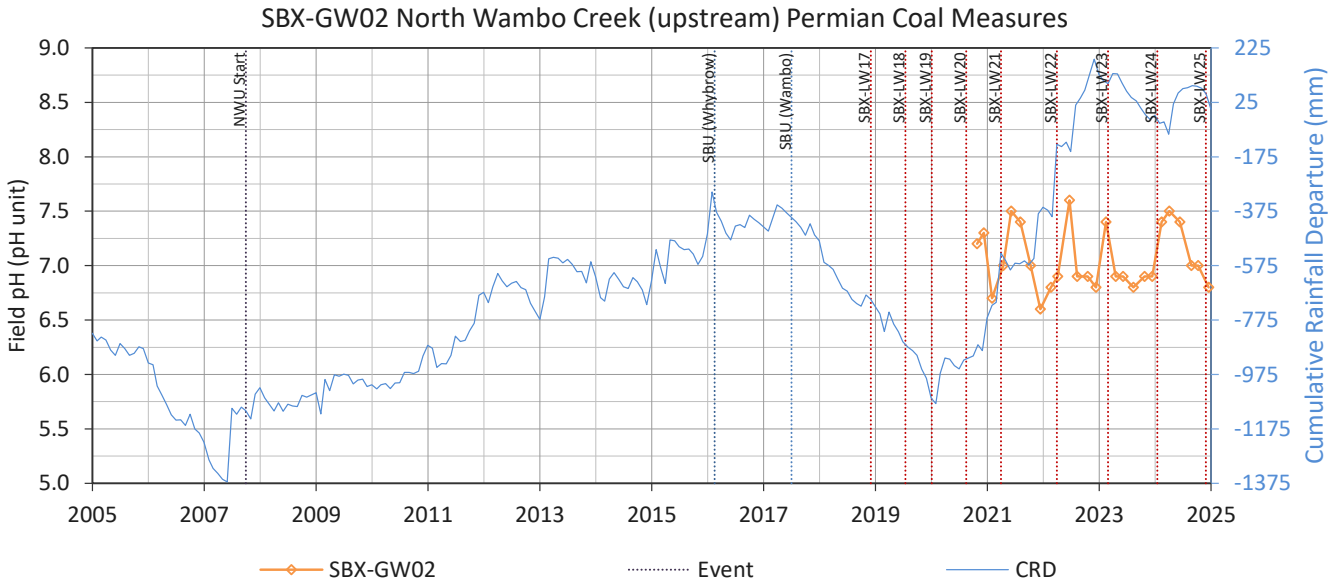

GW16 North Wambo Creek (upstream) Shallow Permian
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW16
Event
CRD

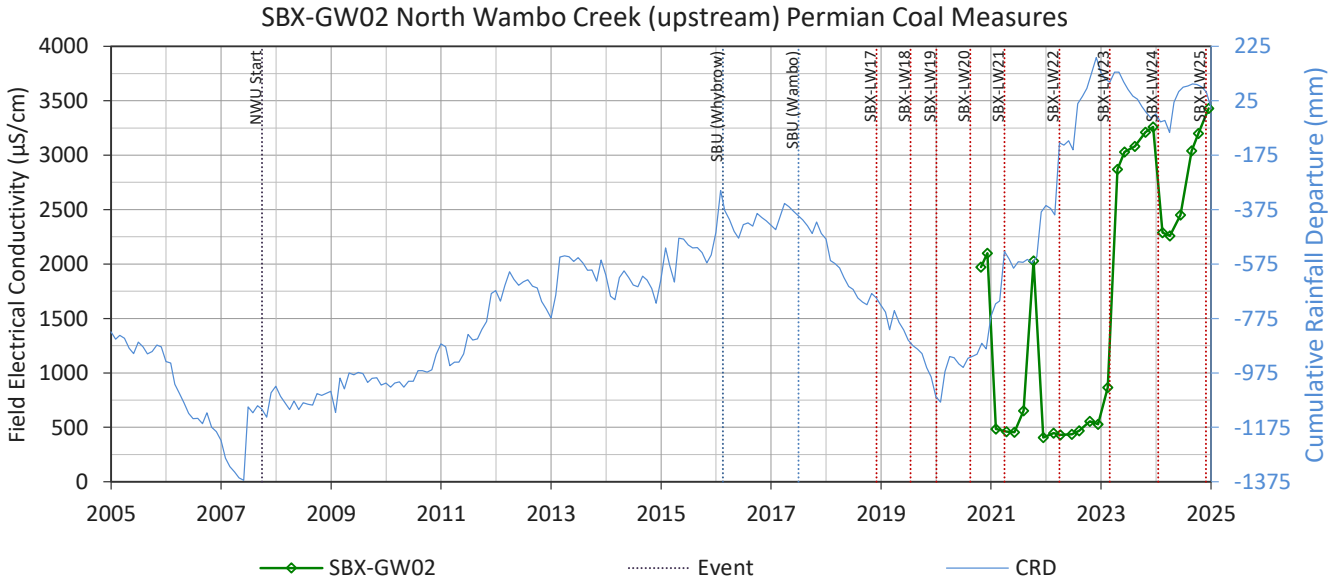

GW17 North Wambo Creek (upstream) Shallow Permian
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Wybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW17
Event
CRD

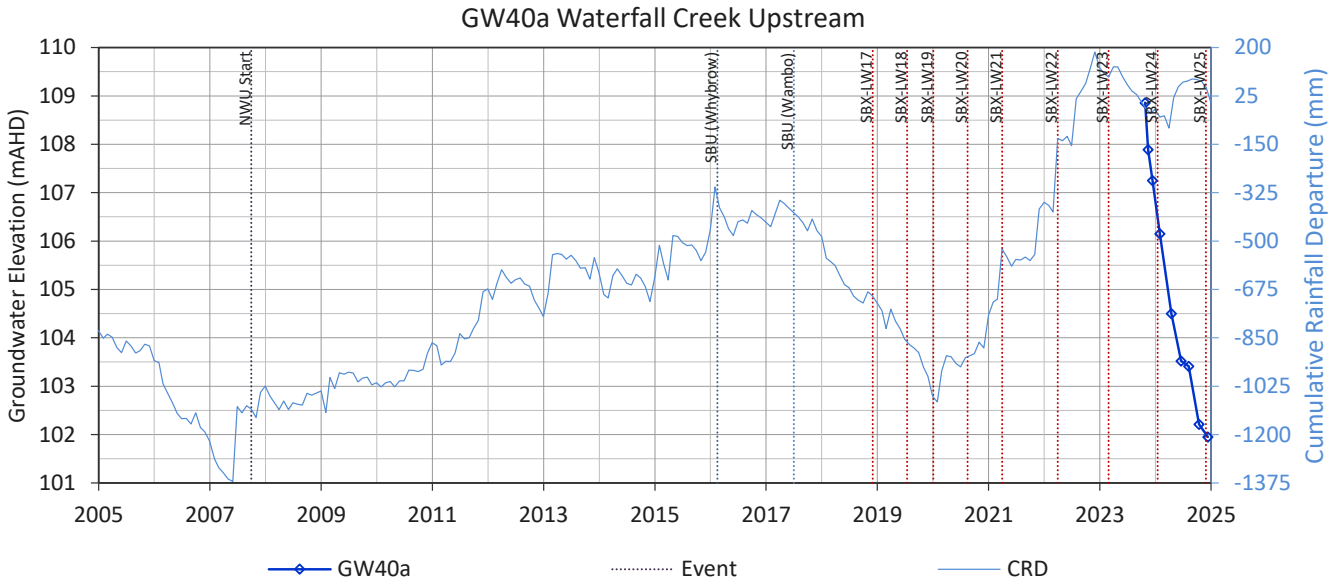

GW17 North Wambo Creek (upstream) Shallow Permian
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Wybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW17
Event
CRD

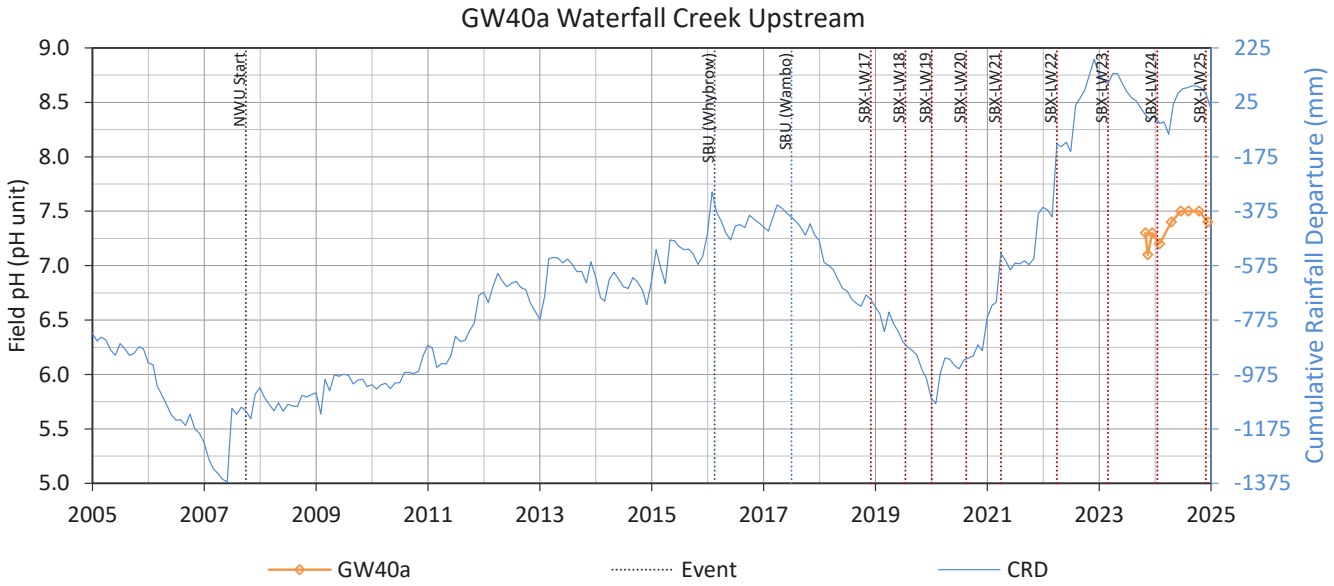

GW17 North Wambo Creek (upstream) Shallow Permian
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Wybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW17
Event
CRD

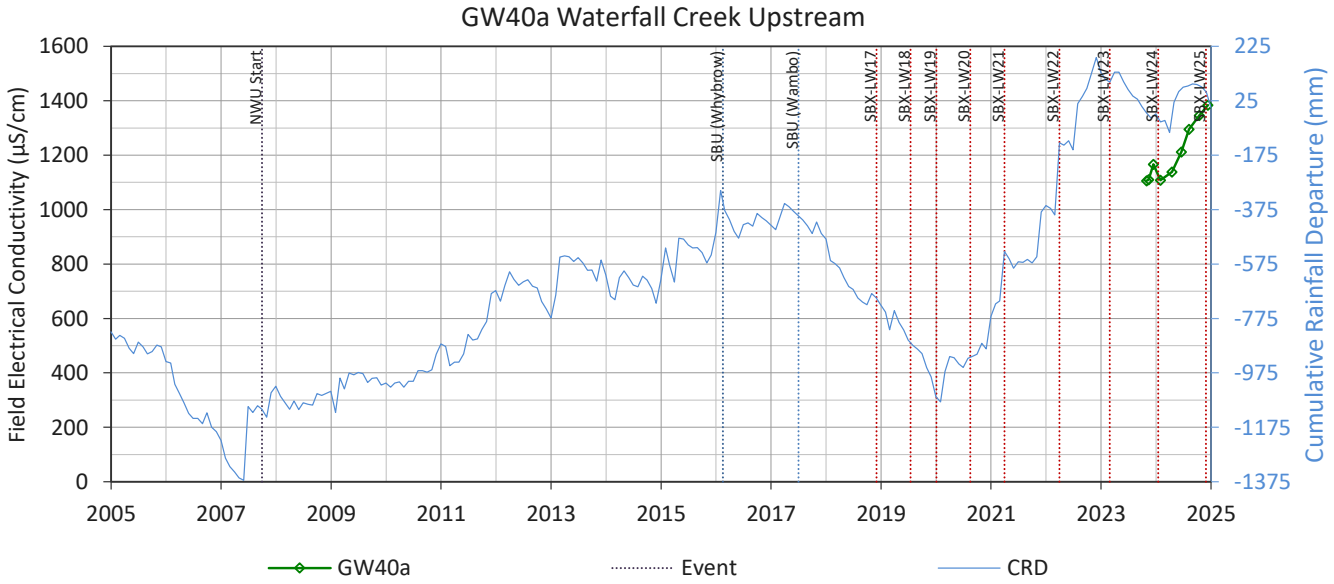

SBX-GW02 North Wambo Creek (upstream) Permian Coal Measures
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
SBX-GW02
Event
CRD

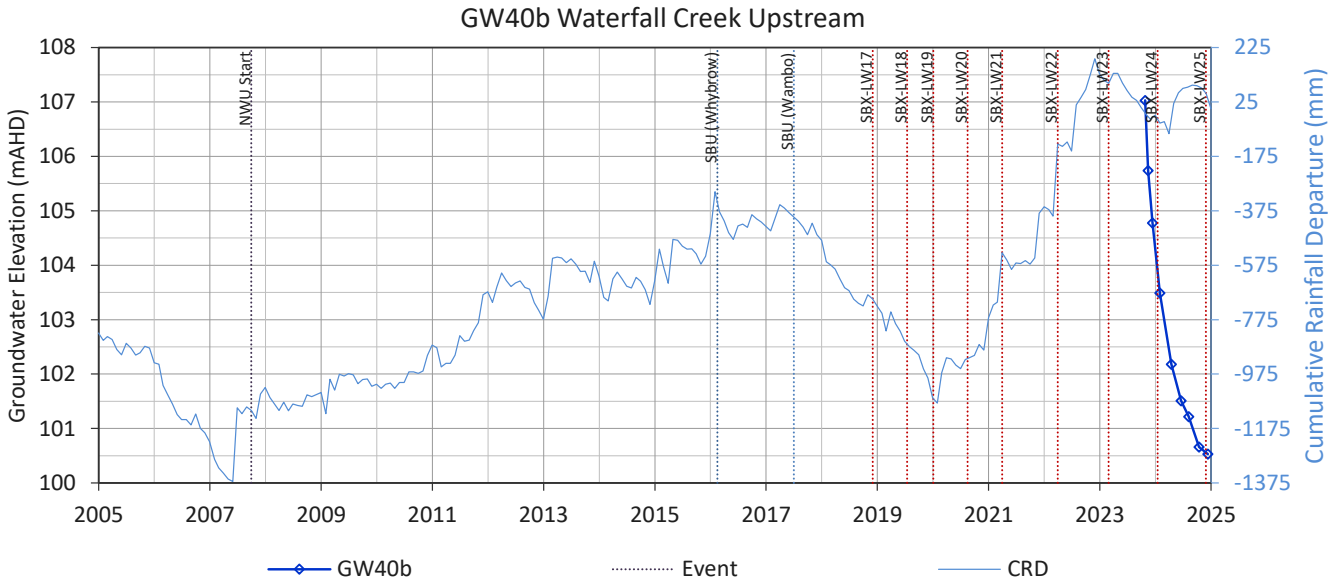

SBX-GW02 North Wambo Creek (upstream) Permian Coal Measures
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
SBX-GW02
Event
CRD

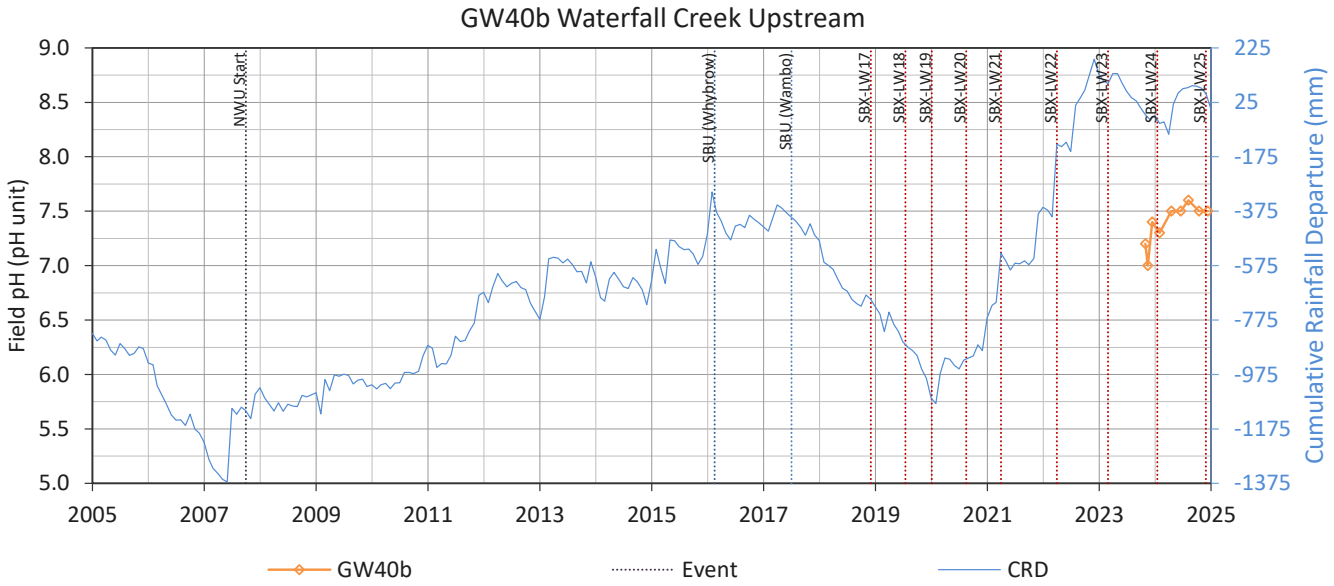

SBX-GW02 North Wambo Creek (upstream) Permian Coal Measures
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
SBX-GW02
Event
CRD

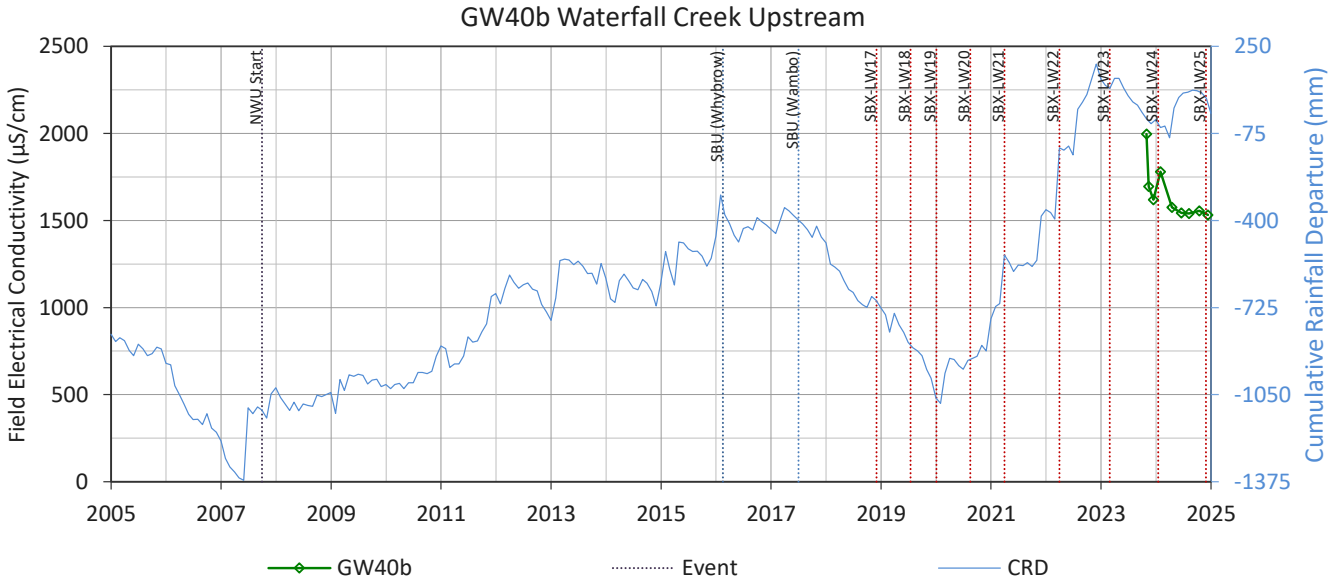

GW40a Waterfall Creek Upstream
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW40a
Event
CRD

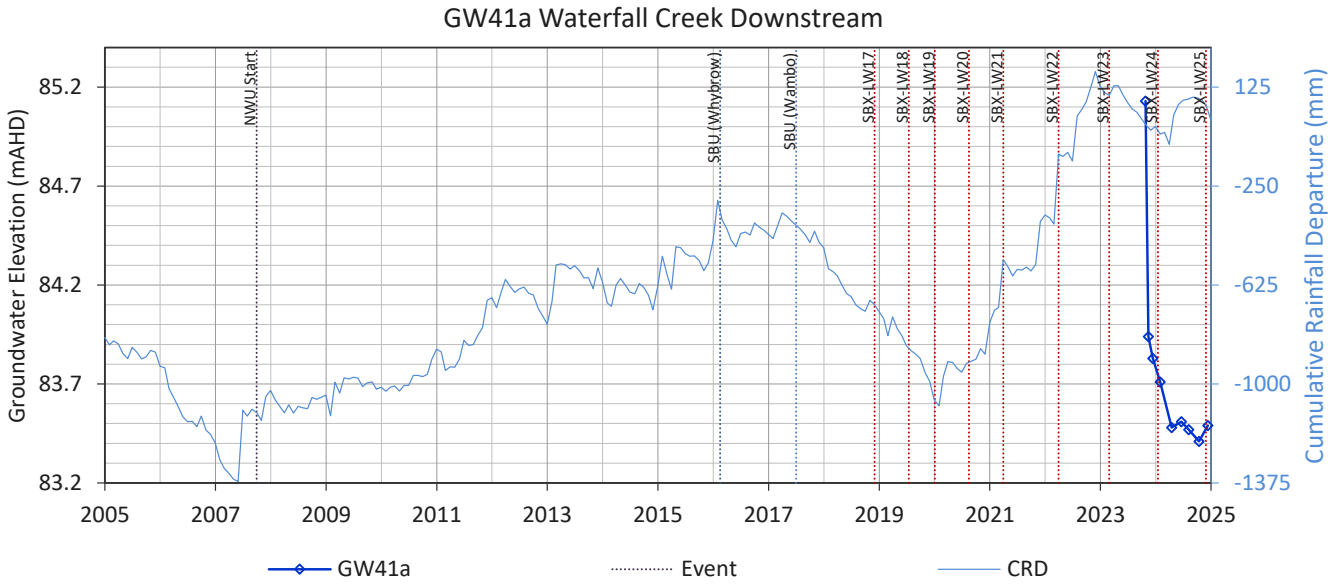

GW40a Waterfall Creek Upstream
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW40a
Event
CRD

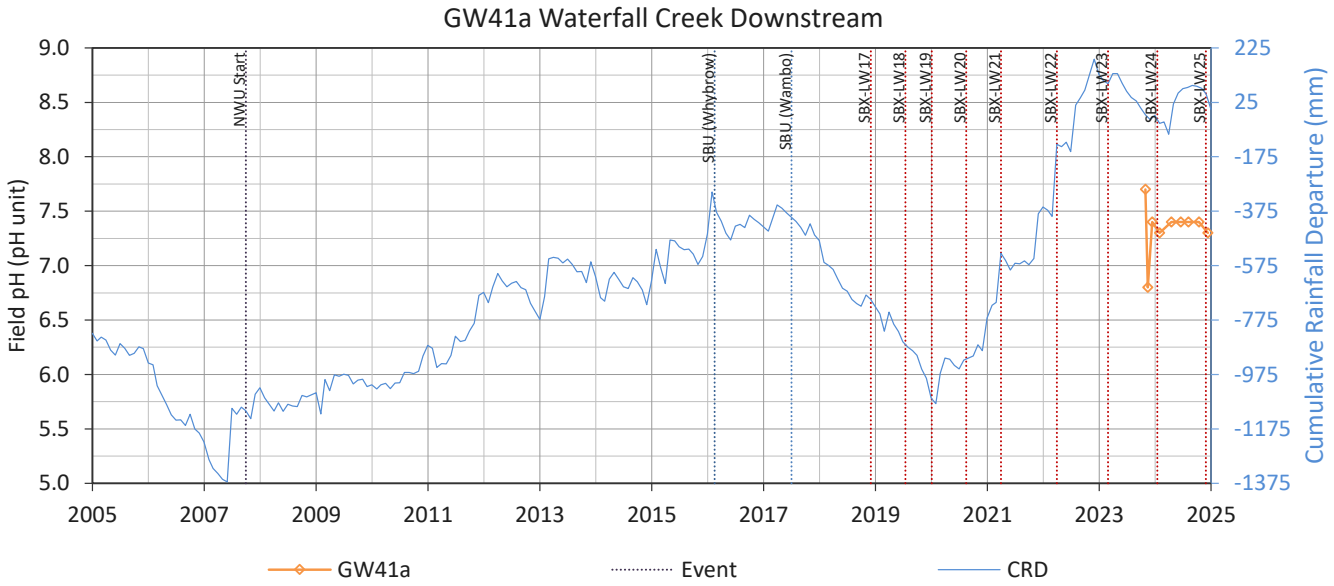

GW40a Waterfall Creek Upstream
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW40a
Event
CRD

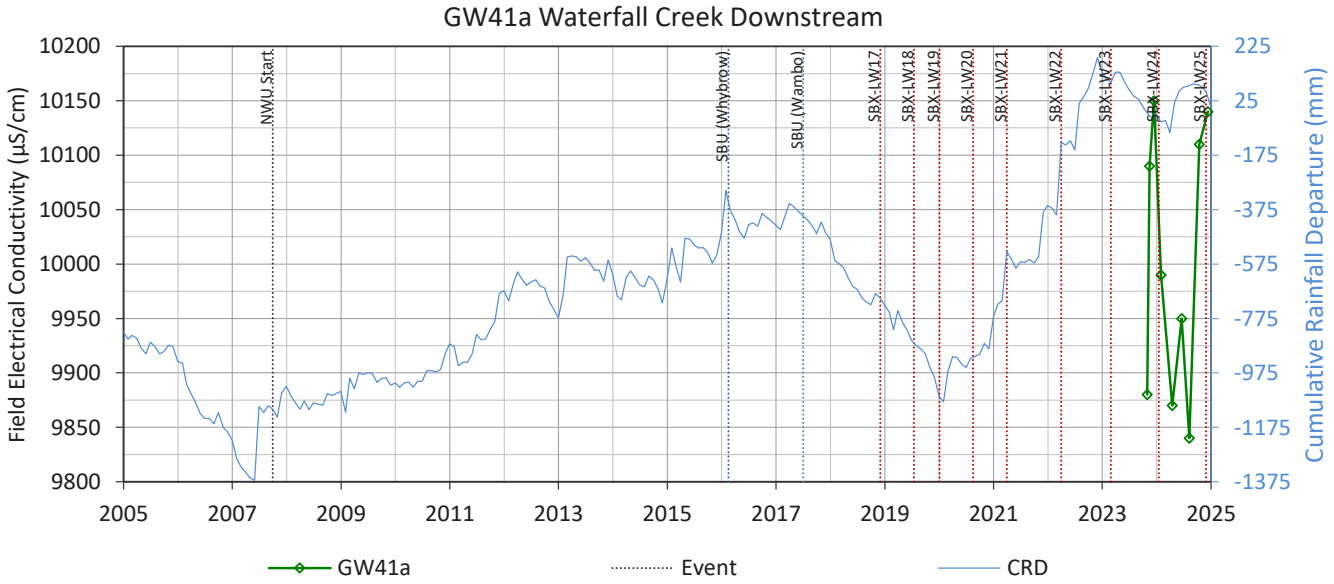

GW40b Waterfall Creek Upstream
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW40b
Event
CRD

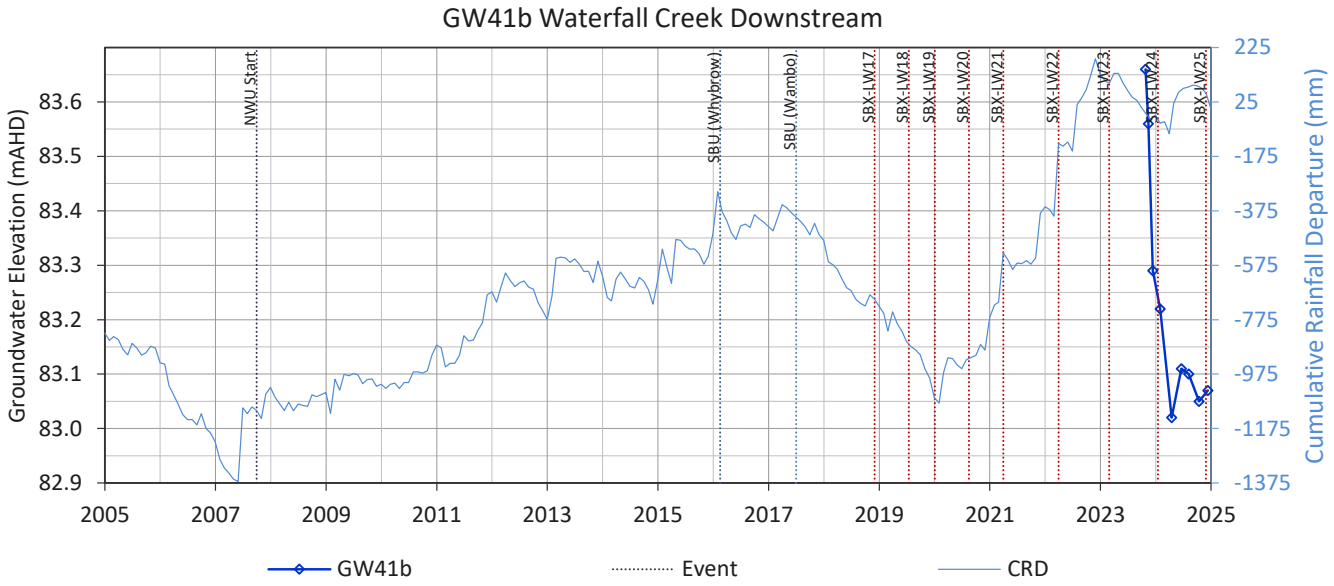

GW40b Waterfall Creek Upstream
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW40b
Event
CRD

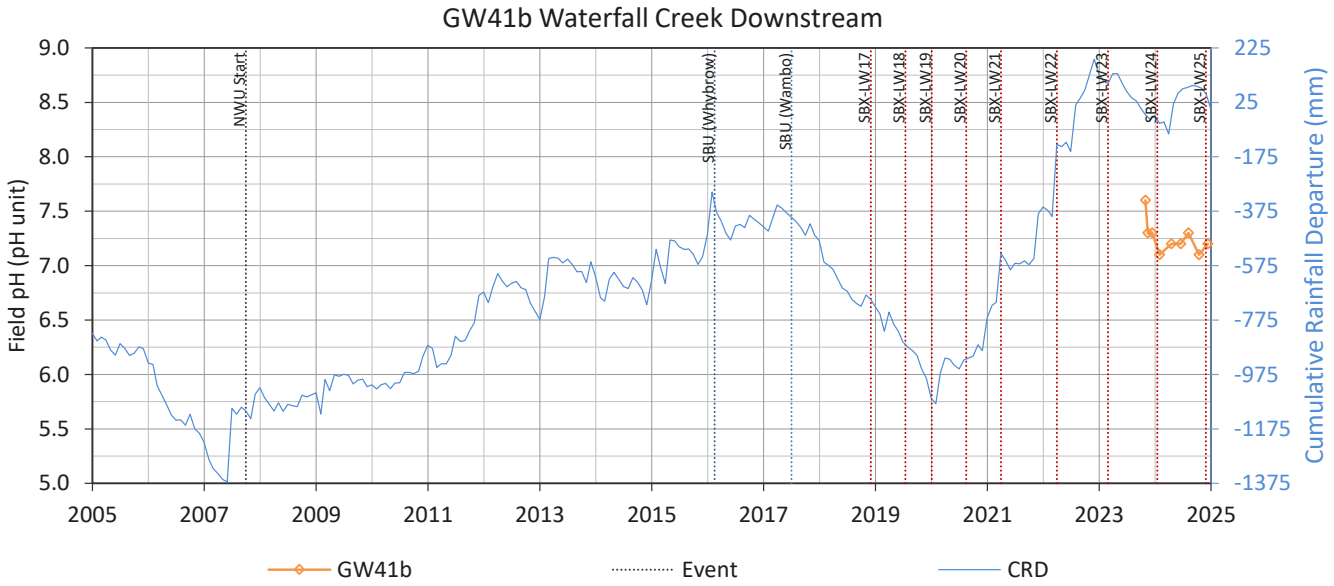

GW40b Waterfall Creek Upstream
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW40b
Event
CRD

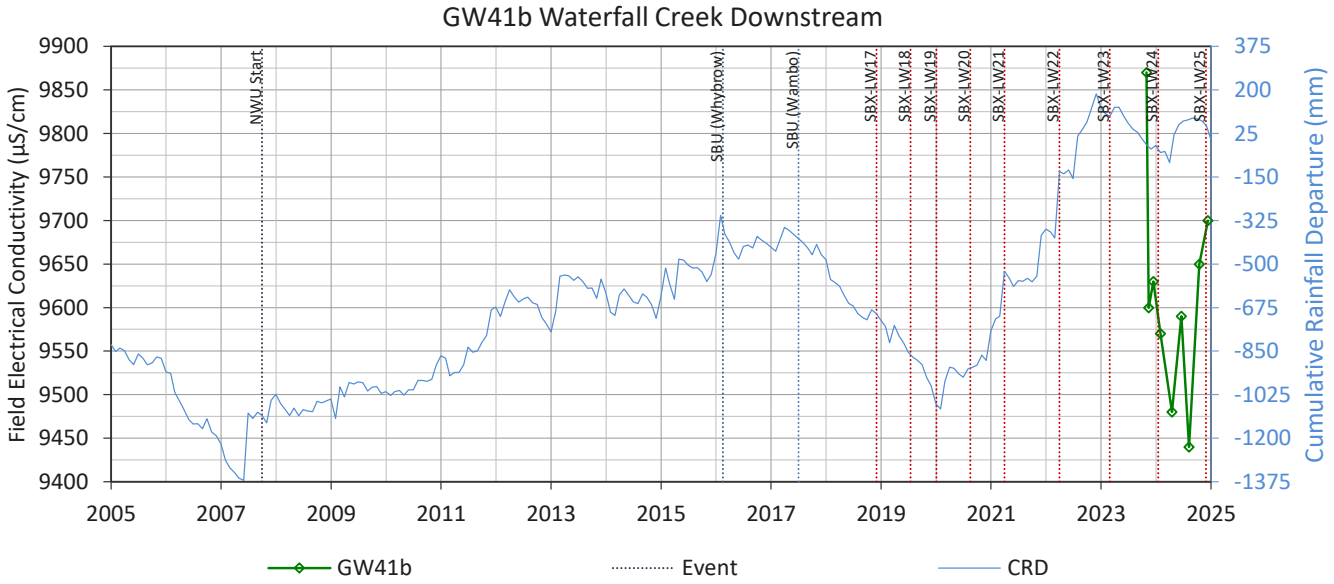

GW41a Waterfall Creek Downstream
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW41a
Event
CRD

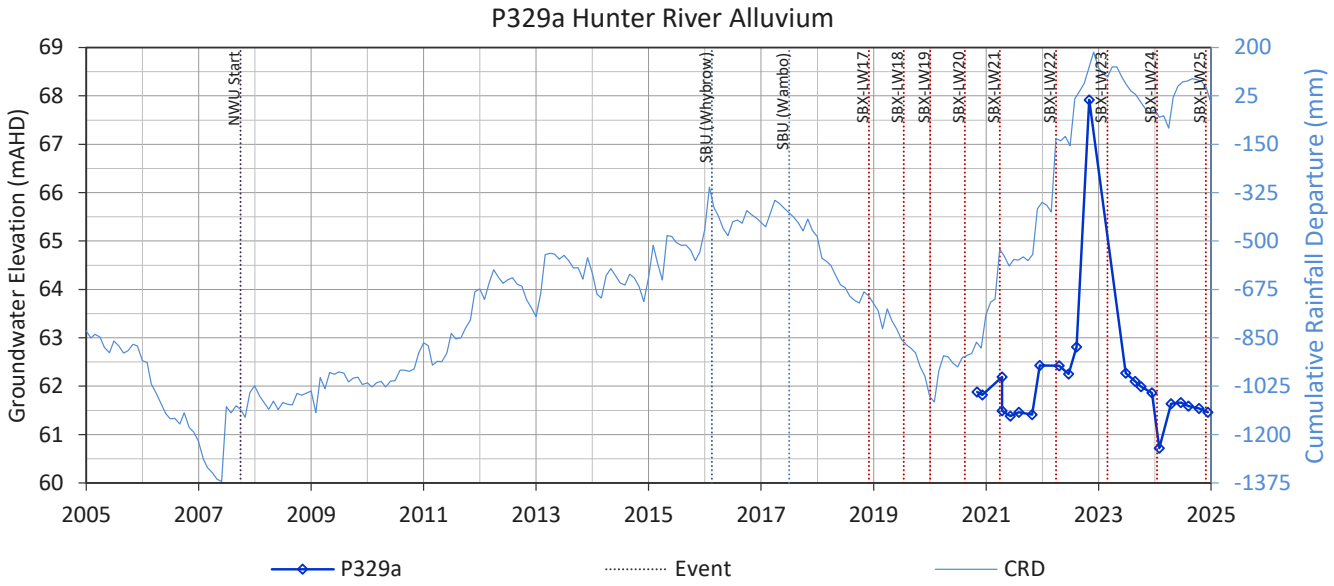

GW41a Waterfall Creek Downstream
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW41a
Event
CRD

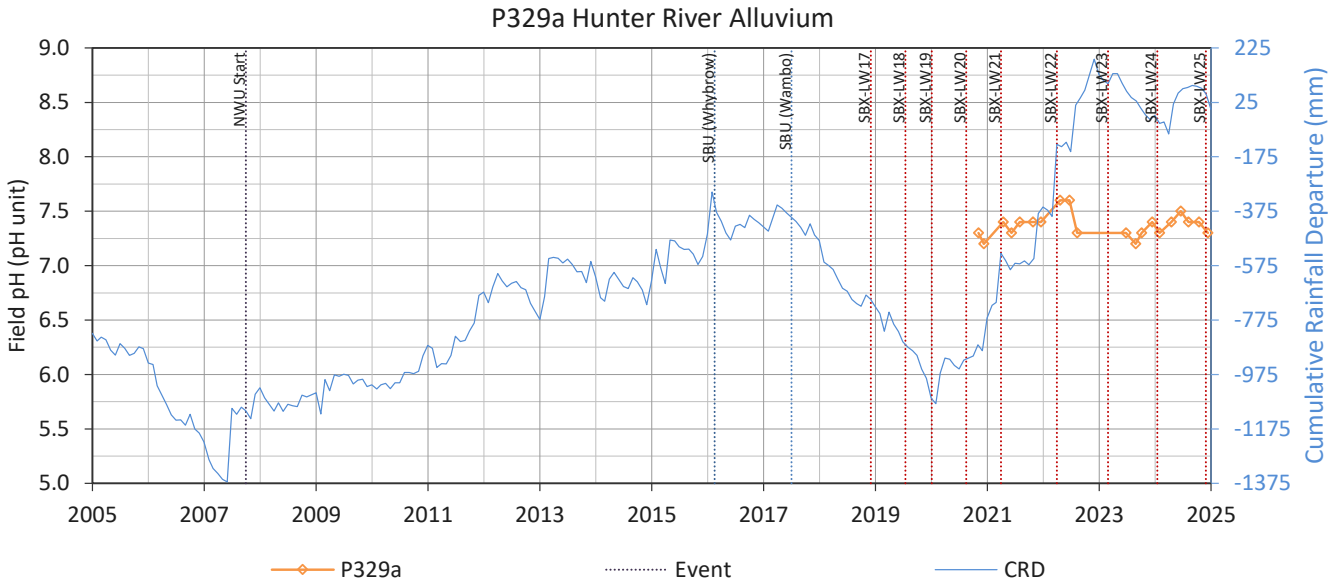

GW41a Waterfall Creek Downstream
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW41a
Event
CRD

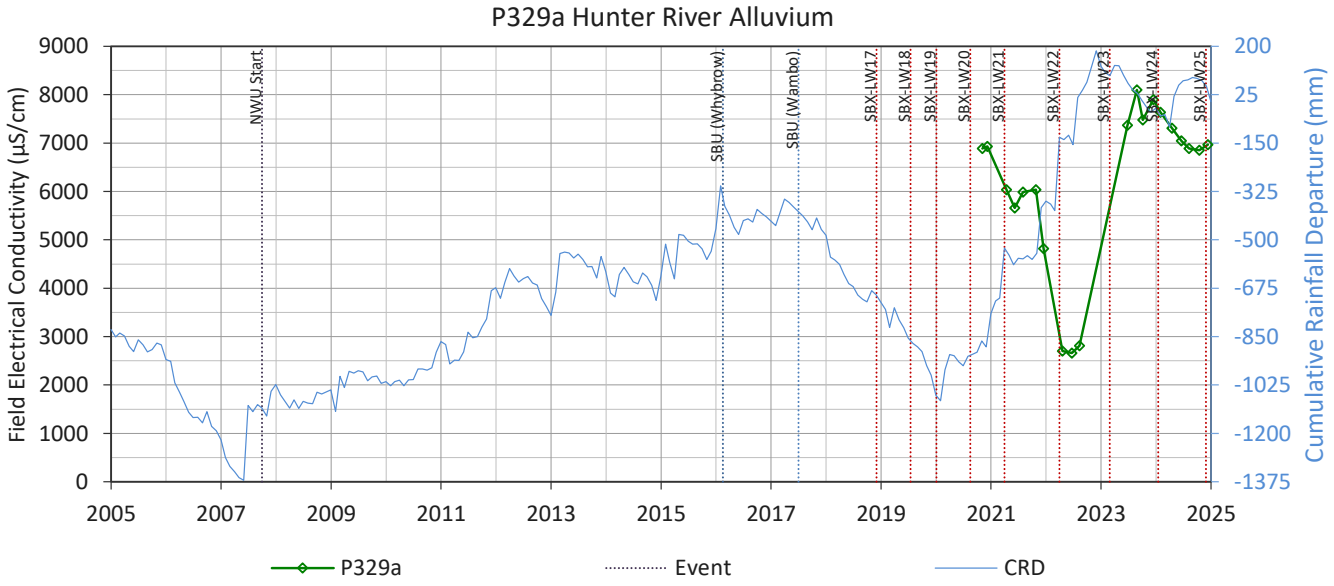

GW41b Waterfall Creek Downstream
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW41b
Event
CRD

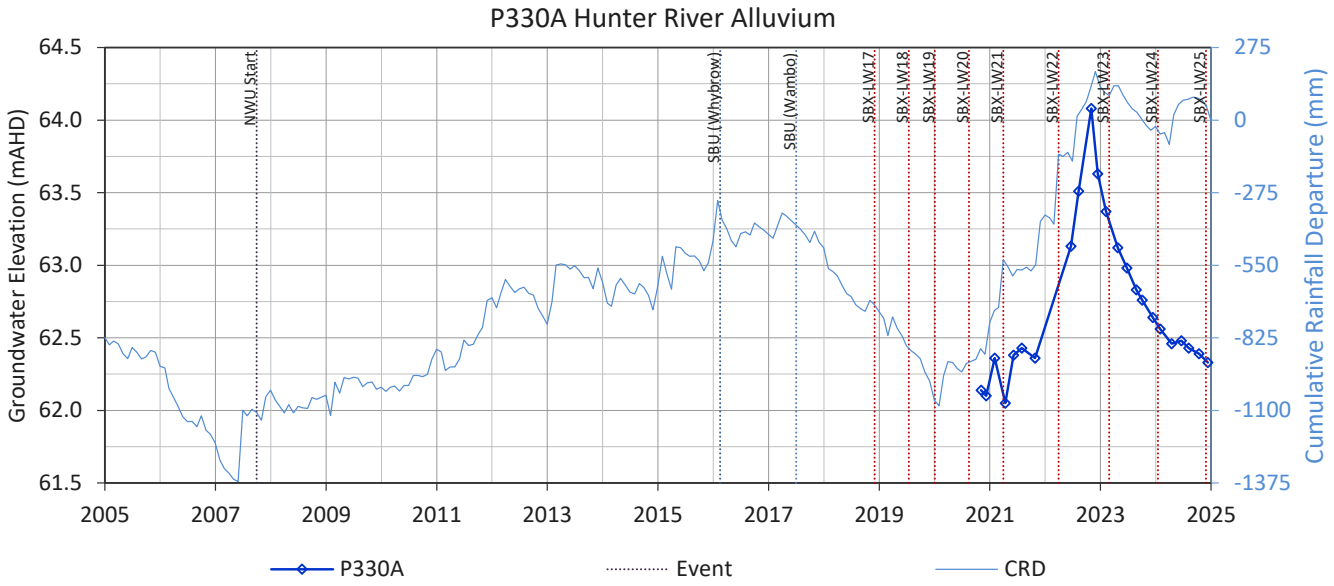

GW41b Waterfall Creek Downstream
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW41b
Event
CRD

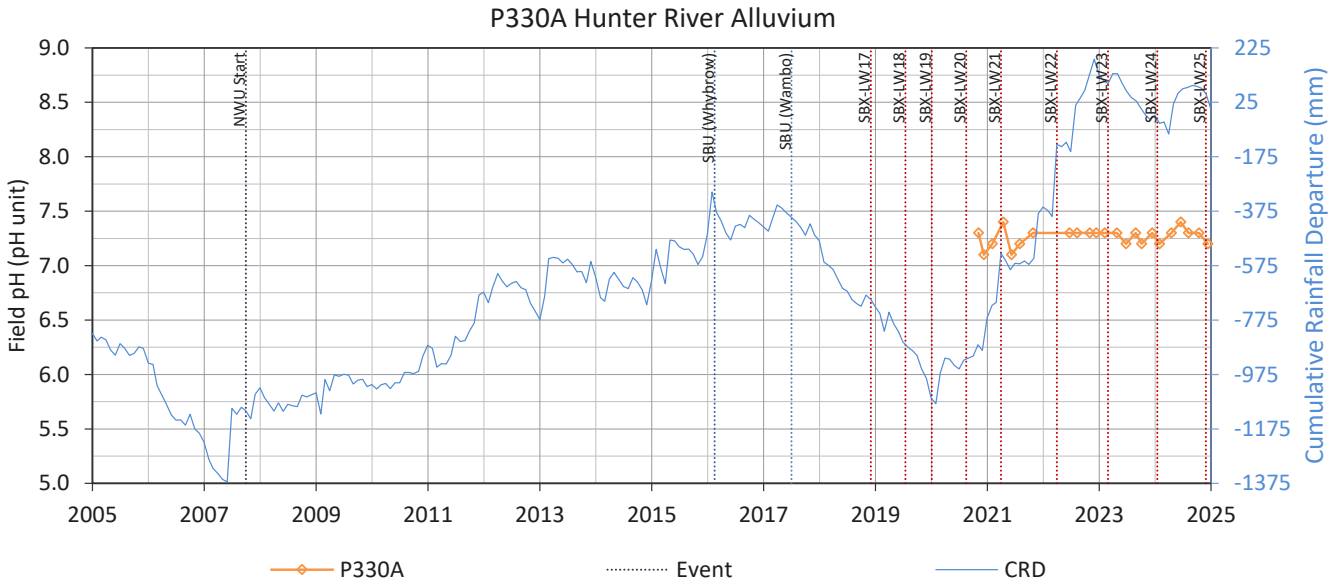

GW41b Waterfall Creek Downstream
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
GW41b
Event
CRD

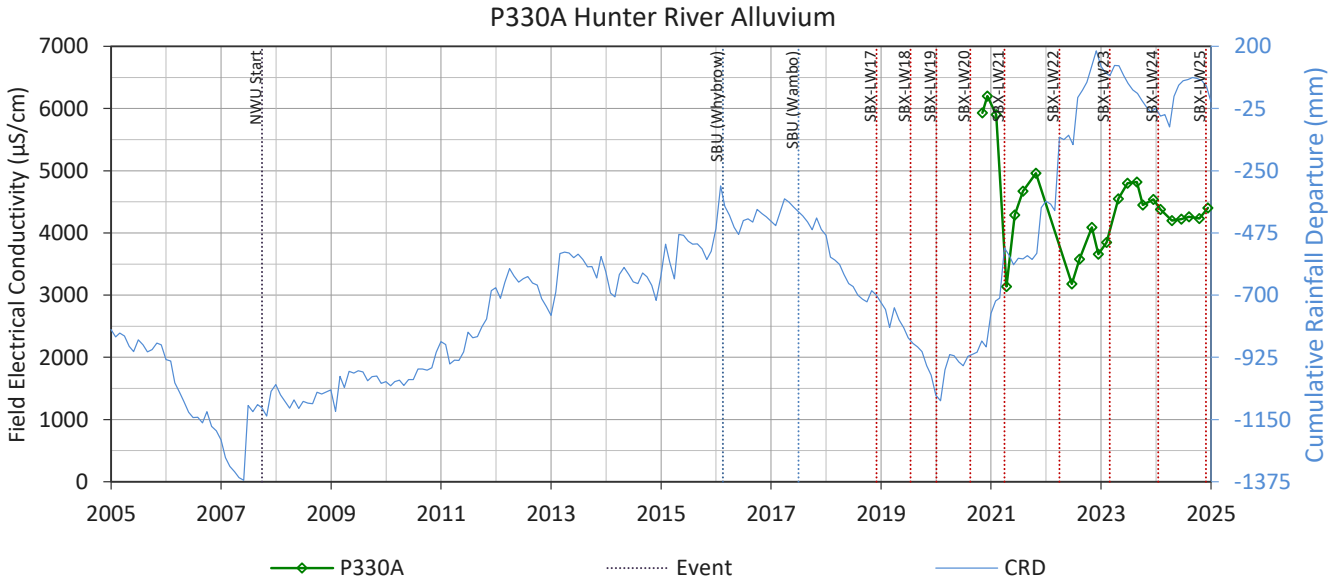

P329a Hunter River Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P329a
Event
CRD

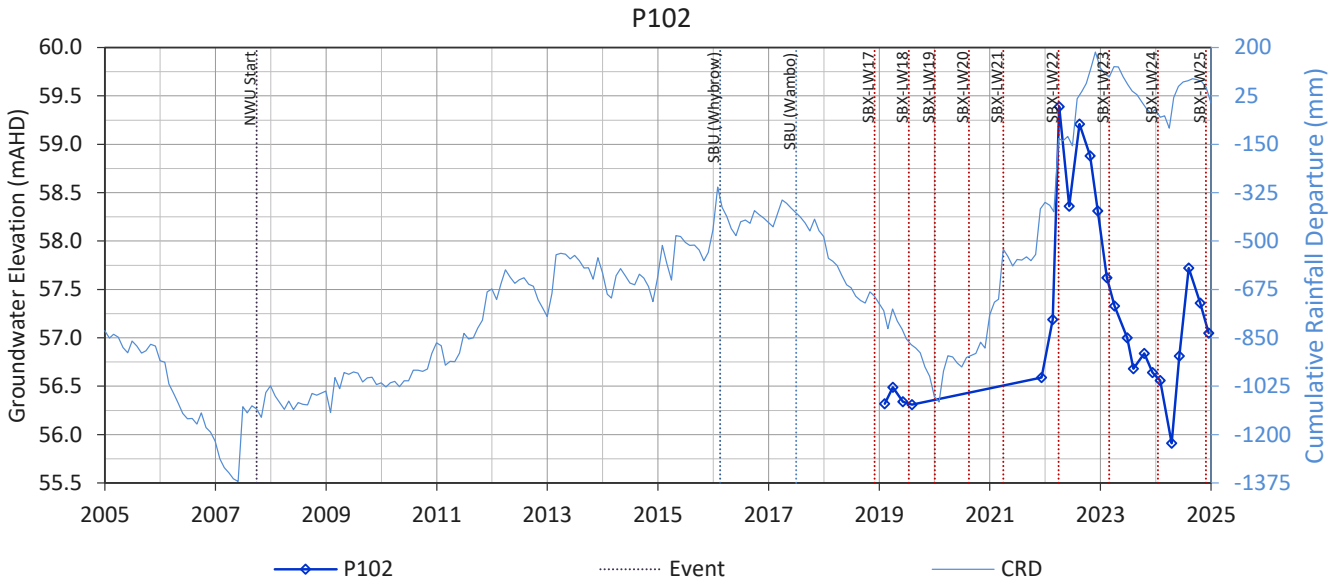

P329a Hunter River Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P329a
Event
CRD

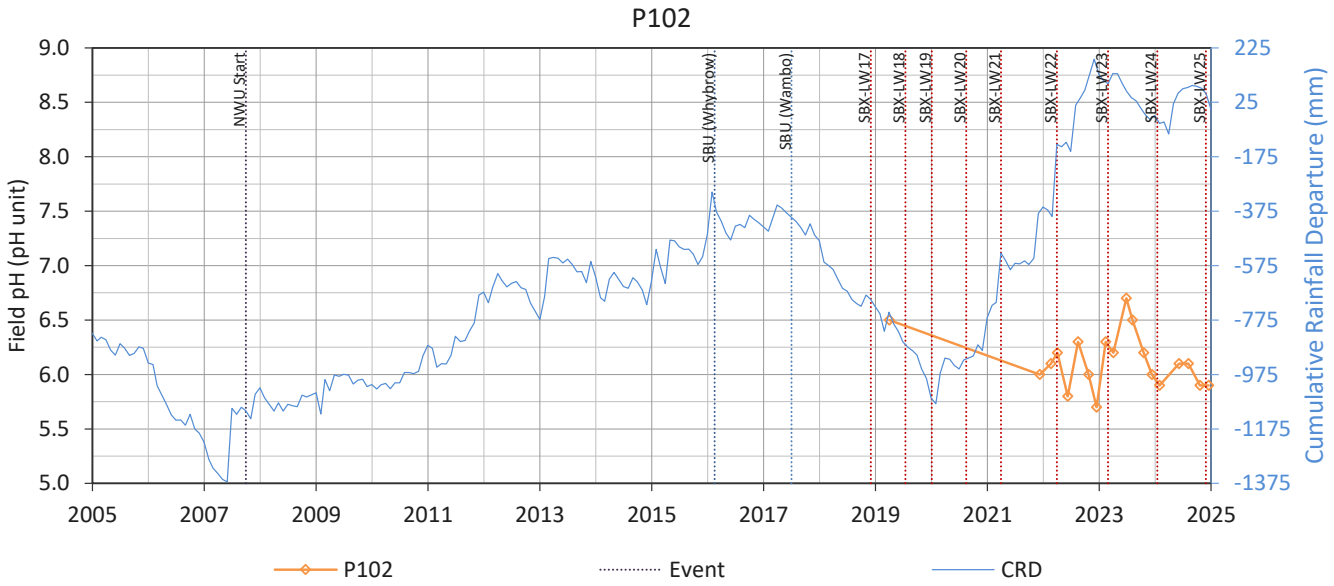

P329a Hunter River Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P329a
Event
CRD

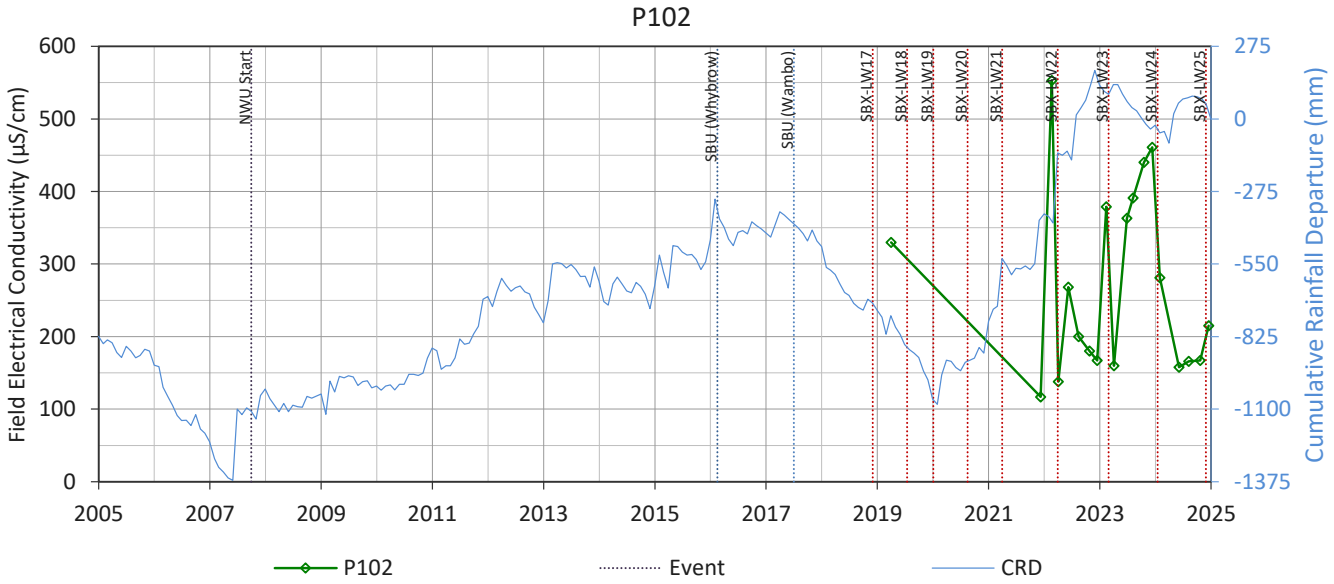

P330A Hunter River Alluvium
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P330A
Event
CRD

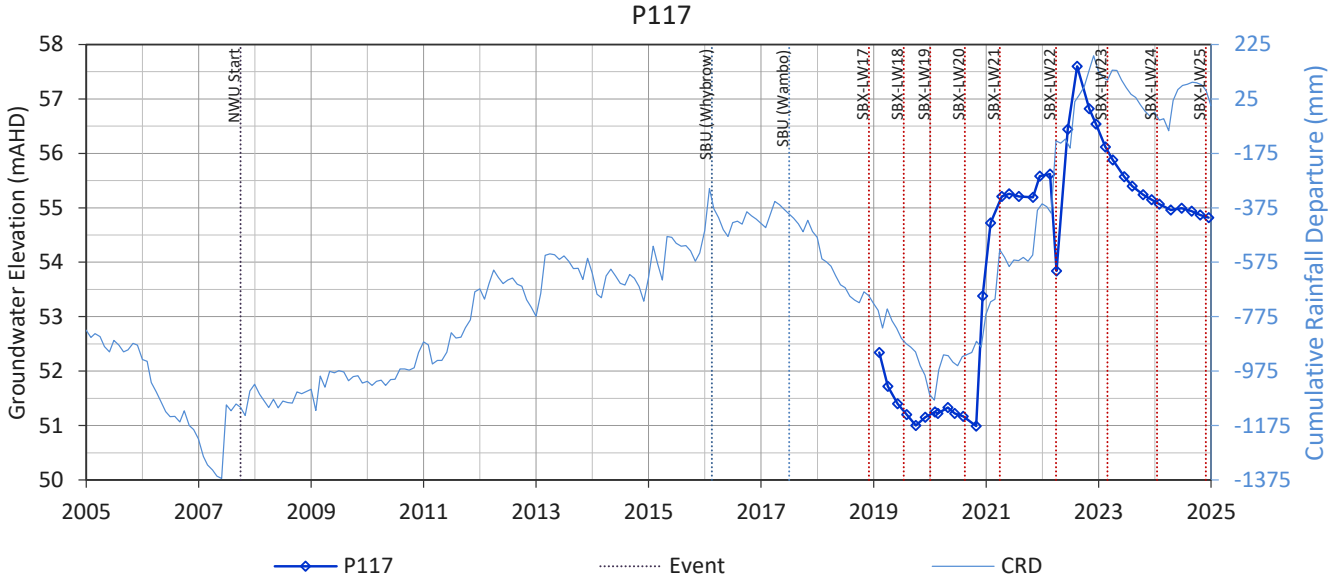

P330A Hunter River Alluvium
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P330A
Event
CRD

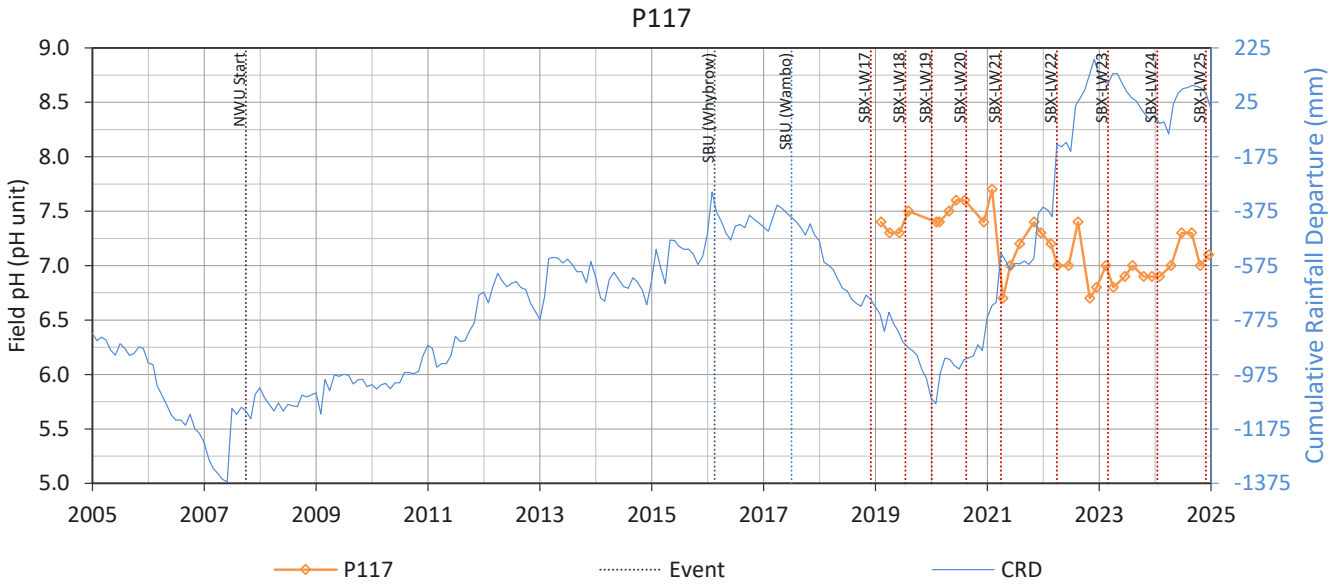

P330A Hunter River Alluvium
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P330A
Event
CRD

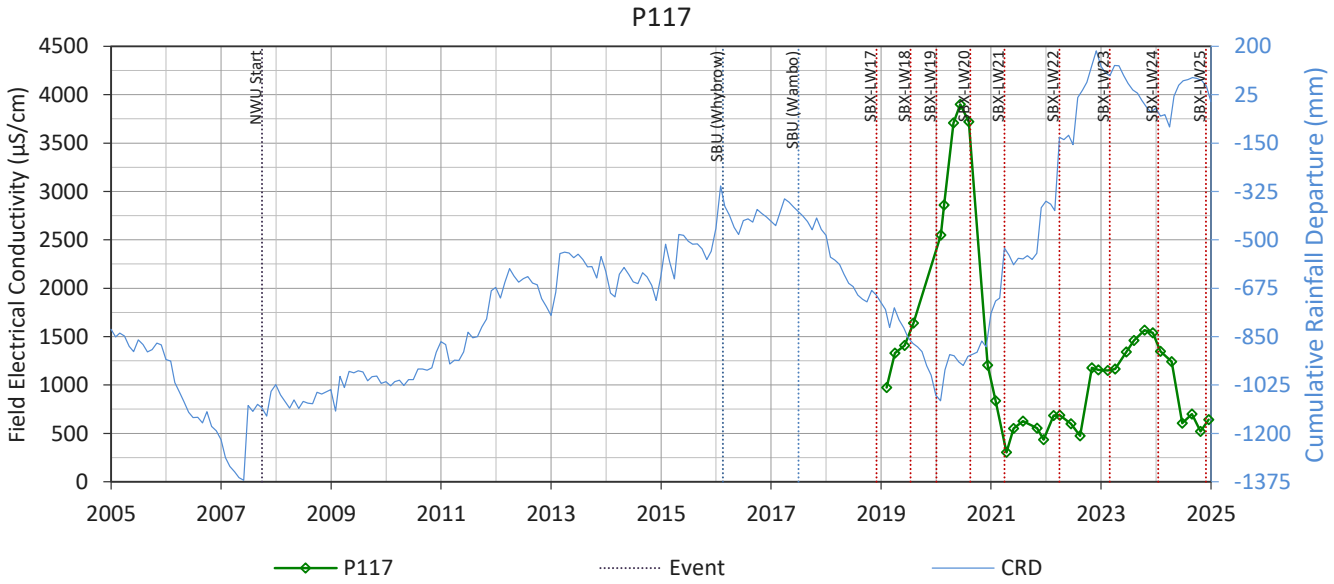

P102
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P102
Event
CRD

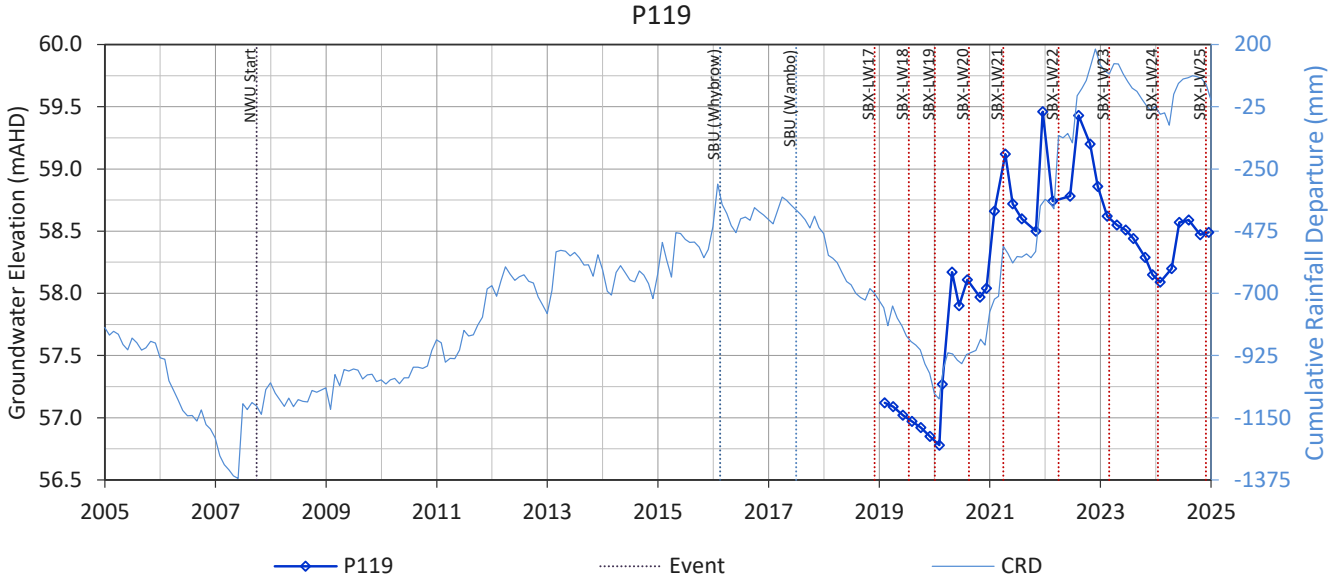

P102
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P102
Event
CRD

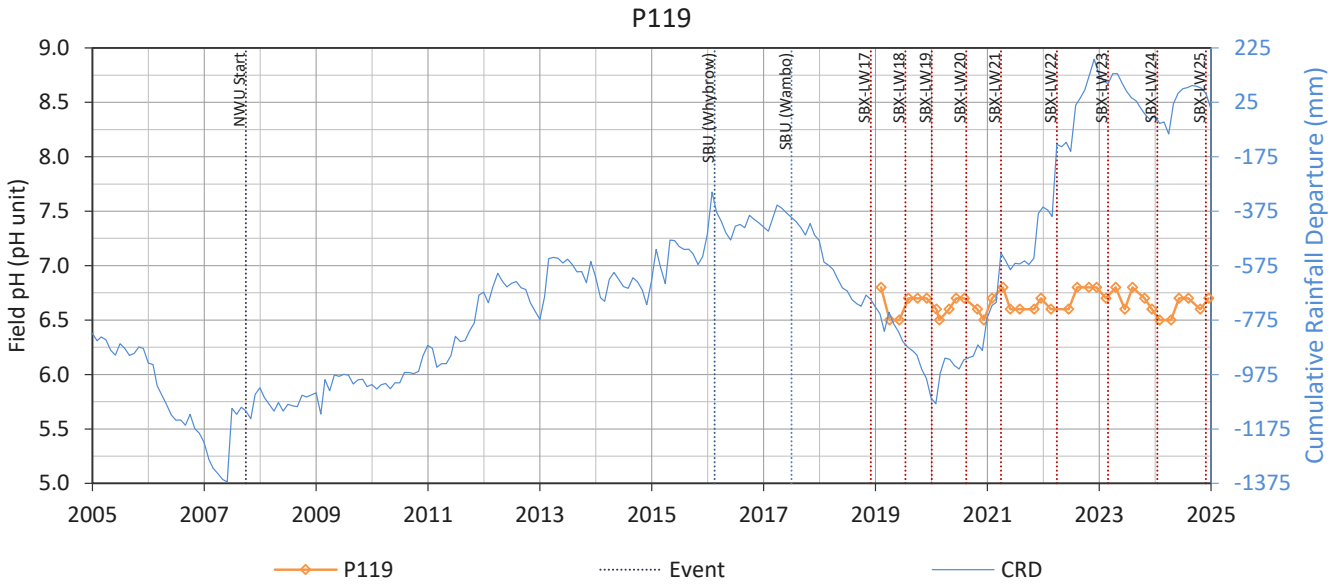

P102
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P102
Event
CRD

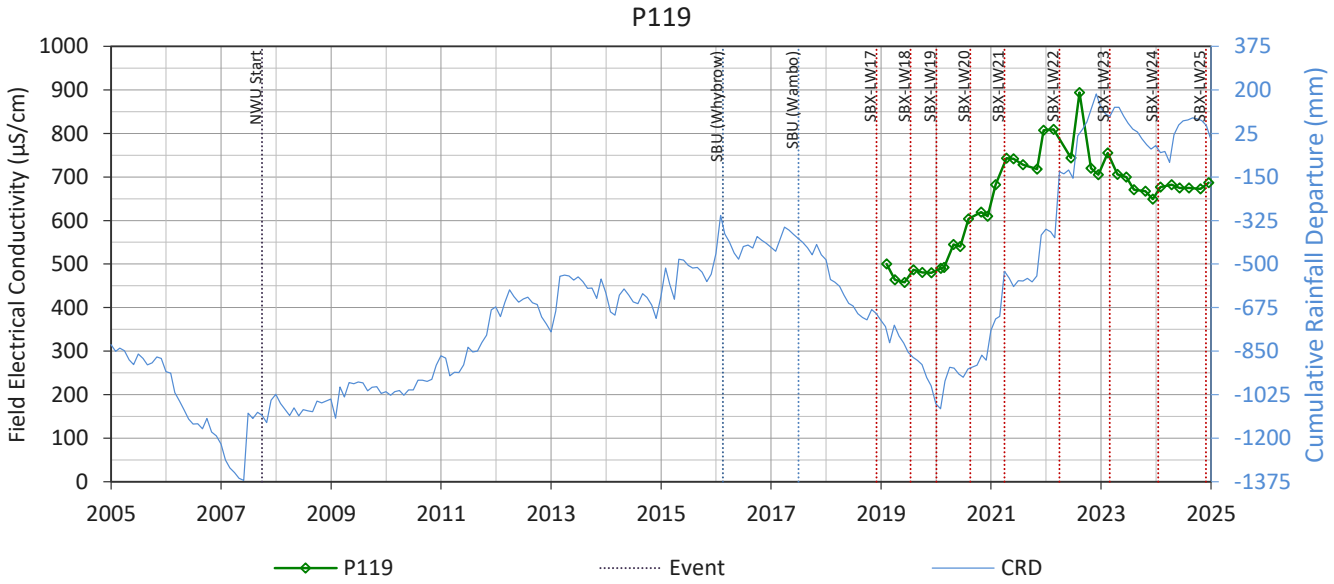

P117
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P117
Event
CRD

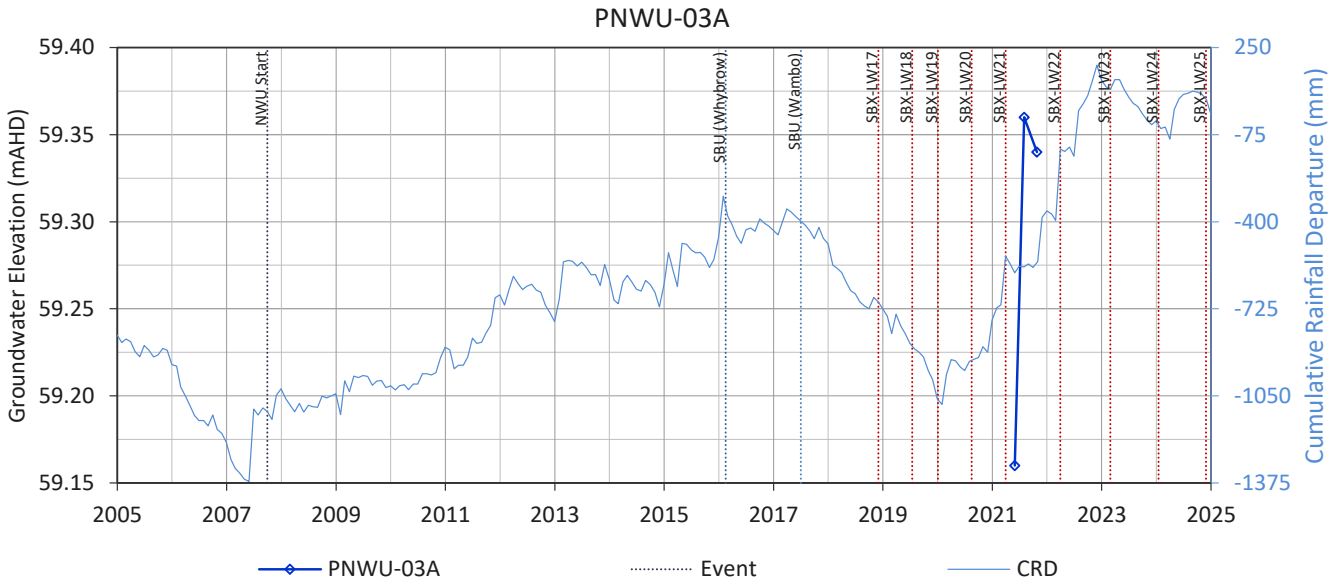

P117
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P117
Event
CRD

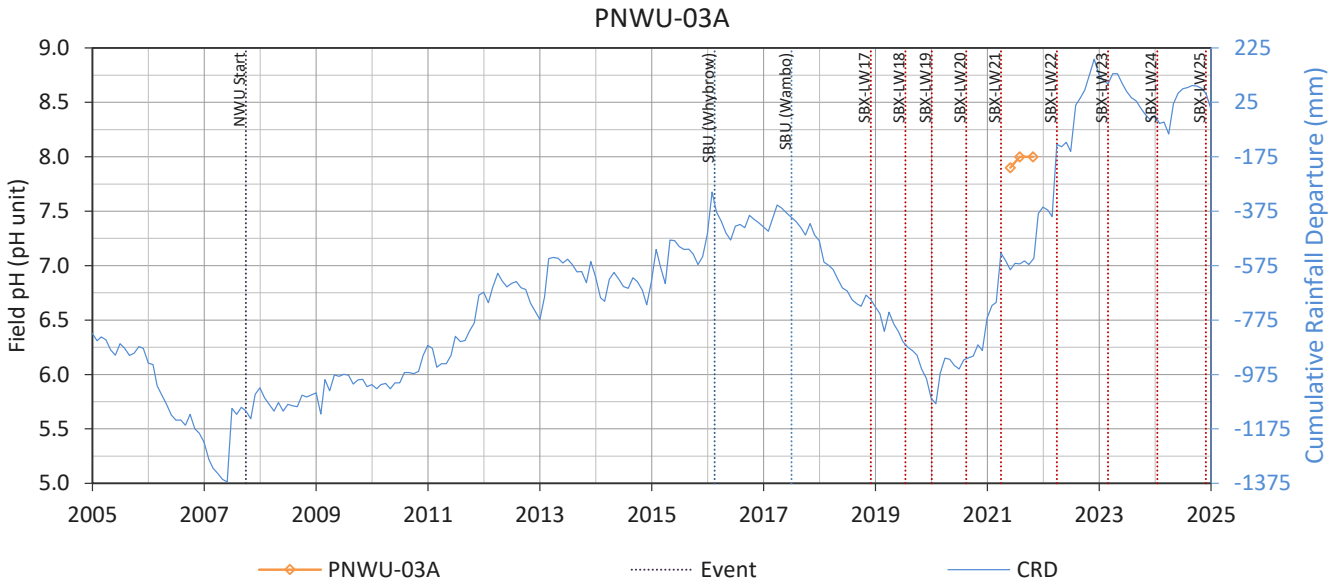

P117
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P117
Event
CRD

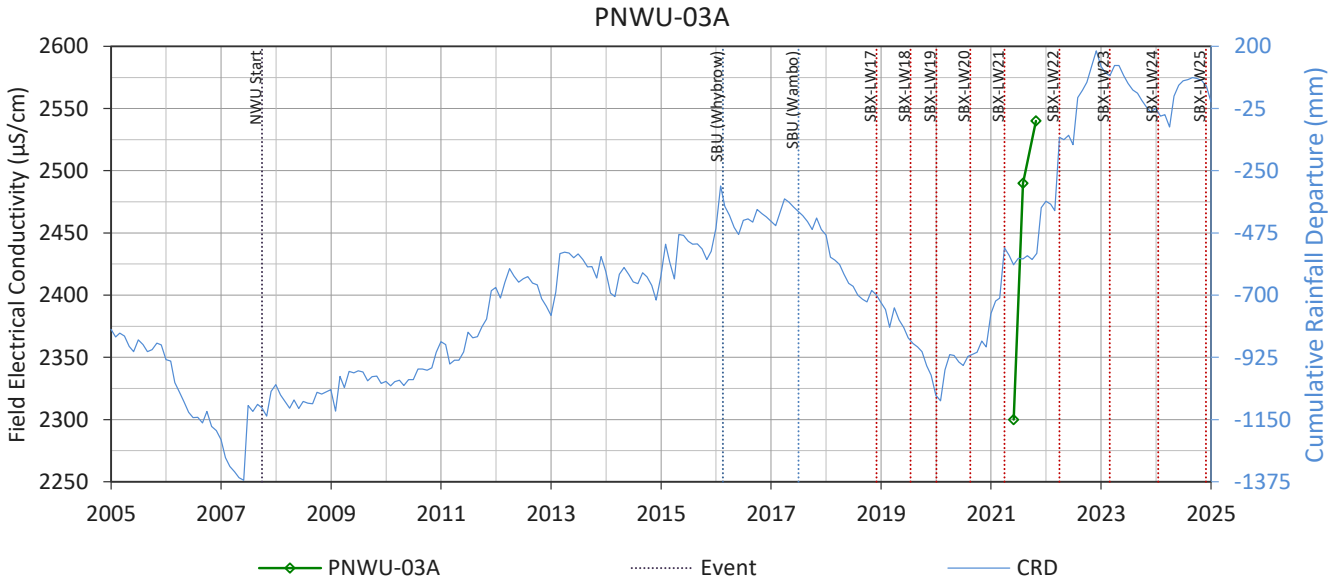

P119
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P119
Event
CRD

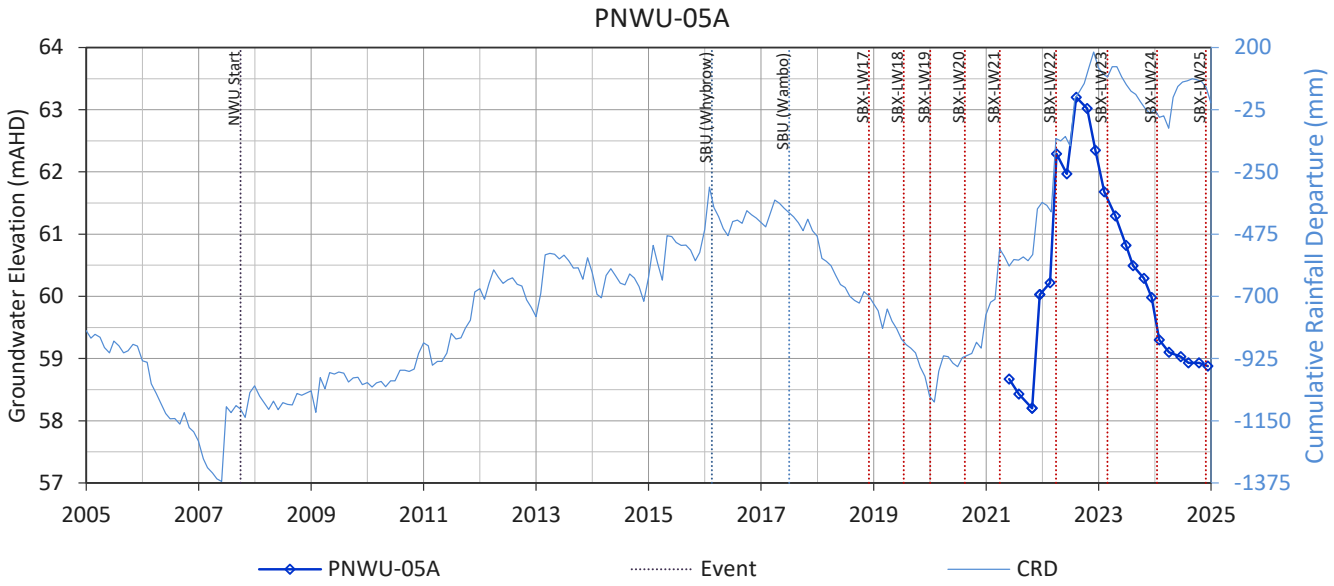

P119
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P119
Event
CRD

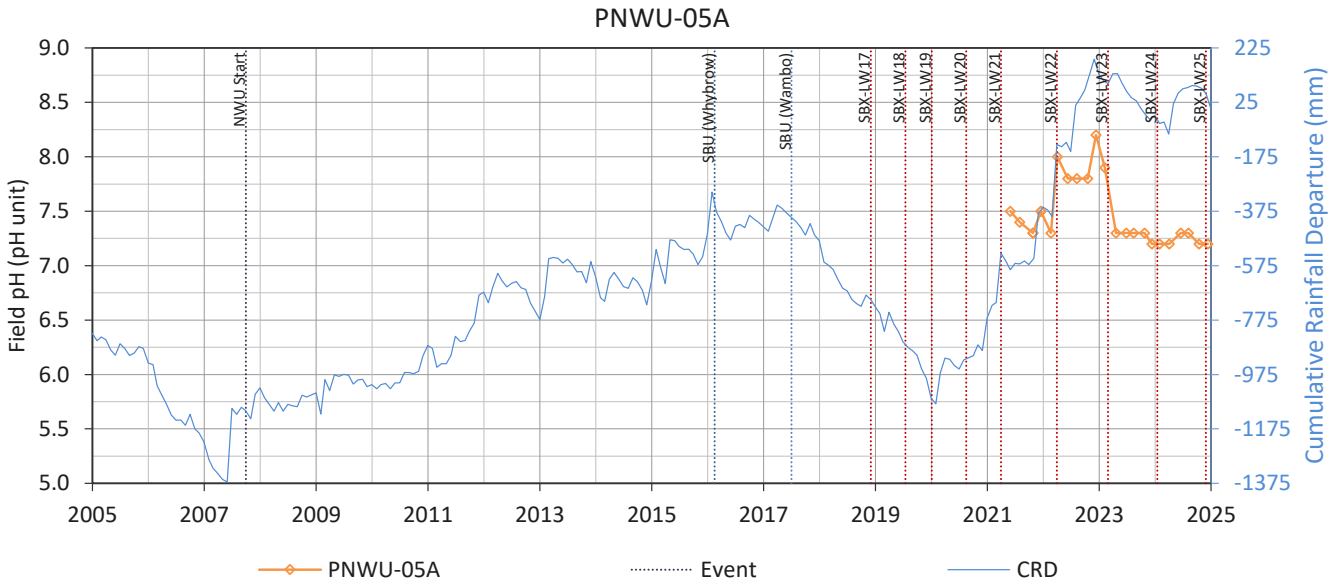

P119
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P119
Event
CRD

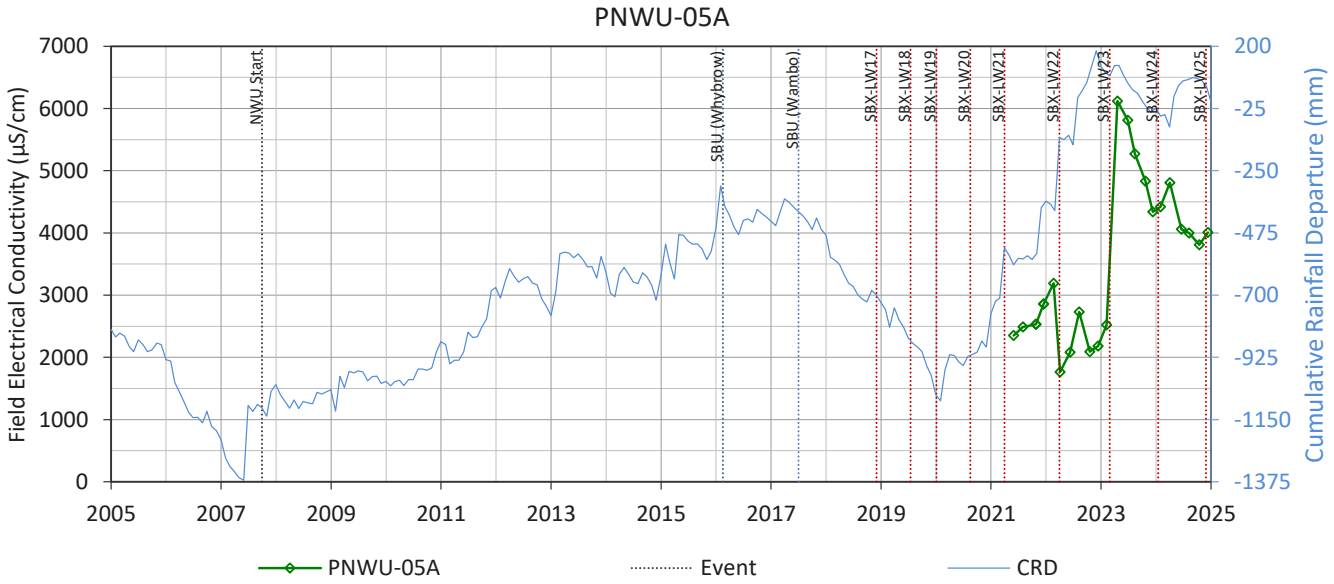

PNWU-03A
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
59.40
59.35
59.30
59.25
59.20
59.15
250
-75
-400
-725
-1050
-1375
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
PNWU-03A
Event
CRD

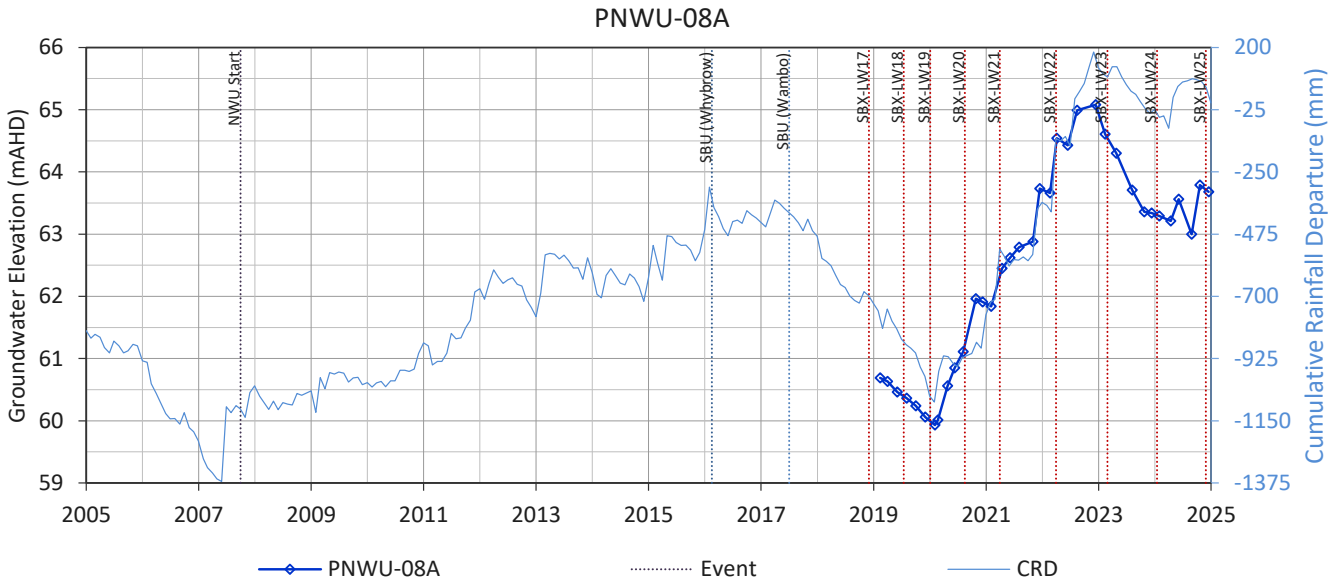

PNWU-03A
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
225
25
-175
-375
-575
-775
-975
-1175
-1375
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
PNWU-03A
Event
CRD

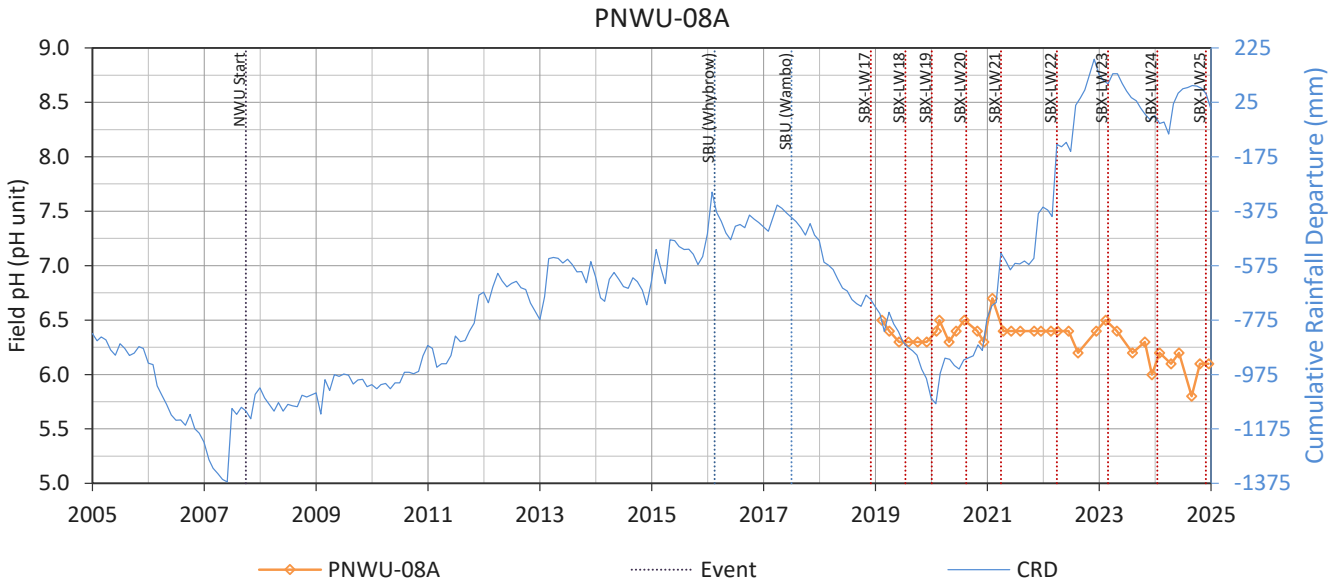

PNWU-03A
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
2600
2550
2500
2450
2400
2350
2300
2250
200
-25
-250
-475
-700
-925
-1150
-1375
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
PNWU-03A
Event
CRD

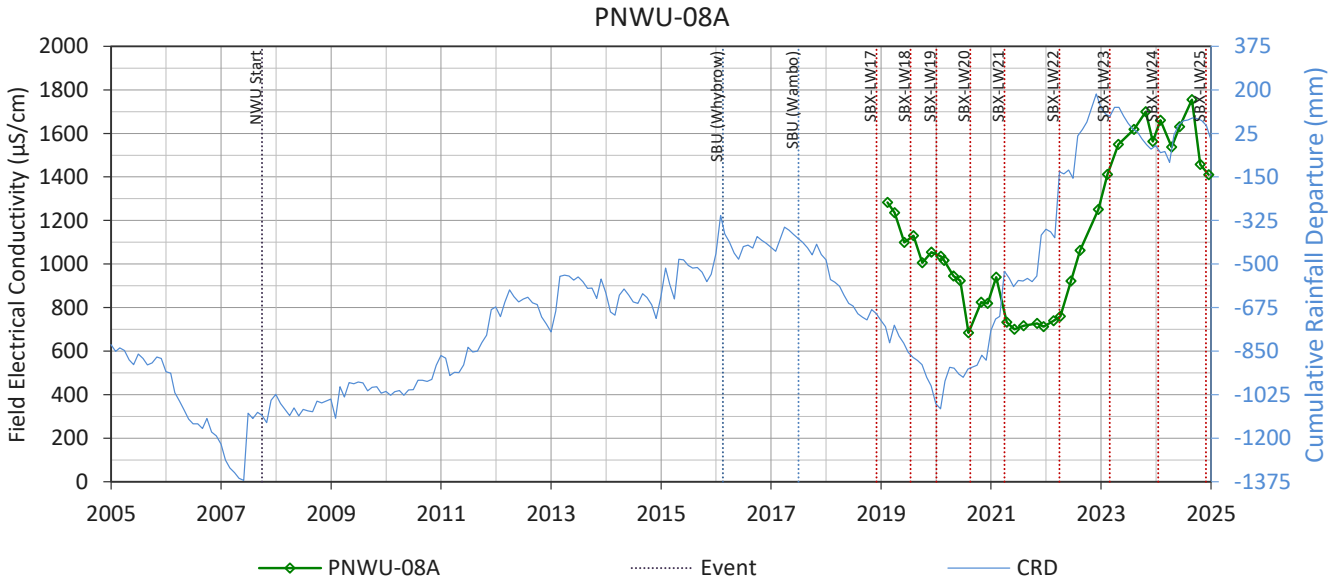

PNWU-05A
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
PNWU-05A
Event
CRD

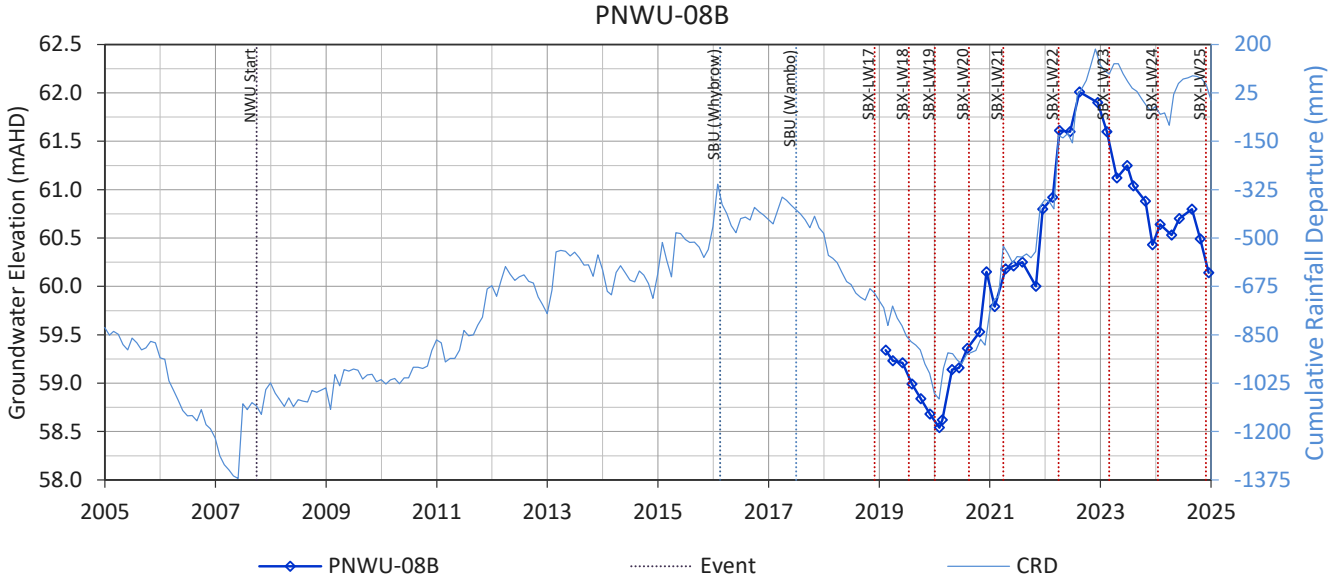

PNWU-05A
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
PNWU-05A
Event
CRD

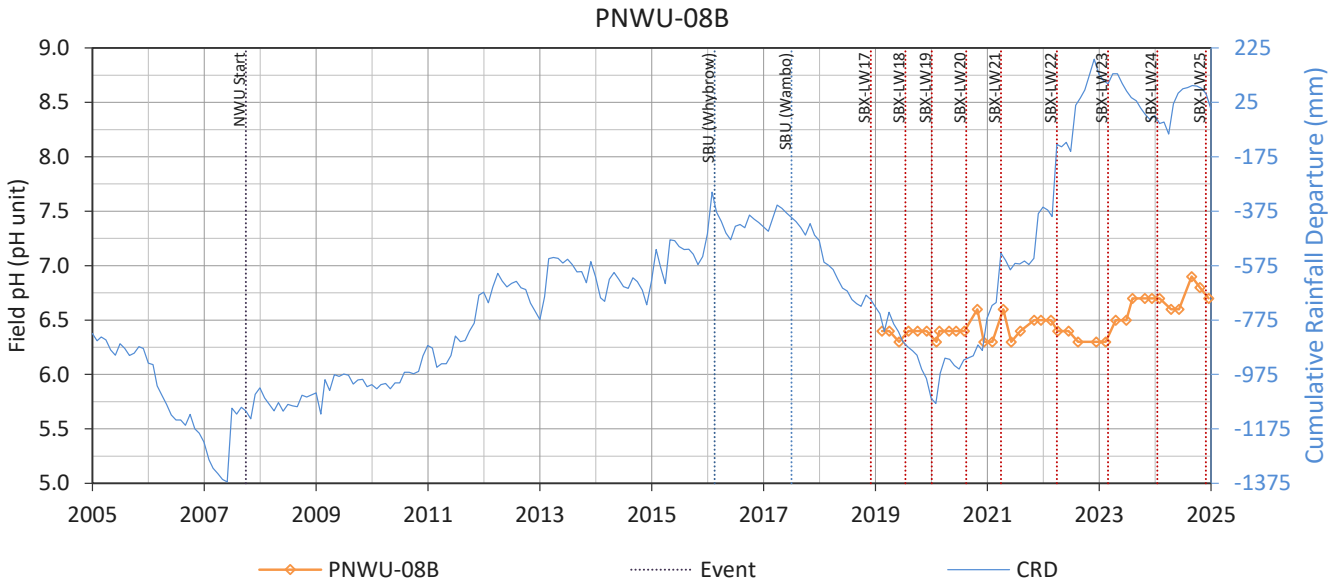

PNWU-05A
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
PNWU-05A
Event
CRD

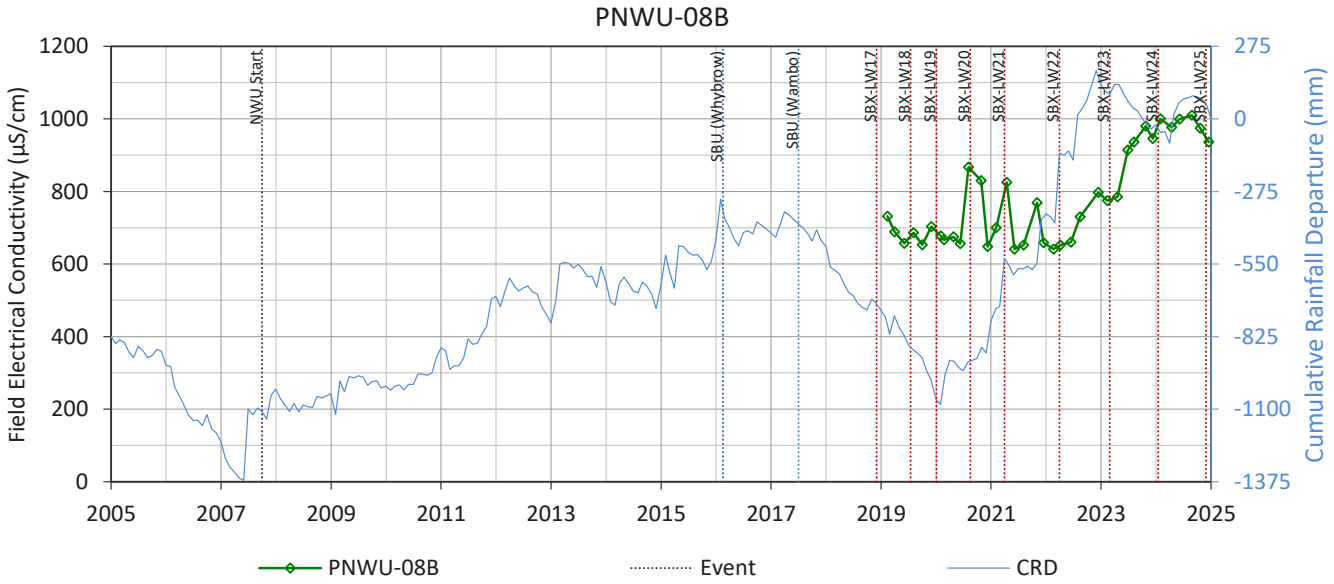

PNWU-08A
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
PNWU-08A
Event
CRD

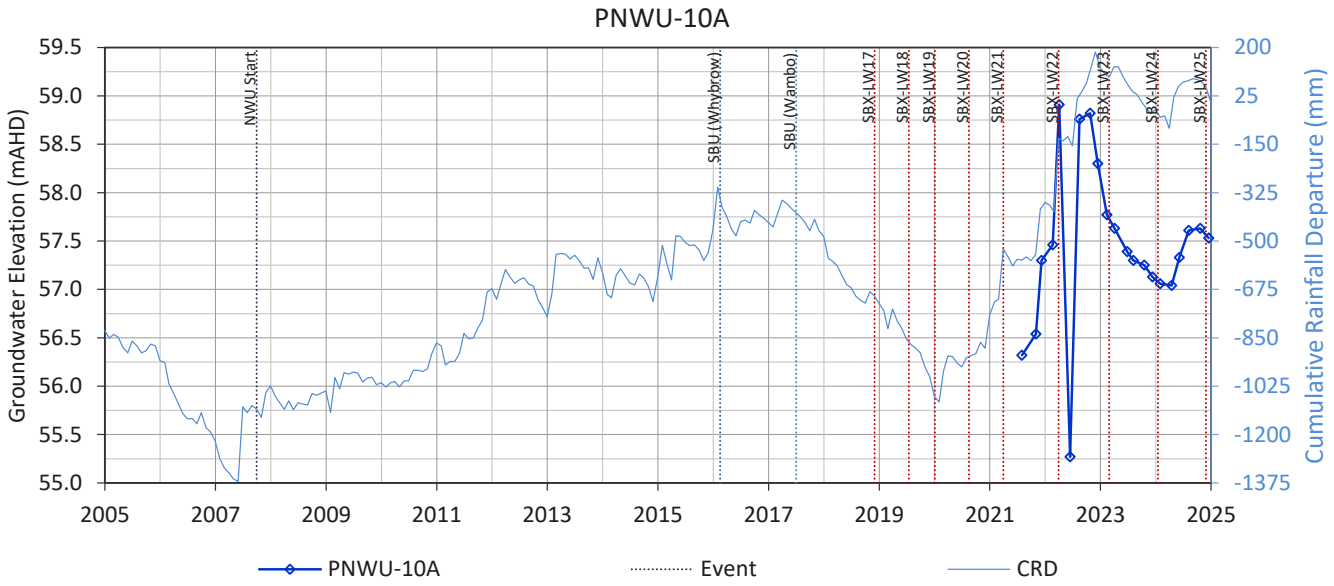

PNWU-08A
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
PNWU-08A
Event
CRD

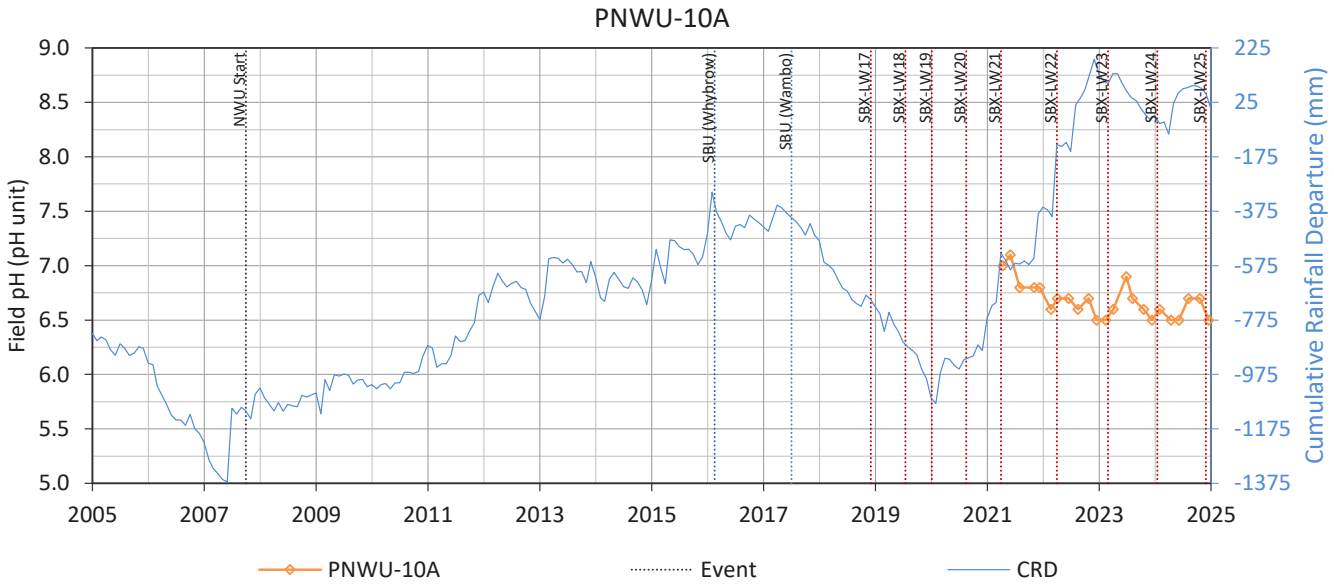

PNWU-08A
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
PNWU-08A
Event
CRD

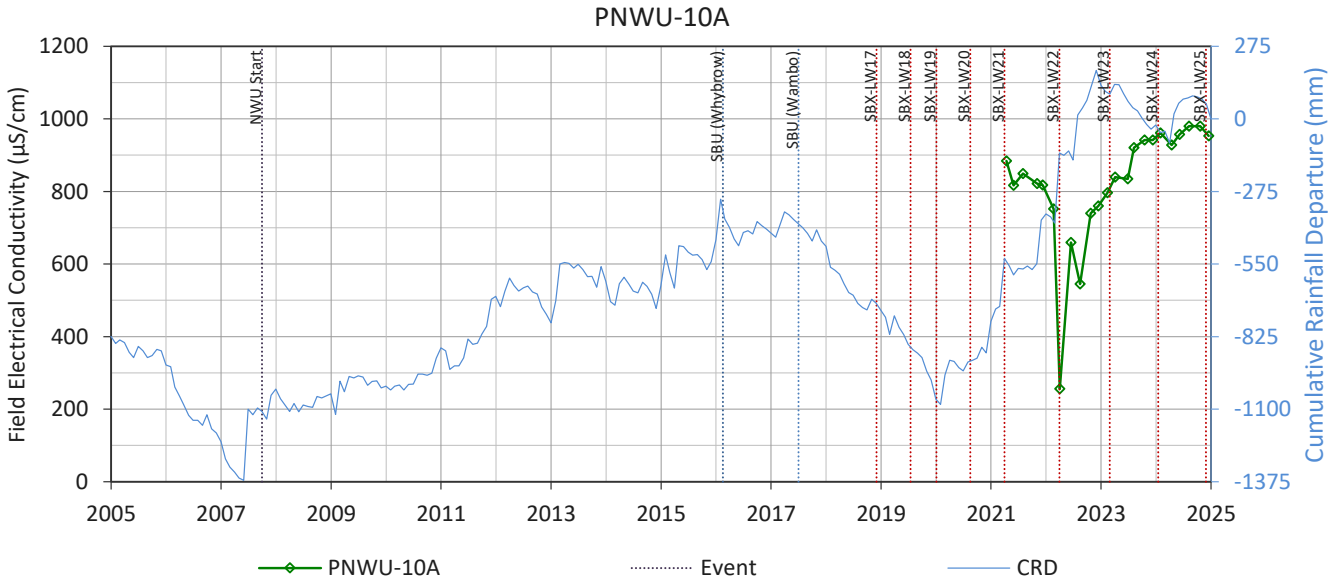

PNWU-08B
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
PNWU-08B
Event
CRD

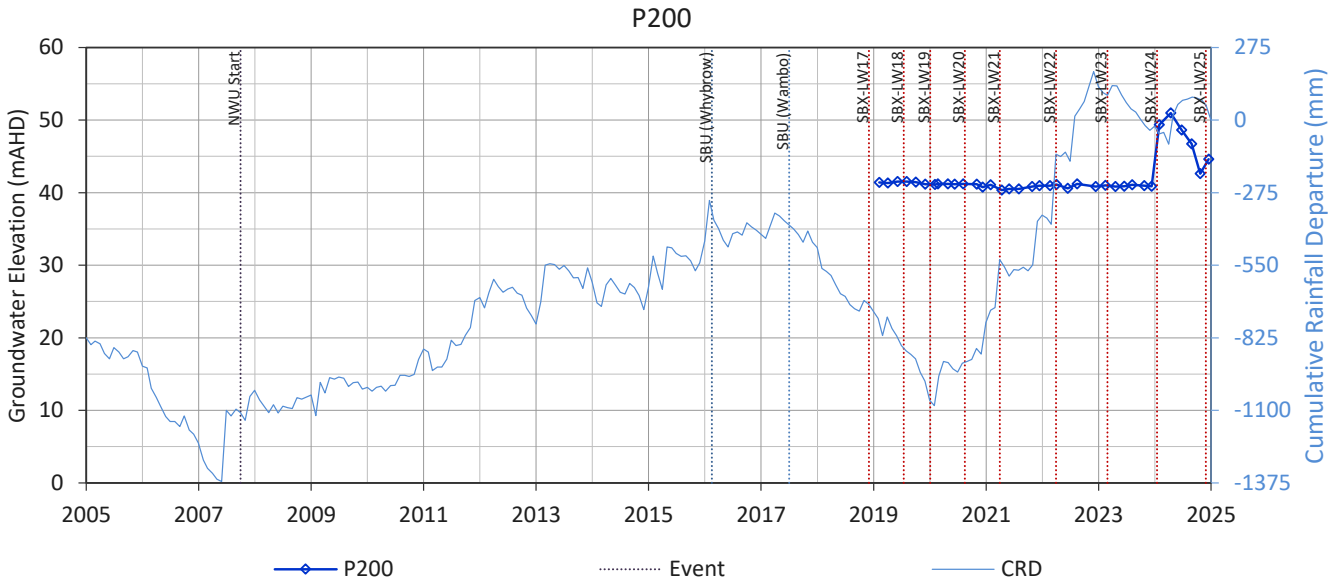

PNWU-08B
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
PNWU-08B
Event
CRD

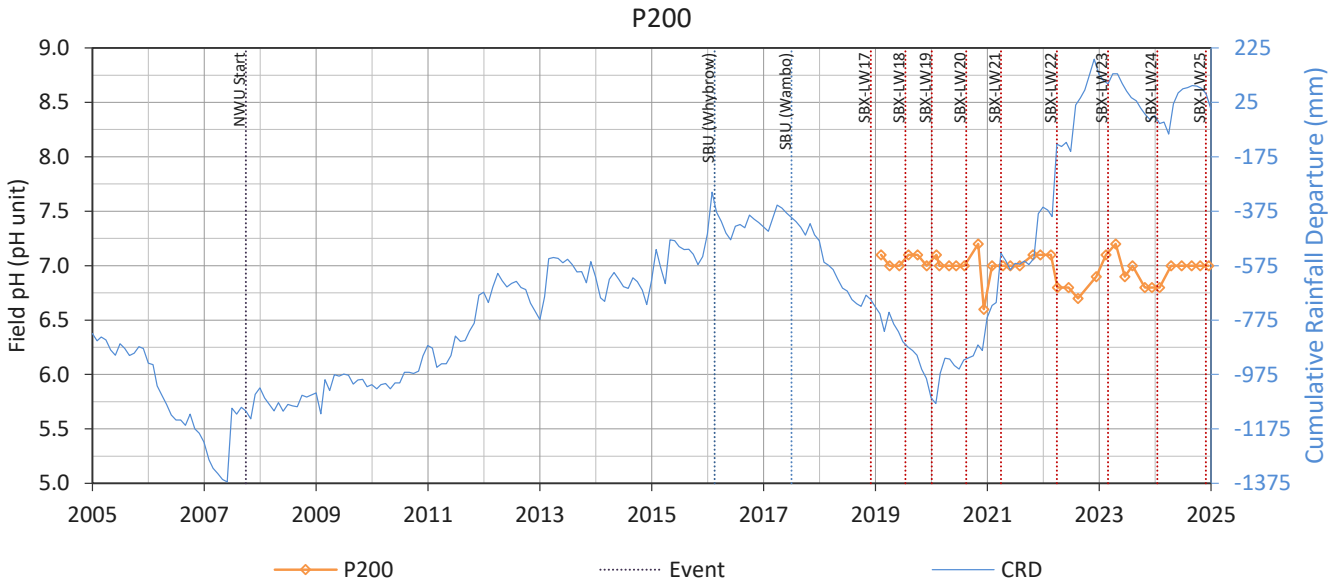

PNWU-08B
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
PNWU-08B
Event
CRD

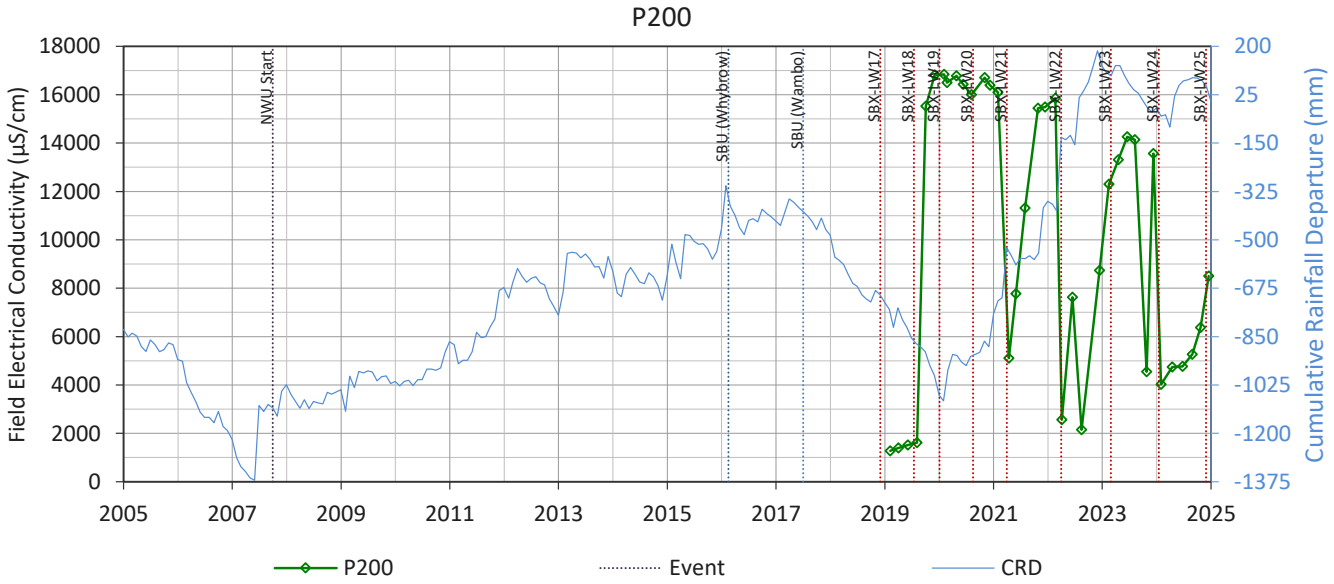

PNWU-10A
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
PNWU-10A
Event
CRD


PNWU-10A
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
PNWU-10A
Event
CRD

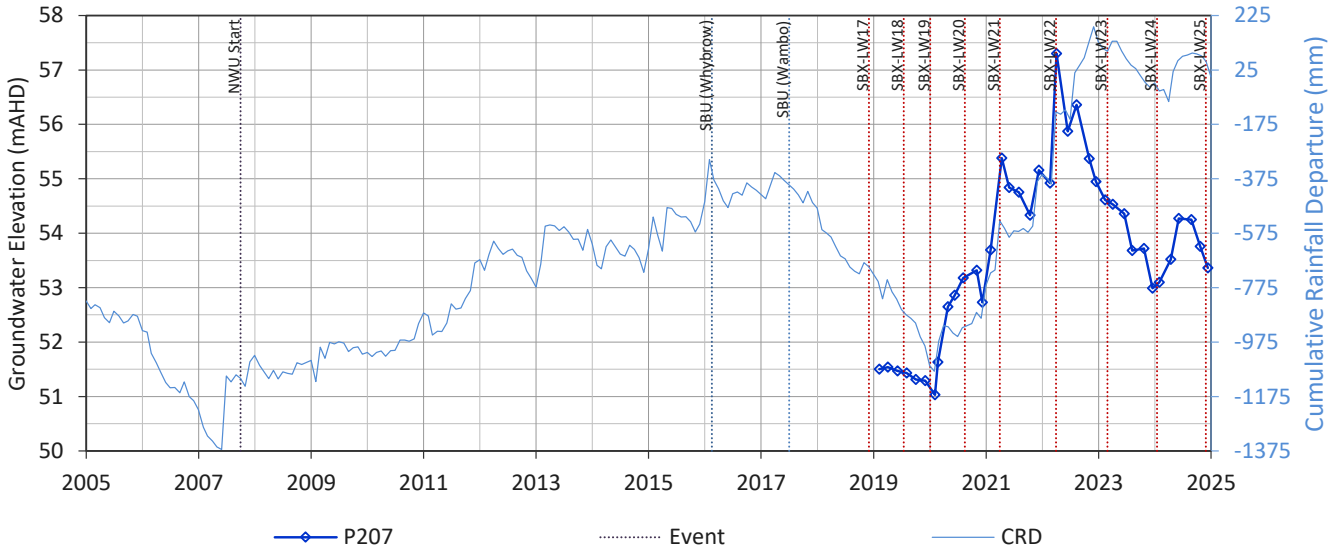

PNWU-10A
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
PNWU-10A
Event
CRD


P200
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P200
Event
CRD


P200
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P200
Event
CRD


P200
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
P200
Event
CRD

P207



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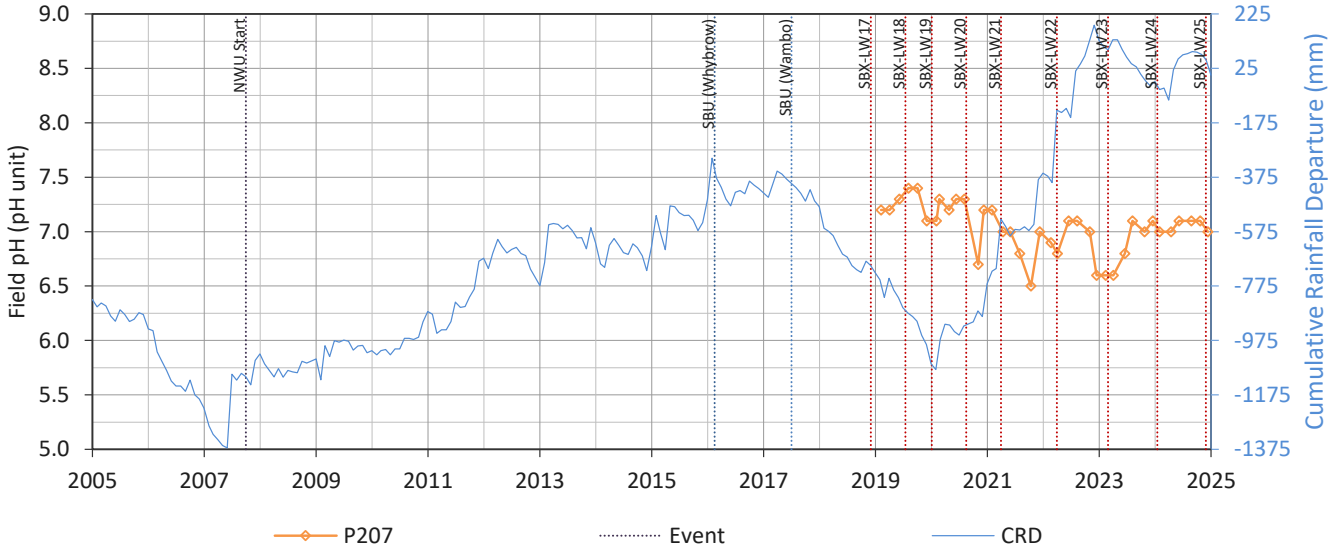

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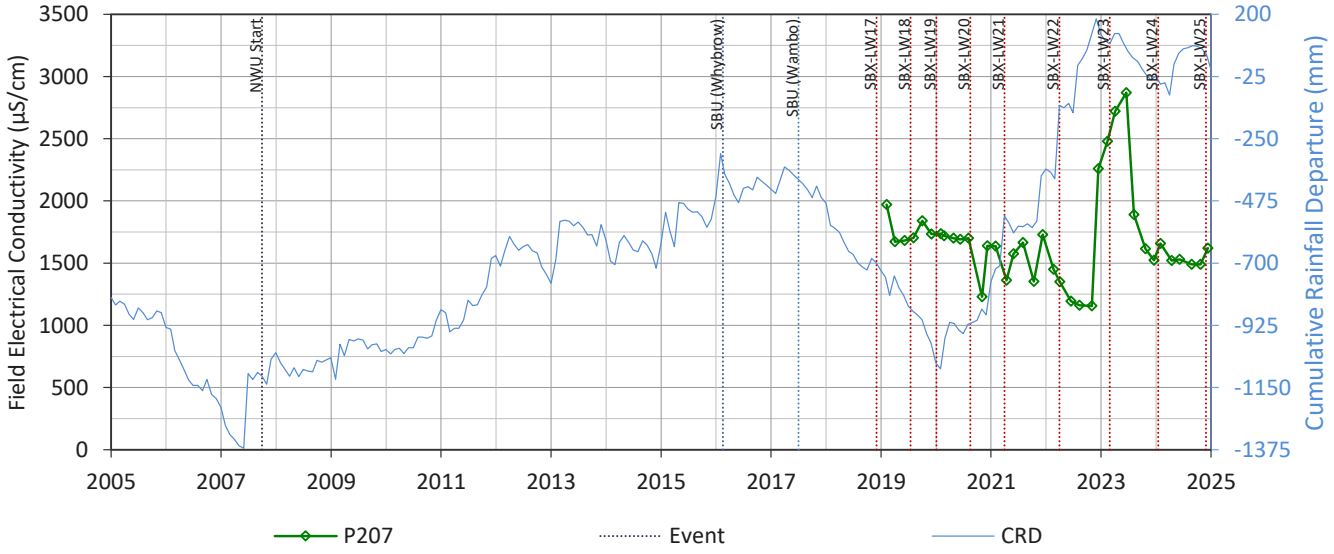
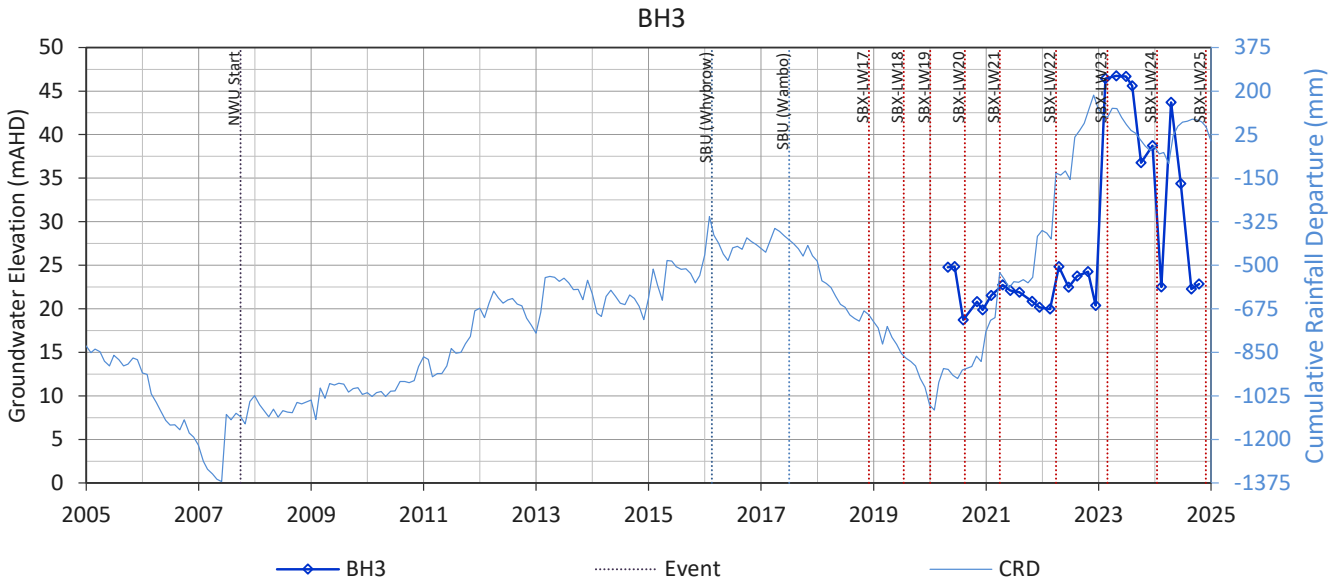
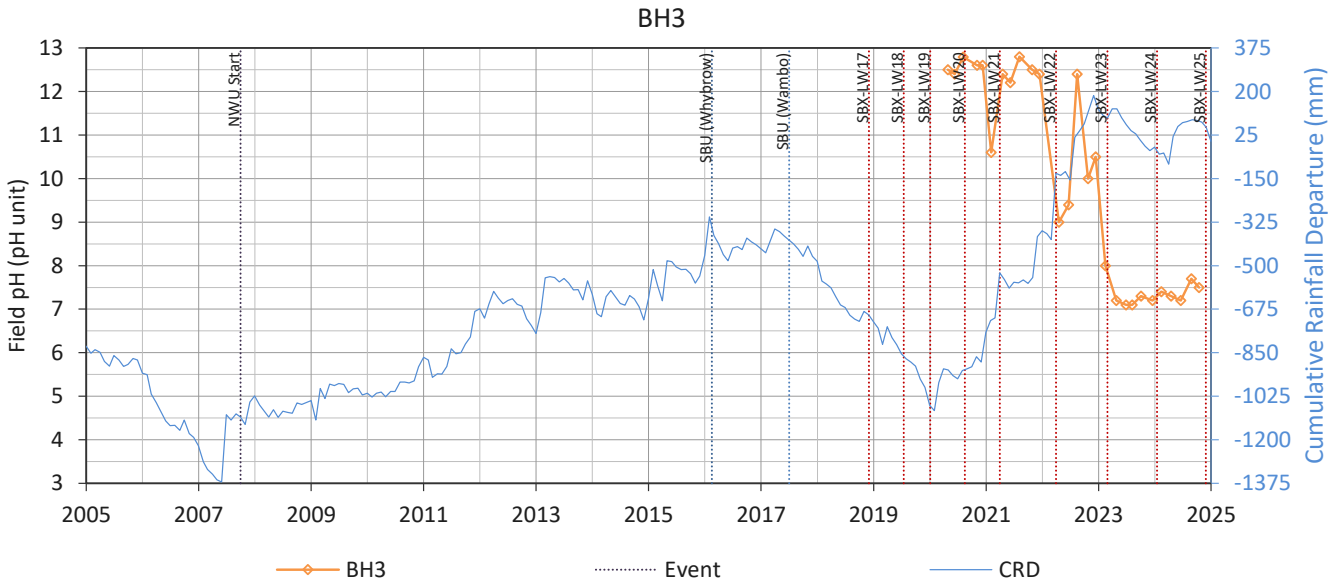
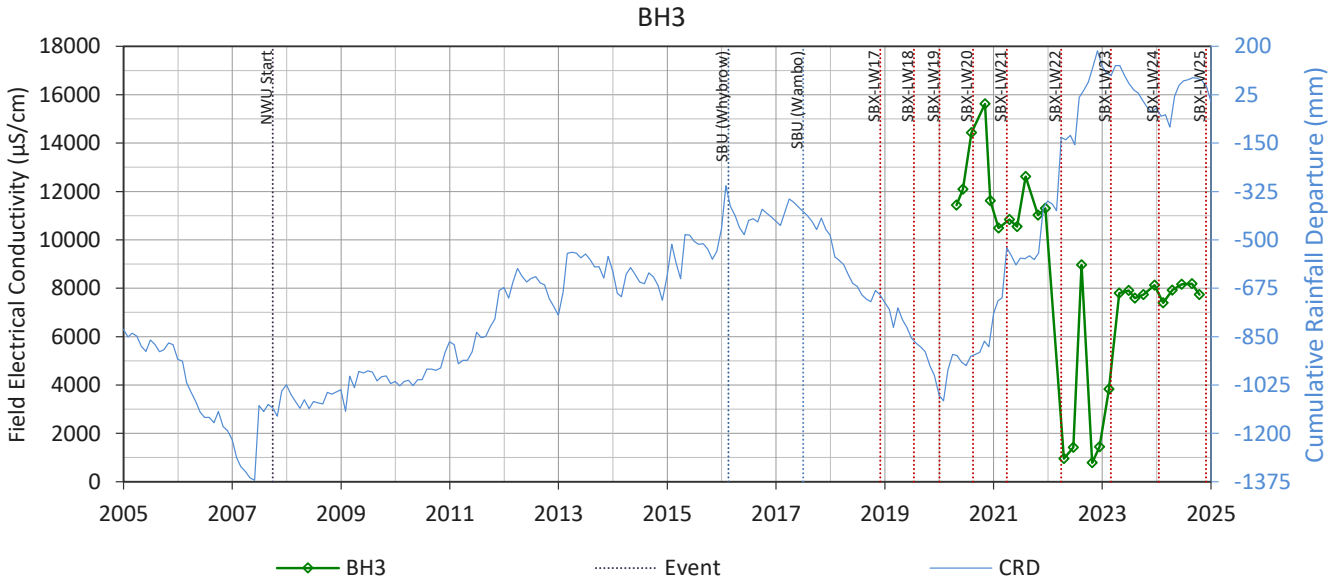



BH3
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
BH3
Event
CRD


BH3
Field pH (pH unit)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
BH3
Event
CRD


BH3
Field Electrical Conductivity (µS/cm)
Cumulative Rainfall Departure (mm)
NWU Start
SBU (Whybrow)
SBU (Wambo)
SBX-LW17
SBX-LW18
SBX-LW19
SBX-LW20
SBX-LW21
SBX-LW22
SBX-LW23
SBX-LW24
SBX-LW25
BH3
Event
CRD

Appendix C Vibrating Wire Piezometer – Data Quality Assessment

Groundwater Annual Review - 2024

Wambo Coal Mine

Wambo Coal Pty Ltd

SLR Project No.: 665.v10008.02031

27 March 2025

Install ID	Wambo ID	Easting	Northing	Ground Elevation (mAHD)	Sensor Depth (mBGL)	Sensor Elevation (mAHD)	Target Geology	Sensor Quality Assessment
EX06	P321	307999	6399498	110.39	31.8	78.6	Arrowfield Seam	WL below sensor since 10/5/2018, unreliable data since 21/1/2019
					72.1	38.3	Warkworth Seam	Ok
					161.2	-50.8	Vaux Seam	Ok
					187.8	-77.4	Bayswater Seam	Ok
SW64	P319	311121	6391412	64.4	11	53.4	Regolith	WL below sensor – all obs, missing data (03/2024 – 07-2024)
					74.9	-10.5	Whybrow Seam	Most likely switched with VWP3 in Mar 2024, WL below sensor, recovered shortly Apr 2019, Oct 2021 and July 2023., missing data (03/2024 – 07-2024)
					161.3	-96.9	Wambo Seam	Most likely switched with VWP2 in Mar 2024, missing data (03/2024 – 07-2024)
					265.3	-200.9	Interburden Sandstone	Ok, missing data (03/2024 – 07-2024)
SW30	P325	312068	6390138	65.2	10.5	54.7	Regolith	No data provided in 2024
					32.5	32.7	Permian Overburden	
					82	-16.8	Whybrow Seam	
					159.5	-94.3	Wambo Seam	
					203	-137.8	Whynot Seam	
					251.5	-186.3	Woodlands Hill Seam	
					336.5	-271.3	Arrowfield Seam	
P408	P408	307000	6399500	74.62	138.8	-64.1	Vaux Seam	Unreliable data since 8/6/2019
					187	-112.4	Bayswater Seam	ok
					223.8	-149.1	Pikes Gully Seam	ok
WJ175	P320	307573	6398890	85.86	344	-258.1	Middle Barret Seam	ok - No data (7/5/2022 - 13/62023)
					305	-219.1	Lower Arties Seam	ok - No data (17/4/2022 - 13/6/2023)
					263	-177.1	Pikes Gully Seam	ok - No data (16/4/2022 - 13/6/2023)

Install ID	Wambo ID	Easting	Northing	Ground Elevation (mAHD)	Sensor Depth (mBGL)	Sensor Elevation (mAHD)	Target Geology	Sensor Quality Assessment
					217.5	-131.6	Bayswater Seam	ok - No data (16/7/2022 - 13/6/2023)
					191	-105.1	Vaux Seam	ok - No data (19/5/2022 - 13/6/2023)
					92	-6.1	Warkworth Seam	ok - No data (26/5/2022 - 13/6/2023)
SW65	P324	310471	6391983	74.44	11.5	62.9	Regolith	WL below sensor – all obs
					95.8	-21.3	Whybrow Seam	WL below sensor – all obs
					157	-82.6	Wambo Seam	ok - WL above sensor since Oct 2022
					269.8	-195.3	Woodlands Hill Seam	Ok, erratic data between 02/08/2024 – 15/12/2024
					304.5	-230.1	Interburden	ok
SW62	P326	310087	6392874	75.48	43	32.5	Overburden	WL below sensor since 24/12/2022, recovered shortly in May 2023 and period 6/4/2024 – 7/10/2024
					113.5	-38	Wambo Seam	Ok, rising WL since July 2022
					234	-158.5	Woodlands Hill Seam	ok
					294.5	-219	Arrowfield Seam	ok
SW28	P318	312599	6388922	71.05	11	60.1	Regolith	WL below sensor – all obs
					150.8	-79.7	Whybrow Seam	ok
					205.3	-134.2	Wambo Seam	ok
					314.3	-243.2	Woodlands Hill Seam	ok
					357	-286	Arrowfield Seam	ok
SW12	P323	309798	6393429	76.64	23	53.6	Overburden siltstone	WL below sensor since 19/9/2022
					33	43.6	Whybrow Seam	WL below sensor since 5/3/2023, sporadically recovered during 2024
					85.5	-8.9	Wambo Seam	ok
					224.5	-147.9	Woodlands Hill Seam	ok
					273.5	-196.9	Arrowfield Seam	ok
ELA3	P327	302941	6399995	141.25	65.3	76	Overburden sandstone	ok
					228.3	-87	Whybrow Seam	ok

Install ID	Wambo ID	Easting	Northing	Ground Elevation (mAHD)	Sensor Depth (mBGL)	Sensor Elevation (mAHD)	Target Geology	Sensor Quality Assessment
					301.1	-159.8	Wambo Seam	ok
					332.5	-191.2	Whynot Seam	ok
P114_116	P316	311252	6391128	60.39	10	50.5	Alluvium	ok - WL above sensor since Jan 2021
					25	35.5	Regolith	ok – all sensors missing 25/1/22-29/11/22 and 25/1/23-23/3/23 (Replaced)
					50.6	9.8	Regolith-overburden	WL below sensor - all obs
					71	-10.6	Whybrow Seam	WL below sensor - all obs
Hunter 1	P329	307454	6400351	72.42	67.6	4.8	Vaux Seam	ok: missing data (21/10/22-28/11/22)
					87.4	-15	Vaux Seam	ok: missing data (21/10/22-28/11/22)
					117.5	-45.1	Bayswater Seam	ok: missing data (11/9/22-28/11/22)
					150.5	-78.1	Pikes Gully Seam	ok: missing data (11/9/22-28/11/22)
Hunter 2	P330	306533	6400050	73.62	67	6.6	Vaux Seam	ok: missing data (25/1/2022-31/1/2023)
					137.3	-63.6	Vaux Seam	ok: missing data (25/1/2022-31/1/2023)
					201.5	-127.9	Pikes Gully Seam	ok: missing data (25/1/2022-31/1/2023)
P317	P317	307115	6394439	155.41	248.5	-93.1	Wambo Seam	No data since 2/9/2019
					213	-57.6	Wambo Rider Seam	No data since 31/8/2019
					174	-18.6	Whybrow Seam	No data since 9/8/2019
					100	55.4	Overburden	WL below sensor since 29/3/2020, missing data (9/2/2020-17/2/2020)
					35	120.4	Regolith	WL below sensor – all obs
ELA5	P328	303160	6398870	131.89	43	88.9	Overburden	Inactive since Sept 2022: ok
					275	-143.1	Whybrow Seam	Inactive since Sept 2022: Poor quality data - all obs
					350	-218.1	Wambo Seam	Inactive since Sept 2022: ok
					388	-256.1	Whynot Seam	Inactive since Sept 2022: Poor quality data in 2022
SW06	P322	312572	6395026	110.13	56	54.1	Regolith	

Install ID	Wambo ID	Easting	Northing	Ground Elevation (mAHD)	Sensor Depth (mBGL)	Sensor Elevation (mAHD)	Target Geology	Sensor Quality Assessment
					65	45.1	Whynot Seam	No data provided in 2024 – understand this location has been mined through.
					128	-17.9	Whynot – Woodlands Hill Interburden	
N5	N5	306753	6395960	110.78	133	-22.2	Wambo Seam	Unreliable T data since 27/4/2023
					89.5	21.3	Interburden	Unreliable data in Aug 2024
					73	37.8	Whybrow Seam	Unreliable data in Aug 2024
					30	80.8	Permian Overburden	Unreliable data in Aug 2024 (Temperature sensor failure)
N3	N3	308313	6394574	104.968	190	-85	Wambo Seam	Unreliable data since 2016
					142	-37	Interburden	Unreliable data since 2016
					108.5	-3.5	Whybrow Seam	Unreliable data since 2016
					75	30	Permian Overburden	Unreliable data since 2016
					55	50	Permian Overburden	WL below sensor since Oct 2017, unreliable data since 2018
					30	75	Permian Overburden	WL below sensor since Aug 2016
N2	N2	308633	6393372	122.52	204	-81.5	Wambo Seam	Unreliable data since 2022, recovered in 2024, failure since 9/6/2024, missing data (9/4/2023 - 23/11/2023)
					172.5	-50	Interburden	Ok, missing data (9/4/2023 - 23/11/2023)
					140	-17.5	Whybrow Seam	Ok, missing data (9/4/2023 - 23/11/2023)
					100	22.5	Permian Overburden	Ok, WL below sensor from Mar 2017, but recovered in Jan 2020, missing data (9/4/2023 - 23/11/2023)
					70	52.5	Permian Overburden	WL below sensor since Aug 2017, recovered shortly between 30/08/2017-20/03/2018, missing data (9/4/2023 - 23/11/2023)
					40	82.5	Permian Overburden	WL below sensor from Dec 2015, recovered shortly

Install ID	Wambo ID	Easting	Northing	Ground Elevation (mAHD)	Sensor Depth (mBGL)	Sensor Elevation (mAHD)	Target Geology	Sensor Quality Assessment
								during January 2016 and March 2017, missing data (9/4/2023 - 23/11/2023)
SBX_20 GW01	SBX_GW01	307009	6395884	107.9	43	65		WL below sensor since 6/8/2022, missing data (29/7/2020-7/4/2022). No data in 2024.
SBX_20 GW02	SBX_GW02	306909	6395939	108.9	65.8	43.1	WWC Seam	WL below sensor since Aug 2023. No data in 2024.
					61.7	47.2	2m above WWC Seam Top	WL below sensor since Aug 2023. No data in 2024.
					53.7	55.2	10m above WWC Seam Top	ok: all channels missing data (14/7/2021-15/8/2023). No data in 2024.
MG08-01 (Unlabelled)	MG08-01	311054	6392670	65.35	9	56.4	Alluvium	WL below sensor since 11/2/2024
					37	28.4	Permian	ok
					46	19.4	Whybrow Seam	WL below sensor since 5/3/2023
					60	5.4	Interburden	WL below sensor since 2015, recovered shortly during July 2022
					77.3	-12	Redbank Seam	Unreliable/no data since 2013
					90	-24.7	Interburden	Unreliable/no data since 2013
					101	-35.7	Wambo Seam	Unreliable/no data since 2013
MG08-01 (Incorrect)	MG08-01	311618	6392876	66			4 sensors at site – installation data unavailable. Naming incorrect – not consistent with MG08 install report	Data provided in 2024 but unable to convert collected data.
MG09-01	MG09-01	310539	6391186	69.75	9	60.8	Alluvium	WL below sensor for all obs
					30	39.8	Permian Upper	Sensors failed since Oct 2014
					60	9.8	Permian Lower	
					103	-33.3	Whybrow Seam	
					130	-60.3	Interburden	

Install ID	Wambo ID	Easting	Northing	Ground Elevation (mAHD)	Sensor Depth (mBGL)	Sensor Elevation (mAHD)	Target Geology	Sensor Quality Assessment
					153	-83.3	Redbank Seam	
					170	-100.3	Interburden	
					192	-122.3	Wambo Seam	
Unknown Fenwick	U/ Fenwick	310636	6390994	70				5 Sensors – not reporting any data
GW20	GW20	309075	6393949	91.31	9.3	82.0	Base of Colluvium/ Alluvium	Data not collected in 2024, suggest check/ test download next time, installation report incomplete.
					61.5	29.8	Whybrow Seam	
					93.0	-1.7	Redbank Seam	
					129.5	-38.2	Wambo Seam	Original template sheet only has data to 2011
"Unknown 1"	MG06-01	310862	6392901	71.62	67.5	4.1	Wambo Seam	Data to June 2011 - none collected since then.
					69.5	2.1	Wambo Seam	
					71.0	0.6	Wambo Seam	
					74.0	-2.4	Interburden	

Appendix D Groundwater Monitoring Network

Groundwater Annual Review - 2024

Wambo Coal Mine

Wambo Coal Pty Ltd

SLR Project No.: 665.v10008.02031

27 March 2025

Bore ID	Type	Status	Easting	Northing	Ground elevation (mAHD)	Bore depth (mbgl)	Screened Interval/ Sensor Depth (mbgl)	Lithology
GW02	Well	EX	309109	6389680	82.5	11.2		Upper South Wambo Creek Alluvium
GW08.2	MB	EX	311869	6392326		3	2 – 3	North Wambo Creek Alluvium
GW09.2	MB	EX	311743	6392326		7.4	4.5 – 7.4	North Wambo Creek Alluvium
GW10.2	MB	EX	311872	6392264		3	2 – 3	
GW10.2a	MB	EX	311872	6392264		25	22 – 25	
GW11	Well	EX	309228	6389699	76.335	9.6		Upper South Wambo Creek Alluvium
GW13	MB	EX	313810	6388990	61.839	15	6 – 15	Regolith
GW15	MB	EX	313164	6392807	61.895	17.4	13.8 – 17.4	Wollombi Bk alluvium
GW16	MB	EX	306639	6396174	112.445	12.15	6.2 – 12.2	Alluvium, Regolith
GW17	MB	EX	306886	6396096	110.685	14	11 – 14	Regolith
GW21	MB	EX	308647	6393378	121.824	36	24 – 36	Whybrow Coal Interburden
GW22	MB	EX	311335	6389535	88.403	54	42 – 54	Whybrow Coal Interburden
GW24	MB	EX	305791	6395668	118.8	13.4	11.7 – 13.4	North Wambo Creek – Consolidated Bedrock
GW25	MB	EX	305299	6395288	129.6	5.6	2.6 – 5.6	North Wambo Creek – Alluvium
GW26	MB	EX	305299	6395668	129.4	13.2	11.7 – 13.2	North Wambo Creek – Consolidated Bedrock
GW37a (P106 replacement)	MB	EX	311415	6390960		6.7	3.6-6.6	Wambo Creek Alluvium
GW37b (P109 replacement)	MB	EX	311415	6390960		12	9-12	Wambo Creek shallow/ weathered Permian
P316(a,b,c)	MB	EX	311255	6391096	60.83	7	4 – 7	Wambo Creek alluvium

Bore ID	Type	Status	Easting	Northing	Ground elevation (mAHD)	Bore depth (mbgl)	Screened Interval/ Sensor Depth (mbgl)	Lithology
	MB	EX	311252	6391090	60.91	13	10 – 13	Weathered Permian
	MB	EX	311249	6391083	61.05	26	23 – 26	Permian
P16	MB	EX	313480	6394655	57.48	11.5	5 – 10.5	West Wollombi Brook Colluvium
P20	MB	EX	313639	6394166	57.4	10.6	6 – 9.2	West Wollombi Brook Colluvium
P28	MB	EX	311396	6392632	63.1	-	-	Whybrow Coal Overburden
P29	MB	EX	311820	6392560	60.8	-	-	Whybrow Coal Overburden
P202	MB	EX	311854	6391262	60.265	20	14 – 20	Overburden Whybrow
P301	MB	EX	309360	6391466	88.18	20.4	??? - 20.4	Alluvium, shallow overburden
P315	MB	EX	309084	6391856	94.74	9.5	??? – 9.5	Stoney Creek Alluvium/Regolith
P317	VWP	Unknown	307115	6394439	155.41	248.5	35	Regolith
							100	Overburden
							174	Whybrow Seam
							213	Wambo Rider Seam
							248.5	Wambo Seam
P318	VWP	Unknown	312599	6388922	71.05	357	11	Regolith
							150.79	Whybrow Seam
							205.25	Wambo Seam
							314.25	Woodlands Hill
							357	Arrowfield Seam
P319	VWP	Unknown	311125	6391412	64.4	265.3	11	Regolith
							74.9	Whybrow Seam

Bore ID	Type	Status	Easting	Northing	Ground elevation (mAHD)	Bore depth (mbgl)	Screened Interval/ Sensor Depth (mbgl)	Lithology
							161.3	Wambo Seam
							265.3	Interburden Sandstone
P320	VWP	Unknown	307573	6398890	85.86	344	92	Warkworth
							191	Vaux
							217.5	Bayswater
							263	Pike Gully
							305	Lower Arties
							344	Middle Barrett
P321	VWP	Unknown	307573	6398890	110.39	187.8	31.8	Arrowfield
							72.1	Warkworth
							161.15	Vaux
							187.82	Bayswater
UG139	VWP	EX	306665.45	6395172.7	128.9	402.0	263.0	Unnamed D
							281.0	Unnamed E
							319.0	Interburden Glen Munro - Unnamed E
							329.0	Glen Munro
							375.0	Interburden Arrowfield - Glen Munro
							382.0	Arrowfield
							402.0	Interburden Warkworth - Bowfield

Bore ID	Type	Status	Easting	Northing	Ground elevation (mAHD)	Bore depth (mbgl)	Screened Interval/ Sensor Depth (mbgl)	Lithology
UG166A	VWP	EX	306488.43	6398076	141.5	260.0	130.0	Unnamed D
							153.0	Unnamed E
							183.0	Blakefield
							200.0	Glen Munro
							238.0	Arrowfield
							254.0	Bowfield
							260.0	Bowfield
BH1	MB	EX	313265	6394804	59.09	9.3	2.1 – 8.1	Tertiary Alluvium
BH1G	Dewatering	EX	310104	6391551		-		Whybrow Seam
BH2	Dewatering	EX	308867	6390147		-		Whybrow Seam
BH2A	Dewatering	EX	308868	6390096		-		Whybrow Seam
BH3	MB	EX	313399	6394644	54.39	65.4 -	55.4 – 61.4	Woodlands Hill Seam
BH4C	Dewatering	EX	309323	6391080		-		Whybrow Seam
BH4D	Dewatering	EX	-	-		-		Whybrow Seam, Wambo Seam
GW30	MB	EX	306076	6395716	118.6	8.5	5.5 – 8.5	North Wambo Creek - Alluvium
GW31	MB	EX	305876.6	6395582	122.12	10.0	7 - 10	North Wambo Creek - Alluvium
GW32	MB	EX	306393.8	6395829	115.05	7.0	4 – 7	North Wambo Creek - Alluvium
GW33	MB	EX	306592.4	6395946				North Wambo Creek - Alluvium
GW34	MB	EX	307357	6395779	104.23	4.0	2.5 - 4	North Wambo Creek - Alluvium
GW35	MB	EX	306987.9	6396012	107.28	9	6 - 9	North Wambo Creek - Alluvium
GW36a	MB	EX	306248	6395901	113	7.9	4.9 – 7.9	North Wambo Creek - Alluvium

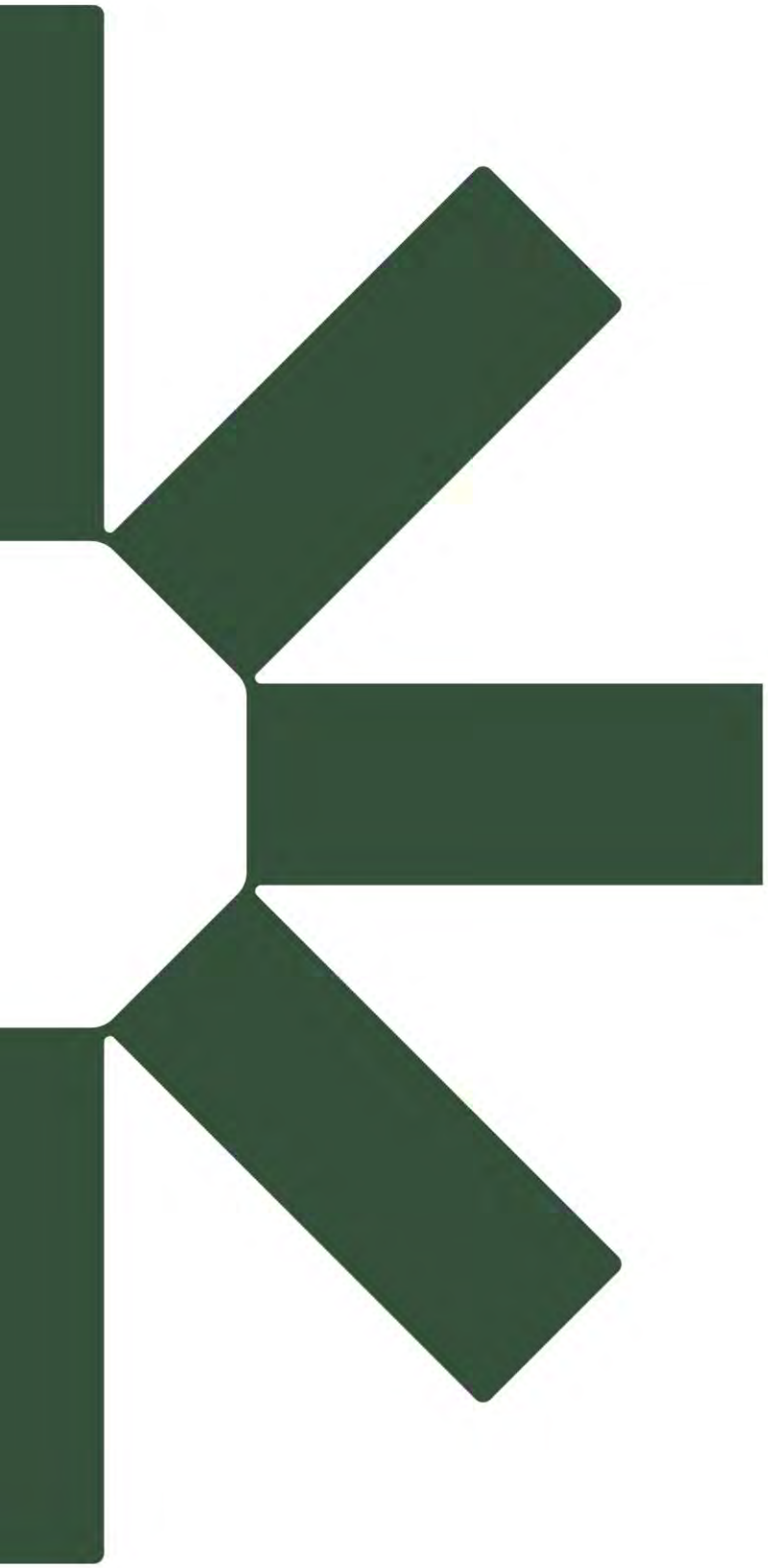
Bore ID	Type	Status	Easting	Northing	Ground elevation (mAHD)	Bore depth (mbgl)	Screened Interval/ Sensor Depth (mbgl)	Lithology
GW36b	MB	EX	306247	6395907	113	16.6	13.4 – 16.4	North Wambo Creek - Weathered Sandstone (In Channel)
GW37a	MB	EX	311432.184	6390925.855	59.269	6.6	3.6-6.6	Wambo Creek – Alluvium
GW37b	MB	EX	311427.880	6390922.742	59.176	12.0	9.0 – 12.0	Wambo Creek – Weathered Permian
GW40a	MB	EX	305981.442	6397928.283	127.812	27.8	21.0 – 27.0	Waterfall Creek -Unconsolidated/ highly weathered.
GW40b	MB	EX	305986.139	6397925.648	127.711	36.0	30.7 – 35.7	Waterfall Creek – Weathered Permian
GW41a	MB	EX	307295.24	6398552.147	90.806	10.0	7.0 – 10.0	Waterfall Creek – Unconsolidated/ alluvium
GW41b	MB	EX	307298.878	6398547.495	90.843	20.0	14.0 – 20.0	Waterfall Creek – Weathered Permian
SBX_20_GW02a	MB	EX	306905.3	6395946.4	108.92	20	17 – 20	North Wambo Creek Weathered Permian
SW Dam 1A (GW38a)	MB	Proposed	310903	6391145		7-10 (approx.)		Alluvium/colluvium
SW Dam 1B (GW38b)	MB	Proposed				14 – 20 (approx.)		Base of weathered Permian
SW Dam 2A (GW39a)	MB	Proposed	311119	6391405		12 – 15 (approx.)		Base of weathered Permian
SW Dam 2B (GW39b)	MB	Proposed				22 – 25 (approx.)		Fresh Permian
N2	VWP	EX	308663	6393376	122.53	204	40	Permian Overburden
							70	Permian Overburden

Bore ID	Type	Status	Easting	Northing	Ground elevation (mAHD)	Bore depth (mbgl)	Screened Interval/ Sensor Depth (mbgl)	Lithology
							100	Permian Overburden
							140	Whybrow Seam
							172.5	Interburden
							204	Wambo Seam
N3	VWP	EX	308314	6394575	104.97	-190	30	Permian Overburden
							55	Permian Overburden
							75	Permian Overburden
							108.5	Whybrow Seam
							142	Interburden
							190	Wambo Seam
N5	VWP	EX	306755	6395963	110.78	133	30	Permian Overburden
							73	Whybrow Seam
							89.5	Interburden
							133	Wambo Seam
P316	VWP	EX	311252	6391128	60.39	71	10	Alluvium
							25	Regolith
							50.63	Regolith Overburden
							71	Whybrow Seam
P323	VWP	EX	309797	6393428	76.65	85.5	23	Overburden siltstone
							224.5	Woodlands Hill Seam
							273.5	Arrowfield Seam

Bore ID	Type	Status	Easting	Northing	Ground elevation (mAHD)	Bore depth (mbgl)	Screened Interval/ Sensor Depth (mbgl)	Lithology
P323	VWP	EX	309799	6393431	76.64	273.5	95.75	Whybrow Seam
							157	Wambo Seam
P324	VWP	EX	310471	6391983	74.44	304.5	11.5	Regolith
							95.75	Whybrow Seam
							157	Wambo Seam
							269.75	Woodlands Hill Seam
							304.5	Interburden
P325 P325	VWP	EX	311806	6390306	65.2	336.5	10.5	Regolith
							32.5	Permian Overburden
							82	Whybrow Seam
							159.5	Wambo Seam
							203	Whynot Seam
							251.5	Woodlands Hill Seam
							336.5	Arrowfield Seam
P325a	MB	EX	312062	6390137	65.2	8	5 - 8	Wambo Creek Alluvium
P326	VWP	EX	310087	6392874	75.48	332.5	43	Overburden
							113.5	Wambo Seam
							234	Woodlands Hill Seam
							294.5	Arrowfield Seam
P327	VWP	EX	302941	6399995	141.25	332.5	43	Overburden
							113.5	Wambo Seam

Bore ID	Type	Status	Easting	Northing	Ground elevation (mAHD)	Bore depth (mbgl)	Screened Interval/ Sensor Depth (mbgl)	Lithology
							234	Woodlands Hill Seam
							294.5	Arrowfield Seam
P328	VWP	EX	303160.33	6398869.64	131.89	338	43	Overburden
							275	Whybrow Seam
							350	Wambo Seam
							388	Whynot Seam
P329	VWP	EX	307454	6400351	72.42	150.5	67.6	Vaux Seam 1
							87.4	Vaux Seam 2/3
							117.5	Bayswater Seam
							150.5	Pikes Gully Seam
P329a	MB	EX	307456	6400352	72.42	16	10 - 16	Hunter River Alluvium
P330	VWP	EX	306533	6400050	73.62	201.5	201.5	Pike Gully Seam
P330a	MB	EX	306533	6400052	73.63	13	10 - 13	Hunter River Alluvium
SBX_GW01	VWP	EX	307009.9	6395886	107.95	51	61.7	Whybrow Overburden (Siltstone/Sandstone)
SBX_GW02	VWP	EX	306910.5	6395943	108.88	78.3	65.8	Whybrow Seam
							61.7	Whybrow Overburden (Siltstone/Sandstone)
							53.7	Whybrow Overburden (Siltstone/Sandstone)
P331	VWP	EX	305397	6396881	60.83	282.29	50	Narrabeen Group*
							118	Overburden 1*

Bore ID	Type	Status	Easting	Northing	Ground elevation (mAHD)	Bore depth (mbgl)	Screened Interval/ Sensor Depth (mbgl)	Lithology
							2185	Overburden 2*
							260.5	Whybrow seam*
P332	VWP	EX	305779	6397521	60.9	144.31	40	Sandstone
							80	Siltstone
							114	Coal (WWA)
P333	VWP	EX	306152	6397780	61.05	83.8	22	Weathered Sandstone
							39	Siltstone
							54	Siltstone
DDH1234	VWP	EX	306153	6397780	157.155	83.8	22	Weathered Sandstone
							39	Siltstone
							54	Siltstone (5 m above WWA seam)
DDH1235	VWP	EX	305779	6397521	167.043	144.31	40	Sandstone
							80	Siltstone
							114	Coal (WWA seam)
DDH1240	VWP	EX	305397	6396881	244.834	282.29	50	Narrabeen Group*
							118	Overburden 1
							218.5	Overburden 2*
							260.5	Whybrow seam*
Wambo-03	Dewatering	EX	311699	6392752				Wambo Seam
Wambore South	Dewatering	EX	311812	6392555				Wambo Seam



Making Sustainability Happen

APPENDIX I
ANNUAL COMPLIANCE REPORT
(EPBC 2016/7636 AND EPBC 2016/7816)

WAMBO COAL PTY LTD
2024 ANNUAL COMPLIANCE REPORT

(EPBC 2016/7636 and EPBC 2016/7816)

1 January – 31 December 2024

Document Control

Title	Wambo Coal 2024 Annual Compliance Report (EPBC 2016/7636 and EPBC 2016/7816)
General Description	Review of compliance with the conditions of EPBC 2016/7636 and EPBC 2016/7816
Document Owner	Manager: Environment & Community

Revisions

Rev No	Date	Description	By	Checked	Signature
1	March 2025	Original	WCPL	ND	

This report addresses Condition 5 of the Wambo Coal Pty Limited (WCPL) Environment Protection and Biodiversity Conservation (EPBC) Approval 2016/7636 for the South Wambo Underground Mine, which states:

> *The person taking the action must publish a report on the website addressing compliance with each of the conditions of this approval, including implementation of any management plan, program, strategy and review required by condition 1. The reporting period and report publication must comply with conditions D10 and D15 of Schedule 2 of the* ***state development consent****. Documentary evidence providing proof of the date of publication and non-compliance with any of the conditions of this approval must be provided to the* ***Department*** *(by email to EPBCMonitoring@environment.gov.au or an address as stipulated by the* ***Department****) at the same time as the compliance report is published. The person taking the action must continue to publish the report until such time as agreed in writing by the* ***Minister****.*

Table 1 provides a reconciliation of the conditions of EPBC 2016/7636 and their compliance status.

This report also addressed Condition 5 of the WCPL EPBC Approval 2016/7816 for the South Bates Extension Underground Mine, which states:

> *The person taking the action must publish a report on the website addressing compliance with each of the conditions of this approval, including implementation of any management plan, program, strategy and review required by condition 1. The reporting period and report publication must comply with conditions D10 and D15 of Schedule 2 of the* ***state development consent****. Documentary evidence providing proof of the date of publication must be provided to the* ***Department*** *(by email to EPBCMonitoring@environment.gov.au or an address as stipulated by the* ***Department****) at the same time as the compliance report is published. The person taking the action must continue to publish the report until such time as agreed in writing by the* ***Minister****.*

Table 2 provides a reconciliation of the conditions of EPBC 2016/7816 and their compliance status.

Table 1: EPBC Approval 2016/7636 Compliance Summary

Condition	Status	Comment
1. The person taking the action must: a. Not clear more than 0.9 ha of Central Hunter Valley Eucalypt Forest and 3.4 ha of foraging habitat for the Regent Honeyeater *(Anthochaera phrygia)*.	Compliant	The action has not yet been commenced. WCPL has not cleared more than 0.9 hectares (ha) of Central Hunter Valley Eucalypt Forest or more than 3.4 ha of foraging habitat for the Regent Honeyeater (*Anthochaera Phrygia*) as part of the action.
b. Implement conditions A1 and A2 of Schedule 2 of the **state development consent** to minimise the impacts of the action on **protected matters**.	Not-compliant	WCPL implements Conditions A1 and A2, Schedule 2 of the Development Consent (DA 305-7-2003). WCPL recorded a non-compliance with Condition B62, Schedule 2 of DA 305-7-2003 (i.e. groundwater quality performance criteria) at P315 during the reporting period. It is noted that the exceedance at P315 has been observed since 2021. P315 is not located proximal to any activities associated with the EPBC 2016/7636 Action. As such, these non-compliances are considered to not be related to the EPBC 2016/7636 Action nor would they result in any significant impacts to relevant Matters of National Environmental Significance.
c. Implement environmental performance conditions B1-B11, B51-B55, B62-B73 and B75-B77 of Schedule 2 of the **state development consent**, where the conditions relate to avoiding, mitigating, managing, offsetting, monitoring or recording, or reporting on impacts to **protected matters**. In implementing these conditions, the approval holder must protect at least 18.3 ha of Central Hunter Valley Eucalypt Forest and at least 27.7 ha of foraging habitat for the Regent Honeyeater *(Anthochaera phrygia)* in perpetuity.	Compliant	WCPL implements Conditions B1-B11, B51-B55, B62-B73 and B75-B77 of Schedule 2 of the Development Consent (DA 305-7-2003). WCPL has amended an existing VCA under the NSW *National Parks and Wildlife Act 1974* to conserve Remnant Woodland Enhancement Program Area E in perpetuity, which includes 18.3 ha of Central Hunter Valley Eucalypt Forest and Woodland and 27.7 ha of foraging habitat for the Regent Honeyeater.
2. Within 30 days after the **commencement of the action**, the person taking the action must advise the **Department** in writing of the actual date of **commencement of the action**.	Compliant	The Action has commenced on 21 October 2024. WCPL advised the Department in writing of the commencement of the action on 7 November 2024 (i.e. within 30 days of commencement).

Condition	Status	Comment
3. Unless otherwise agreed to in writing by the **Minister**, the person taking the action must publish all management plans, programs, strategies and reviews required by condition 1. Each management plan, program, strategy and review must be published on the **website**, and notification must be provided to the **Department**, within 1 month of being approved by the Secretary of the NSW Department of Planning & Environment (or nominee of the Secretary).	Compliant	Copies of all management plans, programs, strategies and reviews required by condition 1 of EPBC 2016/7636 are available to the public on the Peabody Energy website https://www.peabodyenergy.com/Operations/Australia-Mining/New-South-Wales-Mining/Wambo-Approvals,-Plans-Reports. Relevant management plans include the Site Water Management Plan and Biodiversity Management Plan. An Extraction Plan for areas related to the Action has not yet been prepared. Notification is provided to the Department within one month of the approval of any management plans, programs, strategies and reviews by the Secretary of the NSW Department of Planning & Environment (or nominee of the Secretary).
4. The person taking the action must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement a management plan, program, strategy and review required by condition 1, and make them available upon request to the **Department**. Such records may be subject to audit by the **Department** or an independent auditor in accordance with section 458 of the **EPBC Act**, or used to verify compliance with the conditions of approval.	Compliant	WCPL maintains accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement a management plan, program, strategy and review required by condition 1. WCPL will make these records available upon request to the Department.
5. The person taking the action must publish a report on their **website** addressing compliance with each of the conditions of this approval, including implementation of any management plan, program, strategy and review required by condition 1. The reporting period and report publication must comply with conditions D10 and D15 of Schedule 2 of the **state development consent**. Documentary evidence providing proof of the date of publication and non-compliance with any of the conditions of this approval must be provided to the **Department** (by email to EPBCmonitoring@environment.gov.au or an address as stipulated by the **Department**) at the same time as the compliance report is published. The person taking the action must continue to publish the report until such time as agreed in writing by the **Minister**.	Compliant	The WCPL 2024 Annual Review (including this report) will be published on the Peabody Energy website https://www.peabodyenergy.com/Operations/Australia-Mining/New-South-Wales-Mining/Wambo-Approvals,-Plans-Reports.
6. Any potential or actual contravention of the conditions of this approval, including contravention of a commitment made in a management plan, program, strategy and review required by condition 1 must be reported to the **Department** within 7 days of the person taking the action becoming aware of the actual or potential contravention.	Not applicable	No events contravening (or potentially contravening) the conditions of this approval have occurred.

Condition	Status	Comment
7. Upon the direction of the **Minister**, the person taking the action must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the **Minister**. The independent auditor and audit criteria must be approved by the **Minister** prior to the commencement of the audit. The audit report must address the criteria to the satisfaction of the **Minister**.	Not applicable	Upon the direction of the Minister, WCPL will ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the Minister.
8. If, at any time after 5 years from the date of this approval, the person taking the action has not substantially commenced the action, then the person taking the action must not substantially commence the action without the written agreement of the **Minister**.	Not applicable	WCPL did not substantially commence the South Wambo Underground Mine prior to 30 April 2022 (i.e. five years after the date EPBC 2016/7636 was granted). In September 2023 DCCEEW approved WCPL's request to delay commencement of the action, noting the action must now commence by 31 December 2024. WCPL commenced the Action on 21 October 2024

Table 2: EPBC Approval 2016/7816 Compliance Summary

Condition	Status	Comment
1. The person taking the action must: a. Implement administrative conditions A1 and A2 of Schedule 2 of the state development consent to minimise the impacts of the action on protected matters.	Not-compliant	WCPL implements Conditions A1 and A2, Schedule 2 of the Development Consent (DA 305-7-2003). WCPL recorded a non-compliance with Condition B62, Schedule 2 of DA 305-7-2003 (i.e. groundwater quality performance criteria) at P315 during the reporting period. It is noted that the exceedance at P315 has been observed since 2021, These non-compliances are considered to not be related to the EPBC 2016/7816 Action nor would they result in any significant impacts to relevant Matters of National Environmental Significance.
b. Implement environmental performance conditions B1-B3, B7-B10, B51-B55 and B62- B68 of Schedule 2 of the **state development consent**, where the conditions relate to avoiding, mitigating, managing, offsetting, monitoring or recording, or reporting on impacts to **protected matters**.	Compliant	WCPL implements Conditions B1-B3, B7-B10, B51-B55 and B62-B68, Schedule 2 of the Development Consent (DA 305-7-2003).
c. Notify the **Department** in writing of any proposed change to the **conditions** of the **state development consent**, referred to in conditions 1a and 1b, within 5 **business days** of formally proposing a change or becoming aware of any other proposed change.	Compliant	No changes or proposed changes to the Development Consent in 2024
d. Notify the **Department** in writing of any change to conditions of the **state development consent**, referred to in conditions 1a to 1b, within 5 **business days** of a change to **conditions** being finalised.	Compliant	No changes or proposed changes to the Development Consent in 2024
2. Within 25 **business days** after the **commencement of the action**, the person taking the action must advise the **Department** in writing of the actual date of **commencement of the action**.	Notification provided 3 December 2018.	WCPL provided a notification to the Department of the actual date of commencement of the action (3 December 2018), however this was not completed within 30 days of the commencement of the action.

Condition	Status	Comment
3. Unless otherwise agreed to in writing by the **Minister**, the person taking the action must publish all management plans and strategies required by conditions B1-B3, B7-B10, B51-B55 and B62-B68 of Schedule 2 of the **state development consent** on their website. Each management plan and strategy must be published on the **website** within 1 month of being approved by the **Secretary** and remain there for a period of no less than 5 years.	Compliant	Copies of all management plans, programs, strategies and reviews required by condition 1 of EPBC 2016/7636 are available to the public on the Peabody Energy website https://www.peabodyenergy.com/Operations/Australia-Mining/New-South-Wales-Mining/Wambo-Approvals,-Plans-Reports. Relevant management plans include the Extraction Plan for South Bates Extension Underground Mine Longwalls 24 to 26, Site Water Management Plan, Biodiversity Management Plan and Life of Mine Rejects Emplacement Strategy.
4. The person taking the action must maintain accurate records substantiating all activities associated with or relevant to these conditions of **approval**, including measures taken to implement the management plans and strategies required by conditions B1-B3, B7-B10, B51-B55 and B62-B68 of Schedule 2 of the **state development consent**, and make them available upon request to the **Department**. Such records may be subject to audit by the **Department** or an independent auditor in accordance with section 458 of the **EPBC Act**, or used to verify compliance with the conditions of this **approval**.	Compliant	WCPL maintains accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement a management plan, program, strategy and review required by Conditions B1-B3, B7-B10, B51-B55 and B62-B68, Schedule 2. WCPL will make these records available upon request to the Department.
5. The person taking the action must publish a report on their website addressing compliance with each of the **conditions** of this **approval**, including implementation of any management plans and strategies required by condition 1. The reporting period and report publication must comply with conditions D10 and D15 of Schedule 2 of the **state development consent**. Documentary evidence providing proof of the date of publication must be provided to the **Department** (by email to EPBCMonitoring@environment.gov.au or an address as stipulated by the **Department**) at the same time as the compliance report is published. The person taking the action must continue to publish the report until such time as agreed in writing by the **Minister**.	Compliant	The WCPL 2024 Annual Review (including this report) will be published on the Peabody Energy website https://www.peabodyenergy.com/Operations/Australia-Mining/New-South-Wales-Mining/Wambo-Approvals,-Plans-Reports.
6. Any potential or actual contravention of the conditions of this **approval**, including contravention of a commitment made in a management plan or strategy required by condition 1 must be reported to the **Department** no later than 7 **business days** of the person taking the action becoming aware of the actual or potential contravention, by email to EPBCMonitoring@environment.gov.au or an address as stipulated by the **Department**.	Not applicable	No events contravening (or potentially contravening) the conditions of this approval have occurred.

Condition	Status	Comment
7. Upon the direction of the **Minister**, the person taking the action must ensure that an independent audit of compliance with the conditions of **approval** is conducted and a report submitted to the **Minister**. The independent auditor and audit criteria must be approved by the **Minister** prior to the commencement of the audit. The audit report must address the criteria to the satisfaction of the **Minister**.	Not applicable	Upon the direction of the Minister, WCPL will ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the Minister.
8. If, at any time after 5 years from the date of this **approval**, the person taking the action has not substantially **commenced the action**, then the person taking the action must not **commence the action** without the written agreement of the **Minister**.	Compliant	WCPL commenced the action within five years of the date of the approval of EPBC 2016/7816.