CENTENNIAL

CENTENNIAL COAL

Angus Place

ANNUAL REVIEW

March 2024

Annual Review Title Block

Name of Operation	Angus Place Colliery
Name of Operator	Centennial Angus Place Pty Ltd
Development Consent/ Project Approval #	MP06_0021
Name of holder of Development Consent/ Project Approval	Centennial Angus Place Pty Ltd
Mining Lease #	ML1326, (part) ML1424, ML1699, ML1720, MPL314, CCL702, CCL704, EL6856, EL6293, EL7415, EL8188, MLA498.
Name of Holder of Mining Lease	Centennial Springvale Pty Ltd and Boulder Mining Pty Ltd
Water License #	WAL36445; WAL36449; WAL37340; WAL37343; WAL41881
Name of Holder of Water License	Centennial Angus Place Pty Ltd
RMP Start Date	July 2022
RMP End Date	NA
Annual Review Start Date	1 January 2023
Annual Review End Date	31 December 2023

I, certify that this audit report is a true and accurate record of the compliance status of Angus Place for the period 1 January to 31 December 2023 and that I am authorised to make this statement on behalf of Centennial Coal.

Note:

a) *The Annual Review is an 'environmental audit' for the purposes of s122B(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	DAVID CRAFT
Title of Authorised Reporting Officer	MINE MANAGER
Signature of Authorised Reporting Officer	
Date	25.3.2024.

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Abbreviation Table

AEMP	Aquatic Ecology Monitoring Program
AEMR	Annual Environmental Management Report
AR	Annual Review
AQMP	Air Quality Management Plan
AWS	Automatic Weather Station
BOM	Bureau of Meteorology
BC Act	*Biodiversity Conservation Act 2016*
CCL	Consolidated Coal Leases
DCO	Development Control Order
DDG	Depositional Dust Gauges
DPHI	Department of Planning, Housing and Infrastructure
DPIE	Department of Planning, Industry and Environment (now DPHI)
DPE	Department of Planning & Environment (now DPHI)
DRNSW-MEG	Department of Regional NSW – Mining, Exploration & Geosciences
EC	Electrical Conductivity
EPA	Environmental Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
EPL	Environmental Protection Licence
HCS	Habitat Complexity Scores
HVAS	High Volume Air Sampler
LDP	Licenced Discharge Point
LFA	Landscape Function Analysis
ML	Mining Lease
MOP	Mining Operations Plan
NMP	Noise Management Plan
NPI	National Pollutant Inventory
NPSS	Newnes Plateau Shrub Swamps
PA	Project Approval
POLMOP	Privately-Owned Lands Mine Operations Plan
RAP	Registered Aboriginal Parties
SMP	Subsidence Management Plan
SSA	Soil Surface Assessment
SSD	State Significant Development
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
UCRC	Upper Coxs River Catchment
WAL	Water Licences
WAP	Weed Action Plan
WMP	Water Management Plan
WRACHMP	Western Region Aboriginal Cultural Heritage Management Plan

Plans

Plan Reference	Plan Name
Plan 1	Regional Locality
Plan 2	Site Layout
Plan 3	Meteorological, Air and Noise Monitoring
Plan 4	Water Monitoring
Plan 5	Ecological Monitoring
Plan 6	Pit Top
Plan 7	Commonwealth Colliery
Plan 8	Vale of Clywdd #2

1 STATEMENT OF COMPLIANCE

The compliance status of the Angus Place Colliery for the year 2023 is presented in **Table 1-1**. During the reporting period there were six non-compliances. **Table 1-2** presents a summary of the non-compliances.

Table 1-1: Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
Project Approval MP06_0021	No
Environmental Protection Licence 467	No
EPBC 2011/5952	Yes
Mining Leases (CCL702, CCL704, ML1424, ML1326, ML1699, ML1720, MPL314, EL6856, EL6293, EL7415, EL8188, MLA498)	No
SMP Approval 04/1675	Yes
SMP Approval OUT 14/10918	Yes
Water Licenses (WAL36445, WAL36449, WAL37340, WAL37343, WAL41881)	Yes
Rehabilitation Management Plan	Yes
Radiation Management Licence RML29229	Yes

Table 1-2: 2023 Non-Compliances

Relevant Approval	Condition #	Condition summary	Compliance Status	Comment	Where Addressed in Annual Review
EPL 467 MP06_0021	M2.3 Schedule 3, Condition 8	Water and/or Land Concentration Limits	Non-Compliant	Failure to monitor at LDP002 on the 30 April 2023.	**Section 11**
EPL 467 MP06_0021	M2.3 Schedule 3, Condition 8	Water and/ or Land Monitoring Requirements	Non-Compliant	Failure to monitor at LDP003 on the 09 November 2023.	**Section 11**
EPL 467 MP06_0021	M2.3 Schedule 3, Condition 8	Water and/ or Land Monitoring Requirements	Non-Compliant	Failure to monitor required # samples in accordance with M2.3 at EPL Point 16 on two occasions March, October.	**Section 11**
EPL 467 MP06_0021	M2.3 Schedule 3, Condition 8	Water and/ or Land Monitoring Requirements	Non-Compliant	Failure to monitor required # samples in accordance with M2.3 at EPL Point 17 on four occasions January, February, March, and September 2023.	**Section 11**
EPL 467 MP06_0021	M2.3 Schedule 3, Condition 8	Water and/ or Land Monitoring Requirements	Non-Compliant	Failure to monitor required # samples in accordance with M2.3 at EPL Point 18 on 8 occasions throughout 2023.	**Section 11**

Relevant Approval	Condition #	Condition summary	Compliance Status	Comment	Where Addressed in Annual Review
MPL 314 (1973), ML 1699 (1992), ML 1424 (1992), ML 1326 (1992), ML 1720 (1992), CCL 704 (1973)	Schedule 8A, Mining Regulation 2016	Failure to submit Rehabilitation Cost Estimate and Annual Rehabilitation Report and Forward Program by the due date.	Non-Compliant	Failure to comply with Schedule 8A of the Mining Regulation 2016. A large mine must submit an Annual Report and Forward Program, and a Rehabilitation Cost Estimate.	**Section 11**

Note: Compliance Status Key for Table 1-2

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-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)

2 INTRODUCTION

Angus Place Colliery (Angus Place) is an underground coal mining operation located approximately 5 kilometres (km) north of the village of Lidsdale, 8 km northeast of the township of Wallerawang and approximately 15 km northwest of the city of Lithgow in New South Wales (NSW). It is surrounded by Springvale Colliery to the south, Ivanhoe Colliery to the northwest and the Wolgan Valley and Newnes Plateau to the north and east respectively. The Angus Place Rehabilitation Management Plan (RMP) covers an area that includes Kerosene Vale and Vale of Clywdd 2 mines and Commonwealth Colliery open cut. Regional locality is shown on **Figure 2-1** and site layout on **Figure 2-2**.

Angus Place has been in operation since 1979 and is operated by Centennial Angus Place Pty Ltd (Centennial Angus Place) which is owned by Springvale Coal Pty Ltd. Angus Place utilised the longwall retreat method of mining to extract coal from the Lithgow Seam, within Mining Lease (ML) 1424 and Consolidated Coal Lease (CCL) 704.

In March 2015, following the completion of secondary extraction within Longwall 900W, Angus Place moved to a care and maintenance phase during which mining operations have ceased. Environmental management of the site, including dewatering of the underground workings, is ongoing. Mining operations are expected to recommence at Angus Place Colliery (pending consent) following the completion of mining at the adjacent Springvale Mine.

Angus Place's existing Project Approval was granted on 13 September 2006 pursuant to Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act). The current project approval has since been declared a State Significant Development (SSD) under Clause 6 of Schedule 2 to the Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017, for the purposes of the EP&A Act.

Accordingly, Angus Place Colliery now operates as an SSD approval (MP06_0021). MP06_0021 has been modified several times since 2011. Modification (MOD) 7 was approved by DPHI on 25 November 2022 to address NSW regulatory reforms to mine rehabilitation for all NSW mines in line with changes to NSW Mining Leases as detailed in **Section 3**.

The Angus Place MP06_0021 approval (as modified) currently provides for underground mining with a production limit of 4.0 million tonnes per annum of coal from the Lithgow Seam. The main components of Angus Place's operations are an underground longwall mine and development panels with supporting surface infrastructure situated at the Angus Place pit top area and on the Newnes Plateau.

2.1 SCOPE

This Annual Review (AR) details the compliance and environmental management performance of Angus Place over the period 1 January 2023 to 31 December 2023. It has been prepared to demonstrate the sites performance and community engagement activities. The AR has been prepared in accordance with the Annual Review Guideline (DPIE, 2015) and satisfies the following:

- Conditions of Project Approval MP06_0021, in particular Condition 3 in Schedule 5.[1]
- Conditions of Project Approval SSD_5579, in particular Condition 4 in Schedule 5 (relevant to Kerosene Vale and the Haul Roads).
- Reporting requirements of mining tenements[1]
- Reporting requirements of related approved management plans.

2.2 MINE CONTACTS

The contact details for the personnel responsible for environmental management and community relations at Angus Place are provided in **Table 2-1**.

Table 2-1: Centennial Site Environmental Contact Details

Name	Position	Contact Details
David Craft	Mine Manager	T: (02) 6354 8721
		E: David.Craft@centennialcoal.com.au
William Olson	Environment & Community Officer	T: (02) 6355 9509
		E: William.A.Olson@centennialcoal.com.au
Community Information and Complaints Line		T: (02) 6354 8700

[1] See **Appendix 1** for a checklist of annual review reporting requirements and where they have been addressed in this Annual Review.

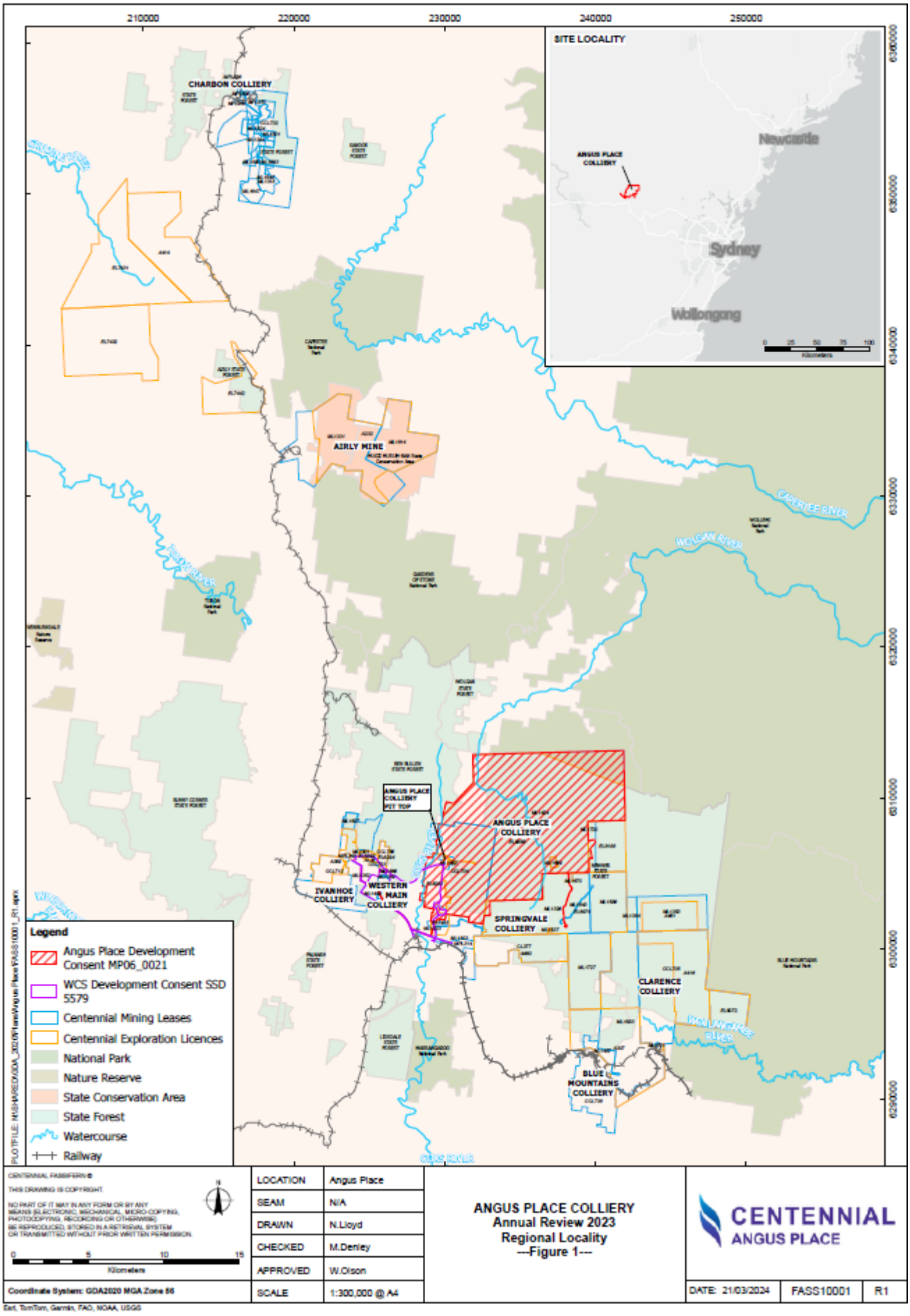


Figure 2-1: Regional Context

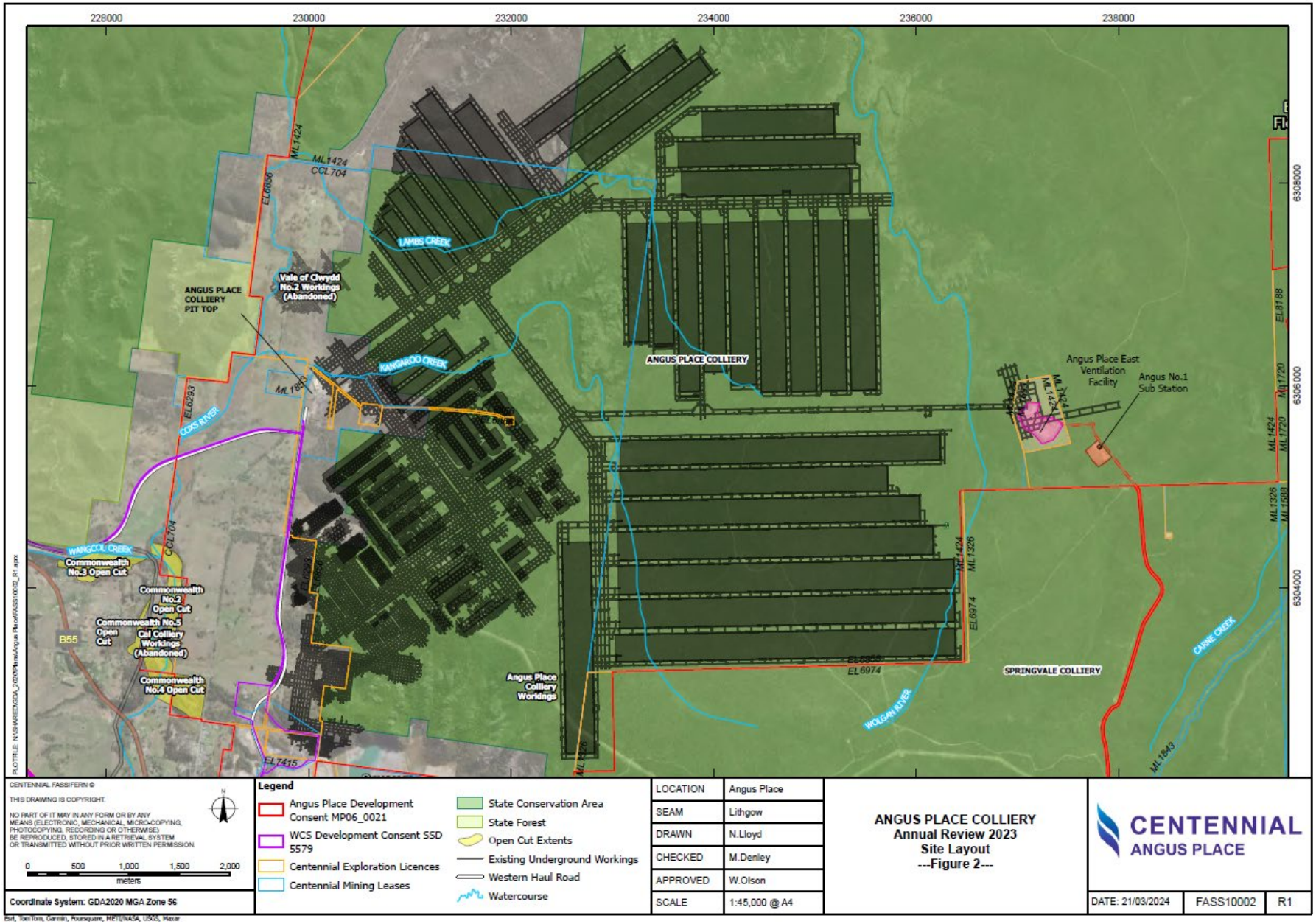


Figure 2-2: Site Layout

3 APPROVALS

3.1 PROJECT APPROVALS, MINING AUTHORISATIONS, AND OTHER LICENCES

A summary of Project Approvals, Mining Authorisations, and other Licences relevant to Angus Place is provided in **Table 3-1**. Current development, mining and environment approvals are available at the Angus Place website.[2]

Table 3-1: Environmental Approvals held by Centennial Angus Place

Approval	Description	Expiry Date	Change during Reporting Period (Y/N)
Project Approval / Development Consent			
MP06_0021	Project approval for Angus Place Coal Mine	18 August 2024	N
MP06_0021 (MOD 1)	Mod 1 (Longwalls 900W and 910)		
MP06_0021 (MOD 2)	Mod 2 (Ventilation facility).		
MP06_0021 (MOD 3)	Mod 3 (Extension of longwalls 980 and 900W)		
MP06_0021 (MOD 4)	Mod 4 (Development continuity)		
MP06_0021 (MOD 5)	Mod 5 (Water management)		
MP06_0021 (MOD 6)	Mod 6 (Water transfer system and water softening plant)		
MP06_0021 (MOD 7)	Mod 7 (Rehabilitation reforms)		
SSD 5579	Sections of SSD 5579 relevant to Kerosene Vale and the Haul Roads.	30 June 2039	N
Environmental Protection Licence			
EPL 467	Environmental Protection Licence	N/A	N
EPBC Approval –			
EPBC 2011/5952	Mining of Longwalls 910 and 900W	19 March 2032	N
Mining Authorisations			
Part Lease CCL 702	(Part) Consolidated Coal Lease	24 November 2024	N
CCL 704	Consolidated Coal Lease	20 July 2039	N
Part ML 1424	Mining Lease	18 August 2024	N
ML 1326	Mining Lease	18 August 2024	N
ML 1699	Mining Lease	26 June 2035	N

[2] https://www.centennialcoal.com.au/operations/angus-place/

Approval	Description	Expiry Date	Change during Reporting Period (Y/N)
ML 1720	Mining Lease	23 November 2036	N
ML 1853	Mining Lease	25 May 2044	Y
EL 6856	Exploration Licence	8 August 2025	Y
EL 6293	Exploration Licence	17 September 2024	N
EL 7415	Exploration Licence	20 October 2019*	N
EL 8188	Exploration Licence	16 October 2025	N
Mine Operations Plan / Rehabilitation Management Plan			
Rehabilitation Management Plan – Angus Place (November 2023)	Rehabilitation Management Plan for Angus Place with commencement date 1 August 2022	N/A	Y – see **Section 3.1.1**
Extraction Plans / Subsidence Management Plans			
SMP Approval 04/1675 (RR)	Mining of Longwalls 930-980	30 June 2014	N
Extraction Plan Approval 12/15868 (DPHI)	Mining of Longwalls 910 and 900W (CCL 704, ML 1424 & ML 1326)	31 March 2021	N
SMP Approval 14/10918 (RR)	Mining of Longwalls 900W and 910 (CCL 704, ML 1424 & ML 1326)	31 March 2021	N
Water Licences			
WAL36445	Extraction of 2,701ML per year	Perpetuity	N
WAL36449	Extraction of 2,523ML per year to dewater the underground coal	Perpetuity	N
WAL37340	Extraction of up to 329ML per year	Perpetuity	N
WAL37343	Extraction of up to 35ML	Perpetuity	N
WAL41881	Extraction of 1,471ML per year	Perpetuity	N

Notes: * Expired

3.1.1 Changes During the Reporting Period

A number of changes to Approvals, Mining Tenements, and other Licences occurred during the reporting period as outlined below.

The following leases and licences were renewed:

- MLA498 Now ML1853 (expiry date 25/05/2044)

The following leases and licenses expired:

- EL7415

3.2 ANNUAL REPORTING REQUIREMENTS

Appendix 1 provides a checklist of reporting requirements and performance conditions addressed within the Annual Review.

In accordance with the requirements of MP06_0021 (Schedule 5, Conditions 3 and 7– Annual Reporting, and Condition 10 – Access to Information), and the conditions outlined in **Appendix 1**, this 2023 Annual Review was provided to the Secretary of the Department of Planning, Housing and Infrastructure (DPHI) and subject to approval is available at the Angus Place website[3].

[3] https://www.centennialcoal.com.au/operations/angus-place/

4 OPERATIONS SUMMARY

Angus Place is presently undertaking care and maintenance provisions (since 28 March 2015). Environmental management of the site, including dewatering of the underground workings, is ongoing. Mining operations are expected to recommence at Angus Place Colliery in 2026 (pending consent) following the completion of mining at the adjacent Springvale Mine.

4.1 PRODUCTION

No reportable production activities were undertaken during the reporting period.

4.2 MINING OPERATIONS

No mining activities (development or secondary extraction) were undertaken during the reporting period.

4.3 EXPLORATION

No exploration activities were undertaken during the reporting period.

4.4 LAND DISTURBANCE

No land disturbance activities were undertaken during the reporting period.

4.5 CONSTRUCTION

No Construction activities were undertaken at the site during the reporting period Next Reporting Period

Angus Place has ceased coal mining and is currently undertaking care and maintenance activities in anticipation of future mining opportunities. Activities to be conducted during the next reporting period are limited to:

- Continue preparation and submission of an Environmental Impact Statement and associated work for Angus Place West.
- Implement relevant components of the *Rehabilitation Management Plan (RMP)* as required and appropriate in accordance with Condition 37, Schedule 3 of MP06_0021.
- Review and if necessary, revise strategies, programs and management plans in accordance with Schedule 5 Condition 4 to reflect current and proposed mining and rehabilitation activities.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

Table 5-1 summarises the outcomes of the 2023 Annual Review, including actions issued by Regulators and actions outlined by the Angus Place Colliery.

Table 5-1: Actions from Previous Annual Review and Regulator Requirements

Action Required	Requested By	Action Taken	Where addressed in Annual Review
Regulator Requirements			
N/A			
Improvement/Other Actions (Committed in 2023 Annual Review)			
Completion and submission of the Angus Place West Project EIS	**Angus Place Colliery**	Ongoing.	**Ongoing**
Review weed management practices particularly for Blackberry.	**Angus Place Colliery**	A weed action plan has been implemented	**Section 8**
Revise biodiversity and water monitoring obligations	**Angus Place Colliery**	Ongoing in accordance with EIS submission	**Ongoing**
Finalise relevant extraction and subsidence monitoring plans	**Angus Place Colliery**	Ongoing in accordance with EIS submission	**Ongoing**
Management Plan Revisions			
Ongoing consultation with the DPHI regarding the Western Region Biodiversity Management Plan	**Western Coal Services**	Resubmitted for approval on the 18 July 2023	**Waiting for approval**
Revision of Water Management Plan	**Angus Place Colliery**	Revision ongoing	**Ongoing**
Condition Triggers			
In accordance with Condition 4(a) in Schedule 5 of MP06_0021 strategies, plans, and programs required under the consent will be reviewed within three months of the submission of this annual review. If necessary, the strategies, plans, and programs required under the approval will be revised to the satisfaction of the Secretary.	**Angus Place Colliery**	Review of strategies, plans, and programs will be completed within three months of the submission of this annual review. If necessary, strategies, plans, and programs will be revised.	**Review completed**

6 ENVIRONMENTAL PERFORMANCE

Angus Place implements an Environmental Management Strategy, including management plans, procedures and monitoring programs that provide a framework for managing environment and community risks and impacts. To measure compliance with site approvals

and licences, Angus Place undertakes a comprehensive monitoring program. Environmental monitoring locations are shown in **Figure 6-2** and **Figure 6-3.**

Table 6-1 provides a summary of the monitoring requirements and environmental performance for the reporting period and provides an overview of the relevant approval requirements and management plans. Environmental performance in the reporting period is detailed further in the following sections:

- **Section 6.1** – Meteorological Summary
- **Section 6.2** – Noise
- **Section 6.3** – Blasting
- **Section 6.4** – Air Quality
- **Section 6.5** – Greenhouse Gas Monitoring
- **Section 6.6** – Biodiversity
- **Section 6.7** – Heritage
- **Section 6.8** – Mine Subsidence
- **Section 6.9** - Waste
- **Section 6.10** – Other Matters
    - Bushfire (**Section 6.10.1**)

Note, there are separate sections for reporting the environmental performance for Water (**Section 7**), Rehabilitation (**Section 8**) and Community Consultation (**Section 9**).

Within relevant management plans, Angus Place has developed *Trigger Action Response Plans (TARPs)* using performance indicators for predicted and approved impacts. The TARP provides a process of tiered/escalating trigger levels for contingency measures should measurements and impacts be greater than predicted/approved. Accordingly, reporting of monitoring results and performance during 2023 against relevant TARPs is provided in the following sections of this Annual Review where appropriate.

Table 6-1 summarises the results of monitoring during 2023 for key environmental and subsidence-related aspects against performance measures of MP06_0021. Further detailed discussion is provided throughout **Sections 6-11** of this Annual Review.

Table 6-1: Summary of Environmental Performance and comparison with approved predictions (EIS/Modifications)

Aspect	MP06_0021 / EPL criteria	Performance during the reporting period (actual)	Trend/ key management implications	Implemented / proposed management action
Noise	As per Schedule 3, Conditions 17-20 of MP06_0021 MOD 7 and Condition L4 of EPL467	Compliant with approval criteria	Results compliant since at least 2015. Mining and processing have ceased during care & maintenance.	No additional mitigation actions required. Continue to maintain compliance with all relevant approvals.
Blasting	N/A	Angus Place did not conduct any blasts within the reporting period.	NA	NA
Air Quality	As per Schedule 3, Condition 14-16 of MP06_0021 MOD 7 and Condition P1 of EPL467.	Compliant with approval criteria.	Mining and processing operations have ceased during care and maintenance.	No additional mitigation actions required. Continue to maintain compliance with all relevant approvals.
Greenhouse Gas	As per Schedule 3, Condition 31 of MP06_0021 MOD 7.	Compliant with approval criteria.	Results have been compliant for at least the last 5 reporting periods.	As above. Ongoing improvement and emissions reductions measures are discussed in **Section 6.5.5**.
Biodiversity	As per Conditions 3, 24, 24A and 24B of Schedule 3 MP06_0021and EPBC Approval 2011/5952.	Monitoring obligations have been met.	Monitoring findings reflect significant impacts from drought and bushfire and following above average rainfall. Some areas previously directly impacted by mining (15+ years ago) continue to show effects of former impacts.	DPHI approval of the Western Region Biodiversity Offsets Strategy (WR-BOS) in 2022.
Heritage	As per Conditions 3,3A-3C(h), 38 and 40 Schedule 3,of MP06_0021.	Compliant with approval criteria	No significant changes in 2023.	Continue to engage with Aboriginal stakeholder groups in accordance with the WR ACHMP.

Aspect	MP06_0021 / EPL criteria	Performance during the reporting period (actual)	Trend/ key management implications	Implemented / proposed management action
Surface Water	As per Schedule 3, Condition 5-13B of MP06_0021 Mod 7 and Condition P1 of EPL467.	Non-compliances with licence conditions relating to failing to monitor.	Refer to **Section 7** and **Section 11** for non- compliances in accordance with EPL 467.	Surface water sampling program to be reviewed for relevance to current and future potential operations.
Groundwater	As per Schedule 3, Condition 5-13B of MP06_0021 Mod 7 and Condition P1 of EPL467.	Non-compliances with licence conditions relating to failure to monitor, some due to road conditions and other factors.	Groundwater levels generally remain stable or have responded to rainfall infiltration. The quality is typical of groundwater from within the Shoalhaven Group.	Groundwater monitoring program to be reviewed for relevance to current and future potential operations.
Waste	As per Condition 32, Schedule 3 of MP06_0021 and Condition L3.1 of EPL467.	Compliant with conditions.	Compliant for last five reporting periods.	No additional mitigation actions required.

6.1 METEOROLOGICAL SUMMARY

During the reporting period, meteorological monitoring at Angus Place was undertaken in compliance with:

- MP06_0021 (Schedule 3, Condition 23,)
- EPL 467 (Condition M4.1)
- Approved Methods for Sampling of Air Pollutants in New South Wales (NSW EPA)
- Western Region Air Quality and Greenhouse Gas Management Plan (November 2021)

The cumulative rainfall for the 2023 reporting period of 652.8mm was above the long-term annual average. January received the highest amount of rainfall of 104.4mm during the reporting period. Rainfall was above the long-term monthly averages[4] in January, March, April, November, and December. May received the least amount of rainfall in the reporting period of 10.6mm.

December recorded the highest average temperatures 18.9°C whilst the lowest average temperature of 5.5°C was recorded in July during the reporting period. The highest temperature (34.8°C) was recorded on 19 March 2023, and the lowest temperature (- 10.0°C) was recorded on 9 August 2023.

Figure 6-1 summarises meteorological conditions at Angus Place during the reporting period.

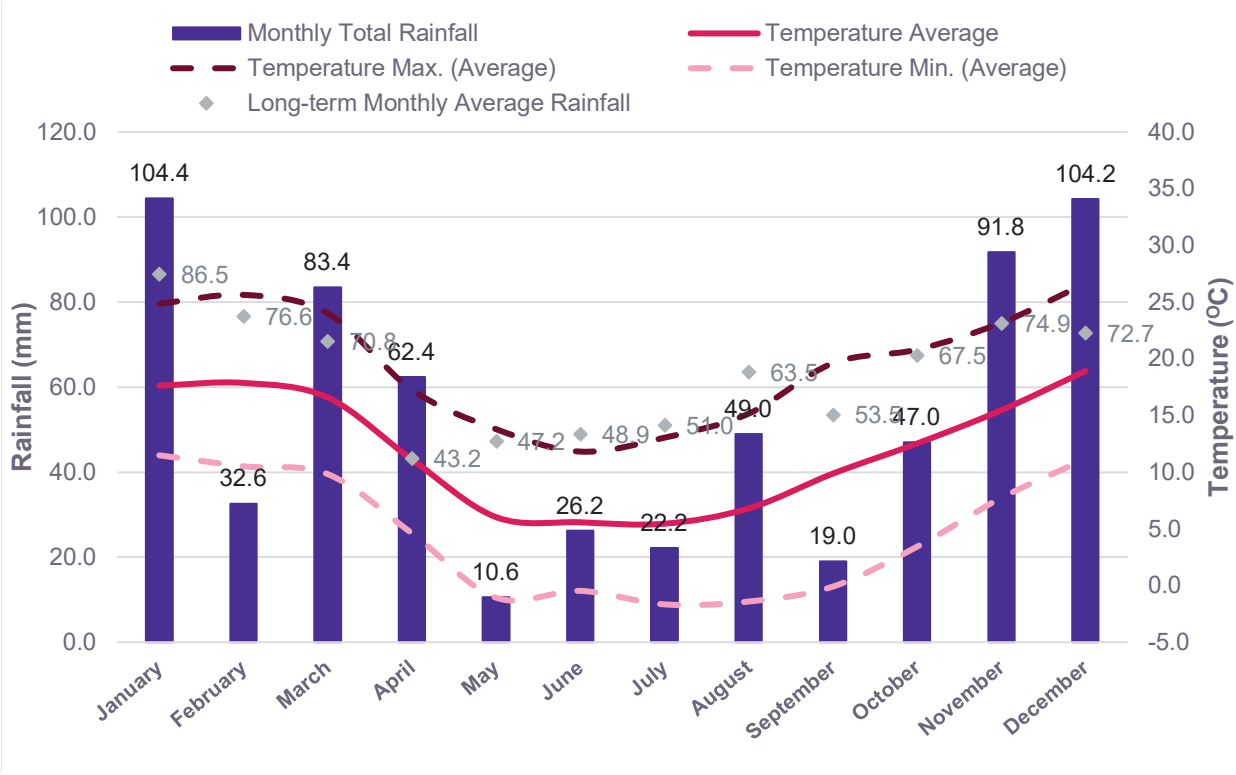


Figure 6-1: Summary of Meteorological Conditions

[4] As determined from a nearby rainfall gauge operated by the Bureau of Meteorology (BOM) in Lidsdale (Station Number 63132) (1959 – 2023)

6.2 NOISE

6.2.1 Environmental Management

Noise at Angus Place is managed in accordance with the *Western Region Noise Management Plan (WR-NMP).* WR-NMP Rev5 (Nov 2021) was approved by DPHI, formerly the Department of Planning and Environment (DPE) on 1 June 2022 to satisfy Schedule 3, Condition 22 of MP06_0021 and EPL 467. The WR-NMP has been developed to ensure that potential noise impacts from Angus Place Colliery on the neighbouring community are minimised. The plan aims to identify suitable measures to manage the noise, as well as to establish protocols for responding in case the noise criteria are exceeded and to comply with statutory approval conditions.

Relevant noise producing activities during the Care and Maintenance phase at Angus Place to which the WR-NMP applied during the 2023 reporting period included:

- Maintaining all plant and equipment to manufactures specifications (ongoing).
- Operate mobile plant in a quiet, efficient manner and regular training of operators (ongoing).
- Installation of frequency modulated reversing alarms or '*quakers*' on mobile plant to replace reversing alarms (complete).
- Installing acoustic enclosures around processing plants (ongoing as required to ensure compliance).
- Speed limits on haul routes (complete).
- Switching off vehicles and plant when not in use (ongoing).

Noise monitoring is undertaken at the following locations shown on **Figure 6-2** and described in **Table 6-2** and **Table 6-3**:

- APNM1 (R1) – (EPL Point 20),
- APNM2 (R2) – (EPL Point 21), and
- APNM3 (WR3) – (EPL Point 22).

It is noted that EPL Point 24 (Lidsdale Village R3) is required to be monitored quarterly only when the Angus Place haul road is operating, as per condition L4.1 of EPL467. As the Wallerawang Power Station Haul Road is no longer in operation, R3 was subsequently decommissioned in June 2019 and relocated for long term monitoring in accordance with the WR-NMP, with Wolgan Residence (WR3) replacing the site. WR3 was considered to be a more representative location to monitor potential noise from the pit top and is in accordance with the WR-NMP. Long term trends now capture results from the new location accordingly.

6.2.2 Environmental Performance

Quarterly attended noise compliance assessments were undertaken during the 2023 reporting period at APNM1, APNM2, and APNM3 in accordance with EPL467, MP06_0021 and the WR-NMP as summarised in **Table 6-2** and **Table 6-3**. Noise monitoring results are also included in environmental monitoring reports published monthly on the Angus Place website.

Noise Criteria are specified by MP06_0021 and EPL467 for day, evening, and night-time period for the amenity of neighbouring residences. Centennial Angus Place complied with the project specific noise criteria at all monitoring sites during attended noise monitoring in the reporting period.

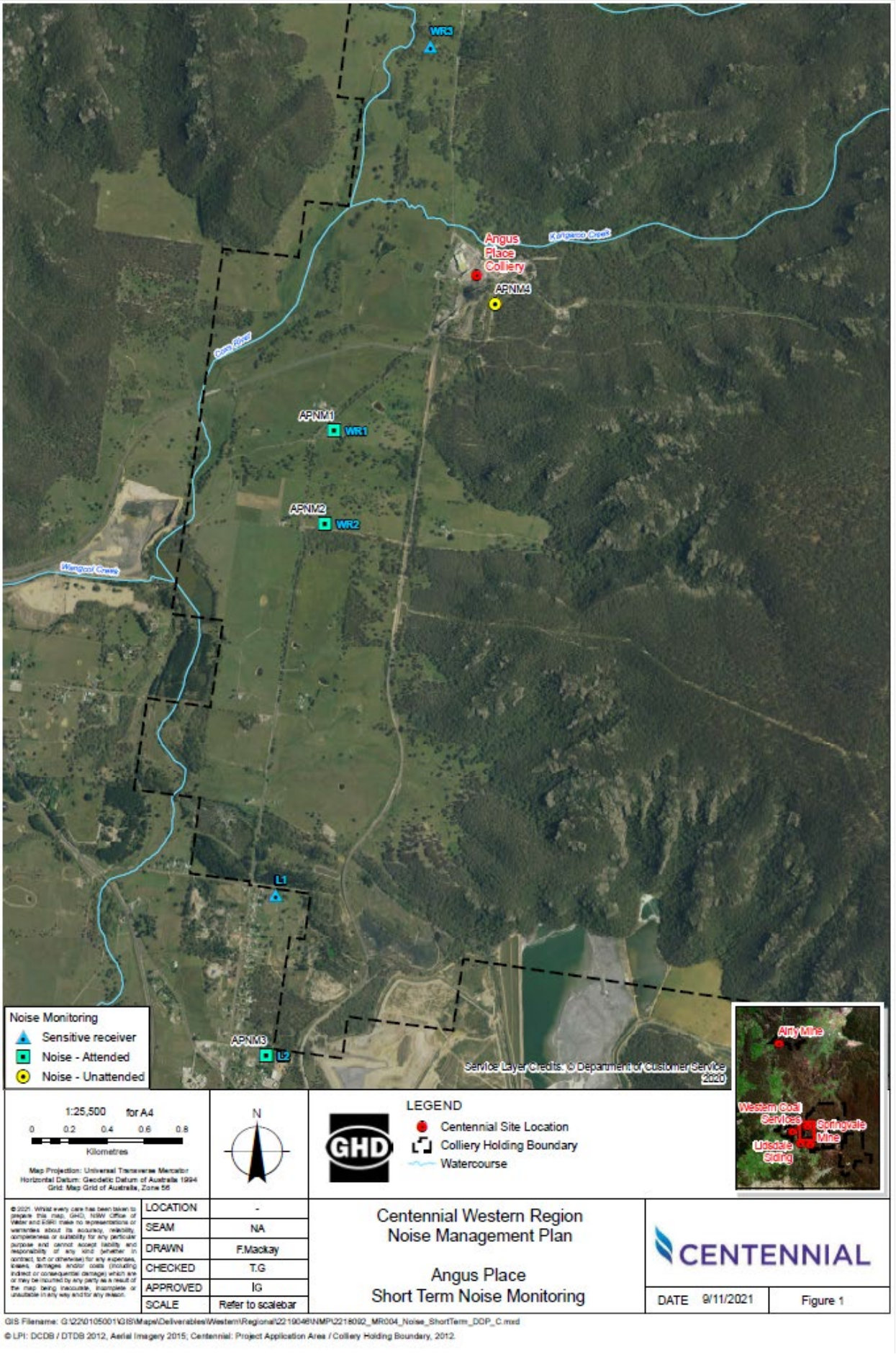


Figure 6-2: Angus Place Colliery Noise Monitoring Locations (WR-NMP Nov 2021)

Table 6-2: Angus Place Noise Criteria and Monitoring Summary

Approved Noise Limit (dBA)[5]				Performance During the Reporting Period	Key Management Implications	Implemented / Proposed Management Actions
Receiver (Monitoring Location)	**Day[6]**	**Evening[7]**	**Night[8]**	Quarterly attended monitoring was undertaken at the 3 required noise monitoring locations (APNM1, APNM2, and APNM3). Operator attended noise measurements were conducted in March, June, September and December 2023. Noise contributions from Angus Place were inaudible or lower than 32dBA for all measurements, i.e., at all monitoring locations and during all time periods, and comply with the Project Approval MP06_0021 and EPL 467 noise criteria.	Noise Management controls at the Angus Place Colliery were effective.	Given the preceding compliance noise monitoring results, additional noise mitigation is not proposed.
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$			
APNM1 (R1) (EPL Point 20)	42	38	36			
APNM2 (R2) (EPL Point 21)	41	37	35			
APNM3 (WR3) – Wolgan Rd (EPL Point 22)	41	37	35			
Lidsdale Village (R3) (EPL Point 24)[9]	44	40	35			

Notes:
[5] The noise criteria in **Table 6.3** are to apply under all meteorological conditions except the following:
a. During wind speeds (at 10 m height) greater than 3 m/s; and
b. Temperature inversion conditions of up to 3ºC/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.
[6] Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays.
[7] Evening is defined as the period from 6pm to 10pm.
[8] Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.
[9] In accordance with EPL 467 Condition L4.1, for Monitoring Point 24, both the noise level and the requirement to measure the noise quarterly only apply when the Angus Place haul road is operating.

Table 6-3: 2023 Quarterly Attended Noise Monitoring Results

Site	Monitoring Period	DAY (dBA)			EVENING (dBA)			NIGHT (dBA)		
		Measured LAeq (15 min)	Criteria LAeq[1] (15 min)	Estimated Site Contribution	Measured LAeq (15 min)	Criteria LAeq[1] (15 min)	Estimated Site Contribution	Measured LAeq (15 min)	Criteria LAeq[1] (15 min)	Estimated Site Contribution
APNM1 (R1)	**Q1**	42	42	Inaudible	36	38	Inaudible	27	36	<25
	Q2	49		Inaudible	48		Inaudible	45		Inaudible
	Q3	56		Inaudible	39		<30	46		<30
	Q4	56		Inaudible	33		Inaudible	41		<30
APNM2 (R2)	**Q1**	42	41	Inaudible	37	37	Inaudible	32	35	Inaudible
	Q2	38		Inaudible	36		Inaudible	41		Inaudible
	Q3	58		Inaudible	50		<30	35		<30
	Q4	41		Inaudible	33		Inaudible	34		<30
APNM3 (WR3) Wolgan Rd	**Q1**	53	41	Inaudible	51	37	<30	32	35	<30
	Q2	58		Inaudible	47		Inaudible	52		Inaudible
	Q3	50		Inaudible	55		Inaudible	37		<32
	Q4	54		Inaudible	32		Inaudible	34		<30

*Notes: 1 As per Condition 17, Schedule 3 of MP06_0021. Noise emission limits identified in the above table do **not** apply in wind speeds of >3 m/s at 10 metres above ground level; or temperature inversion conditions >3°C/100m, and wind speeds of >2 m/s at 10 metres above ground level; or where formalised agreement has been established with a potentially affected landowner.*

6.2.3 Comparison against Predictions

The noise and vibration impact assessment for the *Angus Place Colliery - Modification 6 Project* (GHD, 2020) established project Rating Background Level (RBLs) for Angus Place based on the results of ambient noise monitoring to enable assessment of operational noise emissions in accordance with the *Noise Policy for Industry* (NPfI) (EPA 2017).

An analysis of the results of the operator attended noise monitoring has shown that the Angus Place noise emissions fall below PA/EPL noise limits at all residential monitoring locations during the day, evening and night-time periods. As all attended monitoring locations were noted as inaudible or less than 32 dBA no further analysis of the unattended data has been conducted.

As shown in **Table 6-3** Angus Place Colliery complied with the project specific noise criteria at all monitoring sites during attended noise monitoring in the reporting period and was generally consistent with or below predictions.

6.2.4 Long Terms Analysis

There have been no exceedances recorded in the annual noise compliance assessments for the period of 2015 to 2023 for APNM1 and APNM2.

In June 2019, APNM3 was relocated to Wolgan Road (WR3), this was considered to be a more representative location to monitor noise from the Colliery in the long term as detailed in the WR-NMP. The site has not recorded any exceedances for the period 2019 to 2023, nor at its previous location between 2015-2019.

Table 6-4 shows noise compliance reporting by Angus Place Colliery during the last five reporting periods from 2019 to 2023.

Table 6-4: Long Term Attended Noise Monitoring Trends (recorded exceedances)

Project Approval Location	2019	2020	2021	2022	2023
APNM1 (R1)	0	0	0	0	0
APNM2 (R2)	0	0	0	0	0
(former) APNM3 Lidsdale Village R3	0	0	*NA*	*NA*	*NA*
APNM3 (WR3) *Wolgan Rd*	*NA*	NA	0	0	0

6.2.5 Implemented / Proposed Improvements

Given the preceding compliance of noise monitoring results, additional noise mitigation is not proposed.

6.2.6 Acquisitions and Mitigation Requests

During the 2023 reporting period there were no exceedances of the project criteria and no written requests received for acquisition or noise mitigation measures in accordance with Conditions 18 and 20, Schedule 3 of MP06_0021.

6.3 BLASTING

Blasting did not occur at Angus Place during the 2023 reporting period.

6.4 AIR QUALITY

6.4.1 Environmental Management

Air Quality at Centennial Angus Place is managed and monitored in accordance with the *Western Region Air Quality and Greenhouse Gas Management Plan* (November 2021) (AQGHGMP) which has been developed in accordance with Conditions 14 and 16 in Schedule 3 of MP06_0021, and Condition P1.1 in EPL 467 to ensure that potential air quality impacts from Angus Place Colliery on the neighbouring community are minimised. Additionally, appropriate management measures are identified, and monitoring undertaken to evaluate compliance with relevant approval conditions.

The air quality monitoring network at Angus Place is comprised of three (3) deposition dust gauges (DG3, 5 and 6) and one High Volume Air Sampler (HVAS) for suspended dusts monitoring Total Suspended Particulates (TSP) and PM_{10} (particulate matter less than 10 microns in diameter). Dust Gauge DG3 is a reference site (background monitor). Air quality monitoring locations are illustrated on **Figure 6-3.** Performance measures and monitoring results recorded during 2023 are discussed in **Section 6.4.2.**

6.4.2 Environmental Performance

Table 6-5 shows the air quality impact assessment criteria relevant to the operation as specified in Condition 14 in Schedule 3 of MP06_0021[1].

Table 6-5 Angus Place Air Quality Impact Assessment Criteria

Pollutant	Averaging Period	Criterion[1]
Total Suspended Particulate (TSP)	Annual mean	90 µg/m^3
Particulate Matter < 10µm (PM_{10})	Annual mean	25 µg/m^3
	24 hours maximum	50 µg/m^3
Deposited Dust	Monthly maximum (annual average)	4 g/m^2/month
	Maximum increase (annual average)	2 g/m^2/month

Notes: 1 As per Condition 14, Schedule 3 of MP06_0021. EPL467 requires deposited and suspended dust to be monitored at specified locations but does not prescribe criteria.

During the reporting period, air quality at Angus Place was:

- Compliant with MP06_0021 Conditions 14 and 16, Schedule 3;
- Compliant with EPL 467 Condition P1.1; and
- Managed in accordance with the WR- AQGHG MP.

Monitoring results during 2023 for depositional and suspended dusts are presented in the following sections below.[10]

[10] Detailed monitoring results are described in monthly environmental data reports published on the Angus Place website available at https://www.centennialcoal.com.au/operations/angus-place/.

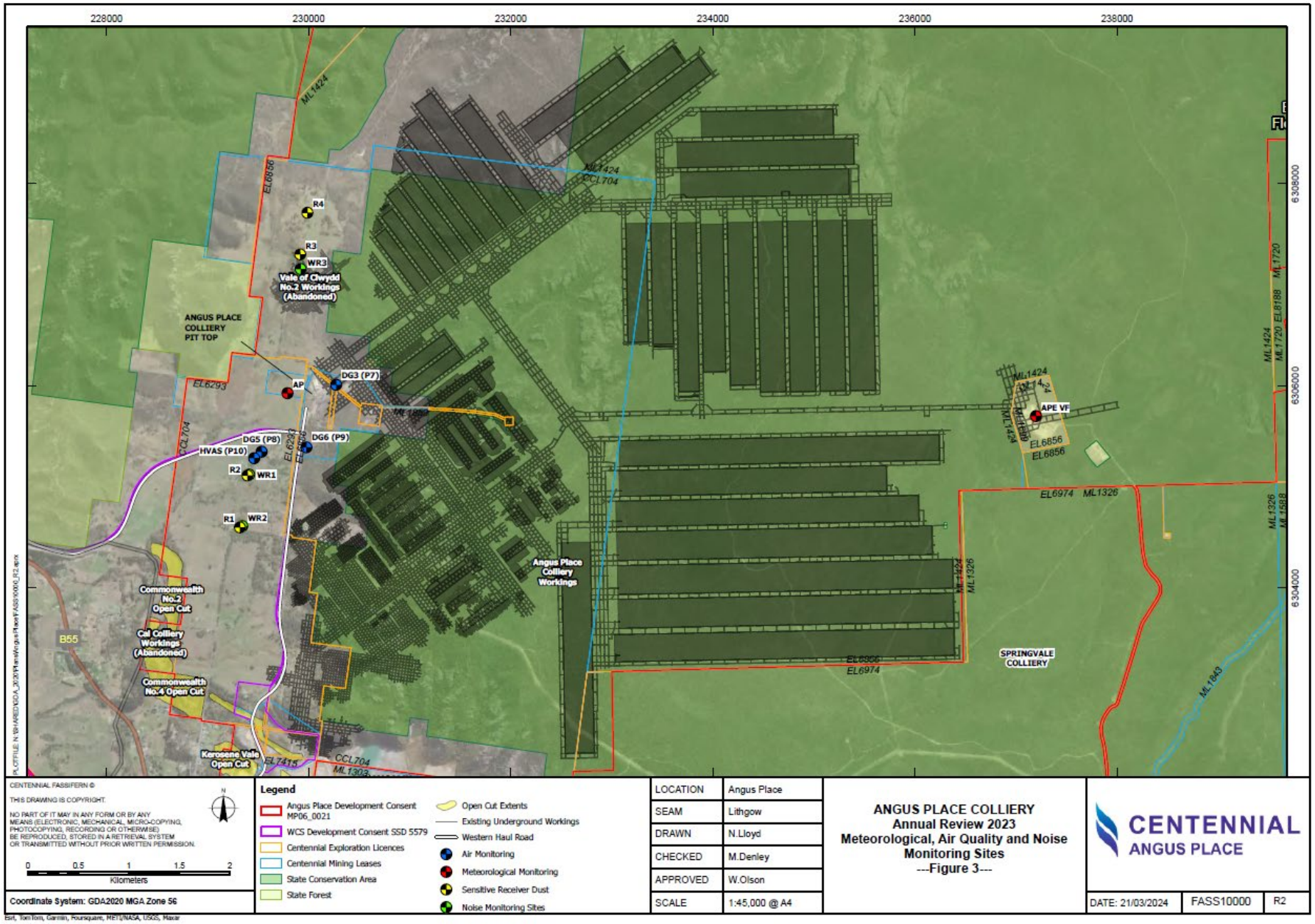


Figure 6-3: Angus Place Colliery Air Quality Monitoring Locations

Dust Deposition

Depositional dust (deposited particulate matter) at three designated sites DG3, DG5 and DG6 was monitored monthly. The annual average particulate monitoring results recorded by all depositional dust gauges were below the development consent limits for the annual averaging period in 2023, as demonstrated in **Table 6-6** and **Figure 6-4** below.

Table 6-6: Summary of Depositional Dust Monitoring Locations

Monitoring Point Reference	Description	Insoluble Solids (g/m²/month)		
		2023 Annual Average	Criteria[1,2] Max Increase in Deposited Dust	Criteria[1] Max Total Deposited Dust (Annual Average)
DG3 (onsite)	Dust Deposition Gauge[3]	0.29	2.00	4.00
DG5	Dust Deposition Gauge[4]	0.31		
DG6	Dust Deposition Gauge[5]	0.51		

Notes: [1] as per Table 5 in Schedule 3, Condition 14 of MP06_0021. [2] criteria is measured against the background dust gauge, which is DG3 under the WR AQGHGMP. [3] Ambient: The monitoring equipment is not at a sensitive receptor location. This monitoring location was selected to provide information regarding dust levels close to sources such as haul roads, ventilation fans or surface operations. [4] Background: The monitoring site is representative of 'background' levels since it is remote from dust generating activities. [5] Compliance: The monitoring site is at a sensitive receptor location and therefore used for compliance purposes.

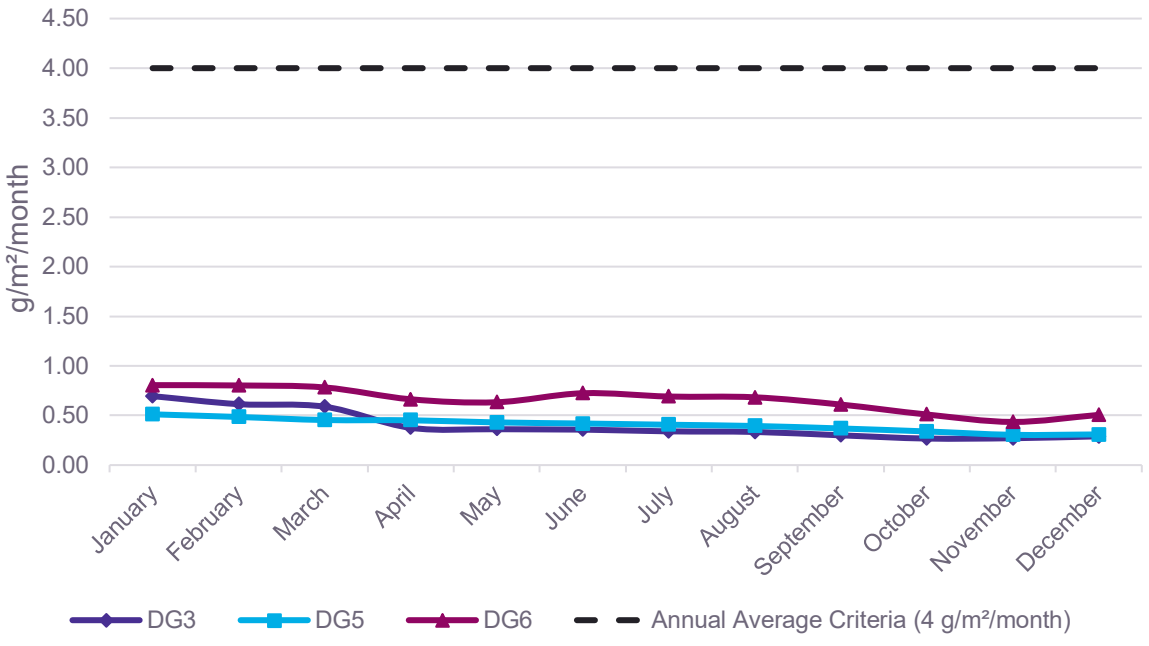


Figure 6-4: Dust Deposition Summary for 2023 (Rolling 12 Month Average)

High Volume Air Samplers

A summary of the recorded results for HVAS is presented in **Table 6-7**. The number of days that exceeded the consent criterion is also shown. Rolling annual average and 24-hour results for HVAS at the Paddock Site (located onsite at Angus Place) are provided for the following:

- PM_{10} (refer **Figure 6-5**)
- TSP (refer **Figure 6-6**)

The results obtained in the reporting period demonstrates compliance with the air quality impact assessment criteria (24hr and annual averages). Note that throughout August and September there were issues with the filter papers in the HVAS resulting no sample.

Table 6-7: Summary of HVAS Monitoring Results

Monitoring Location	Averaging Period	Consent Criteria	Maximum ($\mu g/m^3$)	Mean ($\mu g/m^3$)	Number of days exceeding criterion
HVAS Paddock (PM_{10})	24-hour	50	35.1	N/A	0
	Annual	25	N/A	13.3	0
HVAS Paddock (TSP)	Annual	90	N/A	8.1	0

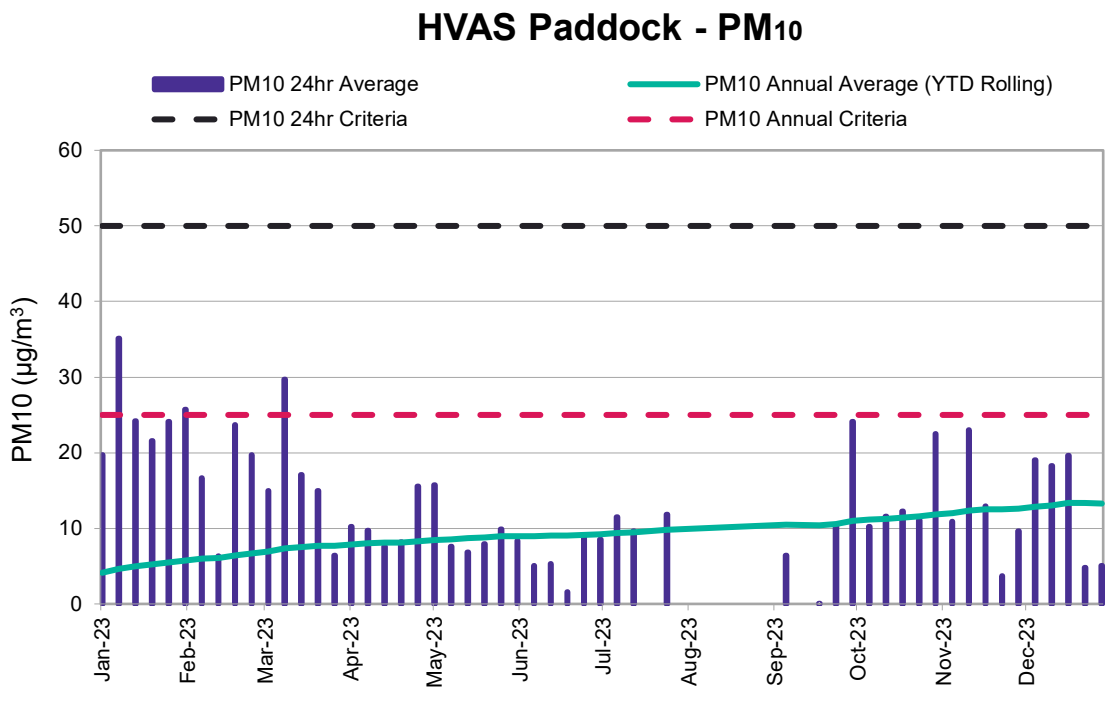


Figure 6-5: Annual HVAS PM_{10} Summary Results at Paddock

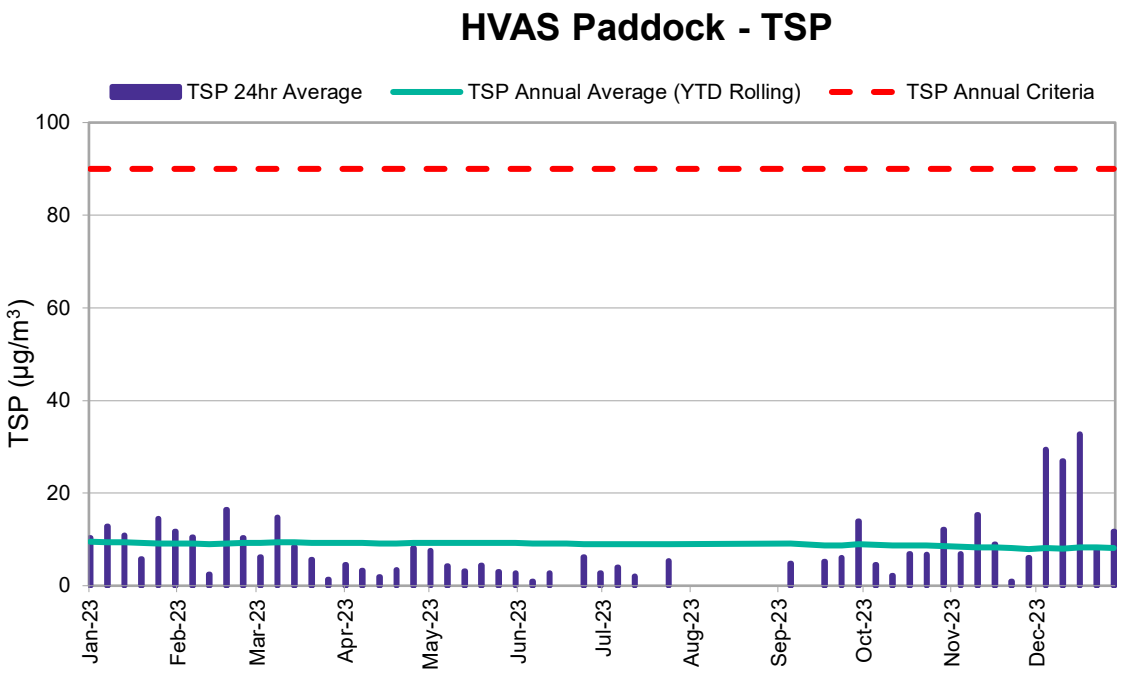


Figure 6-6: Annual HVAS TSP Summary Results at Paddock

6.4.3 Comparisons against Predictions

The air quality impact assessment for MOD2 (SLR 2012) established site-specific ambient air quality levels and modelling predictions for incremental dust increase as shown in **Table 6-8**.

The results of the air quality modelling indicated that predicted concentrations of incremental suspended and depositional dust for particulate matter (TSP, PM_{10}, and dust deposition) were below the applicable impact assessment criteria at all assessment locations.

Air quality monitoring results during 2023 were well below annual criteria and consistent with predicted results.

Table 6-8: Site-Specific Background Air Quality and Predicted Incremental Increases

(Source MOD2 AQIA, SLR 2012)

Receptor	Suspended Dusts						Depositional Dusts (g/m²/month)	
	TSP (µg/m³)[1]		PM_{10} (µg/m³)					
	Annual Avg		Max 24hr Avg		Annual Avg		Annual Avg	
	BG	**INCR**	BG	**INCR**	BG	**INCR**	BG	**INCR**
R1	30.2	**0.1**	65.0	**0.3**	18.3	**<0.1**	1.7	**<0.1**
R2	41.2	**0.1**	68.0	**0.4**	20.9	**<0.1**	2.1	**0.1**
R3	22.3	**0.1**	63.3	**0.4**	16.8	**<0.1**	1.3	**0.1**
R4	20.0	**0.1**	63.3	**0.6**	16.0	**<0.1**	1.2	**0.1**
R5	15.3	**0.1**	63.0	**0.2**	14.1	**<0.1**	1.0	**<0.1**
R6	15.2	**<0.1**	63.00	**0.2**	14.1	**<0.1**	1.0	**<0.1**
Criterion	***90***		***50***		***30***		***4***	

6.4.4 Long Term Analysis

Table 6-9 provides a summary of air quality monitoring results for the previous 5 years from 2019 to 2023, including the annual averages for deposition dust (insoluble solids), PM_{10} and TSP.

All air quality monitoring results are well below annual criteria and consistent with predicted results.

Table 6-9: Long Term Air Quality Monitoring Summary (2019 - 2023)

Monitoring Location	Annual Averages					Development Consent Criteria (Annual Average)
	2019	2020	2021	2022	2023	
Insoluble Solids (g/m²/month)						
DG3 (onsite)	1.26	2.50	2.65	0.70	0.29	4 g/m²/month
DG5	1.05	1.90	0.31	0.43	0.31	
DG6	1.15	1.30	0.29	0.75	0.51	
PM_{10} (µg/m³)						
HVAS Paddock	31.32[1]	8.20[1]	5.50	3.90	13.3	25 µg/m³
TSP (µg/m³)						
HVAS Paddock	49.67[1]	39.52[1]	12.40	9.70	8.1	90 µg/m³

Notes: 1 The severe bushfire that occurred in 2019-20 had a significant impact on the concentration of PM_{10} and TSP in the air throughout 2019 and 2020.

6.4.5 Implemented / Proposed Improvements

No additional dust controls were required during 2023 the care and maintenance site creates little dust generation.. Key dust mitigation measures for Angus Place Colliery during care and maintenance include:

- Signage to display speed limits on all unsealed roads in the surface facilities area; and
- Water sprays (sprinkler system) on the coal stockpile during dry and windy conditions (Note: currently on care and maintenance, therefore no production).

6.5 GREENHOUSE GAS

6.5.1 Environmental Management

Angus Place manages, monitors and reports Greenhouse Gas (GHG) Emissions in accordance with the *Western Region Air Quality and Greenhouse Gas Management Plan (WR-AQGHGMP)*.

Direct GHG emissions (Scope 1) and indirect GHG emissions (Scope 2) from Angus Place continue to be monitored and reported annually in accordance with the Commonwealth Government National Greenhouse and Energy Reporting Scheme (NGERS).

An Energy and Greenhouse Management System is used to monitor and report energy usage. Key Performance Indicators (KPIs) are tracked, which include energy demand and GHG emissions per tonne of ROM coal produced.

6.5.2 Environmental Performance

Table 6-10 reports the Scope 1 Emissions (Direct) and Scope 2 Emissions (Indirect) in tonnes $CO_{2\text{-}e}$ produced for last five (5) reporting periods including the current period and compares these against predictions in related approvals (MP06_0021 as modified).[11]

As noted previously, during the reporting period Angus Place remained in care and maintenance with no active mining operations, which is reflected in both Scope 1 and 2 emissions remaining well below approved predictions. Fugitive emissions (and subsequently total Scope 1 emissions) were significantly reduced on FY21 by 29.6% and have remained around the same level throughout the FY23 (5.5% increase). Overall, total GHG emissions increased by 1.8% in comparison to FY22.

Table 6-10: Total GHG Emissions from Angus Place Colliery

Emission Sources	Estimated Emissions (tonnes $CO_{2\text{-}e}$)					Predicted Emissions[11]
	FY19	FY20	FY21	FY22	FY23	
Scope 1 Emissions (direct emissions)						
Fuel combustion	71	183	27	65	**44**	*2,024*
Oil/grease consumption	4	1	1	0	**0**	*181*
SF_6	1	1	1	1	**1**	*1.8*
Fugitive emissions (CH_4)	681	970	872	539	**643**	*73,940*
Fugitive emissions (CO_2)	5,714	5,386	3,739	2,661	**2,770**	
Total Fugitive:	*6,395*	*6,356*	*4,611*	*3,200*	***3,413***	
Total Scope 1	***6,471***	***6,541***	***4,640***	***3,266***	***3,458***	***76,146***
Scope 2 Emissions (indirect emissions)						
Electricity Consumption	14,799	12,580	10,278	10,354	**10,409**	*50,628*
Total Scope 2	***14,799***	***12,580***	***10,278***	***10,354***	***10,409***	***50,628***
Total Greenhouse Gas Emissions						
Scope 1 and 2 Emissions	***21,1270***	***19,121***	***14,918***	***13,620***	***13,867***	***126,774***

Notes: 1 tonnes $CO_{2\text{-}e}$ per annum as per MP06_0021 (as modified). GHG was varied in MOD2 (SLR, 2012), approved 22 April 2013

[11] Note, data is presented for financial year to align with reporting under the National Greenhouse and Energy Reporting scheme.

6.5.3 Comparison Against Predictions

Table 6-10 summarises GHG emissions predicted for the project, with comparison to actual emissions during the current and previous reporting period. Comparatively, given Angus Place remains in Care and Maintenance, GHG emissions during the current reporting period remained significantly below predictions.

Total Scope 1 (direct) emissions during the 2023 reporting period (3,458 $CO_{2\text{-}e}$) represented a 5.5% increase from the previous reporting period and remains significantly below predictions (<5%). Scope 2 (indirect) emissions generated during the 2023 reporting period also remained significantly lower than the predictions (and similar to FY22).

Fugitive emissions generated during 2023 were also significantly below predictions (<5%).

6.5.4 Long Term Analysis

Table 6-10 presents a summary of GHG emissions reported over the last five (5) financial years, throughout which time Angus Place has been in care and maintenance. Based on the information reported, GHG emissions have been below predictions throughout this five-year period.

6.5.5 Implemented / Proposed Improvements

Angus Place implements measures to minimise GHG emissions to the greatest extent practicable and will continue to implement emission reduction measures in accordance with the *Western Region Air Quality and GHG Management Plan*.

Emissions reduction measures implemented as per the management plan include:

- Cost effective measures to improve energy efficiency;
- Regular maintenance of plant and equipment to minimise fuel consumption; and
- Consideration of energy efficiency in plant and equipment selection.

6.6 BIODIVERSITY

6.6.1 Environmental Management

During the reporting period, management and monitoring of biodiversity (fauna and flora) at Angus Place was undertaken in accordance with the following:

- Angus Place *Fauna and Flora Management Plan (FFMP)* (Rev 1.4, Sep 2014) in accordance with Condition 24 of MP06_0021.
- *Persoonia hindii Monitoring Management Research Program (PhMMRP)* (April 2013), approved by DPHI on 4 October 2013 in accordance with Condition24A of MP06_0021.
- *Longwalls 910 and 900W Temperate Highland Peat Swamps on Sandstone (THPSS) Monitoring and Management Plan (MMP)* prepared in accordance with Conditions 4-8 of EPBC approval 2011/5952 (17 April 2012[12]);

[12] An annual compliance report is submitted to the Commonwealth by 17 April each year in accordance with Condition 8 of EPBC2011/5952. The results of the report submitted during each Annual Review reporting period is presented in **Section 6.6.2**.

- Component management plans and monitoring programs of the *LW 900W and 910 Integrated SMP and Extraction Plan* approved under Condition 3C of MP06_0021;
- Component management plans and monitoring programs of *Subsidence Management Plans* approved under Mining Lease conditions prior to 31 March 2012 (as per Condition 3C of MP06_0021), including:
    - *LW930-980 SMP* (2005)
- *Upper Coxs River Action and Monitoring Program* (UCRAMP) (Rev2, March 2020), an integrated catchment-wide program with adjacent Centennial mines;
- *Western Region Biodiversity Management Plan* (WR-BMP), Rev6 July 2023[13]; prepared to address biodiversity consent conditions (including Condition 24 of MP06_0021)[14]; and
- *Western Region Biodiversity Offsets Strategy* (WR-BOS), Rev8 Feb 2019 as approved by DPHI Jan 2021, satisfying condition 24B of MP06_0021.

Management and monitoring of biodiversity associated with *revegetation* in disturbed areas using endemic species (including targeted programs for *Persoonia hindii*) is also discussed in **Section 8** of this Annual Review.

6.6.2 Environmental Performance

This section presents the performance measures and criteria applicable to, and results of, biodiversity monitoring undertaken during the 2023 reporting period. Preliminary discussion to provide broader context is provided immediately below.

Context to biodiversity impacts resulting from the 2019-2020 bushfires:

During the summer of 2019-2020 the Gospers Mountain mega blaze extensively impacted the surface environment within and significantly beyond the mining lease at Angus Place. Independent consultants, RPS report that the fires at East Wolgan Swamp and Kangaroo Creek Swamp were so severe they consumed most of the *peat layer* that helps sustain swamp moisture levels. This resulted in significant impacts to biodiversity (flora and fauna) that is expected to take a number of years (and in cases decades) to recover. Accordingly, monitoring programs include consideration and discussion in this context as appropriate.

Context to approved offsets for surface disturbance (APE Vent Facility):

Native vegetation disturbance to construct the APE Vent Facility at Angus Place has been offset under the approved strategies in accordance with the requirements of MP06_0021 as detailed in **Section 6.6.6**. Monitoring and research associated with specific threatened species (*Persoonia hindii*) under supplementary offset measures of the approved WR-BOS has been completed meeting offset objectives as discussed in **Section 6.6.2.3**.

[13] As with other management plans, the WR-BMP is periodically revised and updated in accordance with Condition 4, Schedule 5 of MP06_0021 and following other triggers for review by participating mines of the WR-BMP. Following submission of earlier versions, the WR-BMP has not yet been approved by DPHI. Rev 6 of the WR-BMP was submitted to the Biodiversity, Conservation and Science Directorate (BCS) of DPHI in February 2023. The WR-BMP was submitted to the DPHI for approval in 18 July 2023.

[14] It is noted that the WR-BMP, once approved, will supersede the Flora and Fauna Management Plan.

6.6.3 Performance Measures

Performance measures for Angus Place mine in relation to biodiversity are prescribed by the following:

- Conditions of approval for MP06_0021 (notably Schedule 3, Condition 3)
- Conditions of approval for EPBC 2011/5952 and LW910 & 900W THPSS MMP.
- Approved predicted impacts described within environmental assessments for MP06_0021 and associated modifications, as per Schedule 2, Condition 2(a) of MP06_0021.
- Angus Place FFMP (2014).
- Conditions of approval, predicted impacts, management and monitoring for Extraction Plans (EP) and supporting component plans approved under Condition MP06_0021, including:
    - *LW900W & 910 Integrated SMP and Extraction Plan*
    - *Angus Place FFMP (2014, as per earlier above)*
    - *LW900W and 910 Environmental Monitoring Program*
    - *LW900W and 910 Subsidence Monitoring and Reporting Program*
- Conditions of approval, predicted impacts, management and monitoring for *Subsidence Management Plans* and associated component plans, including:
    - *LW930-980 SMP* (SMP Approval 04/1675)

Longwall 900W completed extraction in 2015. No further secondary extraction has occurred to date. Longwall 910 has not been mined and the approval for extraction has lapsed.

During 2023, Angus Place was compliant with all approved Performance Measures. Monitoring results for 2023 for key aspects are provided in the following sections.

6.6.4 Flora Monitoring and Management

During the reporting period, the following performance management and monitoring recommendations discussed in Environmental Assessments for the project (as modified) were implemented:

- No clearing was undertaken;
- Appropriate measures were implemented to minimise erosion and sedimentation impacts upon waterways and associated vegetation. Regular monitoring was undertaken to ensure their functionality and condition;
- A weed spraying program was implemented to control invasive weeds and to appropriately manage weeds, ensuring surrounding communities are protected from invasive species;
- Aquatic ecology monitoring was undertaken;
- Established flora (including THPSS) and fauna monitoring sites were surveyed in summer, autumn, and spring.
- Aerial photography was flown for RGB NIR Imagery during summer, autumn, winter and spring.

- Flora monitoring and research was conducted for *Persoonia hindii* (refer **Section 6.6.6** below); and
- Ongoing monitoring for weed presence at the Ventilation Facility continued to be undertaken.

A summary of 2023 flora monitoring is provided in **Table 6-11**. Compliance with biodiversity performance measures in 2023 is provided in **Table 6-1** (at the start of **Section 6**).

Table 6-11: Flora Seasonal Monitoring Results (2023)

Season	Summary of Flora Monitoring Results and Conclusions
Summer 2022/2023	• Summer 2022-2023 monitoring period recorded lower native vegetation and weed species in impact swamps compared to that observed in spring 2022.This highlights that species richness generally decreases within impact swamps between the spring and summer seasons. There was a slight increase in diagnostic species from 6.6 during spring 2022 to 6.7 during the summer 2022-2023 monitoring. The control swamps had increases in both mean native species richness and weed species richness when compared to the spring 2022 monitoring. Conversely there was a decrease in diagnostic species from 12.3 in spring 2022 to 11.0 in summer 2022-2023. A major part of these differing fluctuations is related to the reduction in control swamp monitoring plots as the Twin Gully sites were inaccessible for the summer 2022-2023 season. Despite this, control swamps in both seasons contained more diagnostic species than impact swamps. This is likely due to the presence of water observed within control plots. The variability in flora species richness between monitoring years may be partly due seasonal influences, especially in a post fire environment. • There has been a decrease in Eucalyptus species cover observed across nine impact swamps and one control swamp. Whilst only six of the 16 plots showed an increase in Eucalyptus species cover, such increases were substantial. This is especially true for East Wolgan plot EW01, which increased from 20% in spring 2022 to 59.5% in summer 2022-2023. • Trigger exceedance values for a reduction in swamp planar area was detected in one impact swamp (Kangaroo Creek Hanging). For the remaining swamps, swamp planar areas were higher than trigger values, indicating swamp recovery since the fires of 2019/20. • Results obtained from the Ground Control Point (GCP) survey performed in the summer 2022/23 monitoring event showed that no impact swamp showed an average live green cover below baseline threshold, however average live green cover was below the lower baseline threshold in all control hanging and control shrub swamps apart from Twin Gully Hanging. In general, live green cover within GCPs is higher in impact shrub swamps when compared to control shrub swamps, and higher in impact hanging swamps, when compared to control hanging swamp. Higher than average rainfall across much of 2022 has likely assisted with the regeneration of vegetation post fire. • Signs of erosion have been documented in Kangaroo Creek, however this is likely due to steep aspect and loss of vegetation after the Gospers Mountain Fires. • Average exotic vegetation cover has increased above the baseline threshold in two impact shrub swamps (Narrow Swamp and Kangaroo Creek Lower). It is notable that the average percentage exotic cover across Narrow Swamp for this monitoring season was determined to be 8% and has increased considerably in comparison to the baseline lower threshold of 1%. Weed species richness within control swamps increased from 1.8 species to 3 in summer 2022-2023. It is likely that the increase in the control swamp is impacted by the reduced number of control swamp plots recorded during the monitoring season. The resulting disturbance from the Gospers Mountain fire continues to influence the potential for invasive species to extend their range.

Season	Summary of Flora Monitoring Results and Conclusions
Autumn 2023	• The autumn 2023 monitoring period recorded higher native vegetation and weed species in impact swamps compared to that observed in summer 2022-2023. This highlights that species richness generally increases within impact swamps between the summer and autumn seasons. • Trigger exceedance values for a reduction in swamp planar area were detected in one impact swamp (Kangaroo Creek Hanging). For the remaining swamps, swamp planar areas were higher than trigger values, indicating swamp recovery since the fires of 2019/20. • There was an increase in diagnostic species from 6.7 during summer 2022-2023 to 7.6 during the autumn 2023 monitoring. The control swamps had decreases in both mean native species richness and weed species richness when compared to the summer 2022-2023 monitoring. Conversely there was a marginal increase in diagnostic species from 11 in summer 2022-2023 to 11.5 in autumn 2023. Control swamps in both seasons contained more diagnostic species than impact swamps. This is likely due to the presence of water observed within control plots. The variability in flora species richness between monitoring seasons may be partly due seasonal climate influences, especially in a post fire environment. • The cover of Eucalyptus species is substantially higher in impact swamps compared to control swamps, and the rate at which the Eucalypt cover is increasing is much higher in impact swamps when compared to control swamps. This is especially true for West Wolgan (an impact swamp), of which five of six plots recorded an increase in cover, outlining the spatial distribution of eucalypt recruitment across the broader swamp since summer 2022-2023. • Results obtained from the autumn GCP survey determined that one impact swamp (Narrow Swamp Hanging) and all control swamps (except Tristar Hanging) showed an average live green cover below baseline threshold. Live green cover in impact Narrow Swamp has also remained notably high, however this may be partially due to exotic cover in this swamp, and spring transect monitoring will determine if vegetation is consistent with species typically representing swamp conditions. • Overall, swamps continue to recover from the Gospers Mountain fire and are trending towards pre-fire mean live vegetation cover, however below average rainfall in the five months prior to monitoring is likely affecting vegetation growth. • Average exotic vegetation cover continues to be above the baseline threshold in impact swamps Kangaroo Creek Lower and Narrow Swamp. This metric has been exceeded for the second consecutive season for Kangaroo Creek Lower and has been continuously exceeded in Narrow Swamp each season since autumn 2020. Weed species richness within control swamps decreased from 3 species to 0.5 in autumn 2023. The resulting disturbance from the Gospers Mountain fire continues to influence the potential for invasive species to extend their range, especially in impact swamps that lack moisture and are thus less resilient and have more bare ground available for recruitment.

Season	Summary of Flora Monitoring Results and Conclusions
Spring 2023	• The spring 2023 monitoring showed variable biodiversity indicator results compared to that observed in autumn 2023. An overall increase in native species richness was observed within impact swamps, and an overall decrease in native species richness was observed in control swamps between autumn and spring 2023 monitoring events. • A decrease in flora species richness between monitoring years may be partly due to seasonal and/or climatological influences, especially in a post fire environment. Importantly, impact swamps consistently had greater native species richness than control swamps in both monitoring seasons. This is to be expected as dry sclerophyll and swamp flora species integrate within impact swamps, potentially linked to the observed dry conditions (i.e., low moisture levels). • Diagnostic species richness decreased within control and impact swamps between autumn and spring 2023 monitoring events, with control swamps displaying a lower species richness than impact swamps during spring 2023. Despite lower diagnostic species richness in control swamps, when comparing health condition of diagnostic species that co-occur across swamp treatments, lower condition scores were observed in impact swamps. • An increase in Eucalyptus species cover continues to be observed across only impact swamps. This increase in Eucalyptus species cover is potentially linked to drier conditions (i.e., low moisture levels) which can reduce their ecological resilience and increase wildfire vulnerability. • Weed species richness slightly decreased in impact swamps and increased in control plots between autumn and spring 2023 monitoring events. • Both impact and control swamps are still recovering from the summer 2019/20 fires, however, are nearing pre-fire live green cover. This is evident by overall mean live vegetation cover trending towards pre fire levels, with some impact swamps (Narrow, Narrow Hanging and Lambs) exceeding pre-fire mean live vegetation cover. • Analysis of cross swamp transects show that control swamps are recovering at a faster rate than impact swamps, evidenced by overall decreases in non-vegetated cover within control swamps, whilst within impact swamps, increases or maintenance of non-vegetated cover since 2022 was observed. Live vegetation cover trends observed within GCPs indicate that average live green cover within control shrub and hanging swamps surpass impact swamps.

6.6.5 Fauna Monitoring and Management

During the reporting period, seasonal fauna monitoring was undertaken by specialist consultants in the 900 area on the Newnes Plateau including the 900W and 910 longwall areas. Reference sites are located on the mining lease in the north-east of any approved and extracted workings.

Monitoring of bird species richness in the Angus Place Combined Area has declined over time and on average eight fewer species were recorded in 2023 compared to 2017. Dry conditions between 2017 and 2019 followed by a fire in 2020 are likely to have contributed to declining bird richness. Conversely, mean bird Simpson's Diversity has remained stable over time. Native mammal species richness and Simpson's Diversity both declined this year, although both remain in the expected range on the 2017-2023 period results. Reptile species richness has shown a slight decline over the period (a difference of one species), while amphibian species richness remains low, comparable to previous years. Reptile and amphibian Simpson's Diversity are lower and have shown more variability over time compared to birds and mammals. This likely reflects the influence of weather conditions on the detection of these fauna groups (i.e. colder periods yield fewer reptiles, drier periods result in less frogs). Reptile Evenness, Simpson's and species richness were all significantly higher at swamp sites compared to forest sites. It should be noted that bat activity is still within the normal level of variation, suggesting the invertebrate food source that this group relies on are also returning to the landscape.

The numbers of small mammals trapped has fluctuated over time. Higher trapping rates in 2012-13 and 2022-23 have primarily been driven by high Bush Rat (Rattus fuscipes), and in recent years Agile Antechinus (Antechinus agilis) captures. It is unsurprising that captures declined after the Summer 2019/20 bushfire. Capture rates of exotic rodents increased one to two years post-fire in 2021-22 but have since declined. Recovery of trapping rates has been very quick post fire, with trapping rates reaching pre fire levels in autumn 2021, just over a year after the Gospers Mountain fire. As is often the case with fire, once the vegetation and associated food source is wiped out, there is a delay in seeing the return of species to the landscape. There were sufficient numbers and diversities of these fauna groups to be able to calculate a set of diversity indices that form part of the monitoring database. Above average rainfall in the years post-fire, appear to have helped the regeneration process on Newnes Plateau.

Thirteen threatened species were located during the 2023 Angus Place Combined Area surveys, which has been quite typical for the area since 2017. These were Spotted-tailed Quoll, Eastern Pygmy-possum, Southern Greater Glider, Yellow-bellied Sheathtail-bat, Large-eared Pied Bat, Eastern False Pipistrelle, Large Bent-winged Bat, Gang-gang Cockatoo, Pilotbird, Varied Sittella, Scarlet Robin, Flame Robin and Blue Mountains Water skink. This is the first record of the Spotted-tailed Quoll in the Angus Place Combined Area since surveys begun in 2004. Despite searching preferred habitats during the warmer months, there was no evidence of Giant Dragonfly, Giant Burrowing Frog or Bathurst Copper Butterfly in the area. The proportion of declining bird species has been low since 2017 but did increase this year. The proportion of woodland-dependent species in the Angus Place Combined Area has sat around 60-67% since 2017.

There are few differences between habitat characteristics in mined and non-mined areas. Low shrub cover was significantly lower at impact sites compared to control sites in both autumn and spring. Spring cutting grass cover was also significantly lower at impact sites. Habitat Complexity Scores (HCS) however did not differ by undermining status. It is difficult to analyse

the habitat information presented in this report with traditional statistical analyses. This data represents habitat metrics summarised from ground trap placements, which is not necessarily representative of the broader vegetation of the site. For this reason, metrics can be swayed by movements of trap lines, which were required after the fire cleared out shelter for traps in 2019-2020. Mean HCS for the combined area were actually the highest on record in spring 2023.

Frog abundance was significantly lower at impact (undermined) sites compared to control sites when data was analysed on the post-fire recovery period (2020-23; Pooled t-test). This may be due to the availability of free water. Conversely bird Simpson's, abundance and species richness were all significantly higher at impact sites compared to control sites in the post fire landscape. Analyses (Two-way Repeated Measures ANOVA of biodiversity indices from 2017 – 2023) did not detect any significant differences due to undermining status. There were however a number of significant differences attributed to time (year), suggesting the magnitude of change in fauna diversities is more dependent on climatic conditions or fire events than undermining.

Statistical analyses over the recent period suggest any changes are not due to mining activities. Differences can normally be attributed to changes in the climate or survey effort. In this area, some differences are attributed to different habitats sampled, and potentially differing impacts from fire. The survey methodology and effort has not changed since 2014, but there have been periods of low rainfall in the lead up to the extensive fire over summer 2019/2020, followed by flooding rains in 2021 and 2022. There appears to be no evidence of potential impacts from subsidence upon the fauna diversity in the Angus Place Colliery Combined SMP, 900 and NE Area.

6.6.6 Persoonia hindii Research Project

Persoonia hindii (*P.hindii*) is listed as Endangered under the *Biodiversity Conservation Act 2016* (BC Act). Schedule 3, Condition 24A (e) and (h) of MP06_0021 for the Angus Place East (APE) ventilation shaft facility required a P. hindii research and monitoring program to be developed. The research program involved assessing three translocation methodologies and comparison with control sites. Following the translocation of 61 individual plants, surveys were carried out over seven years to determine the survival rates. **Table 6-12** presents the live plants identified and the survival rates over the period of 2013 to 2020. An offset for *P.hindii* was to be determined following the outcomes of the translocation research.

In September 2016, Australian Coal Administration Research Program (ACARP) agreed to provide strategic funding to the Royal Botanical Garden and Domain Trust (RBG&DT) to include high interest native Persoonia species of concern into mine site restoration programs through propagation, translocation and field re-introduction programs. The program for several Persoonia species of concern includes aims to identify best practice for germinating and propagating P.hindii for the purpose of translocations back into the environment.

The WR-BOS proposed that suitable habitat not currently containing *P. hindii* would be used by the RBG&DT relocation program for propagated *P. hindii* to be returned back onto Newnes Plateau. The ACARP program was completed in June 2023 with a final report to be produced and to provide advice and support for including *P. hindii* into rehabilitation programs.

Angus Place offset liability is linked to the successful outcomes achieved from the ACARP project and surviving individual plants. **Table 6-12** includes information about individual planted and survival up to May 2022.

The Angus Place 2023 *P.hindii* Identification report indicated that it is clear that *P.hindii* is showing substantial signs of recovery within the Project Area since the cessation of the monitoring program in 2020.

As evidenced by an offset ratio of 12.8:1, the Project has shown that Centennial Angus Place has achieved the aim of the biodiversity offset strategy.

In comparison to historical data captured between 2016 and 2020 within the *P.hindii* monitoring program, the number of individuals was higher than two out of five previous monitoring years, and equal with the 2017 results. Additionally, the number of individuals has increased to pre-fire levels, indicating recovery from the Gospers Mountain fire in early 2020. Although it is unclear what the individual count would have been between 2020 and 2023, results from this survey indicate that count of individuals has gradually been increasing back to pre-fire numbers.

The majority of individuals were located along Sunnyside Ridge Road (Electrical Supply Area [ESA] 1, 2 and 3). This is an expected result as this is where *P.hindii* were translocated in 2016. Their presence in six out of seven ESAs indicates that the population is healthy and spreading across the Project Area. **Figure 6-7** shows the regenerative health of the *P.hindii* with some individuals up to three metres in diameter.

Figure 6-7: Healthy P. Hindii individual approximately 3m in diameter

Table 6-12: Summary of *Persoonia hindii* translocation research outcomes

	2013	2014	2015	2016	2017	2018	2019	2020*	2021	2022	2023	Total to date
Plants impacted	60											**60**
Plants found alive during survey		3		10	8	8	10	4				
Translocation survival (%)		5.3		16.7	15.6	13	17	7				
	ACARP RBG&DT Project											
Translocations							280		80	81		**441**
Plants found alive during survey										187^	667#	**667**

*Notes: * Research assessment area impacts by Gospers Mountain mega blaze. ^ As of May 2022. # As of October 2023.*

6.6.7 Aquatic Ecology

Monitoring of aquatic ecology is undertaken in accordance with Section 4.7.2 of the Angus Place Water Management Plan and the 900W 910 Environmental Monitoring Program. Also, as part of the Upper Coxs River Catchment (*UCRC) Aquatic Ecology Monitoring Program* (AEMP) and the UCRAMP.

Aquatic Ecology monitoring outlined in the FFMP (2014)[15] has been deferred in favour of that outlined in the Angus Place Water Management Plan (2021). Sites on the Newnes Plateau are outside of areas of Angus Place mining influence.

Aquatic ecology monitoring was conducted in waterways associated with Angus Place to determine whether operations have influenced the health of aquatic biota in 2023. Macroinvertebrate samples were collected by GHD in autumn 2023 (11/05/2023-17/05/2023) and spring 2023 (26/10/2023-01/11/2023) at the sites. Water and sediment quality were tested in conjunction with macroinvertebrate monitoring.

A summary of 2023 monitoring results at focus sites, Kangaroo Creek and Coxs River LDP2 are provided below. Monitoring locations are shown on **Figure 6-14:**

- At Kangaroo Creek sites in autumn 2023, taxa richness (i.e. diversity) was slightly higher (one additional taxon) at historical impact site KCdn than at background site KC1 (**Figure 6-8**), while in spring 2023, taxa richness was slightly lower at KCdn than the KCdn. All Kangaroo Creek taxa richness results were well above the long term KC1 median, despite the drying conditions. Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) (EPT) richness results in autumn 2023 were higher at background site KC1 (five EPT taxa in each sample) than at historical impact site KCdn (four EPT taxa in each sample) (**Figure 6-9**). EPT richness results at both Kangaroo Creek sites in autumn 2023 were above the long-term KC1 median. In spring 2023, EPT richness results at KCdn were lower than in autumn 2023 (and the long-term KC1 median), with only two EPT taxa collected in each sample. Plecoptera (stoneflies) were collected in all samples from autumn 2023 but were not observed in spring 2023. SIGNAL-2 results in autumn 2023 were higher at background site KC1 than historical impact site KCdn (**Figure 6-10**). The spring 2023 SIGNAL-2 result at KCdn was slightly lower than that at KCdn in autumn 2023. The SIGNAL-2 scores of all Kangaroo Creek macroinvertebrate samples in 2023 were above the long-term KC1 median.
- The lower cumulative rainfall in 2023 (compared to the above-average rainfall period of 2020 to 2022) led to lower water levels at Kangaroo Creek sites (and reduced flow at KCdn) in spring 2023. As discharges into Kangaroo Creek were occurring during the drought period of 2017 to 2019 (through Angus Place LDP1, ceasing in December 2019), this meant that the water level observed at KCdn in spring 2023 was the lowest observed at the site compared to all historical events. These conditions reduced the quantity, variety, and accessibility of aquatic habitat, as the water level had dropped below that of much of the channel's trailing vegetation. This is likely to be the primary factor influencing the macroinvertebrate community condition at KCdn in spring 2023, including the absence of Plecoptera which prefer flowing water. Water quality in Kangaroo Creek in 2023 (in the absence of any Mine associated water discharges) was generally good, with few toxicants observed in concentrations that are likely to have biological effects on aquatic species. Dissolved

[15] It is noted that the FFMP will be superseded by the WR-BMP once approved. The aquatic ecology monitoring requirements outlined in the WMP are more relevant to current operations than the monitoring outlined in the FFMP.

cobalt was elevated in Kangaroo Creek in 2023, exceeding the 2018 Australian and New Zealand Guidelines (ANZG) Default Guideline Values (DVG) at KC1 in both seasons, and at KCdn in spring 2023. In both autumn and spring 2023, dissolved cobalt concentrations were higher at the background site than at historical impact site KCdn. As such, the presence of elevated dissolved cobalt in Kangaroo Creek is not attributable to Angus Place operations or historical discharges. Dissolved zinc was also elevated in Kangaroo Creek in 2023, exceeding the DGV at historical impact site KCdn in autumn 2023, and at both KC1 and KCdn in spring 2023. The dissolved zinc concentration at KC1 in autumn 2023 was equal to the DGV. The dissolved zinc concentration was higher at historical impact site KCdn than background site KC1 in both autumn and spring 2023. During recent historical sampling (spring 2020 to spring 2022), dissolved zinc concentrations had been consistently higher at background site KC1 than at historical impact site KCdn, suggesting that zinc is naturally elevated within the Kangaroo Creek catchment. As such, much of the aqueous zinc observed at KCdn in 2023 is likely to be sourced from the lithology of the catchment, although, contributions from Angus Place operations (e.g. runoff from the Angus Place pit top) cannot be ruled out, given the higher aqueous concentrations observed at the downstream site in 2023.These elevated dissolved metals concentrations may have impacted the macroinvertebrate community at both KC1 and KCdn in 2023, as the DGV represents the concentration above which there is an increased risk of adverse impacts to aquatic species (ANZG 2018).

- Most macroinvertebrate metric results at both sites were higher than the long-term medians, indicating that the macroinvertebrate community was generally in good condition in 2023 compared to some historical events from the background site. There were no exceedances of any sediment quality DGV (ANZG 2019) at background site KC1 or historical impact site KCdn during the autumn or spring 2023 aquatic ecology monitoring events, though the acid-extractable zinc concentration at KCdn in spring 2023 was much higher than all other Kangaroo Creek sediment zinc concentrations in 2023. In autumn 2023, the macroinvertebrate community health in the Coxs River at CR2, downstream of Angus Place LDP2 discharges and the Kangaroo Creek confluence, was in similar condition to background site CR1, and better condition than background site CR0, based on the macroinvertebrate metrics (**Figure 6-11** to **Figure 6-13**). All macroinvertebrate metrics results at impact site CR2 in autumn 2023 were above the long-term CR0/CR1 median. In spring 2023, however, macroinvertebrate community health declined at CR2. Results for all metrics well below those observed at CR2 in autumn 2023, and taxa richness and EPT richness results lower than those at background site CR1 and the long-term CR0/CR1 median. Water and sediment quality at CR2 were generally good in autumn and spring 2023, with only one exceedance of a toxicant DGV observed (dissolved aluminum in spring 2023).
- In spring 2023, the water level at CR2 was observed to be much lower than in recent sampling events (including autumn 2023), which had caused dieback in much of the macrophyte (Typha sp.) at the site. Therefore, this important macroinvertebrate habitat was not able to be sampled (see **Figure 6-8** for photo of CR2 in spring 2023). Cattle were observed entering and crossing through the river at two points within the reach in spring 2023. The cattle had caused extensive degradation to the site which contributed to very high turbidity, erosion of the banks, and trampling of some instream habitats (Plate 1). This, and the reduced water levels have likely contributed most to the decline observed in the macroinvertebrate community condition at CR2 between sampling events in 2023, rather than any influence due to discharges from Angus Place.

Overall, the results of 2023 aquatic ecology monitoring indicate that the macroinvertebrate community of Kangaroo Creek (and the decommissioned LDP1) and the Coxs River downstream of LDP2 experienced some decline in spring 2023 compared to autumn 2023 and recent historical results from 2021 and 2022 (GHD 2023, 2022). This decline is likely to be the result of the drier conditions in the study area prior to sampling in spring 2023, resulting in reduced flows and water levels, and poorer quality aquatic habitats.

Figure 6-8: Photo of CR2 in spring 2023 depicting lower water levels, high turbidity, dead macrophytes and pugging from cattle

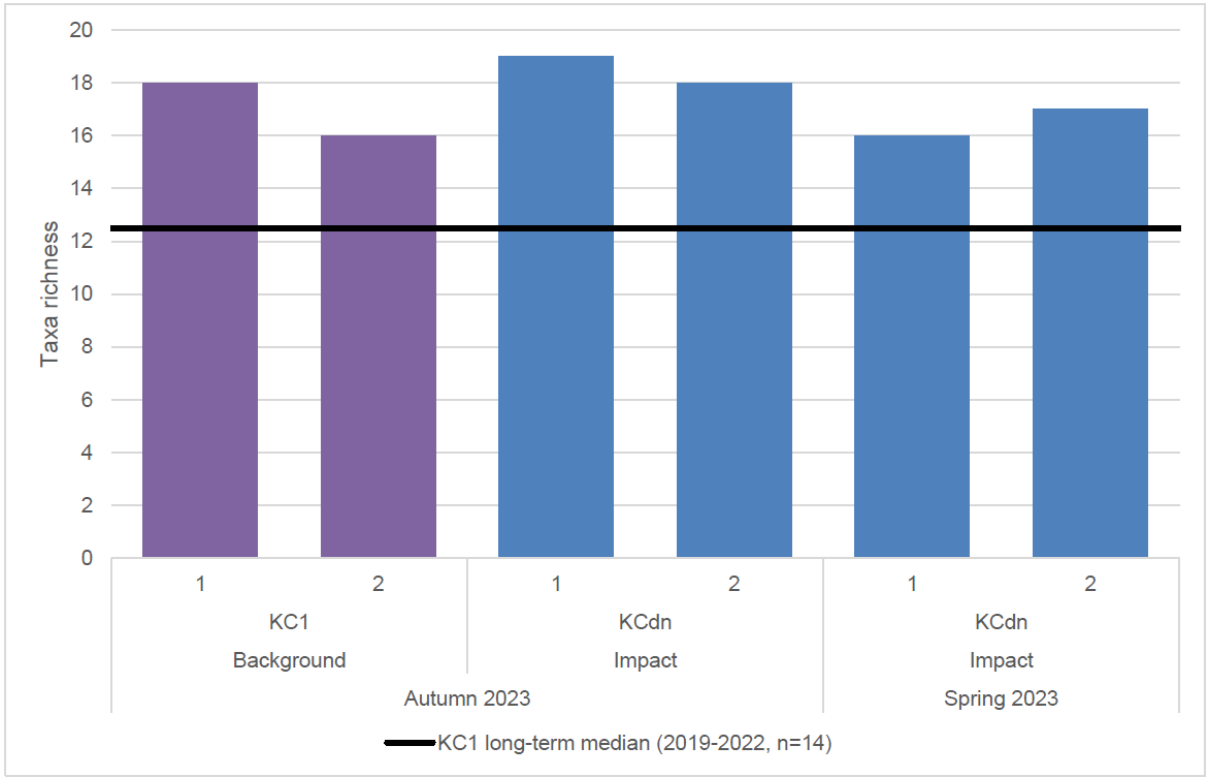


Figure 6-8: Tax richness in Kangaroo Creek samples (2023)

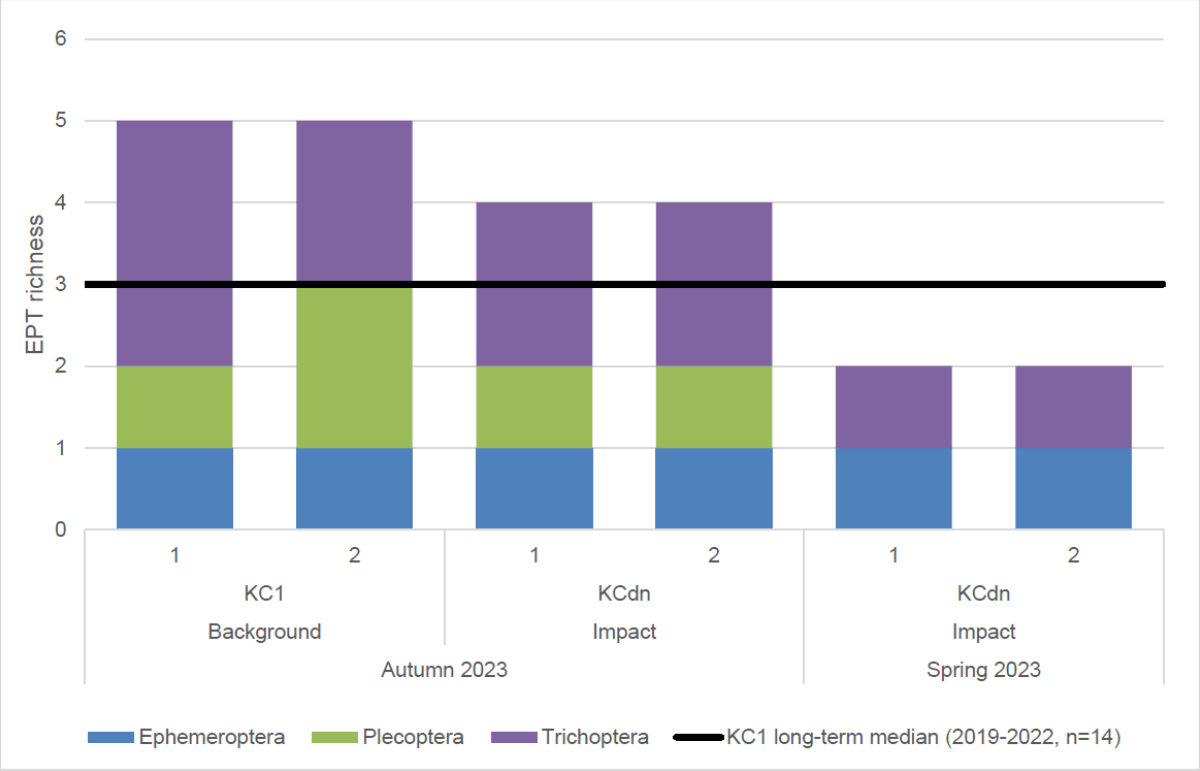


Figure 6-9: EPT richness in Kangaroo Creek samples (2023)

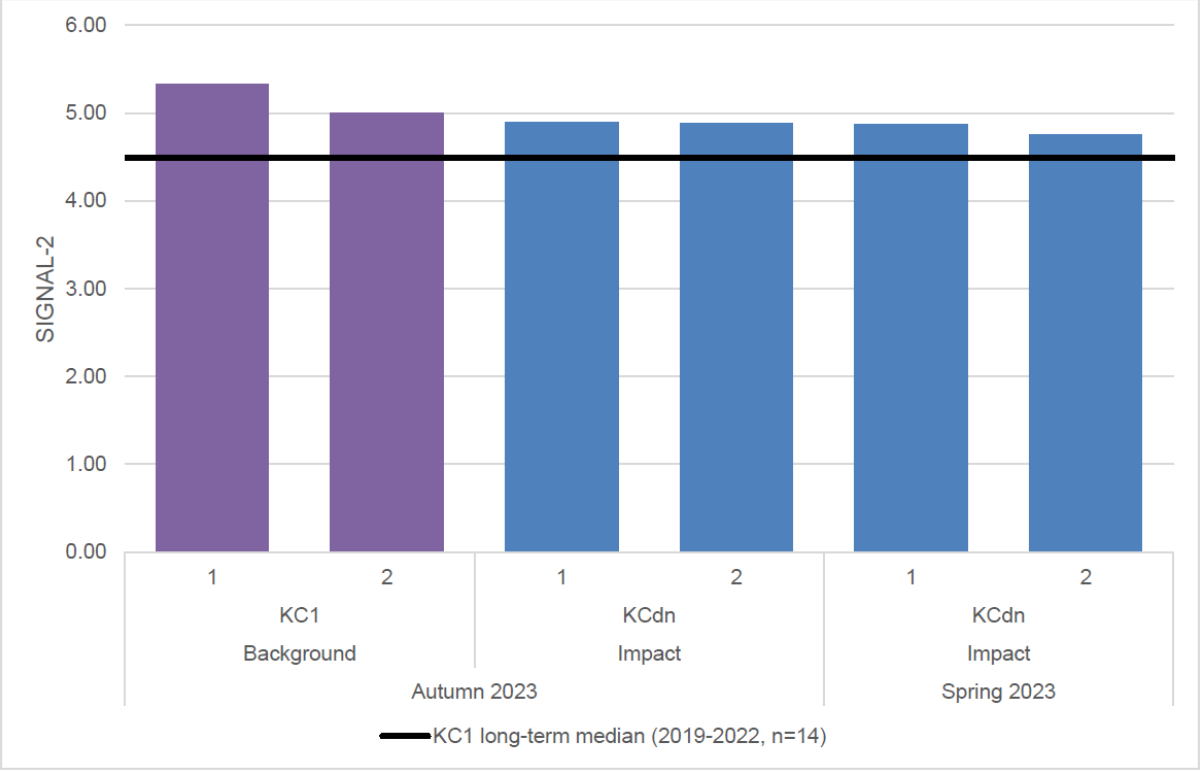


Figure 6-10: Signal-2 results in Kangaroo Creek samples (2023)

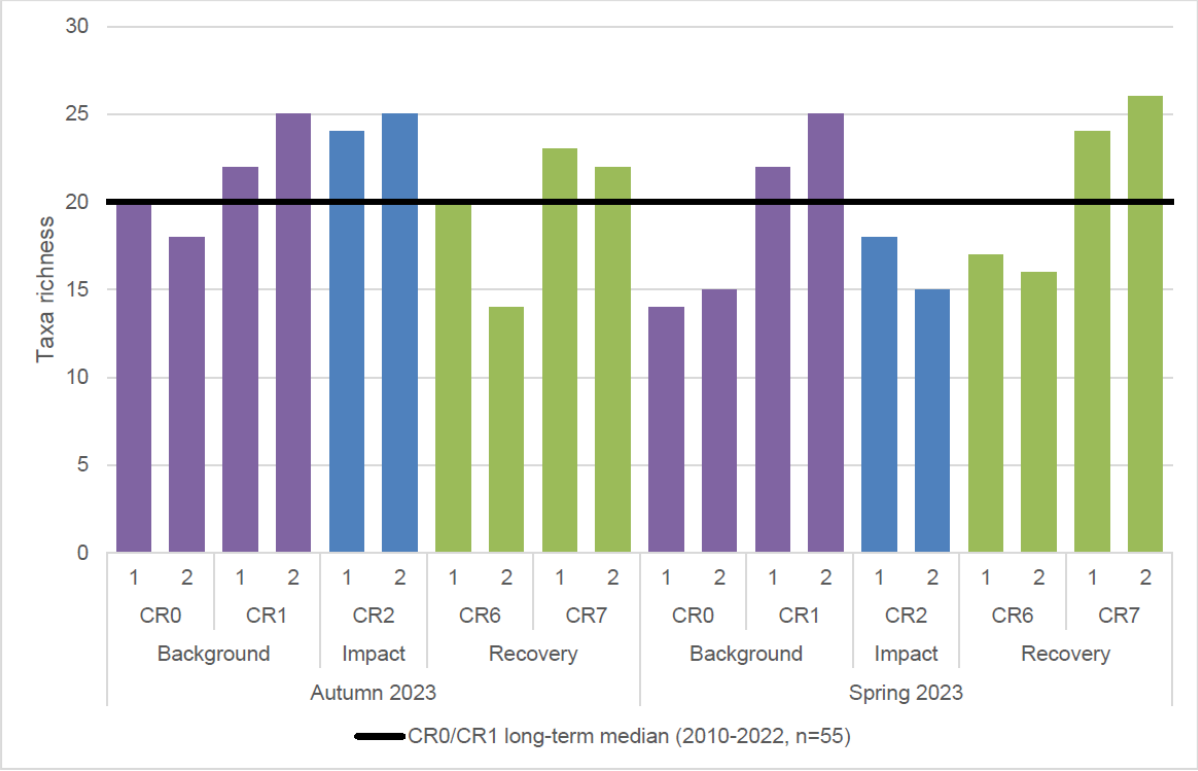


Figure 6-11: Taxa richness in Coxs River samples (2023)

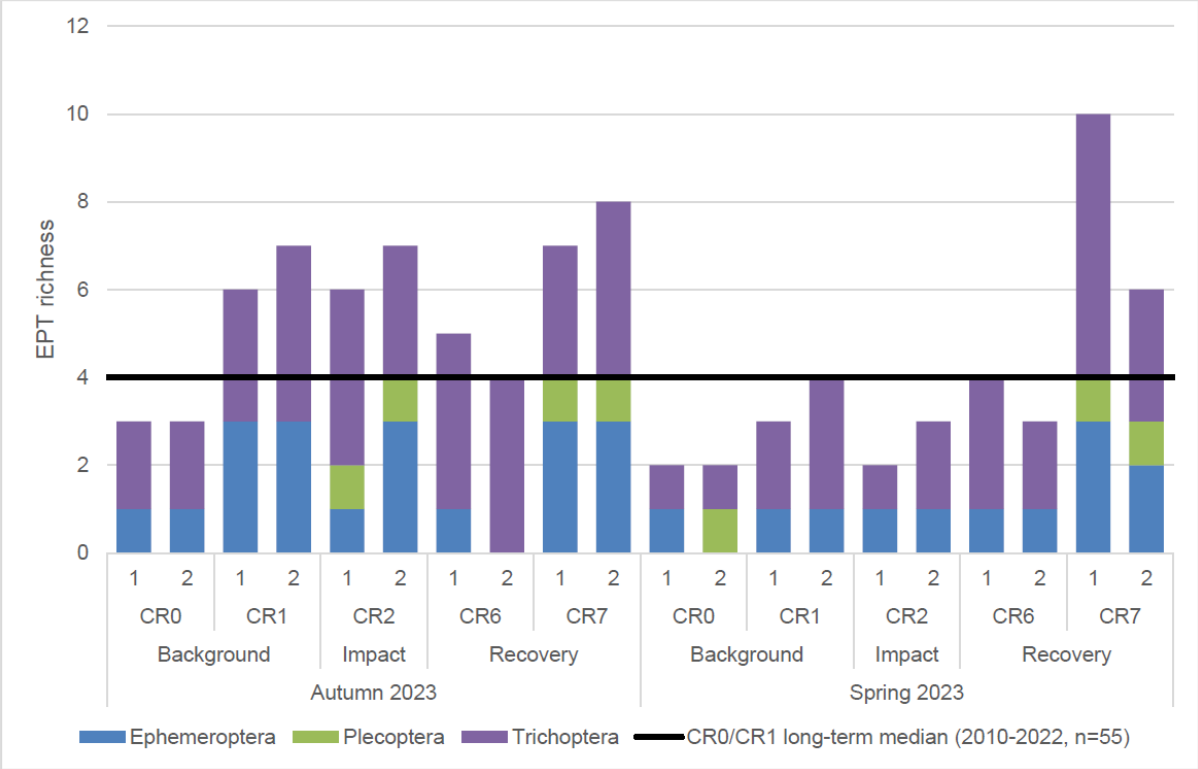


Figure 6-12: EPT richness in Coxs River samples (2023)

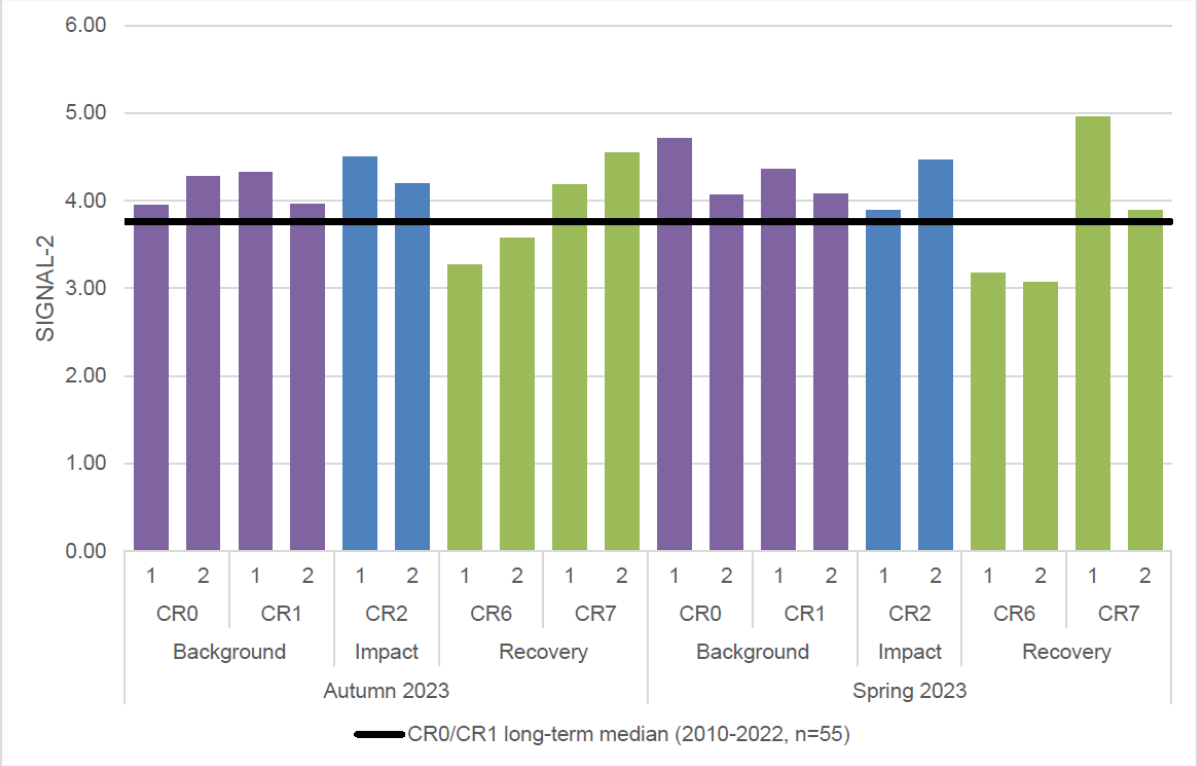


Figure 6-13: Signal-2 results in Coxs River samples (2023)

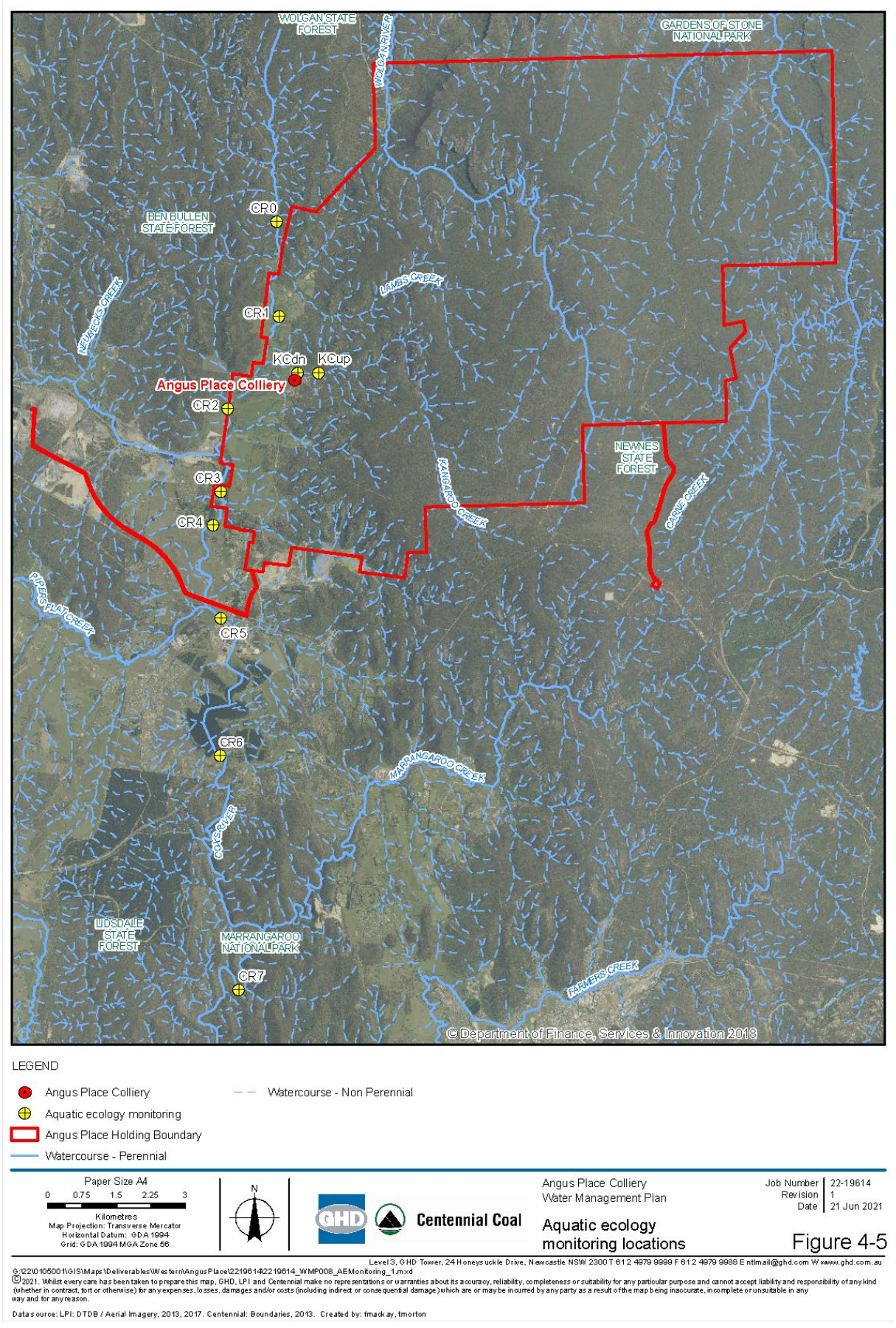


Figure 6-14: Aquatic Ecology Monitoring Program

6.6.8 Comparisons against Predictions and Performance Measures

Comparison of 2023 performance monitoring against predictions of the approved project and performance measures of MP06_0021 is summarised in **Table 6-1** at the start of **Section 6**.

Monitoring undertaken during the 2023 reporting period was compliant with both predictions and with performance measures of the consent.

6.6.9 Long Term Analysis

Historical performance by previous mining activities in areas prior to the current EP Area (LW900W and 910) have been reported in past annual reviews available on the Angus Place website.

Table 6-13 summarises biodiversity compliance reporting over the last five Annual Review reporting periods. Since 2019, monitoring reported in Annual Reviews for Angus Place has identified no instances of technical non-compliance events related to biodiversity.

Table 6-13: Biodiversity Compliance 2019-2023

Aspect	Annual Review Reporting Period				
	2019	2020	2021	2022	2023
Biodiversity-related reported non-compliances (NC)[1]	0	0	0	0	0

Notes: 1 excluding administrative-related aspects (i.e. technical non-compliances).

Any mining related impacts on biodiversity that may have occurred since commencement of care and maintenance in 2015 have been overshadowed by the effects of extreme climate factors. Drought in 2018 and 2019, the Gospers Mountain mega blaze bushfire in 2019 - 2020 and subsequent above average rainfall throughout 2023.

Previous impacts from subsidence and historical mine water discharges, may be related to specific biodiversity observations in recent times.

6.6.10 Implemented / Proposed Improvements

The following measures are being considered by Angus Place for improvement:

- A review of monitoring requirements for biodiversity will be undertaken to consider consent obligations to monitor for specific timeframes as well as focusing on current and proposed mining activity.

6.6.11 Biodiversity Offsets

Angus Place manages biodiversity offsets in accordance with the *Western Region Biodiversity Offset Strategy (WR-BOS)* to address Condition 24B of MP06_0021 associated with surface disturbance requirements for the No2 Ventilation Fan (MOD2 MP06_0021).

Version 8 of the WR-BOS (Nov 2020) was approved by DPIE (now DPHI) on 27 January 2021.

The WR-BOS was prepared to offset 12.36ha of surface disturbance associated with the Angus Place Ventilation Facility, satisfying Condition 24B (Schedule 3) of MP06_0021. In November 2023 the *Persoonia Hindii* Identification Report was submitted to DPHI which indicated that 667 individuals were recorded within the project area equating to 4669 species credits. This satisfies the MP06_0021 MOD2 offset in accordance with Schedule 3, Condition 24B.

6.7 HERITAGE

6.7.1 Environmental Management

During the reporting period, heritage at Angus Place was:

- Compliant with Schedule 3, Condition 3 of MP06_0021;
- Managed and monitored in accordance with the WRACHMP and the WRHHMP;
- Managed and monitored in accordance with the *Longwalls 900W and 910 Heritage Management Plan* (part of the Longwalls 900W and 910 Extraction Plan); and
- Managed and monitored in accordance with the LW930-980 SMP and supporting component plans.

As the heritage monitoring program associated with the *Longwalls 900W and 910 Heritage Management Plan* is specific to the extraction of Longwall 900W and the mine is currently in care and maintenance (with LW910 being unmined to date), there has been no heritage monitoring required during the reporting period. The extraction plan related to LW910 has expired and there are no specific plans to extract the area in proposed workings for Angus Place.

Following extensive bushfires over the 2019/2020 summer period, in 2021 Centennial commissioned a post bushfire cultural heritage assessment. Some sites were affected by bushfire activity and long-term management arrangements for these sites were discussed with the Registered Aboriginal Parties (RAPs) at a 2021 RAP meeting. Further management by the RAPs was not deemed to be required by attending parties. There has been no change to this during the 2023 reporting period.

6.8 MINE SUBSIDENCE

Angus Place completed secondary extraction of the longwall panel 900W on 15 February 2015 and the mine was placed into care and maintenance on 28 March 2015. The extraction plan for LW900W and LW910 expired in 2021. No mining was undertaken at Angus Place while in care and maintenance.

Subsidence monitoring surveys are no longer required to be undertaken due to the time since longwall extraction occurred and accordingly was not undertaken during the 2023 period.

Monitoring requirements for subsidence are outlined in the following subsidence management plans in **Table 6-14**.

Table 6-14: Summary of Previous Subsidence Management Plan Approvals

Subsidence Management Plan	Mining Area	Approved	Complete
SMP Approval 04/1675	Longwalls 930-980	9 December 2005	26 December 2013
SMP Approval OUT 14/10918	Longwalls 900W and 910	8 April 2014	900W 15 February 2015

6.8.1 Environmental Performance

Subsidence performance measures specifically relevant to *subsidence impacts* are prescribed within Tables 1A and 1B of Condition 3, Schedule 3 in MP06_0021. These are applicable to all areas mined since approval of MOD1 MP06_0021 on 29 August 2011. Performance was satisfactory during the reporting period.

6.9 WASTE

6.9.1 Environmental Management

Waste minimisation and management at Angus Place is monitored and reported in accordance with Condition 32, Schedule 3 of MP06_0021. Waste is managed in accordance with relevant regulatory requirements including the POEO Act, the *NSW EPA Waste Classification Guidelines* and the *NSW Waste Avoidance and Resource Recovery Act 2001* and Waste *Management and Resource Recovery Regulations 2017*.

As the site is currently in care and maintenance, waste generated at Angus Place during the 2023 reporting period was related to maintenance and servicing of the small fleet of vehicles, the essential plant and equipment to maintain the mine, clean-up of scrap metal, archive management and IT equipment upgrades. The site hosts several group level staff and has a small office-based workforce not related to specific mining operations.

General waste is separated for recycling and non-recyclables disposed of to landfill by licensed waste contractors. Recyclable materials, such as, plastic, paper and cardboard products, are recovered whenever possible and reported as noted further below.

Some contaminated soil from spill containment, and waste oil has been removed from the site by relevant licensed contractors. No washery tailings or coarse/fine reject material is generated at the site.

Sewage and other wastewater from surface facilities is treated onsite and managed in accordance with the Angus Place WMP. On-site sewage treatment is designed to discharge treated effluent via irrigation areas as LDP005 under EPL 467. During care and maintenance, the volume of sewage generated is significantly lower than the design capacity of the sewage treatment system. In 2019, a bushfire damaged the power supply to the irrigation pumps and monitoring systems and destroyed the irrigation system. Repairs to this system have not been made due to the low volume of sewage to manage.

During the 2023 reporting period no effluent discharges for land irrigation were required/undertaken.

6.9.2 Environmental Performance

Table 6-15 provides a summary of the general waste produced, recycled, and disposed during the reporting period.

During the reporting period, 182.447t (86.86%) of waste was recycled, primarily including steel, oily water, paper and cardboard, oil filters, and empty drums. This is an increase to recycling amounts in recent years (e.g., 2021 and 2022 of 3.648 and 61.268 tonnes respectively). The reason for this increase in reporting period is due to a site clean-up campaign.

Table 6-15: Non-Production Waste Recycling and Disposal (last five reporting years)

Waste Generation (tonnes)	Annual Review Reporting Period				
	2019	2020	2021	2022	2023
Recycled (Hazardous) (e.g. Waste Oil, Waste, Grease)	3.348	4.484	3.138	1.598	1.258
Recycled (Non-Hazardous) (e.g. Steel, Paper & Cardboard) tonnes)	99.696	15.988	0.510	59.670	181.189
Hazardous Disposal (Oily Rags / tonnes)	0.360	0.996	0.190	2.536	0.578
Non-Hazardous Disposal (Mixed Solid Waste / tonnes)	108.250	26.030	14.990	43.340	27.028
TOTAL WASTE (OFFSITE) (tonnes)	**211.654**	**47.498**	**18.828**	**107.144**	**210.053**
TOTAL RECYCLED WASTE (tonnes)	**103.044**	**20.472**	**3.648**	**61.268**	**182.447**
PERCENTAGE WASTE RECYCLED	**48.69%**	**43.10%**	**19.38%**	**57.18%**	**86.86%**

6.9.3 Comparisons against Predictions

Waste management predictions/measures described in the EA/modifications and 2023 performance against these are summarised in **Table 6-16.**

Table 6-16: Summary of Waste Management Predictions and Performance (2023)

Prediction	Performance
Angus Place Colliery will implement a waste free site (vent fan operations). i.e. all waste must be removed from site during the operational phase. As appropriate, it will then be separated, classified *(Source: MOD2 EA, RPS 2012)*	• No waste was generated on site at the vent facility.
There will be preventative measures to ensure controlled use of liquids (Vent Fan operations). All	• No use of liquids except diesel fuel for one pump on site at vent facility.

Prediction	Performance
chemicals including oils, drilling muds, etc will be on self-bunded storage pallets. *(Source: MOD2 EA, RPS 2012)*	

6.9.4 Long Term Analysis

Waste disposal and recycling for the last five (5) reporting periods is summarised in **Table 6-15**.

As the site is currently in care and maintenance, waste generated at Angus Place is variable.

6.10 OTHER MATTERS

6.10.1 Bushfires

There were no bushfires in the vicinity of the approval area during the reporting period.

7 WATER MANAGEMENT

Angus Place Colliery manages and monitors water in accordance with the *Angus Place Water Management Plan (WMP)* (Rev 2, 2021), approved by DPHI on 30 July 2021. The WMP addresses the requirements of the project approval as outlined in Schedule 3, Condition 8 and has been developed to:

- Ensure effective and structured monitoring of surface water resources.
- Ensure that water leaving the site meets the appropriate quality standards outlined in EPL 467.

During the reporting period, Angus Place operated the water management system in accordance with the WMP. Monitoring and data review was undertaken in accordance with the WMP, project approval MP06_0021 and Environmental Protection Licence 467 requirements.

A summary of water management and performance in the reporting period is provided in the following sections, including:

- **Section 7.1** – Details of water licensing and associated take
- **Section 7.2**– A summary of the site water balance
- **Section 7.3**– A summary of surface water monitoring results for the reporting period
- **Section 7.4** – A summary of groundwater monitoring results for the reporting period

Detailed surface water and groundwater monitoring results for the reporting period are provided in **Appendix 2**.

7.1 WATER LICENSES

Water access licences (WALs) under the *Water Management Act 2000* for the extraction of groundwater, are managed collectively across Angus Place Colliery, Springvale Mine and Clarence Colliery. Angus Place Colliery specifically holds five water access licences totalling 7,059 ML/year. Licences for groundwater extraction include:

- from the Sydney Basin Coxs River groundwater source
    - WAL 41881 – licences 1,471 ML/year.
    - WAL 36445 – licences 2,701 ML/year.
    - WAL 37340 – licences 329 ML/year.
- from the Sydney Basin Richmond groundwater source
    - WAL 36449 – licences 2,523 ML/year.
    - WAL 37343 – licences 35 ML/year.

On 1 July 2023, the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023 commenced. As a result, The Sydney Basin Richmond Groundwater Source and Sydney Basin Coxs River Groundwater Source have been amalgamated to reflect their connectivity, now named the Sydney Basin West Groundwater Source.

The relevant water supply works approvals that allow for groundwater to be extracted include:

- 10WA122774 – Angus Place Pit Bottom Pump Station.

- 10WA118748 – Angus Place 48 C/T Pump Station.
- 10WA118750 – Bore 930 and Bore 940.

Table 7-1 provides a summary of water take and available water under water access licences for the water year ending during the reporting period (i.e., 1 July 2022 to 30 June 2023), not the calendar year.

Table 7-1: Water Licenses and Take

Licence	Water sharing plan, source and management zone	Entitlement (ML)	Passive Take/Inflow (ML)	Active Pumping (ML)	TOTAL (ML)
WAL41881	Greater Metropolitan Region Groundwater Sources	1,471	0	793.23	793.23
WAL36445		2,701	0	0	0
WAL37340	Sydney Basin Coxs River Groundwater Source	329	0	0	0
WAL36449	Greater Metropolitan Region Groundwater Sources	2,523	0	2523	2523
WAL37343	Sydney Basin Richmond groundwater source	35	0	0	0
Total		**7,059**	**0**	**3316.23**	**3316.23**

Notes: 1 Volume is reported in megalitres (ML).

7.2 WATER BALANCE

A site water balance model for Angus Place was developed to quantify transfers within the site under existing and future operational conditions using various rainfall patterns.

A summary of the average annual inputs and outputs for the Angus Place Colliery pit top water management system are provided in **Table 7-2**. The site water balance shows that, on average, water balance modelling predicts that inputs are almost entirely comprised of groundwater inflows. Groundwater can be stored in extracted workings which are dewatered and transferred to the Springvale Water Treatment Facility (SWTF) or Pond D at the MPPS. A relatively small volume of surface catchment runoff from the pit top is discharged through LDP002 and catchment runoff at Kerosene Vale is discharged through LDP003.

The 2023 water balance indicated less than predicted groundwater inflows and higher rainfall capture than originally estimated. Transfers to SWTP and Pond D were increased to the maximum capacity available, however a significant increase in underground storage occurred as a result. This is a result of unexpected water transfer limitations. Overall, the water balance was within 0.1% of the total inputs.

Table 7-2: Annual Water Balance – Average Annual Volumes (WMP, 2021)

Water Flow	Average Annual Volume (ML/year)	2023 Annual Volume (ML/year)
Inputs		
Direct rainfall onto storages and catchment runoff	116	43.37
Potable Water Supply	2	1.16
Groundwater inflows into underground workings	2166	1887.70
Total Inputs	**2284**	**1932.23**
Outputs		
Evaporation	20	18.42
Discharge through LDP002	22	26.54
Discharge through LDP003	34	2.44
Discharge through LDP005	1	0
Transfer to SDWTS	0	0
Transfer to SWTP	1428	2226.39
Transfer to Pond D	657 (Avg. 1.8ML/day)	877.83
Transfer from ventilation facility at Springvale Mine	33	0
Losses from operations	1	3.55
Total Outputs	**2196**	**3155.17**
Change in Storage		
Surface water storages	88	0
Underground water storages	88	-1217.7
Total Change in Storages	**-**	**-1217.7**
Water Balance		
Change in water inventory (inputs – outputs – change in storage)	**0**	**-5.24**

7.3 SURFACE WATER

7.3.1 Environmental Management

Surface water monitoring is undertaken in accordance with the *Angus Place Water Management Plan* (WMP, 2021) (WMP), Development Consent MP06_0021, and Environment Protection Licence 467 requirements.

Surface water monitoring includes 24 sites, encompassing:

- **Discharge** surface water quality, measured at two monitoring locations.
- **Watercourse** surface water quality and flow rate, measured at fourteen monitoring locations.
- **Pit top** surface water quality, measured at three monitoring locations.
- **Swamp** surface water quality and flow rate, measured at five monitoring locations.

Surface water flow and quality data is collected at either weekly, fortnightly, or monthly. The surface water monitoring sites are described in **Table 7-3** and shown on **Figure 7-1**.

Table 7-3: Description of Surface Water Monitoring Locations

Monitoring Point	Description
Licenced Discharge Points	
LDP002	Discharge of surface water from facilities into the Coxs River through the Settling Ponds.
LDP003	Discharge of surface water from the Kerosene Vale Stockpile Area via a sediment dam and settling pond.
Pit Top Surface Water	
Carpark Culvert	Dirty water drain prior to entering the Settling Ponds.
South Sediment Dam (Entrance Pond)	Sediment pond at the ventilation facility on Newnes Plateau.
South Sediment Dam (Entrance Pond Discharge Point)	Entrance Pond discharge.
Watercourses	
Bungleboori	Comparative Newnes Plateau water course monitored when Entrance Pond is discharging.
Coxs River Far U/S	Coxs River located approximately 600 m upstream of confluence with Lambs Creek.
Coxs River U/S	Coxs River located approximately 1 km upstream of confluence with Kangaroo Creek.
Cox River D/S	Coxs River located approximately 600 m downstream of confluence with Kangaroo Creek.
Lambs Creek	Lambs Creek located approximately 2 km upstream of confluence with Coxs River.
Long Swamp U/S	Coxs River in Long Swamp, immediately upstream of the confluence with Kangaroo Creek.

Monitoring Point	Description
Kangaroo Creek U/S (AP)	Kangaroo Creek located approximately 500 m upstream of discharges from former LDP001.
Kangaroo Creek D/S (AP)	Kangaroo Creek located approximately 200 m downstream of discharges from former LDP001.
Kangaroo Creek U/S (NP)	Located in the upper reaches of Kangaroo Creek on the Newnes Plateau.
Kangaroo Creek D/S (NP)	Kangaroo Creek located on Newnes Plateau approximately 2 km downstream of Kangaroo Creek U/S (NP).
KC/CR Confluence	Located at the confluence of the Coxs River and Kangaroo Creek.
Wolgan River (Spanish Steps)	Located on the Wolgan River upstream of any potential seepage from the 800 District.
Wolgan River (Wolgan Property)	Located on the Wolgan River downstream of any potential seepage from the 800 District.
LDP003 D/S	Located on Sawyers Swamp Creek approximately 1 km downstream of LDP003 discharge from the KVSA.
Swamps	
Narrow Swamp U/S	Upper reaches of Narrow Swamp.
Narrow Swamp D/S	Lower reaches of Narrow Swamp.
Star Picket	Swamp monitoring.
Tri Star Swamp	Swamp monitoring.
Twin Gully Swamp	Swamp monitoring.
Other	
LDP005	Pond 4 of Sewage Treatment Ponds (STP) feeding to the irrigation area (discharge to utilisation area)

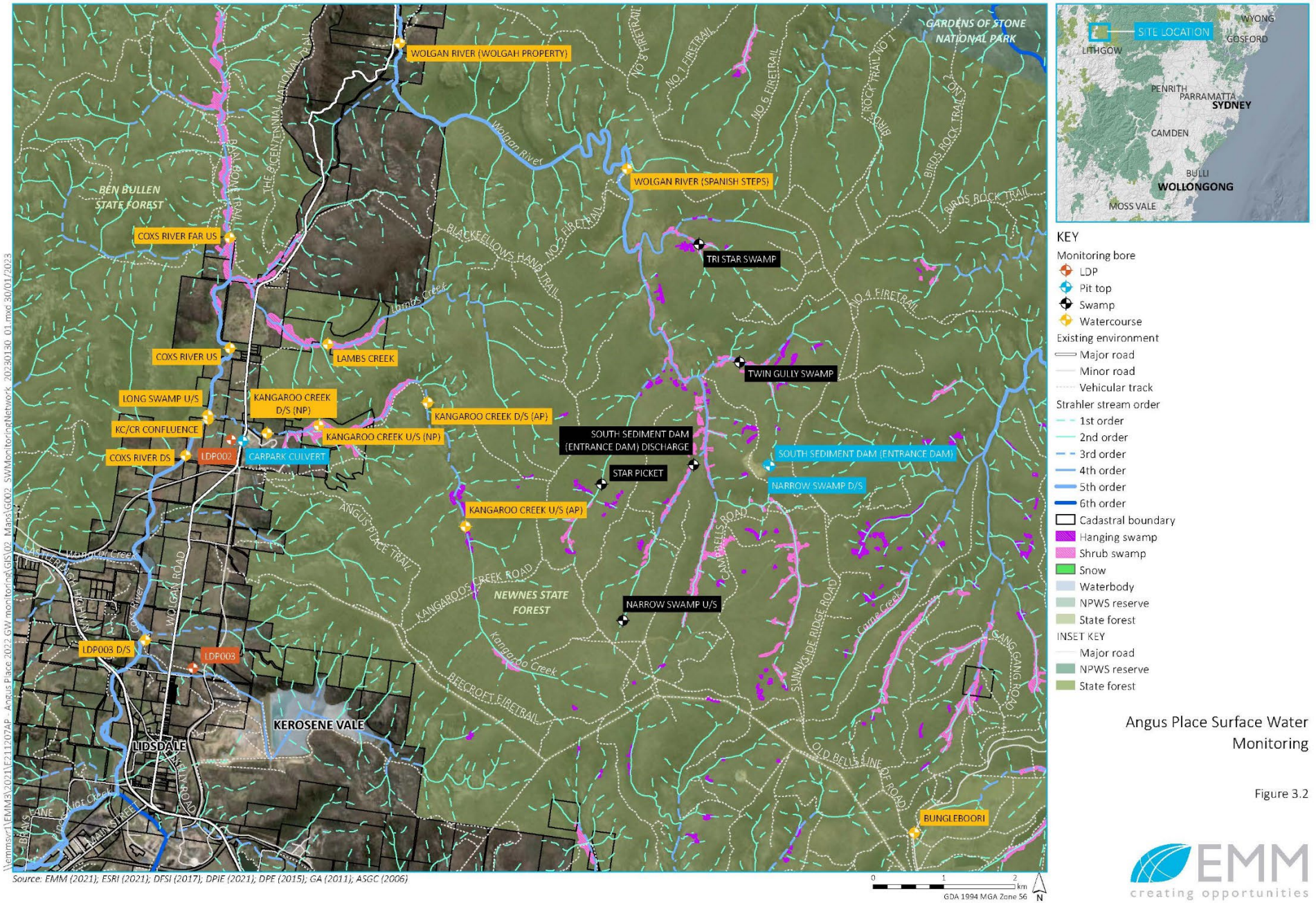


Figure 7-1: Surface Water Monitoring Locations

7.3.2 Environmental Performance

The following subsections summarises surface water monitoring observations for the reporting period. Surface water quality data has been compared to the historical observations and the WMP trigger values for the licensed discharge points (LDP) and relevant watercourse sites.

Discharge Water Monitoring

Angus Place Colliery holds EPL467, with water currently licensed to be discharged from the site through LDP002 and LDP003. Water quality recorded during the reporting period is summarised in **Table 7-4** (LDP002) and **Table 7-5** (LDP003). Long-term time series plots are presented on **Figure 7-2** (LDP002) and **Figure 7-3** (LDP003).

In summary, there were two non-compliances regarding licenced discharges at LDP002, and LDP003 observed during the 2023 reporting period as detailed in **Section 11**. In 2023, a number of rainfall events occurred with >44mm over five consecutive days, exceeding thresholds applicable to licence limits under the EPL on those occasions. In accordance with EPL467 condition L2.5 the limits specified in L2.4 do not apply when the discharge occurs within 5 days after a rainfall event measured at 44mm over five consecutive days. Detailed monthly surface water monitoring results for the reporting period are provided in **Appendix 2**.

Table 7-4: LDP002 Water Quality Summary

Analyte	No. of Samples Collected and Analysed	Lowest Sample Value	Mean of Sample	Highest Sample Value	EPL467 100 Percentile Concentration Limit
Oil & Grease (mg/L)	10	LOR	LOR	LOR	10
pH	10	7.3	7.9	8.3	6.5 – 9.0(A)
Total Suspended Solids (mg/L)	10	5.0	12.0	33.0#	30
Turbidity (NTU)	10	4.0	12.7	28.0	40
Conductivity (µS/cm)	10	265.0	359.9	565.0	NS

Notes: NS = Not specified, (A) 90th percentile concentration limit of 6.5-8.5 also applies to LDP002 # = In accordance with EPL 467 condition L2.5 the limits specified in L2.4 do not apply when the discharge occurs within 5 days after a rainfall event measured at 44mm over five consecutive days

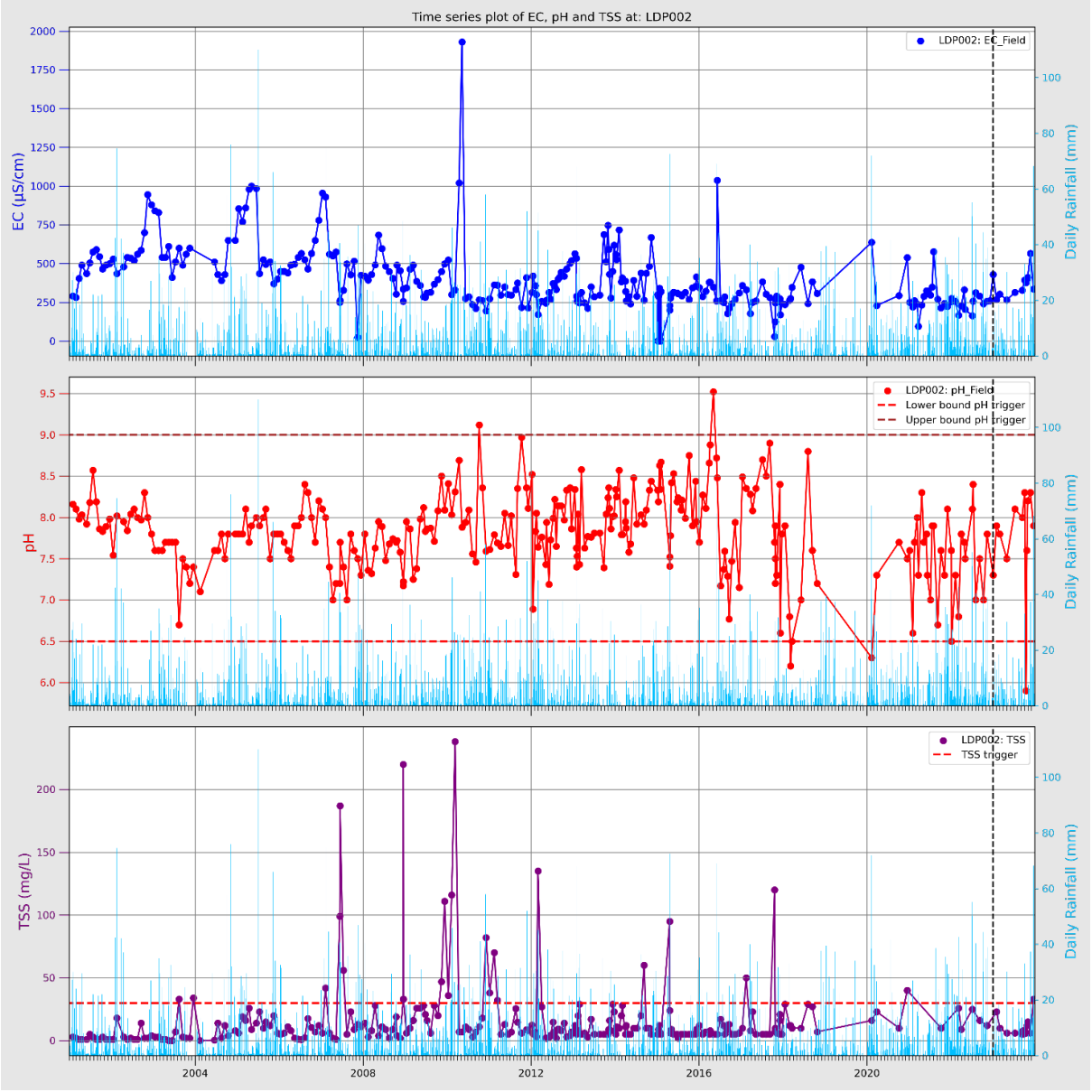
Table 7-5: LDP003 Water Quality Summary

Analyte	No. of Samples Collected and Analysed	Lowest Sample Value	Mean of Sample	Highest Sample Value	EPL467 100 Percentile Concentration Limit
Oil & Grease (mg/L)	2	LOR	LOR	LOR	10
pH	2	6.5	7.0	7.4	6.5 – 8.5
Total Suspended Solids (mg/L)	2	12.0	87.5	163.0#	30
Turbidity (NTU)	2	37.9	139.0	240.0#	40

Conductivity (µS/cm)	2	80.0	80.0	80.0	NS

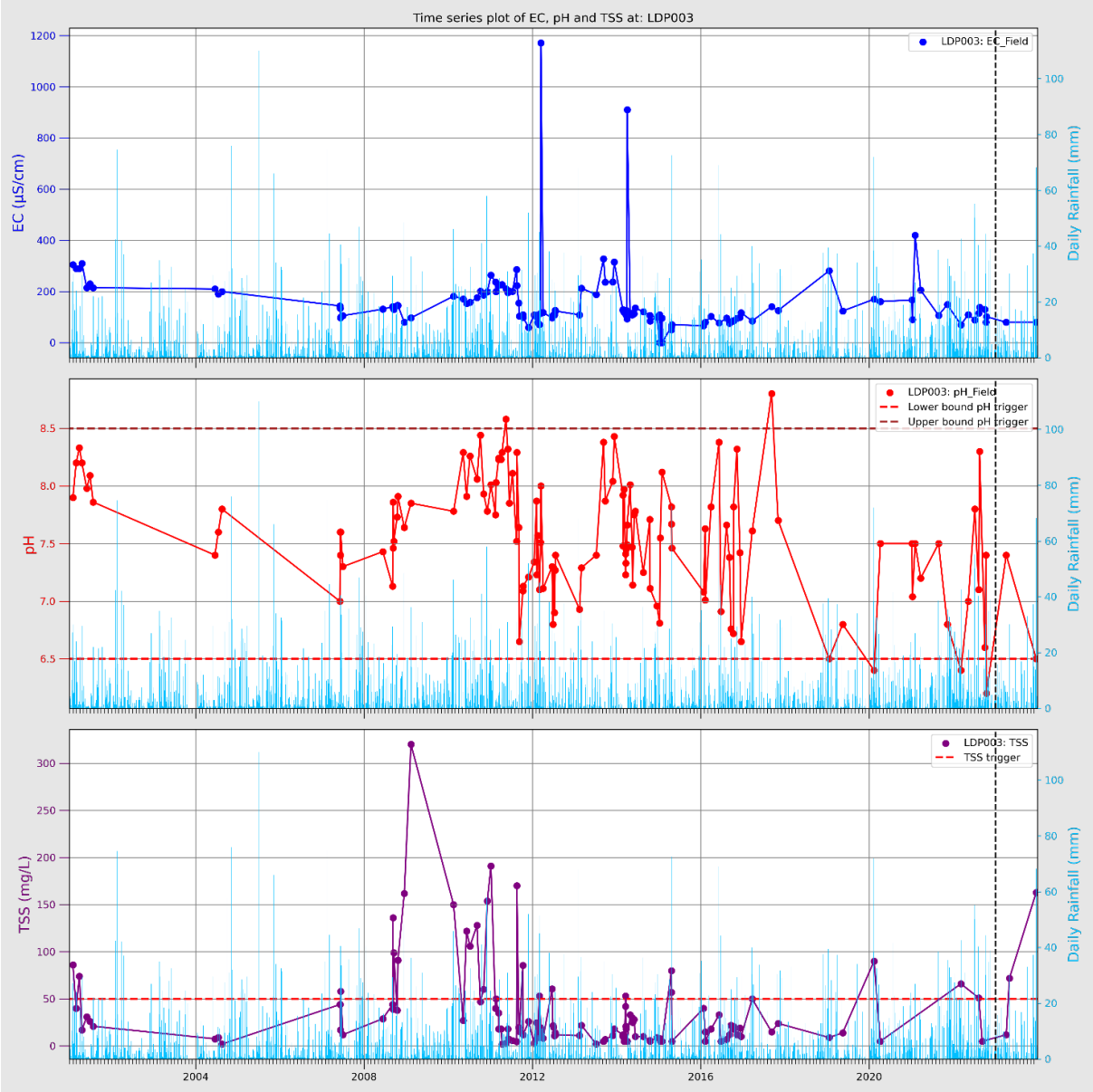
Notes: NS = Not specified # = In accordance with EPL 467 condition L2.5 the limits specified in L2.4 do not apply when the discharge occurs within 5 days after a rainfall event measured at 44mm over five consecutive days

Figure 7-2: Time Series Plot of EC, pH and TSS at LDP002



Note that this data is from live telemetry which is not used for compliance sampling and can be subject to error. These figures should be used for general trends not compliance.

Figure 7-3: Time Series Plot of EC, pH and TSS at LDP003



Note that this data is from live telemetry which is not used for compliance sampling and can be subject to error. These figures should be used for general trends not compliance.

Watercourse Surface Water Monitoring

The water quality monitoring network for surface watercourses comprises of fourteen monitoring locations as specified within the WMP and summarised in **Table 7-6**. Surface water quality is monitored at the downstream watercourse sites KC/CR Confluence and Coxs River D/S.

Surface water quality data is assessed against Site-Specific Guideline Values (SSGVs), which were based on a review of ANZECC (2000) DGVs.

Surface water quality results is summarised in **Table 7-6** for sites KC/CR confluence and Coxs River D/S, assessed against SSGVs.

Three lower bound pH exceedances for Coxs River D/S were observed in September (5.9) and October (5.8, 6.2). One TSS exceedance was observed at KC/CR Confluence in August (30 mg/L). Both exceedances are due to natural variability.

Table 7-6: Watercourse Surface Water Quality and Flow Rate Summary

Monitoring Location	Surface water quality trends during the reporting period
Bungleboori	No data was available during the reporting period as the ephemeral water courses were dry.
Coxs River Far U/S	EC remained stable, while pH displayed a fluctuating trend consistent with historical observations. No TSS readings were observed during the reporting period.
Coxs River U/S	EC and TSS remained stable, while pH fluctuated, consistent with historical observations. Flow was not monitored at the site due to the flow being too low for monitoring.
Coxs River D/S	EC and TSS remained stable, while pH fluctuated, consistent with historical observations. Flow monitoring was taken throughout April, May, June, and August with the highest flow in April (2041KL/day) The rest of the monitoring period flow was too low to monitor. Three lower bound pH exceedances for Coxs River D/S were observed in September (5.9) and October (5.8, 6.2).
Kangaroo Creek D/S (AP)	One EC and pH reading was taken in June. No TSS or flow was observed during the reporting period.
Kangaroo Creek D/S (NP)	EC and TSS remained stable, except for a large EC spike in September 2023 and a TSS spike in November 2023, which was larger than historical observations. These spikes show no correlation to any significant rainfall events. pH and flow fluctuated, consistent with historical observations. Flow measurements ceased in June 2023.
Kangaroo Creek U/S (AP)	No data was available for all analytes during the reporting period.
Kangaroo Creek U/S (NP)	EC and TSS remained stable, while pH and flow fluctuated consistently with historical observations.
KC/CR Confluence	pH and EC show stable trends. One TSS exceedance was observed at KC/KR Confluence in August (30 mg/L).
Lambs Creek	EC remained stable. pH displayed a fluctuating trend consistent with historical observations. TSS remained relatively stable with historical observations. No flow data was available during the reporting period due to no flow conditions.
Long Swamp U/S	EC fluctuated in an increasing trend, consistent with historical observations, while pH fluctuated within historical observations. Two large spikes in TSS were observed in March and June, which was greater than historical observations. One flow reading was observed in March (1654 m^3/day).
Wolgan River (Spanish Steps)	Two EC readings greater than historical observations occurred in May (430 uS/cm) and September (454 uS/cm). pH fluctuated consistently with historical observations except for one reading in September (3.1). TSS remained relatively stable, with one spike within historical observations. Limited flow data was available but remained relatively stable.

Monitoring Location	Surface water quality trends during the reporting period
Wolgan River (Wolgah Property)	EC and flow rate remained stable with minor fluctuations, consistent with the historical average. pH and TSS fluctuated, consistent with historical observations.
Coxs River Far U/S	EC remained stable, while pH displayed a fluctuating trend consistent with historical observations. No TSS readings were observed during the reporting period. One flow reading was observed in January (319 m^3/day).

Pit Top Surface Water Monitoring

The pit top surface water quality monitoring network comprises three monitoring locations. It should be noted that the WMP (GHD 2021) does not apply any trigger criteria to the monitoring locations.

During the reporting period, EC, pH and TSS remained relatively consistent with historical observations. A summary of key observations and trends found during the reporting period are presented in **Table 7-7**.

Table 7-7: Pit Top Surface Water Quality Summary

Monitoring Location	Surface water quality trends during the reporting period
Carpark Culvert	pH and TSS have remained constant with historic observations. It should be noted that EC has not been recorded at the site since 2020 due to the development of monitoring requirements.
South Sediment Dam (Entrance Dam)	EC and TSS remained relatively stable. pH fluctuated consistently with historical observations. Data not available from August onwards in the reporting period.
South Sediment Dam (Entrance Dam) Discharge	Nil Discharge

Swamp Surface Water Monitoring

The swamp surface water quality and flow monitoring networks comprise of four monitoring locations. It should be noted that the WMP (GHD 2021) does not apply any trigger criteria to the monitoring locations.

During the reporting period, EC, pH, TSS and flow rate remained relatively consistent with historical observations. A summary of key observations and trends during the reporting period is provided in **Table 7-8**.

Table 7-8: Swamp Surface Water Quality Summary

Monitoring Location	Surface water quality trends during the reporting period
Narrow Swamp U/S	No data available for all analytes due to dry swamp conditions.
Narrow Swamp D/S	No data available for all analytes due to dry swamp conditions.
Star Picket	No data available for all analytes due to dry swamp conditions.
Tri Star Swamp	Water quality parameters show trends consistent with climatic observations and historical trends.
Twin Gully Swamp	No data was available for 2023 due to access restrictions.

7.3.3 Comparisons against Predictions

Surface water related predictions during the operation of the Project were outlined in the *Angus Place Water Treatment Project MOD5 EIS* (EMM. 2018) and summarised within the water management performance measures as required by Condition 7 in Schedule 3 of Development Consent MP06_0021. Surface water quality data is typically assessed against SSGVs based on a review of ANZECC (2000) DGVs.

As noted in *Angus Place Water Treatment Project MOD5 EIS* (EMM. 2018), surface water impacts were not anticipated in the Coxs River upstream of the Kangaroo Creek/Coxs River Confluence. The proposed Water Treatment Project in 2018 predicted the discharged water from site would satisfy SSGVs, while also forecasting an improvement on conductivity (EC) that would begin to meet SSGVs.

Water quality monitored at the downstream sites KC/CR Confluence and Coxs River D/S are assessed against SSGVs, as shown below.

- Conductivity (EC): 350 µS/cm
- pH: 6.3 – 8.0
- Total Suspended Solids: 25 mg/L
- Turbidity: 72 NTU

Three non-consecutive lower bound pH triggers above SSGV's were observed at KC/KR Confluence in the 2023 reporting period, in September (5.9) and October (5.8, 6.2).

7.3.4 Long Term Analysis

Since 2018, Monitoring reported in Annual Reviews for Angus Place Colliery has identified some instances of non-compliance events (or impacts) related to water.

Table 7-9 summarises water compliance reporting (non-administrative aspects) over the last five (5) Annual Review reporting periods. Non-compliances in 2023 are detailed in **Section 11**.

Table 7-9: Long Term Water Related Compliance Trends (non-administrative)

Aspect	Annual Review Reporting Period				
	2019	2020	2021	2022	2023
Surface Water monitoring location related non compliances	1	0	1	2	3

7.3.5 Implemented / Proposed Improvements

Following review of the Site Water Management Plan in 2023, a contractor has been engaged to revise the plan in the 2024 period to focus monitoring on current and future planned operations.

The revised management plan will be provided to the secretary for approval in accordance with the consent.

7.4 GROUNDWATER

7.4.1 Environmental Management

Groundwater monitoring is undertaken in accordance with the *Angus Place Water Management Plan (*WMP*) (*Rev 2, 2021); Conditions 7-13, Schedule 3 of MP06_0021; and Conditions P1.3 and M2.3 of EPL467.

The Angus Place monitoring program targets Newnes Plateau Shrub Swamps (NPSS), Newnes Plateau Hanging Shrubs (NPHS), perched groundwater system, shallow groundwater

system and the deep groundwater system through a combination of routine surface water monitoring, standpipe piezometers and vibrating wire piezometers (VWP).

Groundwater related monitoring is comprised of the following:

- Soil moisture content is measured daily at nine monitoring locations across three swamps (NPSS and NPHS)
- One standpipe piezometer installed down-dip (north-east) from the 800 District to monitor any potential seepage.
- 14 standpipe piezometers installed in the elevated ridges between swamps that monitor shallow groundwater levels in the upper Banks Wall Sandstone aquifer.
- 18 standpipe piezometers monitoring water levels in the NPSS.
- 15 vibrating wire piezometers (VWPs) monitoring the Narrabeen strata and the Permian Illawarra Coal Measures.
- Six monitoring locations within the Cox River including five standpipe piezometers and one VWP.

The groundwater monitoring sites are described in **Table 7-10**, **Table 7-11**, and **Table 7-12** and shown on **Figure 7-4** and **Plan 4**. Groundwater levels and piezometric pressure are recorded on a range of different frequencies with the majority saved to a data logger at each bore. Data was downloaded every two months during the reporting period, with standpipe piezometers APKC2001, REN, RSE and RNW being manually monitored every two months.

The VWP sites listed below were destroyed during the 2019/2020 Mt. Gospers Bushfire. Although historical information is available for the destroyed sites up until November 2019, a replacement strategy for the sites has not yet been reviewed.

- AP1101, monitoring time ranged from February 2012 to November 2019.
- AP1107, monitoring time ranged from December 2011 to November 2019.
- AP1103, monitoring time ranged from May 2012 to November 2019.
- AP1204, monitoring time ranged from July 2012 to November 2019.
- APXXB1, monitoring time ranged from May 2012 to November 2019.

Table 7-10: Description of Groundwater Monitoring Locations (Ridge Piezometers)

Monitoring Point	Monitoring Commenced	Depth (mbgl)	Formation
Standpipe Monitoring Bores			
AP1801DP	September 2018	336.3	Lithgow Seam
AP1PR	July 2010	37.76	Burralow Formation
AP4PR	July 2010	51.57	Burralow Formation
AP5PR	July 2010	93.82	Banks Wall Sandstone
AP8PR	July 2010	90.90	Banks Wall Sandstone
AP9PR	July 2010	82.31	Banks Wall Sandstone
AP10PR	July 2010	39.69	Banks Wall Sandstone
AP1102	April 2012	111.41	Banks Wall Sandstone
AP1104	February 2012	81.68	Banks Wall Sandstone
AP1105	November 2011	75.85	Banks Wall Sandstone
AP1110	February 2012	70.40	Burralow Formation
AP1204	July 2012	>100	Banks Wall Sandstone
APKC2001	December 2020	30.15	Banks Wall Sandstone
APKC2002	December 2020	67.90	Banks Wall Sandstone
REN	December 2005	54.98	Burralow Formation
RSE	September 2010	49.55	Burralow Formation
RNW	December 2005	55.50	Burralow Formation

Table 7-11: Description of Groundwater Monitoring Locations (VWP Bores)

Monitoring Point	Monitoring Commenced	Total Depth (mbgl)
Vibrating Wire Piezometer Monitoring Bores		
AP2PR	February 2010	411
AP10PR	May 2010	343
AP11PR	May 2010	320
AP1102	January 2012	435.1
AP1104	September 2012	370.8
AP1106	February 2012	380.3
AP1110	September 2012	399.7
AP1206	September 2012	342
APXXB2	January 2012	320
APXXB3	May 2012	331.5

Table 7-12: Description of Groundwater Monitoring Locations (Swamp Bores)

Swamp	Location	Monitoring Commenced	Depth (mbgl)
Swamp Monitoring Bores			
Kangaroo Creek Swamp	KC1	May 2005	1.10
	KC2	November 2008	1.56
	KCU1	October 2020	0.90
Tri Star Swamp	TS1	October 2011	3.98
	TS2	October 2011	2.06
	TS3	November 2011	1.77
West Wolgan Swamp	WW1	May 2005	1.90
	WW2	May 2005	2.30
	WW3	December 2005	2.40
	WW4	February 2006	2.08
East Wolgan Swamp	WE1	May 2005	2.51
	WE2	May 2005	1.20
Trail Six Swamp	XS1	October 2011	1.44
Twin Gully Swamp	TG1	October 2011	1.16
	TG2	April 2018	0.85
Narrow Swamp	NS1	May 2005	2.53
	NS2	May 2005	2.60
	NS3	February 2008	2.80
	NS4	April 2008	2.40
	NSW1R	November 2021	NA
	NSW2R	November 2021	NA
Long Swamp	LS5	February 2019	1.71
	LS6	February 2019	1.86
	CS4	February 2019	2.58
Coxs River Swamp	CS2	February 2019	2.23
	CS3	February 2019	1.92

Notes: NA – Narrow Swamp weirs have been replaced with shallow piezometers to approximate stream flows

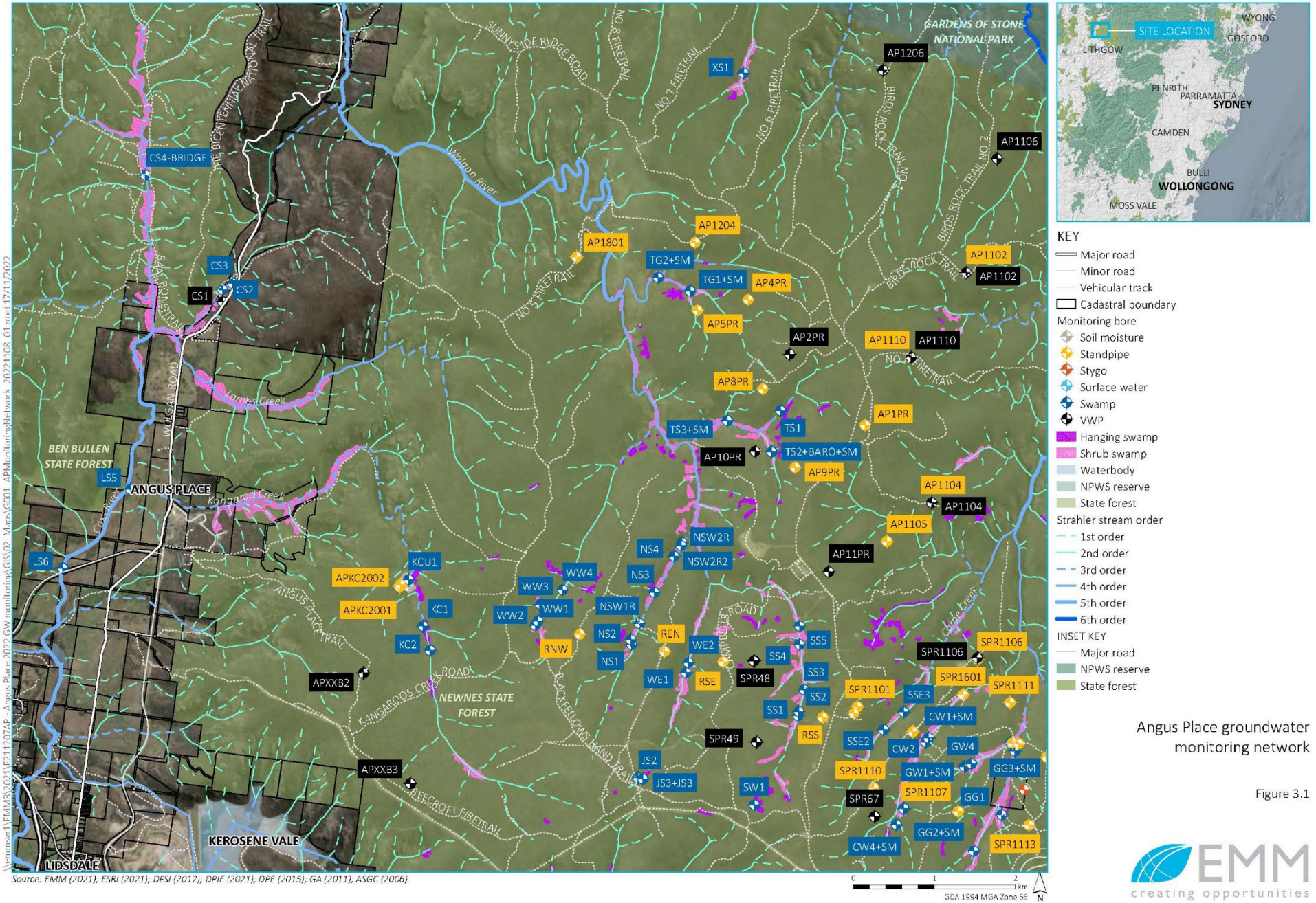


Figure 7-4: Groundwater Monitoring Locations

7.4.2 Environmental Performance

Groundwater monitoring is assessed in accordance with performance requirements set by Schedule 3, Condition 7 of MP06_0021, and against TARP requirements established within the WMP.

The following subsections summarise groundwater monitoring observations from the reporting period. Groundwater levels and piezometric pressures have been compared to the historical monitoring data. Triggers values of the WMP are compared when a monitoring site becomes 'post-mining' which is generally within 600 m of an active longwall. Most monitoring sites in the WMP are 'pre-mining'.

Ridge Piezometers

The ridge piezometer monitoring network is comprised of 16 monitoring bores targeting the shallow aquifer in the Banks Wall Sandstone.

Hydrographs for the ridge piezometers are presented in **Figure 7-5** which includes groundwater level data in metres AHD (mbgl) and the daily Cumulative Rainfall Departure (CRD) (mm). Dashed vertical lines indicate the reporting period, and logger depth at each monitoring location are presented on the left side of the figure. Manual measurements are recorded for locations REN, RSE, RNW and APKC2001.

All ridge piezometers, except for RNW which has been dry for some time, show an increasing trend in groundwater level. This is consistent with the CRD and delayed response to above average rainfall in 2022.

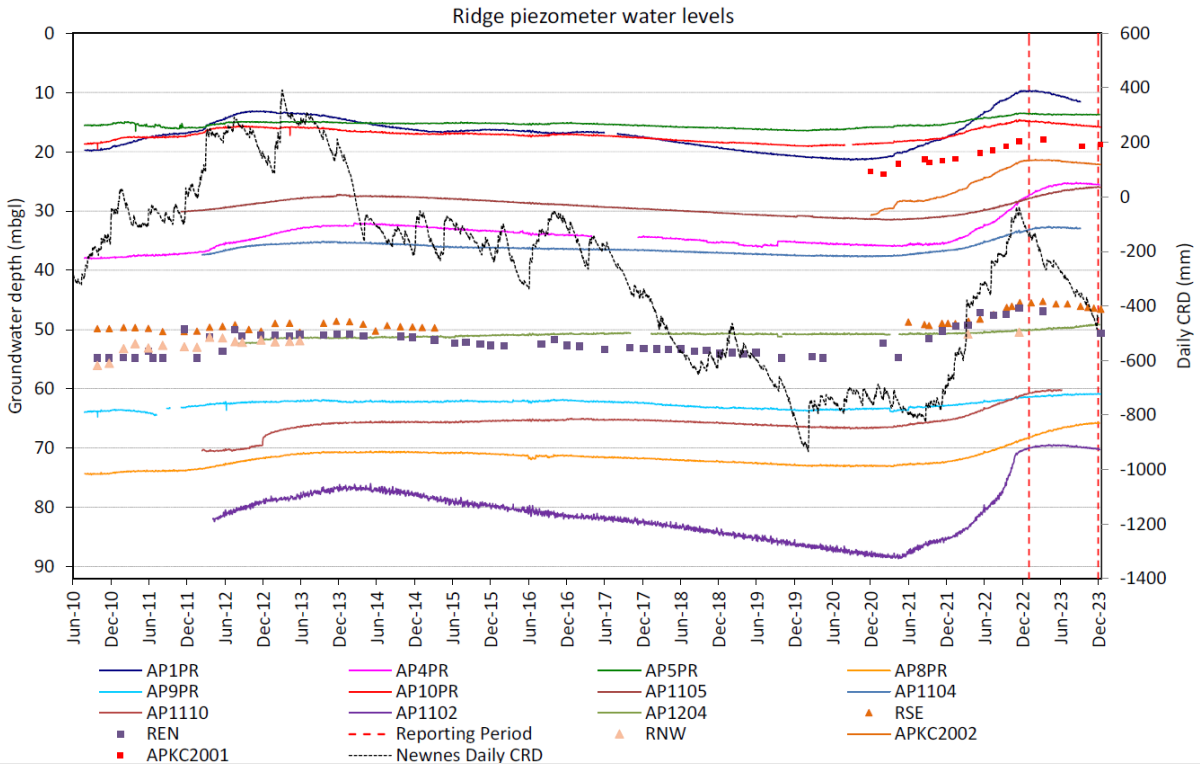


Figure 7-5: Ridge Piezometer Hydrograph

AP1801DP is a deep piezometer established to monitor groundwater quality as EPL467 monitoring point 18. EPL467 requires monthly monitoring for metals and alkalinity in addition to the basic water quality parameters. The bore is located in a remote part of the Newnes Plateau and during the reporting period, monitoring of the point was impeded due to

untrafficable road conditions, and the hydro sleeve breaking and getting caught down the bore hole. The Hydro sleeve was retrieved on 25 September 2023. Results from March, May and September to November are presented in **Table 7-13**.

Table 7-13: AP1801DP 2023 Monitoring Summary

Parameters	Monitoring Date				
	March 2023	May 2023	September 2023	October 2023	November 2023
Aluminium	0.43	0.18	0.97	9.06	1.72
Aluminium (dissolved)	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	0.008	0.005	0.009	0.023	0.009
Arsenic (dissolved)	0.005	0.004	0.004	0.005	<0.001
Barium	0.023	0.013	0.036	0.186	0.055
Barium (dissolved)	0.016	0.009	0.01	0.011	0.01
Boron	0.07	0.09	0.07	0.2	0.16
Boron (dissolved)	0.08	0.12	0.07	0.19	0.11
Copper	0.008	0.001	0.012	0.055	0.015
Copper (dissolved)	0.002	<0.001	<0.001	<0.001	<0.001
EC	400	553	631	637	611
Iron	2.58	1.22	3.82	37.2	6.6
Iron (dissolved)	0.44	0.13	<0.05	<0.05	<0.05
Manganese	0.05	0.03	0.069	0.474	0.088
Manganese (dissolved)	0.037	0.025	0.032	0.036	0.03
Nickel	0.009	0.003	0.013	0.04	0.018
Nickel (dissolved)	0.006	0.002	0.004	0.002	0.002
Oil and Grease	*	<5	<5	<5	<5
pH	7.1	7.1	7.5	7.2	7.4
Total alkalinity	311	306	323	326	316
TSS	*	122	184	*	412
Turbidity	18	26.7	126	169	5.3
Zinc	0.101	0.035	0.179	0.661	0.21
Zinc (dissolved)	0.028	0.016	0.023	0.009	0.01

* Insufficient sample to get the full suite of parameters

Vibrating Wire Piezometers

The Vibrating Wire Piezometer (VMP) monitoring network comprises of eleven monitoring locations measuring the piezometric pressures of multiple hydrogeological horizons within the deep and shallow aquifers. The majority of the VWP monitoring relates to Angus Place East proposed workings and has not been impacted by mining. One VWP has been installed in the Coxs River area where Angus Place West proposed workings are located.

Key observations from VWP data indicated continued stability in the water levels across the north-east area of the Newnes Plateau. If mining in this area is approved at some time in the future, this data will be useful to understand temporal variations in groundwater.

APC CS1 for Angus Place West show Sensors #1 and #3 having a slight decreasing trend, while sensor #2 displayed an increasing trend before decreasing and becoming stable.

Hydrographs for each monitoring site include piezometric pressure data for each sensor in mAHD and daily CRD. Dashed vertical lines indicate the reporting period, with sensor depths indicated to the left of each hydrograph. VWP hydrographs are presented in **Appendix 2.**

Swamp Piezometers

As part of the Angus Place Water Management Plan, an intensive monitoring program has been implemented on the Newnes Plateau to detect any impacts from mining on the groundwater regime, with an emphasis on Newnes Plateau Shrub Swamps (NPSS). The greater monitoring program incorporates NPSS and groundwater monitoring locations above both Angus Place and Springvale collieries.

A summary of key observations and trends is provided in **Table 7-14**, while a discussion of each swamp piezometer hydrograph is provided in the following subsections.

Table 7-14: Swamp Piezometer Summary

Swamp	Location	
Swamp Monitoring Bores		
Kangaroo Creek*	KC1	Predominately dry due to below average rainfall in 2023.
	KC2	Predominately dry due to below average rainfall in 2023.
	KCU1	Predominately dry, responding to rainfall events in March, April, August, October, and November 2023.
Tri Star Swamp	TS1	Decreasing groundwater trend, fluctuations in response to rainfall events.
	TS2	Groundwater level relatively stable until July 2023, whereby a decline likely related to the decreasing CRD trend is observed. Minor increasing fluctuations in response to rainfall.
	TS3	Groundwater level stable, just at or below ground level with minor fluctuations in response to rainfall events. No data available past September 2023.
West Wolgan Swamp*	WW1	Decreasing groundwater trend, fluctuations in response to rainfall events. No data after June 2023 because the bore was predominately dry.

Swamp	Location	
Swamp Monitoring Bores		
	WW2	Decreasing groundwater trend, fluctuations in response to rainfall events.
West Wolgan Swamp* (continued)	WW3	Groundwater level stable, response to rainfall event in November 2023.
	WW4	Predominately dry, responding to rainfall events in March and November 2023.
East Wolgan Swamp*	WE1	Predominately dry due to below average rainfall in 2023.
	WE2	Groundwater level was sustained between responses to multiple rainfall events.
Trail Six	XS1	Groundwater level stable, below ground level with minor fluctuations in response to rainfall events.
Twin Gully	TG1	Groundwater level stable, at or below ground level with minor fluctuations in response to rainfall events.
	TG2	Groundwater level stable, below ground level with relatively larger fluctuations in response to rainfall events compared to TG1.
Narrow Swamp*	NS1	Predominately dry due to below average rainfall in 2023.
	NS2	Predominately dry due to below average rainfall in 2023.
	NS3	Predominately dry due to below average rainfall in 2023. No data after September 2023.
	NS4	Predominately dry due to below average rainfall in 2023.
	NSW1R	Groundwater level fluctuated in response to rainfall events.
	NSW2R	Groundwater level fluctuated in response to rainfall events.
Long	LS5	Groundwater level fluctuating in response to rainfall events.
	LS6	Groundwater level decreasing in February due to below average rainfall, recovery to just below ground level in March. Data gap between June and August 2023.
	CS4	Groundwater level stable, ~1m below ground level.
Coxs River	CS2	Groundwater level stable with slight decreasing trend, just above ground level with minor fluctuations in response to rainfall events. Data gap between March and July 2023.
	CS3	Groundwater level stable, at or below ground level with minor fluctuations in response to rainfall events.

*Notes: * under-mined (in part or whole) by existing mine workings.*

Kangaroo Creek Swamp

The hydrograph for Kangaroo Creek Swamp is presented as **Figure 7-6**. Kangaroo Creek Swamp is currently monitored at three locations: KC1 (installed May 2005), KC2 (installed November 2008) and KCU1 (installed October 2020).

Following undermining in 2008, groundwater levels at KC1 and KC2 were typically dry and have shown minimal response to rainfall events. Since installation, KCU1 has typically been dry, however it is slightly more responsive to rainfall than KC1 and KC2.

During the reporting period, groundwater levels at KC1, KC2 and KCU1 were mostly dry, with immediate and direct responses to significant rainfall events observed at KCU1. Groundwater levels at all monitoring sites decline quickly after rainfall, indicating groundwater observations are likely through flow.

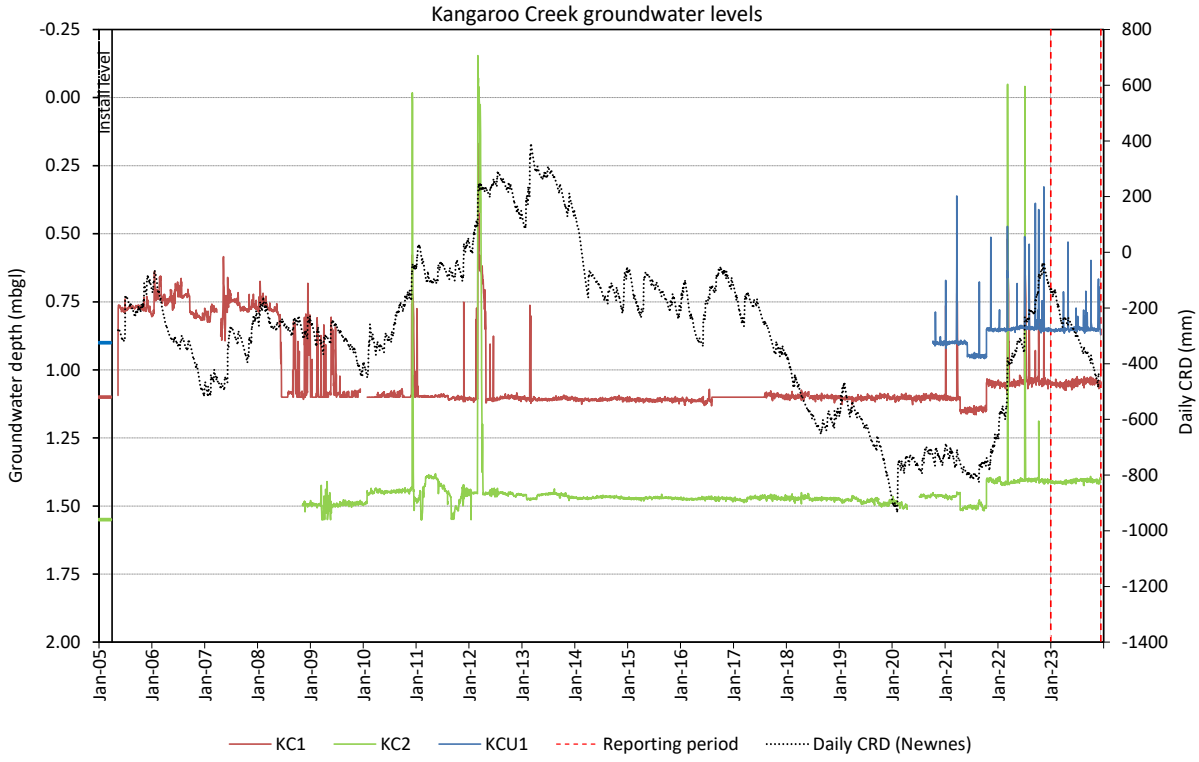


Figure 7-6: Kangaroo Creek Groundwater Levels

Tri Star Swamp

The hydrograph for Tristar Swamp is presented as **Figure 7-7**. Tristar Swamp is currently monitored at TS1, TS2 and TS3, all of which were installed October 2011.

Historically, TS1 and TS2 have been intermittently dry, responding to periods of above average rainfall, while the groundwater level at TS3 has remained stable at just below ground level.

During the reporting period, groundwater levels at TS1 and, TS2 show decreasing trends due to below average rainfall. Groundwater levels increased in November due to intense rainfall events. TS3 remained stable just at or below ground level. No data available for TS3 past September 2023 due to access restrictions.

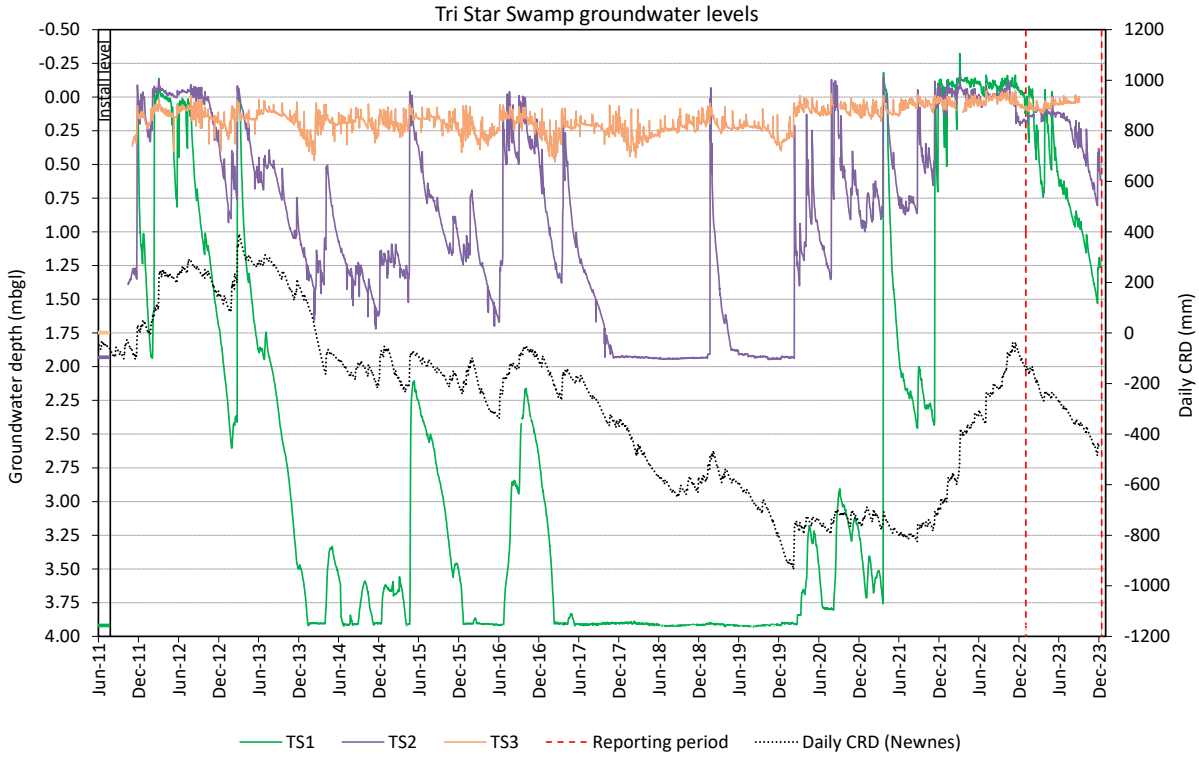


Figure 7-7: Tri Star Swamp Groundwater Levels

West Wolgan Swamp

The hydrograph for West Wolgan Swamp is presented as **Figure 7-8**. West Wolgan Swamp is currently monitored at four locations: WW1, WW2, WW3 and WW4 (all installed in 2005), which were undermined by longwalls LW930, LW940 and LW960 between May 2007 and July 2009.

Historically, groundwater levels at WW1 and WW2 have reflected the daily CRD trend. WW3 responds immediately and directly to rainfall recharge and drains quickly thereafter. WW4 has been predominately dry since 2012, only responding to significant rainfall events with groundwater levels draining quickly thereafter.

During the reporting period, groundwater levels at WW1 and WW2 decreased with minor fluctuations as a response to the decreasing CRD trend and remained below ground level. No groundwater level data was collected at WW1 after June 2023 because it was dry. Groundwater levels at WW3 and WW4 remained predominately dry with a slight increase in level due to above average rainfall in November and December 2023. Groundwater at WW3 drained quickly, while groundwater at WW3 did not drain as rapidly. The quickly declining groundwater level at WW4 indicates groundwater observations are likely through flow.

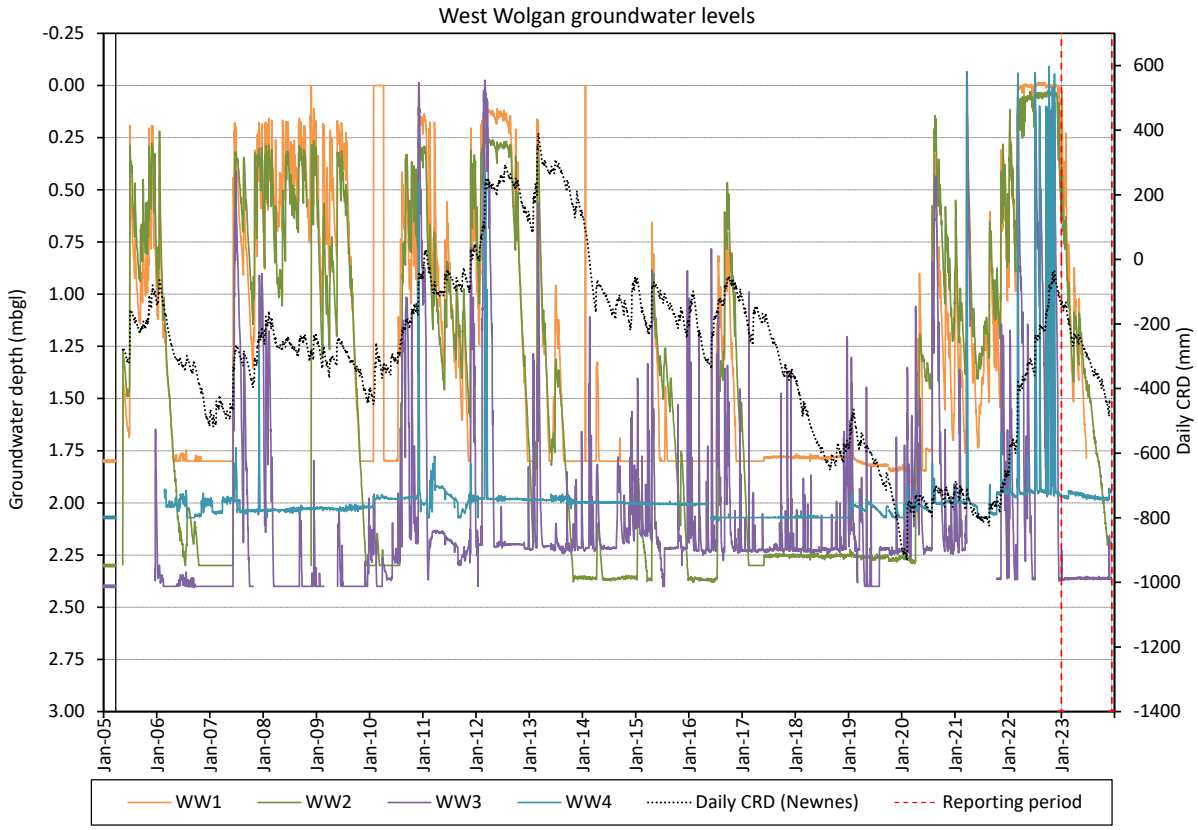


Figure 7-8: West Wolgan Groundwater Levels

East Wolgan Swamp

The hydrograph for East Wolgan Swamp is presented as **Figure 7-9**. East Wolgan Swamp is monitored by WE1 and WE2 (installed in May 2005).

Historically, East Wolgan Swamp has been influenced by emergency mine water discharges from licensed discharge point LDP004. Mine discharge events coincide with a groundwater level increase at WE1 and WE2 in 2005, 2008 and 2009. Apart from the discharge events, groundwater levels at WE1 and WE2 are typically dry, only responding to significant rainfall events. WE2 appears to be more responsive to rainfall than WE1.

During the reporting period, groundwater level at WE1 decreased from previous rainfall events in April and remained dry for the remaining period. Groundwater level at WE2 responded to multiple minor rainfall events in response to the CRD trend.

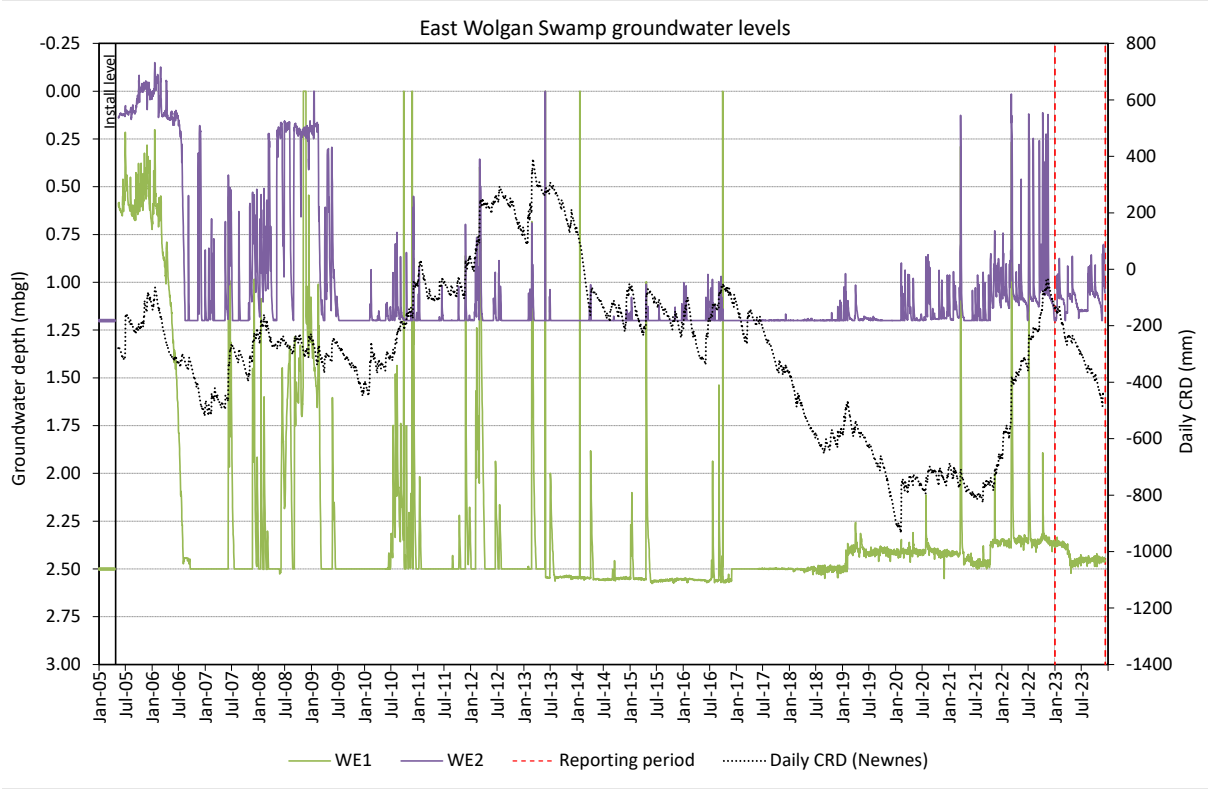


Figure 7-9: East Wolgan Groundwater Levels

Trail Six Swamp

The hydrograph for Trail Six Swamp is presented as **Figure 7-10**. The groundwater level at Trail Six Swamp is currently monitored at XS1, which was installed October 2011.

Historically, groundwater levels at XS1 have been relatively stable, reflecting a subdued response to the daily CRD.

During the reporting period, groundwater levels at XS1 were just below ground surface level with minor fluctuations in response to rainfall recharge.

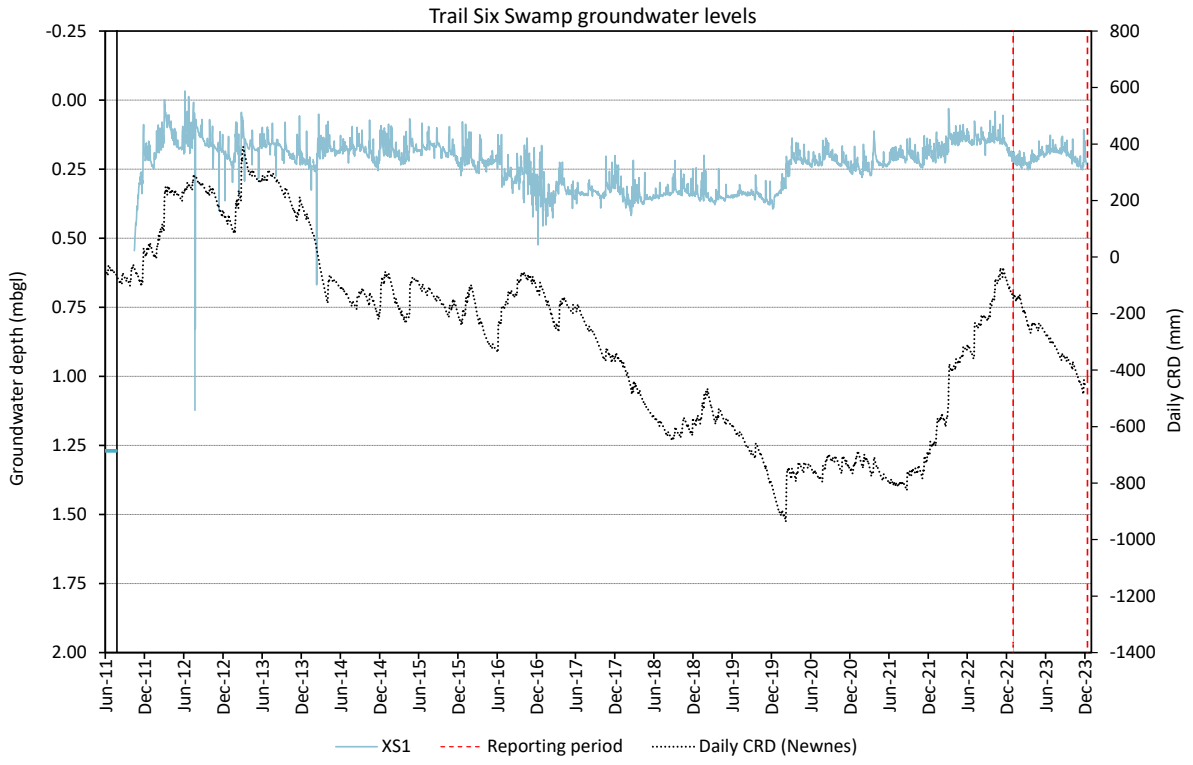


Figure 7-10: Trail Six Swamp Groundwater Levels

Twin Gully Swamp

The hydrograph for Twin Gully Swamp is presented as **Figure 7-11**. Twin Gully Swamp is currently monitored at TG1 (installed October 2011) and TG2 (installed April 2018).

Historically, groundwater levels at TG1 and TG2 have reflected the daily CRD trend, with TG2 tending to fluctuate in greater proportion than TG1.

During the reporting period, TG1 and TG2 decreased in March and rebounded following rainfall April and May. The increase was sustained until September where they again decreased until November where they rebounded following rainfall in November and December.

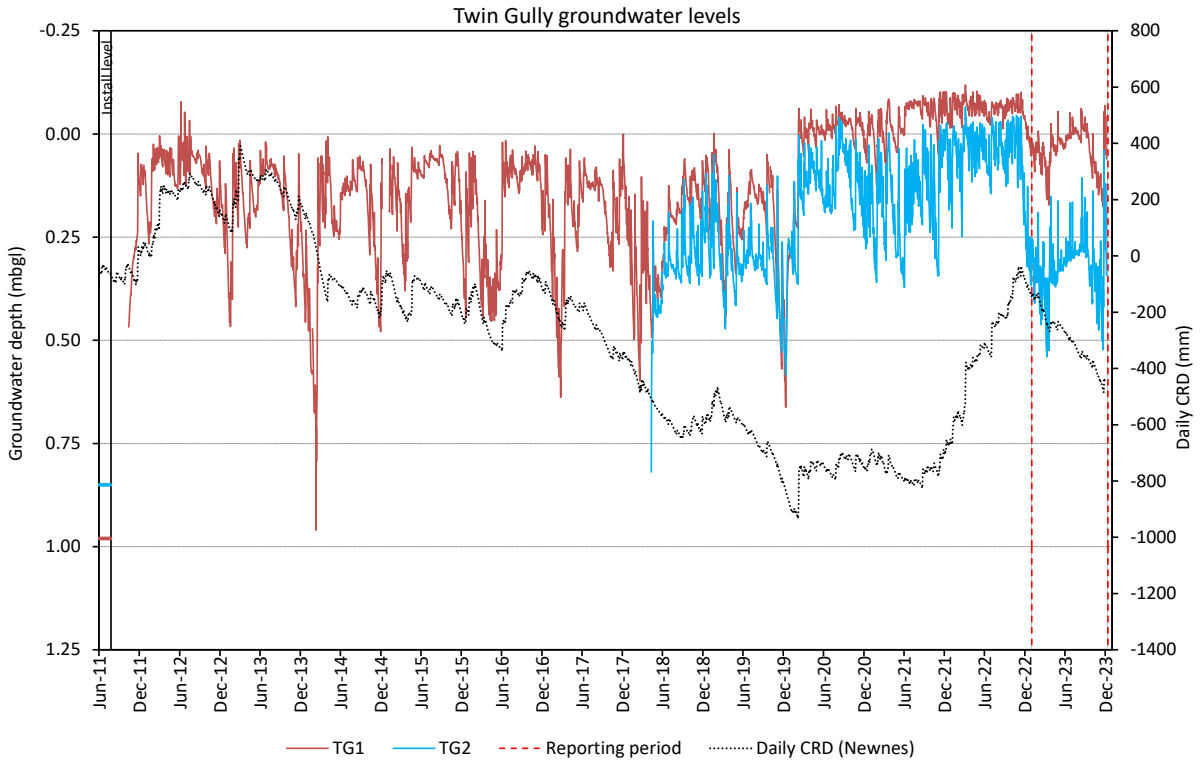


Figure 7-11: Twin Gully Swamp Groundwater Levels

Narrow Swamp

The hydrograph for Narrow Swamp is presented as **Figure 7-12**. Narrow Swamp is currently monitored at six locations: NS1 and NS2, which were installed in May 2005, NS3 which was installed February 2008, NS4 which was installed April 2008, and NSW1R and NSW2R which were installed in September 2021. NS1, NS2 and NSW1R monitor the upstream reaches of the swamp, NS3 monitors the middle reach, and NS4 and NSW2R monitor the downstream reach.

Historically, groundwater levels at Narrow Swamp have been influenced by emergency mine water discharge from licensed discharge points LDP004 and LDP006. Mine discharge events coincide with a water level increase in LDP004 over the period 2005 to 2008, and from LDP006 in 2009. With the exception of the discharge events, NS1 to NS4 have remained predominantly dry since 2009, only responding to significant rainfall events.

During the reporting period, groundwater levels at NS1, NS2, NS3 and NS4 were dry. There is no new data for NS3 since September because the logger reached its service life. The groundwater level at NSW1R and NSW2R fluctuated in response to rainfall events and dry periods.

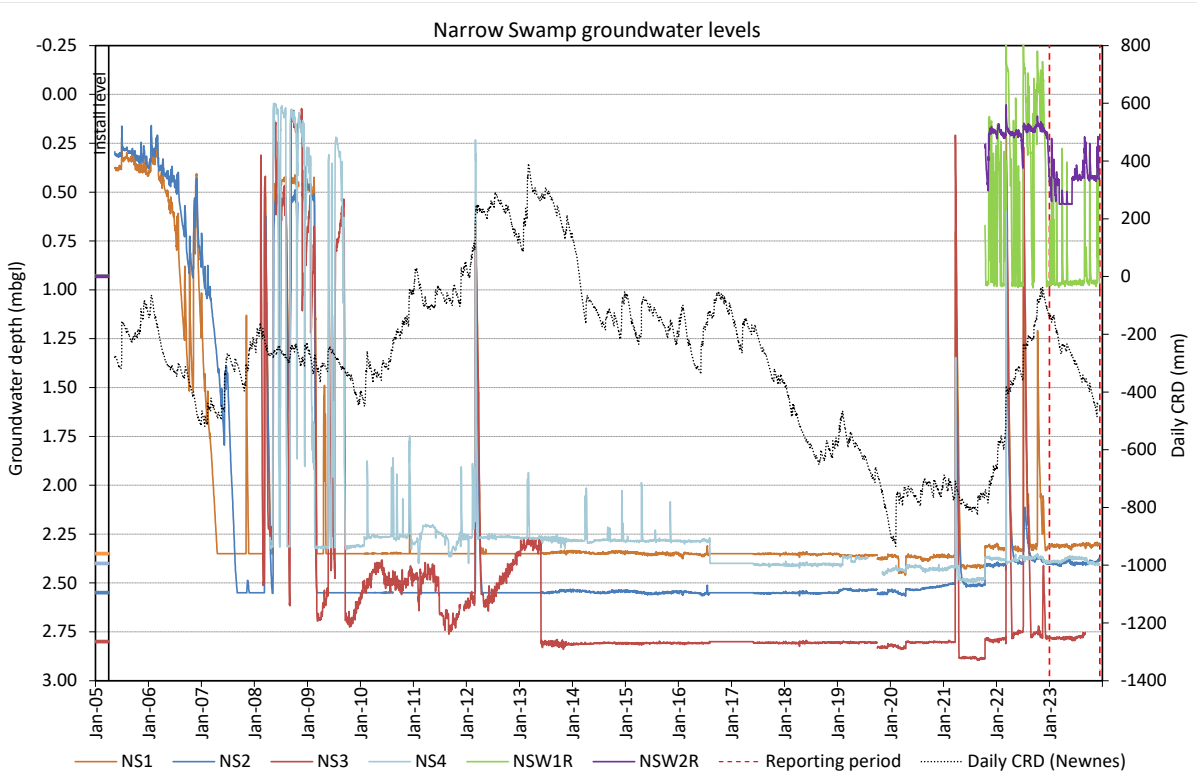


Figure 7-12: Narrow Swamp Groundwater Levels

Long Swamp

The hydrograph for Long Swamp is presented as **Figure 7-13**. Piezometer LS5 is installed in the upper reaches of Long Swamp and LS6 is installed in the lower reaches. Piezometer CS4 is located near the Leg Bridge, adjacent to the upper reaches of the Coxs River.

A data gap exists for CS4 and LS6 from October 2019 when the loggers were destroyed by bushfire. The loggers were replaced in August 2020. Another data gap exists for CS4 from January 2021, as the swamp piezometer was damaged by a vehicle. The piezometer and datalogger were replaced in September 2021.

Historically, groundwater levels at all monitoring sites typically fluctuate immediately and show a direct response to rainfall recharge. The base groundwater level at LS5 fluctuates more compared to CS4 and LS6.

During the reporting period, groundwater levels at CS4 remained relatively stable. Groundwater levels at LS6 showed a decrease in water level following CRD trends before becoming stable until data became unavailable. The groundwater level at LS5 showed minor increases in immediate response to rainfall events and was relatively stable with a longer groundwater level decay.

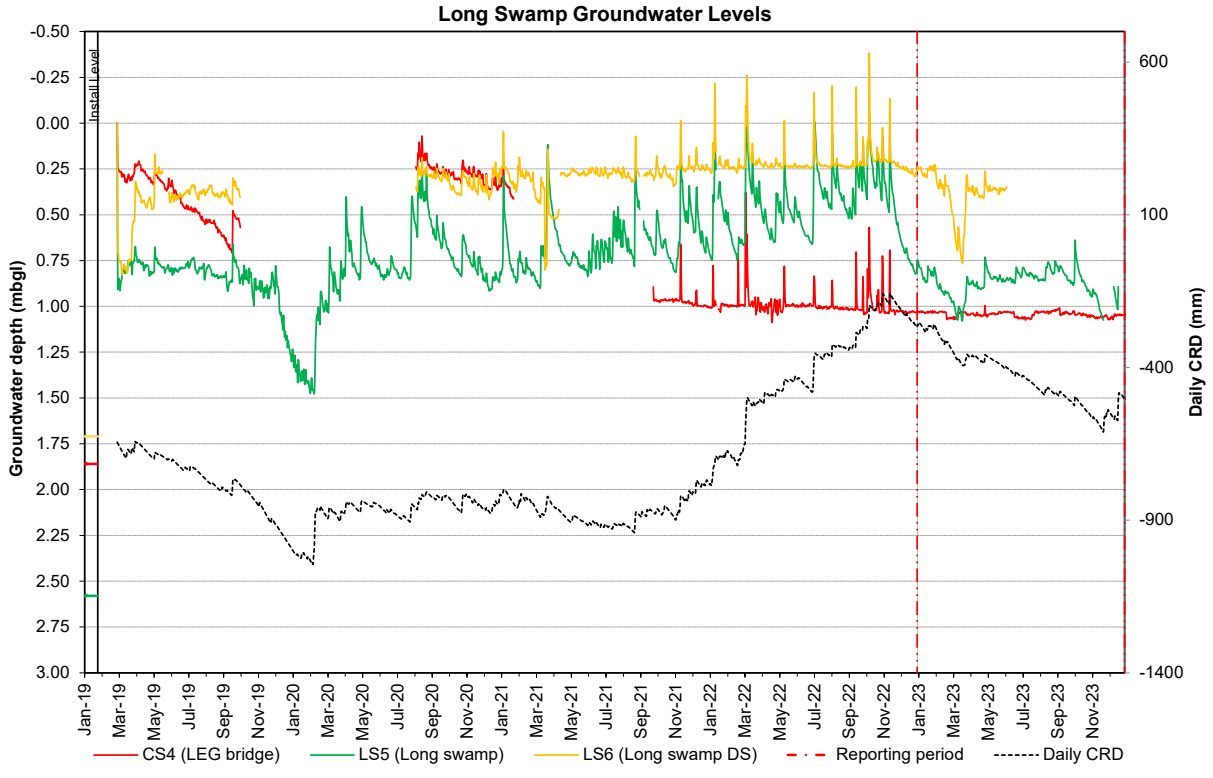


Figure 7-13: Long Swamp Groundwater Levels

Coxs River Swamp

The hydrograph for Coxs River Swamp is presented as **Figure 7-14**. Coxs River Swamp is monitored by CS2 and CS3, which were installed September 2019.

Historically, CS2 and CS3 were dry until February 2020 and July 2020, respectively, and have maintained stable groundwater levels since. This increase in groundwater levels is likely a direct response to the increasing CRD trend.

During the reporting period, groundwater levels at CS2 and CS3 show gradual decreasing trends that are consistent with the climatic observations.

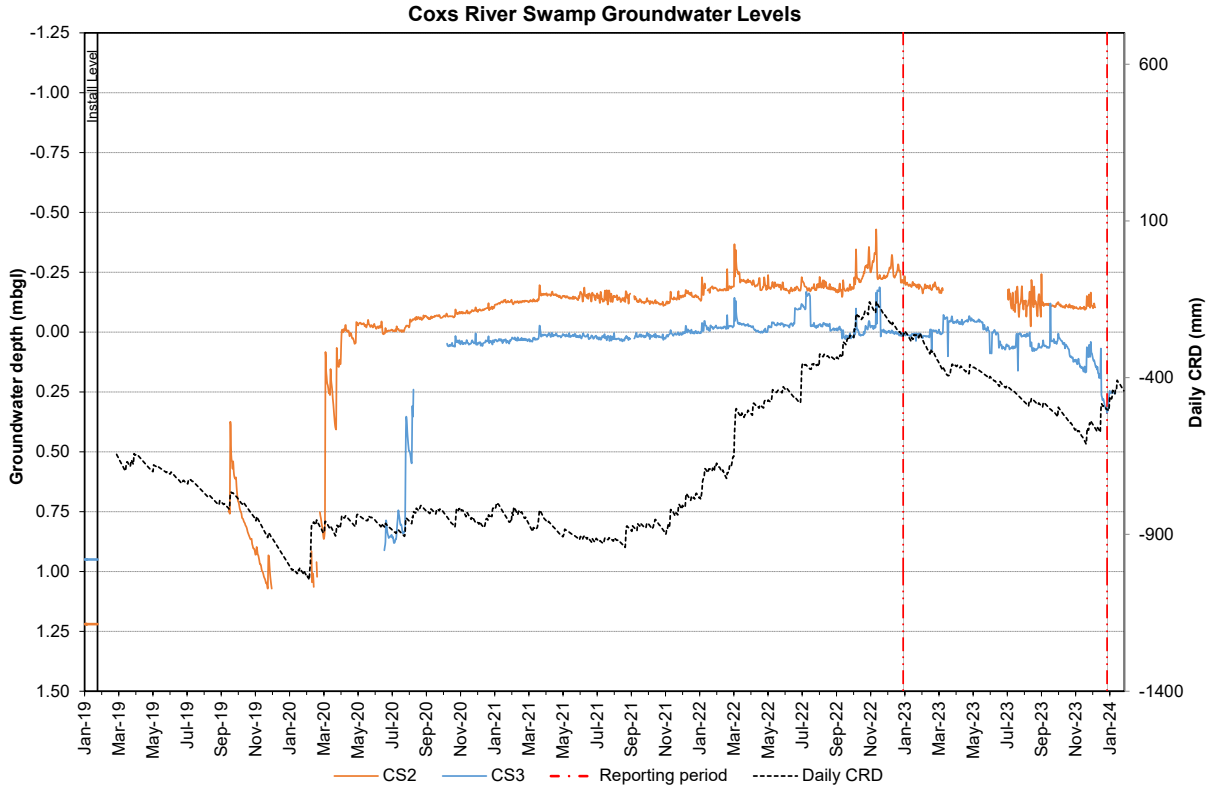


Figure 7-14: Cox River Swamp Groundwater Levels

7.4.3 Comparisons against Predictions

Groundwater water predictions are represented within the triggers established under the TARP of the approved WMP. Triggers values of the WMP are compared when a monitoring site becomes 'post-mining' which is generally within 600 m of an active longwall. Most monitoring sites in the WMP are 'pre-mining'.

Open standpipe piezometers displayed generally increasing groundwater levels, reflecting an attenuated and translated response to above average rainfall during the reporting period.

Vibrating Wire piezometric pressures were generally stable or responding to lower rainfall at most monitoring locations.

Swamp groundwater levels at reference sites were generally stable. Groundwater levels at monitoring locations that are typically dry and previously undermined, varied with rainfall.

7.4.4 Long Term Analysis

Long term groundwater monitoring data (over 10 years) for groundwater level and quality is presented in **Appendix 2** to this Annual Review, and within Section 5 of the WMP. As noted earlier above, during 2023 automated groundwater level monitoring was collected (refer

figures presented in previous sections above providing long term results). Long term data and trends for water quality are provided in the figures presented in the previous sections above. Table 7-15 summarises groundwater compliance reporting (non-administrative aspects) over the last five Annual Review reporting periods. Since 2019, monitoring reported in Annual Reviews for Angus Place Colliery has identified no instances of non-compliance events (or impacts related to) groundwater.

Table 7-15: Groundwater Compliance – Previous Five Annual Reporting Periods

Aspect	Annual Review Reporting Period				
	2019	2020	2021	2022	2023
Groundwater related non compliances	0	0	0	0	0

7.4.5 Implemented / Proposed Improvements

Following review of the Site Water Management Plan in 2023 a contractor has been engaged to revise the plan in the 2024 period to focus monitoring on current and future planned operations.

The revised management plan will be provided to the secretary for approval in accordance with the consent.

8 REHABILITATION

During the 2023 reporting period, Angus Place rehabilitation activities and monitoring for the 2023 Annual Review is presented in accordance with the RMP. A description of the proposed rehabilitation management and monitoring activities is provided in Part 6 and Part 8 of the RMP, available on the Angus Place website[16].

For completeness, it is noted that the introduction of detailed annual rehabilitation reporting required under revised Mining Lease conditions ('*Annual Rehabilitation Report',* in accordance with detailed 'Form and Way' reporting requirements set by NSWRR), is undertaken separately and in addition to the summary information provided in this Annual Review for MP06_0021.

Additionally, in accordance with Condition 36C in Schedule 3 of MP06_0021, Angus Place is required to develop a *Rehabilitation Strategy* within six months of the determination of Modification 7. The Rehabilitation Strategy was submitted on the 20 December 2023 and is sitting with the DPHI for review.

8.1 REHABILITATION PERFORMANCE MEASURES

8.1.1 Rehabilitation Objectives set by Development Consent MP06_0021

Rehabilitation objectives are prescribed by Condition 36B, Schedule 3 of MP06_0021, under which Angus Place must:

- Rehabilitate the site in accordance with the conditions imposed on the mining lease(s) associated with the development under the Mining Act 1992.
- Rehabilitation must be generally consistent with the proposed rehabilitation strategy described in the documents listed in Condition 2, Schedule 2 of the consent, and
- Be consistent with the rehabilitation outcome documents approved under the mining lease(s)

To achieve the broad rehabilitation objectives presented in MP06_0021, Angus Place developed specific domain rehabilitation objectives. The key rehabilitation objectives for each of the domains were established as part of developing the RMP in 2022 and are defined in Part 4 of the RMP. Commencement of the monitoring program will be triggered during rehabilitation planning activities.

The approved final landform, land use and detailed performance criteria further established within the RMP.

8.2 REHABILITATION PERFORMANCE DURING THE REPORTING PERIOD

8.2.1 Mining and Rehabilitation Status – Summary of Rehabilitation

The status of disturbance and rehabilitation for Angus Place (MP06_0021) as at the end of 2023 is presented in **Table 8-2** and **Figure 8-1**.

Table 8-1 below provides an overview of the rehabilitation status for Angus Place, including a summary of the previous, current, and projected reporting periods.

[16] *https://www.centennialcoal.com.au/operations/angus-place/*

Table 8-1: Rehabilitation Status

Mine Area Type	Previous Reporting Period (Actual) 2022	This Reporting Period (Actual) 2023	Next Reporting Period (Forecast) 2024
A1. Total disturbance footprint- Surface Disturbance[17]	64.29 ha	64.29 ha	64.29 ha
A2 Underground mining area	3339.96 ha	3339.96 ha	3339.96 ha
B. Total active disturbance[18]	39.75 ha	39.75 ha	39.75 ha
C. Rehabilitation - Land being prepared for rehabilitation[19]	0 ha	0 ha	0 ha
D. Land under active rehabilitation - Ecosystem and land use establishment and development[20]	0 ha	0 ha	0 ha
E. Completed rehabilitation[21]	0 ha	0 ha	0 ha

8.2.2 Rehabilitation Schedule

As an underground coal mine, infrastructure at Angus Place is required for the life of mine. Subsequently, land associated with key surface infrastructure will not become available for rehabilitation until the cessation of mining operations, with limited opportunity for progressive rehabilitation.

Mining is currently approved at Angus Place up until 2024 with an application underway for Angus Place West.

There are no disturbance or rehabilitation activities associated with surface infrastructure planned over the next three years apart from minor exploration related rehabilitation as part of the exploration program/s.

Minor rehabilitation works associated with approved construction and/or exploration may be required. If such works are required, they will be reported in the *Annual Rehabilitation Report* and *Forward Program*.

[17] **Total mine footprint:** includes all areas within a mining lease that either have at some point in time or continue to pose a rehabilitation liability due to mining and associated activities. As such it is the sum of total active disturbance, decommissioning, landform establishment, growth medium development, ecosystem establishment, ecosystem development and relinquished lands (as defined in the DRE MOP/RMP Guidelines). Please note that subsidence remediation areas are excluded.

[18] **Total active disturbance:** includes all areas requiring rehabilitation

[19] **Land being prepared for rehabilitation:** includes the sum of mine disturbed land that is under the following rehabilitation phases – decommissioning, landform establishment and growth medium development (as defined in DRE MOP/RMP Guidelines)

[20] **Land under active rehabilitation:** includes areas under rehabilitation and being managed to achieve relinquishment – includes 'ecosystem and land use establishment' and 'ecosystem and land use sustainability (as defined under the DRE MOP/RMP Guidelines)

[21] **Completed rehabilitation:** requires formal sign off from DRE that the area has successfully net the rehabilitation land use objectives or completion criteria

8.2.3 Rehabilitation Signoff

In 2023, Angus Place did not seek formal signoff from the NSW Resources Regulator that required land use objectives and completion criteria have been met for any rehabilitation areas.

Other Rehabilitation Works & Activities

Other rehabilitation activities undertaken during the reporting period included:

- **Rehabilitation Planning Activities** identified within the 2023 Annual Rehabilitation Report and Forward Plan included:
    - Engagement with adit sealing contractors was undertaken regarding adit sealing at Kerosene Vale (KV);
    - Planning progressed for the Angus Place Vent Facility reduction of disturbance and water catchment areas; and
    - Designs were developed to improve surface drainage and short-term water management onsite.
- **Rehabilitation Management and Maintenance** identified within the 2023 Annual Rehabilitation Report and Forward Plan included a general site clean-up.

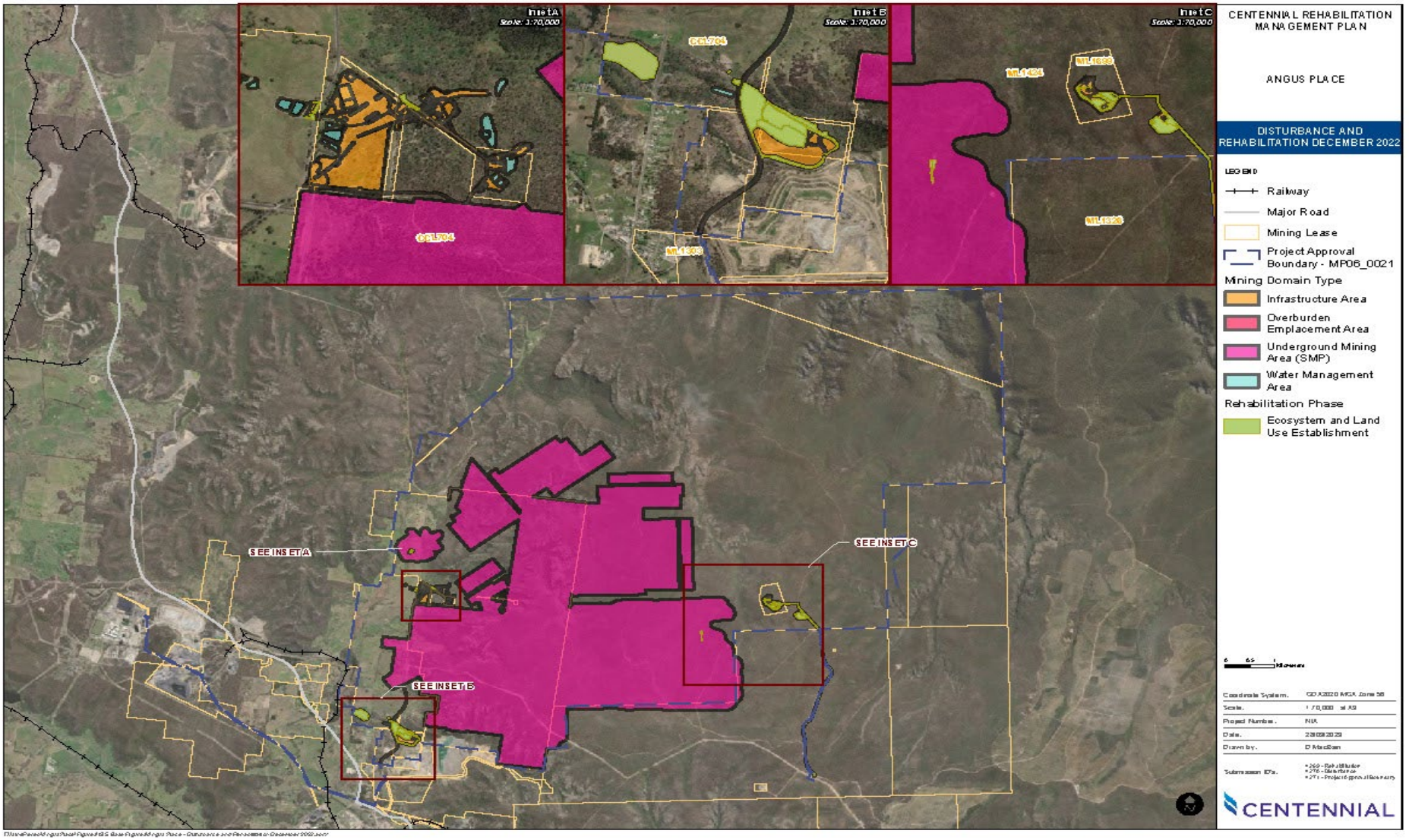


Figure 8-1: Disturbance and Rehabilitation

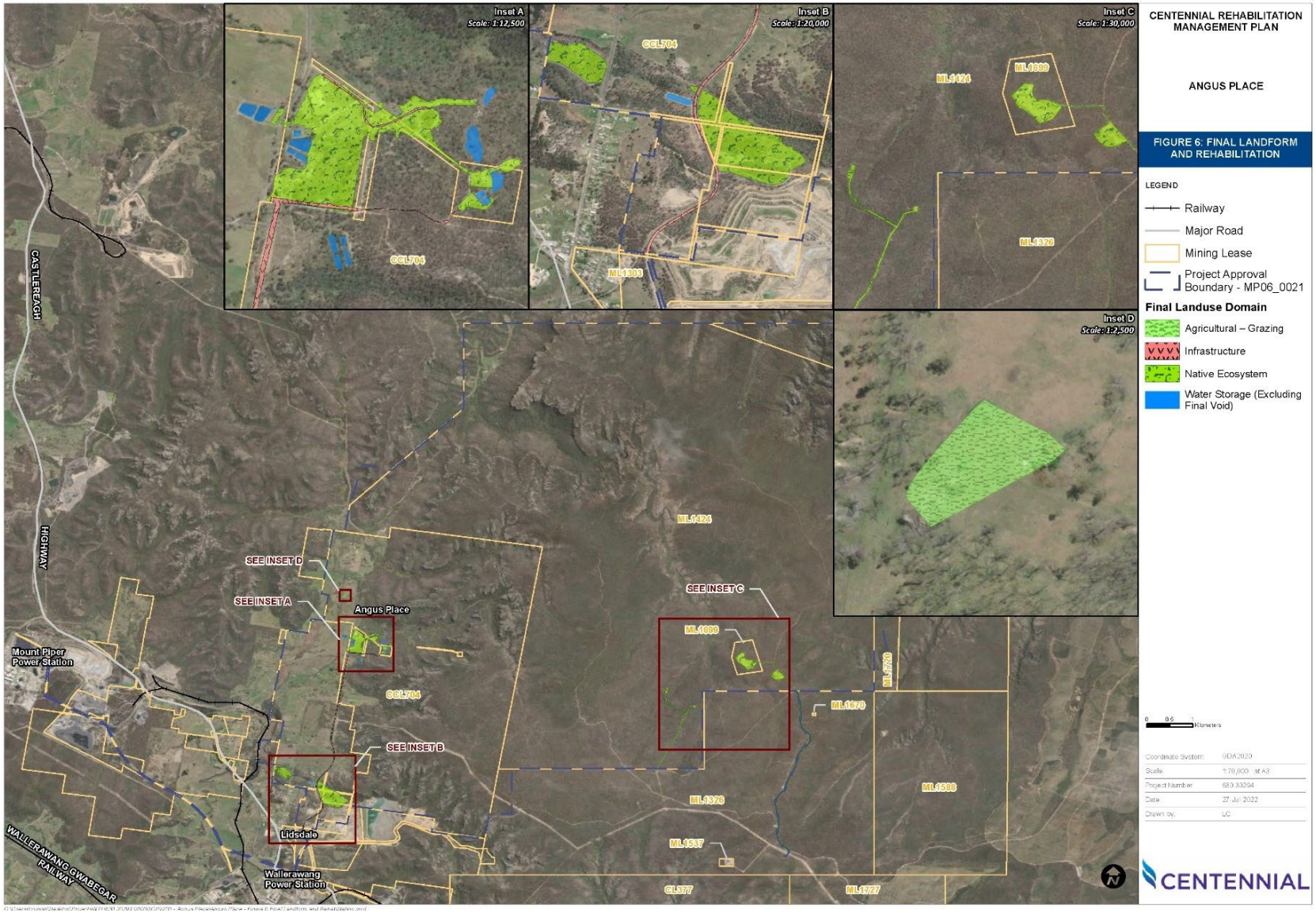


Figure 8-2: Final Landform and Rehabilitation (Source: RMP, November 2023)

8.3 REHABILITATION MONITORING

Angus Place currently has limited existing rehabilitation and infrastructure will be retained for LOM. Opportunities for progressive rehabilitation are currently limited, and monitoring is currently primarily associated with completion of a targeted research program discussed further in **Section 8.4**. Notwithstanding this, a rehabilitation monitoring program has been developed in Section 8 of the RMP (November 2023) ready to establish monitoring of the condition, performance, and progress of rehabilitated areas when rehabilitation commences, including the establishment of appropriate reference sites ('analogue sites') if/where required to increase statistical strength and allow comparison of rehabilitation monitoring sites scores to reference sites. Reporting of rehabilitation monitoring in the Annual Review will occur at such time. The location of current rehabilitation areas and proposed monitoring sites is presented in **Figure 8-6**.

8.3.1 Summary of Rehabilitation Monitoring

This section presents the results of rehabilitation monitoring undertaken during the 2023 reporting period.

Angus Place has very limited existing rehabilitation and infrastructure will be retained for LOM. Commencement of the monitoring program under the RMP will be triggered during rehabilitation planning activities.

Replanting and translocation trials associated with the Angus Place East (APE) Vent Facility was subject to a planning condition to develop a research program as detailed in **Section 6.6.2.3**). Research commenced in 2014 and is currently led by the Royal Botanic Gardens and Domain Trust (RBG&DT) under the auspices of an ACARP funding program. Research has continued to monitor the success of translocations and propagation of individual plants, and determination of plant community survival.

8.3.2 Recommended Actions Arising from 2023 Annual Rehabilitation Monitoring

Rehabilitation maintenance and corrective actions are identified in Section 2.2.3 of the *2023 Annual Rehabilitation Report and Forward Program* and is available on the Angus Place website.

The were no rehabilitation maintenance and corrective actions proposed over the forward program.

8.4 REHABILITATION TRIALS AND RESEARCH

Angus Place established the *Persoonia hindii* Research and Management Plan in 2013 to address Schedule 3, Condition 24A (e) and (h) of MP06_0021, which involved trialling relocation methodologies with respect to *Persoonia. hindii*. survival rates from the trial were last assessed in 2023.

Further research with the *Persoonia hindii* Rare Native Plant Research Program offers insights into how *Persoonia* species may be successfully propagated and re-established in rehabilitation settings. This program falls under Section 4.6 (Supplementary Offset Measures) of the WR-BOS. Propagation/translocation trials have been progressively implemented since inception of the program and are ongoing as detailed in **Section 6.6.2.3**.

There are no other future rehabilitation research, modelling or trials proposed to be undertaken.

8.5 PROPOSED ACTIONS IN NEXT REPORTING PERIOD

During 2024, Angus Place will:

- Continue to pursue approval of the revised *Western Region Biodiversity Management Plan*.
- Continue implementation of the new RMP.

Angus Place will continue to negotiate with the National Parks and Wildlife Service about land management responsibilities and requirement in relevant swamps above secondary extraction areas in the Gardens of Stone State Conservation Area. This action will inform means of addressing specialist recommendations arising from 2023 biodiversity monitoring, as detailed in **Section 6.6**.

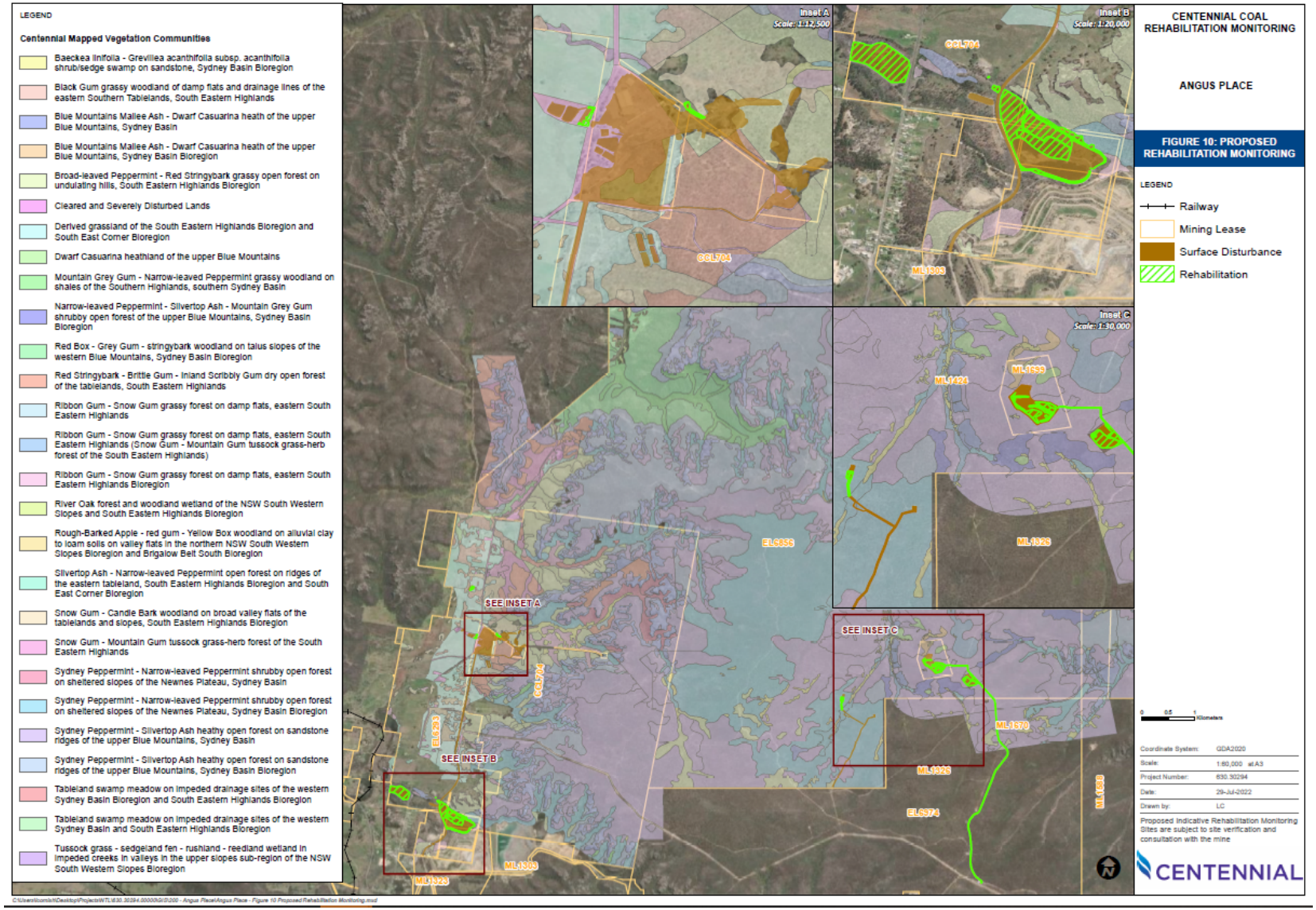


Figure 8-3: Rehabilitation and Proposed Monitoring (RMP, November 2023)

9 COMMUNITY CONSULTATION

9.1 COMMUNITY ENGAGEMENT

Centennial Angus Place consults with the community through forums such as the Angus Place Community Consultative Committee.

Meetings of the Centennial Site Community Consultative Committee (CCC) were held in March, June, September and December 2023. Representatives of the Western community/communities, appointed community representatives, relevant government organisations and company representatives attended the CCC meetings. A detailed presentation was provided to attendees at each CCC meeting on the current operations, an update on key projects, the environmental performance of the operation, and upcoming activities.

Key agenda items discussed in 2023 included the Angus Place West Project, environmental performance and notifiable incidents.

9.2 COMMUNITY DONATIONS AND SPONSORSHIP

Angus Place continues to support the local community through various donations and sponsorship avenues to community activities, groups and associations, including:

- Partnership with the Royal Botanical Gardens with regards to the *Persoonia hindii* ACARP research project detailed in **Section 6.6.2.3**.

9.3 COMMUNITY COMPLAINTS

There was one community complaint received on 19 December 2023 regarding the extent of overgrown weeds including blackberries along Maddox Lane in the Commonwealth Colliery. Angus Place had already sprayed the blackberry in the area prior to the complaint through the 2023 blackberry spraying program. The spraying program will continue throughout 2024.

Table 9-1 below shows the community complaints record for the previous five reporting periods.

Table 9-1: Record of annual community complaints

Community Complaints						
Year	**Air**	**Water**	**Noise**	**Waste**	**Other**	**Total**
2023	**0**	**0**	**0**	**0**	**1**	**1**
2022	0	0	0	0	0	0
2021	0	0	0	0	0	0
2020	0	0	0	0	0	0
2019	0	1	0	0	0	**1**

10 INDEPENDENT ENVIRONMENTAL AUDIT

Schedule 5 Condition 8 of the Angus Place Approval required Angus Place Colliery to commission an independent environmental audit prior to 31 December 2007.

There was no independent audit requirement applicable for the 2023 reporting period.

11 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

During the 2023 calendar year reporting period there were a total of six reportable incidents and non-compliances (excluding community complaints) where multiple incidents occurred over a multiple months (due failure to sample).

Table 11-1 provides a summary of the incidents and non-compliances, including the actions taken in response to the incident/non-compliance:

Table 11-1: Incidents and Non-Compliances during the Reporting Period

Compliance[22]	Overview of incident/non-compliance	Description of incident/non-compliance	Actions	Status of Actions
Non-Compliance 1	**EPL467 M2.3, WMP:** Failure to monitor on the 09/11/23 at LDP003.	A discharge sample was taken from LDP003 on 09/11/2023 by Centennial staff. The sample was picked up by the sampling contractor 10/11/2023. It was confirmed on the 22/12/2023 that the sample was collected from site, although the sampler did not complete any analysis or communicate to the laboratory the status of the sample. The sample was discarded during the monthly lab clean out, resulting in a non-compliance with the sampling frequency specified in condition M2.3.	• Nil, no adverse impacts considered to have occurred. • This has been brought up with the service provider as a contractual issue.	• Completed

[22] See Compliance Status Key beneath **Table 1.2** for risk level, colour code and description.

Compliance[22]	Overview of incident/non-compliance	Description of incident/non-compliance	Actions	Status of Actions
Non-Compliance 2	**EPL467 M2.3, WMP:** Failure to monitor on the 30/04/2023 at LDP002.	Water discharged via LDP002 (overflowed) on the 30/04/2023 without a monthly grab sample being taken in accordance with condition M2.3 following 43.2mm of rainfall.	• Nil, no adverse impacts considered to have occurred. • Sampling of the discharge was conducted on the 01/05/2023. The results obtained for the 01/05/2023 complied with the limits specified in L2.4. • A colour coded TARP level gauge was installed. The Environment Coordinator is responsible to ensure a monthly discharge sample has been completed before weekends where predicted rainfall exceeds 30mm.	• Completed

Compliance[22]	Overview of incident/non-compliance	Description of incident/non-compliance	Actions	Status of Actions
Non-Compliance 3	**EPL467 M2.3, WMP:** Failure to monitor the required number of samples in accordance with M2.3 at EPL Point 18 on 8 occasions throughout 2023.	Monitoring Point 18 was unable to be sampled in January and February due its location on Newnes Plateau along a remote, difficult to access track. The track became impassable due to the wet weather and fallen trees resulting in the monthly grab sample being unable to be taken in accordance with condition M2.3 Monitoring Point 18 was unable to be sampled in June (23/06/2023), July and August due to the hydro sleeve rope snapping (23/06/2023) causing the hydro sleeve and excessive rope to fall into the monitoring bore. An insufficient sample was acquired from Monitoring Point 18 in March (02/03/2023), April (12/4/2023), October (17/10/2023) and December (13/12/2023). Sampling was undertaken, however insufficient volume was able to be obtained to test all analytes listed in M2.3. The bore exceeds 300m in depth and the sampling contractor has had difficulties using the hydro sleeve to retrieve enough water to conduct analysis of all parameters required for the monthly grab sample.	• No adverse impacts considered to have occurred. • A hydro sleeve has been placed in the bore to assist with sampling. The monitoring point is associated with the Temporary Water Treatment Plant and associated discharges which have since ceased and associated conditions removed from the EPL. • This monitoring point will be requested to be removed from the EPL via a licence variation application also triggering a WMP revision • Retrieve the hydro sleeve	• Centennial has an independent report recommending removing this monitoring point from the EPL. Internal recommendation has been to not remove the EPL monitoring points due to the option of installing a new Temporary Water Treatment Plant. • The hydro sleeve was retrieved on the 26/09/23 allowing monitoring to re-commence in September 2023

Compliance[22]	Overview of incident/non-compliance	Description of incident/non-compliance	Actions	Status of Actions
Non-Compliance 4	**EPL467 M2.3, WMP:** Failure to monitor the required number of samples in accordance with M2.3 at EPL Point 17 on 4 occasions January, February, March, and September.	Access to Point 17 was restricted due to a landslide and road closure on Wolgan Gap Road. There was no access for the general public into Wolgan Valley from January to March. In April, a temporary 4WD track was constructed by Lithgow City Council and access was reinstated for approved personnel. In September there was confusion from Lithgow City Council as to why our water sampling contractors required access. This was rectified in October.	• No adverse impacts considered to have occurred. • Road repairs are the responsibility of Lithgow City Council. A temporary 4WD track has been constructed and access granted from Lithgow City Council. • This monitoring point will be requested to be removed from the EPL via a licence variation application also triggering a WMP revision	• Centennial has an independent report recommending removing this monitoring point from the EPL. The EPL variation is currently in draft.
Non-Compliance 5	**EPL467 M2.3, WMP:** Failure to monitor the required number of samples in accordance with M2.3 at EPL Point 16 on 2 occasions March, October.	Failure to monitor in accordance with M2.3 at EPL Point 16. A monthly grab sample was undertaken on the 02/03/2023 at EPL Monitoring Point 16, however, the Oil and Grease glass bottle smashed in transit to the laboratory. The Oil and Grease sample was unable to be analysed, resulting in a non-compliance with M2.3 A monthly grab sample was not conducted in October 2023 at Wolgan River Upstream due to an impassable flooded hole in the road.	• No adverse impacts considered to have occurred. • Sampling contractor has reviewed transport practices. • A monthly grab sample was not conducted in October 2023 at Wolgan River Upstream due to an impassable flooded hole in the road. • This monitoring point will be requested to be removed from the EPL via a licence variation application also triggering a WMP revision	• Centennial has an independent report recommending removing this monitoring point from the EPL. The EPL variation is currently in draft

Non-Compliance 5	**MPL 314 (1973), ML 1699 (1992), ML 1424 (1992), ML 1326 (1992), ML 1720 (1992), CCL 704 (1973) Forward Program for Angus Place Colliery -** Failure to comply with Schedule 8A of the Mining Regulation 2016, 9 October 2023	Centennial Springvale Pty Ltd (Angus Place) was notified of the commencement of an investigation into the alleged contravention of 2 breaches of the Regulation against titles MPL 314 (1973), ML 1699 (1992), ML 1424 (1992), ML 1326 (1992), ML 1720 (1992), CCL 704 (1973). These contraventions were for the 2022 and 2023 Forward Program against Clause 13(1) of Schedule 8A of the Regulation requiring a forward program to be developed and Clause15(2) requiring its submission to the Secretary before 60 days after the last day of each annual reporting period (or a later date as approved by the Secretary). In relation to the 2022 contravention, Angus Place failed to submit the 2022 forward program to the Regulator as required. In relation to the 2023 contravention Angus Place submitted the 2023 forward program on 4 May 2023 after the due date although Regulator Portal issues are acknowledged as a contributing factor to this late submission. The Rehabilitation Cost Estimate (RCE) required as a component of the forward program was submitted on 9 October 2023. The	Both contraventions of s.378D of the Mining Act 1992 were sustained and Springvale was issued an Official Caution on 22 December 2023. All required documents have now been submitted to the Resource Regulator.	Completed

Compliance[22]	Overview of incident/non-compliance	Description of incident/non-compliance	Actions	Status of Actions
		late submission of the RCE component means the forward program requirement was not satisfied until 9 October 2023, later than the 31 March 2023 due date.		

12 ACTIVITES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Table 12-1 presents activities that are currently planned for the next reporting period.

Table 12-1: Forecast Operations for 2024

Improvement/Other Actions
Completion and submission of the Angus Place West Project EIS
Submit a variation of EPL467 to the EPA
Revise biodiversity and water monitoring obligations
A review of monitoring requirements for biodiversity will be undertaken to consider consent obligations to monitor for specific timeframes as well as focusing on current and proposed mining activity.
Management Plan Revisions
Ongoing consultation with the DPHI regarding the Western Region Biodiversity Management Plan
Revision of Water Management Plan
Condition Triggers
In accordance with Condition 4(a) in Schedule 5 of MP06_0021 strategies, plans, and programs required under the consent will be reviewed within three months of the submission of this annual review. If necessary, the strategies, plans, and programs required under the approval will be revised to the satisfaction of the Secretary.

13 REFERENCES

ANZECC (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand.

Biodiversity Monitoring Services (2024). *Fauna Report: Angus Place Combined Terrestrial Fauna Monitoring Report*, prepared for Centennial Angus Place Pty Ltd

EMM (2018). *Angus Place Water Treatment Project Section 75W Modification – Environmental Assessment*, prepared by EMM for Centennial Angus Place Pty Limited.

EMM (2024). *Angus Place Colliery Annual Environmental Monitoring Report – Surface Water and Groundwater*, prepared by EMM for Centennial Angus Place Pty Limited.

GHD (2016). *Upper Coxs River Catchment Aquatic Ecology Monitoring Program*, prepared by GHD Pty Ltd for Centennial Coal Company Ltd.

GHD (2020). *Alternative Water Management Strategy Noise and Vibration Impact Assessment (Modification 6)*, prepared by GHD Pty Ltd for Centennial Coal and Energy Australia.

GHD (2024). *UCRC Aquatic Ecology: Angus Place site summaries from 2023 monitoring*, prepared by GHD Pty Ltd for Centennial Coal Company Ltd.

Heggies (2010). *Angus Place Colliery – Section 75W Modification Air Quality Impact Assessment*, prepared by Heggies Pty Ltd for Centennial Coal Company Limited.

RPS (2012). *Angus Place Colliery, Ventilation Facility Project: Modification 2 of Project Approval 06_0021 Environmental Assessment Volume 1: Report*, prepared by RPS Australia East Pty Ltd for Centennial Angus Place Pty Ltd.

RPS (2024a). *Angus Place Flora Monitoring: Longwalls 920-980 Summer 2022/23 Report*, prepared by RPS for Centennial Angus Place Pty Limited.

RPS (2024b). *Angus Place Flora Monitoring: Longwalls 920-980 Autumn 2023 Report*, prepared by RPS for Centennial Angus Place Pty Limited.

RPS (2024a). *Angus Place Swamp Monitoring Program for LW900-910 Seasonal and Annual Flora Monitoring: Baseline Report*, prepared by RPS for Centennial Angus Place Pty Limited.

RPS (2024b). *Angus Place Flora Monitoring: Longwalls 920-980 Spring 2023 Report*, prepared by RPS for Centennial Angus Place Pty Limited.

SLR (2012). *Angus Place Colliery Ventilation Facility Project: Air Quality and Greenhouse Gas Assessment (Modification 2),* prepared by SLR Consulting Australia Pty Ltd for Centennial Coal Company Limited.

SLR (2022a). *NSW Rehabilitation Reform Support Rehabilitation Monitoring Review and Proposed Method,* prepared by SLR Consulting Australia Pty Ltd for Centennial Angus Place Pty Limited.

SLR (2023b). *Angus Place Quarterly Noise Monitoring – March 2023,* prepared by SLR Consulting Australia Pty Ltd for Centennial Angus Place Pty Limited.

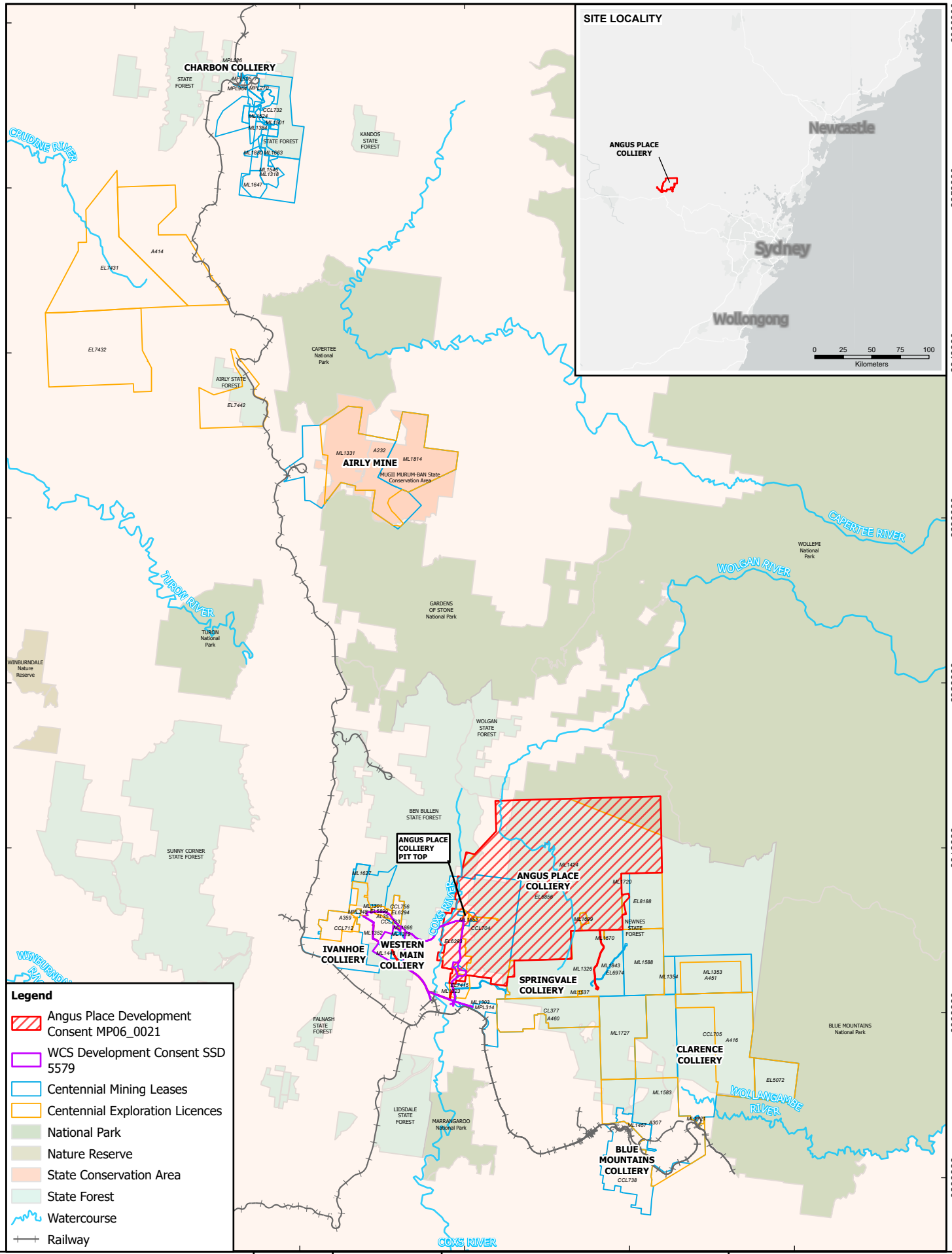
SLR (2023c). *Angus Place Quarterly Noise Monitoring – June 2023,* prepared by SLR Consulting Australia Pty Ltd for Centennial Angus Place Pty Limited.

SLR (2023d). *Angus Place Quarterly Noise Monitoring – September 2023,* prepared by SLR Consulting Australia Pty Ltd for Centennial Angus Place Pty Limited.

SLR (2023e). *Angus Place Quarterly Noise Monitoring – December 2023,* prepared by SLR Consulting Australia Pty Ltd for Centennial Angus Place Pty Limited.

WMP (2021). *Angus Place Colliery Water Management Plan*, prepared by Centennial Angus Place Pty Limited.

PLANS



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N

0 5 10 15
Kilometers

Coordinate System: GDA2020 MGA Zone 56

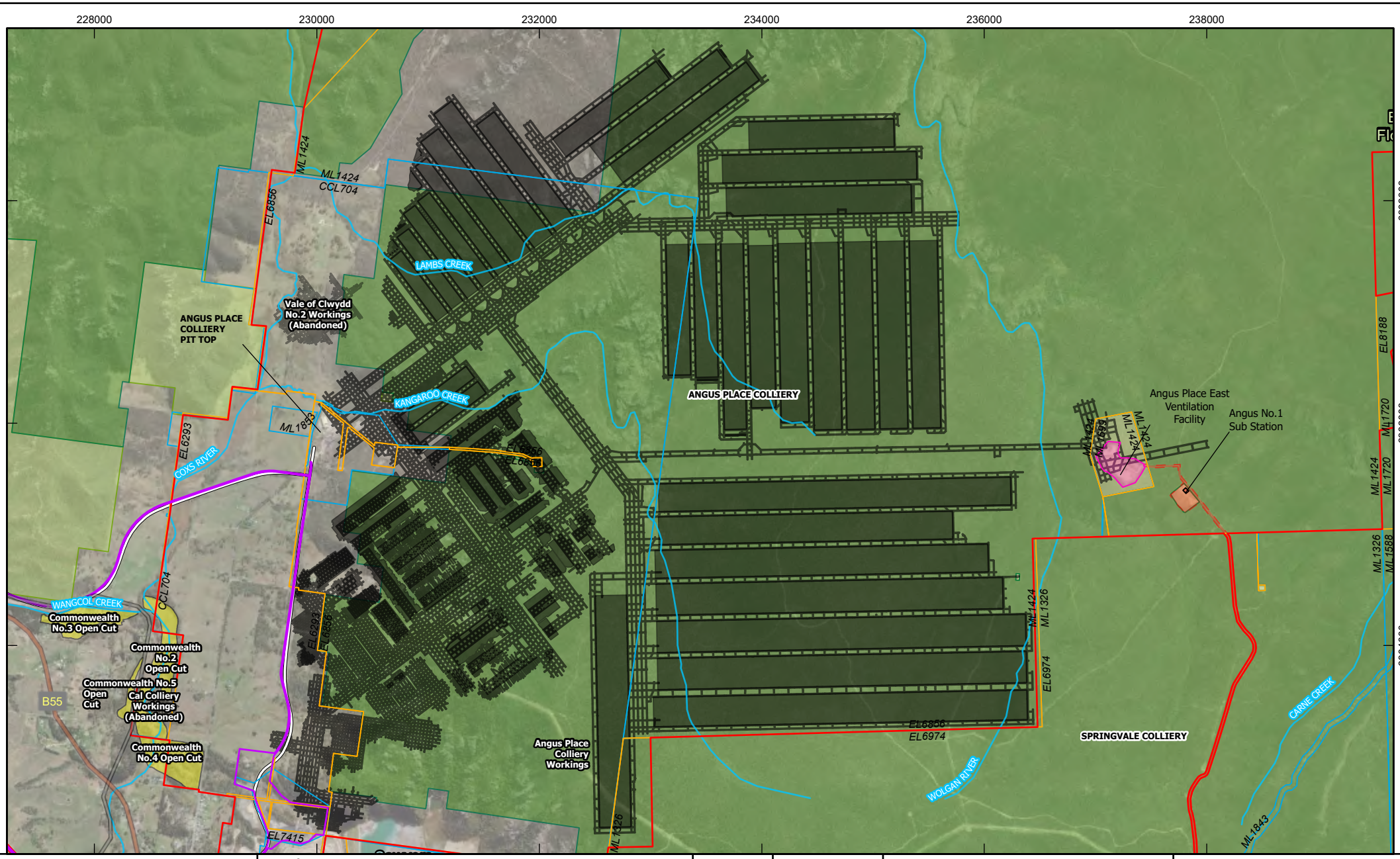
LOCATION	Angus Place
SEAM	N/A
DRAWN	N.Lloyd
CHECKED	M.Denley
APPROVED	W.Olson
SCALE	1:300,000 @ A4

ANGUS PLACE COLLIERY
Annual Review 2023
Regional Locality
---Figure 1---

CENTENNIAL ANGUS PLACE

DATE: 21/03/2024 | FASS10001 | R1

Esri, TomTom, Garmin, FAO, NOAA, USGS



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Coordinate System: GDA2020 MGA Zone 56

Legend

- Angus Place Development Consent MP06_0021
- WCS Development Consent SSD 5579
- Centennial Exploration Licences
- Centennial Mining Leases
- State Conservation Area
- State Forest
- Open Cut Extents
- Existing Underground Workings
- Western Haul Road
- Watercourse

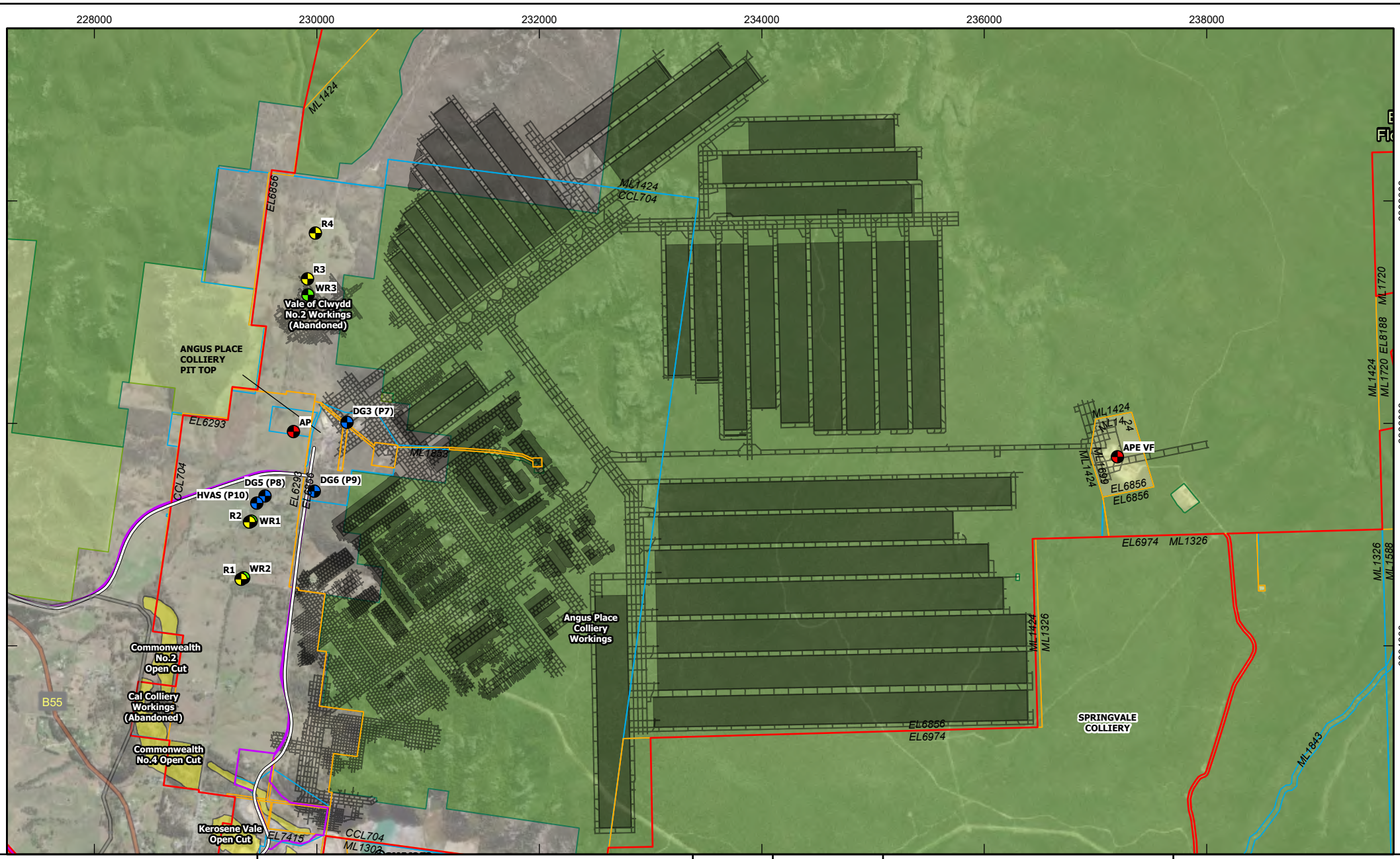
LOCATION	Angus Place
SEAM	Lithgow
DRAWN	N.Lloyd
CHECKED	M.Denley
APPROVED	W.Olson
SCALE	1:45,000 @ A4

ANGUS PLACE COLLIERY
Annual Review 2023
Site Layout
---Figure 2---

CENTENNIAL ANGUS PLACE

DATE: 21/03/2024 | FASS10002 | R1

Esri, TomTom, Garmin, Foursquare, METI/NASA, USGS, Maxar



0 0.5 1 1.5 2
Kilometers

Coordinate System: GDA2020 MGA Zone 56

Esri, TomTom, Garmin, Foursquare, METI/NASA, USGS, Maxar

Legend

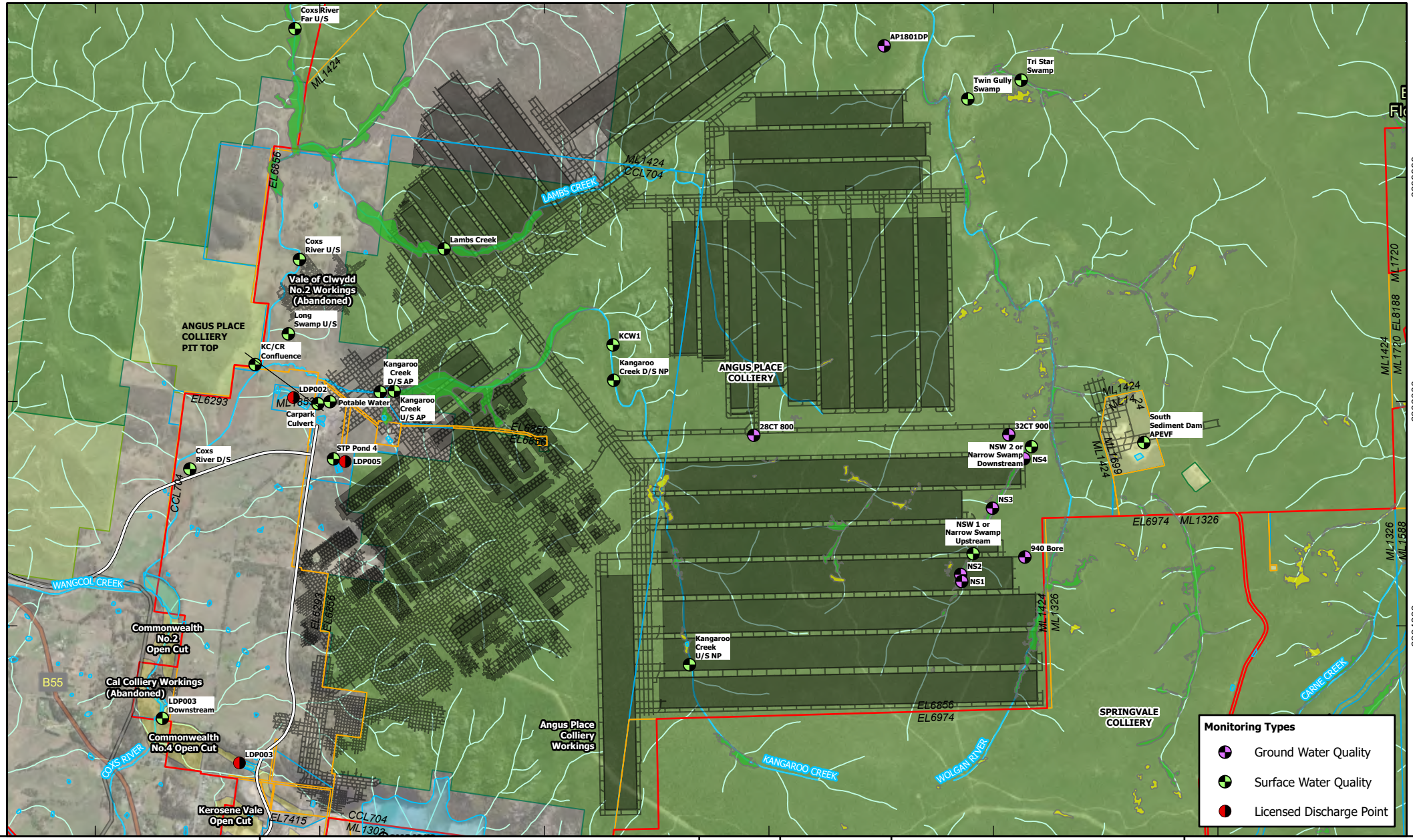
- Angus Place Development Consent MP06_0021
- WCS Development Consent SSD 5579
- Centennial Exploration Licences
- Centennial Mining Leases
- State Conservation Area
- State Forest
- Open Cut Extents
- Existing Underground Workings
- Western Haul Road
- Air Monitoring
- Meteorological Monitoring
- Sensitive Receiver Dust
- Noise Monitoring Sites

LOCATION	Angus Place
SEAM	Lithgow
DRAWN	N.Lloyd
CHECKED	M.Denley
APPROVED	W.Olson
SCALE	1:45,000 @ A4

ANGUS PLACE COLLIERY
Annual Review 2023
Meteorological, Air Quality and Noise Monitoring Sites
---Figure 3---

CENTENNIAL ANGUS PLACE

DATE: 21/03/2024 | FASS10000 | R2



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Kilometers

Coordinate System: GDA2020 MGA Zone 56

Legend

- Angus Place Development Consent MP06_0021
- Centennial Exploration Licences
- Centennial Mining Leases
- State Conservation Area
- State Forest
- Open Cut Extents
- Western Haul Road
- Existing Underground Workings
- Watercourse
- Drainage Lines
- Dams
- MU50 Newnes Plateau Shrub Swamp (EEC)
- MU51 Newnes Plateau Hanging Swamp (EEC)
- MU52 Newnes Plateau Rush - Sedge Snow Gum

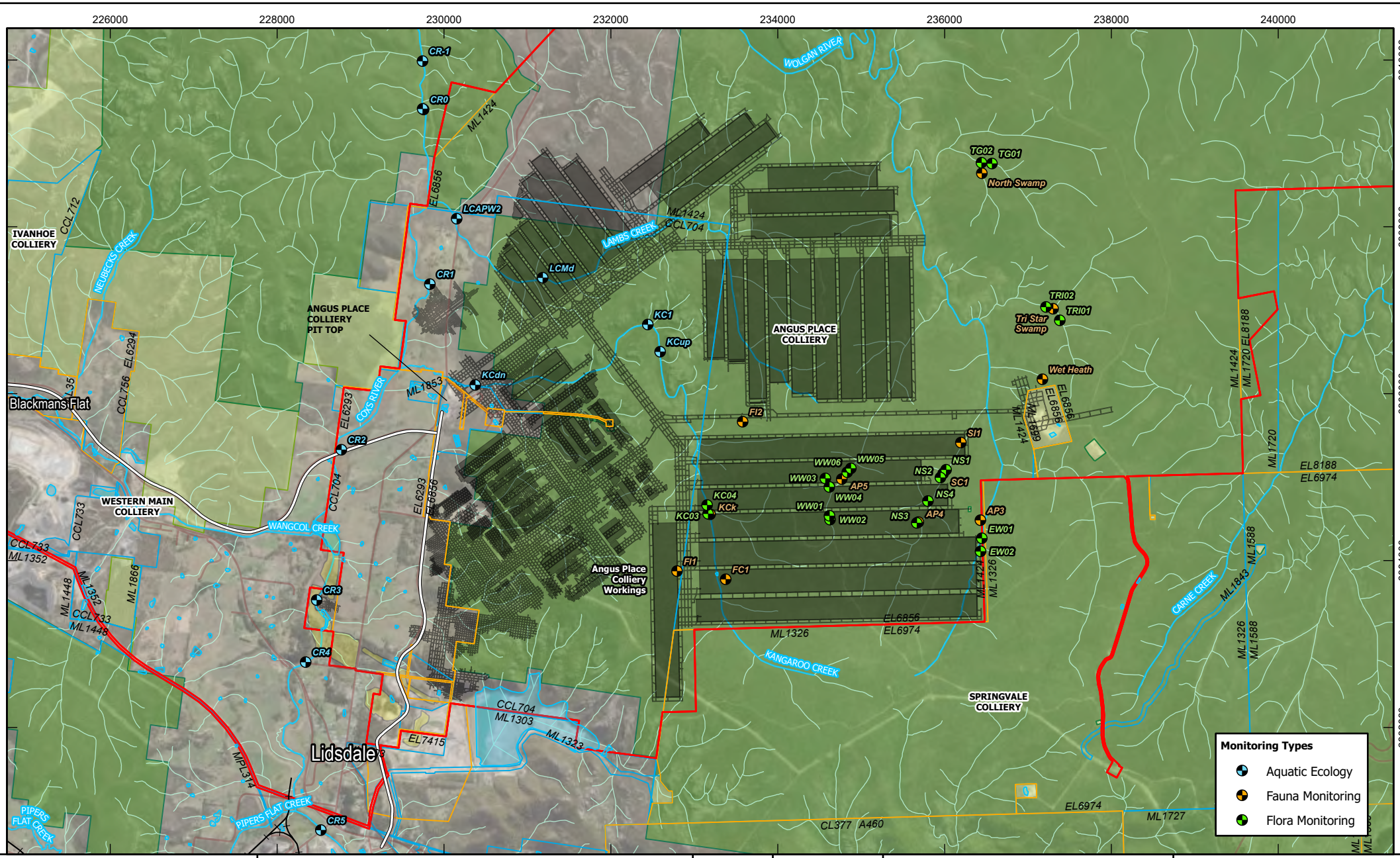
LOCATION	Angus Place
SEAM	Lithgow
DRAWN	N.Lloyd
CHECKED	M.Denley
APPROVED	W.Olson
SCALE	1:45,000 @ A4

ANGUS PLACE COLLIERY
Annual Review 2023
Water Monitoring Sites
---Figure 4---

CENTENNIAL ANGUS PLACE

DATE: 5/12/2023 | FASS10003 | R2

Esri, TomTom, Garmin, Foursquare, METI/NASA, USGS, Maxar



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Kilometers

Coordinate System: GDA2020 MGA Zone 56

Legend

- Angus Place Development Consent MP06_0021
- Centennial Exploration Licences
- Centennial Mining Leases
- State Conservation Area
- State Forest
- MU50 Newnes Plateau Shrub Swamp (EEC)
- MU51 Newnes Plateau Hanging Swamp (EEC)
- Dams
- Underground Workings
- Open Cut Extents
- Existing Underground Workings
- Western Haul Road
- Roads
- Railway
- Watercourse
- Drainage Lines

LOCATION	Angus Place
SEAM	Lithgow
DRAWN	N.Lloyd
CHECKED	M.Denley
APPROVED	W.Olson
SCALE	1:60,000 @ A4

ANGUS PLACE COLLIERY
Annual Review 2023
Ecological Monitoring Sites
---Figure 5---

CENTENNIAL ANGUS PLACE

DATE: 18/01/2024 | FASS10004 | R2

Esri, TomTom, Garmin, Foursquare, METI/NASA, USGS, Earthstar Geographics

PLOTFILE: N:\SHARED\GDA_2020\Plans\Angus Place\FASS10005_R1.aprx

CENTENNIAL FASSIFERN ©

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meters

Coordinate System: GDA2020 MGA Zone 56

Legend

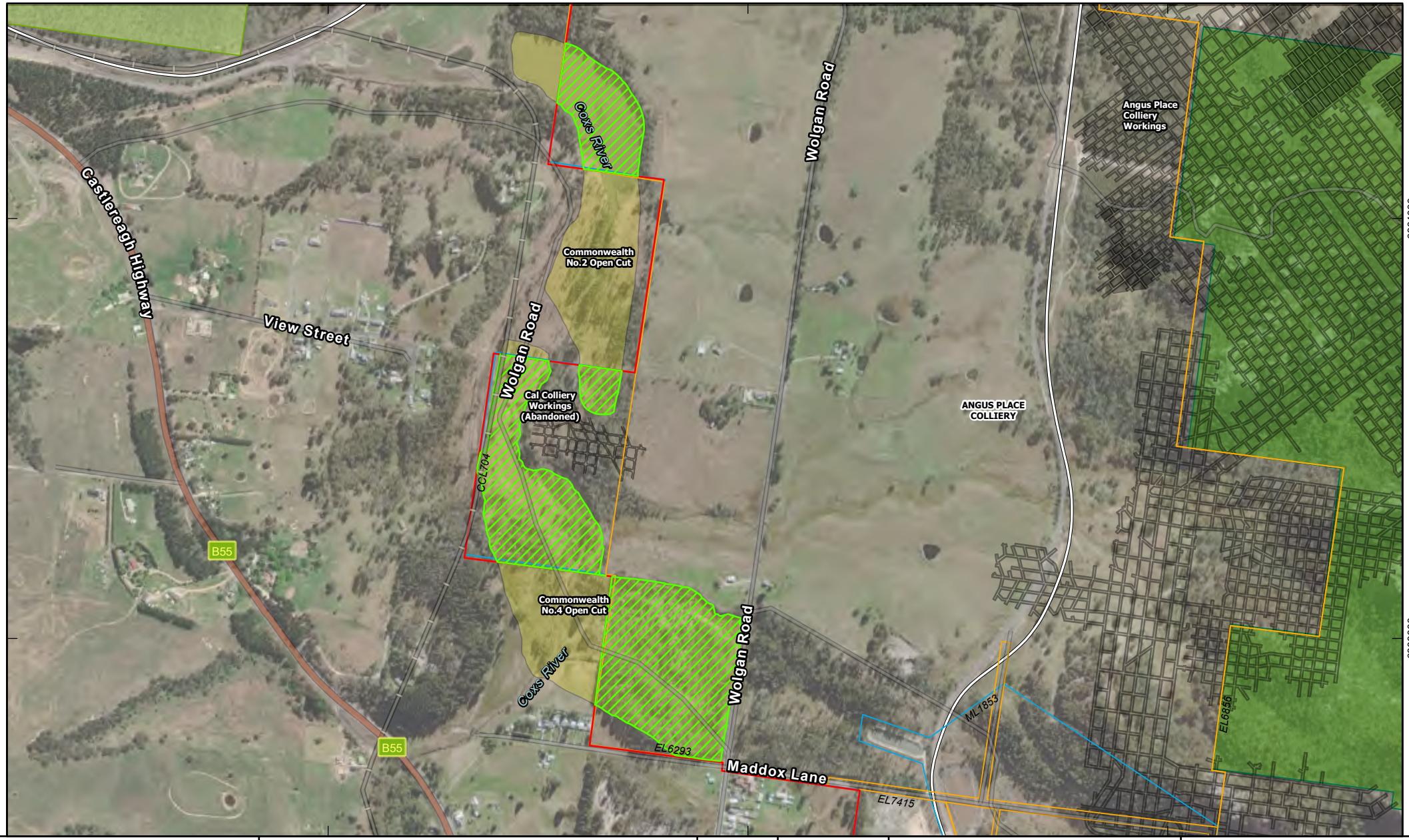
- Centennial Exploration Licences
- Infrastructure Area
- Water Management Areas
- State Conservation Area
- State Forest
- Western Haul Road
- Existing Underground Workings
- Watercourse
- Licence Discharge Points

LOCATION	Angus Place
SEAM	Lithgow
DRAWN	N.Lloyd
CHECKED	M.Denley
APPROVED	W.Olson
SCALE	1:6,000 @ A4

ANGUS PLACE COLLIERY
Annual Review 2023
Angus Place Pit Top
---Figure 6---

CENTENNIAL ANGUS PLACE

DATE: 18/01/2024 | FASS10005 | R1



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meters

Coordinate System: GDA2020 MGA Zone 56

Legend

- Angus Place Development Consent MP06_0021
- Centennial Exploration Licences
- Centennial Mining Leases
- State Conservation Area
- State Forest
- Rehabilitation Areas - Open Cut Boundaries
- Open Cut Extents
- Western Haul Road
- Existing Underground Workings

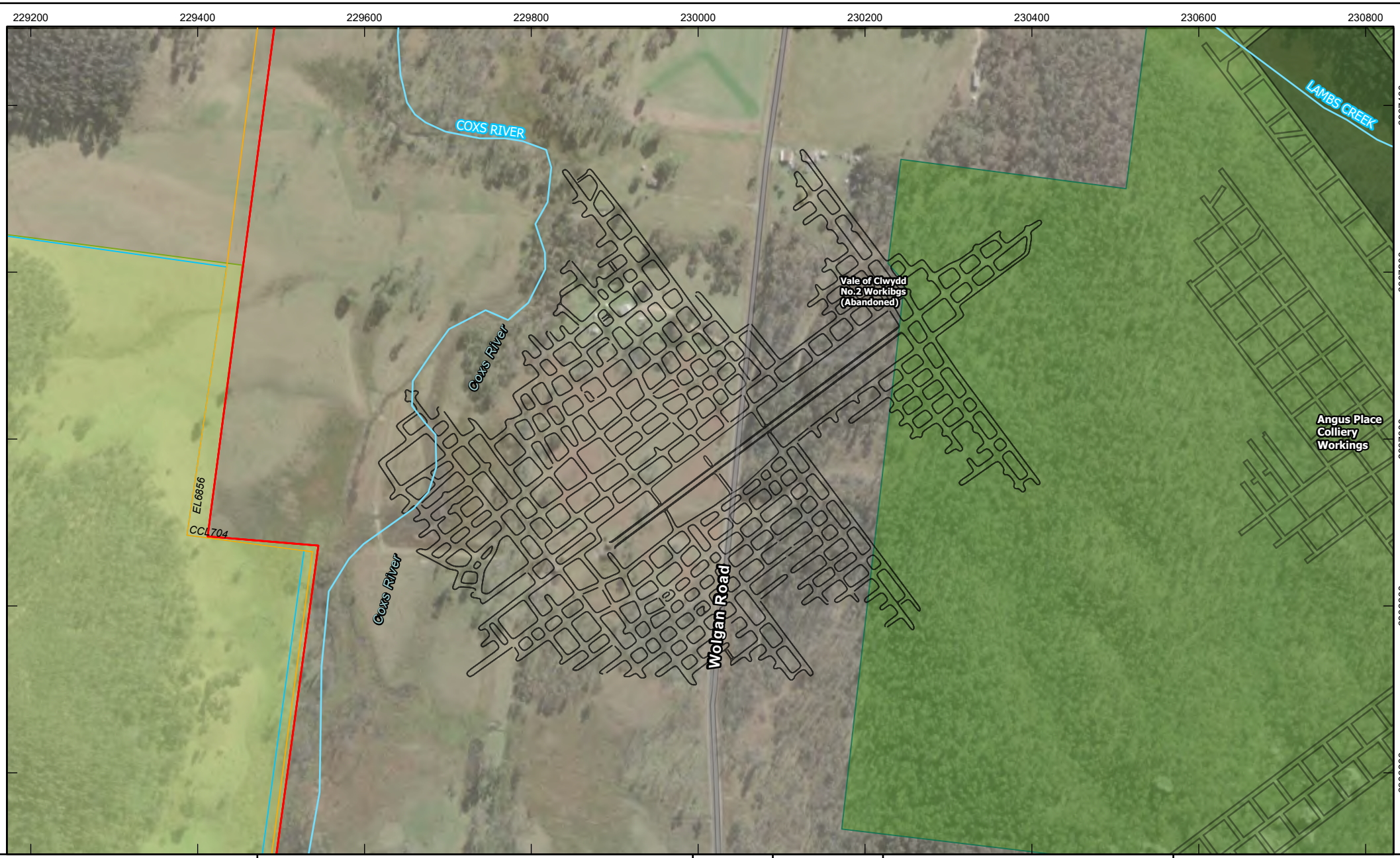
LOCATION	Angus Place
SEAM	Lithgow
DRAWN	N.Lloyd
CHECKED	M.Denley
APPROVED	W.Olson
SCALE	1:12,000 @ A4

ANGUS PLACE COLLIERY
Annual Review 2023
Commonwealth Colliery
---Figure 7---

CENTENNIAL ANGUS PLACE

DATE: 18/01/2024	FASS10006	R1

Esri Community Maps Contributors, Esri, TomTom, Garmin, Foursquare, METI/NASA, USGS, Maxar



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meters

Coordinate System: GDA2020 MGA Zone 56

Legend

- Angus Place Development Consent MP06_0021
- Centennial Exploration Licences (Offset for clarity)
- Centennial Mining Leases
- State Conservation Area
- State Forest
- Existing Underground Workings
- Watercourse

LOCATION	Angus Place
SEAM	Lithgow
DRAWN	N.Lloyd
CHECKED	M.Denley
APPROVED	W.Olson
SCALE	1:6,000 @ A4

ANGUS PLACE COLLIERY
Annual Review 2023
Vale of Clywdd No.2 Colliery
---Figure 8---

CENTENNIAL ANGUS PLACE

DATE: 18/01/2024 | FASS10007 | R2

APPENDICES

Appendix 1: Checklist of Annual Review Reporting Requirements

Table A1-1 provides a checklist of reporting requirements and performance conditions addressed within the Annual Review.

Table A1-1: Project Approval Annual Review Requirements

Approval	Requirement	Where addressed in Annual Review
MP06_0021 Schedule 5 Condition 3	*3. By the end of December 2012, and annually thereafter, the Applicant must review the environmental performance of the project to the satisfaction of the Secretary.* *This review must:* *(a) describe the development (including any rehabilitation) that was carried out in the past calendar year, and the development that is proposed to be carried out over the next year;* *(b) include a comprehensive review of the monitoring results and complaints records of the project over the past calendar year, which includes a comparison of these results against the* • *the relevant statutory requirements, limits or performance measures/criteria;* • *the monitoring results of previous years; and* • *the relevant predictions in the EA;* *(c) identify any non-compliance over the past year, and describe what actions were (or are being) taken to ensure compliance;* *(d) identify any trends in the monitoring data over the life of the project;* *(e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and* *(f) describe what measures will be implemented over the next year to improve the environmental performance of the project.*	This Document
MP06_0021 Schedule 3 Condition 9	*9. The Water Balance must:* *(a) include details of all water extracted, dewatered, transferred, used and/or discharged by the mine, including protocols for managing temporary storage in underground workings / goaf areas as part of the water management system; and* *(b) provide for the annual re-calculation of the water balance and its reporting in the Annual Review.*	**Section 7.2**
MP06_0021 Schedule 3 Condition 21	*21. The Applicant must:* *(a) implement all reasonable and feasible best practice noise mitigation measures;* *(b) investigate ways to reduce the noise generated by the project, including noise generated from use of the Wallerawang power station haul road; and* *(c) report on these investigations and the implementation and effectiveness of these measures in the Annual Review,* *to the satisfaction of the Secretary..*	**Section 6.2**

Approval	Requirement	Where addressed in Annual Review
MP06_0021 Schedule 3 Condition 32	*32. The Applicant must:* *(a) take all reasonable steps to minimise the waste (including coal rejects and tailings) generated by the development;* *(b) classify all waste in accordance with the Waste Classification Guidelines (EPA, 2014);* *(c) dispose of all waste at appropriately licensed waste facilities; and* *(d) monitor and report on the effectiveness of the waste minimisation and management measures in the Annual Review referred to in condition 3 of Schedule 5.*	**Section 6.9**

Appendix 2: Annual Environmental Monitoring Report (EMM, 2024): Water Monitoring Results and Trends

Angus Place Colliery Annual Environmental Monitoring Report

January to December 2023

Prepared for Centennial Coal

March 2024

Angus Place Colliery Annual Environmental Monitoring Report

January to December 2023

Centennial Coal

E221267AP RP#2

March 2024

Version	Date	Prepared by	Approved by	Comments
1	1 March 2024	Kyle McLaren	Jonathon Tait	Draft
2	21 March 2024	Kyle McLaren	Jonathon Tait	Final

Approved by

Jonathon Tait
Associate Hydrogeologist
21 March 2024

Ground floor 20 Chandos Street
St Leonards NSW 2065
PO Box 21
St Leonards NSW 1590

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Appendices

Tables

Figures

Report summary

In accordance with the WMP (GHD 2021) and trigger action response plan (TARP) (Appendix A), all groundwater and surface water monitoring sites were in Normal condition (i.e. trends are consistent with natural variation). The following points summarise observations made during the reporting period:

- The annual total observed rainfall at Newnes Prison Farm was approximately 232 mm less than the long-term total annual average.
- Swamp piezometers: swamp groundwater levels were generally stable, except for fluctuating groundwater levels at monitoring locations that are typically dry. These fluctuations were due to above average rainfall observed during the reporting period.
- Soil moisture probes: soil moisture typically fluctuated closer to ground level, while deeper sensors were more stable or slightly increasing, as a response to above average rainfall observed during the reporting period.
- Open borehole piezometers: groundwater levels were generally increasing, reflecting a delayed and subdued recharge response to above average rainfall during 2022.
- Vibrating wire piezometers (VWP): piezometric pressures were generally stable or increasing at most monitoring locations. It should be noted that data from some VWPs were not available from May 2022 onwards due to degraded access track conditions and timing restrictions.
- Discharge water quality: LDP002 and LDP003 were within the upper and lower bounds for pH during the reporting period. Total suspended solids was exceeded in December for LDP002 and LDP003 but are exempt because 66 mm of rain was recorded over 5 consecutive days prior to discharge.
- Surface water quality and flow: watercourse surface water quality at Coxs Downstream (D/S) and Kangaroo Creek and Coxs River (KC/CR) Confluence surface water monitoring sites were within the site-specific trigger vales (SSTV) during the reporting period except for three lower bound pH exceedances for Coxs River D/S observed in September (5.9) and October (5.8, 6.2). One TSS exceedance was observed at KC/CR Confluence in August (30 mg/L). Both exceedances of pH and TSS are due to natural variability. The surface water quality and flow observations at the watercourse monitoring locations without specified SSTVs generally remained consistent with historical observations. It should be noted that some monitoring locations were dry or inaccessible during the reporting period due to degraded access track conditions.
- Pit top surface water quality: pit top surface water quality observations remained consistent with historical observations.
- Swamp surface water quality and flow: Swamp surface water quality and flow observations generally remained consistent with historical observations. It should be noted that some monitoring locations were dry or inaccessible during the reporting period due to degraded access tracks.

1 Introduction

Angus Place Colliery is an underground coal mine located in the Western Coalfield approximately 5 km north of Lidsdale and approximately 15 km north-west of Lithgow. The colliery is operated by Centennial Angus Place Pty Limited (Angus Place). A Water Management Plan (WMP) was prepared for Angus Place Colliery by GHD in 2021. The WMP addresses specific water components of the conditions of development consent MP 06_0021, which was granted by the Minister for Planning on 13 September 2006.

EMM Consulting Pty Limited (EMM) was engaged by Angus Place to conduct quarter-monthly surface water and groundwater monitoring during 2023 in accordance with the requirements of the WMP.

1.1 Purpose of the report

This Annual Environmental Monitoring Report (AEMR) documents surface water and groundwater monitoring results in accordance with the *Angus Place Colliery Water Management Plan* (WMP) (GHD 2021). The report also details any relevant observations and, if required, makes recommendations pertaining to the current surface water and groundwater monitoring network.

1.2 Reporting period

This report reviews monitoring data from 1 January to 31 December 2023 (the reporting period).

1.3 Mining

No active mining occurred during the reporting period. Angus Place Colliery has been operating under care and maintenance since early 2015.

1.4 Notable changes during the reporting period

No notable changes to the Angus Place groundwater and surface water monitoring network were made during the reporting period.

2 Existing environment

2.1 Climate

Daily rainfall was sourced from the ALS Global Newnes Plateau Prison Farm rain gauge and the Bureau of Meteorology (BOM) weather station at Maddox Lane, Lidsdale (BoM Station No. 063132). Rainfall for the reporting period is summarised in Table 2.1. A comparative analysis of the two weather stations has been presented in Table 2.1 due to the disparate weather patterns occurring across the region, influenced by topography.

Observed rainfall at Newnes Prison Farm was greater than the long-term average monthly rainfall in January, April, November and December 2023. The annual total observed rainfall at Newnes Prison Farm was approximately 232 mm less than the long-term total annual average. Observed rainfall at Lidsdale was greater than the long-term average rainfall values in January, March, April, November and December 2023. The annual total observed rainfall at Lidsdale was 117 mm less than the long-term annual total average.

The daily cumulative rainfall departure (CRD) for Newnes Prison Farm rain gauge is presented on Figure 2.1. The CRD trend shows below average rainfall for most of the calendar year with the exception of later months November and December 2023 showing above average rainfall.

Table 2.1 January to December 2023 climate summary

Month	Observed rainfall (mm)		Long term average rainfall (mm)	
	Newnes Prison Farm	Lidsdale (BoM station 063132)	Newnes Prison Farm[1]	Lidsdale (BoM station 063132)[2]
January	101.4	95.2	94.9	86.2
February	43.8	34.4	118.5	77.2
March	84.4	83.0	112.1	70.5
April	63.2	57.2	61.2	42.8
May	4.6	2.8	42.1	47.9
June	39	26.4	69.7	49.2
July	17.2	18.8	57.4	51.5
August	44.6	40.4	58.4	63.8
September	23	21.4	56.8	54.0
October	39.8	39.4	78.8	67.9
November	112	100.8	102.9	74.3
December	135.6	121.2	89.1	72.7
Total	**708.6**	**641.0**	**941.9**	**758.0**

Notes: 1. Observation period 20 August 1998 to present.
2. Observation period August 1959 to present.

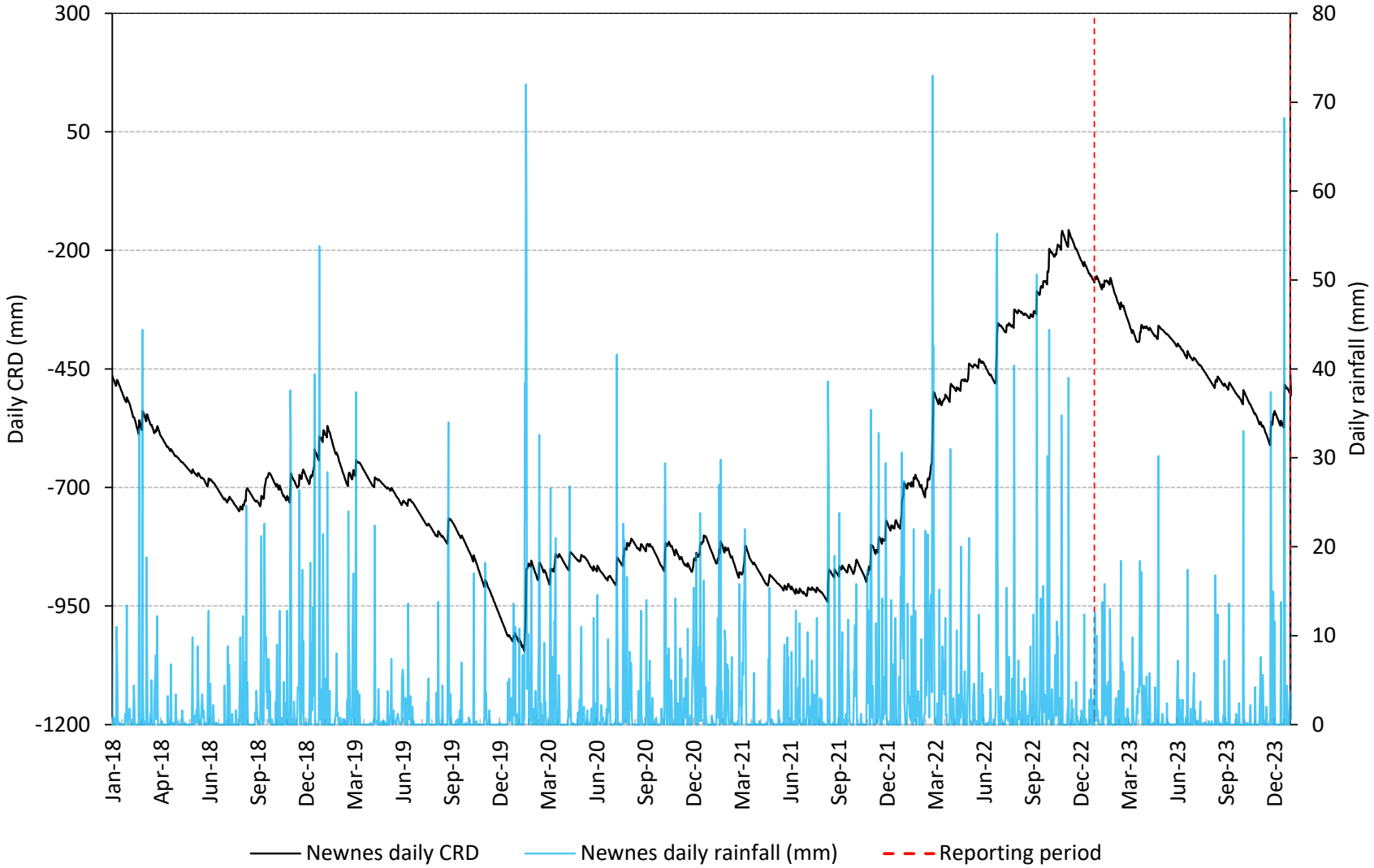


Figure 2.1 **Daily cumulative rainfall deviation 2018 to present**

2.2 Drainage and catchments

Angus Place is in the catchments of the Coxs River and Wolgan River. Watercourses off the plateau are often deeply incised in their lower reaches, incorporating numerous cliff lines and pagodas bordering the valley flanks. In the upper catchment areas, drainage lines are typically poorly defined to non-existent with overland sheet flow being the typical mode of discharge during rainfall events.

2.3 Hydrogeology

The hydrogeological complexities of the Newnes Plateau local area have been well investigated over time. The groundwater systems interacting with the Angus Place have been conceptualised, and are divided into three distinct aquifers (McHugh 2018):

- perched aquifers, predominantly sandstone aquifers between several claystone aquitard units
- shallow aquifers, predominantly regional sandstone aquifers, ranging from unconfined to semi-confined
- deep aquifers, which are confined in the project area and includes the Lithgow Coal Seam.

2.3.1 Perched aquifer—Burralow Formation

The perched aquifer is hosted within the Triassic Narrabeen Group, Burralow Formation and comprises multiple discontinuous perched localised flow bands. The presence of seven distinct fine-grained claystone and siltstone units (YS1 to YS6, including YS5a) act as aquitards, or semi permeable layers, which impede rainfall percolation to the shallow aquifer, associated with the underlying Banks Wall Sandstone. The Burralow Formation is up to 110 m in thickness with YS6 as the basal unit (McHugh 2018).

The Newnes Plateau Shrub Swamps (NPSS) and Newnes Plateau Hanging Swamps (NPHS) are listed as Endangered Ecological Communities under the *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999*, coincide with the lithographic and topographic occurrence of aquitards in the Burralow Formation (McHugh 2018).

2.3.2 Shallow aquifer—Banks Wall Sandstone

The shallow aquifer is a regional system in the Triassic Narrabeen Group, Banks Wall Sandstone and is generally 100 m in thickness (McHugh 2018).

The shallow aquifer is recharged by rainfall, overlying watercourses where it outcrops in incised gullies, and by leakage from the Burralow Formation. Regional recharge may occur in areas of outcrop and sub-crop to the west and south-west of the study area (Jacobs 2019). Local discharge is inferred to occur in incised gullies that intercept the water table with some swamps coinciding with this occurrence (McHugh 2018). Regional discharge is inferred to occur to the north-east, where units outcrop in the scarp of the plateau.

Groundwater flow occurs primarily by interconnective fracturing, bedding planes and structural features such as lineaments and faults with some primary/pore porosity. The fracture system is the primary control of groundwater flow as the rock matrix has low permeability. The general groundwater flow direction is toward the north-east, which is consistent with the dip of the strata.

At the base of the shallow aquifer is the Mount York Claystone (MYC). This unit comprises a sequence of claystone bands interbedded with siltstone and sandstone that form an aquitard, impeding vertical connectivity between the shallow and deep aquifers. The MYC is a regional feature within the project area and is up to 22 m in thickness (McHugh 2018).

2.3.3 Deep aquifer—Illawarra Coal measures

Underlying below the MYC, the deep aquifer, associated with the Triassic Burra-moko Head Sandstone, Caley Formation and Permian Illawarra Coal Measures is up to 200 m in thickness.

Groundwater flow occurs primarily via interconnective fracturing, bedding planes, cleated coal seams and structural features such as lineaments and faults. The fracture system is the primary control of groundwater flow as the rock matrix has low permeability.

The general groundwater flow direction in the deep aquifer is towards the north-east, which is consistent with the dip of the strata. Regional recharge potentially occurs in areas of outcrop/sub-crop to the west and south-west of the study area by rainfall, overlying watercourses, dams and minor leakage from the shallow aquifer. Groundwater discharge is inferred to occur to the north-east, where the units outcrop in the scarp of the plateau.

2.4 Surface water and groundwater interaction

The dominant surface water and groundwater interaction on the Newnes Plateau involve recharge to shallow groundwater and groundwater discharge to surface water (Jacobs 2019).

Surface water leakage to shallow groundwater occurs from overlying watercourses. Groundwater discharge to surface water flow occurs as seepages and drips from exposed faces of cliff lines or exposed bedrock in drainage lines, or as seepage from sub-cropping bedrock to regolith or residual soil profiles on valley flanks and valley floors (Jacobs 2019). Where sufficient seepage occurs, the development of NPHS or NPSS may be supported. Groundwater seepage may contribute to stream baseflow either directly as discharge to drainage lines in the valley floor, or indirectly as a contribution to catchment subsurface flow (Jacobs 2019).

3 Monitoring program

3.1 Overview

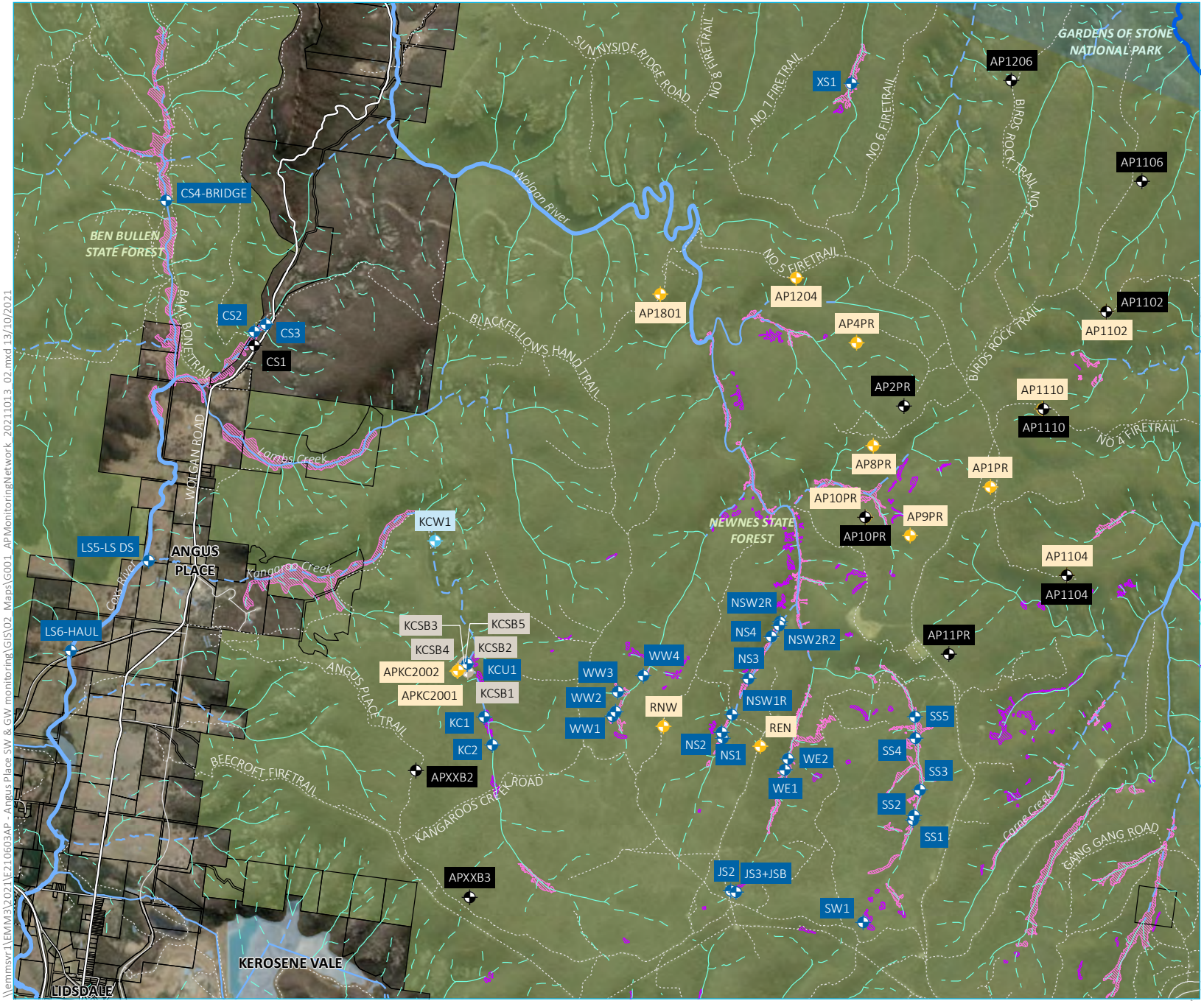
The WMP (GHD 2021) monitoring program requires the collection of groundwater and surface water monitoring data to assess for potential mining-related impacts on the groundwater and surface water regimes. The ongoing collection of groundwater and surface water data facilitates the development and improvement of water management strategies.

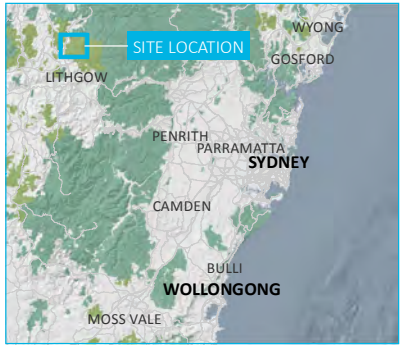
Subsidence from historic mining activities can cause changes to the hydrogeological regime. The Angus Place monitoring program targets NPSS, NPHS, as well as the perched, shallow and deep groundwater systems through a combination of routine surface water monitoring, standpipe piezometers and vibrating wire piezometers (VWP).

The locations of the groundwater and surface water monitoring sites are shown on Figure 3.1 and Figure 3.2. The following details the Angus Place surface water and groundwater monitoring network:

- swamp (NPSS) groundwater levels are measured daily at 26 shallow standpipe piezometers across nine swamps by level loggers (loggers)
- soil moisture content is measured daily at nine monitoring locations across three swamps (NPSS and NPHS)
- shallow aquifer groundwater levels are measured daily at 18 ridge piezometers by loggers, with the exception of three monitoring locations without loggers, which are measured manually
- piezometric pressures within the shallow and deep aquifers are measured daily at 11 monitoring locations by multi-level VWP arrays
- pit top surface water quality is measured at three monitoring locations
- discharge surface water quality is measured at two monitoring locations
- watercourse surface water quality and flow rate are measured at 14 monitoring locations
- swamp surface water quality and flow rate are measured at five monitoring locations.

Groundwater monitoring data was downloaded every two months during the reporting period. Surface water flow and quality data was collected at either weekly or monthly intervals, depending on the criteria set by the WMP (GHD 2021).





KEY

- Major road
- Minor road
- Vehicular track
- Cadastral boundary
- Hanging swamp
- Shrub swamp
- Waterbody
- NPWS reserve
- State forest

Monitoring bore

- Soil moisture
- Standpipe
- Surface water
- Swamp
- VWP

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order
- 5th order
- 6th order

INSET KEY

- Major road
- NPWS reserve
- State forest

Angus Place Surface and Groundwater Monitoring Network

Figure 3.1

Source: EMM (2021); ESRI (2021); DFSI (2017); DPIE (2021); DPE (2015); GA (2011); ASGC (2006)

0 1 2 km

GDA 1994 MGA Zone 56

N

EMM creating opportunities

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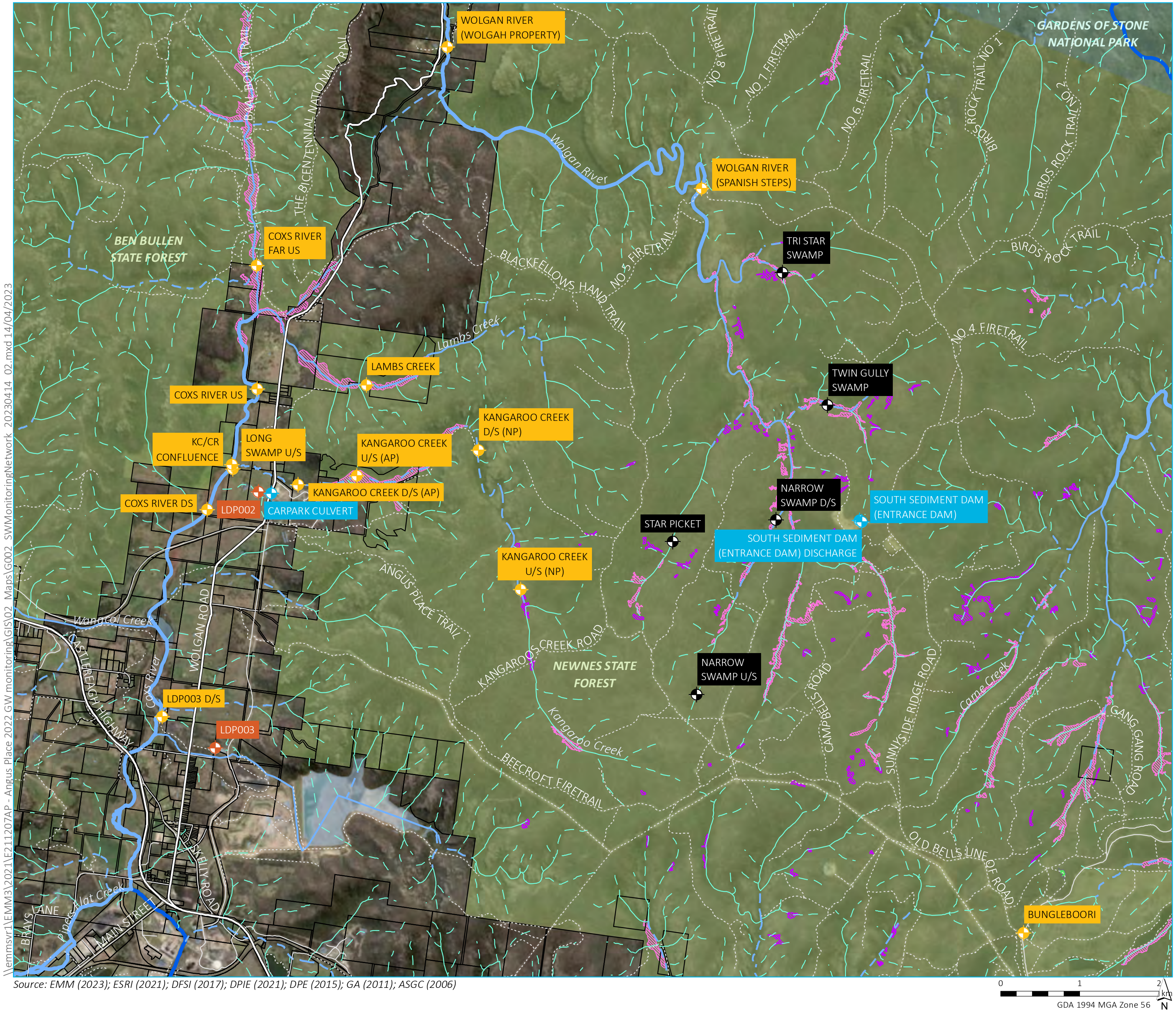

Source: EMM (2023); ESRI (2021); DFSI (2017); DPIE (2021); DPE (2015); GA (2011); ASGC (2006)

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Angus Place Surface Water Monitoring

Figure 3.2

EMM creating opportunities

3.2 Performance measurement

The WMP (GHD 2021) outlines trigger levels for surface water quality and groundwater at specific monitoring locations. Impacts are assessed against performance triggers to identify whether observed changes in groundwater levels and surface water quality exceed natural variance.

The trigger levels are typically developed based on statistical analysis of pre-mining baseline data collection for groundwater levels or review of relevant guidelines and environmental protection licences (EPL) for surface water quality.

3.3 Trigger criteria

The WMP (GHD 2021) outlines several trigger criteria for groundwater level and surface water quality data that allow for the detection of mining-related impacts. The trigger criteria have been developed to prompt specific actions identified in the trigger action response plans (TARPs) presented in Appendix A to prevent the exceedance of the performance criteria. It should be noted the WMP (GHD 2021) does not specify any trigger criteria for soil moisture content, swamp groundwater levels or groundwater quality.

Pre-mining observations are used to develop trigger levels and are collected until a monitoring site is within 600 m of active mining. When a monitoring site falls within 600 m of active mining, the pre-mining period of data collection ends and the pre-mining trigger level is set. Post-mining data is compared to pre-mining trigger levels to discern potential mining impacts.

The groundwater level triggers for ridge piezometers and VWPs were not used in the analysis of respective trends because Angus Place is in care and maintenance. With the exception of licensed discharge points, observations at monitoring bores and surface water monitoring sites are considered a reflection of natural variation. Furthermore, most ridge piezometers and VWP detailed in the WMP are still in their pre-mining period of data collection and any variability in groundwater levels or piezometric pressures are assumed to be due to natural variability.

The criteria for performance indicators for this report are shown in Table 3.1.

Table 3.1 Angus Place water management plan trigger criteria

Monitoring zone	Monitoring type	Comment
Groundwater levels	Ridge piezometers	Groundwater trigger values have been defined by the WMP (GHD 2021) as the observed depth to groundwater falling 2 m below the 95th percentile pre-mining depth to groundwater for more than seven consecutive days. Not assessed against during this reporting period.
	Vibrating wire piezometer	Trigger values for VWPs have been defined by the WMP (GHD 2021) as observed piezometric level falling 2 m below the minimum observed piezometric level for more than seven consecutive days. Not assessed against during this reporting period.

Table 3.1 Angus Place water management plan trigger criteria

Monitoring zone	Monitoring type	Comment
Surface water quality	Discharge water quality	Discharge water quality trigger values are specified by EPL 467. The trigger values are as follows: • LDP002: – pH: 6.5—8.5 (90th percentile concentration limit) and 6.5—9.0 (100th percentile concentration limit). – Total Suspended Solids (TSS): 30 milligrams per litre (mg/L). • LDP003: – pH: 6.5—8.5 (100th percentile concentration limit). – TSS: 50 mg/L. These trigger values do not apply when discharge occurs within five days after 44 mm or more rainfall has been measured at the site during that five-day period.
	Watercourse water quality	Surface water quality monitored at the downstream sites KC/CR confluence and Coxs River D/S assessed against site-specific guideline values (SSGVs), which are based on a review of ANZECC (2000) default guideline values (DGVs) and water quality observed at an upstream reference site. The trigger values are as follows: • Electrical Conductivity (EC): 350 micro siemens per centimetre (µS/cm). • pH: 6.3–8.5. • TSS: 25 mg/L.

4 Groundwater monitoring

The following subsections summarise groundwater monitoring observations from the reporting period. Groundwater levels and piezometric pressures have been compared to the historic monitoring data. As mentioned in Section 3.3, groundwater level triggers specified in the WMP (GHD 2021) were not applied, as Angus Place has been in care and maintenance since 2015.

4.1 Swamp piezometers

Groundwater levels at various NPSS are monitored by a network of loggers recording hydrostatic pressure installed in shallow (approximately 2 m) standpipe piezometers targeting unconsolidated swamp sediments (refer Table 4.1).

Hydrographs for each monitoring site are shown in Section 0 to Section 4.1.9, showing groundwater level data in metres below ground level (mbgl) and the daily CRD (mm). Dashed vertical lines represent the reporting period, and logger depths for each monitoring location are indicated on the left of each hydrograph.

A summary of key observations and trends is provided in Table 4.1. Further discussion of swamp piezometer hydrographs is provided Section 0 to Section 4.1.9 with swamp monitoring locations presented Figure 3.1.

Table 4.1 Swamp piezometer summary

Swamp ID	Piezometer ID	Comments
Kangaroo Creek	KC1	Predominately dry due to below average rainfall in 2023.
	KC2	Predominately dry due to below average rainfall in 2023.
	KCU1	Predominately dry, responding to rainfall events in March, April, August, October, and November 2023.
Tri Star	TS1	Decreasing groundwater trend, fluctuations in response to rainfall events.
	TS2	Groundwater level relatively stable until July 2023, whereby a decline likely related to the decreasing CRD trend is observed. Minor increasing fluctuations in response to rainfall.
	TS3	Groundwater level stable, just at or below ground level with minor fluctuations in response to rainfall events.
West Wolgan	WW1	Decreasing groundwater trend, fluctuations in response to rainfall events. Dry from June.
	WW2	Decreasing groundwater trend to November due to below average rainfall. Dry from November to mi-December where it responded to rainfall events in December.
	WW3	Dry during the reporting period. Brief response to rainfall in November.
	WW4	Predominately dry, responding to rainfall events in March and November 2023.
Wolgan East	WE1	Predominately dry due to below average rainfall in 2023.
	WE2	Groundwater level was sustained between responses to multiple rainfall events.
Trail Six	XS1	Groundwater level stable, below ground level with minor fluctuations in response to rainfall events.

Table 4.1 Swamp piezometer summary

Swamp ID	Piezometer ID	Comments
Twin Gully	TG1	Groundwater level stable, at or below ground level with minor fluctuations in response to rainfall events.
	TG2	Groundwater level stable, below ground level with relatively larger fluctuations in response to rainfall events compared to TG1.
Narrow	NS1	Predominately dry due to below average rainfall in 2023.
	NS2	Predominately dry due to below average rainfall in 2023.
	NS3	Predominately dry due to below average rainfall in 2023. No data after September 2023.
	NS4	Predominately dry due to below average rainfall in 2023.
	NSW1R	Groundwater level fluctuated in response to rainfall events.
	NSW2R	Groundwater level fluctuated in response to rainfall events.
Long	LS5	Groundwater level fluctuating in response to rainfall events.
	LS6	Groundwater level decreasing in February due to below average rainfall, recovery to just below ground level in March. Data gap between June and August 2023.
	CS4	Groundwater level stable, ~1 mbgl.
Coxs River	CS2	Groundwater level stable with slight decreasing trend, just above ground level with minor fluctuations in response to rainfall events. Data gap between March and July 2023.
	CS3	Groundwater level stable, at or below ground level with minor fluctuations in response to rainfall events.

4.1.1 Kangaroo Creek Swamp

The hydrograph for Kangaroo Creek Swamp is presented as Figure 4.1. Kangaroo Creek Swamp is currently monitored at three locations: KC1 (installed May 2005), KC2 (installed November 2008) and KCU1 (installed October 2020).

Following undermining in 2008, groundwater levels at KC1 and KC2 were typically dry and have shown minimal response to rainfall events. Since installation, KCU1 has typically been dry, however it is slightly more responsive to rainfall than KC1 and KC2.

During the reporting period, groundwater levels at KC1, KC2 and KCU1 were mostly dry, with immediate and direct responses to significant rainfall events observed at KCU1. Groundwater levels at all monitoring sites decline quickly after rainfall, indicating groundwater observations are likely through flow.

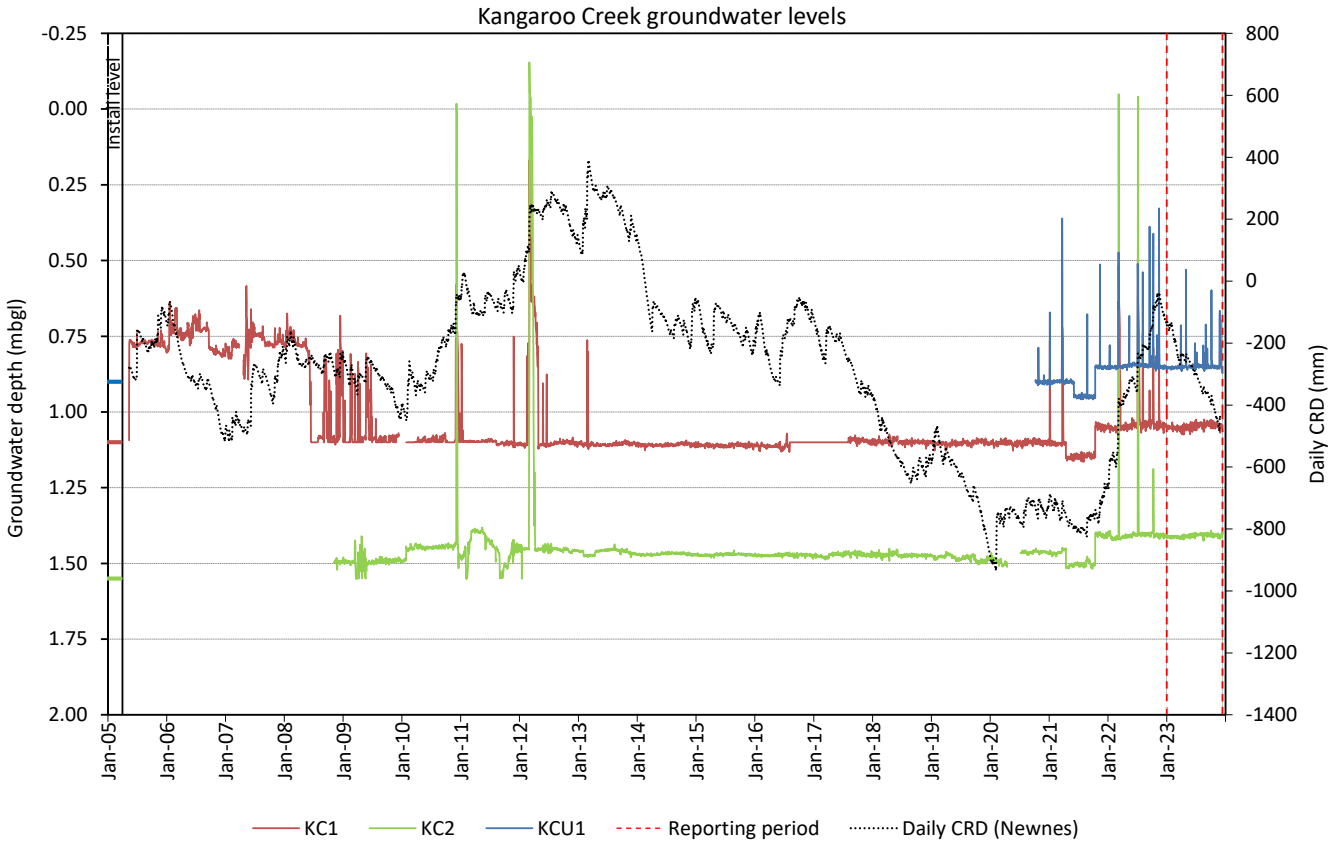


Figure 4.1 Kangaroo Creek Swamp hydrograph

4.1.2 Tristar Swamp

The hydrograph for Tristar Swamp is presented as Figure 4.2. Tristar Swamp is currently monitored at TS1, TS2 and TS3, all of which were installed October 2011.

Historically, TS1 and TS2 have been intermittently dry, responding to periods of above average rainfall, while the groundwater level at TS3 has remained stable at just below ground level.

During the reporting period, groundwater levels at T1S and, TS2 show decreasing trends due to below average rainfall. Groundwater levels increased in November due to intense rainfall events. TS3 remained stable just at or below ground level.

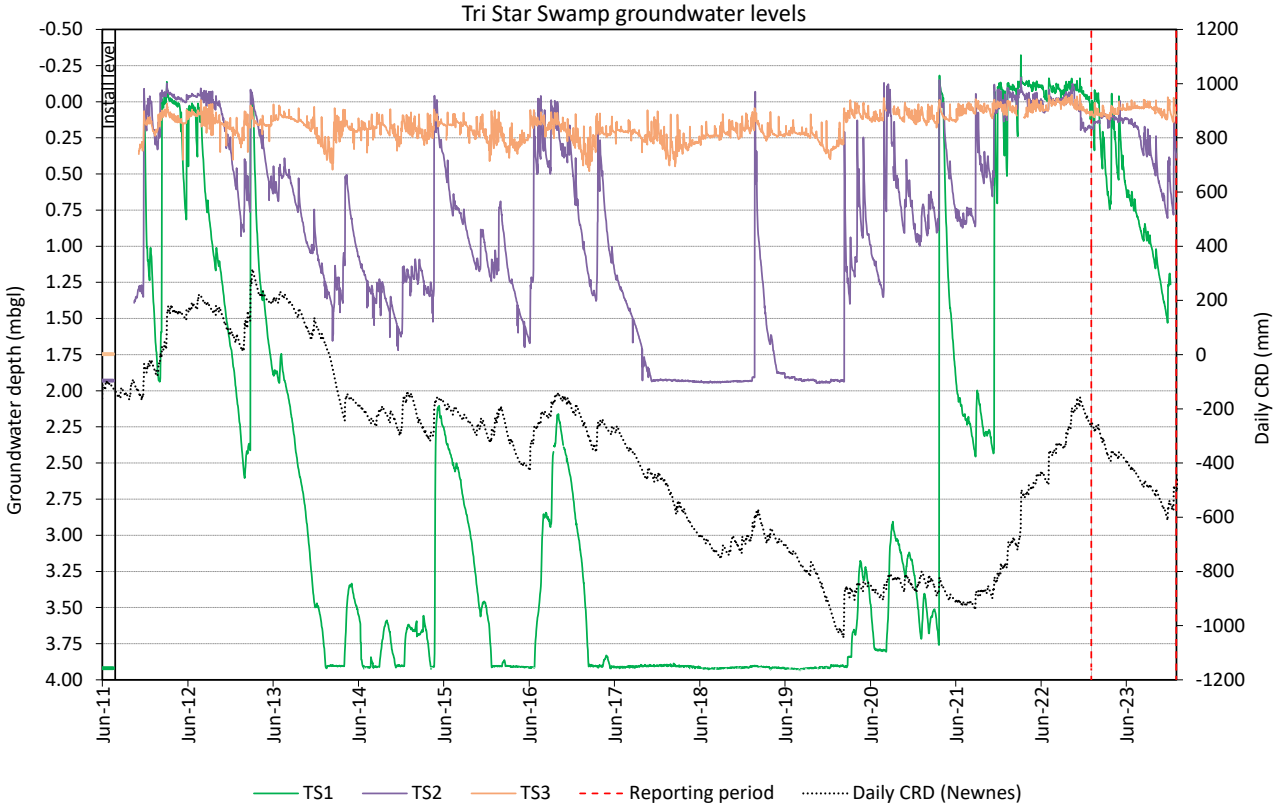


Figure 4.2 Tristar Swamp hydrograph

4.1.3 West Wolgan Swamp

The hydrograph for West Wolgan Swamp is presented as Figure 4.3. West Wolgan Swamp is currently monitored at four locations: WW1, WW2, WW3 and WW4 (all installed in 2005), which were undermined by longwalls LW930, LW940 and LW960 between May 2007 and July 2009.

Historically, groundwater levels at WW1 and WW2 have reflected the daily CRD trend. WW3 responds immediately and directly to rainfall recharge and drains quickly thereafter. WW4 has been predominately dry since 2012, only responding to significant rainfall events with groundwater levels draining quickly thereafter.

During the reporting period, groundwater levels at WW1 and WW2 decreased due to below average rainfall. WW1 was dry from June while WW2 was dry from early-November. WW2 shows a response to rainfall events in December. Groundwater levels at WW3 and WW4 remained predominately dry with slight increase in level due to above average rainfall in November and December 2023.

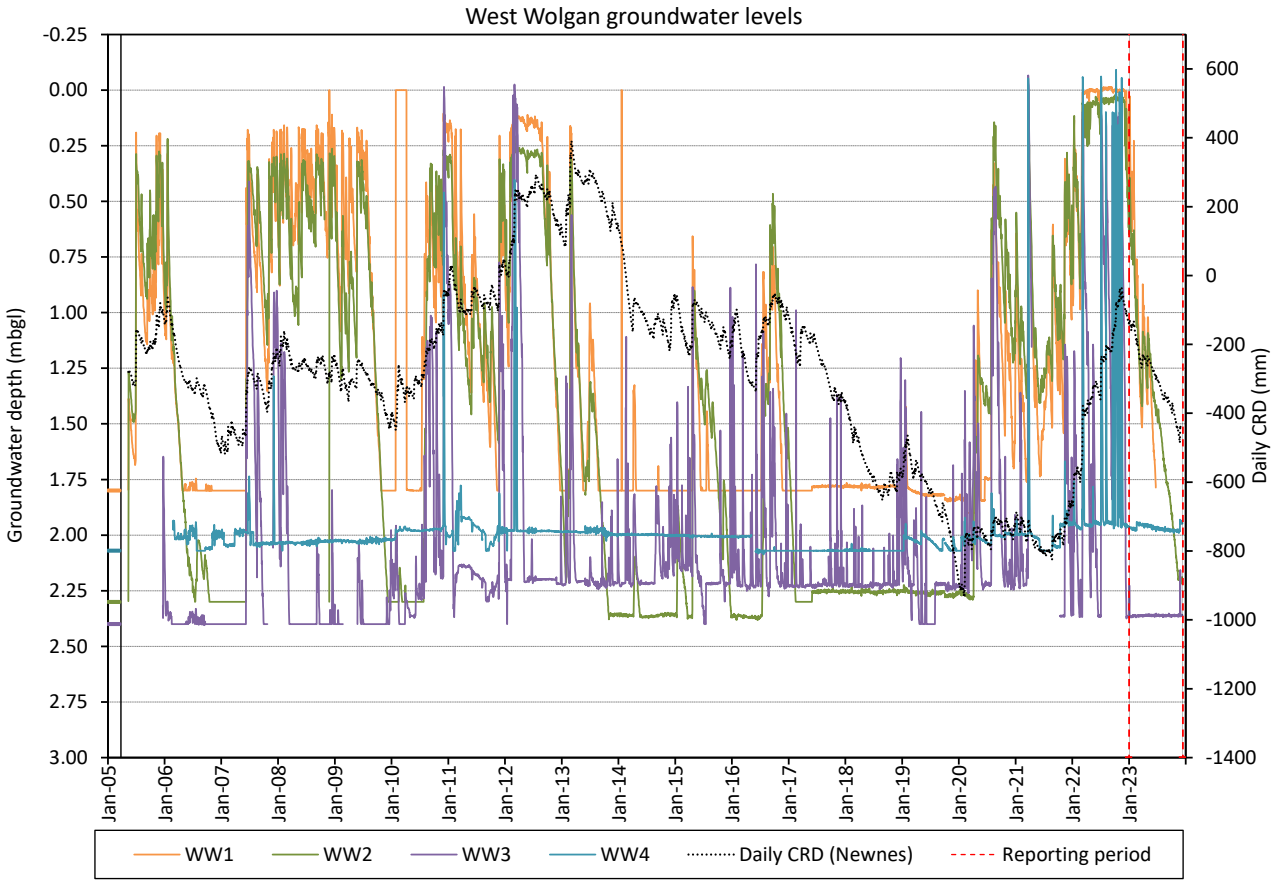


Figure 4.3 West Wolgan Swamp hydrograph

4.1.4 East Wolgan Swamp

The hydrograph for East Wolgan Swamp is presented as Figure 4.4. East Wolgan Swamp is monitored by WE1 and WE2 (installed in May 2005).

Historically, East Wolgan Swamp has been influenced by emergency mine water discharges from licensed discharge point LDP04. Mine discharge events coincide with a groundwater level increase at WE1 and WE2 in 2005, 2008 and 2009. Apart from the discharge events, groundwater levels at WE1 and WE2 are typically dry, only responding to significant rainfall events. WE2 appears to be more responsive to rainfall than WE1.

During the reporting period, groundwater level at WE1 decreased from previous rainfall events in April and remained dry for the remaining period. Groundwater level at WE2 responded to multiple minor rainfall events in response to CRD trend.

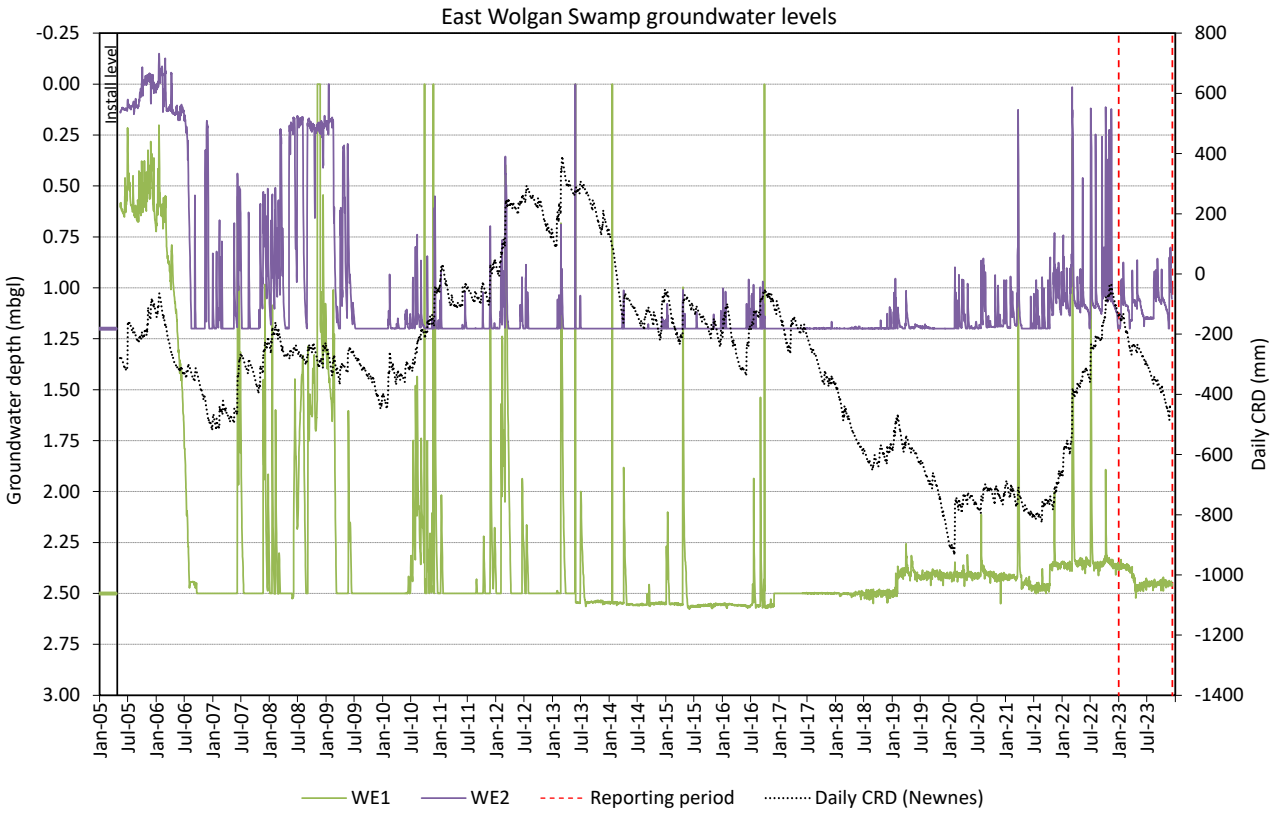


Figure 4.4 East Wolgan Swamp hydrograph

4.1.5 Trail Six Swamp

The hydrograph for Trail Six Swamp is presented as Figure 4.5. The groundwater level at Trail Six Swamp is currently monitored at XS1, which was installed in October 2011.

Historically, groundwater levels at XS1 have been relatively stable, reflecting a subdued response to the daily CRD.

During the reporting period, groundwater levels at XS1 were just below ground surface level with minor fluctuations in response to rainfall recharge.

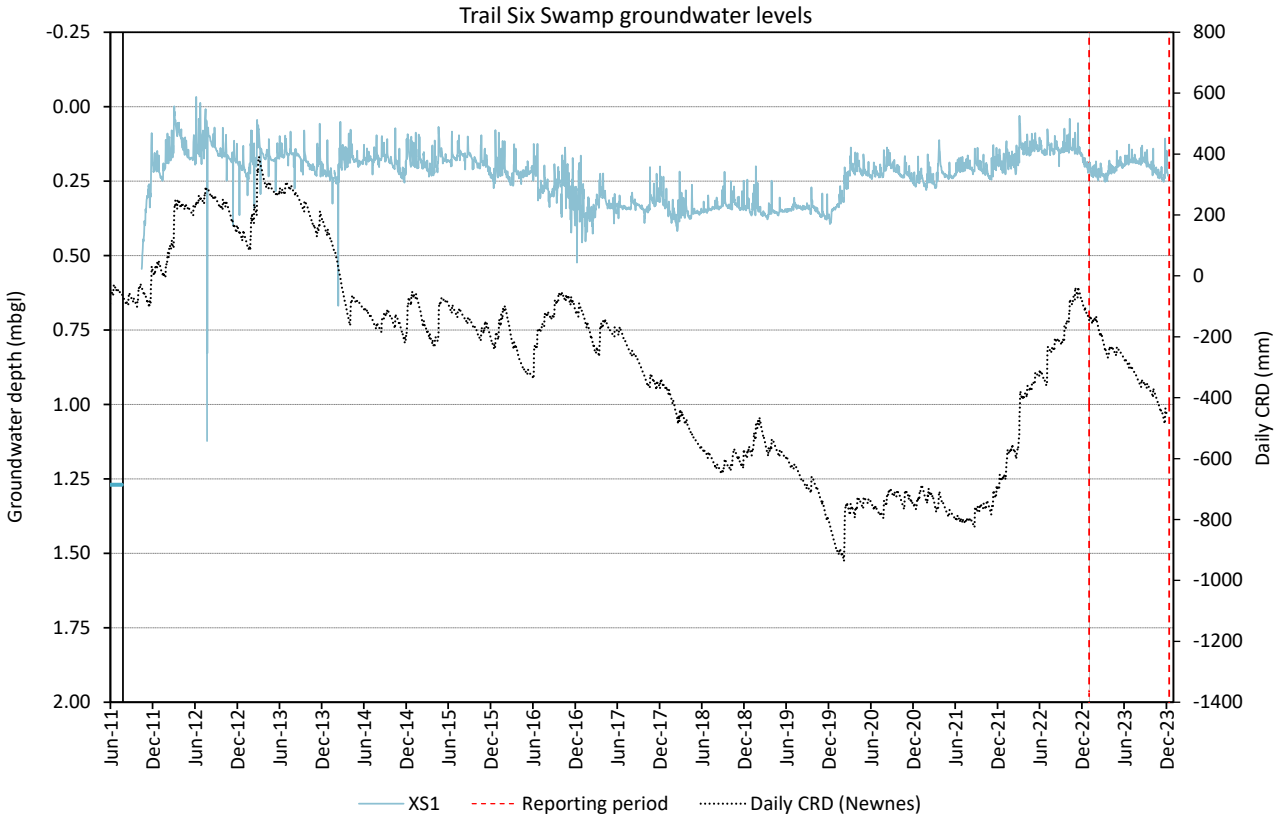


Figure 4.5 Trail Six hydrograph

4.1.6 Twin Gully Swamp

The hydrograph for Twin Gully Swamp is presented as Figure 4.6. Twin Gully Swamp is currently monitored at TG1 (installed October 2011) and TG2 (installed April 2018).

Historically, groundwater levels at TG1 and TG2 have reflected the daily CRD trend, with TG2 tending to fluctuate in greater proportion than TG1.

During the reporting period, TG1 and TG2 decreased to April and rebounded following rainfall April and May. The increase was sustained until September where they again decreased until November where they rebounded following rainfall in November and December.

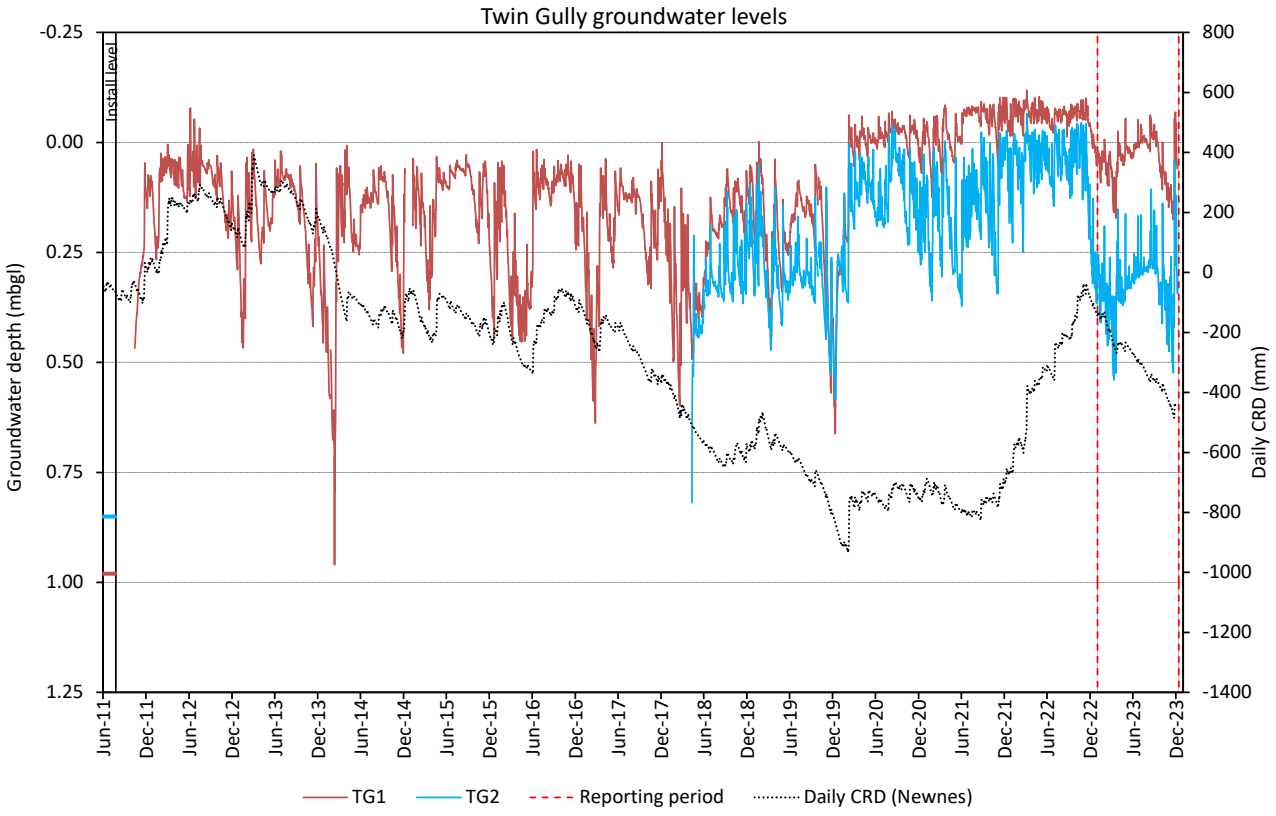


Figure 4.6 Twin Gully Swamp hydrograph

4.1.7 Narrow Swamp

The hydrograph for Narrow Swamp is presented as Figure 4.7. Narrow Swamp is currently monitored at six locations: NS1 and NS2, which were installed May 2005, NS3 which was installed February 2008, NS4 which was installed April 2008, and NSW1R and NSW2R which were installed September 2021. NS1, NS2 and NSW1R monitor the upstream reaches of the swamp, NS3 monitors the middle reach, and NS4 and NSW2R monitor the downstream reach.

Historically, groundwater levels at Narrow swamp have been influenced by emergency mine water discharge from licensed discharge points LDP004 and LDP006. Mine discharge events coincide with a water level increase in LDP004 over the period 2005 to 2008, and from LDP006 in 2009. Except for the discharge events, NS1 to NS4 have remained predominantly dry since 2009, only responding to significant rainfall events.

During the reporting period, groundwater levels at NS1, NS2, NS3 and NS4 were dry. There is no new data for NS3 since September because the logger reached its service life. The groundwater level at NSW1R and NSW2R fluctuated in response to rainfall events and water dry between events.

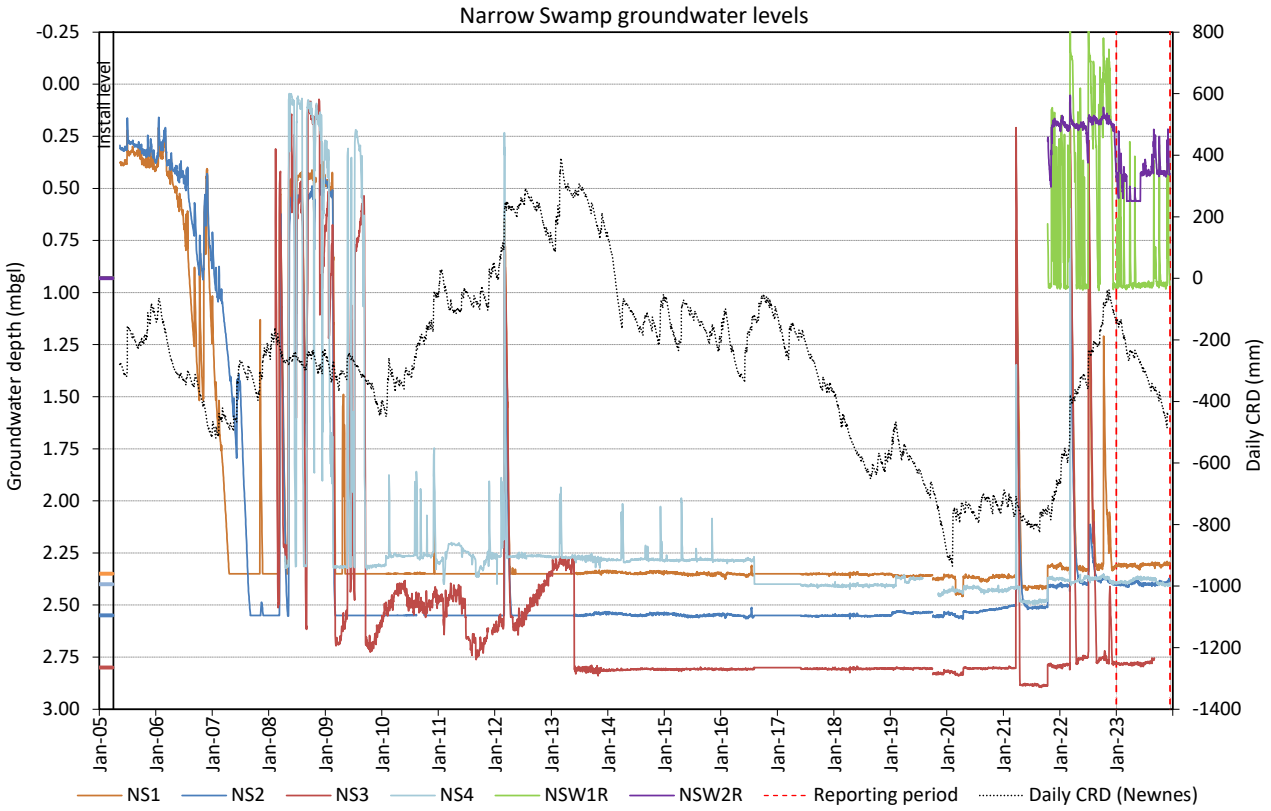


Figure 4.7 Narrow Swamp hydrograph

4.1.8 Long Swamp

The hydrograph for Long Swamp is presented as Figure 4.8. Piezometer LS5 is installed in the upper reaches of Long Swamp and LS6 is installed in the lower reaches. Piezometer CS4 is located near the Leg Bridge, adjacent to the upper reaches of the Coxs River.

A data gap exists for CS4 and LS6 from October 2019 when the loggers were destroyed by bushfire. The loggers were replaced in August 2020. Another data gap exists for CS4 from January 2021, as the swamp piezometer was damaged by a vehicle. The piezometer and datalogger were replaced in September 2021. No new data for LS6 is available since June 2023 to logger issues.

Historically, groundwater levels at all monitoring sites typically fluctuate immediately as a direct response to rainfall recharge. The base groundwater level at LS5 fluctuates more compared to CS4 and LS6.

During the reporting period, groundwater levels at CS4 remained relatively stable. Groundwater levels at LS6 showed a decrease in water level following CRD trends before becoming stable until data became unavailable. The groundwater level at LS5 showed minor increases in immediate response to rainfall events and was relatively stable with a longer groundwater level decay.

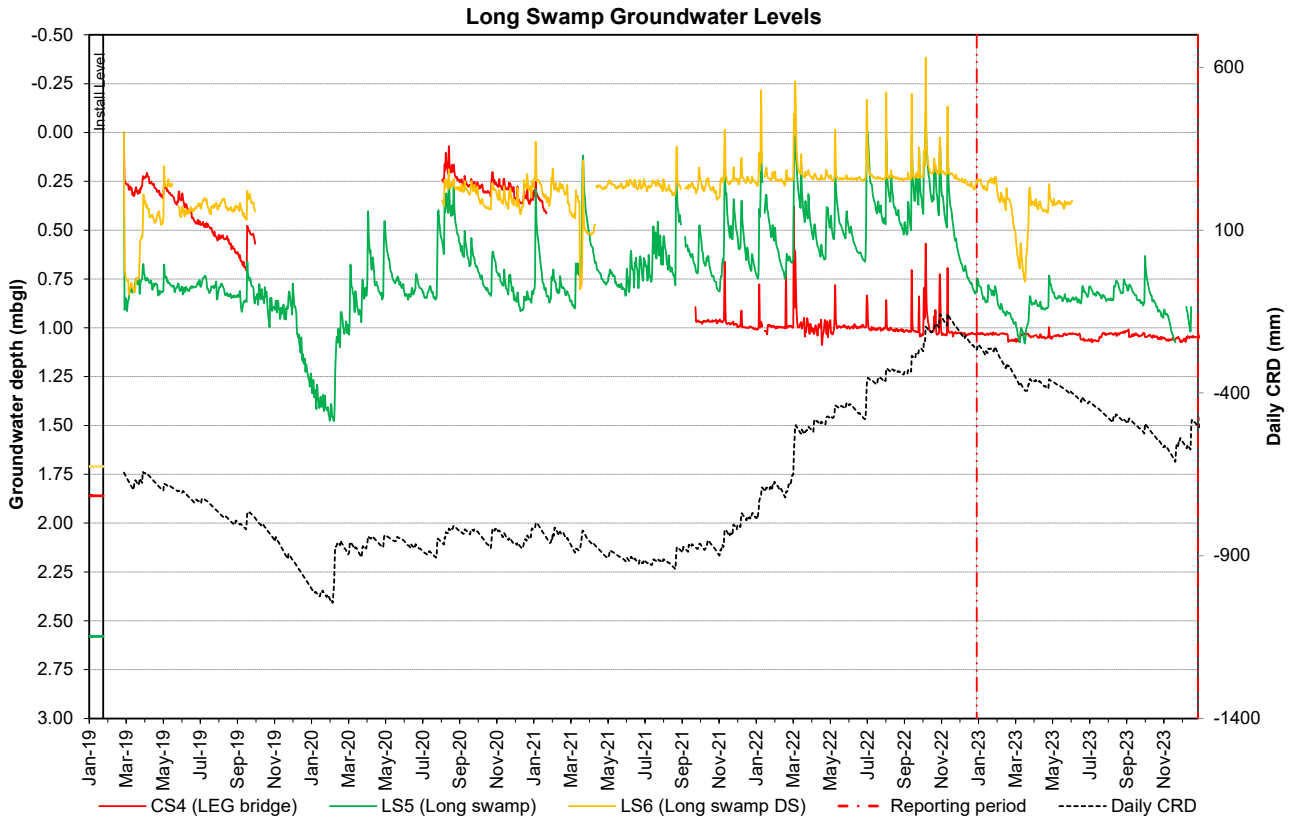


Figure 4.8 Long Swamp hydrograph

4.1.9 Coxs River Swamp

The hydrograph for Coxs River Swamp is presented as Figure 4.9. Coxs River Swamp is monitored by CS2 and CS3, which were installed September 2019.

Historically, CS2 and CS3 were dry until February 2020 and July 2020, respectively, and have maintained stable groundwater levels since. This increase in groundwater levels is due to above average rainfall between February 202 to November 2022. A data gap exists for CS2 between March and June 2023 because the logger was left outside the piezometer.

During the reporting period, groundwater levels at CS2 and CS3 show gradual decreasing trends that are consistent with the climatic observations.

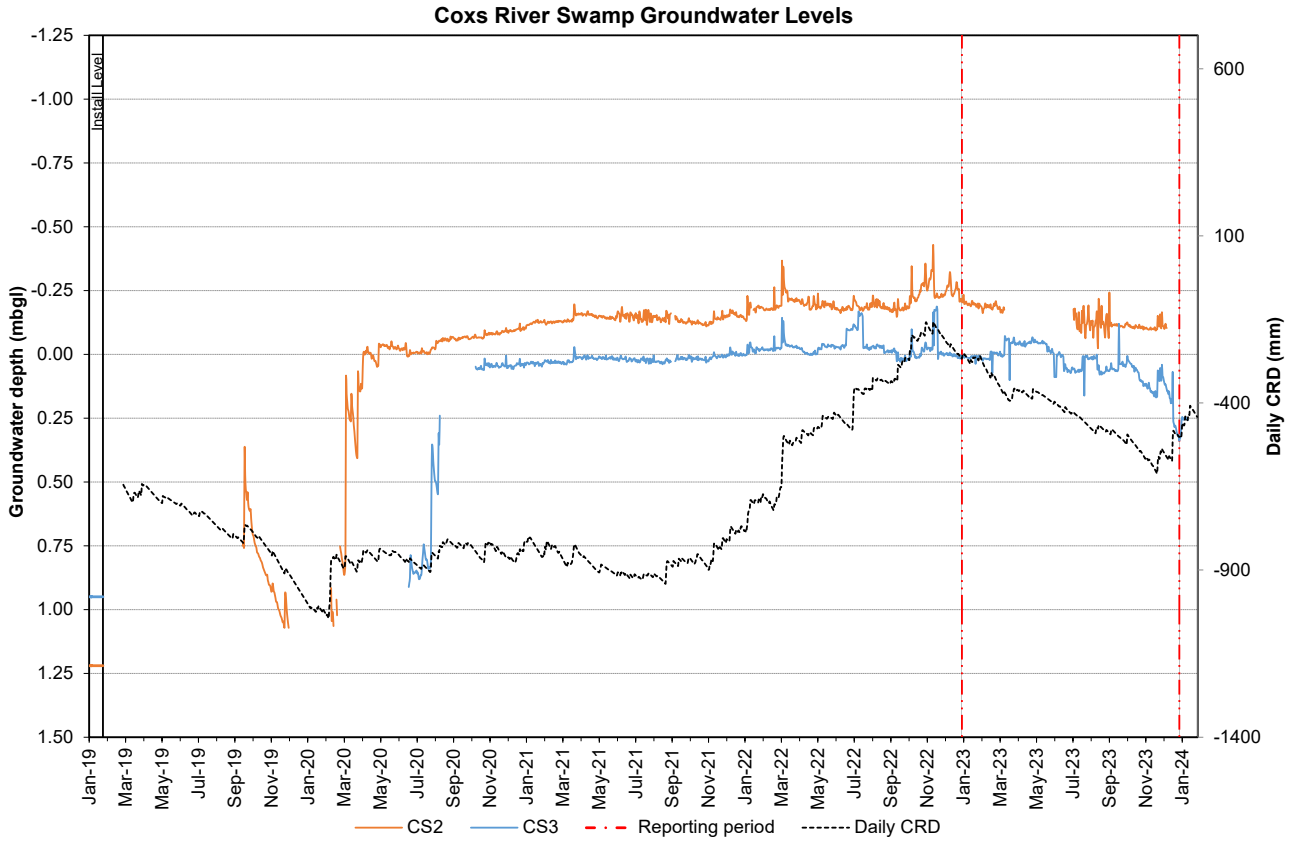


Figure 4.9 Coxs River hydrograph

4.2 Soil moisture monitoring

The soil moisture monitoring network comprises nine monitoring locations in three swamps – Kangaroo Creek Swamp, Twin Gully Swamp and Tristar Swamp.

Historically, all soil moisture probes were destroyed by bushfires between late 2019 and early 2020. The soil moisture probes at Twin Gully Swamp and Tristar Swamp were reinstalled in October 2020. New soil moisture probes were installed at Kangaroo Creek Swamp in November 2020; however, they are not paired with swamp piezometers.

A summary of key observations and trends is presented in Table 4.2. Time series plots for each monitoring location are presented in Appendix B, which includes soil moisture content at each sensor as a percentage. Dashed vertical lines indicate the reporting period.

Soil moisture content time series plots are presented in Appendix B and monitoring locations are presented in Figure 3.1.

Table 4.2 Soil moisture summary

Site ID	Number of sensors bgl[1]	Comments
KCU1SM	8 – every 10 cm	The 10 to 30 cm sensors showed dry soil moisture conditions. The 40 to 80 cm sensors responded to rainfall, with soil moisture content decreasing between rainfall events. Data gap between June and September due to flat battery.
KCU2SM	8 – every 10 cm	The 10 to 20 cm sensors are above surface, and the 30 cm sensor is just below surface, all of which are dry. The 40 to 50 cm sensors showed that soil moisture content was increasing at the beginning of the reporting period, before decreasing in October. The 60 to 80 cm sensors appeared to be fully saturated with a stable and slightly increasing trend. The 60cm sensor had more moisture fluctuation towards the end of the reporting period.
KCU3SM	4 – every 10 cm	The 10cm sensor showed generally dry soil moisture conditions, with minor fluctuations in response to rainfall. The 20 and 30cm sensors displayed moderately increasing soil moisture trends, while fluctuating in response to rainfall. The 40cm sensor appears fully saturated and stable. Data gap between July to October on all sensors because due to flat battery.
KCU4SM	8 – every 10 cm	The 10 to 30 cm sensors displayed dry soil moisture conditions because they are above surface. The 40 to 80 cm sensors showed soil moisture content was fluctuating in response to rainfall and slightly decreasing.
KCU5SM	4 – every 10 cm	No data was available for the reporting period because it has been damaged by fauna. The sensor needs to be replaced.
TG1SM	12 – every 10 cm	The 10 to 30cm sensors showed soil moisture content was stable with fluctuations in response to rainfall. The 40 to 120 cm sensors showed soil moisture content to be a stable and slightly increasing. The trends become increasingly subdued with sensor depth.
TG2SM	8 – every 10 cm	The 10 cm sensor showed a stable trend following a steady decrease in December 2022, with minor fluctuations in response to rainfall. The 20 to 30 cm sensors showed soil moisture content remained relatively stable with fluctuations in response to rainfall. The 40 cm sensor showed more minor moisture fluctuations due to rainfall. The 50 to 80 cm sensors remained stable. Minor fluctuations in response to rainfall reduced with sensor depth.
TS2SM	12 – every 10 cm	The 10 cm sensor showed a decreasing trend in response to rainfall. The 20 to 40 cm sensors remained stable for the first half of the reporting period before decreasing. The 50 to 60 cm sensors showed soil moisture content remained relatively stable to October and decreased thereafter. The 70 to 120 cm remained stable with a slight increasing trend.
TS3SM	12 – every 10 cm	All sensors showed soil moisture content was relatively stable with minor increasing trend. Fluctuations in response to rainfall reduced with sensor depth.

Notes: 1. bgl = below ground level.

4.3 Ridge piezometers

The ridge piezometer monitoring network comprises 16 monitoring bores targeting the shallow aquifer in the Banks Wall Sandstone.

Hydrographs for ridge piezometers are presented on Figure 4.10 which includes groundwater level data (mbgl) and the daily CRD (mm). Dashed vertical lines indicate the reporting period, and logger depths at each monitoring location are presented on the left of the figure. Manual measurements are recorded for REN, RSE, RNW and APKC2001.

A summary of key observations and trends is provided in Table 4.3, while monitoring locations are presented in Figure 3.1.

Table 4.3 Ridge piezometer summary

Site ID	Comments
AP1PR	Groundwater level decreasing.
AP4PR	Groundwater level is slightly increasing and then stable.
AP5PR	Groundwater level is stable.
AP8PR	Groundwater level slightly increasing.
AP9PR	Groundwater level is stable.
AP10PR	Groundwater level decreasing.
AP1104	Groundwater level is stable.
AP1105	Groundwater level slightly increasing.
AP1110	Groundwater level stable with data gap from May 2023.
AP1102	Groundwater level slightly decreasing.
AP1204	Groundwater level slightly increasing.
APKC2001	Groundwater level slightly decreasing.
APKC2002	Groundwater level slightly decreasing.
REN	Groundwater level decreasing
RSE	Groundwater level slightly decreasing.
RNW	Dry.

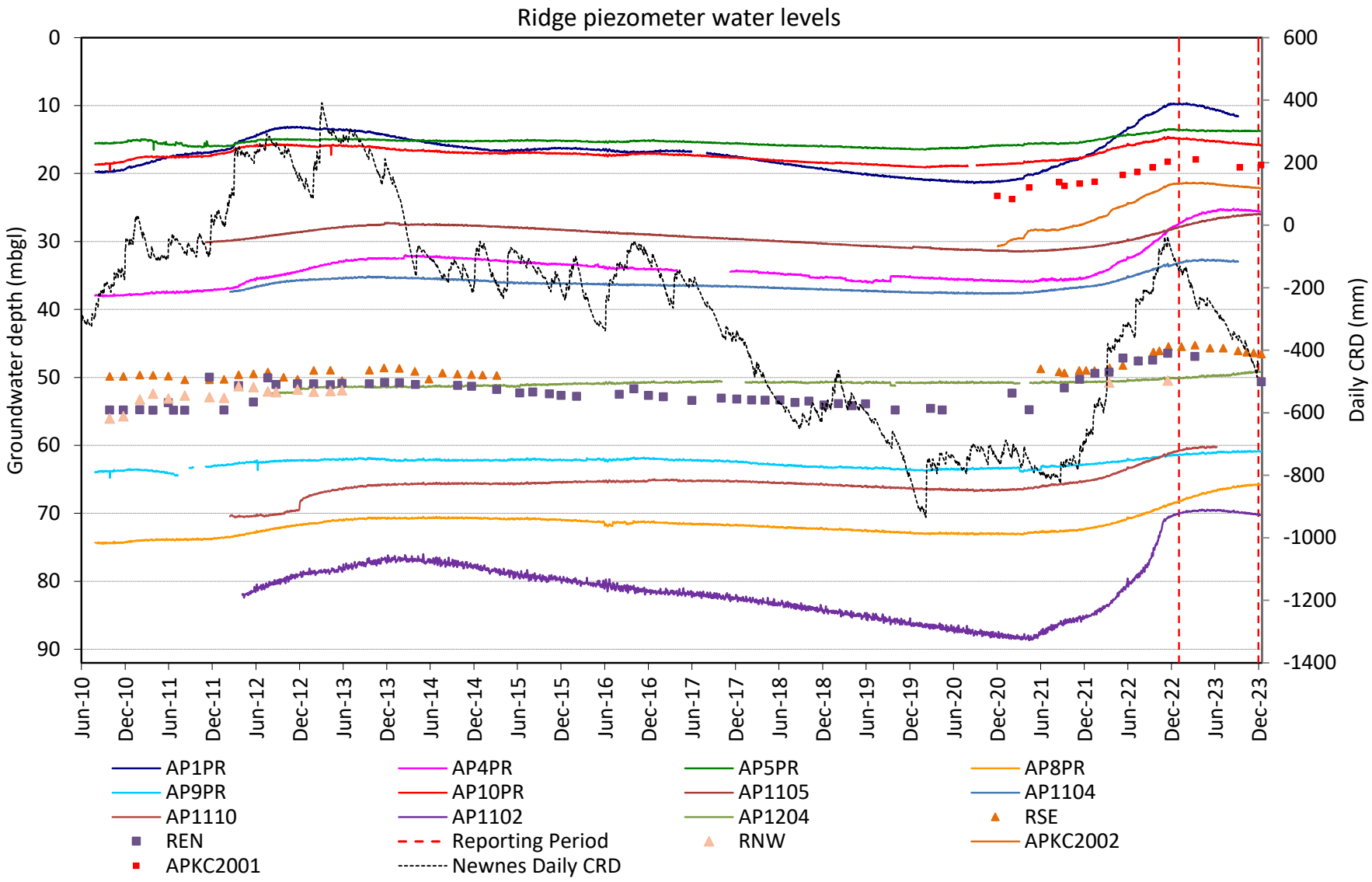


Figure 4.10 **Ridge piezometer hydrograph**

4.4 Vibrating wire piezometers

The VWP monitoring network comprises 11 monitoring locations measuring the piezometric pressures of multiple hydrogeological horizons within the deep and shallow aquifers.

Hydrographs for each monitoring site include piezometric pressure data for each sensor in mAHD and daily CRD. Dashed vertical lines indicate the reporting period, with sensor depths indicated to the left of each hydrograph. VWP hydrographs are presented in Figure C.1 to Figure C.11 (attached as Appendix C).

A summary of key observations and trends is provided in Table 4.4 and monitoring locations are presented in Figure 3.1.

Table 4.4 VWP summary

Site ID	Number of sensors	Summary of piezometric pressure measured by each sensor during the reporting period
AP2PR	6	Sensors #1 and #2 displayed stable trends. Sensor #3, #4 and #5 and sensor #6 (above the MYC) displayed slight increasing trends. Refer to Figure C.1.
AP10PR	9	Sensors #1, #2 and #3 displayed stable trends. Sensors #5 and #6 remained stable. Sensor #7 and sensors #8 and #9 (above the MYC) also displayed stable trends. Communication with sensor #4 was recovered in January 2023 and lost again in May 2023. Refer to Figure C.2.
AP11PR	9	Sensor #1, #2, #3 and # 4 displayed slightly increasing trends. Sensors #5 to #7 (above the MYC) and sensor #9 (above the MYC) remained stable. Sensor #8 (above the MYC) displayed a stable trend, before losing communication towards the end of May 2023. This is likely due to sensor malfunction. Refer to Figure C.3.
AP1102	7	Only 3 readings in June 2023 were available in the reporting period in all sensors. This is due to access restrictions. Refer to Figure C.4.
AP1104	7	Sensors #1 to #4 and sensor #7 displayed stable trends, with the exception of minor fluctuations in piezometric pressure at sensor #7. Sensor #6 displayed a slight increasing trend. Communication with sensor #5 was lost in April 2022 due to sensor malfunction. No new data from September 2023 due to access restrictions. Refer to Figure C.5.
AP1106	6	Sensors #1 to #6 remained stable and gradual increasing trends. It should be noted that data gaps are present from March to June 2023 and from August 2023 till the end of the reporting period. This is due to batteries running flat. Refer to Figure C.6.
AP1110	6	Sensor #5 has displayed a decreasing trend from late 2016, which is unrelated to mining. Sensors #1 to #4 remained stable. Communication with sensor #6 has been lost since February 2021 due to sensor malfunction. No data from June due to access restrictions. Refer to Figure C.7.
AP1206	6	All sensors show stable and slight increasing trends. Refer to Figure C.8.
APXXB2	7	Sensors #1 to #4 and sensors #6 and #7 displayed slight increasing trends. Minor fluctuations in piezometric pressure were observed by sensor #5, however this is consistent with historical trends. Refer to Figure C.9.
APXXB3	7	Sensors #1, #2 and #7 displayed stable trends. Sensors #3 and #4 displayed increasing trends before becoming stable. Sensors #5 and #6 displayed an increasing trend, with minor fluctuations in piezometric head consistent with historical observations. Refer to Figure C.10.
APC CS1	3	Sensors #1 and #3 showed slight decreasing trend, while sensor #2 displayed an increasing trend before decreasing and becoming stable. Refer to Figure C.11.

5 Surface water monitoring

The following subsections summarise surface water monitoring observations from the reporting period. Surface water quality data has been compared to the historic observations and the WMP trigger values.

5.1 Discharge water quality

Angus Place holds EPL 467, with water currently licensed to be discharged from the site through the following LDPs:

- LDP002–discharge of surface water from facilities into the Coxs River through the Settling Ponds
- LDP003–discharge of surface water from a sediment dam located at the Kerosene Vale Stockpile Area.

Water quality time series plots for electrical conductivity (EC), pH and total suspended solids (TSS) at LDP002 and LDP003 are presented in Figure 5.1 and Figure 5.2, respectively. Dashed horizontal lines indicate water quality trigger criteria, while the dashed vertical line indicates the beginning of the reporting period. Water quality trigger criteria for pH and TSS at both LDPs are outlined in Table 3.1.

The following summarises exceedances of the trigger criteria for LDP002 and LDP003 during the reporting period:

- LDP002 and LDP003 were within the upper and lower bounds for pH during the reporting period.
- TSS was exceeded in December for LDP002 and LDP003 but are exempt because 44 mm of rain was recorded over 5 consecutive days prior to discharge (see Section 3.3).

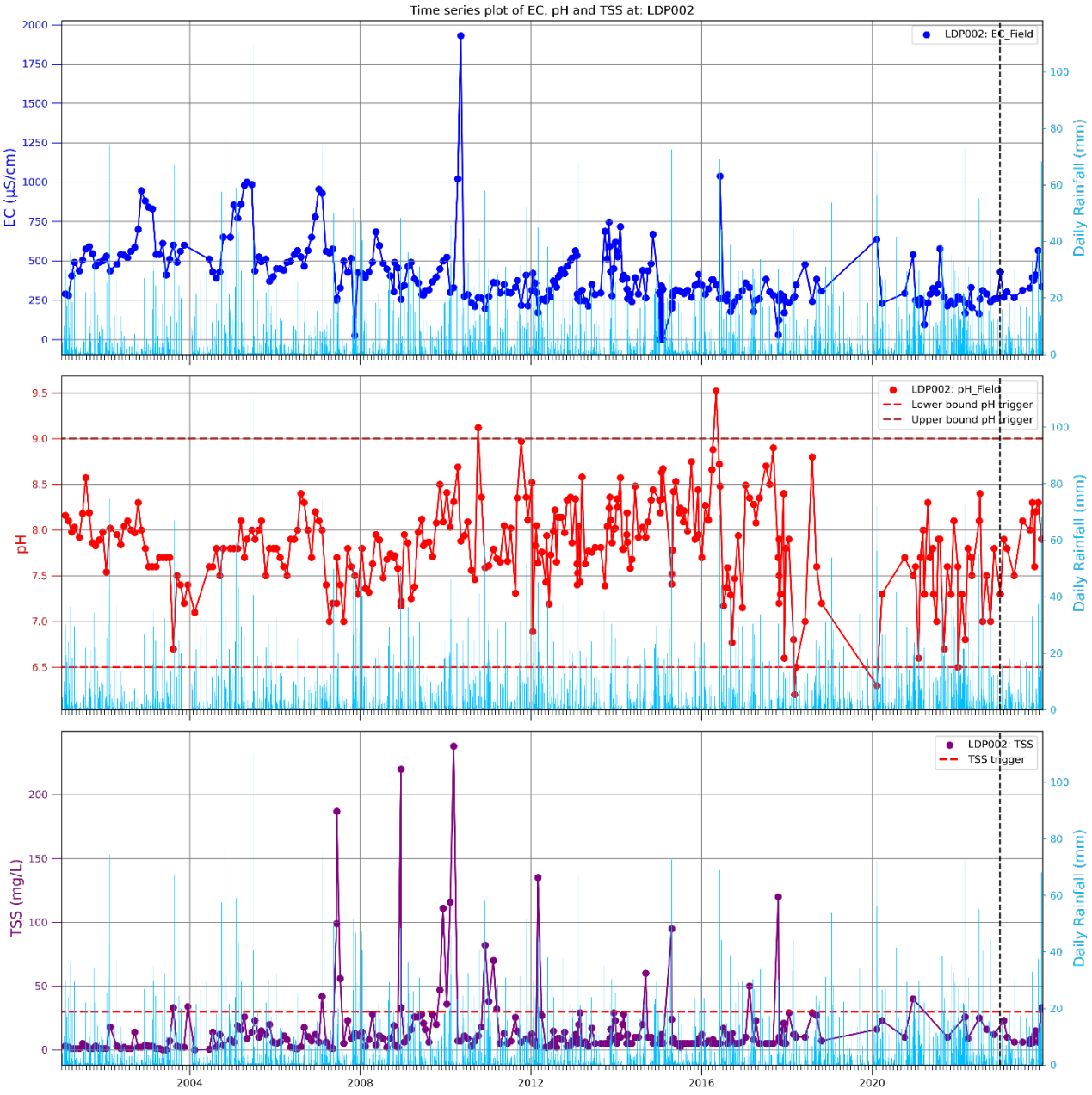


Figure 5.1 LDP002 water quality time series

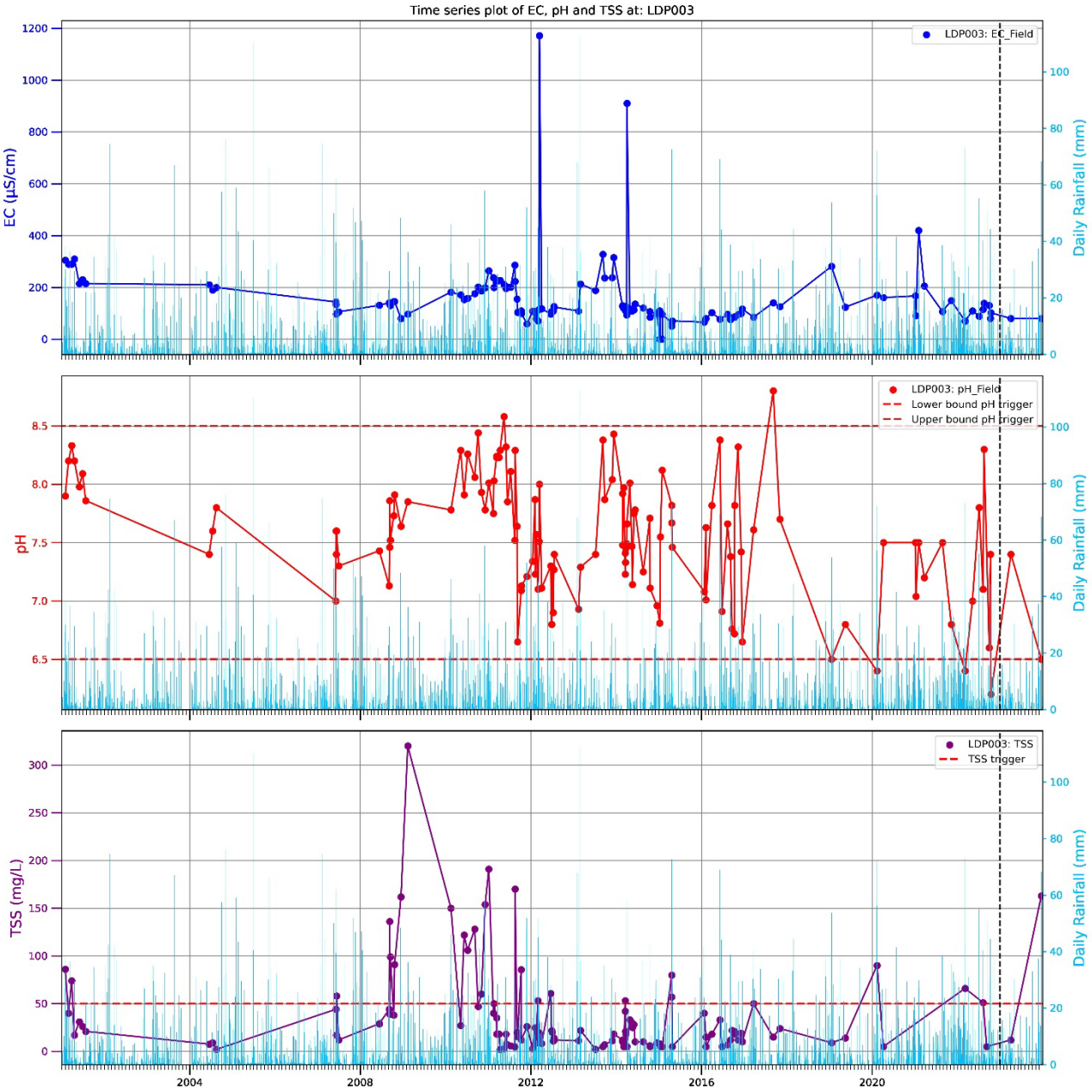


Figure 5.2 LDP003 water quality time series

5.2 Watercourse water quality

There are 13 watercourse monitoring sites, two of which (Coxs River D/S and KC/CR confluence) are assessed against SSGVs, which were based on a review of ANZECC (2000) DGVs. Commentary on observations for other watercourse monitoring sites is presented in Table 5.1 and timeseries are presented in Appendix D.1.

Surface water quality time series plots for EC, pH and TSS at Coxs River D/S and KC/CR confluence are presented in Figure 5.3 and Figure 5.4, respectively. Dashed horizontal lines indicate water quality trigger criteria, while the dashed vertical line indicates the beginning of the reporting period. Water quality trigger criteria for EC, pH and TSS at both monitoring locations are outlined in Table 3.1.

Three lower bound pH exceedances for Coxs River D/S were observed in September (5.9) and October (5.8, 6.2). One TSS exceedance was observed at KC/CR Confluence in August (30 mg/L). Both exceedances are due to natural variability.

Table 5.1 Watercourse surface water quality and flow rate summary

Site ID	Comments of surface water quality trends during the reporting period
Bungleboori	No data was available during the reporting period as water courses were dry.
Coxs River Far U/S	EC remained stable, while pH displayed a fluctuating trend consistent with historical observations. No TSS readings were observed during the reporting period. One flow reading was observed in January (319 kL/day).
Coxs River U/S	EC and TSS remained stable, while pH fluctuated, consistent with historical observations. Flow was not measured at the site because it was too low to measure.
Coxs River D/S	EC and TSS remained stable, while pH fluctuated, consistent with historical observations. Flow was measured in April (2,041 kL/day), May (1,969 kL/day), June (1,371 kL/day), July (8,513 kL/day) and August (1,732 kL/day). Flow in other months were not measured because flow was too low to measure. Three lower bound pH exceedances for Coxs River D/S were observed in September (5.9) and October (5.8, 6.2).
Kangaroo Creek D/S (AP)	One EC and pH reading was taken in June. No TSS or flow was observed during the reporting period.
Kangaroo Creek D/S (NP)	EC and TSS remained stable, except for a large EC spike in September 2023 and a TSS spike in November 2023, which was larger than historical observations. These spikes show no correlation to any significant rainfall events. pH and flow fluctuated, consistent with historical observations. Flow measurements ceased in June 2023.
Kangaroo Creek U/S (AP)	No data was available for all analytes during the reporting period.
Kangaroo Creek U/S (NP)	EC and TSS remained stable, while pH and flow fluctuated consistently with historical observations.
KC/CR Confluence	pH and EC show stable trends. One TSS exceedance was observed at KC/KR Confluence in August (30 mg/L).
Lambs Creek	EC remained stable. pH displayed a fluctuating trend consistent with historical observations. TSS remained relatively stable with historical observations. No flow data was available during the reporting period due to no flow conditions.
Long Swamp U/S	EC fluctuated in an increasing trend, consistent with historical observations, while pH fluctuated within historical observations. Two large spikes in TSS were observed in March and June, which was greater than historical observations. One flow reading was observed in March (1654 m3/day).
Wolgan River (Spanish Steps)	Two EC readings greater than historical observations occurred in May (430 uS/cm) and September (454 uS/cm). pH fluctuated consistently with historical observations except for one reading in September (3.1). TSS remained relatively stable, with one spike within historical observations. Limited flow data was available but remained relatively stable.
Wolgan River (Wolgah Property)	EC and flow rate remained stable with minor fluctuations, consistent with the historical average. pH and TSS fluctuated, consistent with historical observations.

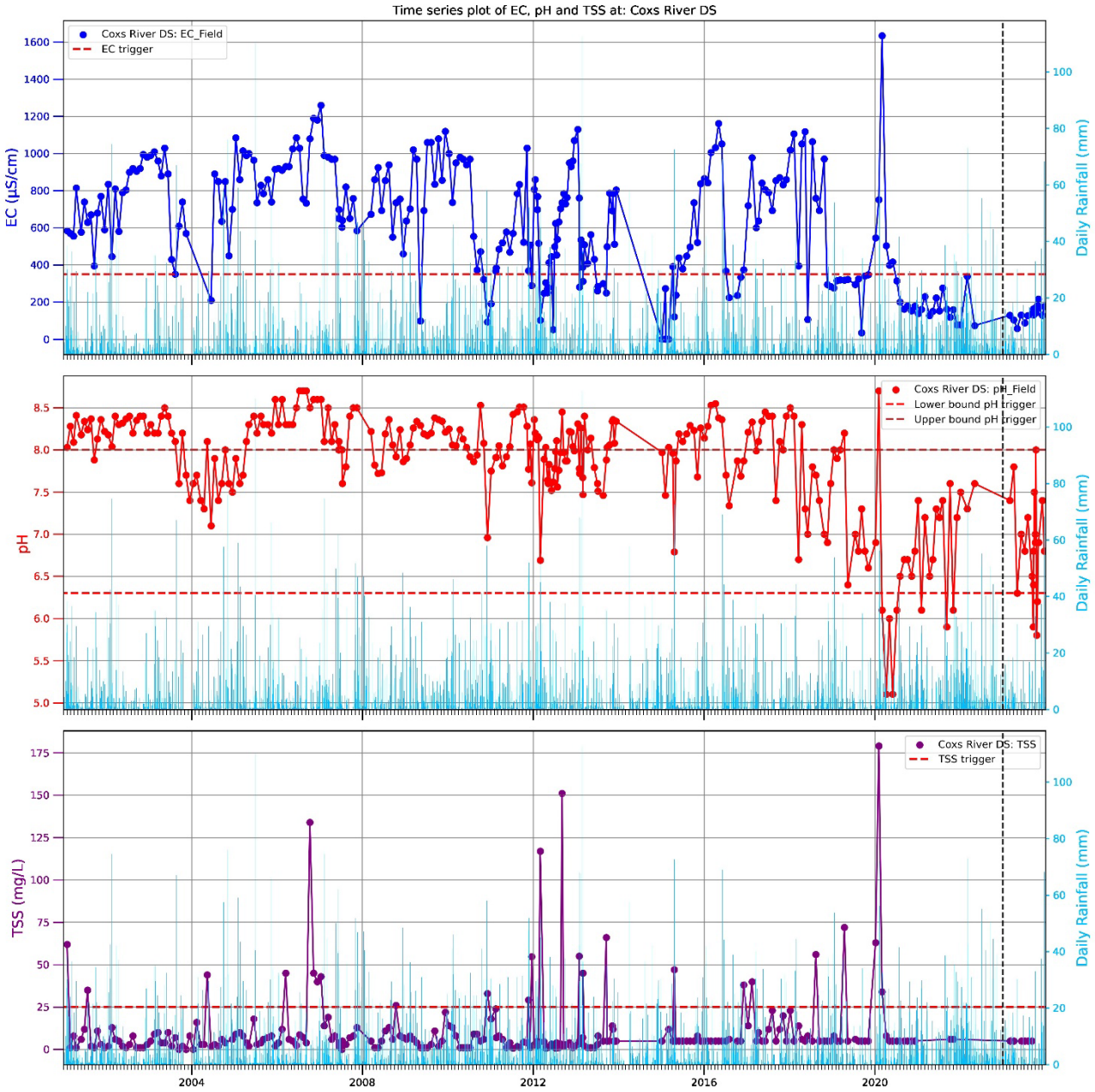


Figure 5.3 Coxs D/S surface water quality time series

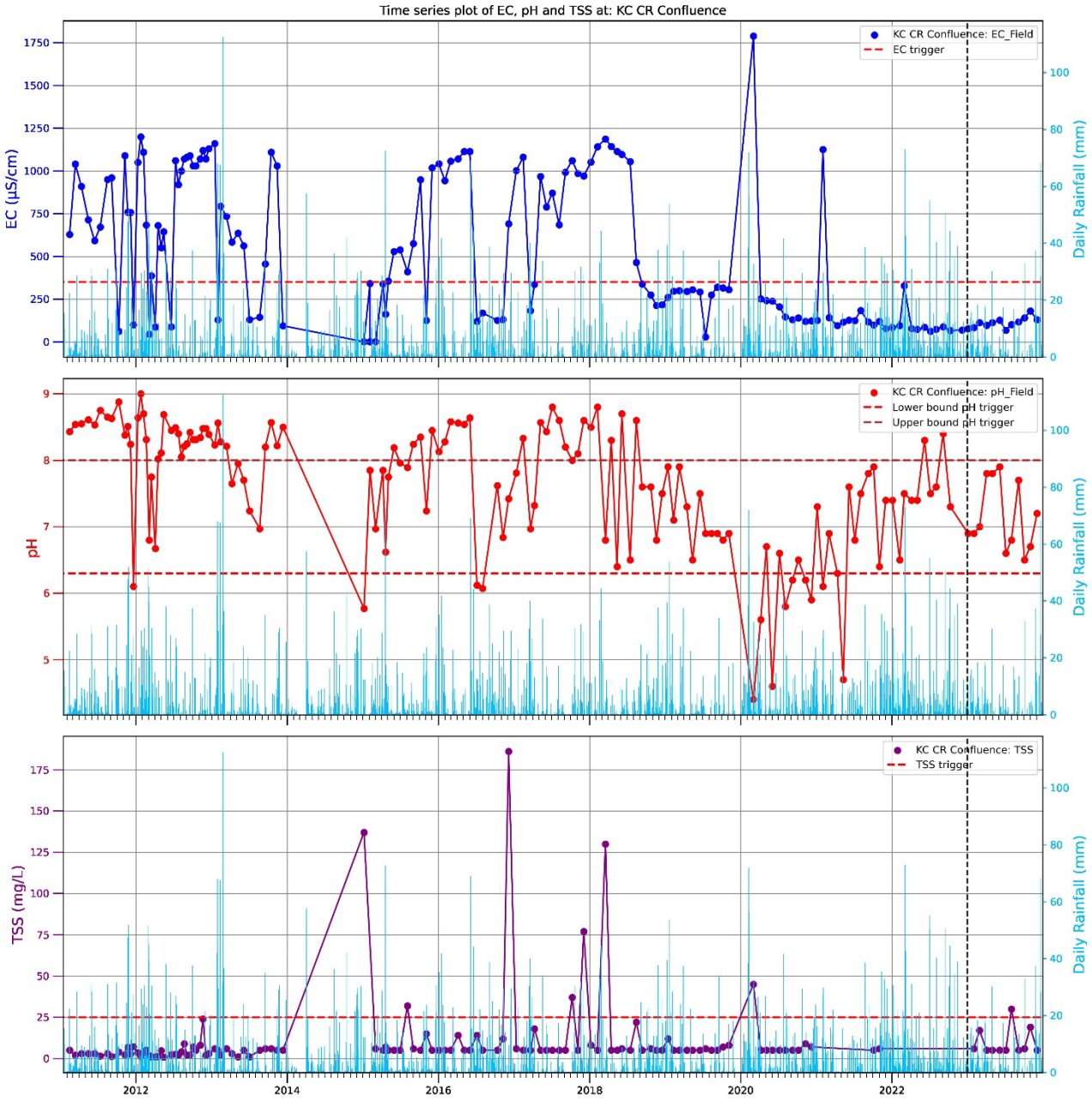


Figure 5.4 KC/CR Confluence surface water quality time series plots

5.3 Pit top surface water quality

The pit top surface water quality monitoring network comprises three monitoring locations. It should be noted that the WMP (GHD 2021) does not apply any trigger criteria to the monitoring locations.

Pit top surface water quality time series plots are presented in Appendix D.2. The dashed vertical line indicates the beginning of the reporting period.

During the reporting period, EC, pH and TSS remained relatively consistent with historical observations.

A summary of key observations and trends during the reporting period is provided in Table 5.2 and monitoring locations are presented in Figure 3.2.

Table 5.2 Pit top surface water quality summary

Site D	Comments of surface water quality trends during the reporting period
Carpark Culvert	pH and TSS have remained constant with historic observations. It should be noted that EC has not been recorded at the site since 2020 due to the development of monitoring requirements.
South Sediment Dam (Entrance Dam)	EC and TSS remained relatively stable. pH fluctuated consistently with historical observations.
South Sediment Dam (Entrance Dam) Discharge	No data was available for the reporting period.

5.4 Swamp surface water quality and flow

The swamp surface water quality and flow monitoring networks comprise of five monitoring locations. It should be noted that the WMP (GHD 2021) does not apply any trigger criteria to the monitoring locations.

Swamp surface water quality time series plots are presented in Appendix D.3. The dashed vertical line indicates the beginning of the reporting period.

During the reporting period, EC, pH, TSS and flow rate remained relatively consistent with historical observations.

A summary of key observations and trends during the reporting period is provided in Table 5.3 and monitoring locations are presented in Figure 3.2.

Table 5.3 Pit top surface water quality summary

Site ID	Comments of surface water quality trends during the reporting period
Narrow Swamp U/S	No data available for all analytes due to dry swamp conditions.
Narrow Swamp D/S	No data available for all analytes due to dry swamp conditions.
Star Picket	No data available for all analytes due to dry swamp conditions.
Tri Star Swamp	Water quality parameters show trends consistent with climatic observations and historical trends.
Twin Gully Swamp	No data was available for 2023 due to access restrictions.

6 Conclusions

The findings of this report are summarised in Table 6.1. The highlighted conditions are those defined in the TARP (refer Appendix A) found in the WMP (GHD 2021).

Table 6.1 Report summary

Monitoring zone	Comments	Condition (TARP)
Swamp monitoring piezometers	Swamp groundwater levels were generally stable, except for fluctuating groundwater levels at monitoring locations that are typically dry, as a response to below average rainfall observed during the reporting period.	Not applicable
Soil moisture probes	Soil moisture content typically fluctuated closer to ground level, while deeper sensors indicated soil moisture content to generally be stable or slightly decreasing.	Not applicable
Open standpipe piezometers	Groundwater levels were generally increasing, reflecting a delayed recharge due to above average rainfall during 2022.	Condition: Normal
Vibrating wire piezometers (VWP)	Piezometric pressures were generally stable or increasing at most monitoring locations. It should be noted that data from some VWPs was not available because of limited access due to degraded access track conditions or flat batteries.	Condition: Normal
Discharge surface water quality	LDP002 and LDP003 were within the upper and lower bounds for pH during the reporting period. TSS was exceeded in December for LDP002 and LDP003 but are exempt because 66 mm of rain was recorded over 5 consecutive days period prior to discharge (see Table 3.1).	Condition: Normal
Watercourse surface water quality and flow rate	Watercourse surface water quality at Coxs D/S and KC/CR Confluence were within the SSTVs during the reporting period, except for three lower bound pH exceedances for Coxs River D/S observed in and September (5.9) and October (5.8, 6.2) and one TSS exceedance observed at KC/KR Confluence in August (30 mg/L). Both exceedances are due to natural variability. The surface water quality and flow observations at the watercourse monitoring locations without specified SSTVs generally remained consistent with historical observations. It should be noted that some monitoring locations were dry or inaccessible due to degraded access track conditions during the reporting period.	Condition: Normal
Pit top surface water quality	Pit top surface water quality observations generally remained consistent with historical observations.	Condition: Normal
Swamp surface water quality and flow rate	Swamp surface water quality and flow observations generally remained consistent with historical observations. It should be noted that some monitoring locations were dry or inaccessible due to degraded access track conditions during the reporting period.	Condition: Normal

References

GHD (2021) *Angus Place Colliery Water Management Plan*, prepared by GHD Group Pty Ltd for Centennial Angus Place Pty Limited, 2021.

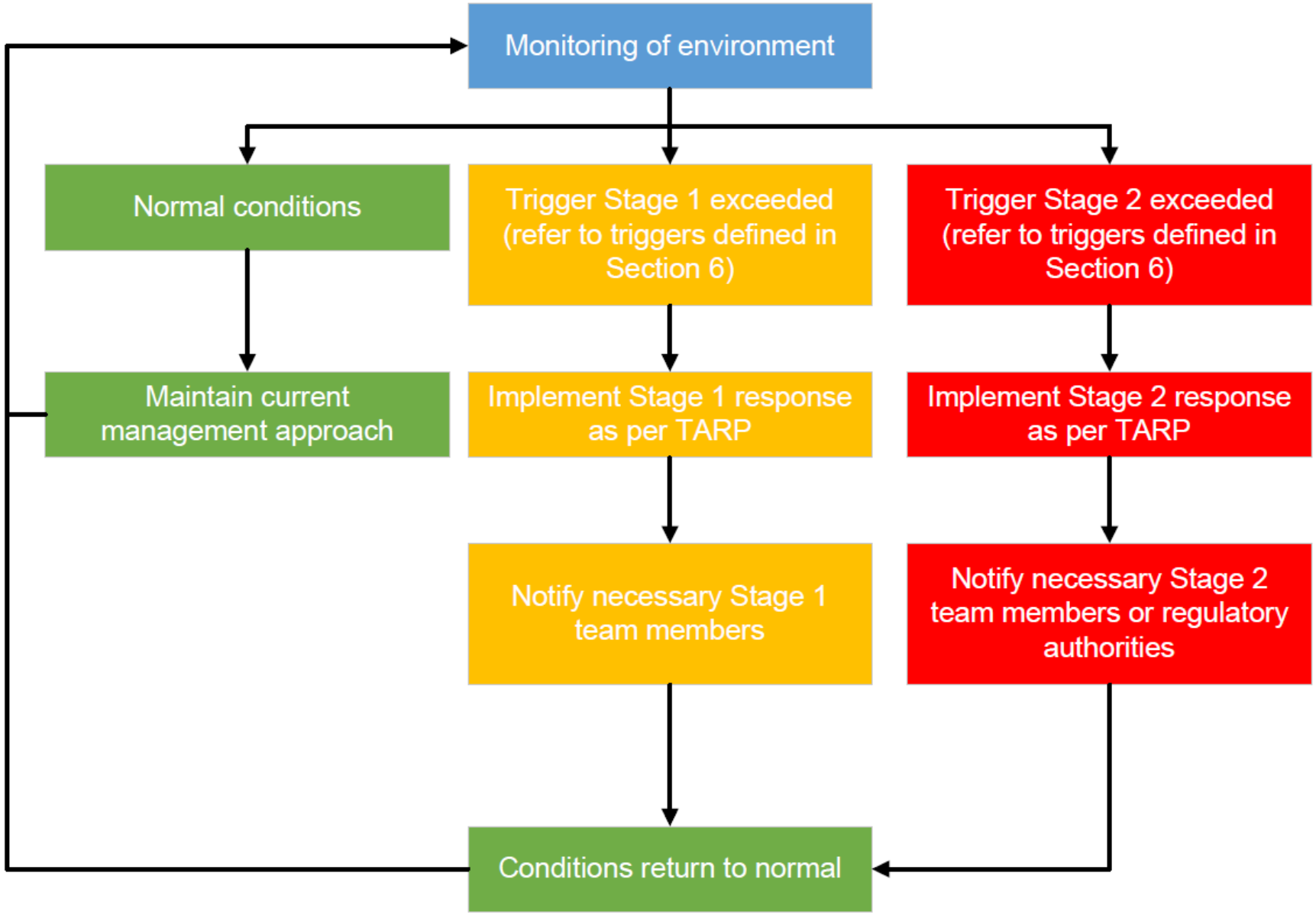
Jacobs (2019) *Groundwater Impact Assessment, Angus place Amended Project*, prepared by Jacobs Group (Australia) Pty Ltd for Centennial Angus Place Pty Ltd, October 2019.

McHugh (2018) *The geology of the shrub swamps within Angus place, Springvale and the Springvale Mine extension project areas*, prepared by E.A. McHugh Geological and Petrographic Services for Centennial Coal Pty Ltd, September 2018.

Appendix A

Trigger action response plans (TARP)

EMM
creating opportunities


Monitoring of environment
Normal conditions
Trigger Stage 1 exceeded (refer to triggers defined in Section 6)
Trigger Stage 2 exceeded (refer to triggers defined in Section 6)
Maintain current management approach
Implement Stage 1 response as per TARP
Implement Stage 2 response as per TARP
Notify necessary Stage 1 team members
Notify necessary Stage 2 team members or regulatory authorities
Conditions return to normal

Site surface operations

Aspect	Normal	Stage 1	Stage 2	Notifications
Surface water storage volume	Storage captures events up to and including the design criteria.	**Trigger:** Storage is not dewatered appropriately following storm event in accordance with design criteria. **Action:** Investigate storage operation and dewatering options. Increase inspection frequency as required. Education of staff.	**Trigger:** Storage is discharging as a result of a storm event less than the design criteria. **Action:** Increase inspection frequency as required. Undertake water quality sampling of discharge and add flocculant as necessary. Undertake water quality sampling of downstream locations.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager immediately. **Stage 2:** Notify relevant agencies in accordance with Pollution Incident Response Management Plan (PIRMP) requirements or if material harm has occurred.
Clean water diversions	Clean water diverted around dirty water areas.	**Trigger:** Clean water bypass through dirty water areas. **Action:** Review catchment plan. Review design capacity of clean water system. Appropriately treat and manage dirty water.	**Trigger:** Clean water creates flooding problems through site. **Action:** Evacuate site if danger exists. Establish temporary bunding around clean water source. Utilise earthworks machinery to cut appropriate channel to manage clean water. Protect equipment and infrastructure. Utilise portable pumps to dewater flooded areas into storages.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager immediately. **Stage 2:** Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred. Notify DPIE if exceedance of limit occurs.

Aspect	Normal	Stage 1	Stage 2	Notifications
Erosion and sediment control	All controls are appropriately in place and well maintained. No disturbance areas or migration of sediment away from designated development areas.	**Trigger:** One or more areas of surface erosion in the form of rilling, bank erosion or other movement of sediment from an area of disturbance. Controls are not maintained or are inappropriately installed. **Action:** Seek to stabilise the area to stop the erosion process. This can include the use of groundcover or other temporary measures. Investigate works undertaken prior to the disturbance activities.	**Trigger:** Controls are not in place. Rainfall event has led to sediment migrating off site. **Action:** Isolate the area through diverting contributing surface flows to another appropriate control structure.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager immediately. **Stage 2:** Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred. Notify DPIE if exceedance of limit occurs.
Hydrocarbon management	All hydrocarbon materials are stored appropriately.	**Trigger:** Minor spill occurs on site with limited risk of offsite migration. **Action:** Implement procedures in the PIRMP. Utilise spill kit.	**Trigger:** Major spill occurs on site with risk of offsite migration. **Action:** Isolate area and divert contributing surface flows. Engage waste contractor to clean spill. Investigate potential for contamination of waterways.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager. **Stage 2:** Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred. Notify DPIE if exceedance of limit occurs.

Aspect	Normal	Stage 1	Stage 2	Notifications
Water Transfer volume	Water transfer volume is within predictions of the site water balance and limits defined by MP06_0021.	**Trigger:** Forecasted transfer volume requirements exceeds predictions/limits. **Action:** Undertake investigation.	**Trigger:** Transfer volumes exceeds predictions/limits. **Action:** Undertake review of water management on site. Review on site transfers and predictions of hydrogeological model/site water balance model. Update models as required.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager immediately. **Stage 2:** Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred. Notify DPIE and WaterNSW if exceedance of limit occurs as soon as practicable.

Watercourses

Aspect	Normal	Stage 1	Stage 2	Notifications
Water quality	Water quality at downstream monitoring locations within or below the SSGVs specified in (for Coxs River) or consistent with upstream monitoring location (for Wolgan River).	**Trigger:** Water quality is outside or above the values specified in Table 6-1 (for Coxs River) or statistically significantly different to upstream monitoring location (for Wolgan River) for at least one parameter for two consecutive sampling events. **Action:** Review recent monitoring results for adjacent sites and any relevant operational data (e.g. mining activities, clearing activities, meteorological data). Investigate the source of the exceedance and develop corrective/preventative actions based on outcomes (refer Appendix I).	**Trigger:** Investigation into Stage 1 trigger identifies that trigger exceedance is due to an operational activity. Community complaint to Centennial regarding surface water quality. **Action:** Determine if an incident has potentially occurred and investigate the source of the exceedance. Increase monitoring frequency and undertake additional monitoring (e.g. water quality, aquatic ecology) where relevant. Implement corrective/preventative actions, in consultation with relevant agencies, based on the outcomes of the investigation and/or additional monitoring (refer Appendix I). Prioritise actions based on the risk to the environment and likelihood of further impact. Review the WMP and related procedures to prevent reoccurrence. Loss of water supply to any adjacent landholder due to mining-related activities will need to be replaced by Centennial.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager immediately. **Stage 2:** Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred. Notify DPIEW as soon as practicable.

Aspect	Normal	Stage 1	Stage 2	Notifications
Water flow	Creek flow rates and relationships with rainfall are consistent with historical baseline results.	**Trigger:** Reduction in flow compared to historical baseline results. **Action:** Review recent monitoring results for adjacent sites and any relevant operational data (e.g. mining activities, clearing activities, meteorological data). Investigation the source of the reduction in flow and develop corrective/preventative actions based on outcomes (refer Appendix I).	**Trigger:** Loss of flow compared to historical baseline results is attributable to site operations. Community complaint to Centennial regarding surface water flow. **Action:** Review recent monitoring results for adjacent sites and any relevant operational data (e.g. mining activities, clearing activities, meteorological data). Determine if an incident has potentially occurred and investigate the source of the loss of flow. Implement corrective/preventative actions, in consultation with relevant agencies, based on the outcomes of the investigation (refer Appendix I). Prioritise actions based on the risk to the environment and likelihood of further impact. Review the WMP and related procedures to prevent reoccurrence. Loss of water supply to any adjacent landholder due to mining-related activities will need to be replaced by Centennial.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager immediately. **Stage 2:** Notify DPIEW and WaterNSW (if within Coxs River catchment) as soon as practicable.

Discharge management

Aspect	Normal	Stage 1	Stage 2	Notifications
LDP discharge quality	Discharge quality is within limits defined by EPL.	**Trigger:** Water quality parameters exceed discharge limits for one parameter for one discharge event. **Action:** Undertake investigation. Repeat sampling. Consider a reduction in pumping from underground storage if appropriate.	**Trigger:** Water quality parameters exceed discharge limits for more than one parameter. **Action:** Undertake review of water management on site. Undertake incident investigation including ecotoxicology and aquatic ecology monitoring if appropriate.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager immediately. **Stage 2:** Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred. Notify DPIE and WaterNSW if exceedance of limit occurs as soon as practicable.
LDP discharge volume	Discharge volume is within predictions of the site water balance and limits defined by EPL.	**Trigger:** Discharge volume exceeds predictions/limit for no more than one day. **Action:** Undertake investigation. Review monitoring equipment.	**Trigger:** Discharge volume exceeds predictions for more than one day. **Action:** Undertake review of water management on site. Review on site transfers and predictions of hydrogeological model/site water balance model. Update models as required.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager immediately. **Stage 2:** Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred. Notify DPIE and WaterNSW if exceedance of limit occurs as soon as practicable.

Aspect	Normal	Stage 1	Stage 2	Notifications
Unlicensed emergency discharges	No discharges from emergency locations.	**Trigger:** Discharge from a non-EPL defined emergency discharge location. **Action:** Undertake investigation. Increase monitoring frequency downstream and undertake additional monitoring where relevant.	**Trigger:** Continued discharge from a non-EPL defined, emergency discharge location. **Action:** Undertake review of water management on site. Undertake incident investigation, including ecotoxicology and aquatic ecology monitoring if appropriate.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager immediately. Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred. Notify DPIE and WaterNSW (if within Coxs River catchment) as soon as practicable.

Groundwater monitoring

Aspect	Normal	Stage 1	Stage 2	Notifications
Groundwater level	Depth to groundwater is less than the depths outlined in Table 6-2 under the conditions outlined.	**Trigger:** Depth to groundwater is greater than the depths outlined in Table 6-2 under the short-term and long-term conditions outlined. **Action:** Undertake investigation including review of adjacent sites and any relevant operational data (e.g. mining activities, meteorological data) to determine if the change is due to mining related activities.	**Trigger:** Investigation into Stage 1 trigger identifies that trigger exceedance is due to an operational activity and is outside predictions from the hydrogeological model and impact assessment predictions. Community complaint to Centennial regarding loss of groundwater at landholder bore. **Action:** Verify whether monitoring results are consistent with hydrogeological model predictions and consider recalibration. Implement corrective/preventative actions, in consultation with relevant agencies, based on the outcomes of the investigation (refer Appendix I). Prioritise actions based on the risk to the environment and likelihood of further impact. Review the WMP and related procedures to prevent reoccurrence. Loss of water supply to any adjacent landholder due to mining-related activities will need to be replaced by Centennial.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager immediately. **Stage 2:** Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred.

Aspect	Normal	Stage 1	Stage 2	Notifications
Piezometric level	Piezometric pressure is above levels provided in Table 6-3 under the conditions outlined.	**Trigger:** Piezometric level is below the levels in Table 6-3 under the conditions outlined. **Action:** Undertake investigation including review of adjacent sites and any relevant operational data (e.g. mining activities, meteorological data) to determine if the change is due to mining related activities.	**Trigger:** Investigation into Stage 1 trigger identifies that trigger exceedance is due to an operational activity. Community complaint to Centennial regarding loss of groundwater at landholder bore. **Action:** Implement corrective/preventative actions, in consultation with relevant agencies, based on the outcomes of the investigation (refer Appendix I). Prioritise actions based on the risk to the environment and likelihood of further impact. Review the WMP and related procedures to prevent reoccurrence. Loss of water supply to any adjacent landholder due to mining-related activities will need to be replaced by Centennial.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager immediately. **Stage 2:** Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred.

Aspect	Normal	Stage 1	Stage 2	Notifications
Groundwater quality	Groundwater quality monitoring results are consistent with historical results.	**Trigger:** Review of groundwater quality monitoring data identifies a statistically significant change compared to historical results. **Action:** Undertake investigation including review of adjacent sites and any relevant operational data (e.g. mining activities, meteorological data) to determine if the change is due to mining related activities.	**Trigger:** Investigation into Stage 1 trigger identifies that trigger exceedance is due to mining-related activity. Community complaint to Centennial regarding groundwater quality at landholder bore. **Action:** If environmental impacts are unacceptable and/or if the beneficial use of the groundwater changes, remediation options will be considered. Loss of water supply to any adjacent landholder due to mining-related activities will need to be replaced by Centennial.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager immediately. **Stage 2:** Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred.

Stream health

Aspect	Normal	Stage 1	Stage 2	Notifications
Watercourse instabilities (Kangaroo Creek and Long Swamp)	Watercourse monitoring indicates no areas of new instabilities compared to historical monitoring (2017 baseline conditions).	**Trigger:** Visual inspection indicates one or more areas of minor instability. **Action:** Review historical monitoring records. Investigate the factors contributing to the instability, which may include advice from technical specialists. Implement corrective actions as required as soon practicable to stabilise the surface and/or watercourses based on the outcomes of the investigation. Increase monitoring frequency and undertake additional monitoring where relevant.	**Trigger:** Visual inspection indicates one or more areas of major instability. **Action:** Immediately isolate areas of instability and implement remediation measures to stabilise surface and/or watercourse. Investigate the factors contributing to the instability, which may include advice from technical specialists. Implement corrective actions as required as soon as practicable to stabilise the surface and/or watercourses based on the outcomes of the investigation (refer Appendix I). Prioritise actions based on the risk to the environment and likelihood of further impact. Increase monitoring frequency and undertake additional monitoring (e.g. watercourse stability, water quality, aquatic ecology) where relevant. Review WMP and related procedures to prevent reoccurrence.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager immediately. **Stage 2:** Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred.

Aspect	Normal	Stage 1	Stage 2	Notifications
Watercourse instabilities (all other watercourses)	Subsidence levels are within predictions.	**Trigger:** Subsidence levels 1.5 times greater than predicted values. **Action:** Undertake visual monitoring of watercourses to identify any instabilities that may have formed.	**Trigger:** Investigation into Stage 1 trigger indicates watercourse instabilities. **Action:** Investigate the factors contributing to the instability, which may include advice from technical specialists. Undertake additional monitoring (e.g. watercourse stability, water quality, aquatic ecology) where relevant. Implement corrective actions as required as soon as practicable to stabilise the surface and/or watercourses based on the outcomes of the investigation (refer Appendix I). Prioritise actions based on the risk to the environment and likelihood of further impact. Review WMP and related procedures to prevent reoccurrence.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager immediately. **Stage 2:** Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred.

Aspect	Normal	Stage 1	Stage 2	Notifications
Instream vegetation	No significant change in vegetation extent or quality compared with previous monitoring results.	**Trigger:** Visual inspections show change in extent and density of instream vegetation not specific to season. Introduction or increase in number of exotic species. **Action:** Review activities likely to influence instream vegetation. Review flow monitoring and rainfall data. Consider using RCE measure to quantify change from historical results.	**Trigger:** Visual inspections show significant change in extent and density of instream vegetation because of clearing or impact. **Action:** Increase monitoring frequency and undertake additional monitoring (e.g. watercourse stability, water quality, aquatic ecology) where relevant. Undertake water quality monitoring to determine potential impact on in situ conditions. Stabilise watercourse banks as necessary.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager immediately. **Stage 2:** Notify DPIEW as soon as practicable.
In situ water quality	No significant change in water quality compared with previous monitoring results.	**Trigger:** Poor water quality observed compared with previous monitoring results. **Action:** Investigate sources of water quality degradation. Repeat sampling within one week.	**Trigger:** Continued poor water quality observed compared with previous monitoring results and attributable to site operations. **Action:** Review catchment inputs. Inspect waterway upstream of monitoring locations. Undertake analysis of full suite of parameters.	**Stage 1:** Notify Environment and Community Coordinator/Mine Manager immediately. **Stage 2:** Notify DPIEW as soon as practicable.

Appendix B

Soil moisture time series plots

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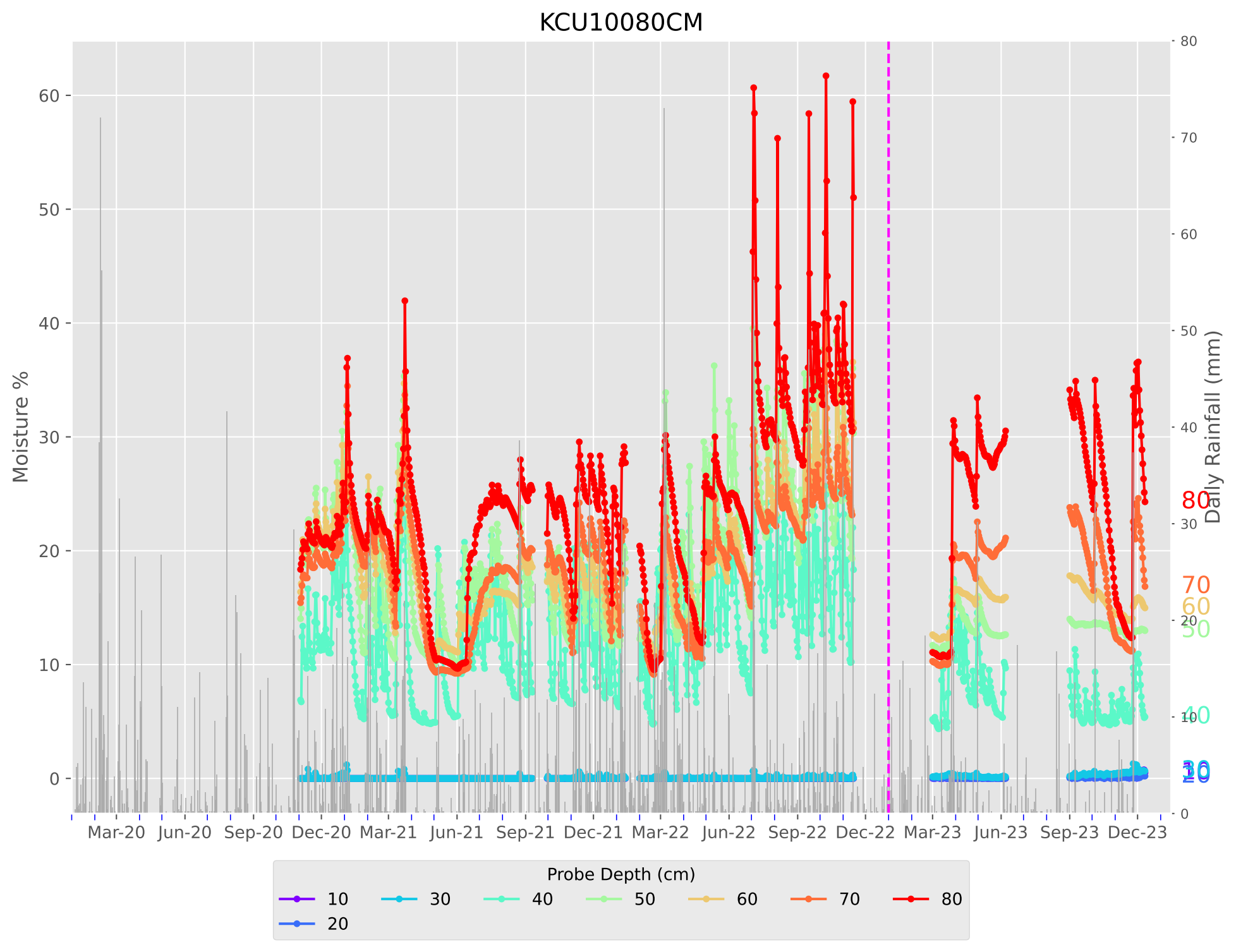
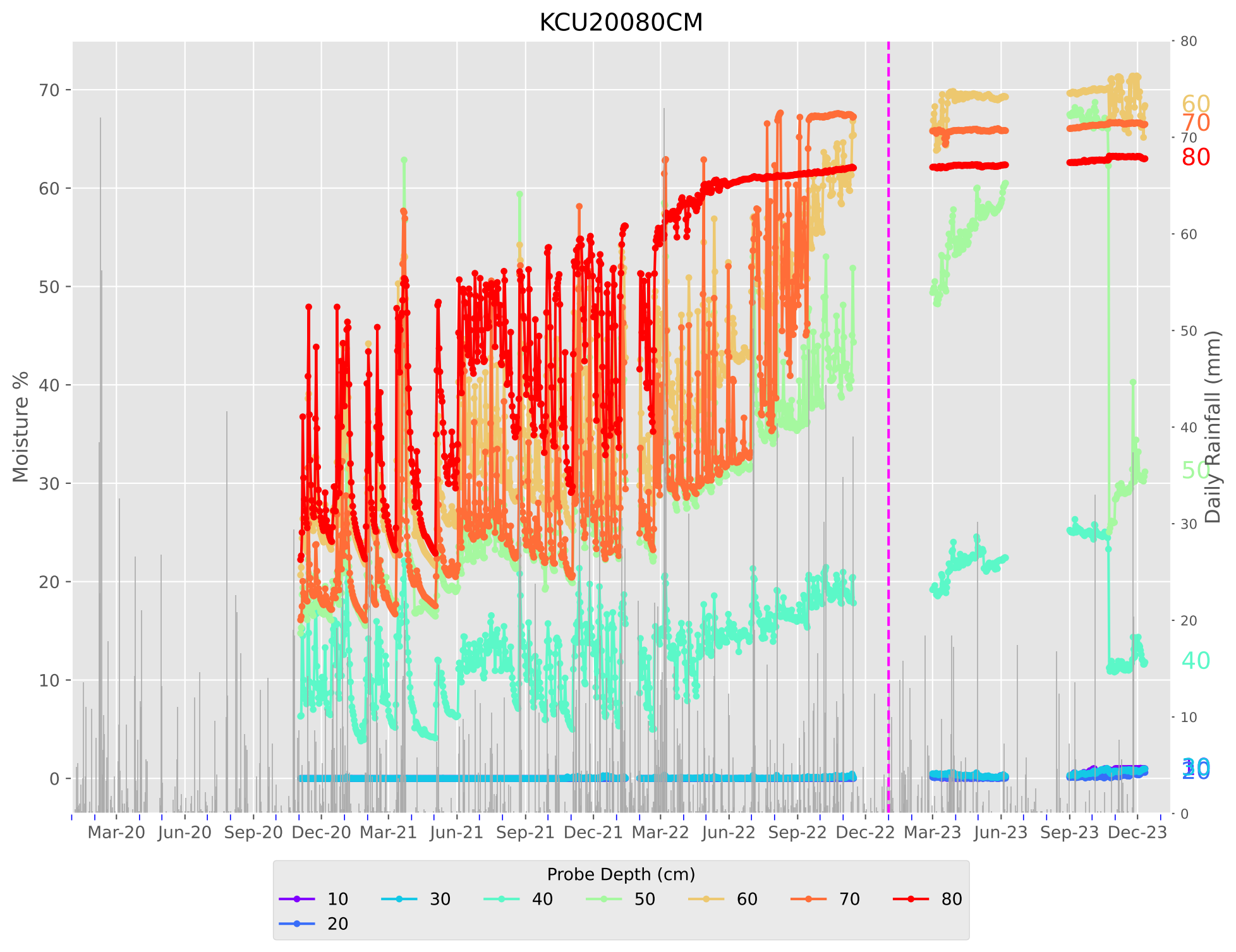
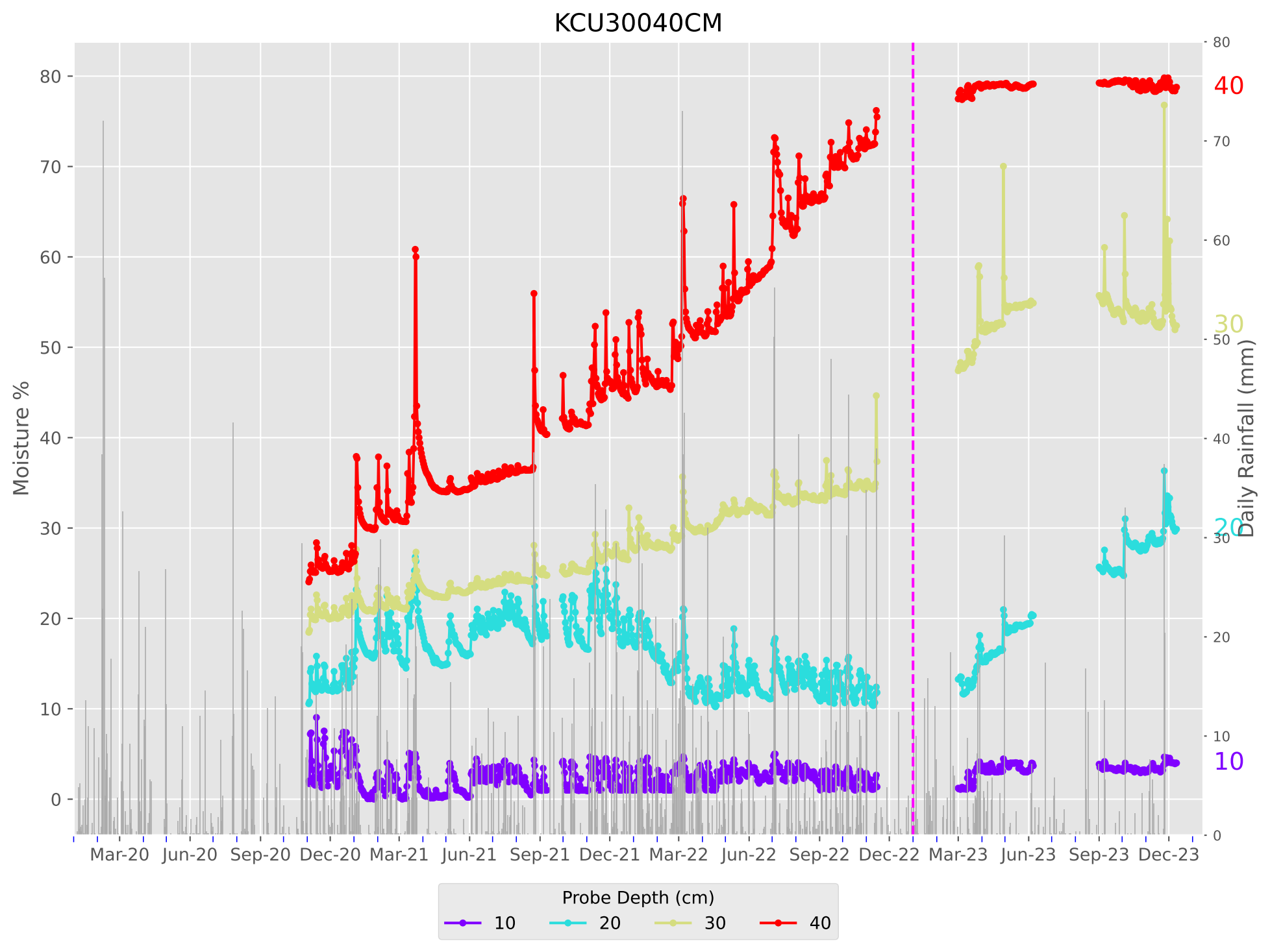
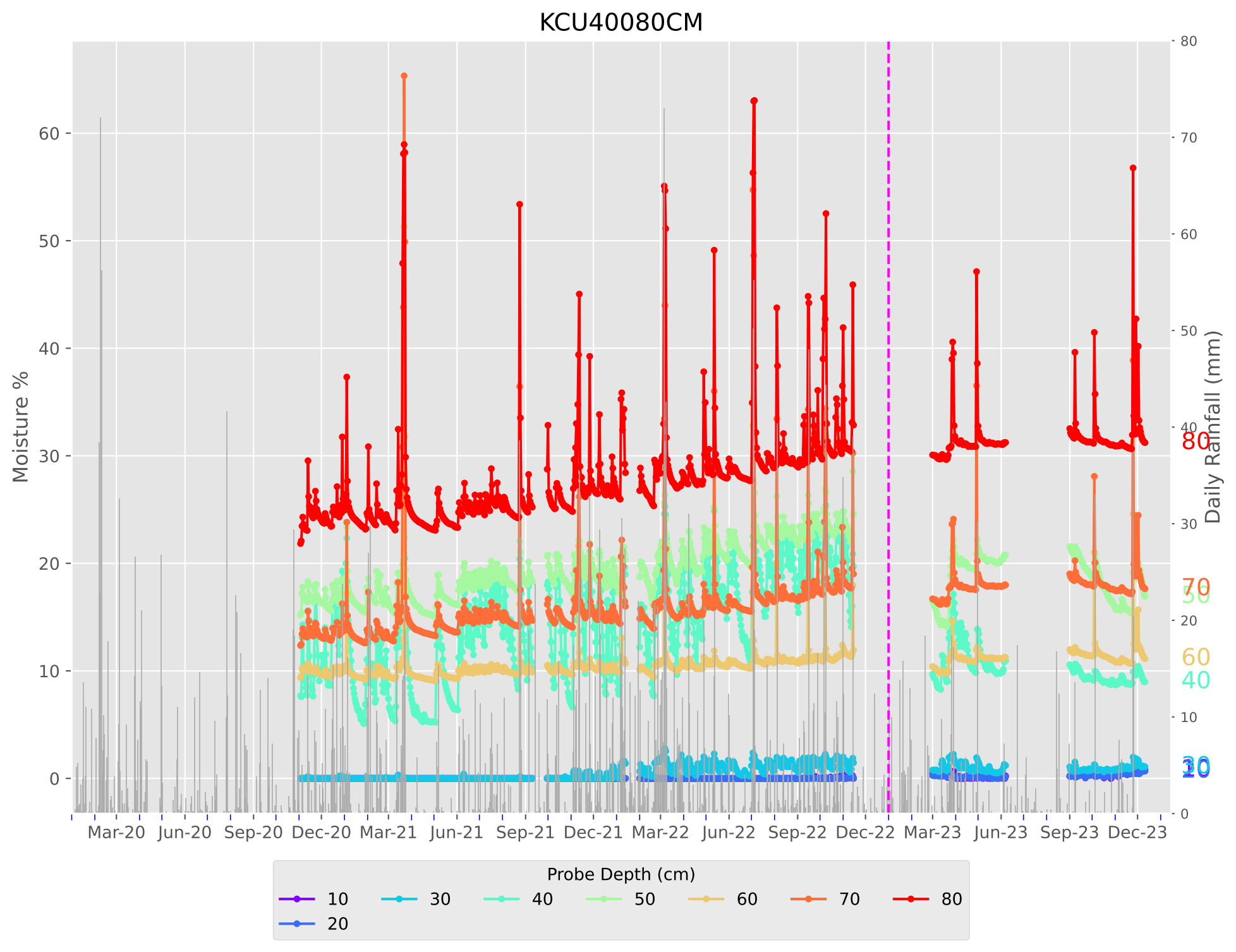

KCU10080CM
Moisture %
Daily Rainfall (mm)
0
10
20
30
40
50
60
70
80
Mar-20
Jun-20
Sep-20
Dec-20
Mar-21
Jun-21
Sep-21
Dec-21
Mar-22
Jun-22
Sep-22
Dec-22
Mar-23
Jun-23
Sep-23
Dec-23
Probe Depth (cm)
10
20
30
40
50
60
70
80


KCU20080CM
Moisture %
Daily Rainfall (mm)
Mar-20
Jun-20
Sep-20
Dec-20
Mar-21
Jun-21
Sep-21
Dec-21
Mar-22
Jun-22
Sep-22
Dec-22
Mar-23
Jun-23
Sep-23
Dec-23
Probe Depth (cm)
10
20
30
40
50
60
70
80


KCU30040CM
Moisture %
Daily Rainfall (mm)
40
30
20
10
Mar-20
Jun-20
Sep-20
Dec-20
Mar-21
Jun-21
Sep-21
Dec-21
Mar-22
Jun-22
Sep-22
Dec-22
Mar-23
Jun-23
Sep-23
Dec-23
Probe Depth (cm)
10
20
30
40


KCU40080CM
Moisture %
Daily Rainfall (mm)
0
10
20
30
40
50
60
70
80
Mar-20
Jun-20
Sep-20
Dec-20
Mar-21
Jun-21
Sep-21
Dec-21
Mar-22
Jun-22
Sep-22
Dec-22
Mar-23
Jun-23
Sep-23
Dec-23
Probe Depth (cm)
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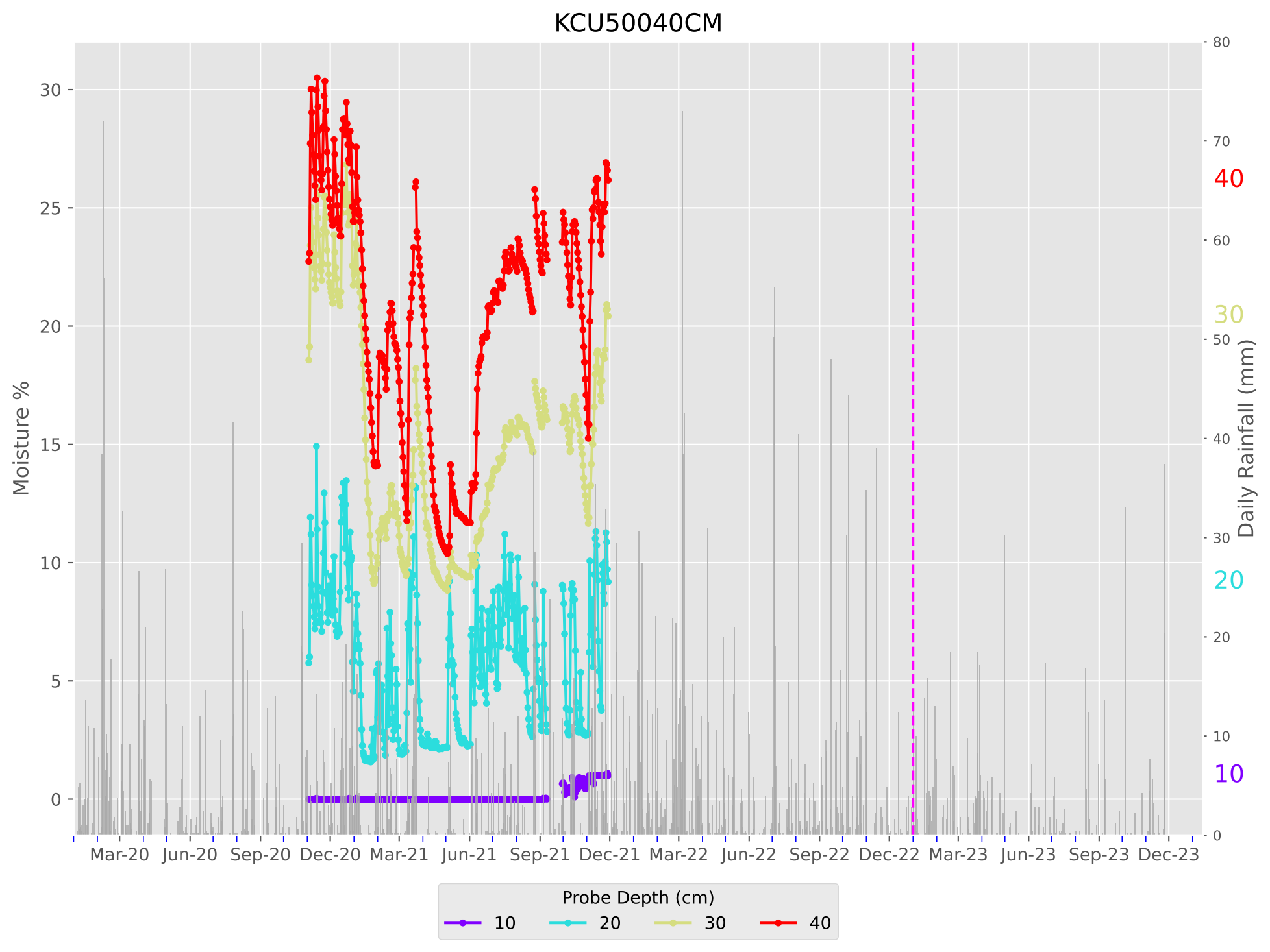
30
40
50
60
70
80


KCU50040CM
Moisture %
Daily Rainfall (mm)
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5
10
15
20
25
30
0
10
20
30
40
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60
70
80
40
30
20
10
Mar-20
Jun-20
Sep-20
Dec-20
Mar-21
Jun-21
Sep-21
Dec-21
Mar-22
Jun-22
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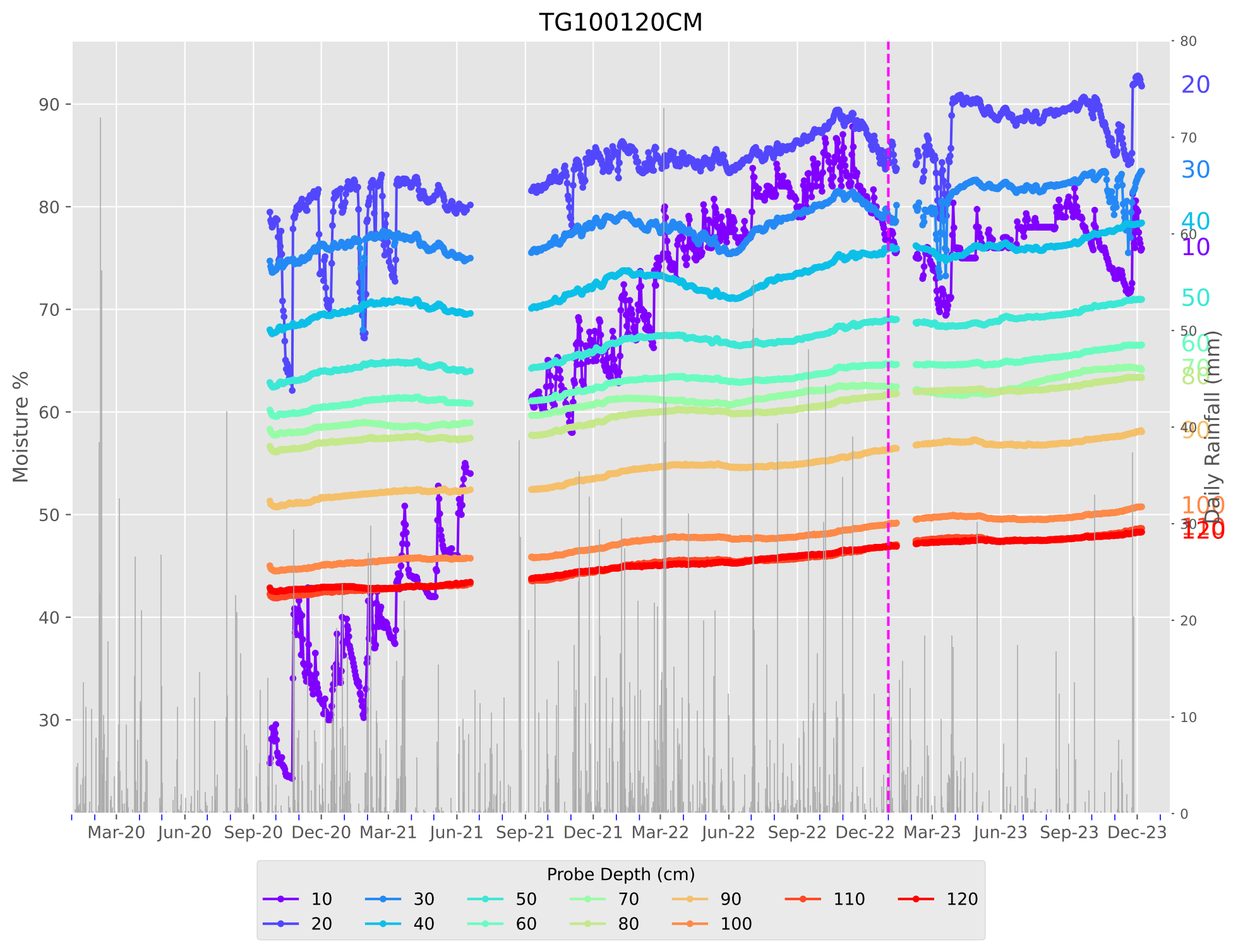
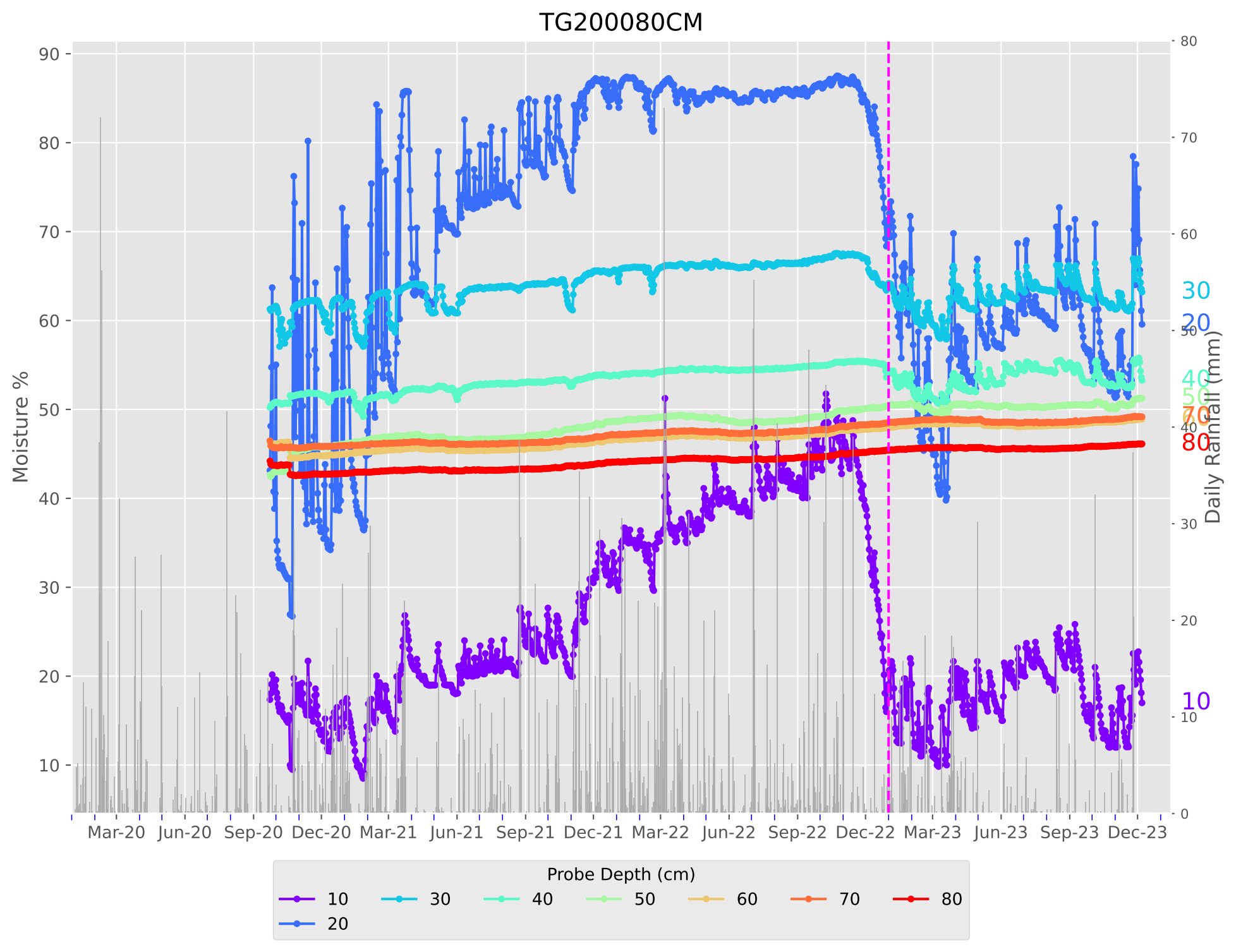
Dec-22
Mar-23
Jun-23
Sep-23
Dec-23
Probe Depth (cm)
10
20
30
40


TG100120CM
Moisture %
Daily Rainfall (mm)
Mar-20
Jun-20
Sep-20
Dec-20
Mar-21
Jun-21
Sep-21
Dec-21
Mar-22
Jun-22
Sep-22
Dec-22
Mar-23
Jun-23
Sep-23
Dec-23
Probe Depth (cm)
10
20
30
40
50
60
70
80
90
100
110
120


TG200080CM
Moisture %
Daily Rainfall (mm)
90
80
70
60
50
40
30
20
10
80
70
60
50
40
30
20
10
0
30
20
40
50
60
70
80
Mar-20
Jun-20
Sep-20
Dec-20
Mar-21
Jun-21
Sep-21
Dec-21
Mar-22
Jun-22
Sep-22
Dec-22
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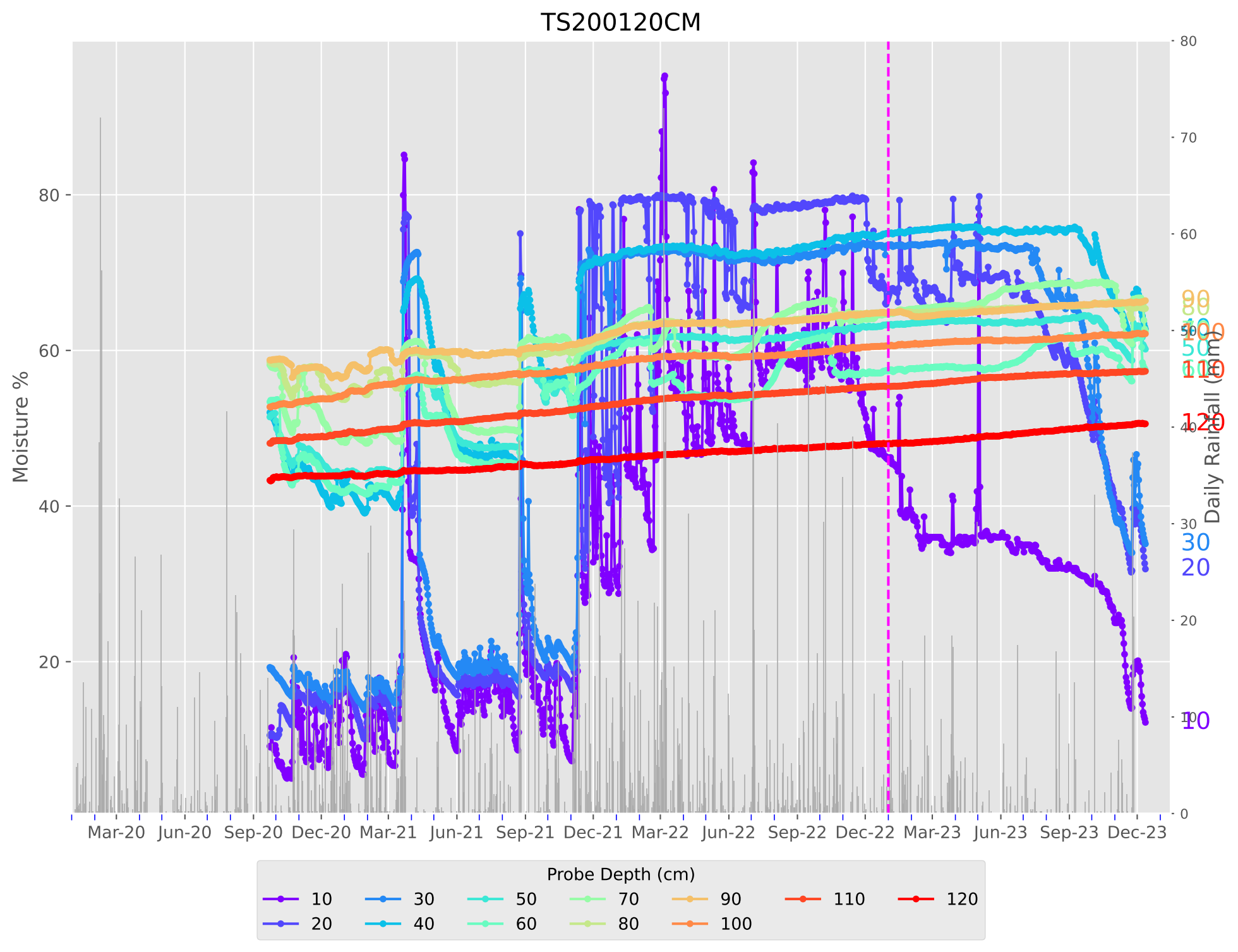
Dec-23
Probe Depth (cm)
10
20
30
40
50
60
70
80


TS200120CM
Moisture %
Daily Rainfall (mm)
80
60
40
20
0
Mar-20
Jun-20
Sep-20
Dec-20
Mar-21
Jun-21
Sep-21
Dec-21
Mar-22
Jun-22
Sep-22
Dec-22
Mar-23
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Dec-23
Probe Depth (cm)
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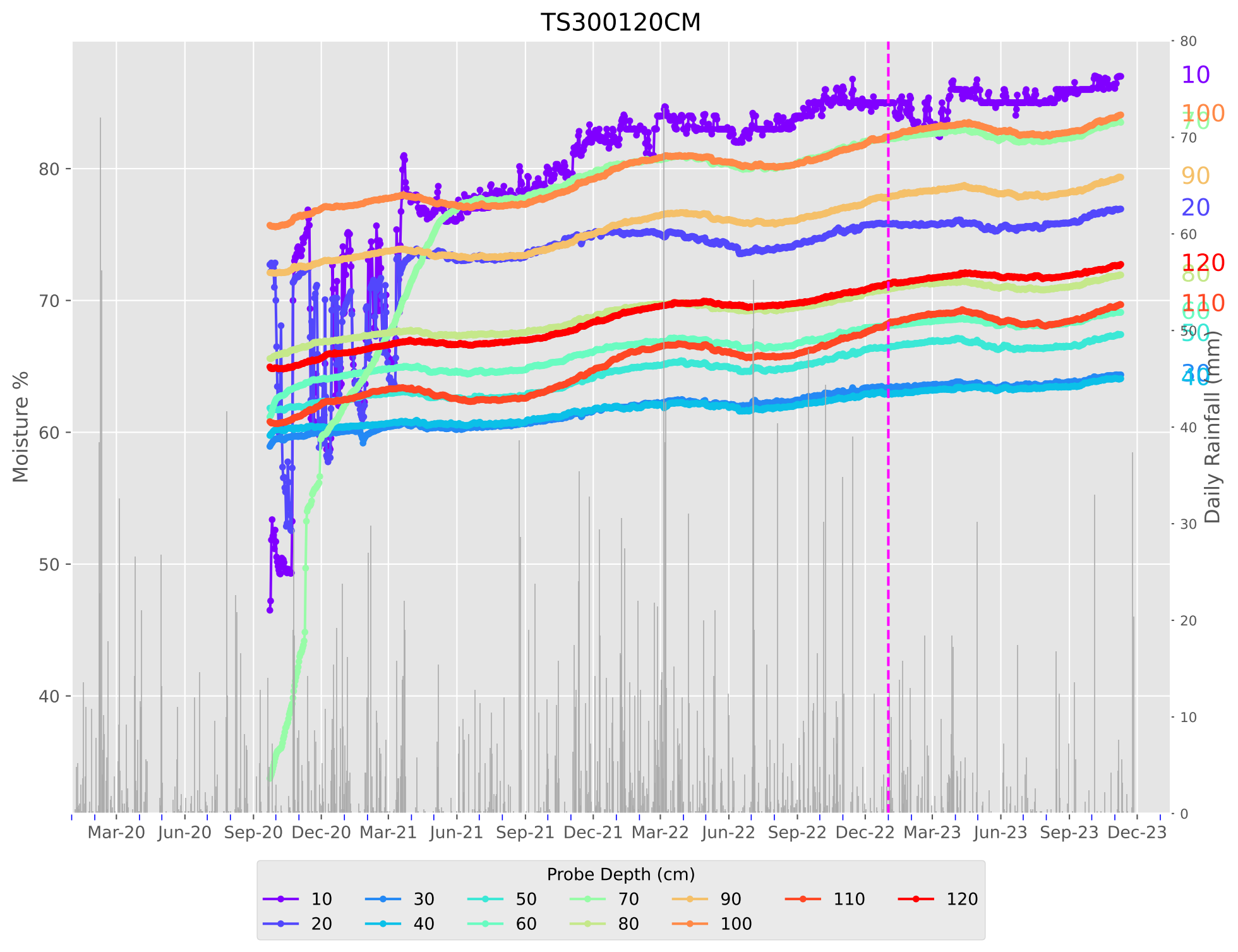
30
40
50
60
70
80
90
100
110
120


TS300120CM
Moisture %
Daily Rainfall (mm)
80
70
60
50
40
30
20
10
0
Mar-20
Jun-20
Sep-20
Dec-20
Mar-21
Jun-21
Sep-21
Dec-21
Mar-22
Jun-22
Sep-22
Dec-22
Mar-23
Jun-23
Sep-23
Dec-23
Probe Depth (cm)
10
20
30
40
50
60
70
80
90
100
110
120

Appendix C
VWP hydrographs

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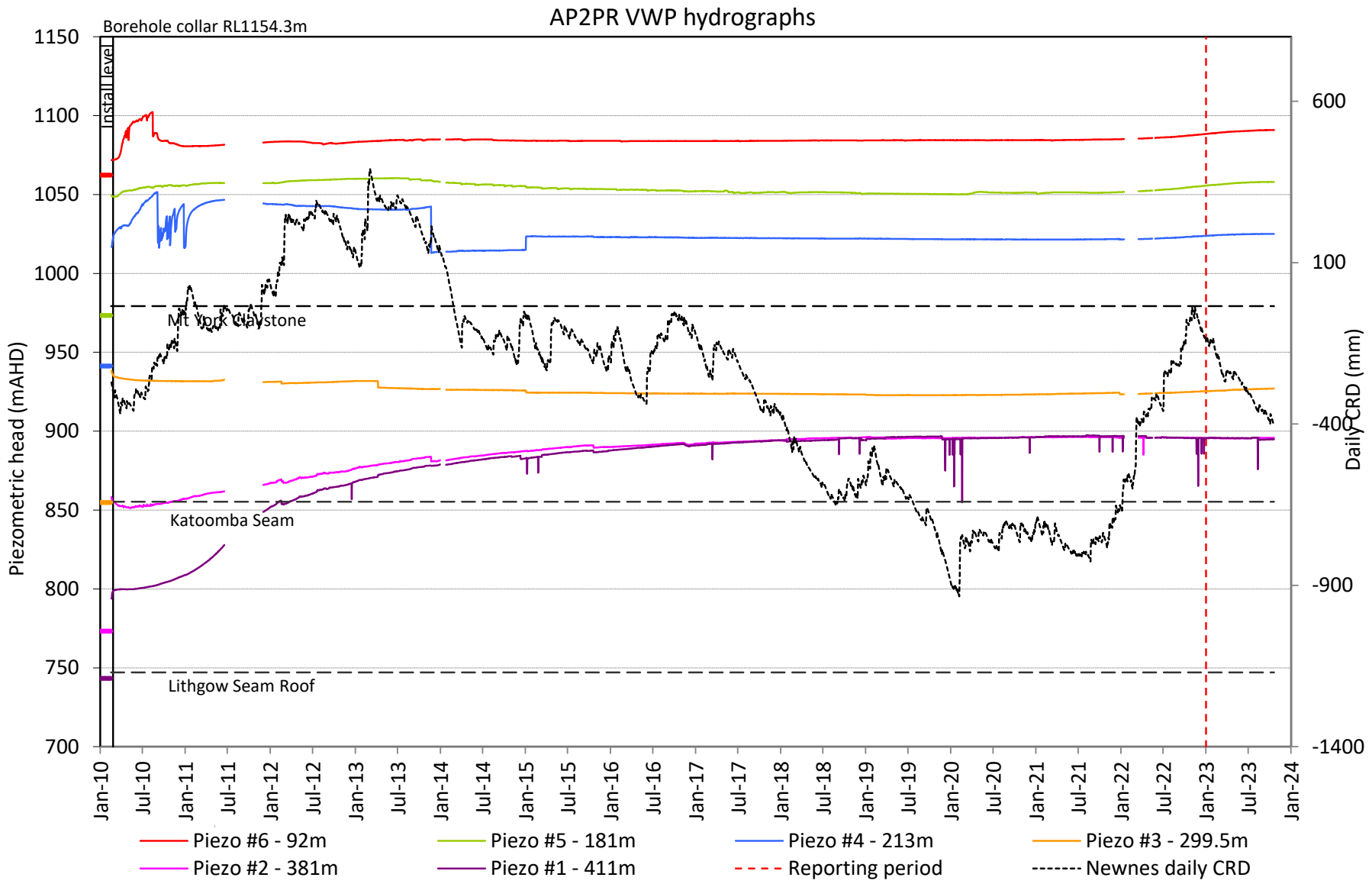

Figure C.1 **AP2PR VWP hydrograph**

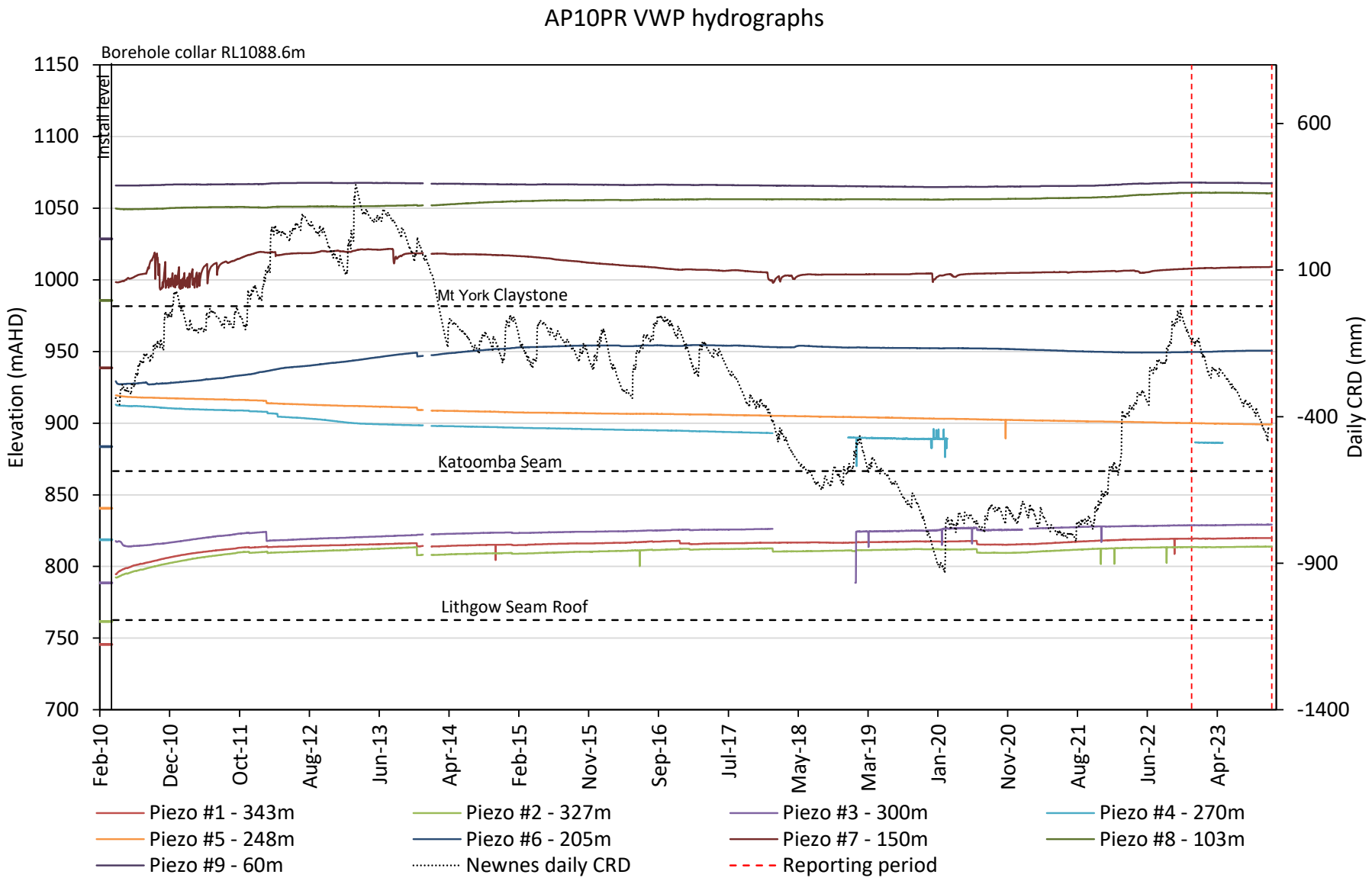

Figure C.2 **AP10PR VWP hydrograph**

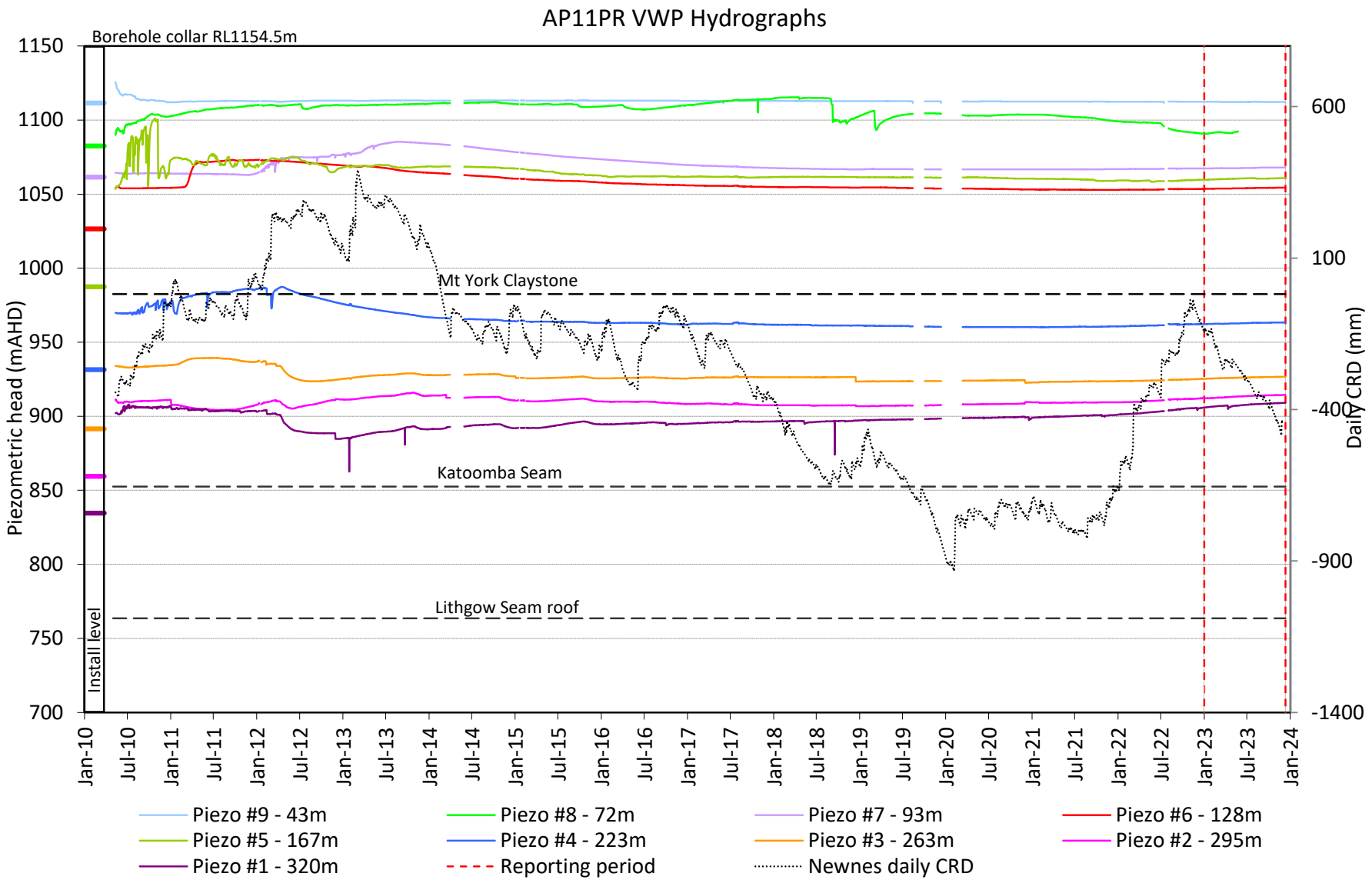

Figure C.3 **AP11PR VWP hydrograph**

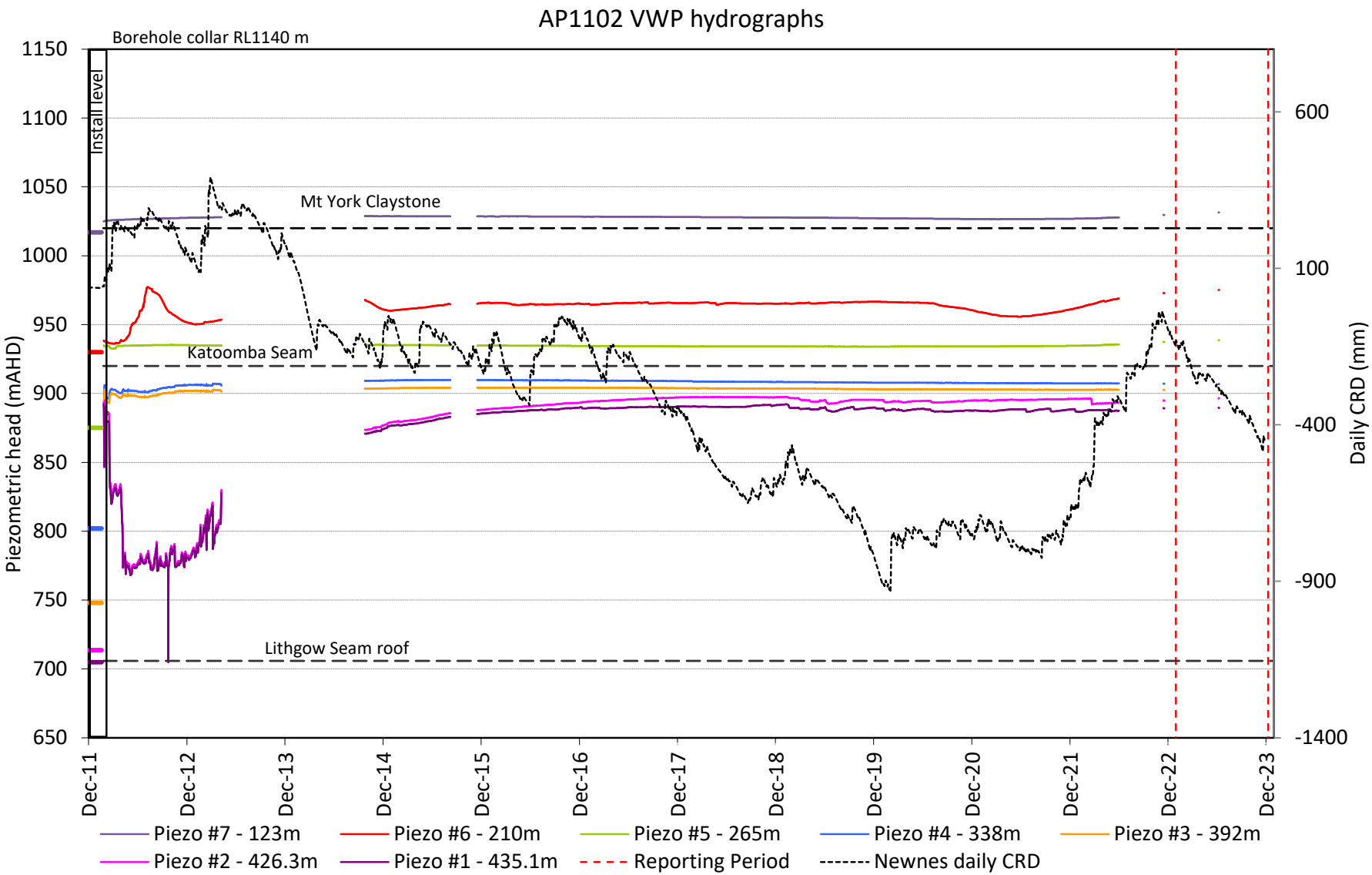

Figure C.4 **AP1102 VWP hydrograph**

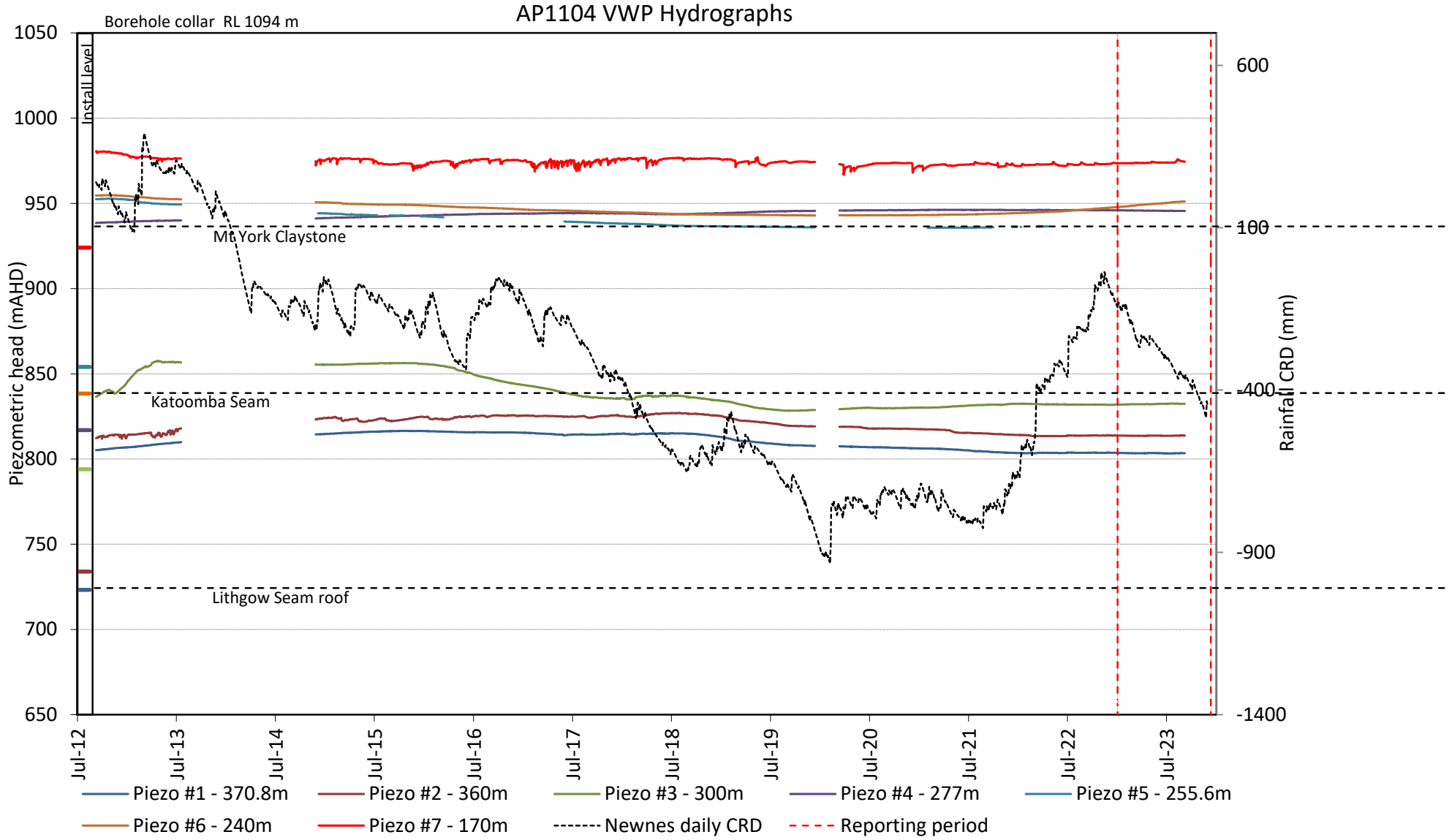

Figure C.5 **AP1104 VWP hydrograph**

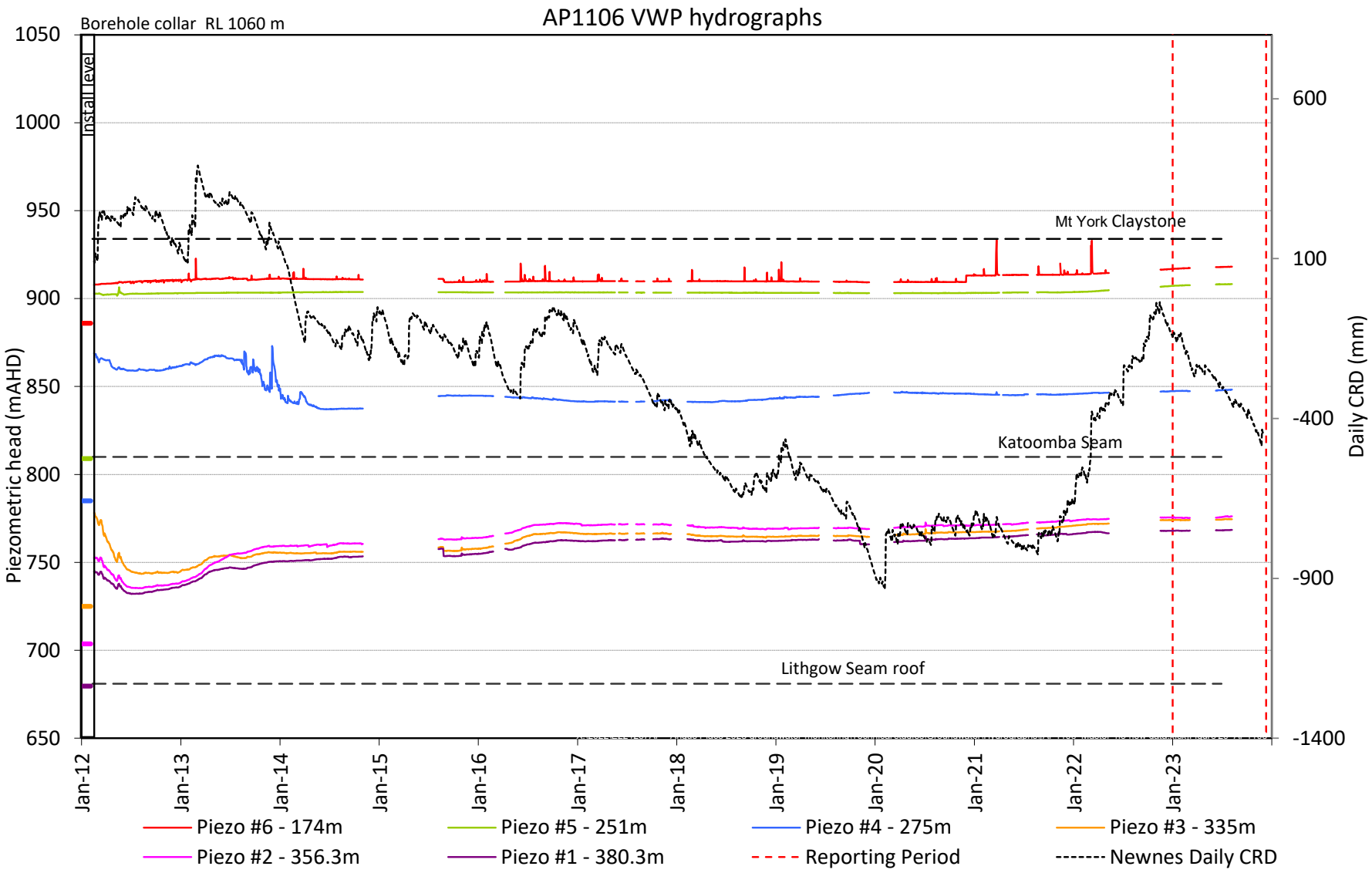

Figure C.6 **AP1106 VWP hydrograph**

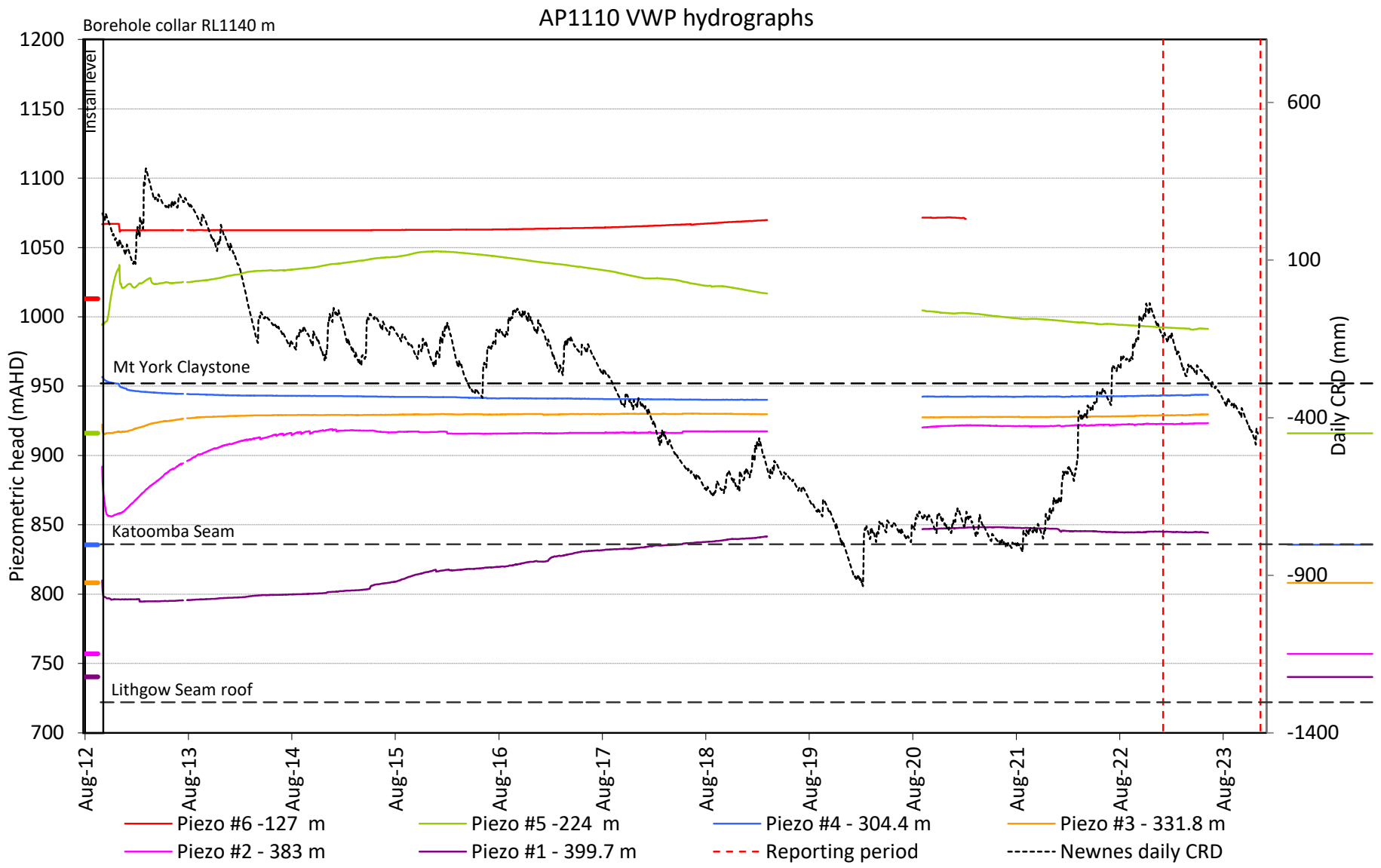

Figure C.7 **AP1110 VWP hydrograph**

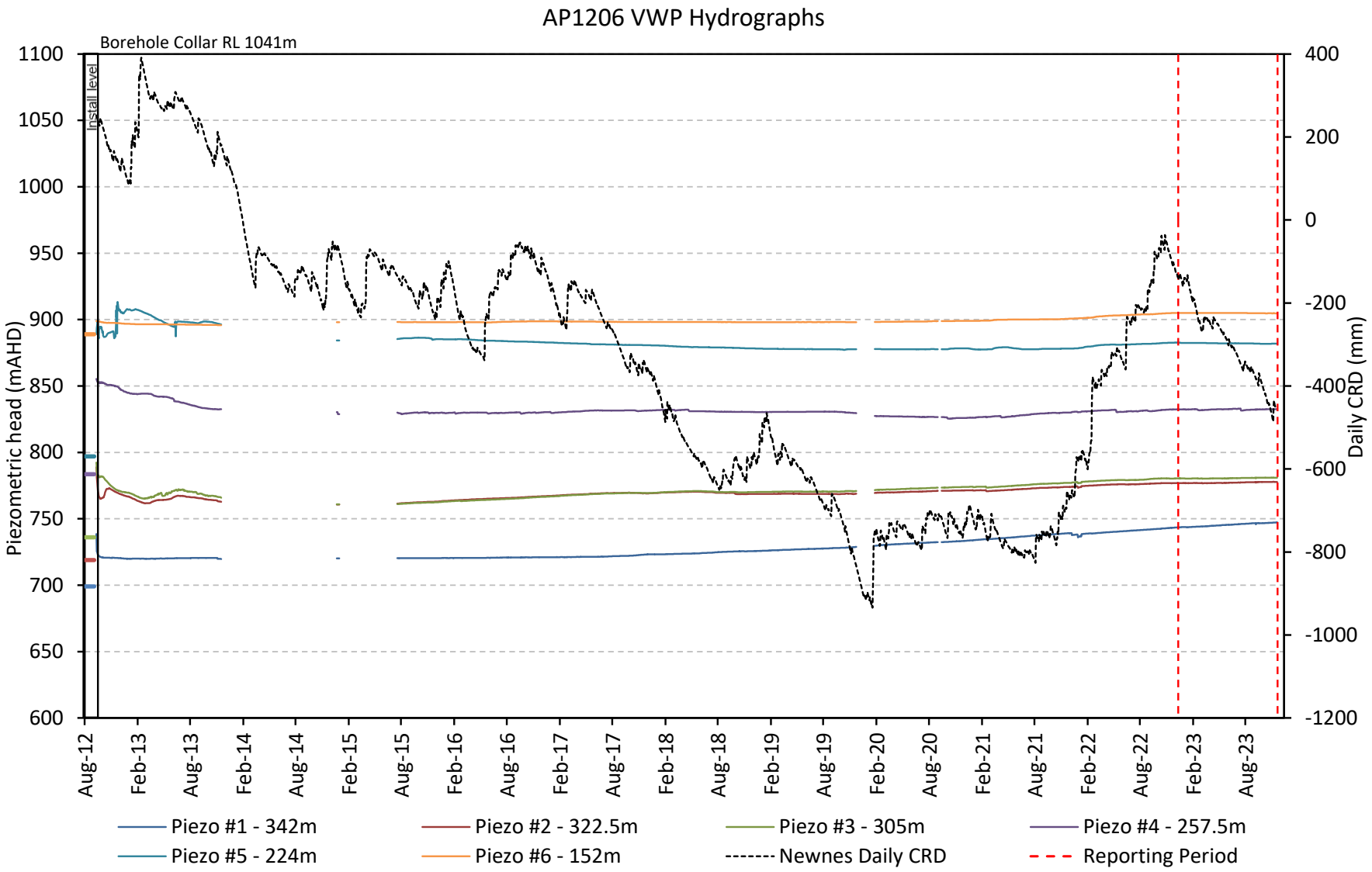

Figure C.8 **AP1206 VWP hydrograph**

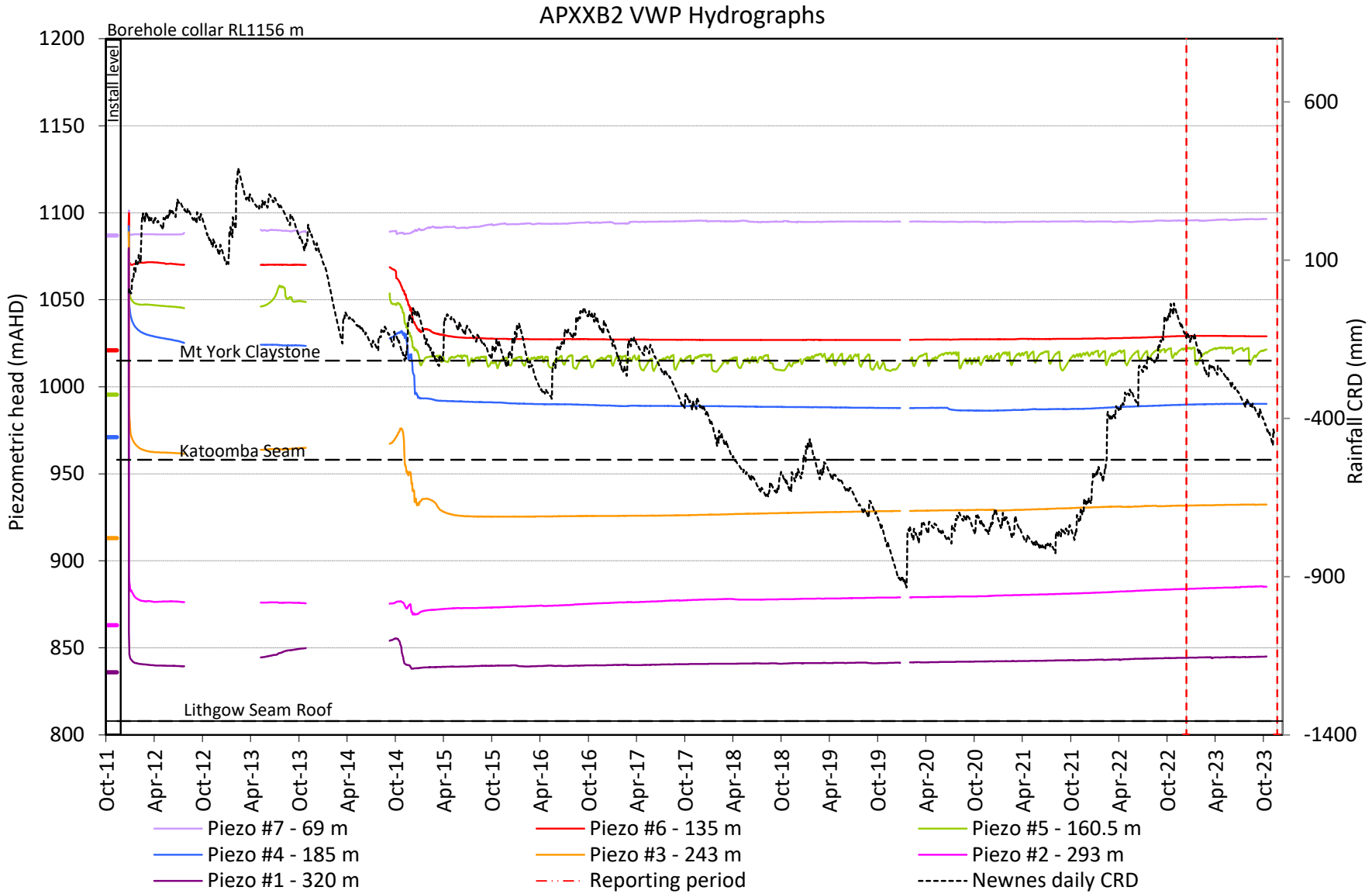

Figure C.9 **APXXB2 VWP hydrograph**

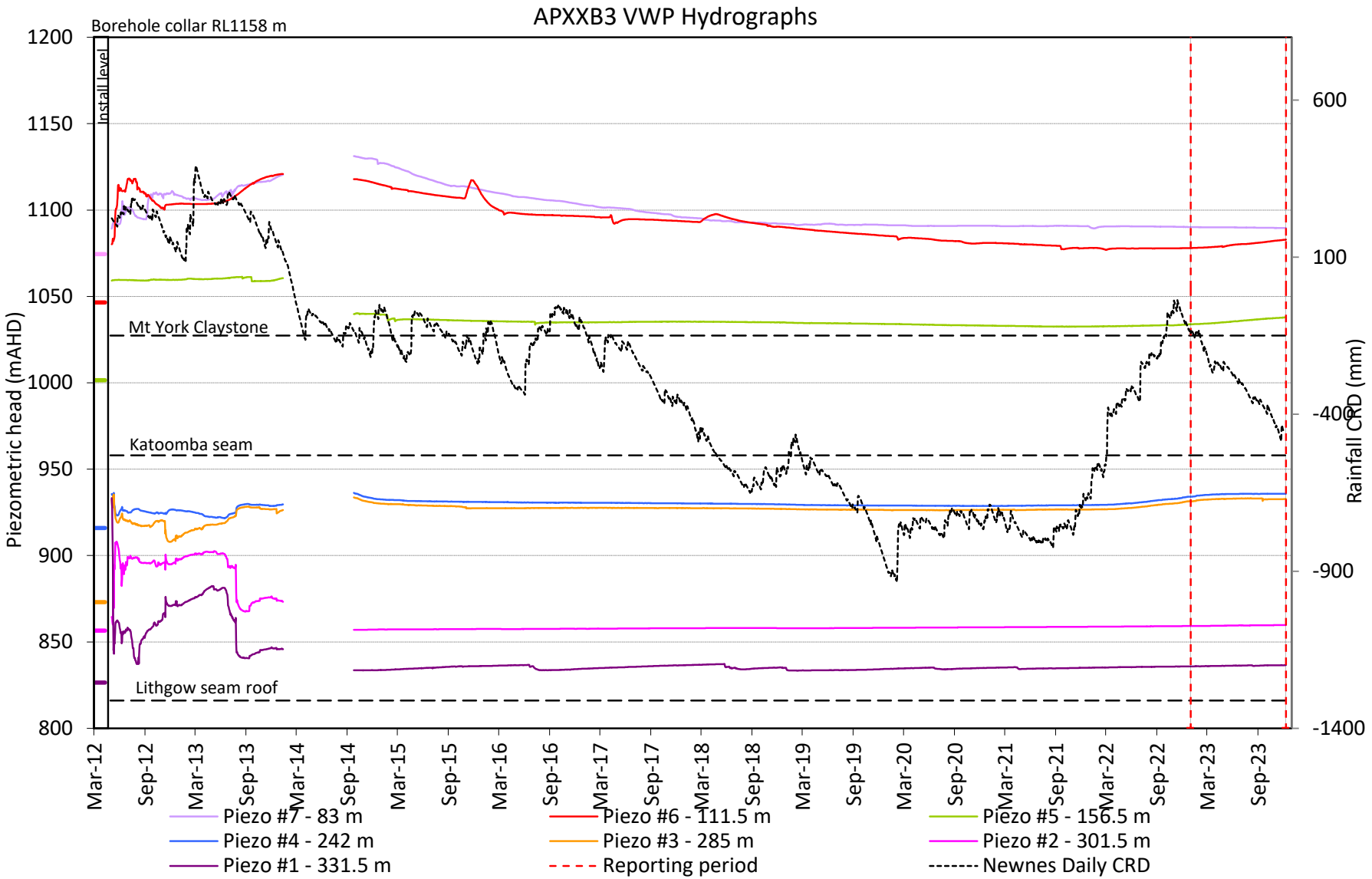

Figure C.10 **APXXB3 VWP hydrograph**

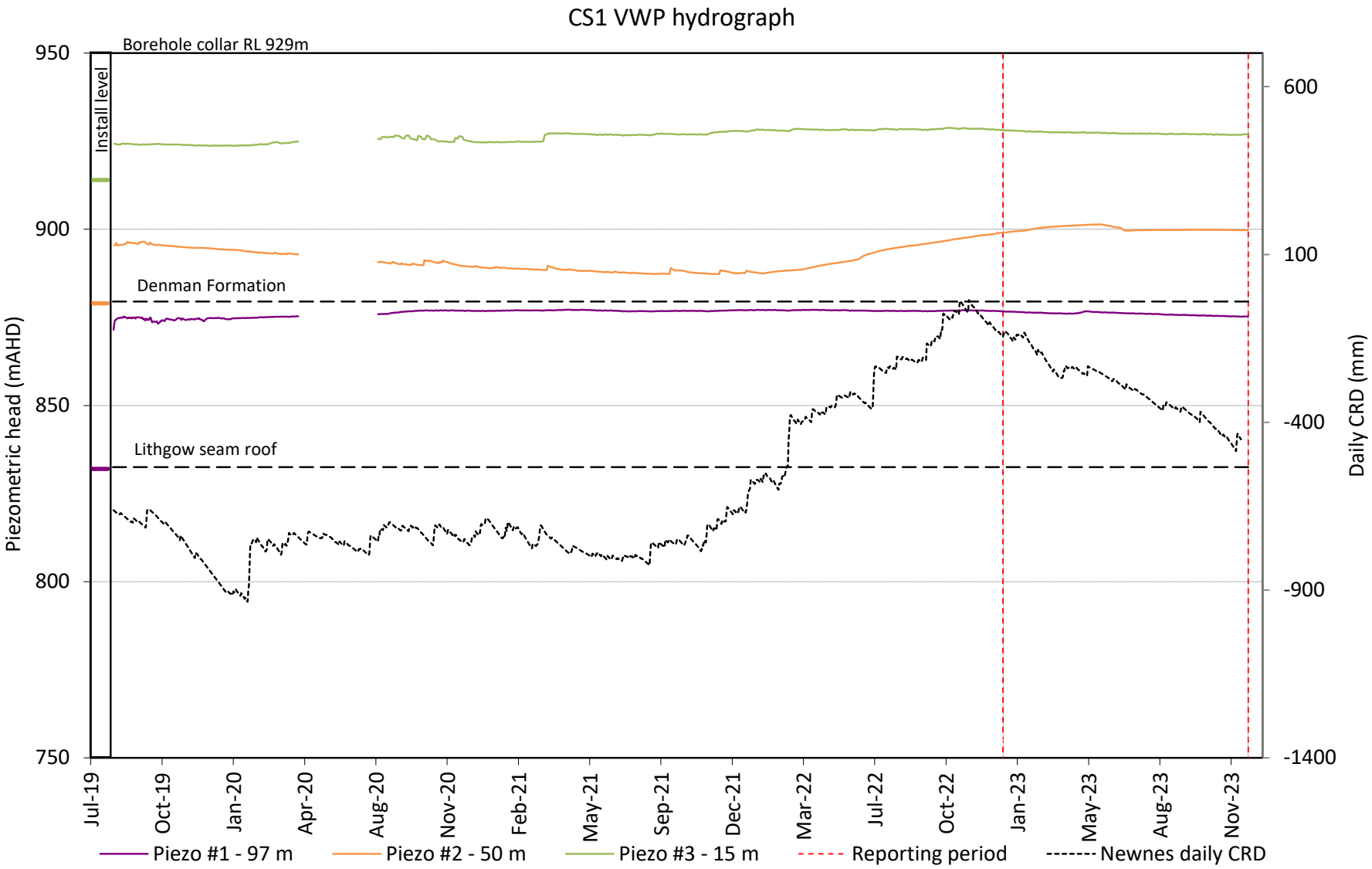

Figure C.11 **APC CS1 VWP hydrograph**

Appendix D

Surface water quality time series plots

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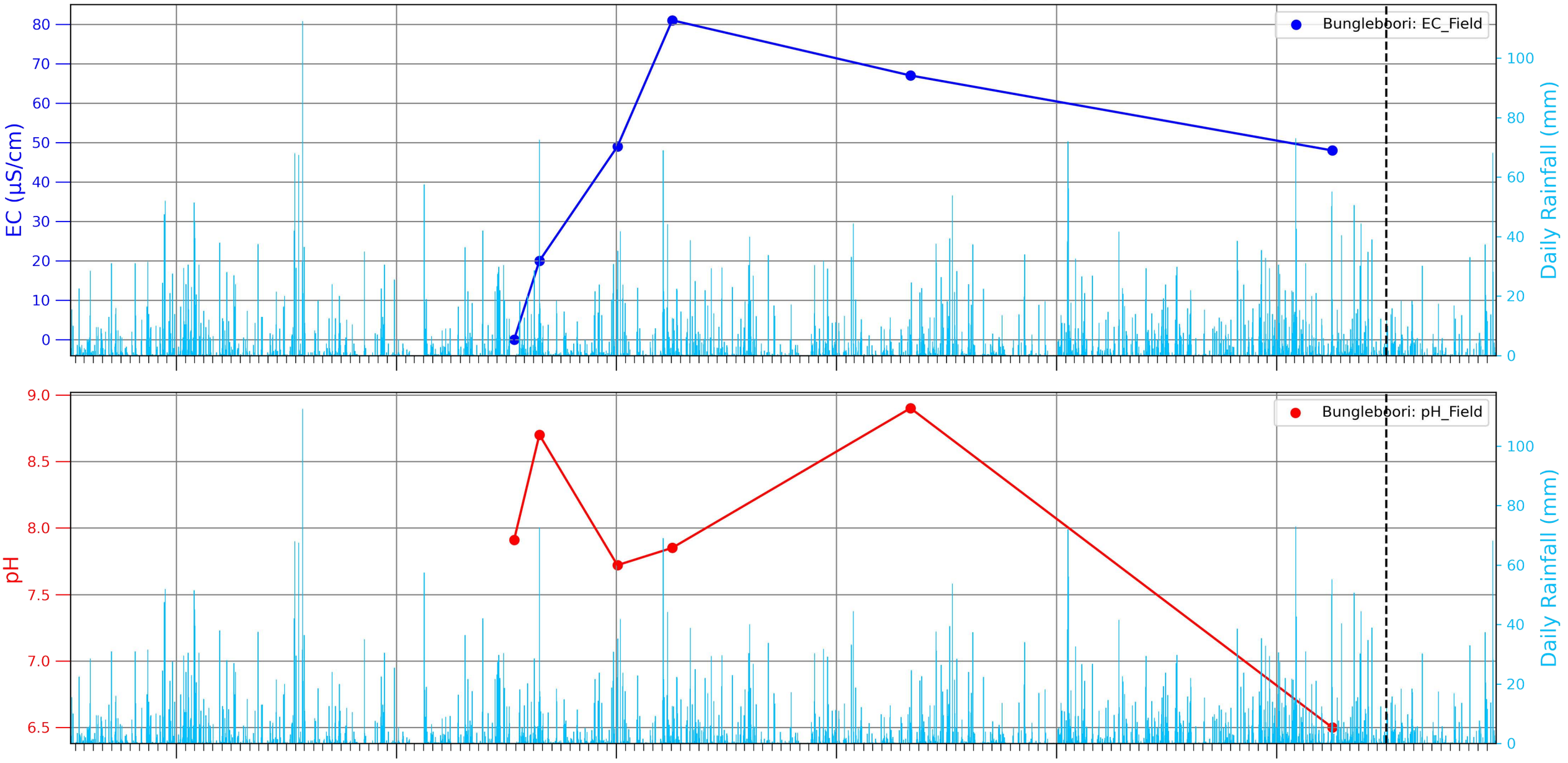
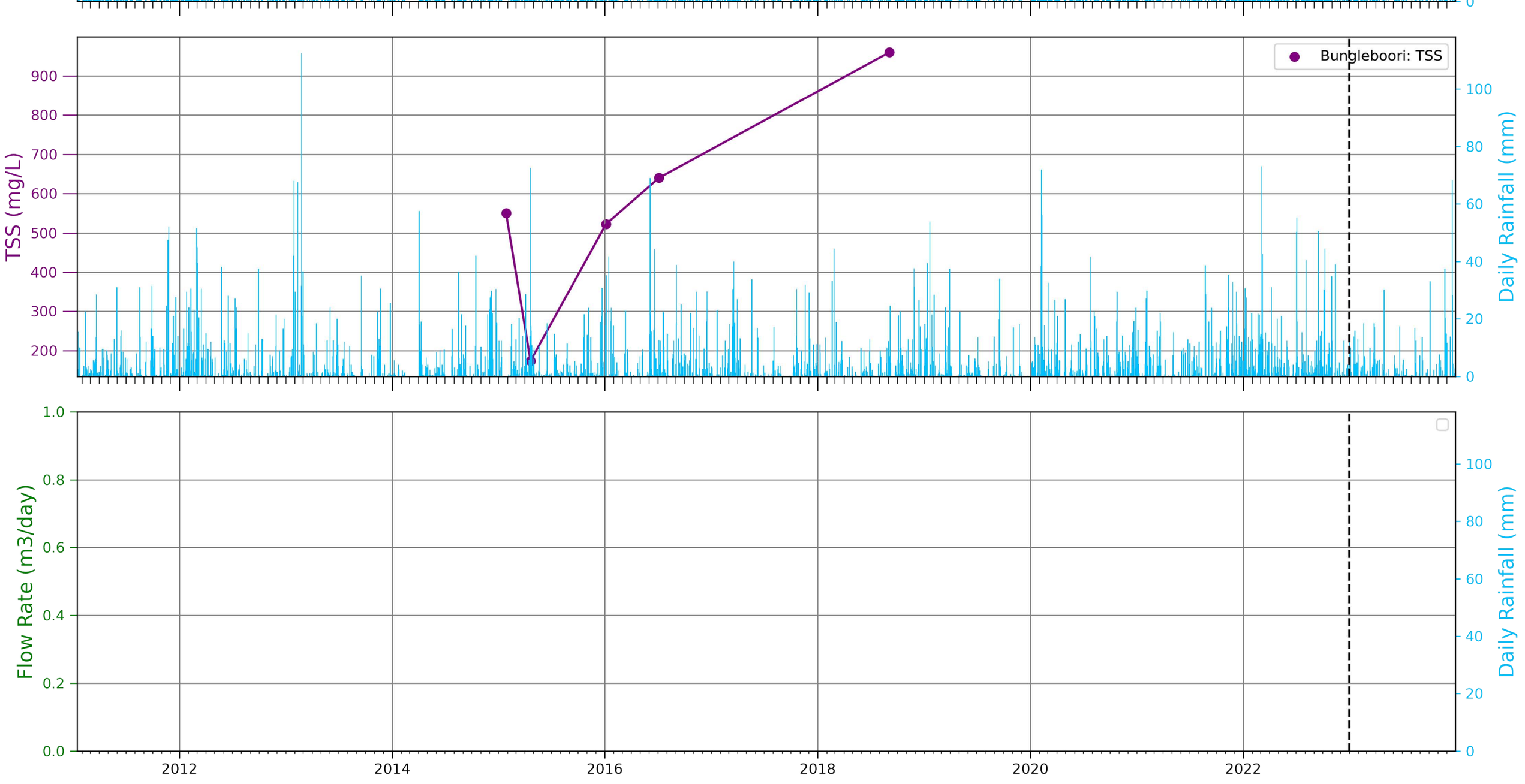
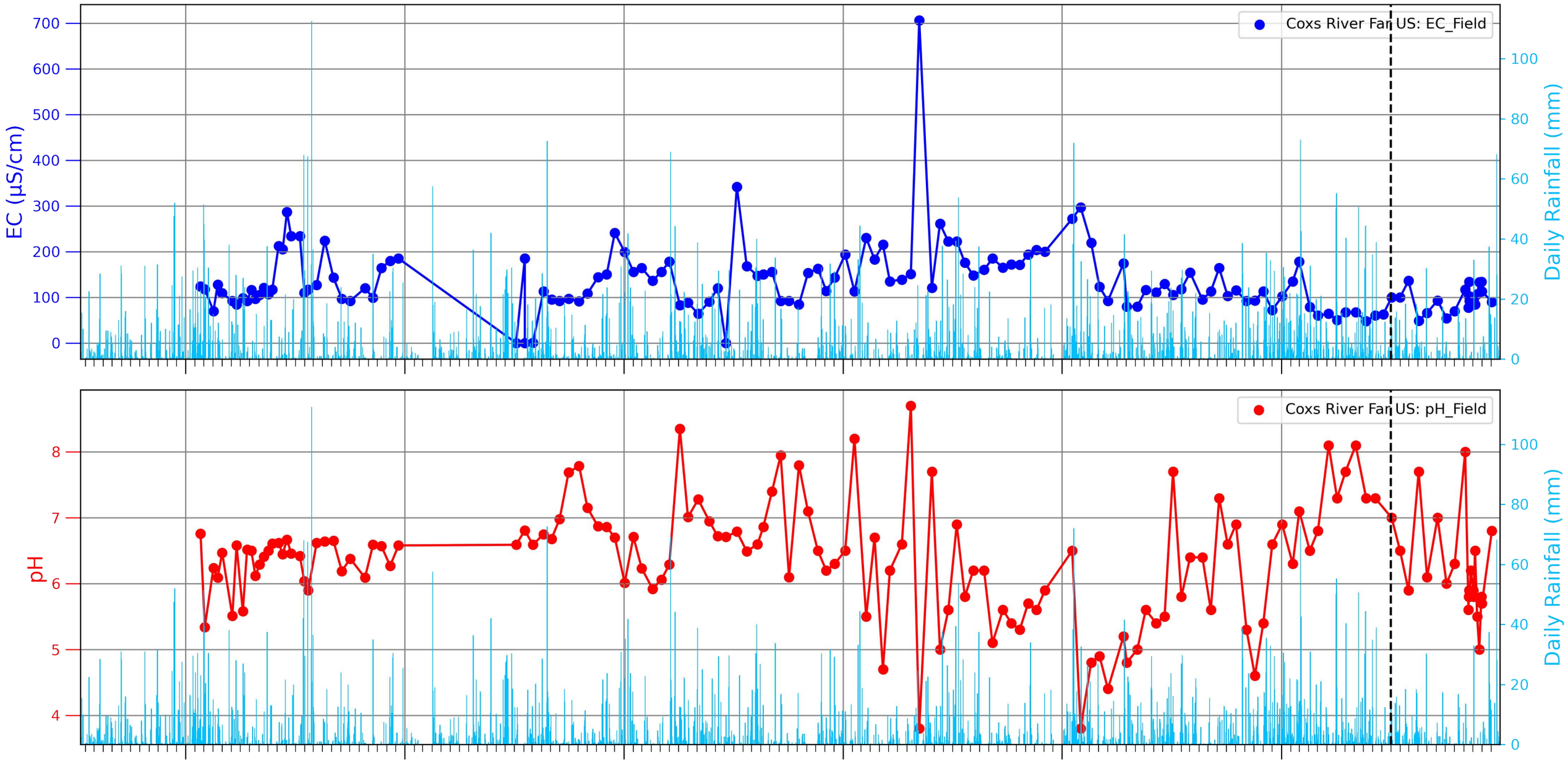
D.1 Watercourse surface water quality and flow rate time series plots

Time series plot of EC, pH, TSS and flow rate at: Bungleboori

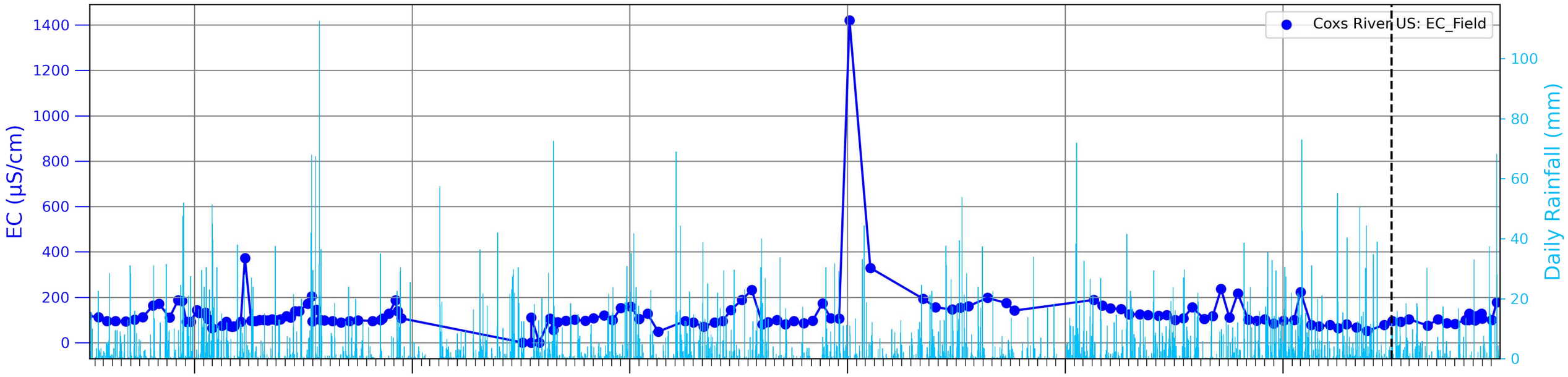


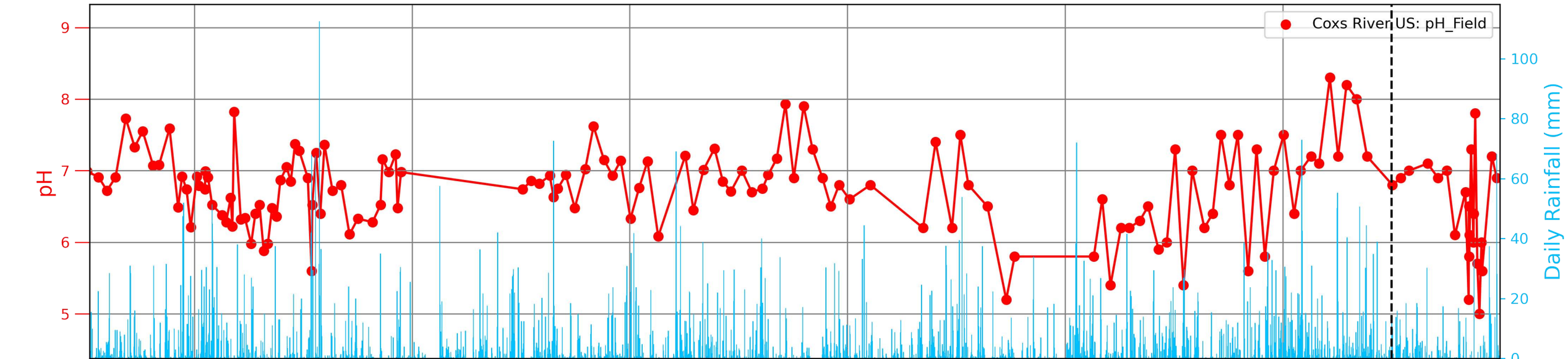


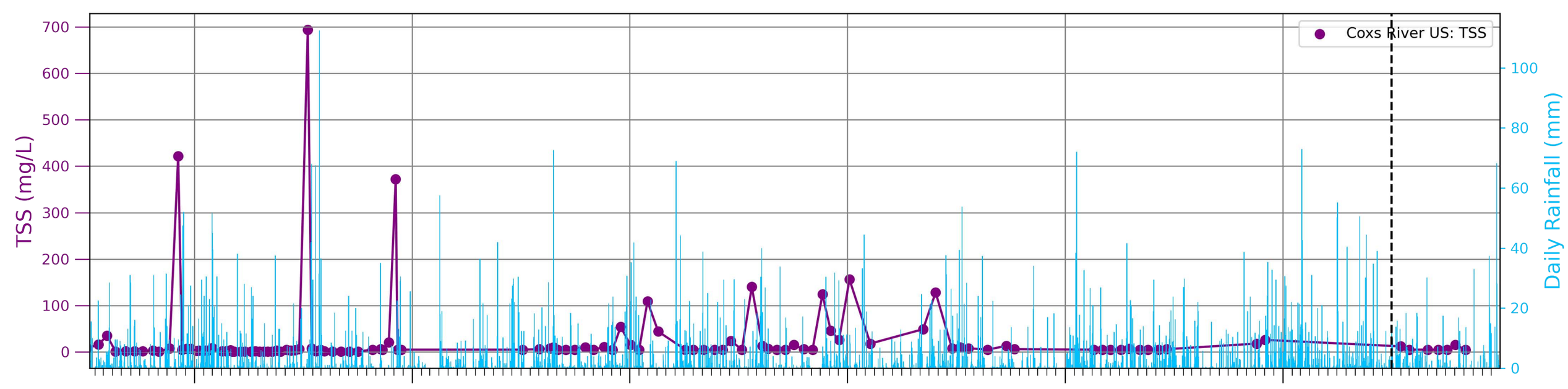
Time series plot of EC, pH, TSS and flow rate at: Coxs River Far US

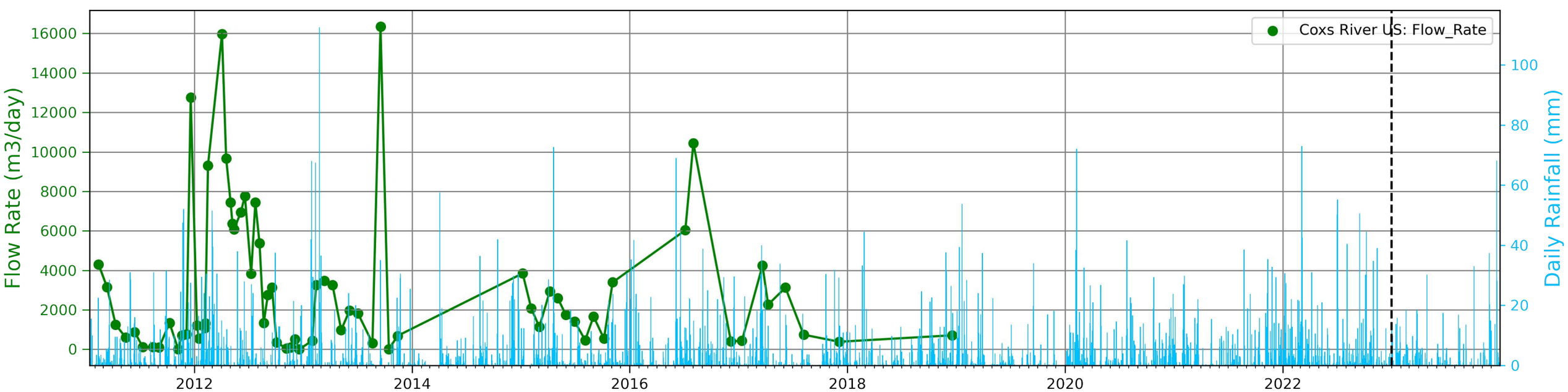


Time series plot of EC, pH, TSS and flow rate at: Coxs River US

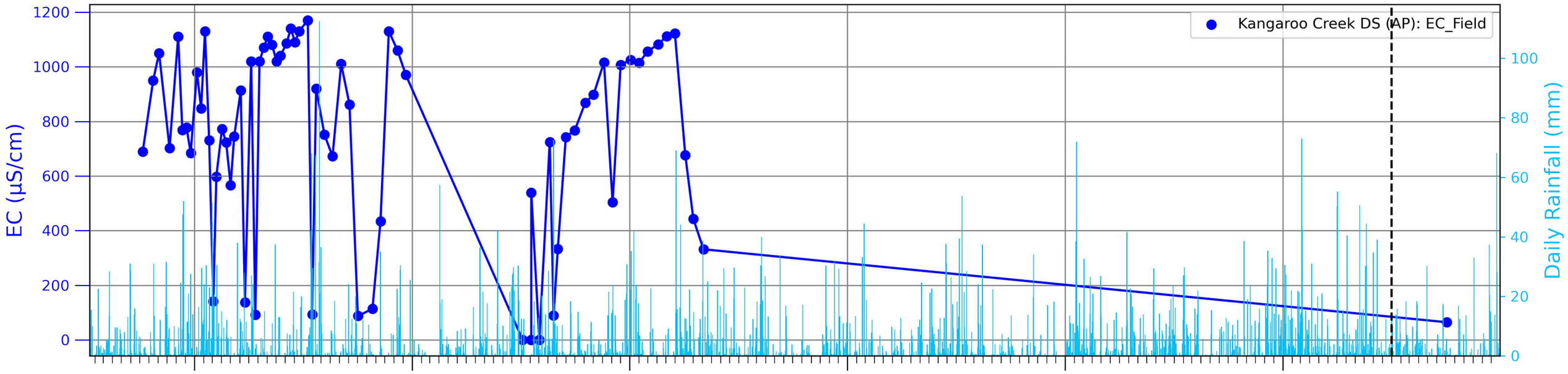


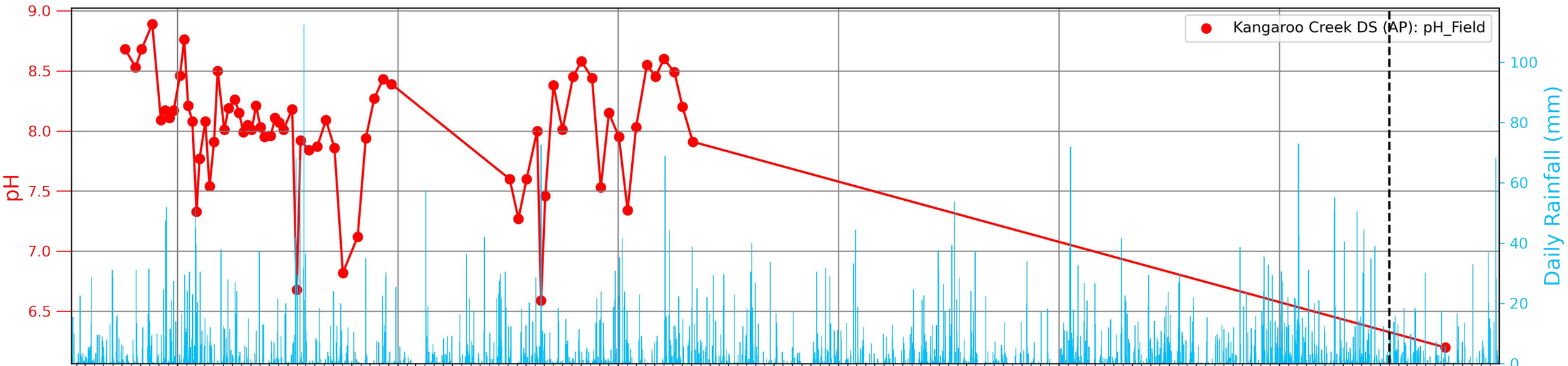


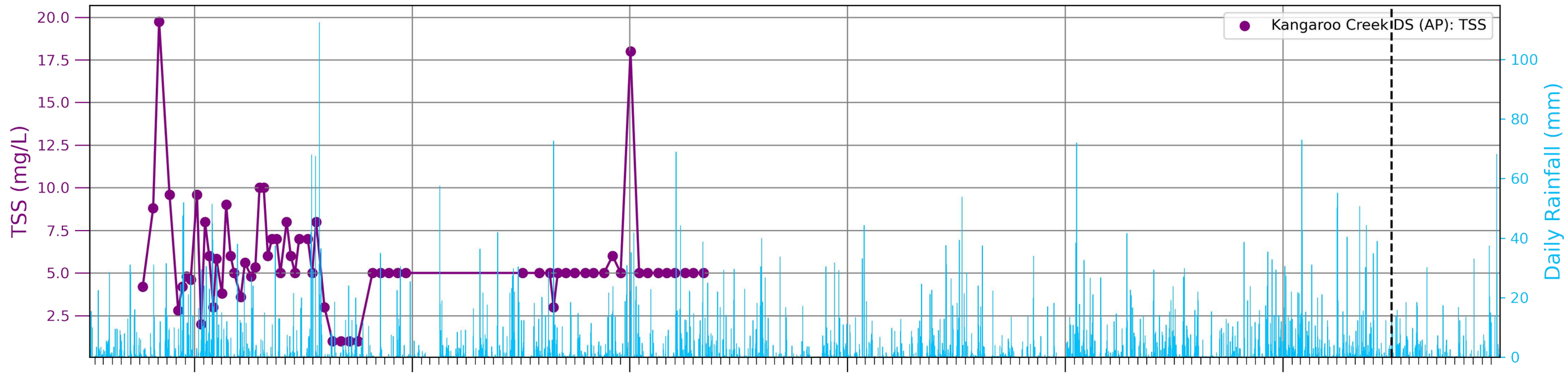


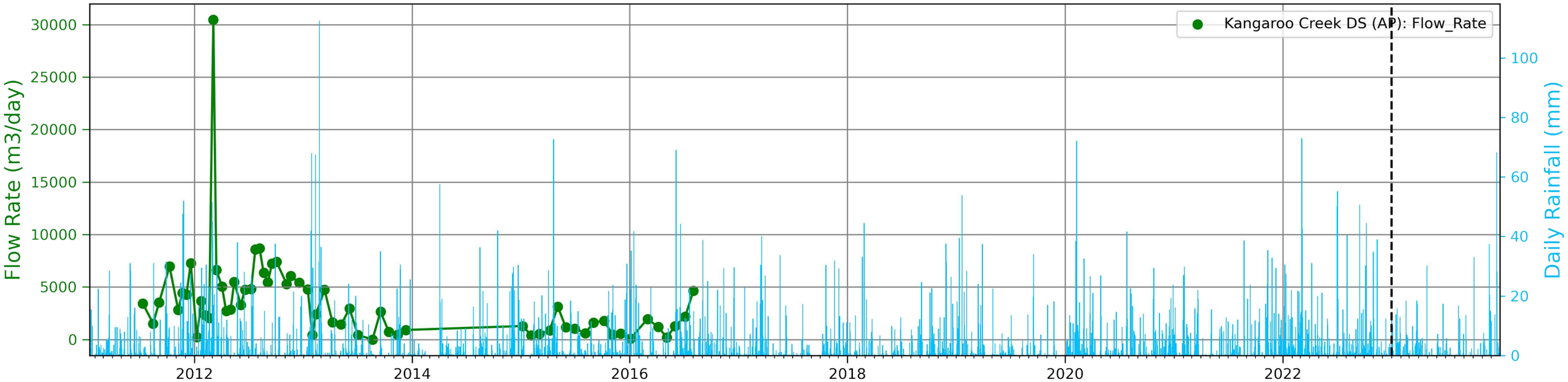


Time series plot of EC, pH, TSS and flow rate at: Kangaroo Creek DS (AP)

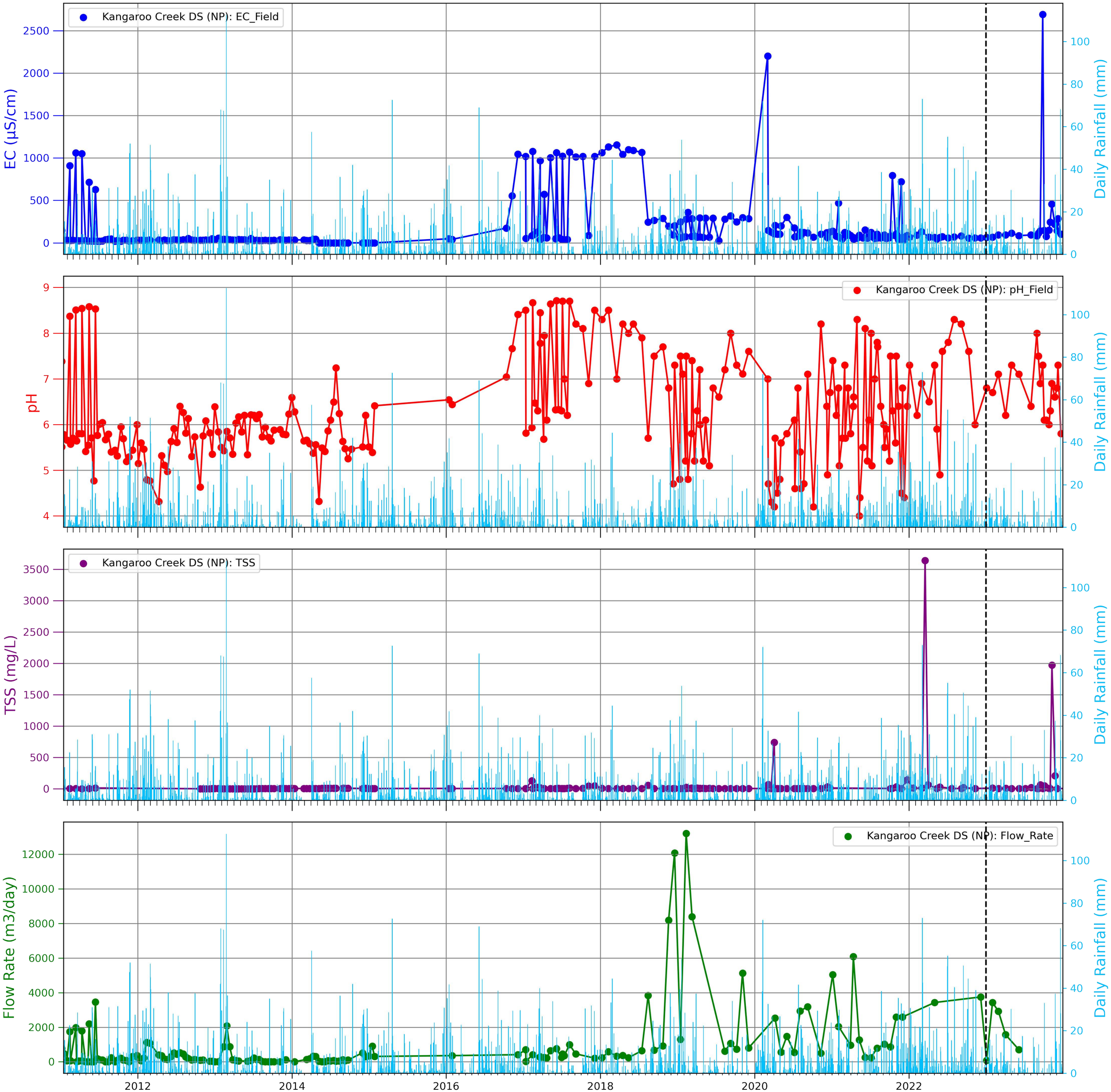




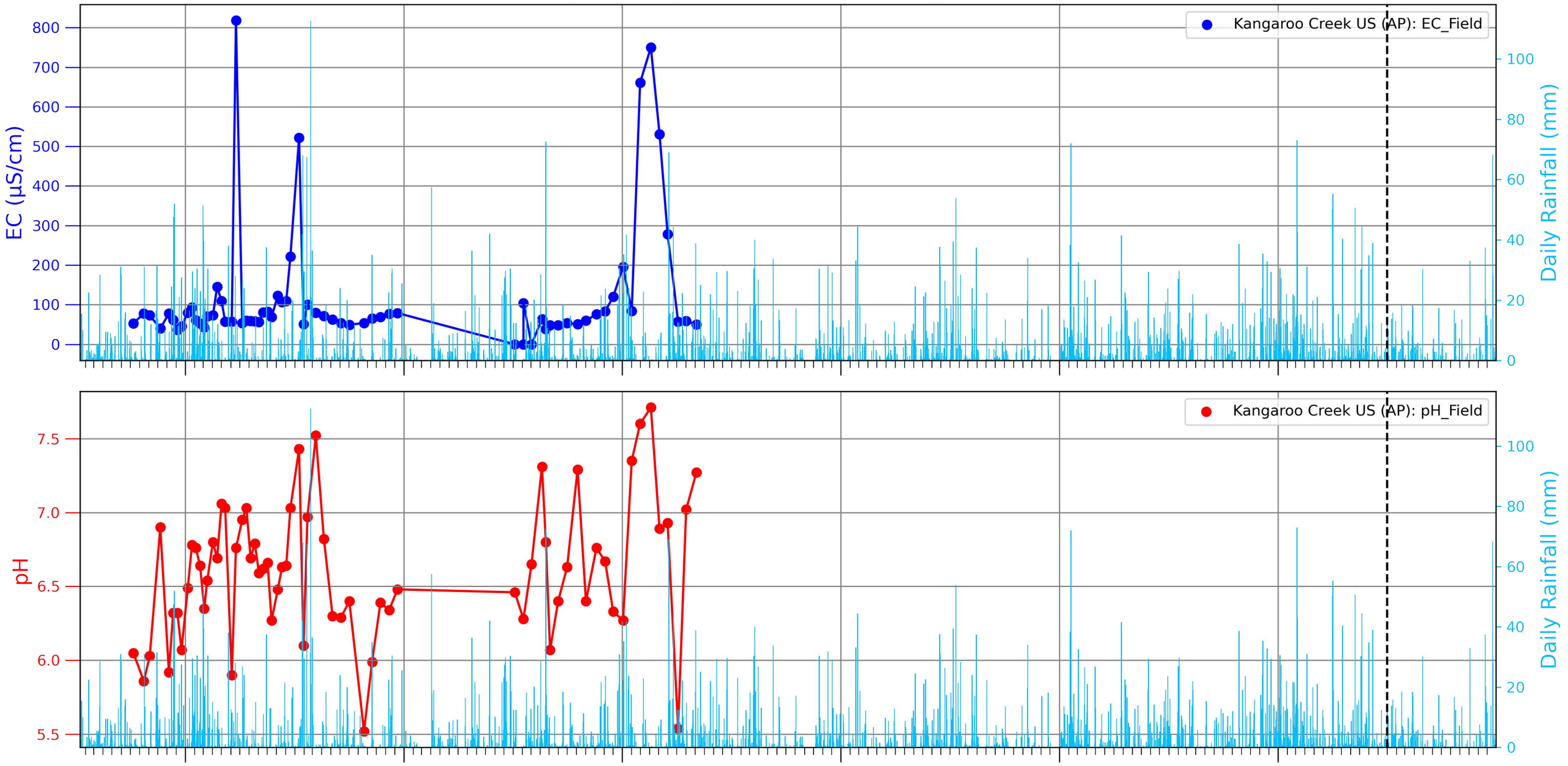




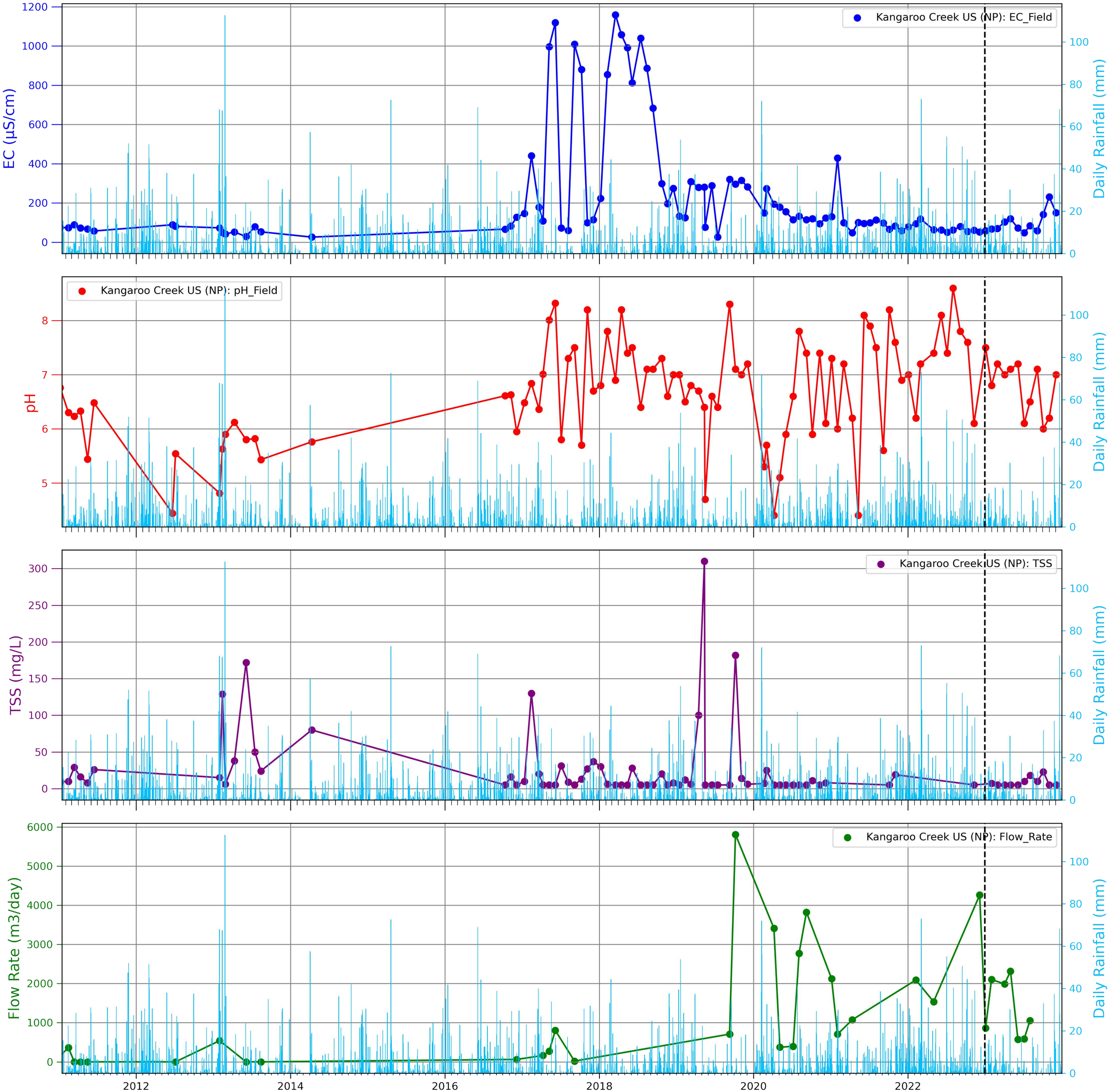
Time series plot of EC, pH, TSS and flow rate at: Kangaroo Creek DS (NP)



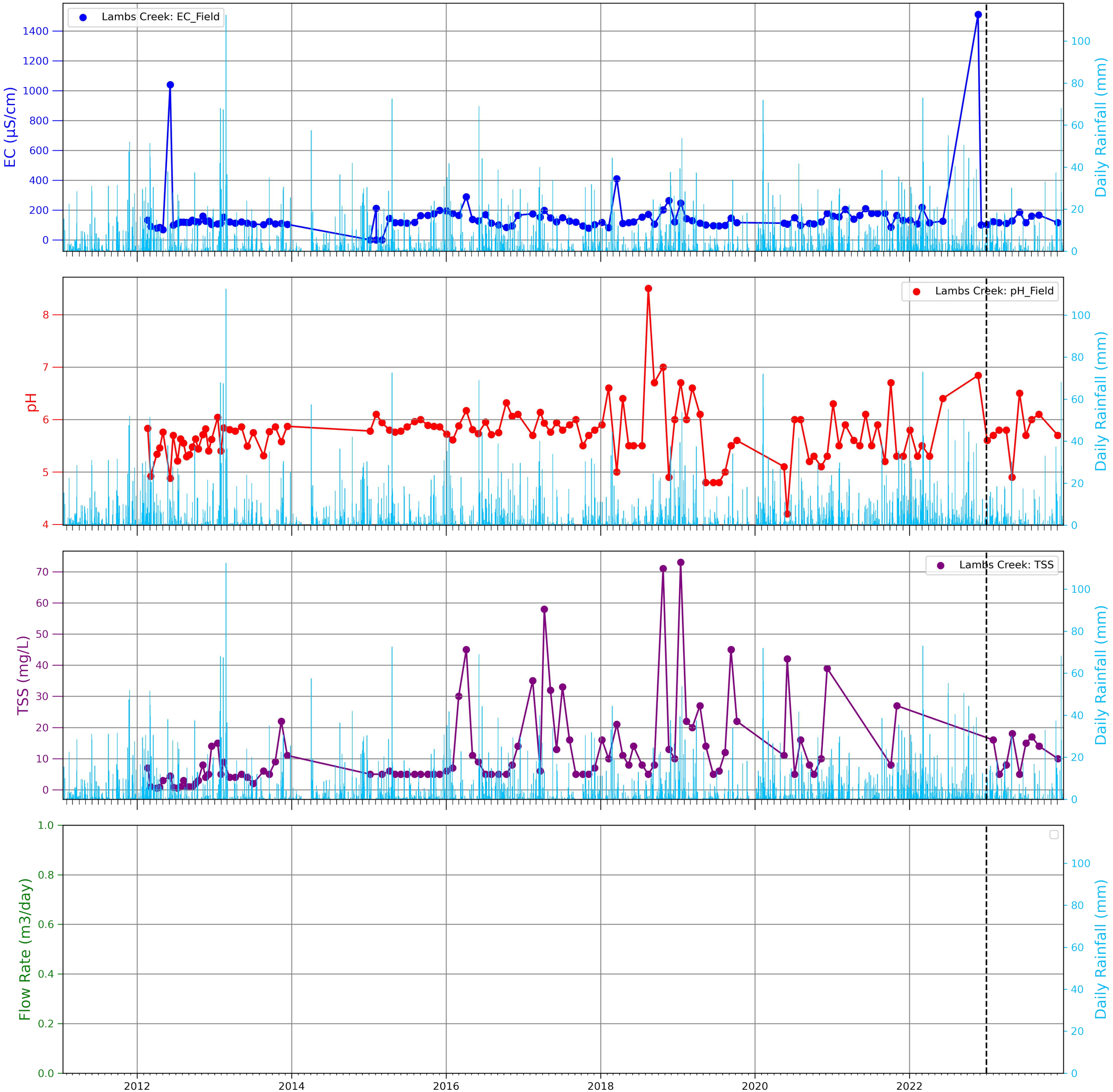
Time series plot of EC, pH, TSS and flow rate at: Kangaroo Creek US (AP)



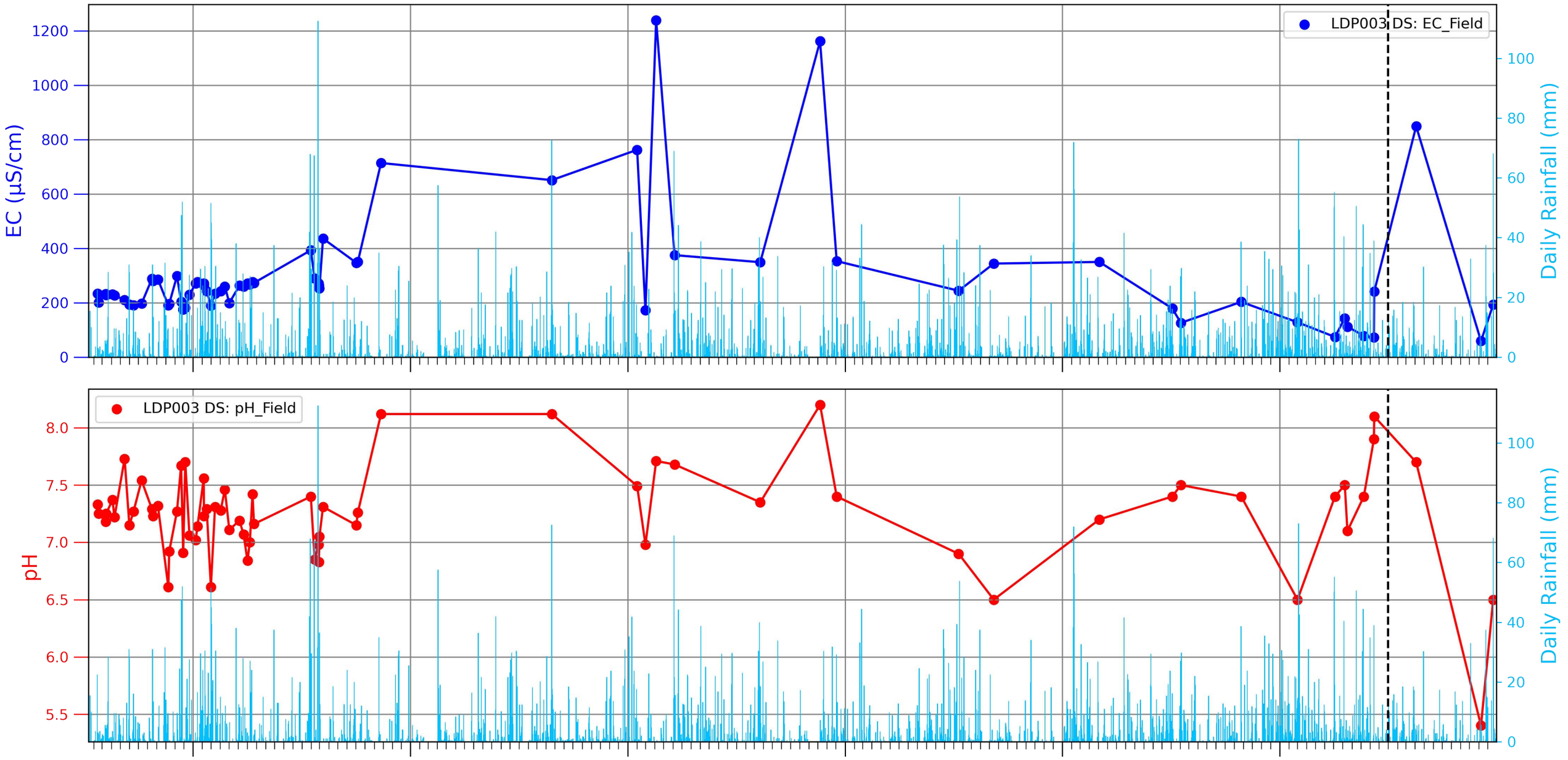
Time series plot of EC, pH, TSS and flow rate at: Kangaroo Creek US (NP)

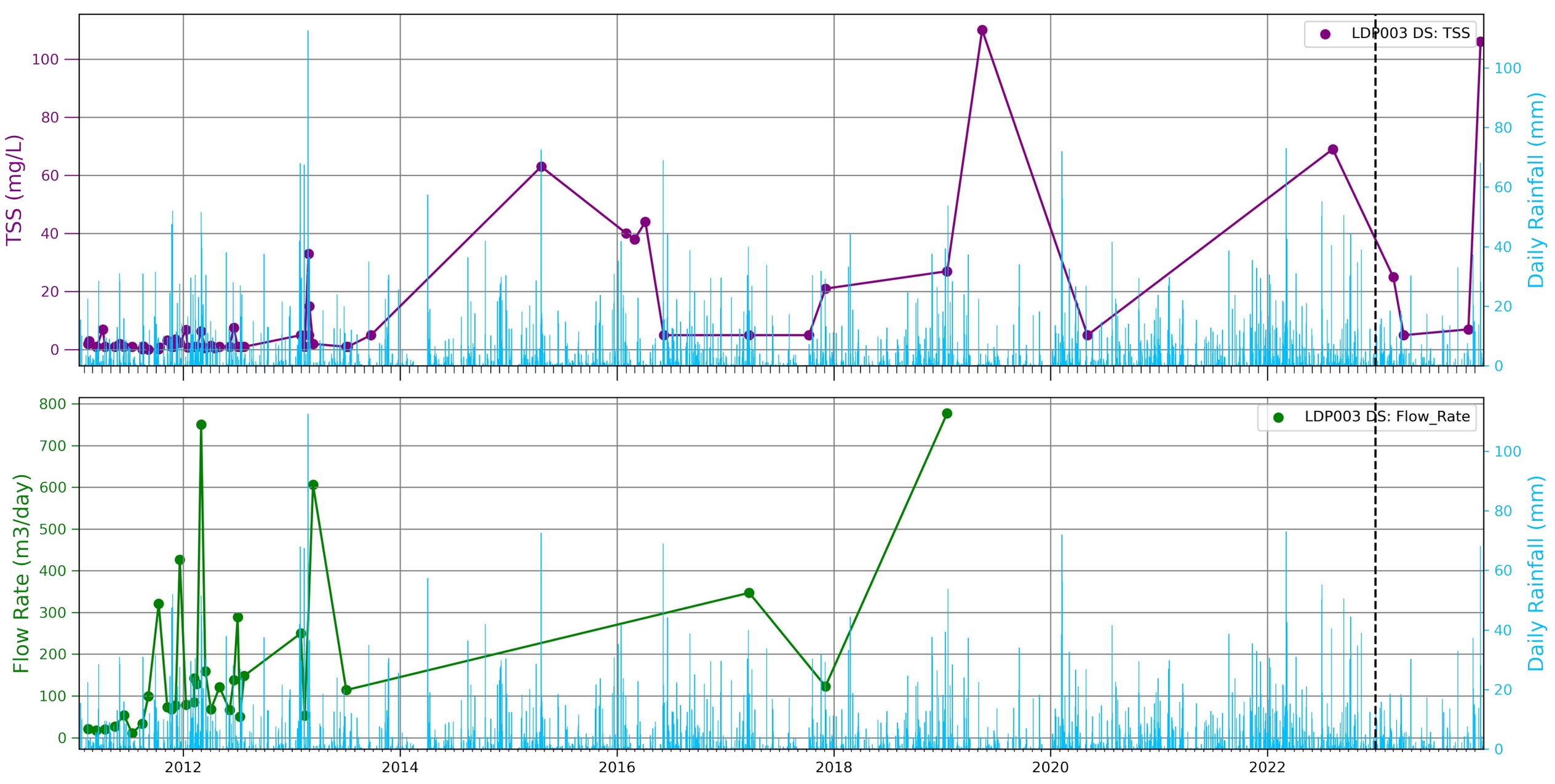


Time series plot of EC, pH, TSS and flow rate at: Lambs Creek

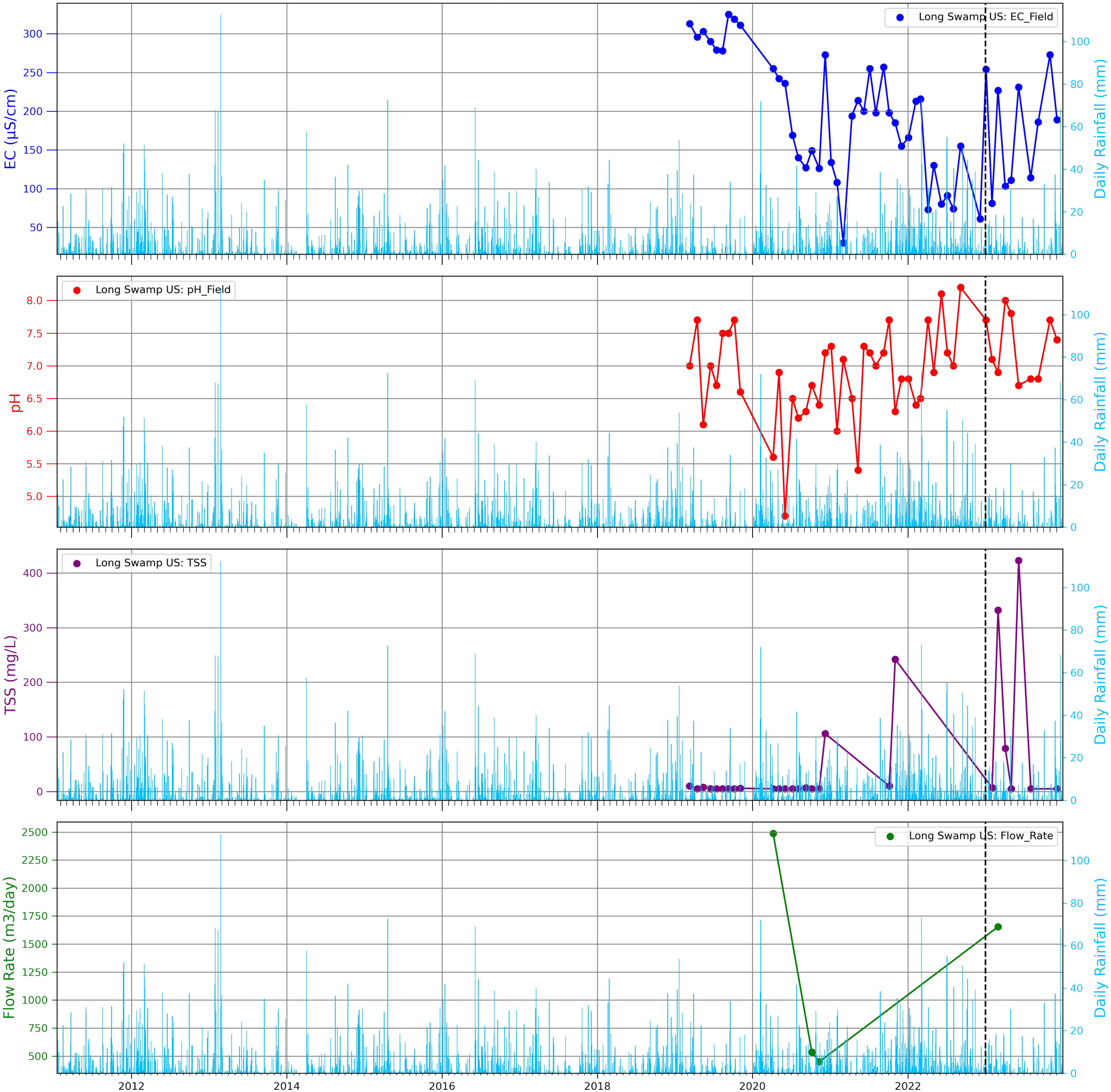


Time series plot of EC, pH, TSS and flow rate at: LDP003 DS

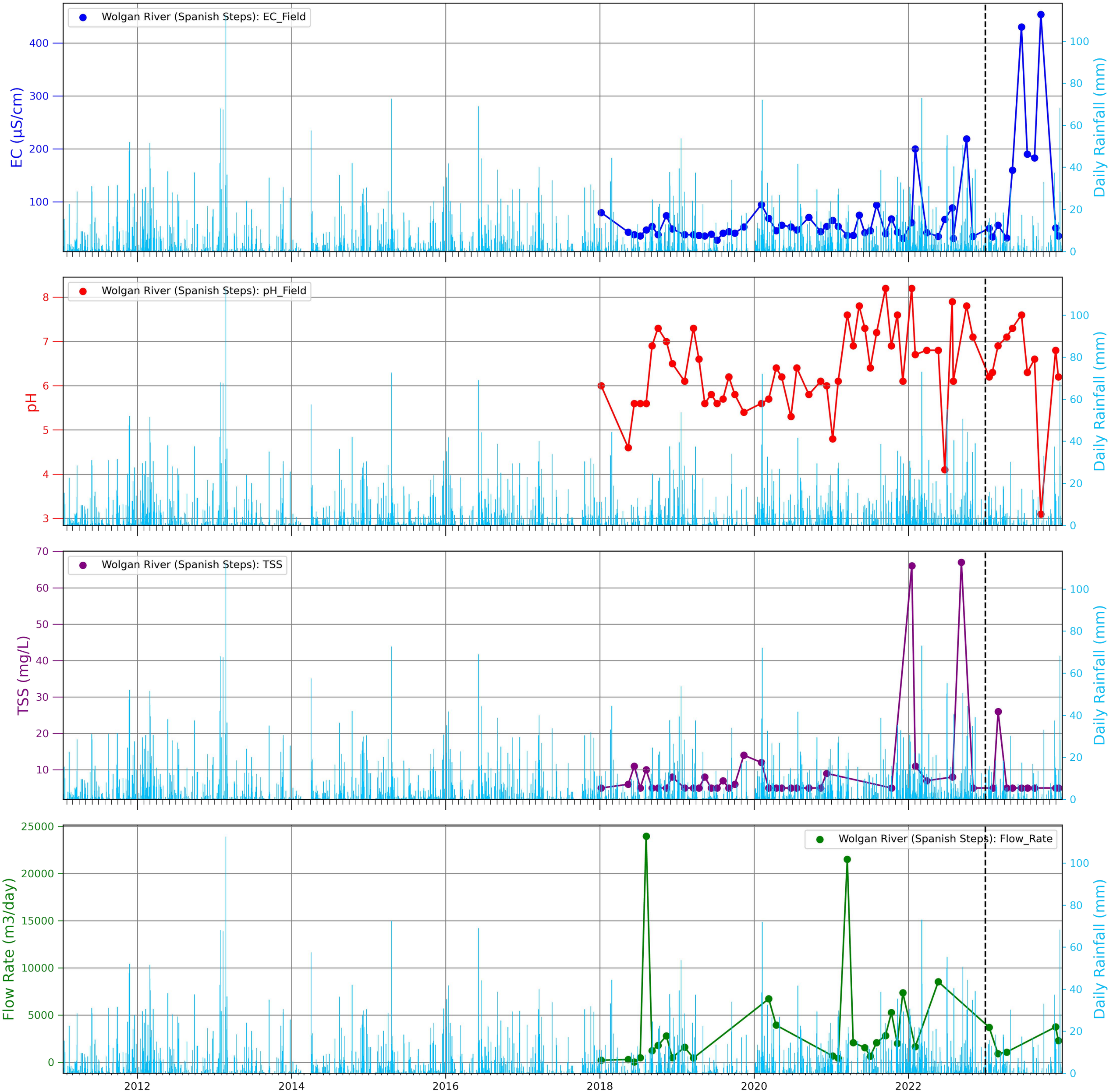




Time series plot of EC, pH, TSS and flow rate at: Long Swamp US



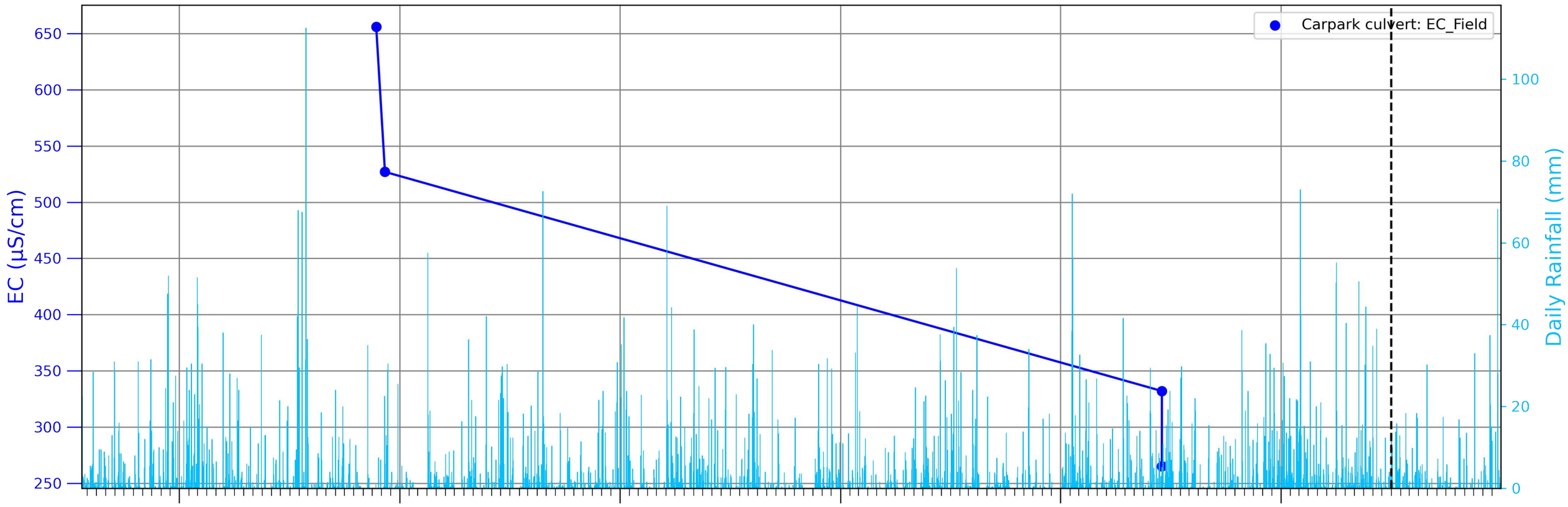
Time series plot of EC, pH, TSS and flow rate at: Wolgan River (Spanish Steps)

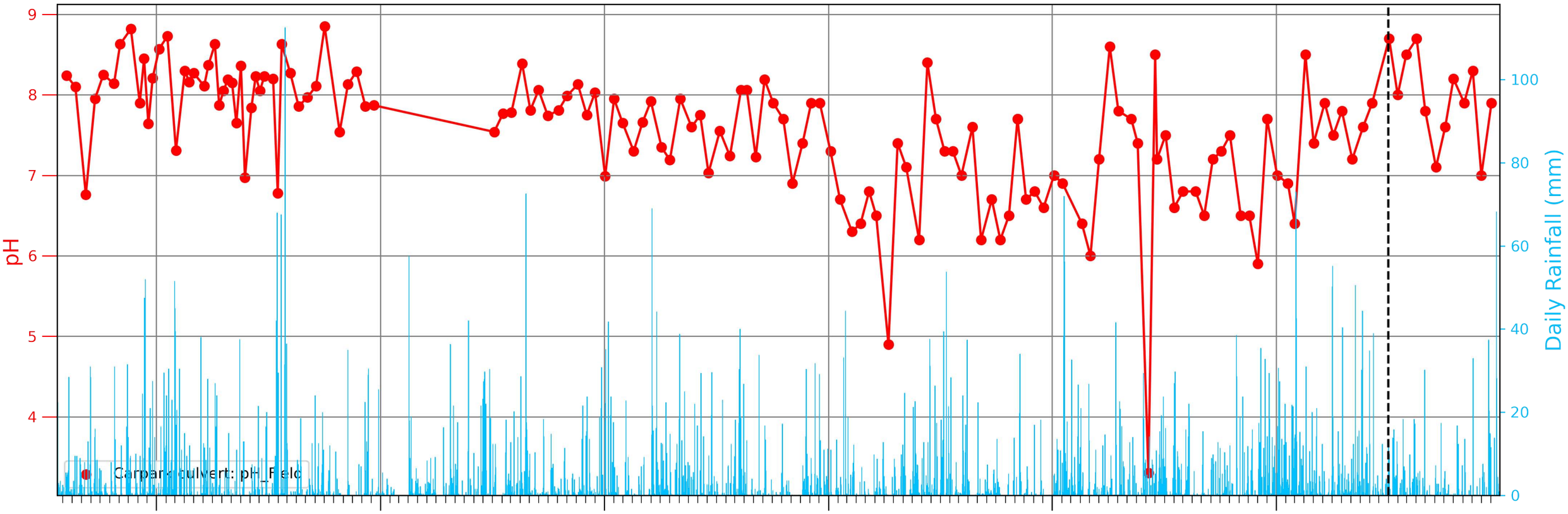


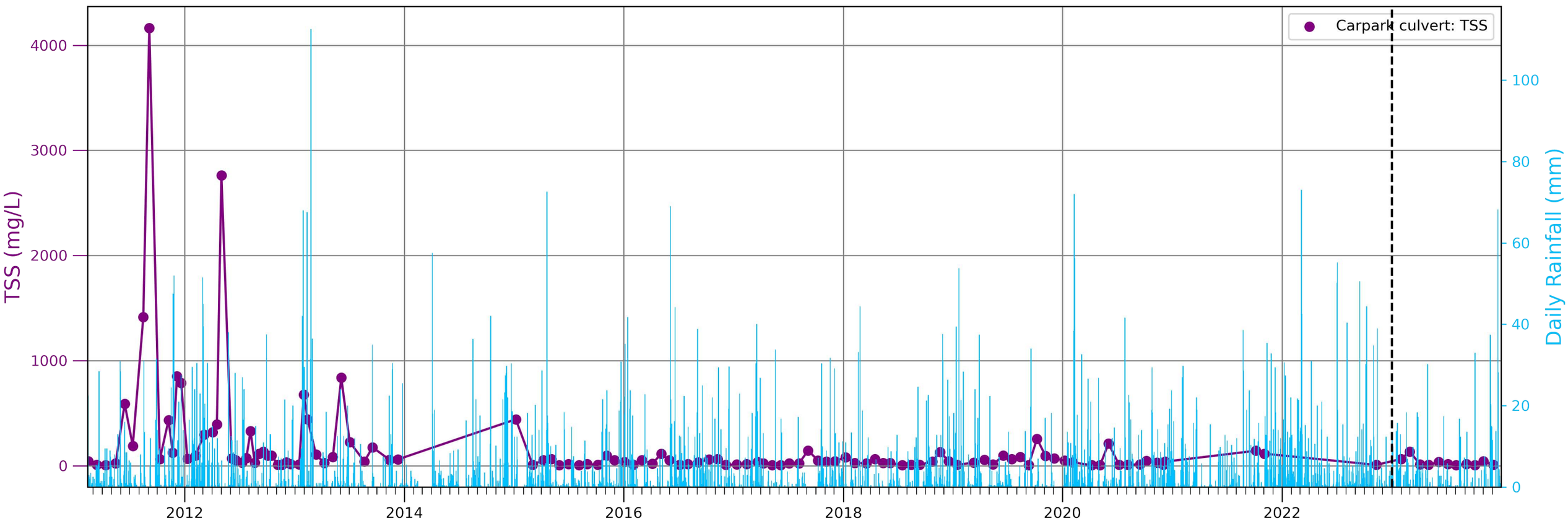
Time series plot of EC, pH, TSS and flow rate at: Wolgan River (Wolgah Property)

D.2 Pit top surface water quality time series plots

Time series plot of EC, pH and TSS at: Carpark culvert

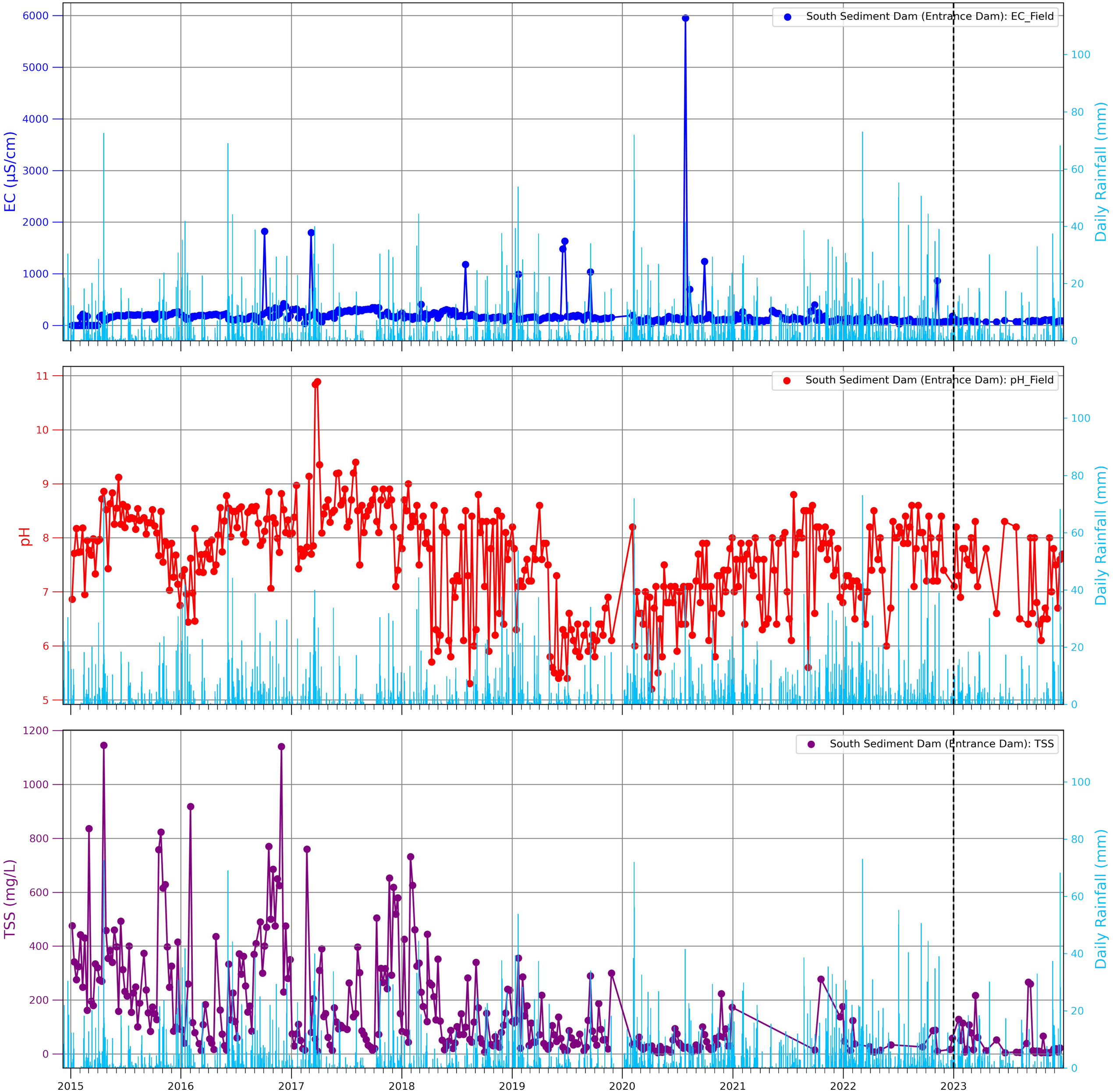






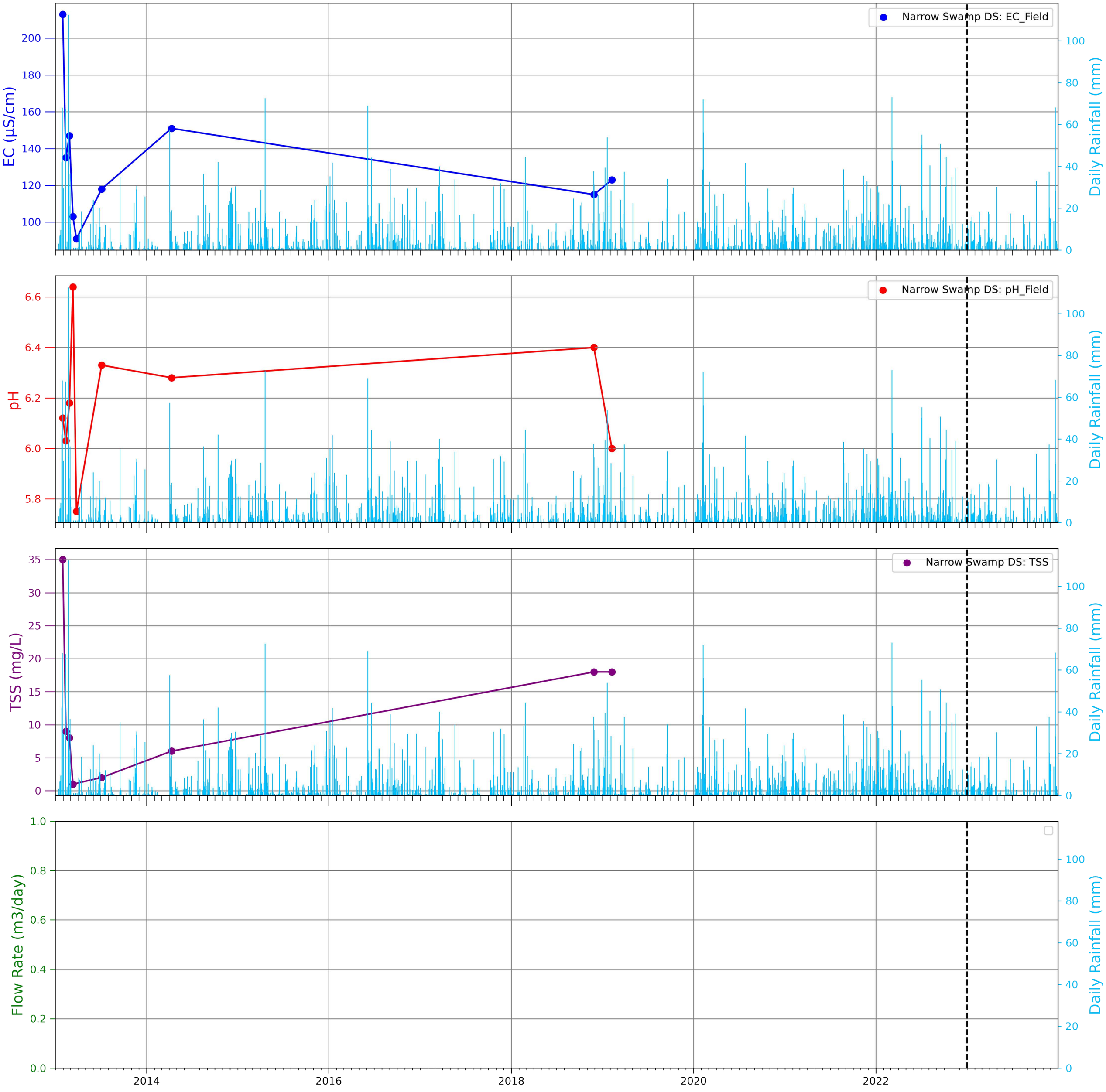
Time series plot of EC, pH and TSS at: South Sediment Dam (Entrance Dam) discharge

Time series plot of EC, pH and TSS at: South Sediment Dam (Entrance Dam)

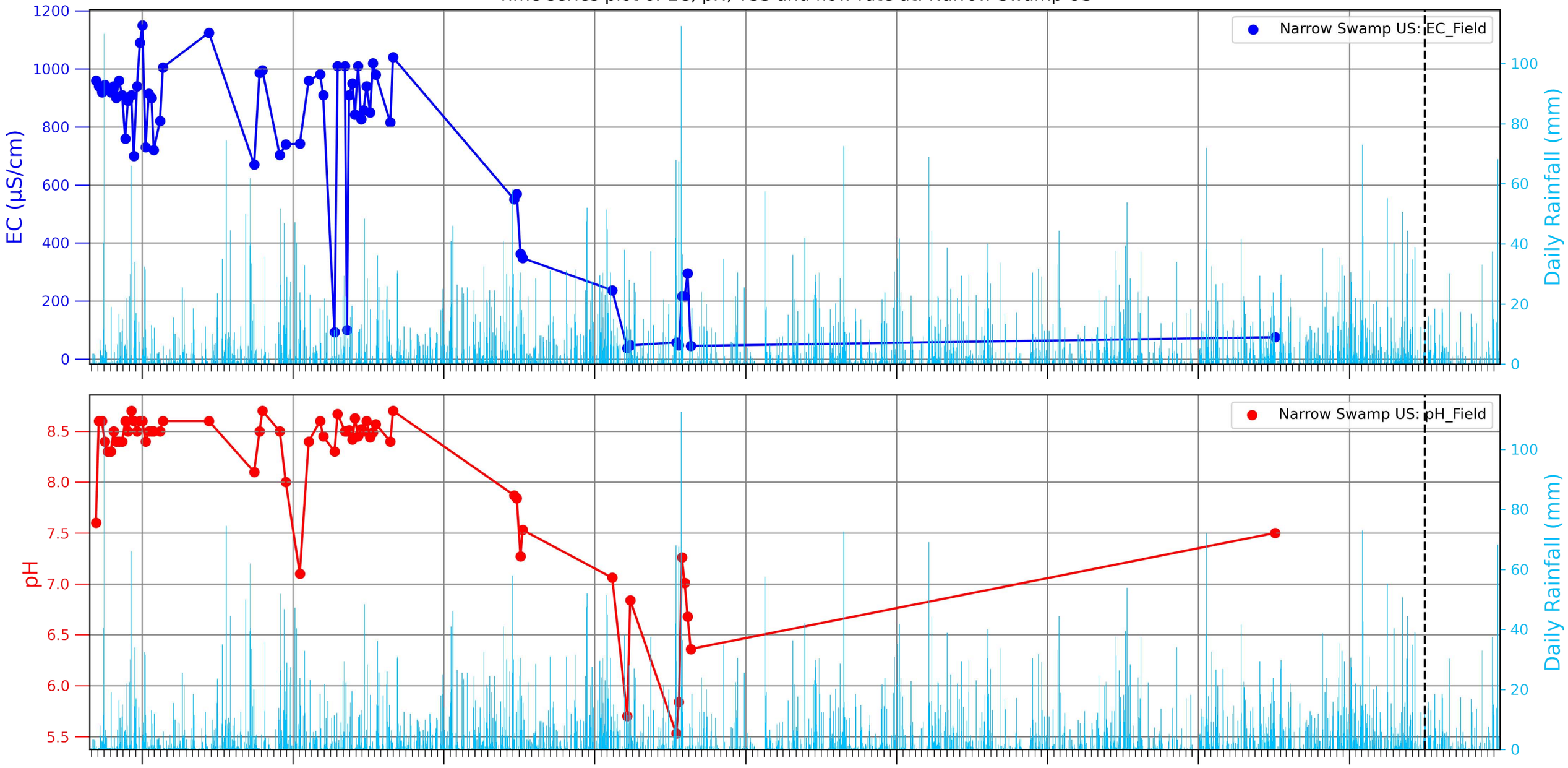


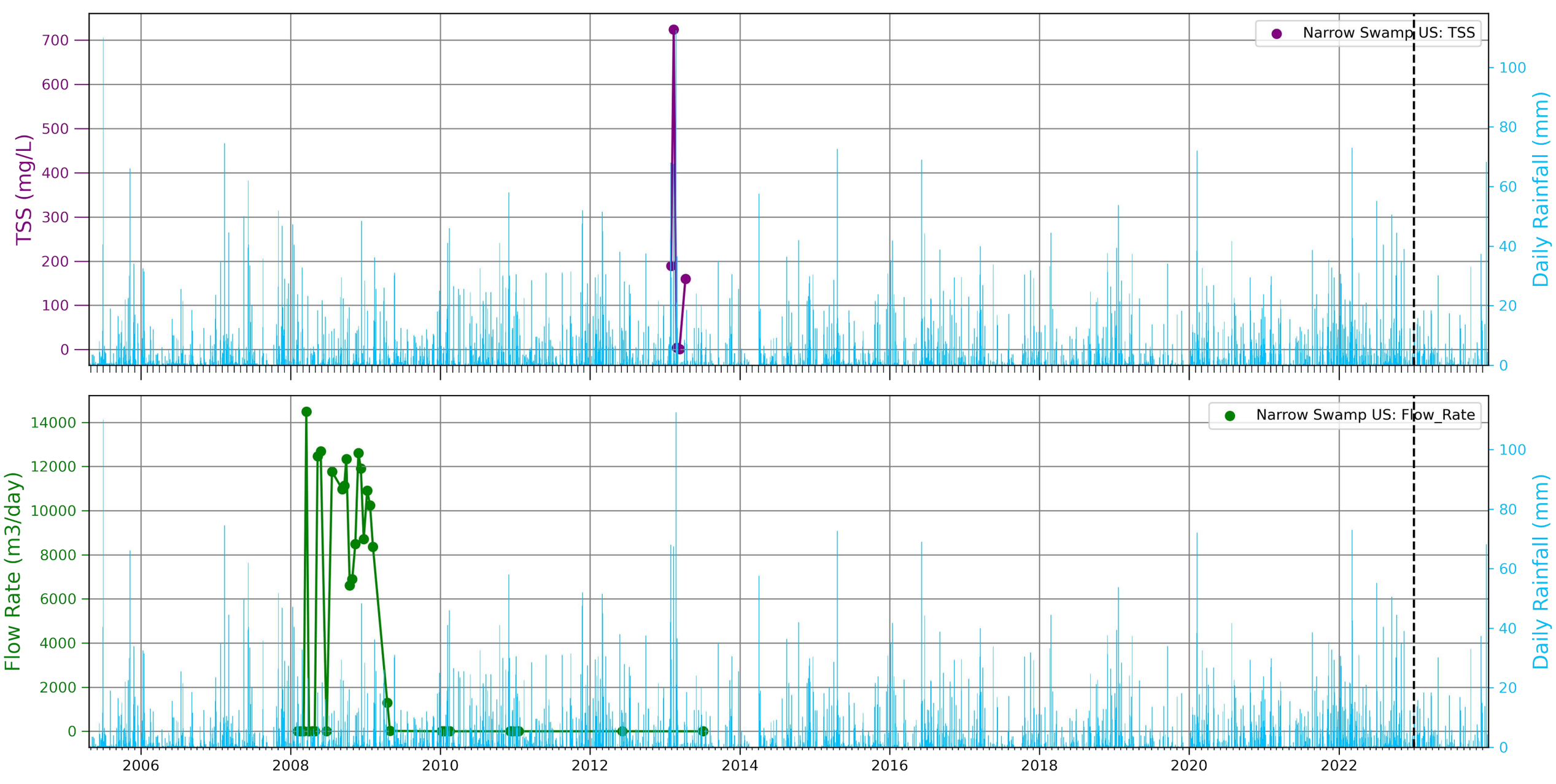
D.3 Swamp surface water quality and flow time series plots

Time series plot of EC, pH, TSS and flow rate at: Narrow Swamp DS

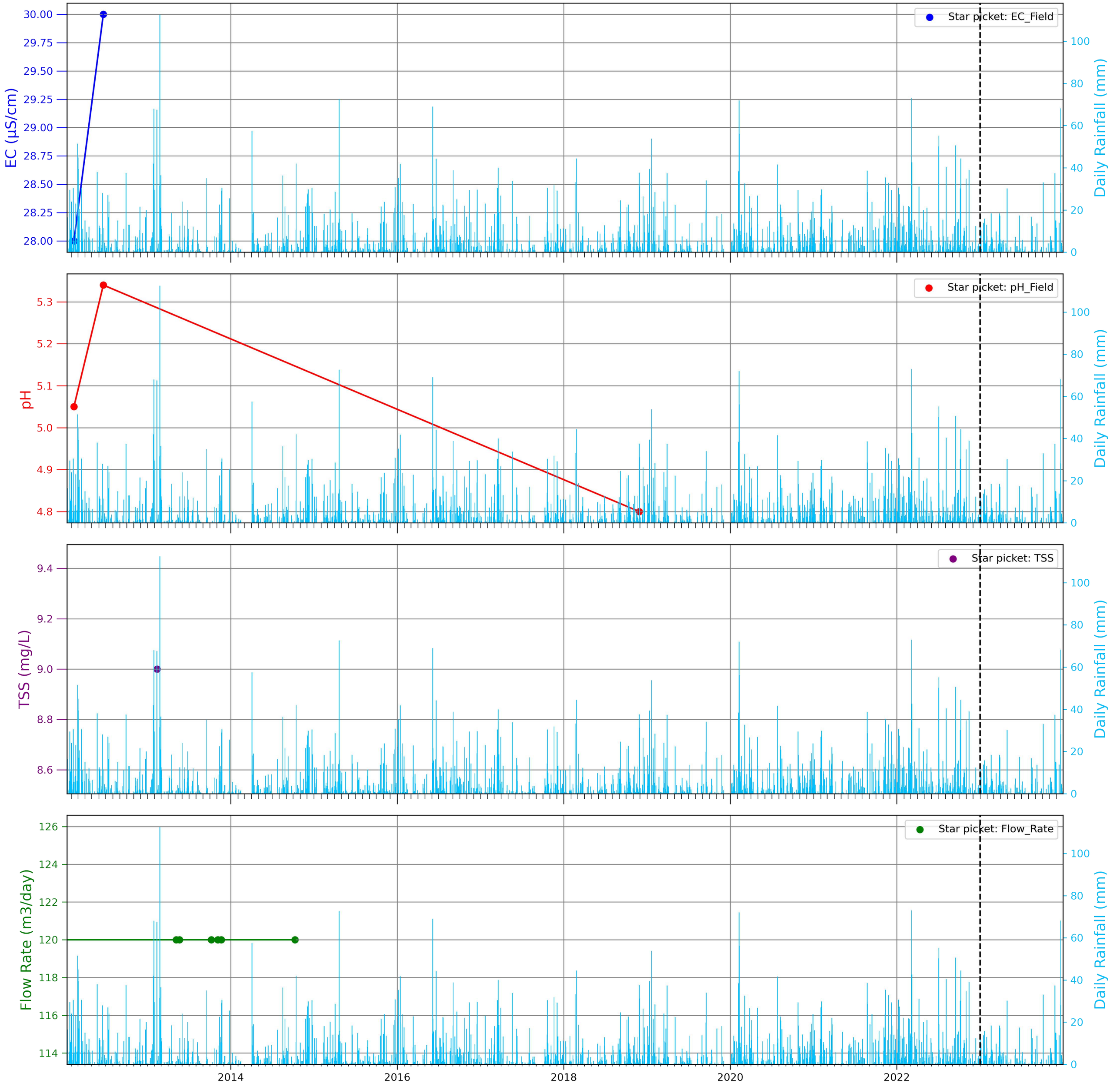


Time series plot of EC, pH, TSS and flow rate at: Narrow Swamp US

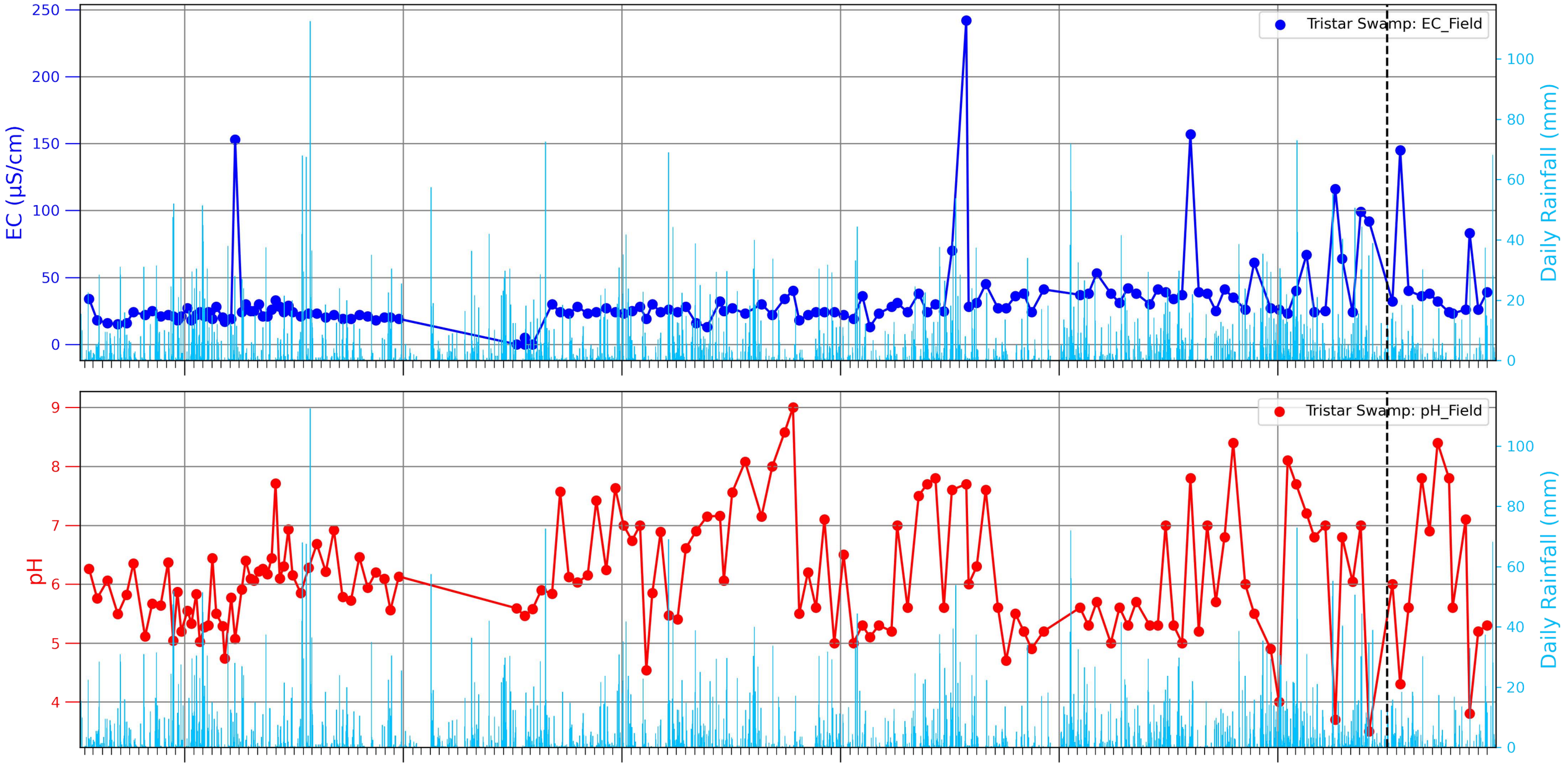


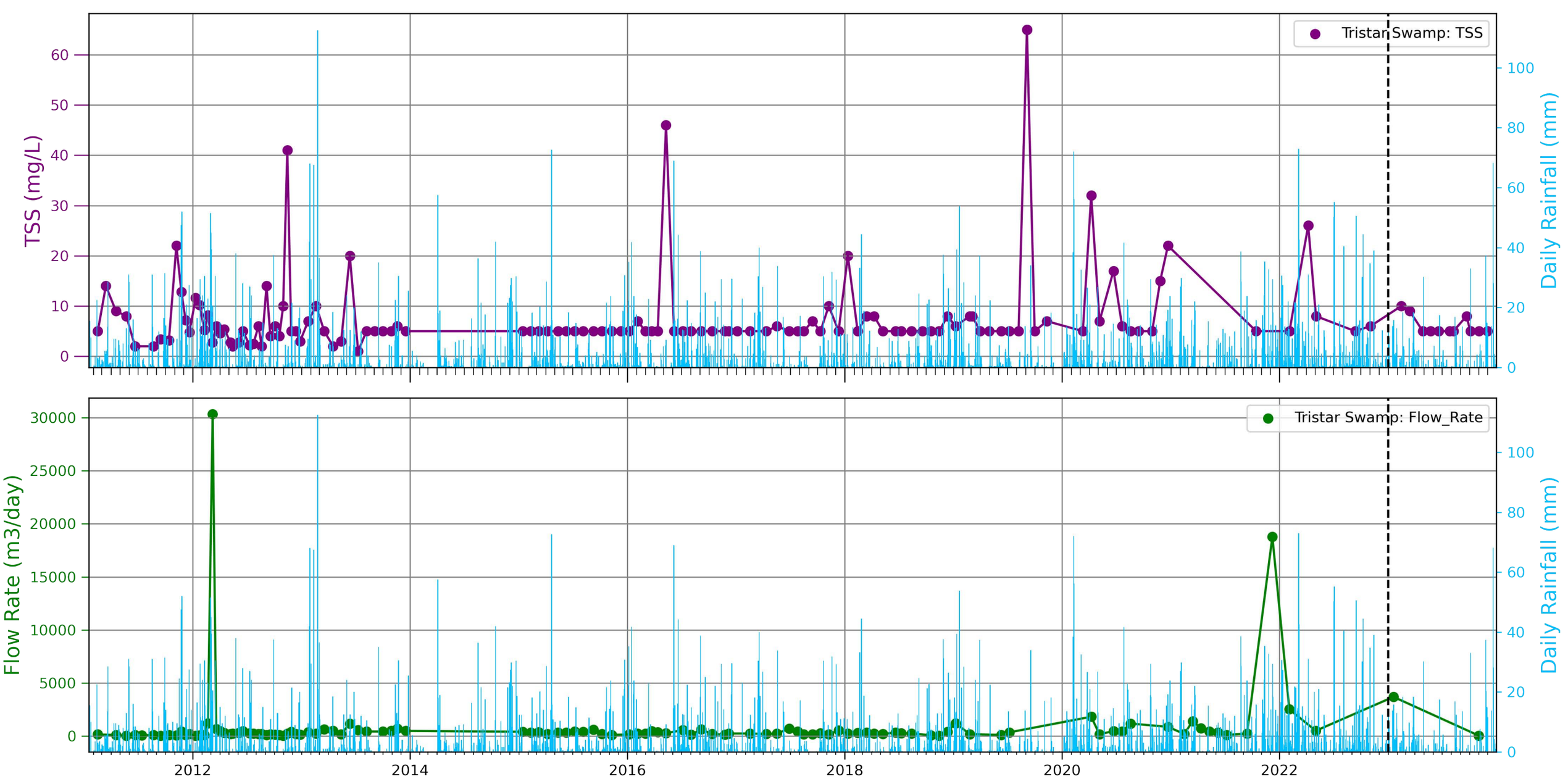


Time series plot of EC, pH, TSS and flow rate at: Star picket

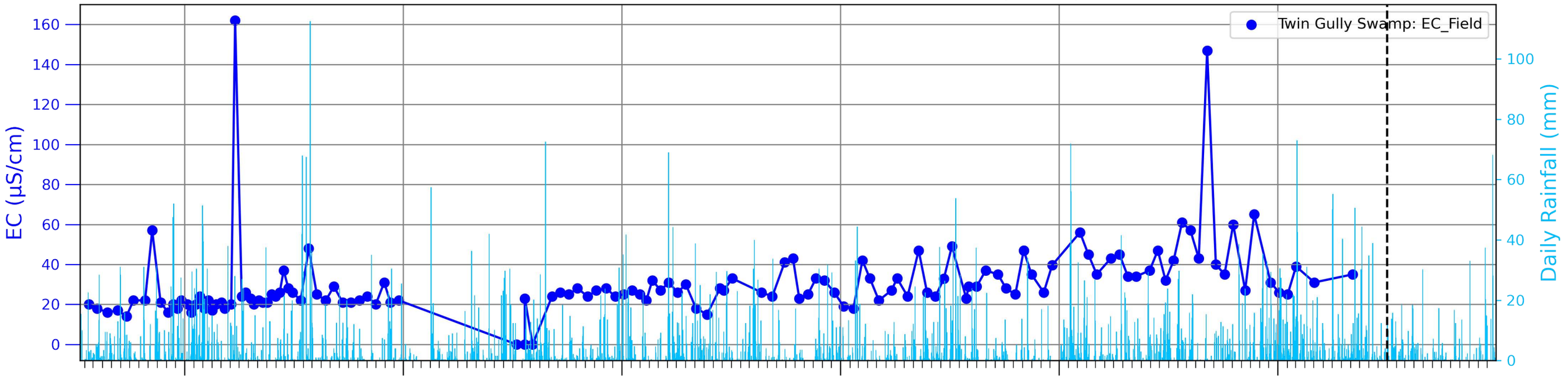


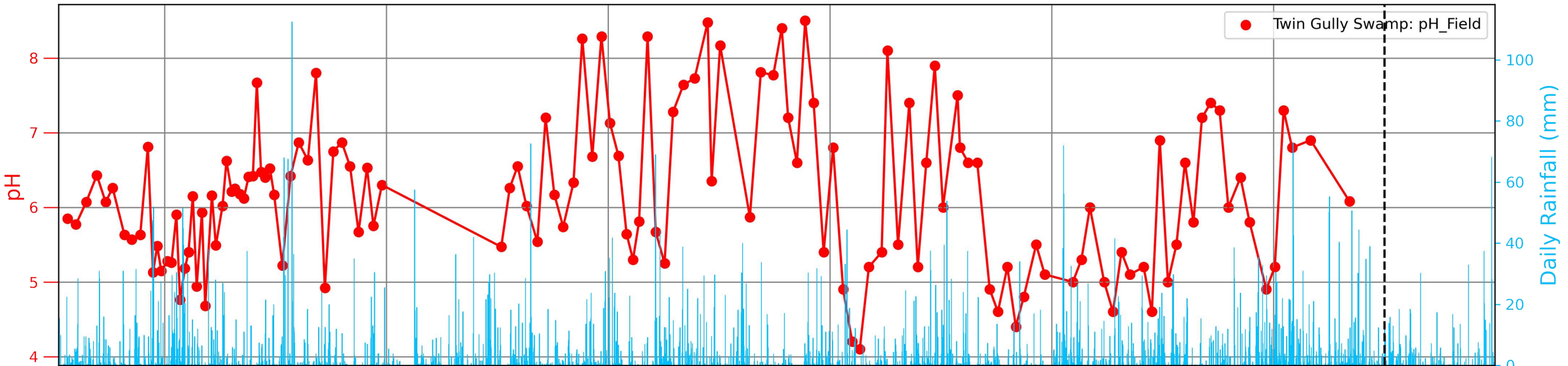
Time series plot of EC, pH, TSS and flow rate at: Tristar Swamp

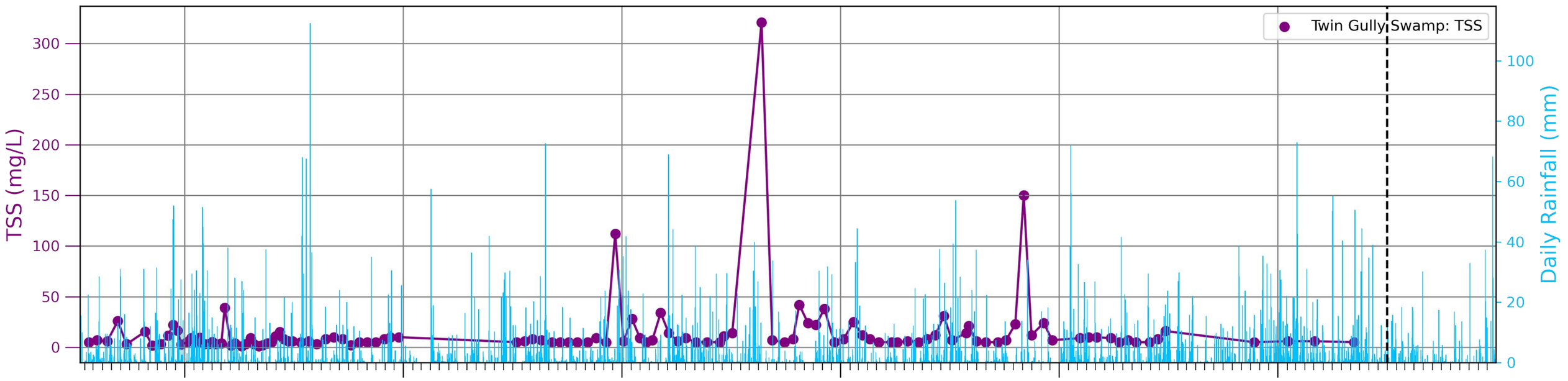


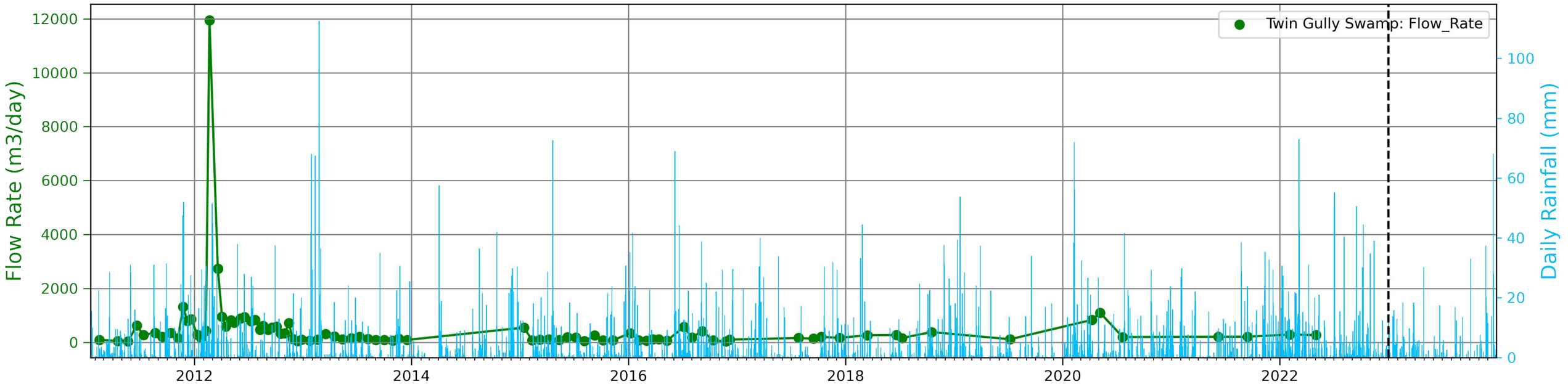


Time series plot of EC, pH, TSS and flow rate at: Twin Gully Swamp









Australia

SYDNEY
Ground floor 20 Chandos Street
St Leonards NSW 2065
T 02 9493 9500

NEWCASTLE
Level 3 175 Scott Street
Newcastle NSW 2300
T 02 4907 4800

BRISBANE
Level 1 87 Wickham Terrace
Spring Hill QLD 4000
T 07 3648 1200

CANBERRA
Suite 2.04 Level 2
15 London Circuit
Canberra City ACT 2601

ADELAIDE
Level 4 74 Pirie Street
Adelaide SA 5000
T 08 8232 2253

MELBOURNE
Suite 8.03 Level 8
454 Collins Street
Melbourne VIC 3000
T 03 9993 1900

PERTH
Suite 9.02 Level 9
109 St Georges Terrace
Perth WA 6000
T 08 6430 4800

Canada

TORONTO
2345 Yonge Street Suite 300
Toronto ON M4P 2E5
T 647 467 1605

VANCOUVER
60 W 6th Ave
Vancouver BC V5Y 1K1
T 604 999 8297

linkedin.com/company/emm-consulting-pty-limited

emmconsulting.com.au

Centennial Coal Company Limited
P O Box 1000
Toronto NSW 2283
www.centennialcoal.com.au