NARRABRI MINE
2024 ANNUAL REVIEW

Whitehaven

Name of Operation	Narrabri Mine
Name of Operator	Narrabri Coal Operations Pty Ltd
Development consent / Project Approval #	Project Approval 08_0144
Name of holder of development consent/project approval	Narrabri Coal Operations Pty Ltd
Mining lease #	ML 1609
Name of holder of mining lease	Narrabri Coal Pty Ltd
Water Licence #	Refer to Water Licences in Table 5
Name of holder of water licence	Narrabri Coal Pty Ltd, Narrabri Coal Australia Pty Ltd, Posco International Australia Holdings Pty Ltd, J-Power Australia Pty Ltd, Kores Narrabri Pty Ltd and Upper Horn Investments (Australia) Pty Ltd
Forward Program start date	1 January 2025
Forward Program end date	31 December 2027
Rehabilitation Management Plan approval date	30 November 2023 (Approval date)
Annual Review Commencement Date	01 January 2024
Annual Review Completion Date	31 December 2024

I, Grant Case, certify that this audit report is a true and accurate record of the compliance status of the Narrabri Mine for the period 01 January 2024 to 31 December 2024, and that I am authorised to make this statement on behalf of Narrabri Coal Operations Pty Ltd.

Note.

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

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

Name of Authorised Reporting Officer	**Grant Case**
Title of Authorised Reporting Officer	**General Manager**
Signature	
Date	26.03.25

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ABBREVIATIONS

Abbreviation	Detailed Name
µg	Micrograms
ACHMP	Aboriginal Cultural Heritage Management Plan
AGE	Australasian Groundwater and Environmental
AQMP	Air Quality Management Plan
ARRFP	Annual Rehabilitation Report and Forward Program
BC Act	Biodiversity Conservation Act 2016
Blue Book	Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004)
BMP	Biodiversity Management Plan
BOA	Biodiversity Offset Area
BOM	Bureau of Meteorology
BOS	Biodiversity Offset Strategy
CCC	Community Consultative Committee
CEEC	Critically Endangered Ecological Communities
CF	Cut and Flit
CH4	Methane
CHPP	Coal Handling and Preparation Plant
CO2-e	Carbon Dioxide Equivalent
DAWE	Australian Department of Agriculture, Water and the Environment
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DDG	Dust Deposition Gauges
DPHI	NSW Department of Planning, Housing and Infrastructure
EA	Environmental Assessment
EC	Electrical Conductivity
EEC	Endangered Ecological Communities
EIS	Environmental Impact Statement
EL	Exploration Licence
EMS	Environmental Management Strategy
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	NSW Environment Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPBC Approval	Environment Protection and Biodiversity Conservation (Approval 2009/5003 and 2019/8427)
EPL 12789	Environment Protection Licence 12789

EP-WMP	Extraction Plan - Water Management Plan
ESAP	Energy Savings Action Plan
ESC	Erosion and Sediment Control
FBS	Floristic-Based Subsidence
FWP	Forward Program
FY	Financial Year
GAB	Great Artesian Basin
GHG	Greenhouse Gas
GHGMP	Greenhouse Gas Minimisation Plan
GIS	Geographical Information System
GPS	Global Positioning System
GWMP	Groundwater Management Plan
ha	Hectares
HVAS	High Volume Air Sampler
IEA	Independent Environmental Audit
kL	Kilolitres (1kL = 1,000 L)
km	Kilometres
L	Litres
LGA	Local Government Area
LHD	Load Haul Dump
LiDAR	Light Detection and Ranging
LMP	Landscape Management Plan
LOM	Life of Mine
LW	Longwall
MDB	Murray Darling Basin
MEG	Department of Regional NSW, Mining, Exploration and Geoscience
MEVF	Main Exhaust Ventilation Fan
ML	Mining Lease (Followed by Number)
ML	Mega Litre (Preceded by Number)
mm	millimetres
MOD	PA 08_0144 Modification
Mt	Million Tonnes
Mtpa	Million Tonnes Per Annum
MWh	Megawatt Hour
NCOPL	Narrabri Coal Operations Pty Ltd

NDVI	Normalised Difference Vegetation Index
NGCG	Native Ground Cover Grass
NGERS	National Greenhouse and Energy Reporting Scheme
NMP	Noise Management Plan
NMS	Native Midstorey Cover
NOS	Native Overstorey Cover
NPI	National Pollutant Inventory
NPS	Native Plant Species
NPW Act	National Parks and Wildlife Act 1974
NPWS	National Parks and Wildlife Services
NSC	Narrabri Shire Council
NSW	New South Wales
PA 08_0144	Project Approval 08_0144
PAB	Photosynthetically Active Biomass
PIRMP	Pollution Incident Response Management Plan
PM10	Particulate Matter less than 10 Micrograms
PTW	Permit to Work
RAPs	Registered Aboriginal Parties
RCE	Rehabilitation Cost Estimate
REA	Reject Emplacement Area
Reporting Period	1 January 2024 - 31 December 2024 (Calendar Year)
RFS	Rural Fire Service
RMP	Rehabilitation Management Plan
ROM	Run of Mine
RR	NSW Resources Regulator
SD	Sediment Dam
SoC	Statement of Commitments
SPMP	Subsidence Pond Management Plan
SPW	Sound Power Level
SSD-10269	State Significant Development (Narrabri Mine Stage 3 Extension Project)
STP	Sewerage Treatment Plan
t	Tonnes
TEOM	Tapered Element Oscillating Microbalance
TfNSW	Transport for NSW
TIS	Total Insoluble Solids

TSP	Total Suspended Particulate
TSS	Total Suspended Solids
VAM	Ventilation Air Methane
VWP	Vibrating Wire Piezometers
VZ	Vegetation Zones
WAL	Water Access Licence
WasteMP	Waste Management Plan
WHC	Whitehaven Coal Limited
WMP	Water Management Plan

1 STATEMENT OF COMPLIANCE

This Annual Review has been prepared to provide a summary of the environmental performance of the Narrabri Mine over the **Reporting Period**, 1 January 2024 to 31 December 2024. The compliance status of the Narrabri Mine against relevant approvals was assessed as at the end of the Reporting Period and is summarised in **Table 1**.

Non-compliances recorded during the Reporting Period (if applicable) were ranked according to the risk matrix included in **Table 2** and a brief description of each is provided in **Table 3** (if applicable). Further information about the non-compliances is provided in **Section 11** (if applicable). The compliance status described in this Annual Review (**Section 1** and **Section 11**) relates to the conditions of the relevant approvals listed in **Table 1** during the Reporting Period.

Table 1: Statement of Compliance

Were all the conditions of the relevant approvals complied with?	Yes/No
Project Approval (**PA**) 08_0144	Yes
Environment Protection Licence (**EPL**) 12789 (applicable conditions as above)	Yes
Rehabilitation Management Plan (**RMP**) and Forward Program (**FWP**)	Yes
Mining Lease (**ML**) 1609	Yes
Water Access Licence (**WAL**) 15922	Yes
WAL12833	Yes
WAL12822	Yes
WAL20131	Yes
WAL6762	Yes
WAL2671	Yes
WAL2728	Yes
WAL20152	Yes
WAL29549	Yes
WAL43017	Yes
90CA811347	Yes
90WA812891	Yes
90CA802130	Yes
90WA822539	Yes
Groundwater Monitoring Bores: 90BL254481-487, 90BL254658-663, 90BL254701, 90BL254958-967, 90BL255167-173, 90BL255216-218, 90BL255769-772, 90BL256060-064, 90BL256344 and 90BL256346	Yes
Environment Protection Biodiversity Conservation (**EPBC**) Approval 2009/5003	Yes

Table 2: Compliance Status Key

Risk Level	Colour Code	Description
High	High	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Medium	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	Low	Non-compliance with: • potential for moderate environmental consequences, but is unlikely to occur; or • potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Administrative non-compliance	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)

Table 3: Non-Compliances

Relevant Approval	Cond. #	Condition Description (Summary)	Compliance Status	Comment	Where addressed in Annual Review
Nil	N/A	N/A	Nil	Nil	Nil

2 INTRODUCTION

This Annual Review has been prepared for the Narrabri Mine (**Figure 1**) and has been prepared in accordance with the *'Annual Review Guideline, Post-Approval requirements for State significant mining developments'* (NSW Government, October 2015) (Guidelines). This document has been prepared to satisfy the following requirements:

- The Annual Review requirements per PA 08_0144, Schedule 6, Condition 6; and
- The routine reporting expectations of relevant government authorities.

The Annual Review covers the period 1 January 2024 to the 31 December 2024. The Annual Review provides information on historical aspects of the Narrabri Mine, longer term trends in environmental monitoring results and relevant information on activities to be undertaken during the following Reporting Period.

2.1 PROJECT DESCRIPTION

The Narrabri Mine is operated by Narrabri Coal Operations Pty Ltd (**NCOPL**), on behalf of the Narrabri Mine Joint Venture, which consists of 2 Whitehaven Coal Limited (**WHC**) wholly owned subsidiaries, and other joint venture partners[1].

The Narrabri Mine is an underground coal mining operation situated in the Gunnedah Coalfield. It is located approximately 25 kilometres (**km**) south-southeast of Narrabri and approximately 60km north-west of Gunnedah, within the Narrabri Shire Council (**NSC**) Local Government Area (**LGA**) in New South Wales (**NSW**). The Narrabri Mine includes an underground coal mine, a Coal Handling Preparation Plant (**CHPP**) and associated rail siding and surface infrastructure.

The Narrabri Mine Stage 1 Operations was granted approval (PA 05_0102) on 13 November 2007 under Part 3A of the *Environmental Planning and Assessment Act 1979* (**EP&A Act**). A modification to this approval was sought and granted approved in 2010 to allow for the construction of a CHPP, ventilation shaft and other long lead time items that would ultimately form part of an expanded longwall mining operation.

The Narrabri Mine Stage 2 Operations was granted approval (PA 08_0144) on 26 July 2010 under Part 3A of the EP&A Act. Since 2010, PA 08_0144 has undergone seven modifications. PA 08_0144 permits the mining of coal up to 11 million tonnes per annum (**Mtpa**) Run of Mine (**ROM**) until 26 July 2031. The Narrabri Mine is covered by ML1609 which encompasses an area of 5,298 hectares (**ha**) for the predominant purpose of mining for coal from the Hoskissons Coal Seam.

The Narrabri Mine Stage 3 Extension Project was granted State Significant Development approval (**SSD-10269**) on 1 April 2022. The Environment Protection and Biodiversity Conservation Approval (**EPBC Approval**) 2019/8427 was granted approval on 24 September 2024. NCOPL plan to trigger physical commencement of the development SSD-10269 (condition A14) on or around 01 July 2025.

[1] Narrabri Coal Pty Ltd, Narrabri Coal Australia Pty Ltd, Posco International Australia Holdings Pty Ltd, J-Power Australia Pty Ltd, Kores Narrabri Pty Ltd and Upper Horn Investments (Australia) Pty Ltd

2.2 MINE CONTACTS

The relent contacts for environmental management at the Narrabri Mine are outlined in **Table 4**.

Table 4: NCOPL Contacts

Contact	Contact Details
Grant Case General Manager	Phone: (02) 6794 4755
Brent Baker Environmental Manager	Phone: (02) 6794 4755
Narrabri Coal Website (Copies of public notices, environmental management documents, monitoring results and other information relating to Narrabri Mine's operations)	https://whitehavencoal.com.au/our-business/our-assets/narrabri-mine/
Phone	Narrabri Mine General Enquiries: 02 6794 4755 Community Complaints Hotline: 1800 942 836

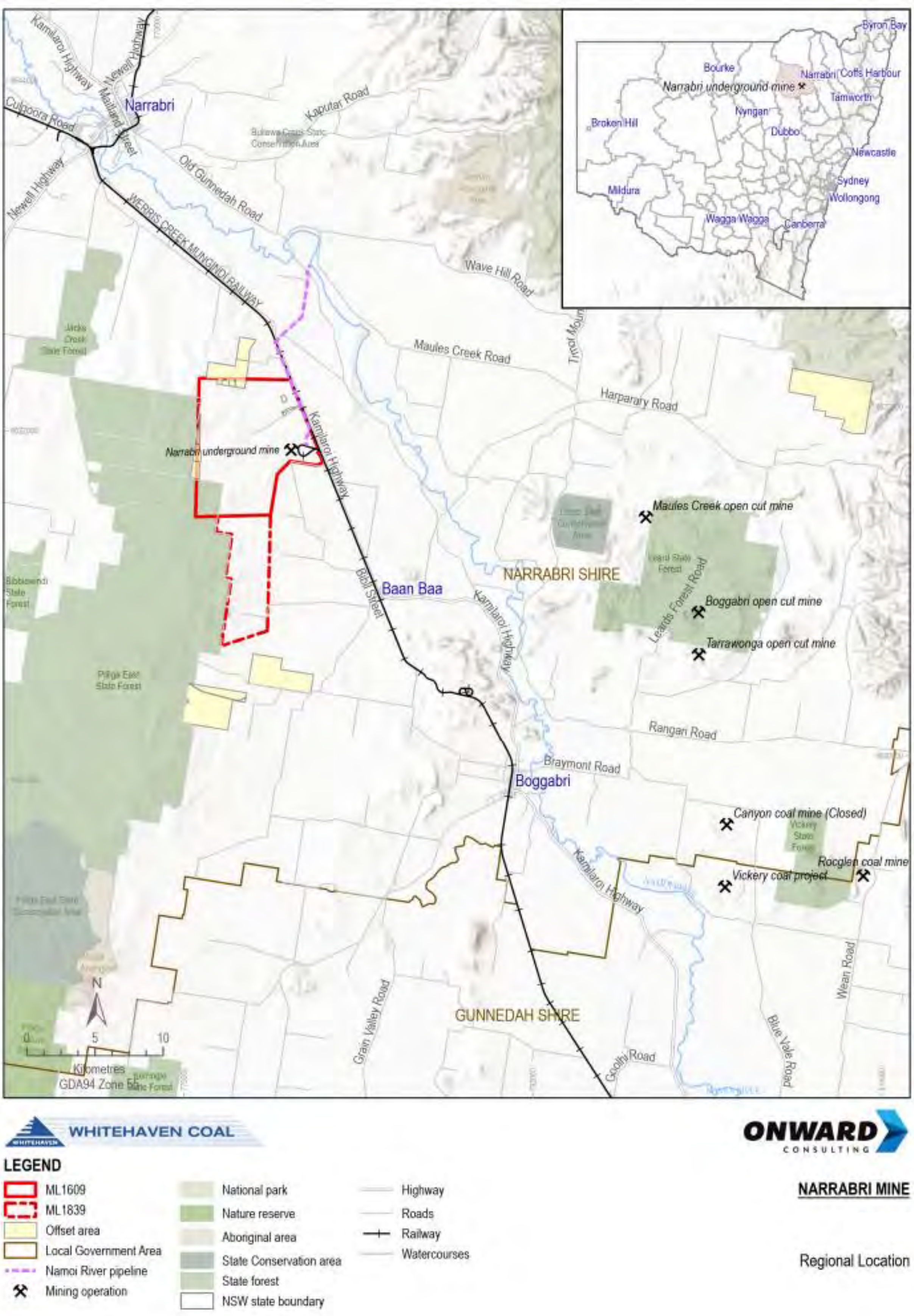


Figure 1: Regional Scale Locality Plan

Figure 2: Local Scale Locality Plan

3 APPROVALS

Table 5 provides a summary of the key licences, leases and approvals that have been obtained (and remain active) for the Narrabri Mine to enable the construction and operation of Narrabri Mine.

Table 5: Licences, Leases and Approvals

Approval	Approval Period(s)	Authority[1]
PA 08_0144 *(as modified)*	26/7/2010 – 26/7/2031*	NSW Department of Planning, Housing and Infrastructure (**DPHI**)
PA 08_0144 Modification (**MOD**) 1, approved 30 March 2011	26/7/2010 – 26/7/2031	DPHI
PA 08_0144 MOD2, approved 21 December 2011	26/7/2010 – 26/7/2031	DPHI
PA 08_0144 MOD4, approved 22 September 2015	26/7/2010 – 26/7/2031	DPHI
PA 08_0144 MOD5, approved 9 December 2015	26/7/2010 – 26/7/2031	DPHI
PA 08_0144 MOD6, approved 13 January 2017	26/7/2010 – 26/7/2031	DPHI
PA 08_0144 MOD7, approved 23 November 2021	26/7/2010 – 26/7/2031	DPHI
SSD-10269**	1/4/2022 – 31/12/2044	DPHI
EPBC Approval 2009/5003	21/1/2011 – 31/12/2040	Commonwealth Department of Climate Change, Energy, the Environment and Water (**DCCEEW**)
EPBC Approval 2019/8427**	24/9/2024 – 31/12/2066	DCCEEW
EPL 12789	Anniversary date: 20 February	NSW Environment Protection Authority (**EPA**)
Radiation Management Licence 5063666	Expiry date: 3/1/2026	EPA
Construction Certificate DP816020	17/10/2008 – Perpetuity	NSC
Inspection Report/Permit to Occupy No 2413	6/8/2009 – 26/7/2031	NSC
Construction Certificate DP816020	23/10/2010 – Perpetuity	NSC
RMP	Approved 16/11/2023	NSW Resources Regulator (**RR**)
Forward Program (**FWP**)	1/1/2023 – 31/12/2025	RR
ML1609	18/1/2008 – 18/1/2029	RR
ML1839**	13/9/2022 – 13/9/2043	RR
Exploration Licence (**EL**) 6243	21/5/2004 – 21/5/2029	Department of Regional NSW, Mining, Exploration and Geoscience (**MEG**)

Approval	Approval Period(s)	Authority[1]
EL 9455	6/9/2022 – 6/9/2028	MEG
EL 9456	6/9/2022 – 6/9/2028	MEG
XSTR100215 (Licence to Store Explosives)	20/12/2020 – 20/7/2025	SafeWork NSW
NDG037955 (Notification of Hazardous Chemicals on Premises)	23/03/2021 - Perpetuity	SafeWork NSW
WAL 6762 (Lower Namoi Regulated River Water Source (high security)) – 20 units	Continuing	Water NSW
WAL 2728 (Lower Namoi Regulated River Water Source (general security)) – 10 units	Continuing	Water NSW
WAL 20152 (Lower Namoi Regulated River Water Source (general security)) – 600 units	Continuing	Water NSW
WAL 2671 (Lower Namoi Regulated River Water Source (general security)) – 48 units	Continuing	Water NSW
WAL 12833 (Upper Namoi Zone 5 Namoi Valley Groundwater Source) – 67 units	Continuing	Water NSW
WAL 20131 (Upper Namoi Zone 5 Namoi Valley Groundwater Source) – 150 units	Continuing	Water NSW
WAL 12822 (Upper Namoi Zone 5 Namoi Valley Groundwater Source) – 43 units	Continuing	Water NSW
WAL 29549 (Gunnedah – Oxley Basin Murray Darling Basin Groundwater Source) – 818 units	Continuing	Water NSW
WAL 43017 (Gunnedah – Oxley Basin Murray Darling Basin Groundwater Source) – 403 units	Continuing	Water NSW
WAL 15922 (Southern Recharge Water Source) – 248 units	Continuing	Water NSW

Notes:

* Schedule 2, Condition 5 of PA 08_0144 provides that mining operations may be carried out until 26 July 2031. The consent continues to apply in all other respects other than the right to conduct mining operations until rehabilitation and other relevant obligations have been carried out satisfactorily.

** Operations under *Approval* have not commenced.

1 - Authority Name as at 31 December 2024 (i.e. End of Reporting Period)

3.1 PENDING APPLICATIONS AT END OF REPORTING PERIOD

There were no pending applications as at 31 December 2024.

3.2 VARIATIONS

The following new or varied approvals were issued during the Reporting Period:

1. EPL 12789 variation approved on 05 February 2024 to amend conditions relating to the construction of the Western Ventilation Shaft and associated hardstand and sediment dam (**SD**) 9. The variation added a wet weather discharge point for SD9, an additional ambient flow monitoring point, and the amendment of some existing monitoring points (Point 18, 20, 24, 25 & 26) to correct administrative errors.

2. EPL12789 variation approved on 21 November 2024 arising from EPA 5 yearly periodic review of the licence; where some conditions were removed as no longer required or had been completed, and subsequent administrative updates to numbering following removal of conditions.

3.3 STATUS OF MANAGEMENT PLANS

Table 6 outlines the environmental management plans and the approval status of each at the end of the Reporting Period.

Table 6: Status of NCOPL Management Plans

Management Strategy / Plan	Regulatory Approval
Aboriginal Cultural Heritage Management Plan (**ACHMP**)	3/10/2023
Air Quality Management Plan (**AQMP**)	24/8/2023
Biodiversity Offset Strategy (**BOS**)	16/9/2019 – formerly Australian Department of Agriculture, Water and the Environment (**DAWE**), now known as DCCEEW 25/9/2019 – DPE
Extraction Plan 201 – 202	27/4/2022
Extraction Plan LW203 – LW206*	7/5/2023
Environmental Management Strategy (**EMS**)	13/10/2020
Greenhouse Gas Minimisation Plan (**GHGMP**)	21/12/2023
Noise Management Plan (**NMP**)	7/8/2023
Offsite Kenna Biodiversity Offset Management Plan**	11/8/2014
Onsite Biodiversity Offset Management Plan**	11/8/2014
Pollution Incident Response Management Plan (**PIRMP**)	7/2/2024
Waste Management Plan (**WasteMP**)	19/10/2020
Water Management Plan (**WMP**)***	5/4/2013

*Conditional approval for extraction of LW203.
** Combined into single Narrabri Stage 2 Offset Management Plan, revision dated 18/12/2024 and submitted to Commonwealth DCCEEW for review and approval, as required by Narrabri Mine EPBC Approval 2009/5003 Condition 14 a & b. Approval pending.
*** WMP rev4A submitted for consultation to DCCEEW 26/06/2024, response received 31/10/2024. Approval pending.

1. Mining under Extraction Plan LW101-106 and Extraction Plan LW107-110 has been completed.

4 OPERATIONS SUMMARY

4.1 MINING OPERATIONS

Longwall

The secondary longwall (**LW**) extraction of LW203 continued during the Reporting Period.

Cut and Flit (CF)

CF201 extraction was completed in January 2024. NCOPL commenced extraction of CF202 during the Reporting Period.

Development

Underground development continued into MG204, MG205 and the 200 Mains.

Reject Emplacement Area (REA)

Approximately 40,000m^3 of subsoil and topsoil were placed on the REA.

Table 7 presents the production summary for the previous and current Reporting Periods and the forecast production schedule for the next Reporting Period.

Table 7: Production Summary

Material	Approved limit (Million Tonnes) (Mt)	Previous Reporting Period (actual) (Mt)	This Reporting Period (actual) (Mt)	Next Reporting Period (forecast) (Mt)
Waste Rock / Overburden	-	0	0	0
ROM Coal*	11	4.25	5.12	5.50
Reject Material	-	0.17	0.12	0.12
Saleable Product**	-	4.39	5.00	5.50

* ROM Coal is total production at the mine site. The difference between ROM Coal and final product is related to changes in stockpile volumes at the mine.
** Saleable Product is coal railed from site.

4.2 OTHER OPERATIONS

4.2.1 Exploration Activities

Four (4) exploration boreholes were drilled during the Reporting Period. The drilling was conducted in the southwestern part of ML1609 over LW207. These boreholes confirmed the presence of a geological anomaly identified in a previous Reporting Period. Data acquired from these boreholes were incorporated into the geological database and model.

4.2.2 Construction

The following construction activities were undertaken during the Reporting Period:

- Dilling of the western downcast shaft commenced early 2024 and is expected to be completed mid-2025.
- An additional three sheds were constructed in the main administration area.

4.2.3 Hours of Operation

The approved hours of operation are provided in **Table 8**.

Table 8: Hours of Operation

Activity	Hours / Days
Pit bottom area development, underground mining, gas drainage, ventilation fan operation, coal processing and handling, rail loading and transportation, and surface maintenance	24 hours / 7 days
CHPP reject disposal	24 hours / 7 days[1]
Raw materials / supply delivery	7:00am to 10:00pm / 7 days

1. Reject disposal activities will generally be restricted to 7:00am to 10:00pm, 7 days per week. However, it is possible that the proportion of reject material generated by the CHPP may exceed the predicted average 5% level for short periods. To account for these periods of elevated reject production, contingent hours of operation will be 24 hours / 7 days (when inversion conditions do not prevail).

4.3 NEXT REPORTING PERIOD

4.3.1 Mine Operations

The planned mine production for 2025 will be 5.50 Mt of ROM coal, which is expected to contain approximately 0.12 Mt of coarse reject material. Longwall extraction of LW203 will continue with completion currently forecast early 2025. Development (first workings) will continue for MG205, MG206 and 200 Mains with MG207 forecast to commence mining (first workings) late 2025. There will also be production from the CF202-CF203 panel area.

4.3.2 Exploration

One (1) exploration borehole is planned within ML1609 during 2025 to confirm the geological structure of a Life of Mine (**LOM**) Mains panel for a planned service borehole.

4.3.3 Construction Activities

NCOPL propose to:

- Complete the drilling of the downcast shaft located on the southern extent of LW205 during 2025;
- Commence construction of the eastern shaft facilities located on the southern extent of ML 1609; and
- Install a powerline from the main substation to the eastern shaft facilities located on the southern extent of LW204 during 2025.

4.3.4 Mining Fleet Upgrades

Underground mining equipment introduced to the project during this Reporting Period included:

- 1 x continuous miner Komatsu Joy 12CM12;
- 2 x shuttle cars;
- 2 x underground mining load haul dump (**LHD**) loaders;
- 2 x underground personnel transport SMVs;
- 1 x Multi bolter;
- 1 x Breaker Feeder;
- 2 x Panel Belts; and
- 1 x Development Electrical Equipment Set.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

The 2023 Annual Review identified the following actions, summarised in **Table 9**.

Correspondence was received from DPHI on 30 May 2024 stating that the 2023 Annual Review report generally satisfied the reporting requirements of the approval and the NSW Planning Annual Review Guideline. DPHI noted that the National Greenhouse and Energy Reporting Scheme (**NGERS**) Scope 1 and 2 Greenhouse Gas (**GHG**) emissions were in excess of the Modification 5 Environmental Assessment (**EA**) GHG predictions, the breach was recorded with no further enforcement action proposed. Following submission of the 2022 Annual Review NCOPL identified that the methods and input assumptions used to estimate fugitive emissions established in PA 08_0144 MOD 5 EA are no longer an appropriate measure of performance for the purpose of the Annual Review reporting requirements. The GHGMP was updated during the 2023 Reporting Period to include contemporary methods and input assumptions used to estimate fugitive emissions. The GHGMP was prepared in consultation with the NSW Independent Expert Advisory Panel for Mining and the NSW Government Net Zero Emissions Modelling Team, and has obtained Planning Secretary approval. The GHGMP contains Scope 1 and Scope 2 GHG emissions forecast for the 5-year period covering Financial Year (**FY**) 23-FY27. The reported emissions for NGER FY2023 were lower than the GHGMP revised predictions.

Table 9: Actions Required by the 2023 Annual Review

Action Required from Previous Annual Review	Requested By	Action Taken by NCOPL	Where Discussed in Annual Review
Air Quality: Installation and commissioning of new real time Air Quality monitoring network.	NCOPL	Ongoing. NCOPL commissioned one Tapered Element Oscillating Microbalance (**TEOM**) - Turrabaa in November 2024. TEOM-Omeo is to be commissioned early 2025. The TEOM units are required by the AQMP approved for SSD-10269 (Stage 3 Project). Narrabri Mine will trigger commencement of SSD-10269 post 01 July 2025.	**Section 6.2**
Subsidence Pond Monitoring: Conduct review of Subsidence Pond monitoring programme to reflect contemporary conditions contained within the Extraction Plan LW203-LW206.	NCOPL	Completed. The Subsidence Pond Monitoring Program (**SPMP**) was revised to provide the approach for monitoring both the existing subsidence ponds over the 100 series LW panels and those anticipated to form over the 200 series panels. The SPMP has been developed in accordance with approved management documents.	**Section 6.5**
Management Plans: Seek continuation approval of Extraction Plan LW203-206.	NCOPL	Completed. NCOPL obtained approval from the Planning Secretary on 07 March 2025 for Extraction Plan LW203-206 to allow secondary extraction for LW204. Further conditions are required to be met prior to a revised extraction plan being submitted 3 months prior to commencement of mining LW205.	**N/A**
Management Plans: Update WMP.	NCOPL	Ongoing. The WMP (rev4A) was provided to DCCEEW for consultation on 26 June 2024. Letter advice was received from DCCEEW on 31 October 2024 and the WMP is undergoing further revisions to address DCCEEW recommendations.	**N/A**

Action Required from Previous Annual Review	Requested By	Action Taken by NCOPL	Where Discussed in Annual Review
Systems: Finalise the implementation of the electronic PTW procedure.	NCOPL	Completed. Activities involving Ground Disturbance and Excavation require an electronic Permit to Work (**PTW**) and are managed through an online permit system within the NCOPL Environment & Rehabilitation Data Hub, via the ESRI ArcGIS Online applications.	**N/A**
Rehabilitation: REA rehabilitation to be undertaken in accordance with the *REA Capping Assessment and Closure Design.*	NCOPL	Ongoing. Approximately 40,000m^3 of subsoil and topsoil were placed on portions of the REA that have been graded to final approved landform design.	**N/A**
Greenhouse Gas Emissions: Implement the greenhouse gas abatement research projects and progress with decarbonisation pathway as per the GHGMP.	NCOPL	Ongoing. Annual Review 2024 provides details on the decarbonisation projects.	**Section 6.4**
Rehabilitation: Review rehabilitation risk assessment and Rehabilitation Cost Estimate (**RCE**)	NCOPL	Ongoing. Consultation with the RR was undertaken regarding updating the Narrabri Mine rehabilitation documents prepared under Schedule 8A of the Mining Regulation, including the RMP, to incorporate ML1839 (Stage 3 Project). This work will be completed prior to commencing operations on ML1839 (scheduled post 01 July 2025). The RMP revision will review the rehabilitation risk assessment. Submission of a revised FWP on 31 March 2025 will include a revised RCE.	**N/A**

6 ENVIRONMENTAL PERFORMANCE

The following sub-sections report on the environmental performance achieved during the Reporting Period and provides a summary of the environmental monitoring data compared to data predictions, trends and management measures.

Environmental monitoring locations are illustrated on **Figure 3**.

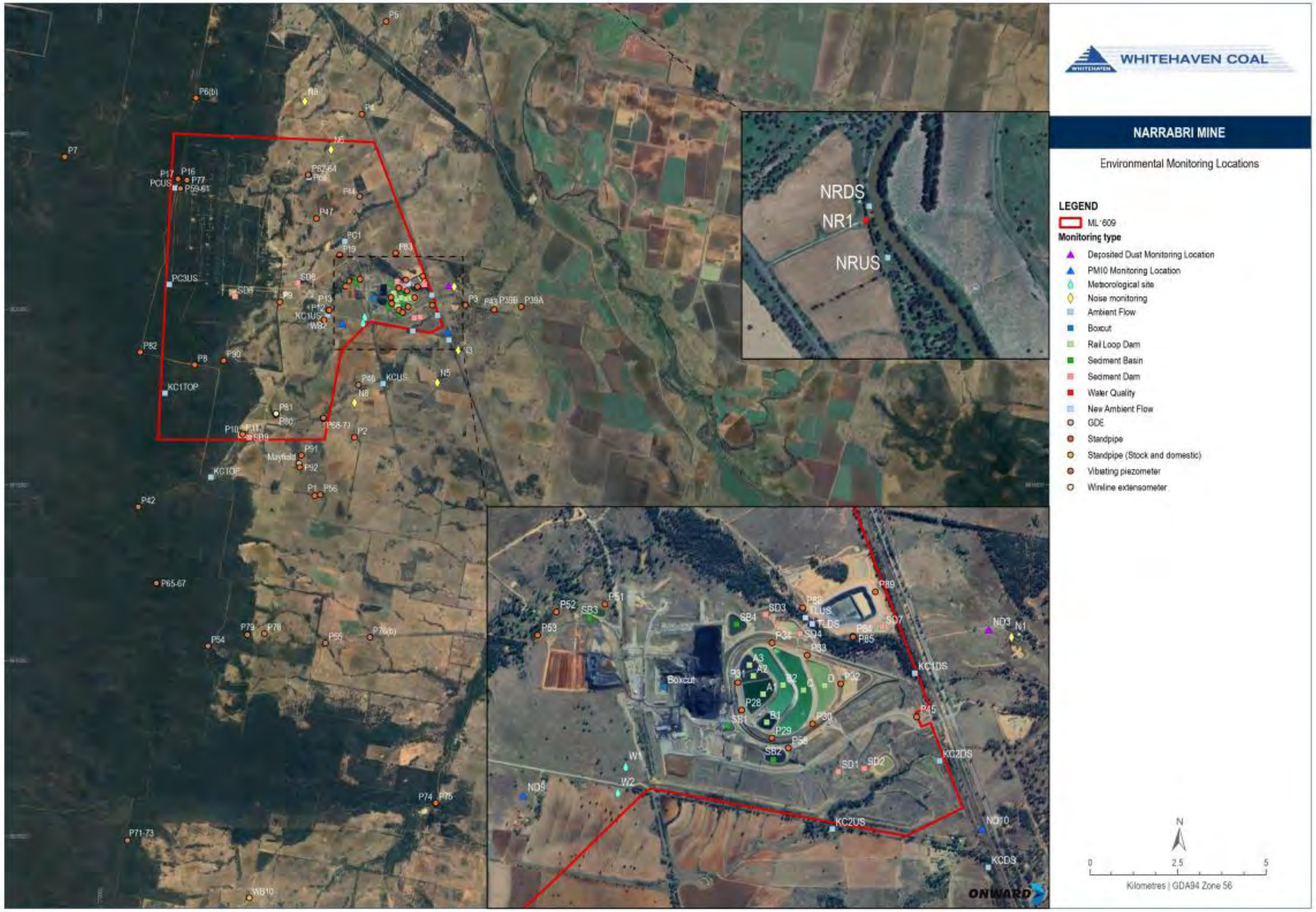


Figure 3: Environmental Monitoring Location

6.1 METEOROLOGY

6.1.1 Environmental Management

NCOPL operates a meteorological station and inversion tower in accordance with requirements of PA 08_0144 and EPL 12789 (see **Figure 3**).

Maintenance and calibration activities completed on the meteorological station and inversion tower were undertaken in March and October 2024.

6.1.2 Environmental Performance

Wind speed, wind direction, air temperature, relative humidity, solar radiation, rainfall and evapotranspiration are recorded at the meteorological station. **Appendix A** summaries the monthly meteorological conditions recorded at the Narrabri Mine weather stations for the Reporting Period.

The total rainfall for the Reporting Period was recorded at 696.8 millimetres (**mm**), which is above the historical average of 581mm recorded from the Narrabri Airport and above than the 555.4mm recorded during 2023.

The minimum temperature during the Reporting Period was -1.0°C in July 2024 and the maximum temperature was 41.6°C in February 2024. The minimum temperatures recorded were slightly below historical averages while the maximum temperatures recorded were slightly above historical averages.

The predominant wind direction in the Reporting Period was south to south-east, which is comparable to previous Reporting Periods.

6.1.3 Activities for the Next Reporting Period

There are no additional actions planned for 2025.

6.2 NOISE

6.2.1 Environmental Management

Potential noise impacts associated with the Narrabri Mine are managed in accordance with:

- PA 08_0144, Schedule 4, Condition 1 to 5 - noise criteria and operating conditions;
- EPL 12789 - conditions L4, M7, R4 and E2; and
- the NMP.

The Narrabri Mine noise monitoring network is illustrated in **Figure 3** and includes:

- quarterly compliance attended monitoring at locations as described in the EPL and NMP; and
- continuous unattended monitoring at 3 locations (real-time, for management purposes).

6.2.2 Environmental Performance

Attended Monitoring (Compliance)

Attended noise monitoring is conducted on a quarterly basis by an independent consultant. There were no exceedances of the noise criteria during the Reporting Period. A summary of the noise monitoring results is outlined in

Table 10.

Table 10: Noise Monitoring Summary 2024

Site ID	Site name	Criteria ($L_{Aeq(15\ minute)}$, dB(A))	Criteria ($L_{A(1\ minute-Night)}$, dB(A))	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
				12-14 March		03-05 June		02-04 September		02-04 December	
				(Mine Contribution, dB(A))[2]							
				L_{Aeq} 15 min	L_{A1}	L_{Aeq} 15 min	L_{A1}	L_{Aeq} 15 min	L_{A1}	L_{Aeq} 15 min	L_{A1}
N1	Bow Hills[1]	50	50	29	35	34	50	I/A	32	32	43
N5	Oakleigh[3]	-	-	I/A	30	37	40	I/A	41	29	40
N6	Newhaven	35	45	30	38	31	42	I/A	44	29	33
N8	Haylin View[3]	-	-	25	40	34	39	I/A	48	N/M	44
N9	High Range[3]	-	-	I/A	36	31	41	I/A	36	I/A	I/A

I/A = Inaudible, N/M = Not Measurable
L_{Aeq} 15 minute = A-weighted equivalent sound pressure level, over a 15 minute period
L_{A1} = A-weighted sound pressure level exceeded for 1% of the 15 minute interval over the period from 10:00pm to 7:00am.
Note 1: A private agreement between NCO and the residents of N1 Bow Hills defines a compliance level of 50 dBA LAeq(15minute).
Note 2: Noise levels presented are the highest measured noise level under compliant weather conditions over the monitoring period.
Note 3: Property is owned by NCOPL and are not a private residence, therefore the noise criteria does not apply.

Sound Power Level (SPW) Testing

SPW testing was undertaken on key mobile plant and other fixed equipment during the Reporting Period and were generally consistent with the predictions in the PA 08_0144 MOD 5 EA, with the exception of the Main Exhaust Vent Fan (**MEVF**) which slightly exceeded the predictions.

Comparison to Assessment Predictions

Noise monitoring results recorded during the Reporting Period were generally consistent with the predictions in the Environmental Impact Statement (**EIS**) for the Narrabri Coal Mine Stage 2 Longwall Project.

6.2.3 Activities for the Next Reporting Period

There are no proposed actions planned for 2025. NCOPL will continue to review the NMP and if amendments are required, NCOPL will lodge the revised NMP with relevant regulatory agencies for comment and then with the DPHI for approval.

6.3 AIR QUALITY

6.3.1 Environmental Management

Potential air quality impacts associated with the Narrabri Mine are managed in accordance with:

- PA 08_0144, Schedule 4, Condition 6 – air quality criteria;
- EPL 12789 – conditions O3, P1 and M2; and
- the AQMP.

The Narrabri Mine air quality monitoring network is illustrated in **Figure 3** and includes:

- 2 High Volume Air Samplers (**HVAS**) measuring Particulate Matter less than 10 micrograms (**PM_{10}**) for a 24-hour period, every 6 days; and
- 8 Deposited Dust Gauges (**DDGs**), measuring deposited dust collected monthly.

Note: Total Suspended Particulate (**TSP**) matter is inferred at a ratio of 1:2 from the measured PM_{10} data.

6.3.2 Environmental Performance

Deposited Dust

Table 11 details the annual average DDG monitoring results for the Reporting Period, indicating all monitoring locations are below the annual average Total Insoluble Solids (**TIS**) criteria of 4 g/m^2/month. Narrabri Mine measure compliance with the criteria with results of ND3, as all other monitoring locations are located on NCOPL owned land and are monitored for internal purposes only, therefore compliance measures do not apply.

The Reporting Period average for ND3 was 0.4 g/m^2/month and the long-term average is 1.8 g/m^2/month.

Table 11: Deposited Dust Monitoring Data Summary for the Reporting Period

Site	EPL ID No.	Property Name	PA 08_0144 Annual Average Criteria		Annual Mean Total Insoluble Solids (g/m^2/month)
			Max Increase (g/m^2/month)	Max Total (g/m^2/month)	
ND1	-	Turrabaa	2	4	1.1
ND2	-	Claremont	2	4	1.4
ND3	3	Bow Hills	2	4	0.4
ND4A	-	Matoppo	2	4	0.9
ND5	-	Willarah	2	4	2.3
ND6	-	Willarah	2	4	0.9
ND7	-	Claremont	2	4	1.4
ND8	**-**	Claremont	2	4	1.4

DDG was generally lower during the Reporting Period than the previous Reporting Period (**Figure 4**). Lower results within the Reporting Period may be attributed to higher rainfall in 2024.

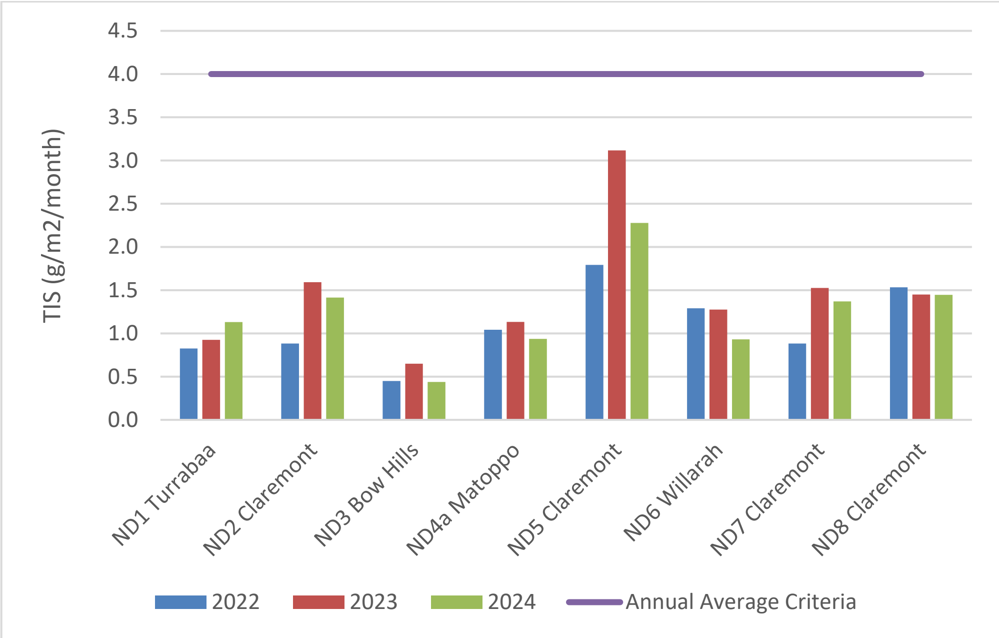


Figure 4: Deposited Dust Annual Mean 2022 - 2024

PM_{10}

During the Reporting Period, NCOPL recorded one elevated PM_{10} 24-hour all source measurement (69.1µg/m^3) at ND9 'Claremont' on 12 March 2024, above the criterion (50 µg/m^3). The elevated reading was investigated and reported to DPHI, determining that the elevated reading was not a result of mining activities. All PM_{10} monitoring is shown in **Figure 5** and **Figure 6**.

Table 12 presents PM_{10} annual average monitoring results for the Reporting Period and the previous 2 years. The cumulative annual average PM_{10} concentration for the Reporting Period was below the annual average criterion (30 µg/m^3) at both compliance monitoring sites.

Table 12: PM_{10} Annual Average (2022 – 2024)

Site		2022	2023	2024
ND9	µg/m³	4.29	8.67	9.5
ND10	µg/m³	4.26	9.37	8.49

The AQMP assumes an ambient background level for annual average PM_{10} at 11µg/m^3, indicating that 2024 results are below the ambient background level.

Lab readings were not recorded for sites ND9 and ND10 from the sample run on 23.02.2024 and 01.12.2024 due to the filter papers being lost in transit or at ALS Laboratory.

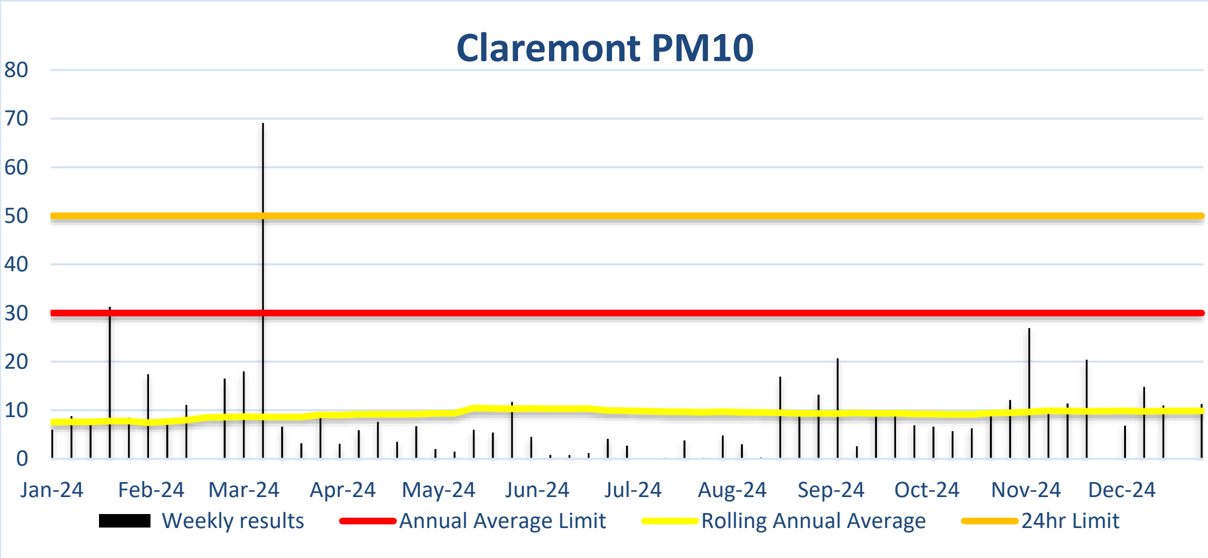


Figure 5: ND9 PM_{10} Results Including Extraordinary Weather Events

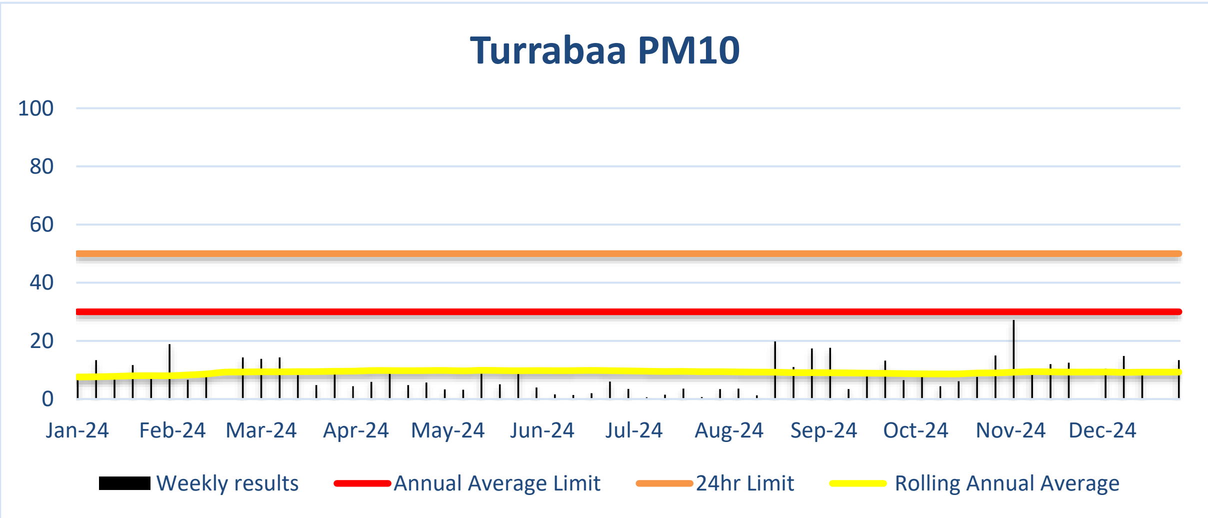


Figure 6: ND10 PM_{10} Results Including Extraordinary Weather Events

TSP

TSP is calculated at a ratio of 1:2 from the measured PM_{10} data. Therefore, based on the results in **Table 12** the calculated annual average TSP concentrations of 19 µg/m³ at ND9 and 16.98 µg/m³ at ND10 are both below the 90 µg/m³ annual average impact assessment TSP criterion.

Comparison to Assessment Predictions

Air quality monitoring results recorded during the Reporting Period were generally consistent with the predictions in the EIS for the Narrabri Coal Mine Stage 2 Longwall Project.

6.3.3 Activities for the Next Reporting Period

NCOPL will commission two real-time air quality monitors prior to the commencement of SSD-10269. NCOPL will continue to review the AQMP and if amendments are required, NCOPL will lodge the revised AQMP with relevant regulatory agencies for comment and then with the DPHI for approval.

6.4 GREENHOUSE GAS

6.4.1 Environmental Management

GHG emissions at the Narrabri Mine are managed in accordance with:

- PA 08_0144, Schedule 4, Conditions 30 and 32; and
- the GHGMP.

The main sources of GHG emissions considered in the GHGMP are:

- Consumption of diesel fuel – Scope 1;
- Consumption of electricity – Scope 2; and
- Fugitive emissions associated with gas drainage and ventilation – Scope 1.

6.4.2 Environmental Performance

GHG emissions are reported through participation in the National Pollutant Inventory (**NPI**) and as part of the WHC Group in the NGERS. The total of Scope 1 and Scope 2 GHG emissions reported for the NGERS FY2024 reporting year was 617,863 tonnes (**t**) Carbon Dioxide Equivalent (**CO_2-e**), a 28% reduction from FY2023 (852,758t CO_2-e). The decrease was due to the following factors:

- Fugitive emissions from underground mining ventilation and drainage decreased by 29%;
- Production moved into new part of the mine, with the new mining domain having an initially lower emissions intensity with the average gas content (through ventilation) on a weight basis of 0.05% methane (**CH_4**) compared to 0.11% CH_4 in FY2023;
- The decrease in average gas content of CH_4 (through ventilation) meant that NCOPL did not trigger the requirment to report post-mining activities in FY2024; and
- ROM production decreased by 10% compared to FY2023.

The GHGMP prediction for total of Scope 1 and Scope 2 GHG emissions for FY2024 Reporting Year was 1,550,762 t CO_2-e. The reported emissions for NGER FY2024 are lower than the GHGMP predictions and this can be attributed to the following factors:

- FY2024 ROM production of ~4.8Mt was lower than forecast production of ~6.5Mt, directly reducing fugitive emissions.
- FY2024 measured CH_4 content at the main fan was lower than forecasted, causing emissions to fall below the trigger for reporting of post mining emissions. Consequently, post-mining emissions were excluded from the reported NGER FY2024 data; these were previously included in the forecast.

The following sections detail the key contributors for the NGERS FY2024 Reporting Year.

Scope 1 Emissions

Scope 1 GHG emissions for the NGERS FY2024 Reporting Year were 555,048t CO_2-e; this is lower than the GHGMP total Scope 1 emission predictions of 1,487,697t CO_2-e. The breakdown of contributors to the Scope 1 emissions total is as follows:

- Fuel combustion, emissions released from combustion of Diesel oil: Approximately 4,258 kilolitres (**kL**) was consumed, equating to 10,672t CO_2-e. The diesel emissions are lower than the GHGMP prediction for FY2024 of 14,269t CO_2-e.
- Fugitive emissions (including pre-drainage gas, goaf gas, ventilation exhaust gas and post-mining activities): The reported figure of 544,360t CO_2-e is a decrease from the previous Reporting Period. The fugitive emissions are lower than the GHGMP prediction for FY2024 of 1,473,428t CO2-e.

Scope 2 Emissions

- Approximately 92,375 Megawatt Hour (**MWh**) electricity was purchased by NCOPL during the FY2024, equating to 62,815t CO_2-e GHG emissions. This is lower than the GHGMP prediction for FY2024 of 63,065t CO2-e.

Minimising GHG Emissions

WHC are currently investigating several decarbonisation project strategies to reduce GHG emissions at the Narrabri Mine.

- ***Reducing diesel consumption:*** Opportunities to reduce diesel generator reliance were assessed and progressed with one diesel generator decommissioned and replaced with mains power connection.
- ***Fugitive emissions abatement opportunities:***
    - **Flaring of pre-drainage gas:** procurement of an enclosed flare was achieved during the Reporting Period. The enclosed flare system is designed to efficiently combust CH_4 in pre-drainage areas where methane concentrations exceed 30%.
    - **Northen area fugitive reduction study**: A pilot project to seal LW107 goaf, using two pressure chambers and nitrogen injection, has been successful. Pre-work and post-work gas surveys confirmed the effectiveness of this approach in reducing fugitive emissions from the mined LW107. Ongoing monitoring is being conducted to validate the method further.
    - **Ventilation exhaust gas:** Process Suitability Assessment of Ventilation Air Methane (**VAM**) destruction was undertaken, which concluded that VAM technology is not currently viable for Narrabri Coal.
- ***Reducing Scope 2 emissions:***
    - During the Reporting Period, Whitehaven Coal submitted an EIS for a 26MW solar photovoltaic electricity generation system (solar farm) located adjacent to the Narrabri Mine. This proposal would supply electricity directly to the mine, reducing reliance on grid electricity and lowering Scope 2 emissions.
    - During the Reporting Period, NCOPL achieved carbon neutrality for its Scope 2 emissions in NSW by purchasing Climate Active certified carbon-neutral electricity.
- ***Concept Studies***
    - Gas Separation: NCOPL explored options for separating the CH_4 and CO_2 in pre-drainage gas, with the aim to use CH_4 for power generation and vent or on-sell the high-purity CO_2. Consultation with companies that specialise in biogas generators has been undertaken to evaluate the practical implementation and cost-benefit of this abatement option.
    - Algae Farm: NCOPL have been exploring the use of CO_2 from pre-drainage gas to be utilised in the growth of algae at a commercial algae farm facility. In this initiative, algae consume the CO_2 to promote their growth. This sustainable project aims to reduce the carbon footprint and enhance CO_2 mitigation through biological processes.

6.4.3 Activities for the Next Reporting Period

NCOPL will continue to progress with further monitoring and review of the decarbonisation research projects outlined in the above section.

The following reports and reviews are planned for completion during the 2025 Reporting Period:

- Scope 1 Emissions Minimisation Plan: required to be prepared within 12 months of commencing development under SSD-10269 (condition B18). NCOPL have engaged a suitably qualified consultant, and the report is scheduled to be completed within the Reporting Period.
- Energy Audit- conduct an energy audit in accordance with AS/NZS 3598:2014 Energy Audits as required by the GHGMP.

- Review the GHGMP on the commencement of commencing development under SSD-10269 (i.e. Stage 3 project).

6.5 BIODIVERSITY AND LAND MANAGEMENT

6.5.1 Environmental Management

Biodiversity and land impacts associated with the Narrabri Mine are managed in accordance with:

- PA 08_0144, Schedule 3, Condition 4, and Schedule 5, Conditions 1 to 7;
- The Narrabri Mine Extraction Plan and relevant sub-plans, including the Biodiversity Management Plan (**BMP**);
- the Narrabri Mine Landscape Management Plan (**LMP**);
- the SPMP;
- the BOS; and
- the RMP.

NCOPL Biodiversity Offset Area (**BOA**) properties are shown at a regional scale in **Figure 7**. To meet these BOS approval requirements; WHC established the Kenna BOA (**Figure 8**) and the Onsite BOA (which consists of the Greylands, Omeo, Rosevale, Greylands Road, Kurrajong Park and West Haven properties) (**Figure 9**).

The Narrabri Mine Stage 1 and 2 BOS (Eco Logical Australia, 2014 and revised 2019) confirmed the ability of these properties to meet “like for like or better” and “maintain or improve” conservation outcomes and outlined that the NCOPL BOA covers an area of native vegetation greater than 1,243ha from the Kenna BOA and greater than 422ha from the Onsite BOA.

Furthermore, up to 1,168 ha of woodland vegetation that was subject to subsidence impacts at the Narrabri Mine will also be established as the “future” BOA, adjoining the Onsite BOA to be progressed at the end of mine life, resulting in an overall BOS of 2,833ha.

NCOPL implemented various programs during the Reporting Period to manage and mitigate impacts of the Narrabri Mine, including (but not limited to):

- Weed monitoring and inspections;
- Feral animal monitoring, inspections and control;
- Flora and Fauna monitoring; and
- Ground maintenance and land monitoring.

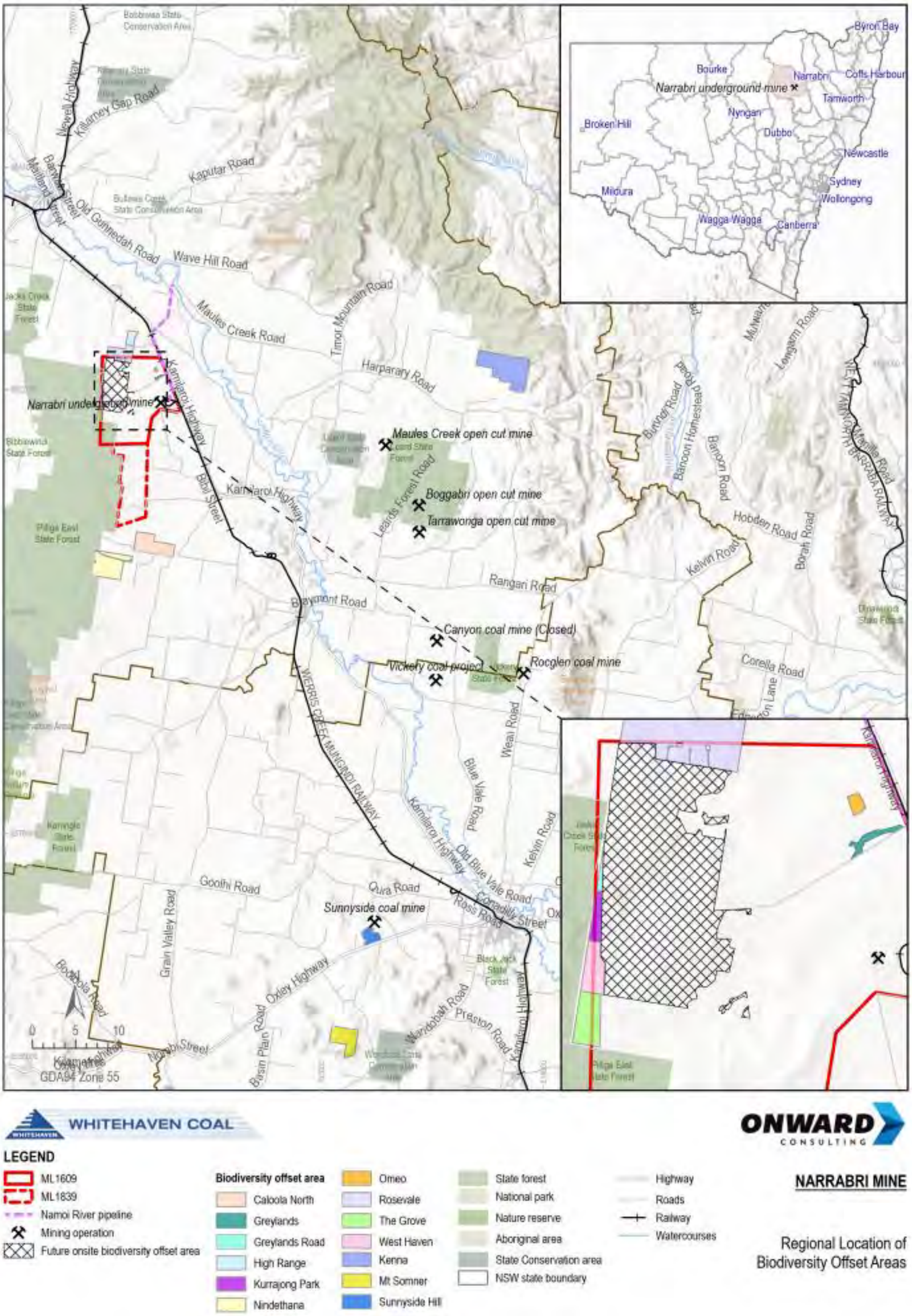


Figure 7: Regional Location of BOA's

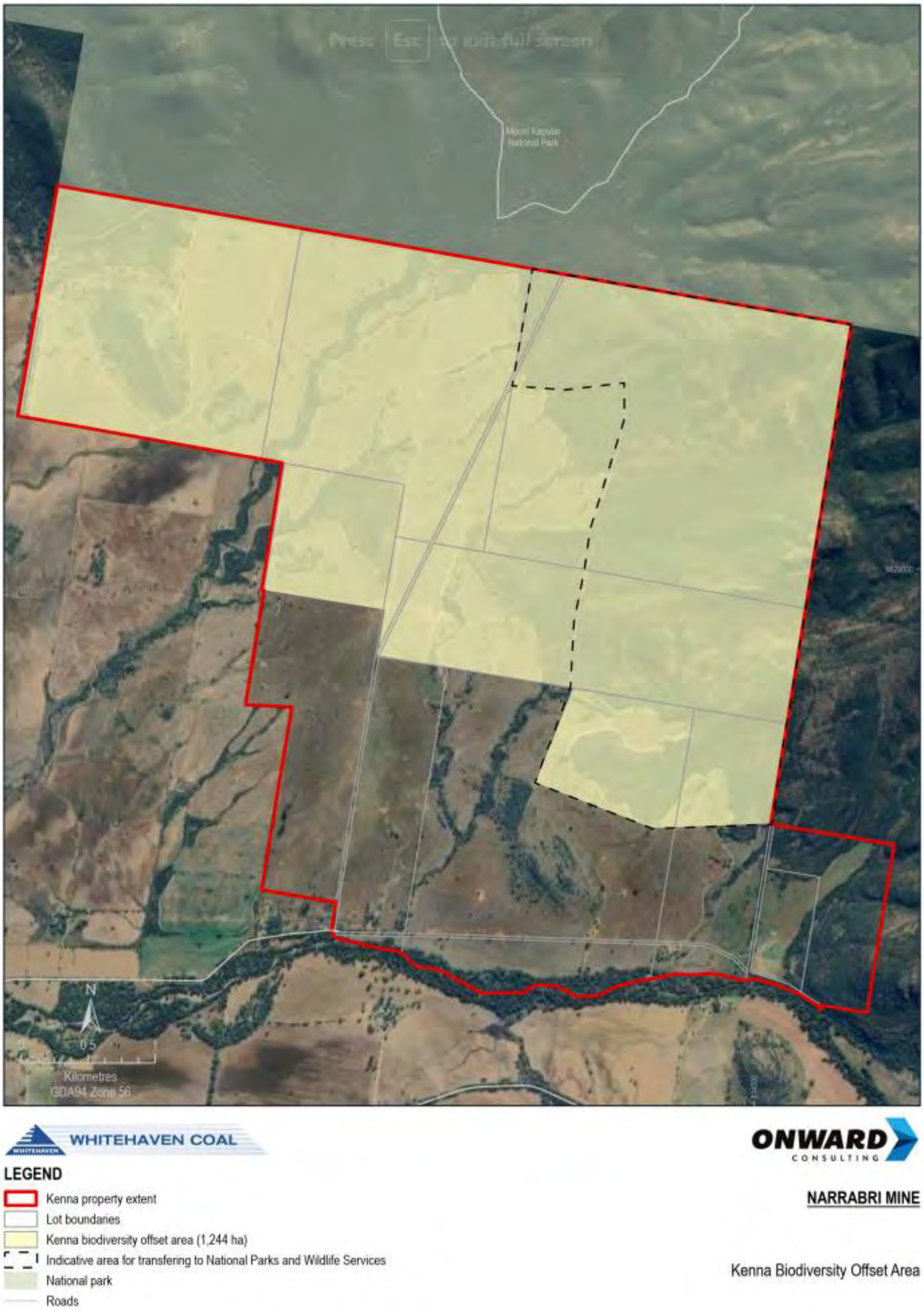


Figure 8: Kenna BOA

Figure 9: Onsite and Future BOA

6.5.2 Environmental Performance and BOMP Implementation

6.5.2.1 Mine Site Environmental Performance

Weed Management

Weed management programs were implemented at Narrabri Mine during 2024. Weed management consists of spot spraying programs periodically throughout the year when conditions are favourable. Locations requiring management are identified through:

- Weed management mapping supported by the ArcGIS software application 'Field Maps'; and
- Ecological monitoring reports and locations of listed weed species.

Weed control in the pastoral areas is planned to be managed by landholder management and pasture improvement (or as recommended in subsequent monitoring reports). Weeds targeted in the Reporting Period include African Boxthorn, Common Pear and Mother of Millions.

Feral Animals

NCOPL undertook two vertebrate animal control programs at Narrabri Mine in Summer, Autumn and Spring 2024 targeting both feral pigs and foxes (Spring only).

The Summer program results are below;

- Feral pigs
  - 2 sites were setup across site;
  - A total of 21 pigs were successfully baited.

The Autumn program results are below;

- Feral pigs
  - 4 sites were setup across site;
  - A total of 22 pigs were successfully baited.

The Spring program results are below

- Feral pigs
  - 4 sites were setup across site;
  - A total of 27 pigs were successfully baited.
- Foxes
  - 35 baits were presented at 25 stations set up across site;
  - A total of 12 foxes were successfully baited.

Appropriately qualified and experienced feral animal contractors (appropriate feral animal management qualifications and pesticide accreditation where relevant) were engaged to undertake feral animal control works for WHC.

Annual Extraction Plan Monitoring

The results of annual biodiversity and land management monitoring was undertaken during the Reporting Period, as required by the Extraction Plan, are summarised in **Table 13** and **Table 14**.

Table 13: Biodiversity Management Plan 2024 Monitoring Results

Performance Measures	BMP Performance Criteria[1]	2024 Results[1]
LW101-106		
Woodland and riparian vegetation composition and health	Clearing does not exceed the allowable limit of the Project Approval	Clearing does not exceed the approved disturbance limits approved under the PA 08_0144.
LW107-LW110		
Woodland and riparian vegetation health and habitat value	Clearing does not exceed the estimated area of clearing assessed by the EIS and as updated in PA 08_0144 MOD 5 EA for infrastructure above LW107 to LW110.	Clearing does not exceed the approved disturbance limits approved under the PA 08_0144.
CF201-CF02		
Threatened fauna populations and habitat are maintained	Threatened fauna and their habitat do not experience adverse impacts including reduction in habitat area, hollow-bearing trees and woody debris	**Ongoing** Habitat features were recorded for the first time during the 2023 monitoring period. It is recommended to continue Floristic-Based Subsidence (**FBS**) monitoring to assess any impact to habitat area, hollow-bearing trees, and woody debris. Terrestrial fauna monitoring in 2024 has confirmed the presence of threatened microbat and bird species. It is recommended to continue fauna monitoring in 2025 in accordance with the BMP and the recommendations of this report to monitor any changes in both pest and threatened species occurrence.

Performance Measures	BMP Performance Criteria[1]	2024 Results[1]
To minimize the clearing and disturbance of vegetation above the mining area	Areas of Normalised Difference Vegetation Index (**NDVI**) change no greater than 1 standard deviation from the mean change and no greater than 0.1ha in area	**Achieved** Areas with a decrease in Photosynthetically Active Biomass (**PAB**) can be attributed to the clearing of vegetation for mining activities including the construction of tracks and infrastructure. Increases in PAB are predominantly within woodland and riparian forest communities.
	Canopy dieback is not substantially greater than that observed during baseline traverses and considered beyond natural seasonal dieback and natural variation due to weather.	**Ongoing** PAB increases since pre-mining over woodland and riparian areas indicate that there is no significant canopy dieback.
	Data does not indicate declining trend in vegetation and habitat conditions.	**Ongoing** PAB increases since pre-mining over woodland and riparian areas indicate that there is no declining trend in vegetation conditions.
	Less than 10% increase in weed cover in impact quadrats in comparison to control quadrats.	**Achieved** Exotic species percentage cover is 1% or less across all Floristic-Based Subsidence (**FBS**) sites in 2024. Control of priority weed Opuntia stricta at FBS sites 70, 74, 75 and 77 as well as, *Lycium ferocissimum* at sites 71 and 72 is recommended. To reviewed in subsequent FBS monitoring.
	Clearing does not exceed the estimated area of clearing assessed by the EIS and as updated in PA 08_0144 MOD 5 EA.	Clearing does not exceed the approved disturbance limits approved under the Project Approval 08_0144.
LW203-LW206		
No vegetation clearance outside of approved areas	No vegetation is cleared outside or approved area. No unauthorised ground disturbance (i.e. without a PTW).	All clearing activities were carried out under the approved PTW process. Clearing does not exceed the approved disturbance limits approved under the Project Approval 08_0144.
	Surface cracking, erosion, slumping and/or ponding determined during subsidence monitoring.	**Ongoing** No significant surface cracks or erosion was detected during subsidence monitoring.

Performance Measures	BMP Performance Criteria[1]	2024 Results[1]
No ongoing or significant (>50 mm) surface cracking, erosion, slumping, or ponding impacting native vegetation. Surface cracks >50 mm are remediated within 2 months of identification or when safe to do so.	Surface crack remediation and stabilisation works conducted.	**Ongoing** Subsidence crack monitoring was undertaken and where cracks identified rehabilitation was completed.
	FBS monitoring determines no impact on native vegetation.	**Achieved** FBS vegetation monitoring in 2024 recorded varied results with little indication of the association between the subsidence zone above LW203 and overall vegetation condition of the site.
	No decline in vegetation health within ponded areas.	**Achieved** No ponded areas identified within vegetated areas. Areas with a decrease in PAB can be attributed to the clearing of vegetation for mining activities including the construction of tracks and infrastructure such as vents or drier conditions in grassland.
High Threat Weeds identified during monitoring have been controlled.	High Threat Weeds are 1controlled determined by biannual weed monitoring.	**Ongoing** Exotic species percentage cover is 5% or less across FBS sites in 2024. Control of priority weed *Opuntia stricta* at FBS sites 89 as well as, *Lycium ferocissimum* at sites 81.5, 83, 85 and 89 is recommended. To be reviewed in subsequent FBS monitoring.
Pest animals identified during monitoring have been controlled.	Pest animals are controlled determined by biannual monitoring.	**Ongoing** Fauna monitoring was not conducted in 2024, there were no signs to impacts from pest animals from opportunist observations.

1 – Performance Criteria that has been Previously Achieved (i.e. not assessed in 2024) has been excluded from Table.

Table 14: Land Management Plan 2023 Monitoring Results

Performance Measures	Performance Criteria[1]	2024 Results[1]
LW101-LW106		
Multi-spectral image analysis		
Groundcover (multi-spectral images – erosion and pasture cover)	Identified areas of NDVI change (greater than 1 standard deviation from the mean change) investigated in the field to determine the source of the change.	**Ongoing** Assessments of NDVI change between 2012 and 2024, and 2023 and 2024, were completed. Areas of significant decrease since 2012, which have been consistently associated with surface ponding are correlating with a decline in plant health. Long-term management options for areas of subsidence ponding are being reviewed.
LW107-LW110		
Surface cracking		
Creek lines	Change to overall drainage pattern is not more than predicted.	**Achieved** Longwall mining was completed during 2023 and subsidence impacts at surface have stabilised. Subsidence measurements are lower than predictions, no significant changes to drainage patterns has been detected.
Groundcover (multi-spectral images – erosion and pasture cover)	Identified areas of NDVI change (greater than 1 standard deviation from the mean change) investigated in the field to determine the source of the change.	**Achieved** Assessment of NDVI change between 2014 and 2024, and 2023 and 2024, were completed. As discussed, decreases for pasture areas likely due to dry and timing.
CF201-CF202		
Surface cracking	Permanent cracks (which do not self-close within 1 month of longwall face passing) are remediated as soon as practicably possible (and safe to do so). Surface cracking that does not self-correct will be remediated to prevent erosion and slope instability issues within 1 month after mining.	**Ongoing** No subsidence cracks were recorded in the 2024 period.
Landscape morphology	Subsidence across the landscape does not exceed subsidence predictions for CF201 and CF202.	**Achieved** Subsidence measurements were below the maximum predicted (**Table 15**).

Performance Measures	Performance Criteria[1]	2024 Results[1]
Creek lines	Change to overall drainage pattern is not more than predicted.	**Achieved** Subsidence measurements were negligible (~0.01m) (**Table 15**) and therefore no changes to the overall drainage pattern were detected.
Groundcover (multi-spectral images – erosion and pasture cover)	Identified areas of NDVI change (greater than 1 standard deviation from the mean change) investigated in the field to determine the source of the change. Site specific management report prepared, and recommendations implemented where necessary.	**Achieved** Assessment of NDVI change between 2021 and 2024 were completed. Significant PAB decreases in pasture/grassland occurred along the entire width of the longwall and extending onto non-undermined areas indicating that the decreases are due to climatic conditions and not directly related to subsidence impacts.
LW203 - LW206		
Surface cracking	Surface cracks are remediated within 2 months of identification or when safe to do so.	**Achieved** Monitoring for subsidence cracks undertaken in accordance with Extraction Plan and cracks remediated when identified.
Landscape morphology	Detected alteration in topography/landscape morphology within normal range compared to baseline data.	**Not assessed** To be conducted after next Light Detection and Ranging (**LiDAR**) monitoring cycle (2026)
Creek lines	Change to overall drainage pattern is not more than predicted and detected alteration in channel dimensions or processes within normal range compared to baseline data.	**Not triggered** No significant watercourse undermined by LW203 during the Reporting Period.

1 – Performance Criteria that has been Previously Achieved (i.e. not assessed in 2024) has been excluded from Table.

Subsidence Pond Monitoring

Routine inspections were carried out by NCOPL during the Reporting Period.

The 2024 subsidence pond water quality monitoring results are found in **Appendix H**.

The SPMP was revised during 2024 to provide the approach for monitoring both the existing subsidence ponds over the 100 series LW panels and those anticipated to form over the 200 series panels. The revised SPMP will be implemented during the 2025 Reporting Period.

Pre-Clearing and Clearing Surveys

During the Reporting Period the mine has undertaken clearing to facilitate surface disturbance activities. The ecological works for the clearing consisted of the following activities;

- Fauna and flora Pre-clearing Surveys;

- Clearance Supervision; and
- Post-felling inspections.

Prior to the commencement of any disturbance activities the limits of clearing are surveyed and physically marked with flagging tape. Targeted threatened flora surveys were conducted prior to clearing activities commencing with all threatened flora identified during these surveys recorded and their locations mapped using hand-held Global Positioning System (**GPS**) units.

Fauna pre-clearance surveys were also conducted and consisted of identifying, marking and documenting suitable fauna habitat features. These features generally include nests, large woody debris and trees bearing hollows, which have the potential to support species such as bats, gliders, possums, reptiles and birds. All trees with habitat features are felled following a clearing protocol and is done in the presence of a suitably qualified Ecologist. All trees identified as having habitat features were recorded using a hand-held GPS unit.

Fauna was occasionally encountered during clearing works undertaken during the Reporting Period, including species of birds, mammals and reptiles. No fauna or their habitats were significantly impacted during clearing works. None of the species recorded were listed as threatened under the BC Act or the Environment Protection and Biodiversity Conservation Act 1999 (**EPBC Act**). No threatened flora was encountered during clearing works.

6.5.2.2 BOS Environmental Performance

Offset Security Management

As of 16 July 2021; WHC have successfully registered seven Conservation Agreements on the land titles for the seven BOA as required per the BOS. The Conservation Agreements were secured under Part 4 Division 12 of the NSW *National Parks and Wildlife Act 1974* (**NPW Act**) and Part 5 Division 3 of the *Biodiversity Conservation Act 2016* (**BC Act**) in accordance with EPBC Approval 2009/5003 Conditions 2a and 2b and PA 08_0144, Schedule 5 Condition 7.

WHC will consult with National Parks and Wildlife Services (**NPWS**) regarding previous interests from NPWS for the NCOPL BOA's to be transferred to the National Park Estate.

Weather Summary of Narrabri Mine BOA's

Regionally central meteorological station to the BOA's is the Gunnedah Pool site (Bureau of Meteorology (**BOM**) 2024)) which has recorded highly variable rainfall over the last 5 years; from the driest on record of 233mm in 2019, followed by above average rainfall years in 2020, 2021 and 2022 of 844mm, 990mm and 860mm respectively (resulting in numerous major flooding events of the Namoi River). While in 2023 and 2024, the Gunnedah Airport site (BOM 2024) recorded 496mm and 572mm which are closer to the annual average rainfall of 572mm.

WHC maintains three meteorological stations across the NCOPL BOA's, with a summary of weather conditions experienced during the Reporting Period:

- Kenna - Maximum monthly average temperature was 36°C in January 2024; minimum monthly average temperature was 6°C in June 2024; and annual temperature ranges were 1°C to 42°C in 2024. The total annual rainfall in 2024 was 445mm with the maximum in February (101mm) and minimum in January (10mm).
- Rosevale - Maximum monthly average temperature was 35°C in January 2024; minimum monthly average temperature was 3°C in June 2024; and annual temperature ranges were -2°C to 41°C in 2024. The total annual rainfall in 2024 was 649mm with the maximum in November (99mm) and minimum in March (22mm).

- Caloola North - Maximum monthly average temperature was 34°C in January 2024; minimum monthly average temperature was 2°C in June 2024; and annual temperature ranges were -3°C to 40°C in 2024. The total annual rainfall in 2024 was 583mm with the maximum in May (93mm) and minimum in March (8mm).

Infrastructure Management

During the Reporting Period, a total of 8.3km of new or repaired fencing (fauna friendly) was constructed along the perimeter of the NCOPL BOA's including of Kenna, Caloola North and Nindethana as well as maintenance of signage and gates undertaken as required to continue to restrict unauthorised access and minimise livestock incursion. Additionally, 11km of redundant internal fences were deconstructed from NCOPL BOA's including Kenna and Nindethana. Any remaining derelict assets/infrastructure items will continue to be assessed, removed and remediated as required prior to potential transfer of certain NCOPL BOA's to the National Park Estate.

Seed Management

The routine seed assessments on the NCOPL BOA's aims to identify on a seasonal basis the life cycle stage and development of native plants to identify what, where, when and how to target appropriate resources to collect seed for future revegetation programs. A total of six species were collected resulting in 5.1kg of local provident seed from across the Kenna, Rosevale and High Range BOA's that was incorporated with other local and regionally provident seed sourced by reputable seed collectors as part of the WHC group wide revegetation planning. A local revegetation provider was engaged to propagate the seed to produce Box Gum and other non-Endangered Ecological Communities (**EEC**) / non-Critically Endangered Ecological Communities (**CEEC**) Woodland overstorey species seedlings required for the completed 2024 revegetation program as well as planning for the 2025 revegetation program for the NCOPL BOA's.

Revegetation Management

The NCOPL BOA's revegetation strategy focuses on restoration and revegetation of previously cleared non-native grassland and derived native grasslands and assisting natural regeneration in better quality woodland areas. only a small overstorey tree screen planting was undertaken in June 2024 with 110 hiko seedlings of Woodland species planted over 1ha on the Nindethana BOA. Other than future revegetation programs required for Biodiversity Stewardship Sites; only ongoing maintenance revegetation is required for the original NCOPL BOA's having materially completed primary revegetation in 2023 towards the target Woodland PCT vegetation composition, structure and function.

Heritage Management

During the Reporting Period, annual heritage inspections were completed on the 41 known heritage sites (Aboriginal archaeological) within the NCOPL BOA's. Heritage sites were maintained with 3.4km of demarcation fencing around the perimeter and signage to mitigate access and inadvertent disturbance.

During the Reporting Period, 6 new heritage sites (Aboriginal archaeological) were identified on the Caloola North, Nindethana and The Bulga BOA's resulting an additional 0.7km of new fencing being completed.

Habitat Management

During the Reporting Period, habitat augmentation was undertaken with 25 new nest boxes installed on the Kenna BOA.. This brings the total habitat augmentation constructed since 2021 on NCOPL BOA's to 39 nest boxes and 168 coarse woody debris piles.

Weed Management

WHC coordinated weed monitoring/inspections across NCOPL BOA's in March, May, June, September, November and December 2024. The priority weeds identified included legacy weeds inherited from previous owners management regimes such as Buffel Grass, African Lovegrass, Blue Heliotrope, Coolatai Grass, African Boxthorn, Prickly Pear, Velvet Pear and Noogoora Burr.

During the Reporting Period, WHC implemented a weed control program across 199ha being treated, targeting primarily broadleaf weeds within revegetation areas and along fire-break tracks as required within the Kenna, Greylands, Omeo, Caloola North High Range and Nindethana BOA's.

Weed control works for WHC were conducted by qualified and experienced contractors with AQF3 accreditation or higher for herbicide use.

Pest Animals Management

WHC is implemented a comprehensive pest animal management program across NCOPL BOA's, using a grid-based motion detection camera monitoring program and observations. Monitoring data from grid-based motion cameras, pest observations, and previous control results guided the program. The program focused on high detection areas like Feral Pigs and Goats, while other species have scarce detection levels. In 2024, WHC implemented a pest animal control program using 1080 canid pest ejectors, Hoggone baits, and trapping programs.

The program resulted in 102 canid pest ejectors triggered from 547 deployed and 802 Hoggone baits consumed from 2064 laid across the NCOPL BOA's. A further 73 Feral Pigs were trapped and removed from the NCOPL BOA's. Open range shooting programs resulted in 14 Feral Pigs, 11 Foxes and 321 Eastern Grey Kangaroos being controlled. Feral Goat mustering continued resulting in 219 Goats being captured and sold to an abattoir.

Soil & Erosion Management

Annual inspections of unsealed fire-break tracks and associated drainage structures across the NCOPL BOA's to review appropriate Erosion and Sediment Control (**ESC**) measures required in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004)* (**the Blue Book**). A total of 16 observations were recorded with no locations requiring targeted additional track maintenance to mitigate further erosion and sedimentation. The remaining tracks/drainage structures are maintained during routine WHC track maintenance program.

In addition, known erosion sites are subject to a separate annual inspection process and updates to the WHC erosion register. During the Reporting Period, monitoring or remediation actions and investigations commensurate to the risk were undertaken for the eight erosion sites identified within NCOPL BOA's.

Grazing Management

NCOPL BOA's continued to be destocked with no strategic grazing occurring during the Reporting Period. There were six instances of stock incursion during the Reporting Period; with stock on each occasion retrieved and fencing repaired as required.

Bushfire Management

The NCOPL BOA's annual fuel load monitoring was undertaken between September and November 2024 as part of the planning and assessment of bushfire hazard and ecological burn program for 2025; with the results indicating high to very high overall fuel loads present.

WHC undertook 1 controlled ecological burn in May 2024, with 92.1ha burnt with low to moderate intensity on the Caloola North BOA. WHC also undertook other fire management controls, including track maintenance of approximately 138.6km across the NCOPL BOA's.

WHC maintains regular communications with the Namoi-Gwydir Zone Rural Fire Service (**RFS**) teams around planning of WHC BOA ecological burn programs, as well as contact points in case of emergency. WHC engages a specialist firefighting contractor during the fire season to respond to any fires on WHC owned land, including BOA's.

Threatened Flora Management

During the Reporting Period, threatened flora inspections were completed of the known threatened flora site for *Tylophora linearis, Lepidium monoplocoides, Bertya opponens* and *Pomaderris queenslandica* within the NCOPL BOA's maintained with demarcation fencing around the site perimeter and signage to mitigate access and inadvertent disturbance.

During the Reporting Period, there were four new threatened flora sites identified on the Omeo, Rosevale, Caloola North and The Grove BOA's as well as another transplantation of 13 Bertya opponens seedlings to go with the 30 surviving seedlings from the initial Bertya opponens transplant from 2023 on the Rosevale BOA.

Monitoring Program

During the Reporting Period, the ecological monitoring program of the NCOPL BOA's included:

- Winter bird surveys that were undertaken in July and August 2024;
- Spring flora monitoring of 39 plots across seven Vegetation Zones (**VZs**) undertaken between September and October 2024; and
- Annual fauna monitoring at 26 bird monitoring sites, 14 echolocation sites and 5 motion detection camera sites.

During the winter bird surveys, no threatened species were recorded.

During spring flora monitoring:

- Two VZ was recorded as meeting or exceeding completion criteria for all 4 biometrics.
- Native Plant Species (**NPS**) richness completion criteria (NPS benchmark for relevant biometric vegetation communities) was met or exceeded at 6 out of 7 VZs.
- Native Overstorey Cover (**NOS**) completion criteria (minimum NOS benchmark for relevant biometric vegetation communities) was met or exceeded at 3 out of 7 VZs.
- Native Midstorey Cover (**NMS**) completion criteria (minimum NMS benchmark for relevant biometric vegetation communities) was met or exceeded at 3 out of 7 VZs.
- Native Ground Cover Grass (**NGCG**) completion criteria (minimum NGCG benchmark for relevant biometric vegetation communities) was met or exceeded at all 7 VZs.

Comparison of individual plot data shows that:

- NPS increased from 24 out of 39 plots last year to 31 out of 39 plots meeting or exceeding completion criteria in 2024.
- NOS increased from 17 out of 39 plots last year to 21 out of 39 plots meeting or exceeding the completion criteria in 2024.
- NMS increased from 14 out of 39 plots last year to 16 out of 39 plots meeting or exceeding the completion criteria in 2024.
- NGCG remained consistent with 37 out of 39 plots meeting or exceeding the completion criteria in 2024.

Apart of the annual fauna monitoring program were standardised bird surveys across 26 survey sites resulting in 99 bird species being recorded compared with 77 bird species detected in 2023. Bird richness across woodland habitats was 74 species from 7 remnant woodland sites (average = 29.28; range 24 to 42), 57 species in 8 revegetation sites (average = 26.57; range 10 to 24), and 75 species in 7 naturally regenerating sites (average = 26.57; range 14 to 40).

During echolocation and harp trap surveys, a total of 14 microbat species were detected across 14 sites, including 2 threatened species listed under the BC Act. Microbat richness across woodland habitats was 13 species detected in remnant woodland sites (average 8.66, range 7 - 10), 14 species in naturally regenerating sites (average = 9.1, range 8 - 11) and 9 species in revegetation sites (average 3.8, range 0 - 7).

Apart of the annual fauna monitoring program for the Rosevale biodiversity property were standardised bird surveys across 12 survey sites resulting in 48 bird species being recorded. Bird richness across woodland habitats was 48 species from 8 remnant woodland sites (average = 15.78; range 9 to 21), 33 species in 2 naturally regenerating sites (average = 23; range 18 to 28), and 4 species in 2 revegetation sites (average = 2.5; range 1 - 4). Eight species of fauna were detected on Rosevale biodiversity property at the two motion detection camera sites including three introduced species.

6.5.3 Activities for the Next Reporting Period

NCOPL will continue to review the monitoring requirements in the BMP, LMP, SPMP, BOS and RMP and implement actions, as required. If amendments to any of the above are required, NCOPL will lodge the revised Plans with relevant regulatory agencies for comment and then with the DPHI / DCCEEW for approval.

NCOPL will continue to review management options for areas of subsidence ponding during 2025.

6.6 ABORIGINAL CULTURAL HERITAGE

6.6.1 Environmental Management

Aboriginal Cultural Heritage is managed in accordance with:

- PA 08_0144, Schedule 4, Condition 23;
- PA 08_0144 Statement of Commitments (**SoC**); and
- the ACHMP.

6.6.2 Environmental Performance

Archaeological Salvage Program

No sites were salvaged during the Reporting Period.

Fencing Program

NCOPL has continued to upgrade and/or install new fencing to protect both known Aboriginal artefact sites and newly identified Aboriginal artefact sites during the Reporting Period

Ongoing Consultation

NCOPL maintains regular contact with a representative of the Registered Aboriginal Parties (**RAPs**) in order to ensure appropriate cultural heritage supervision is available for planned surface disturbance activities. NCOPL conduct formal biannual consultation meetings with the RAPs.

Previously Unidentified Sites

During the Reporting Period, cultural heritage monitors identified a previously unrecorded cultural artefact scatter and a scar tree during pre-disturbance surveys. NCOPL engaged a qualified archaeologist and, with the assistance of RAP representatives conducted a detailed review of the identified sites, which have been registered procedure outlined in the ACHMP:

- Kurrajong AS1 (AHIMS 19-6-0302)
- Grncarski ST1 (AHIMS 19-6-0301)

During the Reporting Period, Westhaven AS1 was extended when artefacts were found outside of the site footprint. NCOPL engaged a qualified archaeologist and with the assistance of RAP representatives conducted a detailed review of the identified site. The additional artefacts were recorded and the existing site fence extended to include artefacts.

6.6.3 Activities for the Next Reporting Period

NCOPL will inspect and maintain fencing surrounding all registered sites in accordance with the ACHMP.

NCOPL will implement the Extraction Plan LW203-206- Heritage Management Plan, including a LW204 trial of slotting protection measures to demonstrate that potential impacts from mining of LW205 on the cultural heritage site, known as Mayfield Grinding Grooves (Mayfield GG1), can be sufficiently mitigated to achieve the required performance measures of PA 08_0144.

6.7 TRANSPORT

6.7.1 Environmental Management

Traffic impacts associated with the Narrabri Mine are managed in accordance with:

- PA 08_0144, Schedule 4, Conditions 25 to 27; and
- Narrabri Mine Shuttle Bus Traffic Control Protocol (when triggered).

6.7.2 Environmental Performance

The portion of Greylands Road that traverses Narrabri Mine has been purchased by NCOPL and is no longer accessible to the public.

Scratch Road, located in the western portion of ML1609 has not been utilised to construct mining related infrastructure and as such, no agreement has been developed with NSC.

Prior to commencement of PA 08_0144, NCOPL constructed the intersection to the Narrabri Mine along the Kamilaroi Highway in consultation with both NSC and Transport for NSW (**TfNSW**). TfNSW has advised NCOPL that the ongoing maintenance of the intersection is the responsibility of TfNSW.

The Narrabri Mine Shuttle Bus Traffic Control Protocol has been implemented, for the workforce engaged for the bord and pillar mining operations approved by the PA 08_0144 MOD7.

6.7.1 Activities for the Next Reporting Period

NCOPL have prepared a draft design for the upgrade of the intersection of the Mine Access Road with Kurrajong Creek Road and the Kamilaroi Highway. The draft design will be submitted to Transport for NSW within three months of the date of commencement of activities under SSD-10269.

6.8 WASTE MANAGEMENT

6.8.1 Environmental Management

NCOPL aims to implement all reasonable and feasible measures to minimise waste and ensure it is appropriately stored, handled and disposed. Waste materials at Narrabri Mine are generally managed in accordance with:

- PA 08_0144, Schedule 4, Condition 33;
- the WasteMP; and
- the PIRMP.

Narrabri Mine waste streams generally include general waste, underground waste, oil & greases, recyclables (steel and paper/cardboard), drill cuttings and effluent.

6.8.2 Environmental Performance

During the Reporting Period, NCOPL engaged a licenced contractor to transport waste from the Narrabri Mine to a licenced facility. NCOPL produced a approximately 2,083t of general waste. In addition, NCOPL produced recyclable material, consisting of approximately 11t of cardboard/paper, 261t of timber and 186t of steel, including approximately 150,800 Litres (**L**) of used oils. These figures are generally consistent with previous years, as shown in **Figure 10**.

Effluent from the sewage and ablutions facilities at the Narrabri Mine is managed through from a Sewage Treatment Plant (**STP**) with a continuous extended aeration process. During the STP process, a waste product (sludge) is collected weekly and transported by a licensed contractor. During the Reporting Period, a total of 621,000L was collected and transported off-site, which was slightly higher than 2023 quantities.

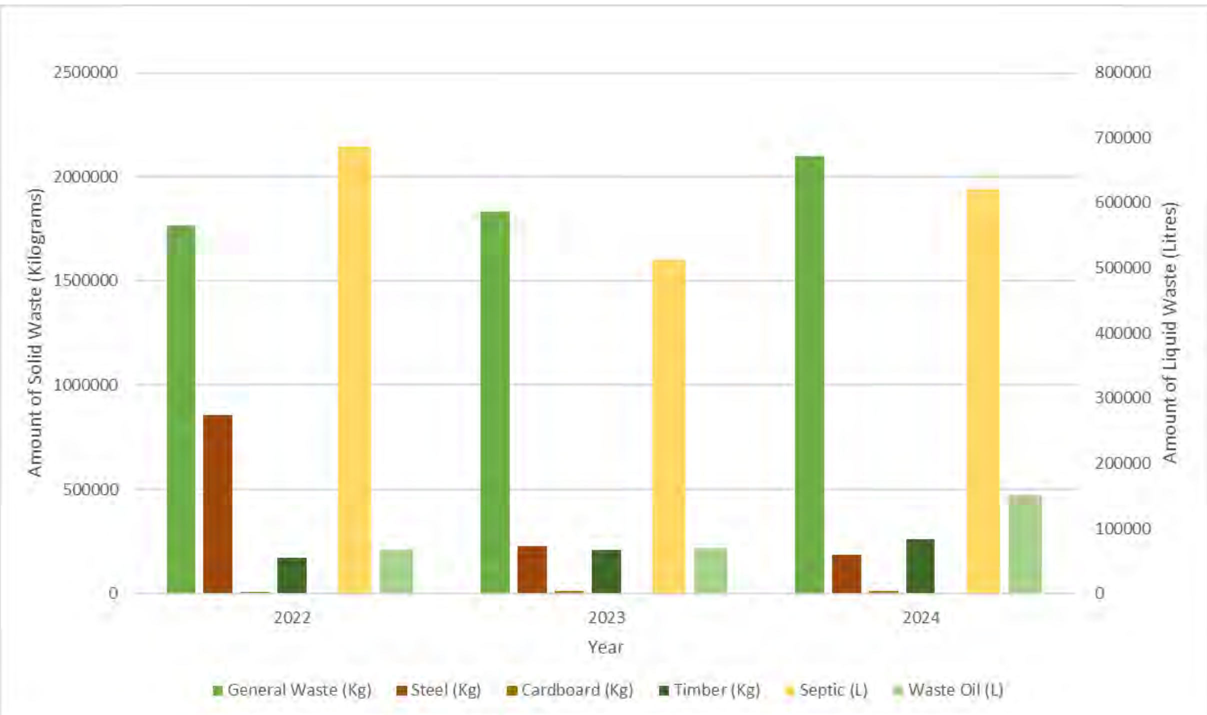


Figure 10: Comparison of Waste Streams Previous 3 Years

6.8.3 Activities for the Next Reporting Period

NCOPL will continue to monitor wastes on a regular basis to effectively manage waste generated by the operation and maximise re-use and recycling opportunities.

6.9 VISUAL & LIGHTING

6.9.1 Environmental Management

Visual amenity and lighting impacts associated with the Narrabri Mine are managed in accordance with:

- PA 08_0144, Schedule 4, Conditions 28 and 29; and
- PA 08_0144 SoC

As required by the SoC, the mine must not impact the Siding Springs Observatory, by following the Dark Sky Planning Guideline.

6.9.2 Environmental Performance

No community complaints were received during the Reporting Period relating to the visual amenity or lighting associated with Narrabri Mine.

6.9.3 Activities for the Next Reporting Period

NCOPL will continue to manage visual and lighting impacts from Narrabri Mine during 2025.

6.10 MINE SUBSIDENCE

6.10.1 Environmental Management

Potential mine subsidence impacts associated with the Narrabri Mine are managed in accordance with the Subsidence Monitoring Programs outlined in PA 08_0144 Schedule 3, Condition 4 (g), notably:

- Extraction Plan CF201-202; and
- Extraction Plan LW203-206.

6.10.2 Environmental Performance

Subsidence monitoring was conducted in accordance with the approved Extraction Plans. Subsidence remained within predicted ranges (**Table 15**).

Telecommunications Infrastructure

No telecommunications infrastructure exists within the approved Extraction Plan areas.

Public Roads

There are no public roads within the active mining area.

Land Surface

There have been rehabilitation activities of subsidence cracks across the active subsidence areas and previously subsided longwall panels. An electronic Geographical Information System (**GIS**) based monitoring platform for subsidence crack monitoring is utilised to record the size and location of subsidence related cracking, rehabilitation records and inspection areas.

Buildings and Other Structures

No buildings or sheds were undermined during the Reporting Period.

Water Storage Dams and Contour Banks

No subsidence related impacts were identified following monitoring.

Fences and Gates

NCOPL has excluded all stock from the active mining area.

Mine Infrastructure

No subsidence related impacts were identified following monitoring.

6.10.3 Comparison Against Predictions

NCOPL has monitored for subsidence movement in accordance with the approved Extraction Plans. **Table 15** outlines the maximum subsidence parameters recorded as part of the subsidence monitoring program and a comparison with the maximum predicted subsidence parameters as outlined in the Extraction Plan. Results were within acceptable limits.

No mine emergency response procedures were activated as a result of subsidence during the Reporting Period.

6.10.4 Activities for the Next Reporting Period

NCOPL will continue subsidence monitoring and repair programs as required by the Extraction Plan. NCOPL will continue to review the Extraction Plans in accordance with PA 08_0144. If amendments to the Exaction Plans (or sub-Plans) are required, NCOPL will lodge the revised Extraction Plans with relevant regulatory agencies for comment and then with the DPHI for approval.

Table 15: Subsidence Parameters – Predicted and Measured

Longwall Panels (LW)		
	Maximum Predicted Extraction Plan	**Maximum Measured**
Line H – Cross Panel Survey Line (over LW108 & 109 for a cover depth range of 255m to 290m & T = 4.3 m)		
Subsidence (m)	2.75	2.62
Tilt (mm/m)	34 - 39	24 - 32
Tensile Strain (mm/m)	11 (22^)	9 - 17
Compressive Strain (mm/m)	14 (28^)	8
Line I – Cross Panel Survey Line (over LW110b for a cover depth of 320 m & T=4.3 m)		
Subsidence (m)	2.75	2.43
Tilt (mm/m)	18 - 27	20
Tensile Strain (mm/m)	7 (14^)	7
Compressive Strain (mm/m)	9 (18^)	9
Line J – Cross Panel Survey Line (over LW203 for a cover depth of 200 m & T = 4.0m)		
Subsidence (m)	2.75	2.15
Tilt (mm/m)	35 - 53	20 - 37
Tensile Strain (mm/m)	15 (31^)	3.1 - 7.6
Compressive Strain (mm/m)	18 (35^)	3.9 - 4.2
Line K –Survey Line (CF201 East at a cover depth of 180 m & h' = 4.2 m)		
Subsidence (m)	1.77	0.024
Tilt (mm/m)	15 - 22	< 1.5
Tensile Strain (mm/m)	8 (16^)	< 2
Compressive Strain (mm/m)	9 (17^)	< 2
Line L – Cross Panel Survey Line (CF201 East at a cover depth of 180 m & h' = 4.2 m)		
Subsidence (m)	1.77	0.018
Tilt (mm/m)	15 - 22	< 1.5
Tensile Strain (mm/m)	8 (16^)	< 2
Compressive Strain (mm/m)	9 (17^)	< 2
Line M – Cross Panel Survey Line (CF202 east at a cover depth of 180 m & h' = 4.2 m)		
Subsidence (m)	1.77	0.013
Tilt (mm/m)	16 - 24	< 1.5
Tensile Strain (mm/m)	9 (19^)	< 2
Compressive Strain (mm/m)	9 (17^)	< 2

^ - strain measurements may exceed the predicted U95%CL values by up to 2 times due to discontinuous subsidence or cracking. h' = effective mining height of 4.13 m based on mining height of 3.2 m + 1 m of floor brushing). *Note: NOCPL is no longer proposing to brush the floor in these workings, so the predicted values shown are conservative for an actual mining height of 3.2 m.*

7 WATER MANAGEMENT

7.1 WATER SUPPLY

Table 16 summarises the water licences held by NCOPL to account for indirect take associated with mining, and water usage for operational purposes, during the Reporting Period. All water take for the Reporting Period is below current licence entitlements.

Table 16: Narrabri Mine Water Take

Water Sharing Plan	Water Source/ Licence category	Water Access Licence	Allocation (Unit Shares)	Annual Use Limit	Active (Pumped) Take	Indirect Take[2]	Total Take
Namoi Alluvial Groundwater Sources Order 2020	Upper Namoi Zone 5 Groundwater Source	WAL 12833	67	134	58	-	58
		WAL 20131	150	300	0	-	
		WAL 12822	43	86	n/a[1]	0	
NSW Great Artesian Basin (**GAB**) Groundwater Sources 2020	GAB Southern Recharge Groundwater Source	WAL15922	248	322.4	n/a[1]	9	9
NSW Murray Darling Basin (**MDB**) Porous Rock Groundwater Sources Order 2020	Gunnedah Oxley Basin MDB Groundwater Source	WAL 29549	818	1,526.3	n/a[1]	549	549
		WAL43017	403				
Upper Namoi and Lower Namoi Regulated Water Sources 2016	Lower Namoi Regulated River Water Source Regulated River (High Security)	WAL 6762	20	20	0	-	0
	Lower Namoi Regulated River Water Source Regulated River (General Security)	WAL 2671	48	60	0	-	278
		WAL 2728	10	12.5	n/a[1]	0	
		WAL 20152	600	750	278	-	

[1] No active pumping for water usage purposes, Water Access Licence's have been assigned to miscellaneous work approvals to account for indirect take from the individual water sources as a result of mining impacts.

[2] Predicted maximum indirect take during 2024 from *Narrabri Coal Mine Groundwater Model- Re-calibration Stage 2 MOD7, Australasian Groundwater and Environmental Pty Ltd (**AGE**) 2024*.

* All units in Mega Litres (**ML**)

7.2 SURFACE WATER MANAGEMENT

7.2.1 Environmental Management

The Narrabri Mine surface water management system is managed in accordance with:

- PA 08_0144, Schedule 4, Conditions 10 to 17;
- EPL 12789 Conditions P1, L1, L2 and M2;
- the WMP; and

- the Extraction Plan – Water Management Plan (**EP–WMP**) prepared to satisfy the requirements of PA 08_0144, Schedule 3, Condition 4.

Surface water monitoring is conducted at locations within and surrounding Narrabri Mine as shown in **Figure 3**.

Activities in 2024

Condition 21, Schedule 4 of the PA 08_0144 requires NCOPL to engage an independent expert to review the brine management and beneficial use options for raffinate, brine and mine water produced at Narrabri Mine every 5 years. A review was completed during 2024, confirming that all recommendations from the 2019 review had been actioned, and provided the following recommendations for the five-year period 2024-2029:

- Record current evaporation fan usage at SB3 and estimate efficiency.
- Continue to monitor site water use, groundwater inflows and reclaim / saline and brine inventories; (dam water levels); and
- prepare concept designs for the water treatment plant upgrades, including a commissioning schedule and appropriate trial periods.

Following the commissioning of the brine dam BR1 in October 2023, NCOPL conducted additional testing and water transfers throughout 2024, the dam is now operational.

7.2.2 Environmental Performance

Surface Water Quality

NCOPL undertakes surface water monitoring of creeks and tributaries during flow events, as detailed in the WMP. Surface water and ambient flow monitoring results are presented in **Appendix E** and **Appendix G** respectively.

Wet Weather Discharge Monitoring

NCOPL undertook four discharge events[2] from EPL 12789 licence point 43 (SD9) during the Reporting Period following the rainfall trigger. In accordance with EPL12789, the discharge and ambient monitoring points were routinely sampled with results presented in **Table 17**.

[2] Discharge Event is defined as continuous release of water following a rainfall event greater than 38.4mm over 5-day period.

Table 17: Controlled Discharge Monitoring

Location	Date	Has Discharge been triggered by Rainfall > 38.4 mm, 5 Day Rainfall Event.	pH (field)	Oil and Grease[1] (mg/L)	Total Suspended Solids[2] (TSS) (mg/L)
	EPL Criteria	N/A	6.5 - 8.5	10	50
SD9	5 April 24	Yes	7.21	<5	906
	6 April 24		8.33	<5	239
	7 April 24		8.43	<5	254
	8 April 24		7.76	<5	142
	9 April 24		8.45	<5	113
	13 May 24	Yes	7.73	–	219
	14 May 24		8.24	4	396
	16 May 24		8.14	4	143
	1 June 24	Yes	7.38	<5	688
	2 June 24		8.31	<5	723
	3 June 24		8.31	<5	421
	4 June 24		7.94	<5	343
	30 November 24	Yes	8.4	<5	175
	2 December 24		7.46	<5	411
	3 December 24		7.38	<5	1900
	4 December 24		7.25	<5	950
	5 December 24		6.74	<5	1670
KCUS	5 April 24	Yes	–	–	–
	6 April 24		–	–	–
	7 April 24		–	–	–
	8 April 24		–	–	–
	9 April 24		–	–	–
	1 June 24	Yes	7.37	<5	1090
	2 June 24		6.59	<5	75
	3 June 24		7.05	<5	102
	4 June 24		7.16	<5	120
	30 November 24	Yes	7.82	<5	39
	2 December 24		7.2	27	14
	3 December 24		7.5	<5	8
	4 December 24		6.87	<5	31
	5 December 24		7.4	<5	13

[1]Oil and Grease and TSS are determined via lab analysis, while pH is measured in situ in the field. Lab analysis is undertaken at the frequency specified by EPL 12789, Condition M2.4

[2]EPL12789 Condition L2.5 (a), TSS concentration limits are permitted to be exceeded for water discharged following rainfall measured at the premises that exceeds 38.4mm over any consecutive 5 day period.

Subsidence Surface Water Impacts

Subsidence surface water impacts are outlined in **Section 6.5.2**. (Subsidence Pond Monitoring) of this Report. Results of the subsidence ponding water quality sampling conducted during the Reporting Period are presented in **Appendix H**.

Brine & Raffinate Management

No raffinate was discharged to the Namoi River during the Reporting Period.

7.2.3 Activities for the Next Reporting Period

NCOPL will continue to review the monitoring requirements in the WMP and implement actions, as required. If any new amendments are identified, NCOPL will lodge the revised Plans with relevant regulatory agencies for comment and approval.

7.3 GROUNDWATER MANAGEMENT

7.3.1 Environmental Management

The Narrabri Mine groundwater management system is managed in accordance with:

- PA 08_0144, Schedule 4, Condition 18;
- EPL 12789 Conditions P1, L1, L2 and M2;
- the WMP (including the groundwater management plan (**GWMP**)); and
- the EP–WMP prepared to satisfy the requirements of PA 08_0144, Schedule 3, Condition 4.

Activities in 2024

Groundwater monitoring is conducted at locations within and surrounding Narrabri Mine as shown in **Figure 3** and outlined in **Table 18**.

Table 18: Groundwater Monitoring Summary

Location	Parameters	Frequency
Standpipes P1, P2, P3, P4, P5, P6, P6B, P7, P8, P9, P10, P11, P12, P13, P16, P17, P19, P39a, P39b, P43, P47, P51, P52, P53, P58, , P59, P60, P62, P63R, P65, P66, P68, P69, P71, P72, P74, P75, P82, P90, P91, P92, WB2, WB3a, WB3b, WB4, WB5a, WB5b, WB6a, WB6b, and WB7	Water level, Electrical Conductivity (**EC**), pH, TDS, Metals, Anions and Cations	Quarterly (Water level, EC, pH) Annually (full water quality)
Pit top water storage standpipes P28, P29, P30, P31, P32, P33, P34, P58, P83, P84, P85, P88, and P89	In accordance with EPL: Water level, EC, pH, Anions and Cations Brine dam standpipe sampling to include dissolved and total metals.	Quarterly
Vibrating Wire Piezometers (**VWPs**) P42, P44, P45, P46, P54, P55, P56, P61, P64, P67, P70, P73, P76, P77, P78, P79, and P80	Water pressure (level)	Daily (telemetry)
Mine water pumped into and out of the mine (Box Cut)	Flow, EC, pH, TDS, Metals, Anions and Cations	Monthly (full water quality and flow)

The WMP (rev4A) was provided to DCCEEW for consultation on 26 June 2024. Letter advice was received from DCCEEW on 31 October 2024 and the WMP is undergoing further revisions to address DCCEEW recommendations.

7.3.2 Environmental Performance

Annual Hydrogeological Review

An annual hydrogeological review was undertaken by AGE for the period 1 January 2024 to 31 December 2024. Groundwater monitoring results for the Reporting Period are provided in **Appendix F** as required by the WMP.

Groundwater Levels

Groundwater level data collected from the NCOPL monitoring bores are provided in **Appendix F**.

Groundwater Quality

Groundwater quality data collected from the NCOPL monitoring bores are provided in **Appendix F**.

Compensatory Water Supply

No compensatory water has been required as no privately-owned water supplies have been affected.

7.3.3 Activities for the Next Reporting Period

NCOPL will continue to review the monitoring requirements in the WMP and implement actions, as required. If any new amendments are identified, NCOPL will lodge the revised Plans with relevant regulatory agencies for comment and approval.

7.4 SITE WATER BALANCE

Surface water

Table 19 presents an estimate of the volume of stored water at the beginning and end of the Reporting Period (i.e. calendar year). NCOPL pumped 303 ML into Dam D from Namoi Alluvium or the Namoi River water sources via approved WAL's during the Reporting Period (i.e. calendar year). NCOPL also utilised water from sediment basins for mine supply. The site water balance has been reviewed following the 2024 Reporting Period and includes forecast simulation of the key inflows and outflows for the next 5-year period. The water balance model results show that (for the period 2024-2029) there were no spills from A1, A2, A3, B2, C or BR1 into the receiving environment for any of the climatic conditions assessed. The SB dams would be sufficiently managed during operations as to prevent uncontrolled spills to the receiving environment.

Table 19: Stored Water

	Volumes Held (ML)		Capacity* at the end of the Reporting Period (ML)
	Start of Reporting Period	At End of Reporting Period	
Raw & Filtered Water (Dam D and B1 in Rail loop)	128	131	44
Dirty Water (in Sediment Dams SD1-SD9)	26	51	190
Mine reclaim water (A1-A3, SB1- SB4)	258	275	62
Brine storage (BR1, B2, C)	317	484	359

*capacity determined as FSV- full storage volume

Groundwater Inflows

Table 16 summarises the water licences held by NCOPL to account for indirect take associated with mining, and water usage for operational purposes, during the Reporting Period. All water take for the Reporting Period is below current licence entitlements. Information on actual groundwater inflows is inferred from monitoring of the volume of water pumped underground and the volume of water returned via the box-cut dewatering pump. The calculated water take utilising inputs and losses of water within the mine are represented by the waterfall chart (**Figure 11**).

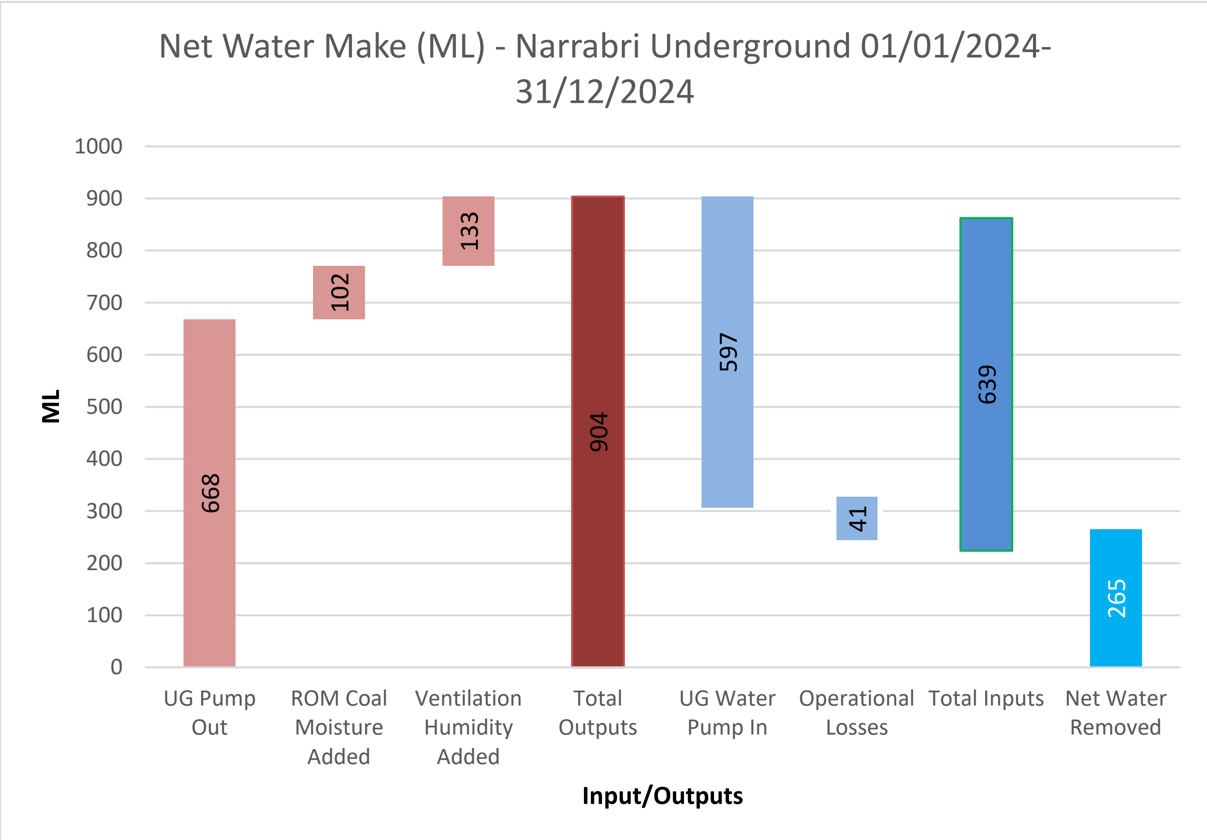


Figure 11: Waterfall Chart – Water Inputs/Outputs for Reporting Period

8 REHABILITATION

Narrabri Mine rehabilitation works are managed in accordance with:

- PA 08_0144, Schedule 5, Condition 4;
- EPBC Approval 2009/5003, Condition 5;
- PA 08_0144 SoC;
- FWP;
- RMP; and
- Standard mining lease conditions, Division 1 (4-6), Division 2 (7), Division 3 (10 and 12).

The Rehabilitation Objectives for Narrabri Colliery (official name given by RR) were approved by the RR on October 18, 2023. The objectives and other updates were then added to the RMP. The Annual Rehabilitation Report and Forward Program (**ARRFP**), as required by the *NSW Mining Regulation 2016*, has been prepared and submitted to the RR.

Section 8.1 provides an overview of the rehabilitation practices that were conducted during the Reporting Period.

8.1 REHABILITATION PERFORMANCE DURING THE REPORTING PERIOD

8.1.1 Status of Mining and Rehabilitation

Rehabilitation activities were undertaken over the disturbed areas above LW108-110 during the Reporting Period, with approximately 21.3ha being rehabilitated. Rehabilitation activities undertaken during the Reporting Period included:

- Decommissioning drill holes;
- Grading landforms and re-spreading topsoil/subsoil; and
- Weed management.

In November 2024, NCOPL had confirmed that all available areas for surface rehabilitation within the northern longwall mining panels (LW101 – LW110) had been completed.

8.1.2 Post Rehabilitation Land Uses

Narrabri Mine final land use requirements is outlined in Table 2-1 of the RMP.

8.1.3 Rehabilitation Performance Indicators

The rehabilitation completed for 2023 (previous Reporting Period), 2024 (this Reporting Period) and the predicted rehabilitation activities for 2025 is summarised in **Table 20**.

Figure 12 and **Figure 13** shows the status of rehabilitation at the Narrabri Mine.

Table 20: Rehabilitation Status

Mine Area Type*	Previous Reporting Period 2023 (Actual) **	This Reporting Period 2024 (Actual) **	Next Reporting Period 2025 (Forecast) **
A. Total Mine Footprint	508.60	521.85	557.23
B. Total Active Disturbance	328.96	344.05	375.07[1]
C. Land Being Prepared for Rehabilitation	22.10	7.29	4.37
D. Land Under Active Rehabilitation	157.53	170.50	182.16
E. Completed Rehabilitation	0	0	0

Notes: * Data reported to align with definitions in the Annual Review Guideline (DPE, 2015).

** Data sourced from ARRFP

1. ARRFP, total cumulative active disturbance is 375.07 ha.

8.1.4 Rehabilitation Risks

The NSW *Mining Act 1992* requires the Leaseholder to conduct a rehabilitation risk assessment and implement measures to eliminate, minimise or mitigate the risks in accordance with the *Guideline: Rehabilitation Risk Assessment*. NCOPL maintain a register for the rehabilitation risk assessment, of which, no new risks were identified during the Reporting Period.

8.1.5 Decommissioning and Demolition Activities

Decommissioning activities were undertaken during the Reporting Period included:

- Reclaiming of gas drainage infrastructure, e.g. poly pipe;
- Cementing and rehabilitation of boreholes; and
- Dilapidated houses (and associated infrastructure) on mine-owned land that are were longer required or that have been adversely affected by subsidence.

8.1.6 Departmental Sign-off of Rehabilitated Areas

Departmental sign-off was not requested during the Reporting Period.

8.1.7 Monitoring

Rehabilitation monitoring results are outlined in **Section 6.5**. Additionally, NCOPL undertake routine inspections of roads and creeks impacted by mine subsidence, water management structures, soil stockpiles and seeded areas for evidence of instability/erosion and/or poor germination and borehole sealing.

8.1.8 Trials, Research Projects and Initiatives

During the Reporting Period, NCOPL engaged specialist consultants to assist with the implementation of an electronic GIS based monitoring platform to improve implementation of rehabilitation workflows and provide a database for monitoring records.

8.2 ACTIVITIES FOR THE NEXT REPORTING PERIOD

Rehabilitation activities for 2025 will be carried out generally in accordance with the FWP and RMP subject to operational progress.

NCOPL will continue the staged rehabilitation of the REA in accordance with the *REA Capping Assessment and Closure Design*.

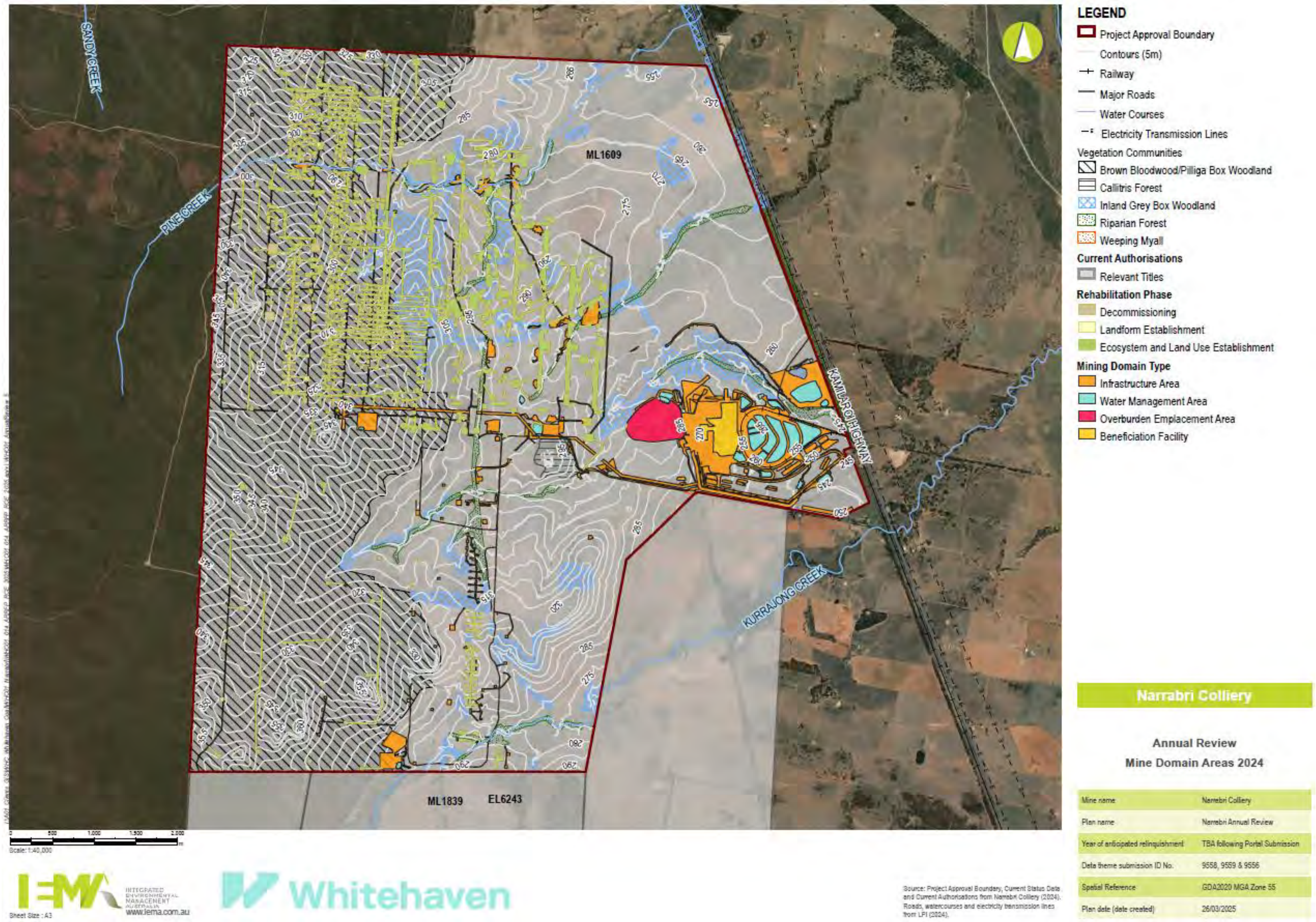


Figure 12: Mine Domains Reporting Period 2024

Figure 13: Rehabilitated Areas, Reporting Period 2024

9 COMMUNITY

Social impacts and opportunities associated with the Narrabri Mine are managed in accordance with PA 08_0144 and the SoC.

9.1 COMMUNITY ENGAGEMENT

NCOPL undertook a range of engagement activities during 2024:

- Narrabri Mine Community Consultative Committee (**CCC**) meetings. The CCC comprises representatives of NCOPL, NSC and the local community. The meetings were held in March, June, September and December 2024. Minutes of each of these meetings are available at the WHC website.
- Near neighbour consultation regarding impacts, address any potential concerns and other interactions.

In addition, general information relating to Narrabri Mine is available:

- On the WHC website;
- The Annual Sustainability Report; and
- At other consultation meetings as required with neighbours and a range of stakeholders including government and non-government agencies. WHC meets regularly with the NSC and is a regular attendee at the Narrabri and Boggabri Business Chamber meetings.

9.2 COMMUNITY CONTRIBUTIONS & INITIATIVES

In addition to attending functions, WHC and NCOPL also contributed to the community by providing financial support to the Narrabri community and sponsorship to various community events and initiatives during the Reporting Period including:

- 1st Narrabri West Scouts
- Baan Baa Community Hall Incorporated
- Black 'n' Blue Boxing
- Boggabri Business Chamber
- Boggabri Junior Rugby League
- Boggabri Pony Club
- Boggy Ninja
- Brewarrina Central School
- Carroll Public School
- Challenge Community Services
- Dolly Parton Library
- Dorothea Mackellar Memorial Society
- Drovers Campfire
- Eulah Creek Hall
- Girl Guides Australia
- Gomeroi Allstars
- Gomeroi Roos
- GS Kidd Memorial Golf Day
- Gunnedah Bulldogs
- Gunnedah Business Chamber
- Gunnedah Catholic School
- Gunnedah District Soccer Association
- Gunnedah Eisteddfod
- Gunnedah Junior Bowling Club
- Gunnedah Junior Rugby League
- Gunnedah Meals on Wheels
- Gunnedah Men’s Dart League
- Gunnedah Ministers Fraternal
- Gunnedah PCYC

- Gunnedah Show Society
- Gunnedah Swimming Club
- Kelvin Hall
- Lake Keepit Fishing Club
- Little Wings
- Manilla Team Penning
- Mary Valley Rattler Heritage Railway
- Maules Creek Campdraft Club
- Movember Foundation
- Mullaley Public School
- Narrabri and District Chamber of Commerce
- Narrabri Arts Eisteddfod
- Narrabri District Health Service
- Narrabri district junior rugby league club
- Narrabri Dolphins Water Polo Club Incorporated
- Narrabri High School
- Narrabri Jockey Club
- Narrabri Junior Rugby Union
- Narrabri Local Aboriginal Land Council
- Narrabri Oz Tagg
- Narrabri Rugby League Club
- Narrabri Shire Community Radio
- Narrabri Show Society
- Nosh Narrabri
- Primal Functional Fitness
- Primary Schools Network
- Quirindi Football Club
- Quirindi Netball Club
- Quirindi Returned & Service League of Australia
- Quirindi Rodeo
- Quirindi Show Society
- Rotary Club Gunnedah West
- Rotary Club Narrabri
- Rotary Club of Tamworth
- Royal Far West
- Southside Uniting Church
- St Mary's Catholic College Gunnedah
- St Xaviers Narrabri
- Summit Community Services Inc
- Tamworth Aboriginal Medical Services
- Tamworth Crows
- Tamworth Family support service
- Tamworth PCYC
- Barraba Rugby Union
- The Gunnedah Bulldogs Rugby League Football
- The Gunnedah Uke-Alypts
- Red Chief Local Aboriginal Local Council
- Werris Creek Community Garden
- Two Rivers Art Council
- Vinnies Christmas Appeal
- Wallabadah Public School
- Wean Jockey Club
- Wee Waa Community Band
- Wee Waa Local Aboriginal Land Council
- Wee Waa Show Society Inc.
- Werris Creek Golf Club

- Werris Creek Progress Association
- Werris Creek Rugby League Football Club
- Westpac Rescue Helicopter
- Yallambee Homes of the Aged Charity Golf Day
- Yarrie Lake Flora and Fauna Trust

9.3 COMMUNITY COMPLAINTS

NCOPL maintains a designated complaints line (1800 942 836). In the event of a complaint, details pertaining to the complainant, complaint and action taken are recorded on a complaint register. The complaints register is available on the WHC website.

During the Reporting Period, NCOPL received 1 community complaint.

9.3.1 Complaint Trends

One community complaint was received during the Reporting Period which is a decrease from three complaints received during 2023 (**Figure 14**).

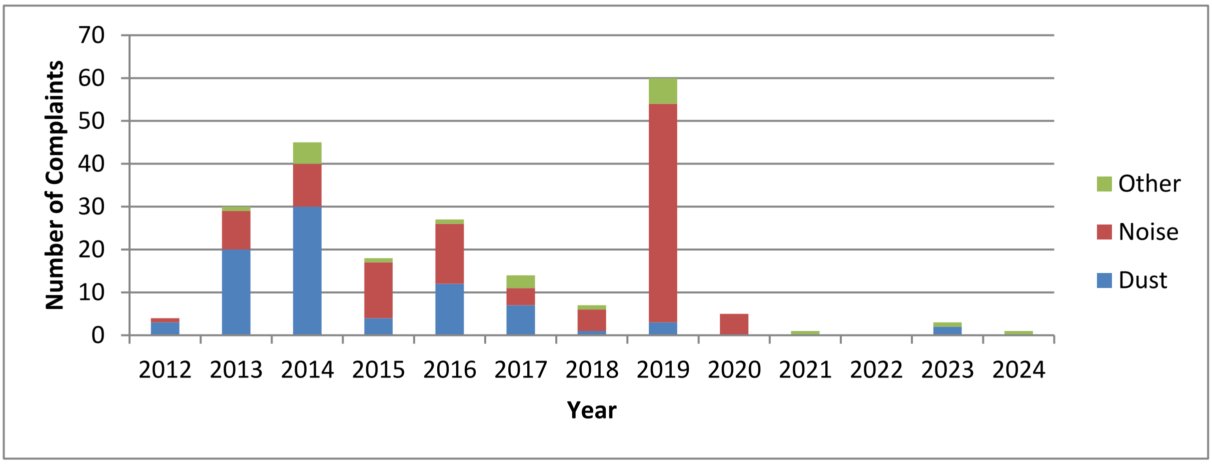


Figure 14: Complaints Trend Since Commencement of Operations

9.4 ACTIVITIES FOR THE NEXT REPORTING PERIOD

NCOPL will also continue to meet with NSC and the Narrabri Business Chamber regularly and support the Narrabri Shire Community through the Community Investment Committee.

10 INDEPENDENT AUDIT

10.1 INDEPENDENT ENVIRONMENTAL AUDIT

The NCOPL 3-yearly Independent Environmental Audit (**IEA**) was undertaken in 2022 in accordance with PA 08_0144, Schedule 6, Condition 7. All actions identified in the IEA were completed in 2023.

The next IEA will be commissioned by 13 September 2025.

11 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

11.1 NON-COMPLIANCES

The compliance status of the Narrabri Mine against relevant approvals during the Reporting Period was assessed in **Section 1** as at the end of the Reporting Period (i.e. 31 December 2024). Further details of any non-compliance and actions undertaken or proposed for the following Reporting Period is summarised in **Table 21**.

Table 21: Non-Compliance Details and Proposed Action Plan

Non – Compliance Summary	Cause / Details	Action Taken to Ensure Compliance
Nil	Nil	Nil

11.2 REPORTABLE INCIDENTS OR EXCEEDANCES

There were no "incidents" (as that term is defined in PA 08_0144) during the Reporting Period.

Table 25 provides details of matters or exceedances during the Reporting Period that were reported by NCOPL to regulatory authorities. Matters addressed at **Section 1** or **Section 11.1** are not reproduced in **Table 22**.

Table 22: Reportable Matters or Exceedances 2024

No.	Date	Reported To	Nature	Details	Action Taken	Matter Status
1	12 March 2024	DPHI	Air Quality	Potential exceedance of 24-hour air quality criteria at PM_{10} site ND9, all sources reading measured 69.1µg/m^3.	Analysis report (concluding NCOPL did not exceed criteria) submitted to DPHI.	No further action required. Completed and closed.
2	10 October 2024	DPHI	Ground water	Monitoring bore water quality and water level trigger exceedances. P10, P11, P29 and P53 were identified as exceeding their EC trigger for three consecutive recordings. P11 water level exceeded the Tier 2 water level trigger.	Hydrogeological review completed. Event report submitted to DPHI in accordance with notification requirements. Hydrogeological investigation outcomes to be reported in Annual Review.	Annual Groundwater Report (**Appendix F**)

No.	Date	Reported To	Nature	Details	Action Taken	Matter Status
3	14 November 2024	DPHI	Ground water	* Monitoring bore water quality exceedances. P4, P39A, P39B, P43 and P47 were identified as exceeding their water quality EC trigger for three consecutive recordings. P7 was identified as exceeding the pH minimum trigger for three consecutive readings.	Hydrogeological review completed. Event report submitted to DPHI in accordance with notification requirements. Hydrogeological investigation outcomes to be reported in Annual Review.	Annual Groundwater Report (**Appendix F**)

* Previously notified exceedances were not included with this notification

11.3 REGULATORY ACTIONS

There were no formal regulatory actions issued during the Reporting Period.

Summary of formal notices received by regulatory agencies are outlined below:

- 17/01/2024 - DPHI issued a Warning Letter for a breach of Section 4.2 of the EP&A Act by carrying out development not in accordance with the conditions of development consent. The particulars of the breach related to failure to implement the Energy Savings Action Plan (**ESAP**) (2014) during the 2022 Annual Review Reporting Period. DPHI considered the particulars of the breach and noted that NCOPL partially met the intent of the ESAP 2014 by purchasing carbon neutral electricity for the 2022 Annual Review period, and that there is no known harm to the environment. No formal action was required.

  NCOPL reviewed the GHGMP to include the requirements of the ESAP, the GHGMP was approved by DPHI on 21/12/2023 and NCOPL have implemented the requirements of the GHGMP (**Section 6.4**).

- 22/04/2024 - DPHI issued a Warning Letter for a breach of Section 4.2 of the EP&A Act by carrying out development not in accordance with the conditions of development consent. The particulars of the breach related to failure to ensure greenhouse gas emissions for the 2022 Annual Review period were generally in accordance with the predictions in the Narrabri Mine MOD 5 EA. DPHI considered NCOPL responses in determining the breach, noting that the 2015 MOD 5 assessment inadvertently omitted the fugitive CO2 emissions.

  NCOPL have subsequently updated the project emissions forecast within the approved GHGMP. The reported emissions for NGER FY2024 are lower than the GHGMP predictions (**Section 6.4**).

12 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

A summary of key environmental management activities proposed for 2025 is presented in **Table 23**. Progress against these activities will be reported in the 2025 Annual Review.

Table 23: Environment Management Activities Proposed for 2025

Area / Issue	Actions Proposed	Timeline for Implementation
Air Quality	Installation and commissioning of new real time Air Quality monitoring network	Prior to commencement of Stage 3 Project Approval
Management Plans	Seek progressive approval of Extraction Plan LW203-206	3 months prior to commencement of mining LW205.
Mining Operations	Commence development under SSD-10269.	Q3, 2025
IEA	Commission IEA per PA 08_0144, Schedule 6, Condition 7	13 September 2025

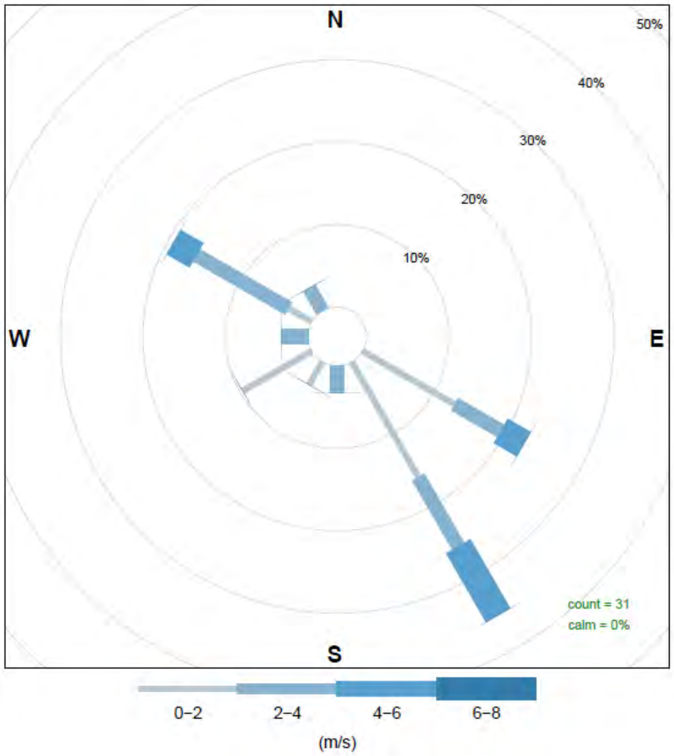
Appendix A – *Meteorological Monitoring*

Table A1: Summary of Meteorological Conditions 2024

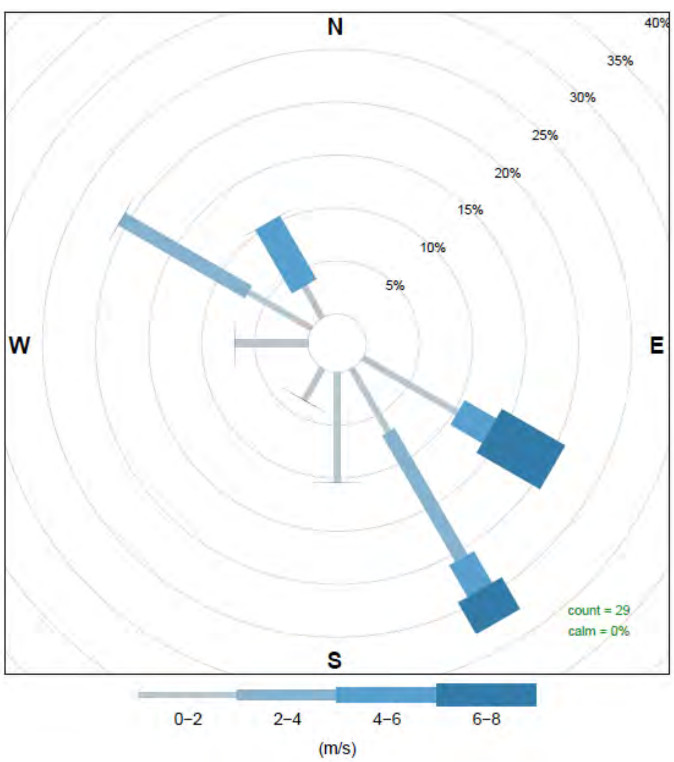
Month	Rain (mm)	Cumulative Rainfall (mm)	Rainfall Days (>1mm)	2m Temperature (°C)			Wind		Inversion Conditions[1]
				Min	Mean	Max	Av. Speed (m/s)	Predominant Direction	% of Evening/Night Time Period[2] (%)
Jan-24	46.2	46.2	4	14.2	27.7	41.4	2.6	S	59
Feb-24	10.4	56.6	4	16.6	27.1	41.6	2.7	S	54
Mar-24	9.8	66.4	1	12.8	24.7	40.0	2.3	SE	66
Apr-24	92.8	159.2	7	6.1	18.2	30.8	2.4	S	82
May-24	77.6	236.8	5	1.3	14.6	24.2	2.7	SE	85
Jun-24	63	299.8	4	-0.4	10.0	21.1	1.7	SW	87
Jul-24	55.4	355.2	5	-1.0	10.0	20.9	2.8	S	80
Aug-24	64.6	419.8	5	1.9	14.0	29	2.1	S	92
Sep-24	50.2	470	2	2.6	15.2	28.1	2.5	S	86
Oct-24	26.8	496.8	3	7.6	19.3	33.5	2.4	SE	77
Nov-24	160.8	657.6	8	14.2	24.6	39.9	2.4	S	65
Dec-24	39.2	696.8	4	13.6	26.6	39	2.3	S	71

1. Inversion conditions are calculated from measurements recorded by the site 60m Inversion Tower. Inversions occur during E, F and G stability categories (these categories represent weak, moderate and strong inversion conditions).
2. Evening and night period generally includes 6pm-7am

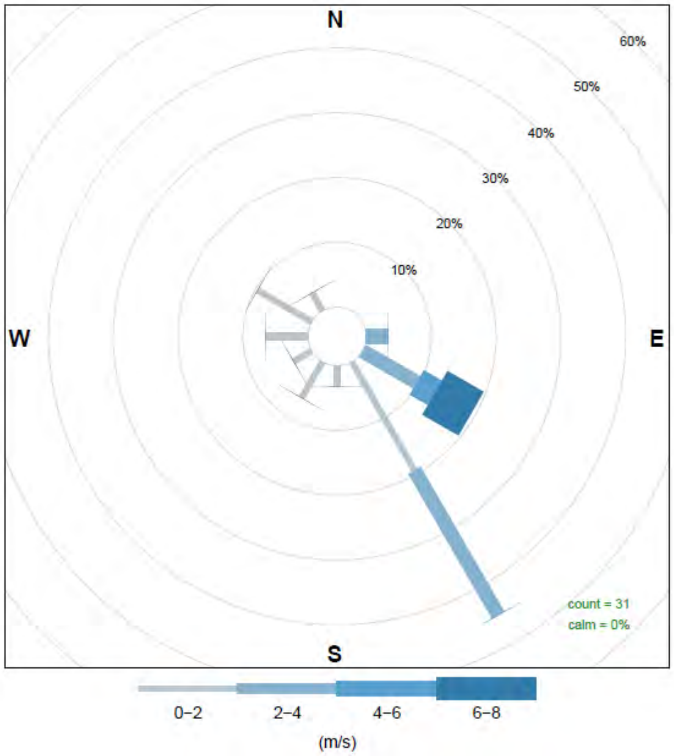
January 2024



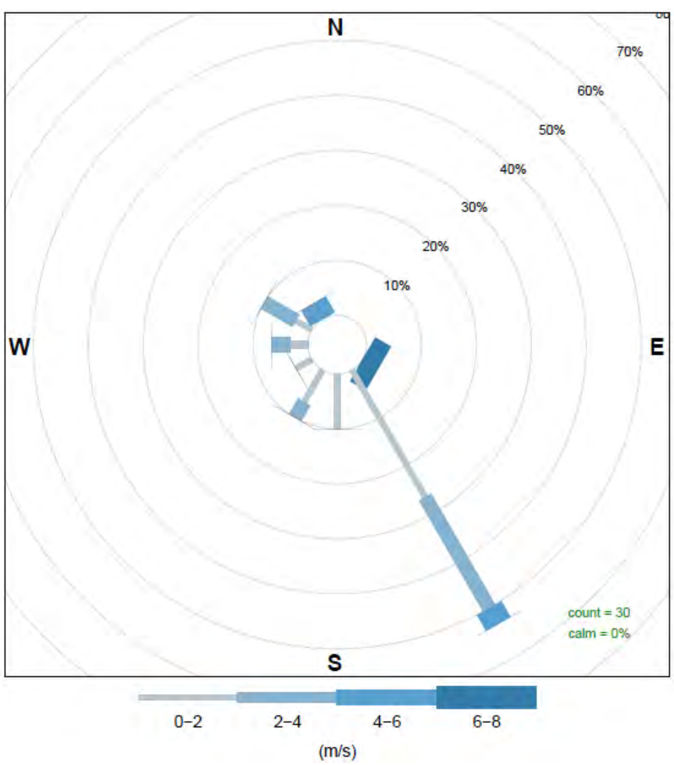
February 2024



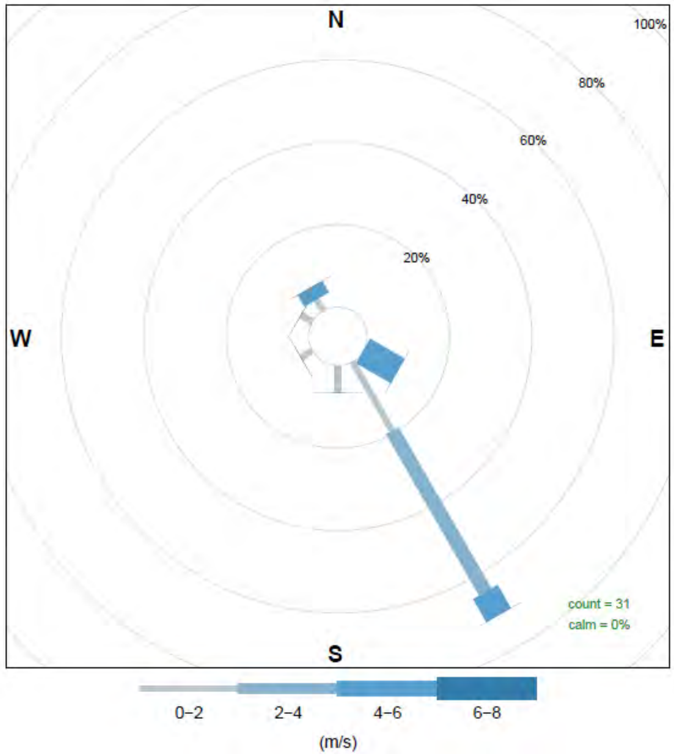
March 2024



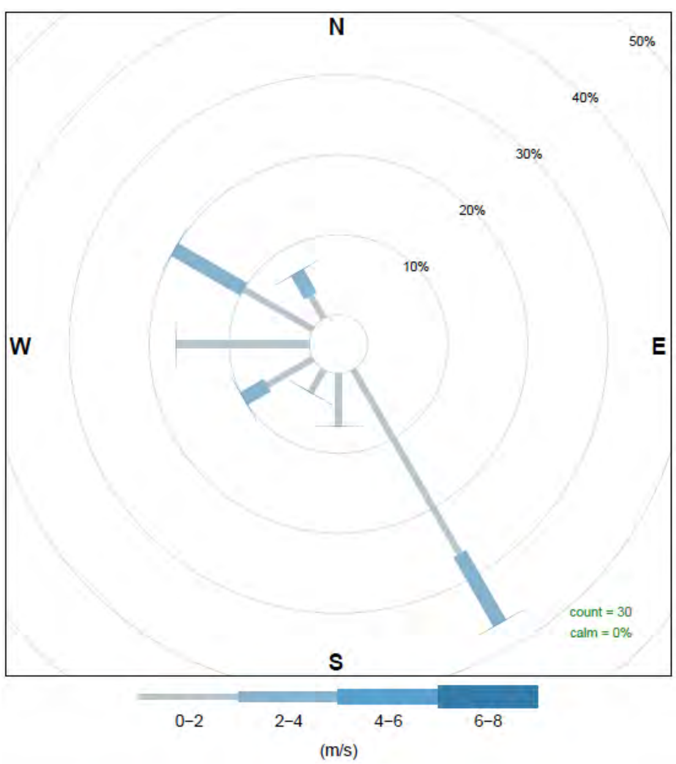
April 2024



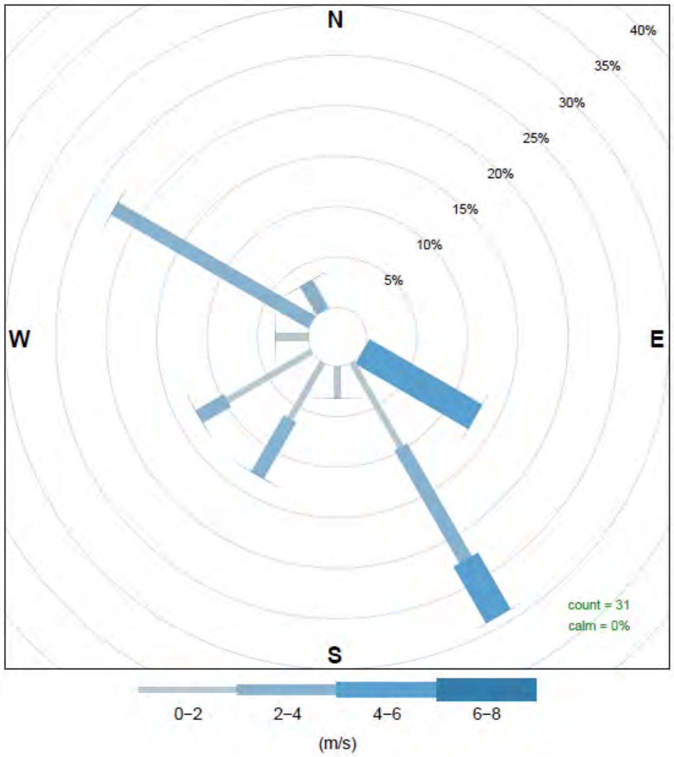
May 2024



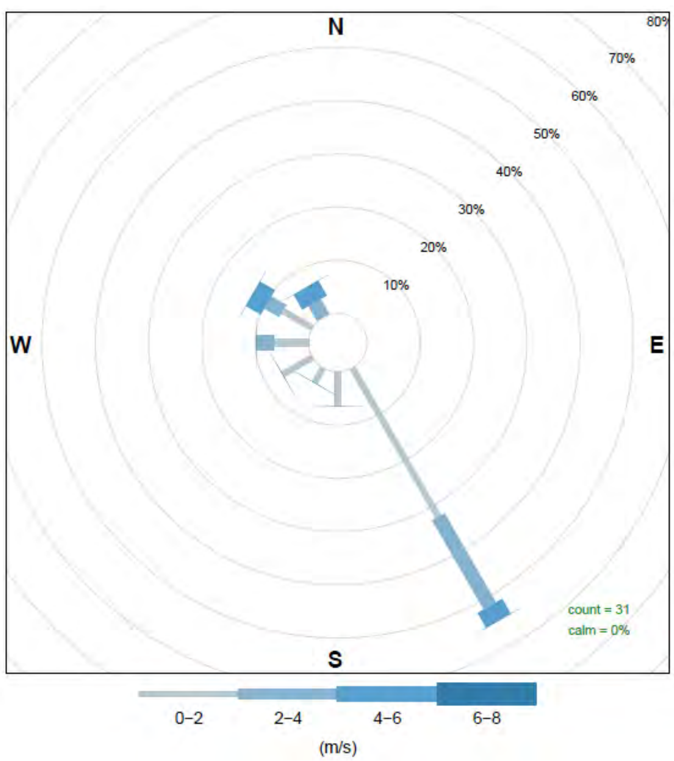
June 2024



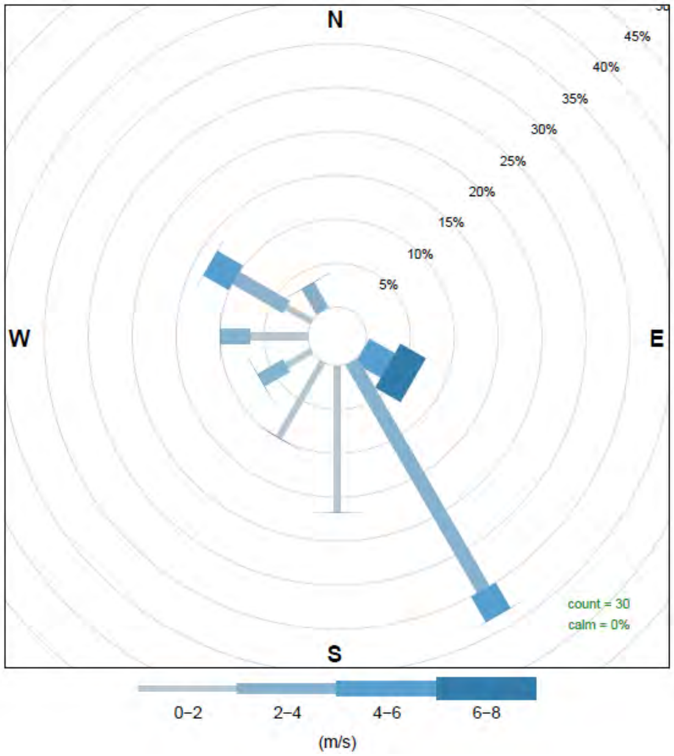
July 2024



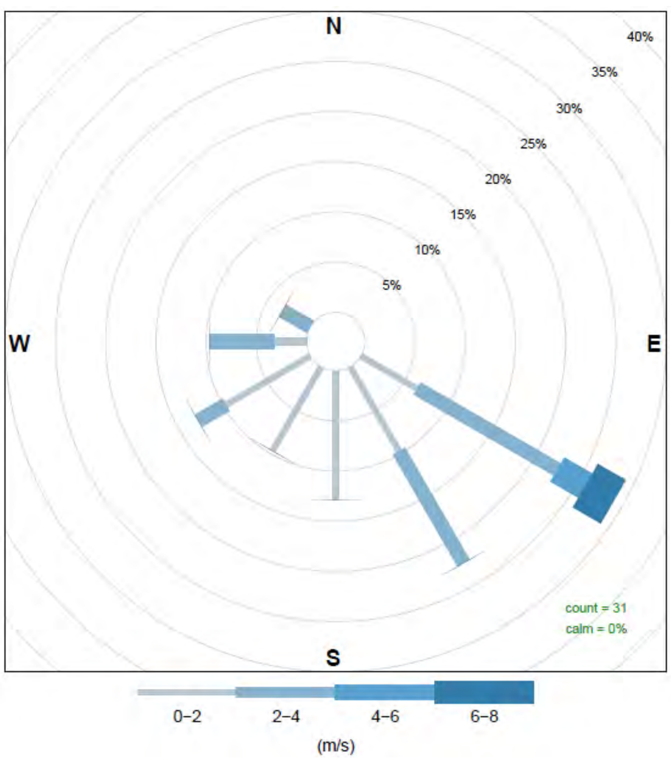
August 2024



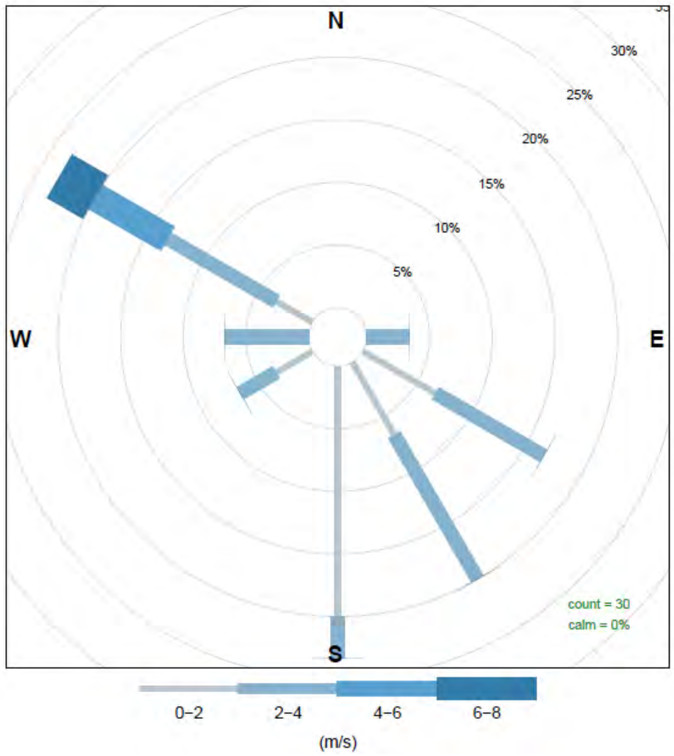
September 2024



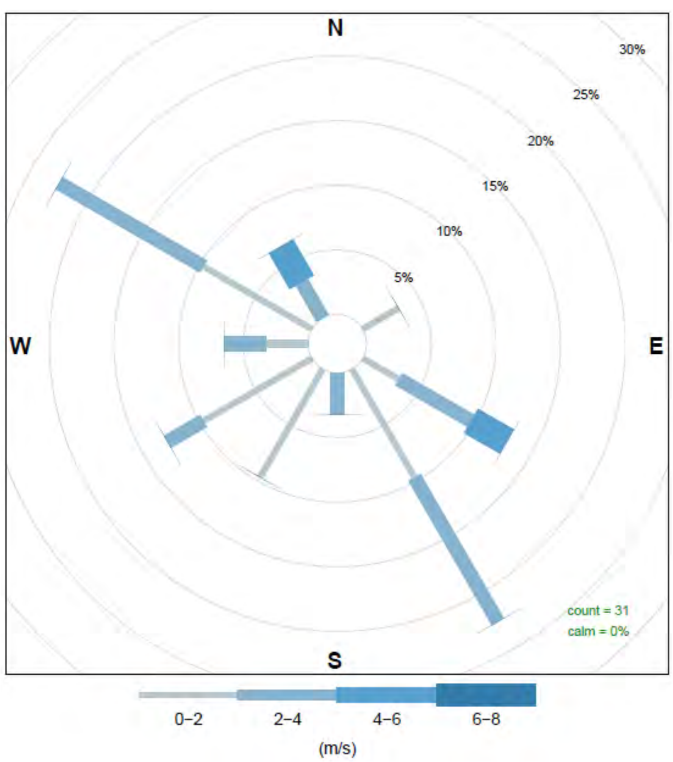
October 2024



November 2024



December 2024



Appendix B – *Flora Species List*

Scientific Name	Common Name	Native Exotic HTE	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	WEH-1	Grand Total
Abutilon oxycarpum	Straggly Lantern-bush	Native										X		1
Acacia burrowii	Burrow's Wattle	Native		X	X	X	X	X					X	6
Acacia deanei	Green Wattle	Native			X			X		X		X	X	5
Acacia ixiophylla		Native											X	1
Acacia leiocalyx		Native										X		1
Acacia leiocalyx subsp. leiocalyx	Curracabah	Native	X	X	X	X	X	X						6
Acacia neriifolia	Silver Wattle	Native											X	1
Acacia penninervis	Mountain Hickory	Native	X		X	X								3
Acacia spp.	Wattle	Native					X							1
Actinotus gibbonsii		Native		X	X	X	X							4
Actinotus helianthi	Flannel Flower	Native	X											1
Allocasuarina diminuta		Native	X										X	2
Allocasuarina luehmannii	Bulloak	Native						X		X				2
Alphitonia excelsa	Red Ash	Native		X	X								X	3
Alstonia constricta	Quinine Bush	Native			X									1
Anthosachne scabra		Native									X			1
Aristida caput-medusae	Many-headed Wiregrass	Native		X	X			X					X	4
Aristida jerichoensis	Jericho Wiregrass	Native				X								1
Aristida personata		Native		X	X	X	X	X						5
Aristida ramosa	Purple Wiregrass	Native							X	X				2
Aristida spp.		Native			X				X	X	X	X	X	6
Aster subulatus	Wild Aster	Exotic							X					1
Asteraceae spp.		Exotic											X	1

Scientific Name	Common Name	Native Exotic HTE	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	WEH-1	Grand Total
Atalaya hemiglauca	Whitewood	Native										X		1
Austrostipa scabra	Speargrass	Native			X			X		X	X	X	X	6
Austrostipa spp.		Native			X			X			X		X	4
Austrostipa verticillata	Slender Bamboo Grass	Native			X			X						2
Bertya gummifera		Native											X	1
Bertya opponens	Coolabah Bertya	Native		X	X								X	3
Boronia glabra	Sandstone Boronia	Native	X		X									2
Boronia occidentalis		Native	X	X	X	X								4
Bothriochloa decipiens var. decipiens		Native							X					1
Bothriochloa spp.	Redgrass, Bluegrass	Native								X		X		2
Brachychiton populneus	Kurrajong	Native						X		X			X	3
Brachyscome goniocarpa		Native						X						1
Brachyscome spp.		Native		X	X					X		X		4
Briza minor		Exotic								X				1
Bromus spp		Exotic									X			1
Brunoniella australis	Blue Trumpet	Native						X					X	2
Bulbine semibarbata	Wild Onion	Native						X						1
Bursaria spp.		Native											X	1
Calandrinia spp.		Native			X									1
Callitris endlicheri	Black Cypress Pine	Native				X	X							2
Callitris glaucophylla	White Cypress Pine	Native		X					X	X	X	X	X	6
Calochilus robertsonii	Purplish Beard Orchid	Native	X				X	X						3
Calotis cuneifolia	Purple Burr-Daisy	Native		X	X			X	X	X	X		X	7

Scientific Name	Common Name	Native Exotic HTE	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	WEH-1	Grand Total
Calotis lappulacea	Yellow Burr-daisy	Native							X		X	X		3
Calytrix tetragona	Common Fringe-myrtle	Native	X				X							2
Carex inversa	Knob Sedge	Native							X					1
Carthamus lanatus	Saffron Thistle	High threat							X		X	X		3
Cassinia spp.		Native	X			X							X	3
Cassytha glabella		Native	X											1
Casuarina cristata	Belah	Native										X		1
Centaurea spp.	Thistle	Exotic							X					1
Centaurium erythraea	Common Centaury	Exotic										X		1
Centaurium spp.		Exotic							X	X	X			3
Centipeda spp.		Native								X				1
Cerastium spp.		Exotic									X			1
Chamaesyce drummondii	Caustic Weed	Native									X			1
Chamaesyce spp.		Native										X		1
Cheilanthes sieberi	Rock Fern	Native		X	X	X		X	X	X	X	X	X	9
Cheilanthes vergatis		Native									X			1
Chenopodiaceae indeterminate	Salt-bushes	Exotic									X			1
Chloanthes parviflora		Native	X			X	X							3
Chloris truncata	Windmill Grass	Native									X	X		2
Chloris ventricosa	Tall Chloris	Native									X			1
Chondrilla juncea	Skeleton Weed	Exotic							X					1
Chrysocephalum apiculatum	Common Everlasting	Native			X				X	X	X	X		5

Scientific Name	Common Name	Native Exotic HTE	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	WEH-1	Grand Total
Cleistochloa rigida		Native	X			X	X							3
Convolvulus graminetinus		Native							X					1
Convolvulus spp.		Native									X	X		2
Conyza spp.		Exotic						X	X	X	X	X		5
Corymbia trachyphloia	White Bloodwood	Native	X	X	X	X	X							5
Crassula sieberiana		Native										X		1
Crassula spp.		Native								X			X	2
Cryptandra spp.		Native											X	1
Cyclospermum leptophyllum		Exotic							X	X		X		3
Cymbopogon refractus	Barbed Wire Grass	Native		X	X			X	X	X	X	X	X	8
Cynodon dactylon	Common Couch	Native							X	X	X			3
Cyperus gracilis	Slender Flat-sedge	Native						X	X					2
Dampiera adpressa	Purple Beauty Bush	Native	X			X	X							3
Daucus glochidiatus	Native Carrot	Native		X	X			X		X	X	X		6
Denhamia cunninghamii		Native						X					X	2
Dianella revoluta	Blueberry Lily	Native	X					X					X	3
Dichanthium sericeum	Queensland Bluegrass	Native							X		X	X		3
Dichondra sp. A	Kidney Weed	Native									X	X		2
Dichondra sp. Inglewood		Native						X	X	X	X		X	5
Digitaria breviglumis		Native		X										1
Digitaria spp.		Native			X	X	X						X	4
Dodonaea falcata		Native	X		X	X	X							4

Scientific Name	Common Name	Native Exotic HTE	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	WEH-1	Grand Total
Dodonaea viscosa	Sticky Hop-bush	Native		X	X								X	3
Echium plantagineum	Patterson's Curse	Exotic							X	X		X		3
Einadia nutans	Climbing Saltbush	Native									X	X		2
Einadia trigonos		Native						X						1
Enteropogon acicularis	Curly Windmill Grass	Native									X			1
Epaltes australis	Spreading Nut-heads	Native								X	X			2
Eragrostis alveiformis		Native									X			1
Eragrostis brownii	Brown's Lovegrass	Native		X	X			X		X		X		5
Eragrostis curvula	African Lovegrass	High threat							X	X	X			3
Eragrostis elongata		Native								X				1
Eragrostis lacunaria	Purple Lovegrass	Native			X			X		X		X		4
Eragrostis leptostachya	Paddock Lovegrass	Native							X	X				2
Eragrostis megalosperma		Native						X						1
Eragrostis spp.		Native		X					X		X	X		4
Eremophila debilis		Native									X			1
Eriochloa pseudoacrotricha		Native											X	1
Eriochloa spp.		Native										X		1
Eucalyptus crebra	Narrow-leaved Ironbark	Native						X					X	2
Eucalyptus dwyeri	Dwyer's Red Gum	Native	X		X									2
Eucalyptus fibrosa	Red Ironbark	Native	X	X	X	X	X	X					X	7
Eucalyptus microcarpa	Western Grey Box	Native							X	X				2
Eucalyptus pilligaensis	Narrow-leaved Grey Box	Native						X						1
Eucalyptus spp.		Native		X					X		X	X		4

Scientific Name	Common Name	Native Exotic HTE	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	WEH-1	Grand Total
Euchiton sphaericus	Star Cudweed	Native						X						1
Euchiton spp.		Native								X		X		2
Euphorbia drummondii	Caustic Weed	Native						X		X		X		3
Evolvulus alsinoides	Bindweed	Native						X						1
Fimbristylis dichotoma		Native								X				1
Gahnia aspera	Rough Saw-sedge	Native						X					X	2
Gamochaeta spp.		Exotic			X						X			2
Geijera parviflora	Wilga	Native						X						1
Geranium homeanum		Native						X						1
Glandularia aristigera	Mayne's Pest	Exotic							X	X	X	X		4
Glycine clandestina	Twining glycine	Native			X			X		X			X	4
Glycine spp.		Native								X			X	2
Glycine tabacina	Variable Glycine	Native										X		1
Glycine tomentella		Native								X				1
Gomphrena celosioides		Exotic			X									1
Gonocarpus elatus		Native	X	X	X	X	X	X					X	7
Goodenia rotundifolia		Native	X	X	X	X	X						X	6
Harmogia densifolia		Native	X			X								2
Hibbertia circumdans		Native	X				X							2
Hibbertia covenyana		Native	X											1
Hibbertia spp.		Native					X						X	2
Hibiscus sturtii	Hill Hibiscus	Native		X				X				X		3
Homoranthus flavescens		Native		X	X									2

Scientific Name	Common Name	Native Exotic HTE	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	WEH-1	Grand Total
Hyparrhenia hirta	Coolatai Grass	High threat								X				1
Hypericum gramineum	Small St John's Wort	Native								X	X			2
Hypochaeris glabra	Smooth Catsear	Exotic		X	X			X	X	X	X	X		7
Hypochaeris microcephala		Exotic										X		1
Hypochaeris spp.		Exotic							X					1
Indigofera adesmiifolia	Tick Indigo	Native											X	1
Isoetopsis graminifolia		Native										X		1
Juncus spp.		Native							X	X				2
Keraudrenia corollata		Native		X										1
Leontodon rhagadioloides		Exotic							X	X	X	X		4
Lepidosperma laterale	Variable Sword-sedge	Native	X											1
Leptochloa asthenes		Native						X						1
Linaria arvensis		Exotic			X									1
Linaria spp.		Exotic								X				1
Lolium rigidum		Exotic							X	X	X	X		4
Lolium spp.		Exotic								X				1
Lomandra filiformis		Native	X		X			X						3
Lomandra multiflora subsp. multiflora	Many-flowered Mat-rush	Native			X			X					X	3
Lysimachia arvensis	Scarlet Pimpernel	Exotic			X				X	X	X	X		5
Lythrum hyssopifolia		Native								X				1
Maireana enchylaenoides	Wingless Fissure-weed	Native												0
Maireana microphylla	Small-leaf Bluebush	Native									X	X		2

Scientific Name	Common Name	Native Exotic HTE	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	WEH-1	Grand Total
Malva spp.		Native						X				X		2
Marsdenia viridiflora subsp. viridiflora	Native Pear	Native		X				X						2
Medicago minima	Woolly Burr Medic	Exotic									X			1
Medicago spp.		Exotic								X		X		2
Medicago truncatula	Barrel Medic	Exotic							X		X	X		3
Melaleuca uncinata	Broombush	Native											X	1
Melichrus erubescens	Ruby Urn Heath	Native					X							1
Melichrus urceolatus	Urn Heath	Native	X	X										2
Microlaena stipoides	Weeping Grass	Native		X	X			X					X	4
Microtis spp.		Native							X		X			2
Microtis unifolia		Native								X				1
Mimulus spp.		Native										X		1
Misopates orontium	Lesser Snapdragon	Exotic								X				1
Muehlenbeckia rhyticarya		Native		X										1
Nuttallanthus texanus		Exotic							X	X				2
Olearia decurrens	Clammy Daisy-bush	Native						X						1
Opuntia spp.		Exotic									X			1
Opuntia stricta	Common Prickly Pear	Exotic			X			X						2
Ornithopus compressus		Exotic							X	X				2
Oxalis spp.		Native		X	X			X	X	X	X	X	X	8
Panicum effusum	Hairy Panic	Native						X	X	X		X		4
Panicum simile	Two-colour Panic	Native			X									1
Panicum spp.	Panicum	Native		X				X			X		X	4

Scientific Name	Common Name	Native Exotic HTE	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	WEH-1	Grand Total
Parsonsia eucalyptophylla	Gargaloo	Native			X			X					X	3
Paspalidium spp.		Native		X	X			X				X	X	5
Persoonia sericea		Native	X											1
Petrorhagia dubia		Exotic								X				1
Petrorhagia nanteuilii	Proliferous Pink	Exotic							X		X			2
Phebalium squamulosum		Native	X	X	X	X	X	X					X	7
Philotheca ciliata		Native	X	X	X	X	X	X					X	7
Phyllanthus fuernrohrii		Native			X									1
Phyllanthus hirtellus		Native							X					1
Phyllanthus virgatus	Wiry Spurge	Native		X	X				X	X	X	X		6
Pimelea spp.		Native			X									1
Plantago debilis		Native										X		1
Platysace ericoides		Native				X	X							2
Poaceae indeterminate	Grasses, reeds and bamboos	Exotic							X		X	X		3
Polycarpon tetraphyllum		Exotic									X			1
Pomax umbellata	Pomax	Native	X			X	X						X	4
Poranthera microphylla		Native			X		X	X						3
Poranthera sp.		Native	X	X									X	3
Portulaca pilosa		Exotic		X				X						2
Prostanthera ringens	Gaping Mint-bush	Native											X	1
Pterostylis bicolor		Native											X	1
Pterostylis spp.		Native									X			1

Scientific Name	Common Name	Native Exotic HTE	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	WEH-1	Grand Total
Ranunculus sessiliflorus		Native								X				1
Romulea rosea var. australis		High threat								X				1
Rumex brownii	Swamp Dock	Native							X	X				2
Rytidosperma spp.		Native										X		1
Schinus spp.		Exotic								X				1
Schkuhria pinnata var. abrotanoides	Dwarf Marigold	Exotic										X		1
Schoenus kennyi		Native	X											1
Schoenus spp.		Native				X								1
Sclerolaena birchii	Galvinized Burr	Native							X		X	X		3
Senecio spp.	Groundsel, Fireweed	Native		X										1
Seringia collina		Native			X									1
Setaria parviflora		Exotic								X				1
Sida corrugata	Corrugated Sida	Native										X		1
Sida cunninghamii	Ridge Sida	Native								X			X	2
Sida hackettiana	Golden Rod, Spiked Sida, Queensland Hemp	Native								X	X			2
Sida spinosa		Exotic							X		X	X		3
Sida spp.		Native		X	X			X		X		X		5
Silene gallica		Exotic							X	X				2
Sisyrinchium spp.		Exotic								X				1
Solanum ferocissimum	Spiny Potato-bush	Native		X				X					X	3
Solanum jucundum		Native		X	X			X					X	4
Solanum parvifolium subsp. parvifolium	Nightshade	Native			X			X						2

Scientific Name	Common Name	Native Exotic HTE	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	WEH-1	Grand Total
Solanum spp.		Native										X		1
Sonchus oleraceus	Common Sowthistle	Exotic						X	X	X		X	X	5
Sonchus spp.		Native									X			1
Sporobolus creber	Slender Rat's Tail Grass	Native							X	X	X	X		4
Stuartina muelleri		Native		X	X			X						3
Thelymitra spp.		Native			X									1
Thyridolepis mitchelliana	Mulga Mitchell Grass	Native		X	X	X	X	X					X	6
Trifolium arvense		Exotic							X	X	X	X		4
Trifolium campestre	Hop Clover	Exotic							X	X	X	X		4
Trifolium glomeratum		Exotic							X	X	X	X		4
Triptilodiscus pygmaeus	Common Sunray	Native								X				1
Tylophora linearis		Native						X						1
Vaccaria gaudichaudii													X	1
Verbascum virgatum		Exotic							X					1
Verbena gaudichaudii	Verbena	Native							X					1
Vernonia cinerea		Native						X					X	2
Vittadinia dissecta		Native						X						1
Vittadinia muelleri		Native									X	X		2
Vittadinia pustulata		Native			X				X	X				3
Vittadinia spp.	Fuzzweed	Native									X	X		2
Vulpia spp.	Rat's-tail Fescue	Exotic								X	X			2
Wahlenbergia communis	Tufted Bluebell	Native							X	X	X	X	X	5
Wahlenbergia gracilis	Sprawling Bluebell	Native									X			1

Scientific Name	Common Name	Native Exotic HTE	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	WEH-1	Grand Total
Wahlenbergia graniticola		Native						X	X					2
Wahlenbergia spp.	Bluebell	Native		X	X				X	X	X	X		6
Xerochrysum bracteatum		Native		X								X		2
Xerochrysum spp.		Native			X			X	X					3

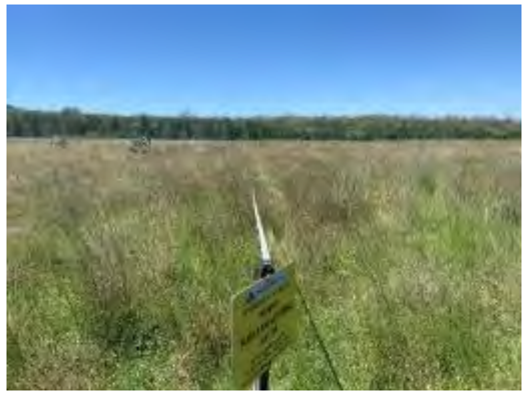
Appendix C – *Photo Monitoring Points*

Attachment A: Photo Monitoring Points

Greylands - 1

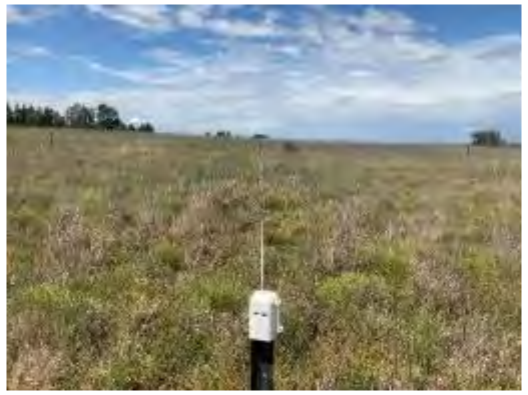
PLOT ID: FL-WSD-GRY-1-G	**MANAGEMENT COMMENCED: 2016**	**MONITORING COMMENCED: 2021**		
START	**EASTING: 772042**	**NORTHING: 6622013**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**
END	**EASTING: 772002**	**NORTHING: 6621987**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**

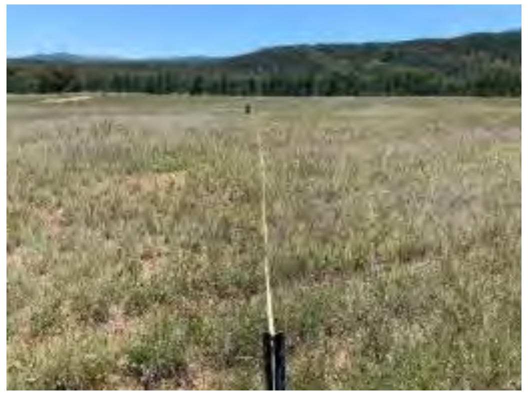
Kenna – 5

PLOT ID: FL-WSD-KEN-5-D	MANAGEMENT COMMENCED: 2020	MONITORING COMMENCED: 2014	* PHOTOS AVAILABLE FROM 2019	
START	EASTING: 236891	NORTHING: 6623818		
Year 0 – 2019*	Year 1 – 2020	Year 2 – 2021	Year 3 – 2022	Year 4 - 2023
				
Year 5 - 2024	Year 6 - 2025	Year 7 - 2026	Year 8 - 2027	Year 9 - 2028
				

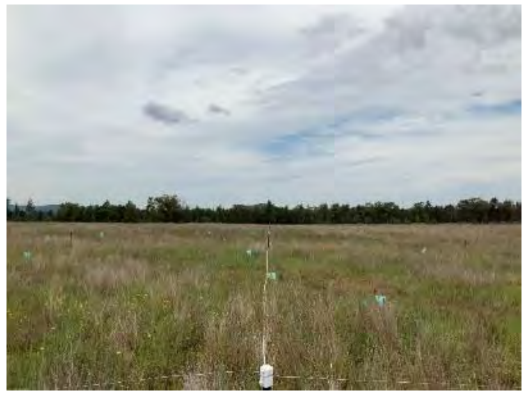
END	EASTING: 236880	NORTHING: 6623769		
Year 0 – 2019*	Year 1 – 2020	Year 2 – 2021	Year 3 – 2022	Year 4 - 2023
				
Year 5 - 2024	Year 6 - 2025	Year 7 - 2026	Year 8 - 2027	Year 9 - 2028
				

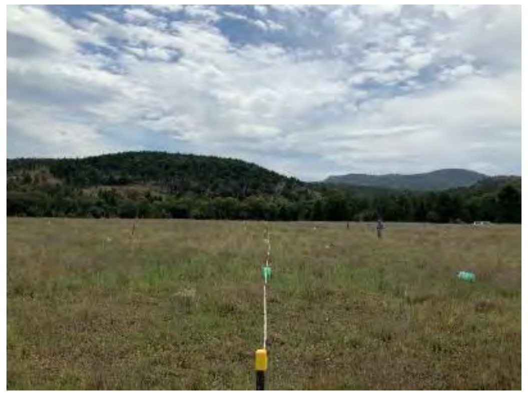
Kenna – 6

PLOT ID: FL-WSD-KEN-6-D	**MANAGEMENT COMMENCED: 2016**	**MONITORING COMMENCED: 2014**	*** PHOTOS AVAILABLE FROM 2018**	
START	**EASTING: 236996**	**NORTHING: 6622393**		
Year 3 – 2018*	**Year 4 - 2019**	**Year 5 - 2020**	**Year 6 - 2021**	**Year 7 - 2022**
				
Year 8 - 2023	**Year 9 - 2024**	**Year 10 - 2025**	**Year 11 - 2026**	**Year 12 - 2027**
				

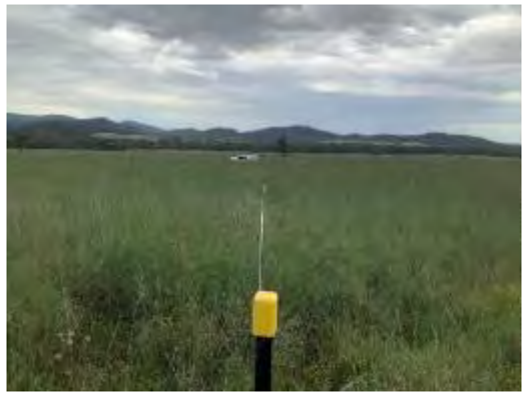
END	EASTING: 236990	NORTHING: 6622350		
Year 3 – 2018*	Year 4 - 2019	Year 5 - 2020	Year 6 - 2021	Year 7 - 2022
				
Year 8 - 2023	Year 9 - 2024	Year 10 - 2025	Year 11 - 2026	Year 12 - 2027
				

Kenna – 7

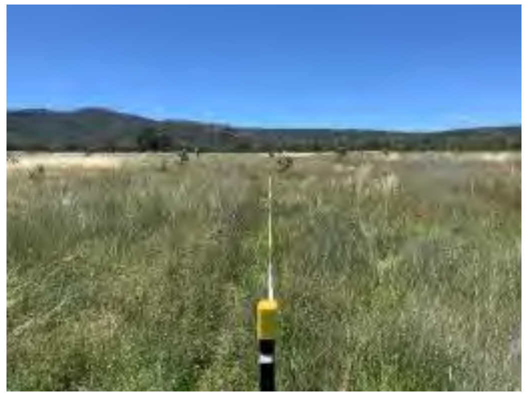
PLOT ID: FL-WSD-KEN-7-D	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2014	* PHOTOS AVAILABLE FROM 2018	
START	EASTING: 237522	NORTHING: 6622394		
Year 3 – 2018*	Year 4 - 2019	Year 5 - 2020	Year 6 - 2021	Year 7 - 2022
				
Year 8 - 2023	Year 9 - 2024	Year 10 - 2025	Year 11 - 2026	Year 12 - 2027
				

END	EASTING: 237512	NORTHING: 6622345		
Year 3 – 2018*	Year 4 - 2019	Year 5 - 2020	Year 6 - 2021	Year 7 - 2022
				
Year 8 - 2023	Year 9 - 2024	Year 10 - 2025	Year 11 - 2026	Year 12 - 2027
				

Kenna – 8

PLOT ID: FL-WSD-KEN-8-D	**MANAGEMENT COMMENCED: 2016**	**MONITORING COMMENCED: 2021**		
START	**EASTING: 237814**	**NORTHING: 6621782**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**
END	**EASTING: 237826**	**NORTHING: 6621827**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**

Kenna – 9

PLOT ID: FL-WSD-KEN-9-D	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	EASTING:	NORTHING:		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030
END	EASTING: 236675	NORTHING: 6623721		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030

Kenna – 10

PLOT ID: FL-WSD-KEN-10-G	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2014	* PHOTOS AVAILABLE FROM 2018	
START	EASTING: 237960	NORTHING: 6624186		
Year 3 – 2018*	Year 4 - 2019	Year 5 - 2020	Year 6 - 2021	Year 7 - 2022
				
Year 8 - 2023	Year 9 - 2024	Year 10 - 2025	Year 11 - 2026	Year 12 - 2027
				

END	EASTING: 237965	NORTHING: 6624142		
Year 3 – 2018*	Year 4 - 2019	Year 5 - 2020	Year 6 - 2021	Year 7 - 2022
				
Year 8 - 2023	Year 9 - 2024	Year 10 - 2025	Year 11 - 2026	Year 12 - 2027
				

Kenna – 11

PLOT ID: FL-WSD-KEN-11-G	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2014	* PHOTOS AVAILABLE FROM 2018	
START	EASTING: 237564	NORTHING: 6624008		
Year 3 – 2018*	Year 4 - 2019	Year 5 - 2020	Year 6 - 2021	Year 7 - 2022
				
Year 8 - 2023	Year 9 - 2024	Year 10 - 2025	Year 11 - 2026	Year 12 - 2027
				

END	EASTING: 237573	NORTHING: 6624060		
Year 3 – 2018*	**Year 4 - 2019**	**Year 5 - 2020**	**Year 6 - 2021**	**Year 7 - 2022**
				
Year 8 - 2023	**Year 9 - 2024**	**Year 10 - 2025**	**Year 11 - 2026**	**Year 12 - 2027**
				

Kenna – 12

PLOT ID: FL-WSD-KEN-12-G	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2014	* PHOTOS AVAILABLE FROM 2018	
START	EASTING: 237297	NORTHING: 6624220		
Year 3 – 2018*	Year 4 - 2019	Year 5 - 2020	Year 6 - 2021	Year 7 - 2022
				
Year 8 - 2023	Year 9 - 2024	Year 10 - 2025	Year 11 - 2026	Year 12 - 2027
				

END	EASTING: 237297	NORTHING: 6624165		
Year 3 – 2018*	Year 4 - 2019	Year 5 - 2020	Year 6 - 2021	Year 7 - 2022
				
Year 8 - 2023	Year 9 - 2024	Year 10 - 2025	Year 11 - 2026	Year 12 - 2027
				

Kenna – 13

PLOT ID: FL-WSD-KEN-13-G	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	**EASTING: 237097**	**NORTHING: 6622264**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**
END	**EASTING: 237080**	**NORTHING: 6622210**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**

Kenna – 14

PLOT ID: FL-WSD-KEN-14-G	**MANAGEMENT COMMENCED: 2016**	**MONITORING COMMENCED: 2021**		
START	**EASTING: 236970**	**NORTHING: 6623089**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**
END	**EASTING: 236963**	**NORTHING: 6623040**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**

Kenna – 15

PLOT ID: FL-WSD-KEN-15-G	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	EASTING: 237070	NORTHING: 6623580		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030
END	EASTING: 237052	NORTHING: 6623529		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030

Kenna – 16

PLOT ID: FL-WSD-KEN-16-G	**MANAGEMENT COMMENCED: 2016**	**MONITORING COMMENCED: 2014**	*** PHOTOS AVAILABLE FROM 2018**	
START	**EASTING: 234272**	**NORTHING: 6624557**		
Year 3 – 2018*	**Year 4 - 2019**	**Year 5 - 2020**	**Year 6 - 2021**	**Year 7 - 2022**
NO PHOTO AVAILABLE	NO PHOTO AVAILABLE	NO PHOTO AVAILABLE		
Year 8 - 2023	**Year 9 - 2024**	**Year 10 - 2025**	**Year 11 - 2026**	**Year 12 - 2027**
				

END	EASTING: 234266	NORTHING: 6624511		
Year 3 – 2018*	Year 4 - 2019	Year 5 - 2020	Year 6 - 2021	Year 7 - 2022
		NO PHOTO AVAILABLE		
Year 8 - 2023	Year 9 - 2024	Year 10 - 2025	Year 11 - 2026	Year 12 - 2027
				

Kenna – 17

PLOT ID: FL-WSD-KEN-17-S	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2014	* PHOTOS AVAILABLE FROM 2020	
START	**EASTING: 236475**	**NORTHING: 6623523**		
Year 5 – 2020*	**Year 6 - 2021**	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**
				
Year 10 - 2025	**Year 11 - 2026**	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**
END	**EASTING: 236468**	**NORTHING: 6623472**		
Year 5 – 2020*	**Year 6 - 2021**	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**
				
Year 10 - 2025	**Year 11 - 2026**	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**

Kenna – 18

PLOT ID: FL-WSD-KEN-18-S	**MANAGEMENT COMMENCED: 2016**	**MONITORING COMMENCED: 2014**	*** PHOTOS AVAILABLE FROM 2018**	
START	**EASTING: 236284**	**NORTHING: 6624183**		
Year 3 – 2018*	**Year 4 - 2019**	**Year 5 - 2020**	**Year 6 - 2021**	**Year 7 - 2022**
				
Year 8 - 2023	**Year 9 - 2024**	**Year 10 - 2025**	**Year 11 - 2026**	**Year 12 - 2027**
				

END	EASTING: 236291	NORTHING: 6624231		
Year 3 – 2018*	Year 4 - 2019	Year 5 - 2020	Year 6 - 2021	Year 7 - 2022
				
Year 8 - 2023	Year 9 - 2024	Year 10 - 2025	Year 11 - 2026	Year 12 - 2027
				

Kenna – 19

PLOT ID: FL-WSD-KEN-19-S	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	**EASTING: 234140**	**NORTHING: 6625283**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**
END	**EASTING: 234108**	**NORTHING: 6625321**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**

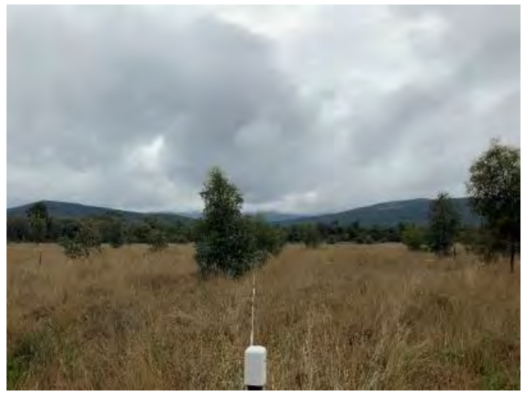
Kenna – 20

PLOT ID: FL-WSD-KEN-20-S	**MANAGEMENT COMMENCED: 2016**	**MONITORING COMMENCED: 2021**		
START	**EASTING: 234293**	**NORTHING: 6624851**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**
END	**EASTING: 234308**	**NORTHING: 6624803**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**

Kenna – 21

PLOT ID: FL-WSD-KEN-21-S	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	EASTING: 235300	NORTHING: 6623419		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030
END	EASTING: 235304	NORTHING: 6623467		
Year 6 - 2021	Year 7 - 2022	Year 8 – 2023 (end point moved)	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030

Kenna – 22

PLOT ID: FL-WSG-KEN-22-D	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2014	* PHOTOS AVAILABLE FROM 2018	
START	EASTING: 236383	NORTHING: 6624974		
Year 3 – 2018*	Year 4 - 2019	Year 5 – 2020 (Start and end swapped)	Year 6 - 2021	Year 7 - 2022
				
Year 8 – 2023 (start and end point moved)	Year 9 - 2024	Year 10 - 2025	Year 11 - 2026	Year 12 - 2027
				

END	**EASTING: 236375**	**NORTHING: 6625023**		
Year 3 – 2018*	**Year 4 - 2019**	**Year 5 – 2020 (Start and end swapped)**	**Year 6 - 2021**	**Year 7 - 2022**
				
Year 8 – 2023 (start and end point moved)	**Year 9 - 2024**	**Year 10 - 2025**	**Year 11 - 2026**	**Year 12 - 2027**
				

Kenna – 23

PLOT ID: FL-WSG-KEN-23-D	MANAGEMENT COMMENCED: 2019	MONITORING COMMENCED: 2014	* PHOTOS AVAILABLE FROM 2018	
START	EASTING: 234687	NORTHING: 6625266		
Year 0 – 2018*	Year 1 – 2019	Year 2 - 2020	Year 3 - 2021	Year 4 - 2022
				
Year 5 - 2023	Year 6 - 2024	Year 7 - 2025	Year 8 - 2026	Year 9 - 2027
				

END	**EASTING: 234715**	**NORTHING: 6625312**		
Year 0 – 2018*	**Year 1 – 2019**	**Year 2 - 2020**	**Year 3 - 2021**	**Year 4 - 2022**
				
Year 5 – 2023 (end point moved)	**Year 6 - 2024**	**Year 7 - 2025**	**Year 8 - 2026**	**Year 9 - 2027**
				

Kenna – 24

PLOT ID: FL-WSG-KEN-24-D	**MANAGEMENT COMMENCED: 2016**	**MONITORING COMMENCED: 2021**		
START	**EASTING: 236557**	**NORTHING: 6623986**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**
END	**EASTING: 236547**	**NORTHING: 6624037**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**

Kenna – 25

PLOT ID: FL-WSG-KEN-25-D	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	EASTING: 235968	NORTHING: 6624792		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030
END	EASTING: 235975	NORTHING: 6624842		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030

Kenna – 26

PLOT ID: FL-WSG-KEN-26-D	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	**EASTING: 235876**	**NORTHING: 6623240**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**
END	**EASTING: 235925**	**NORTHING: 6623228**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**

Kenna – 27

PLOT ID: FL-WSG-KEN-27-D	**MANAGEMENT COMMENCED: 2016**	**MONITORING COMMENCED: 2021**		
START	**EASTING: 236049**	**NORTHING: 6624460**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**
END	**EASTING: 236085**	**NORTHING: 6624434**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**

Kenna – 28

PLOT ID: FL-WSG-KEN-28-D	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	**EASTING: 235068**	**NORTHING: 6624719**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**
END	**EASTING: 235020**	**NORTHING: 6624697**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**

Kenna – 29

PLOT ID: FL-WSG-KEN-29-S	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2014	* PHOTOS AVAILABLE FROM 2018	
START	EASTING: 233741	NORTHING: 6625134		
Year 3 – 2018*	Year 4 - 2019	Year 5 - 2020	Year 6 - 2021	Year 7 - 2022
				
Year 8 - 2023	Year 9 - 2024	Year 10 - 2025	Year 11 - 2026	Year 12 - 2027
				

END	EASTING: 233755	NORTHING: 6625184		
Year 3 – 2018*	**Year 4 - 2019**	**Year 5 - 2020**	**Year 6 - 2021**	**Year 7 - 2022**
NO PHOTO AVAILABLE				
Year 8 - 2023	**Year 9 - 2024**	**Year 10 - 2025**	**Year 11 - 2026**	**Year 12 - 2027**
				

Kenna – 30

PLOT ID: FL-WSG-KEN-30-S	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2014	* PHOTOS AVAILABLE FROM 2018	
START	EASTING: 235949	NORTHING: 6625112		
Year 3 – 2018*	Year 4 - 2019	Year 5 - 2020	Year 6 - 2021	Year 7 - 2022
				
Year 8 - 2023	Year 9 - 2024	Year 10 - 2025	Year 11 - 2026	Year 12 - 2027
				

END	EASTING: 235931	NORTHING: 6625068		
Year 3 – 2018*	Year 4 - 2019	Year 5 - 2020	Year 6 - 2021	Year 7 - 2022
				
Year 8 - 2023	Year 9 - 2024	Year 10 - 2025	Year 11 - 2026	Year 12 - 2027
				

Kenna – 31

PLOT ID: FL-WSG-KEN-31-S	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2014	* PHOTOS AVAILABLE FROM 2018	
START	EASTING: 235935	NORTHING: 6624213		
Year 3 – 2018*	Year 4 - 2019	Year 5 - 2020	Year 6 - 2021	Year 7 - 2022
				
Year 8 - 2023	Year 9 - 2024	Year 10 - 2025	Year 11 - 2026	Year 12 - 2027
				

END	EASTING: 235926	NORTHING: 6624167		
Year 3 – 2018*	Year 4 - 2019	Year 5 - 2020	Year 6 - 2021	Year 7 - 2022
				
Year 8 - 2023	Year 9 - 2024	Year 10 - 2025	Year 11 - 2026	Year 12 - 2027
				

Kenna – 32

PLOT ID: FL-WSG-KEN-32-S	**MANAGEMENT COMMENCED: 2016**	**MONITORING COMMENCED: 2021**		
START	**EASTING: 235629**	**NORTHING: 6624014**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**
END	**EASTING: 235673**	**NORTHING: 6623986**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**

Rosevale – 1

PLOT ID: FL-WSD-ROV-1-G	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	EASTING: 774876	NORTHING: 6625271		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030
END	EASTING: 774843	NORTHING: 6625302		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030

Rosevale – 2

PLOT ID: FL-WSD-ROV-2-G	**MANAGEMENT COMMENCED: 2016**	**MONITORING COMMENCED: 2021**		
START	**EASTING: 774785**	**NORTHING: 6624729**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**
END	**EASTING: 774738**	**NORTHING: 6624717**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**

Rosevale – 3

PLOT ID: FL-WSD-ROV-3-G	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	EASTING: 773697	NORTHING: 6625385		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030
END	EASTING: 773739	NORTHING: 6625364		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030

Rosevale – 4

PLOT ID: FL-WSD-ROV-4-G	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	EASTING: 773626	NORTHING: 6625135		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030
END	EASTING: 773678	NORTHING: 6625141		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030

Rosevale – 5

PLOT ID: FL-WSD-ROV-5-G	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	EASTING: 774783	NORTHING: 6625874		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030
END	EASTING: 774748	NORTHING: 6625907		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030

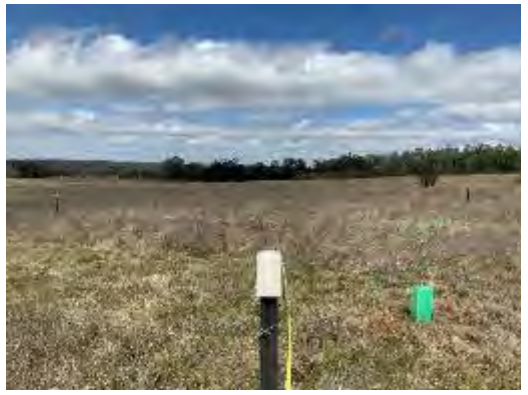
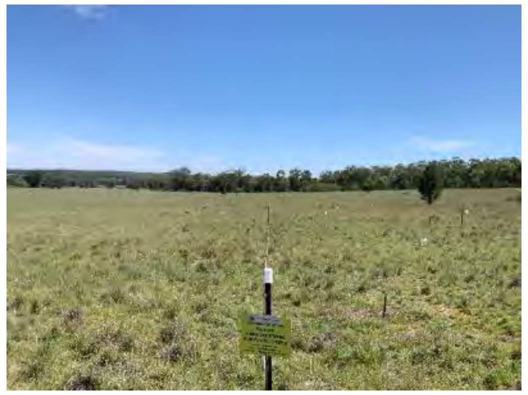
Rosevale – 6

PLOT ID: FL-WSD-ROV-6-D	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	**EASTING: 774822**	**NORTHING: 6624361**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**
END	**EASTING: 774865**	**NORTHING: 6624384**		
Year 6 - 2021	**Year 7 - 2022**	**Year 8 - 2023**	**Year 9 - 2024**	**Year 10 - 2025**
				
Year 11 - 2026	**Year 12 - 2027**	**Year 13 - 2028**	**Year 14 - 2029**	**Year 15 - 2030**

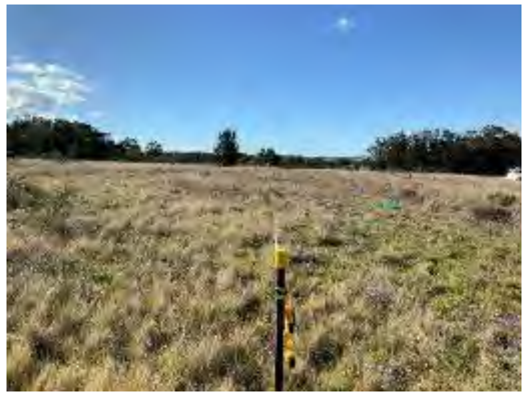
Rosevale – 7

PLOT ID: FL-WSG-ROV-7-D	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	EASTING: 775169	NORTHING: 6625904		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030
END	EASTING: 775209	NORTHING: 6625942		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030

Rosevale – 8

PLOT ID: FL-WSD-ROV-8-D	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	EASTING: 774966	NORTHING: 6624662		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030
END	EASTING: 774936	NORTHING: 6624620		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030

Rosevale – 9

PLOT ID: FL-WSD-ROV-9-D	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	EASTING: 775107	NORTHING: 6625276		
Year 6 - 2021	Year 7 - 2022	Year 8 – 2023 (start & end point moved)	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030
END	EASTING: 775098	NORTHING: 6625228		
Year 6 - 2021	Year 7 - 2022	Year 8 – 2023 (start & end point moved)	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030

West Haven – 1

PLOT ID: FL-WSD-WEH-1-G	MANAGEMENT COMMENCED: 2016	MONITORING COMMENCED: 2021		
START	EASTING: 772007	NORTHING: 6620721		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030
END	EASTING: 771956	NORTHING: 6620721		
Year 6 - 2021	Year 7 - 2022	Year 8 - 2023	Year 9 - 2024	Year 10 - 2025
				
Year 11 - 2026	Year 12 - 2027	Year 13 - 2028	Year 14 - 2029	Year 15 - 2030

Appendix D – *Fauna Species List*

Species	ROS-BM-01	ROS-BM-02	ROS-BM-03	ROS-BM-04	ROS-BM-05	ROS-BM-06	ROS-BM-07	ROS-BM-08	ROS-BM-09	ROS-BM-10	ROS-BM-13	ROS-BM-14	CAM-ROV-01	CAM-ROV-02	Total
Rosevale															
Struthidea cinerea	3				12		18								**33**
Gymnorhina tibicen		6				1		4			4				**15**
Corvus coronoides		2	4	1	2	1	1		2	1					**14**
Geopelia humeralis						1	4	2	2	2		3			**14**
Coracina novaehollandiae					1				0	2		1			**4**
Lichmera indistincta							1								**1**
Climacteris picumnus victoriae				1											**1**
Phaps chalcoptera		3		1	2				4		3	1			**14**
Ocyphaps lophotes		1			2		3				2				**8**
Stizoptera bichenovii				4		5	9				1	2			**21**
Eopsaltria australis		3		8	1	1	2		1	2	4				**22**
Cacomantis flabelliformis										1					**1**
Pachycephala pectoralis				2	1	4				1	1				**9**
Cracticus torquatus		2					1								**3**
Rhipidura albiscapa		1		5		4	6			1		3			**20**
Colluricincla harmonica							2	1		3	2	2			**10**
Pomatostomus temporalis temporalis					6			3			4				**13**
Acanthiza apicalis				5		3	7			1	3	4			**23**
Myiagra rubecula								1		1					**2**
Grallina cyanoleuca		1				1	4			3	2				**11**
Dicaeum hirundinaceum		1			1		1								**3**
Philemon corniculatus		12		3			4	24	4	2	2				**51**
Manorina melanocephala					11				12						**23**
Geopelia striata		1		1			2								**4**
Cracticus nigrogularis					1		2					2			**5**
Strepera graculina						1	1		4		2	4			**12**
Merops ornatus		21		4	4	24	1	3		1		1			**59**
Psephotus haematonotus											2				**2**
Pachycephala rufiventris		4		6	5	1	5	1	5		4	6			**37**
Todiramphus sanctus										1		1			**2**
Chalcites lucidus						1									**1**

Chthonicola sagittata				10		1	5			1		1			**18**
Acanthagenys rufogularis		1			2	4	3			1	1	1			**13**
Pardalotus striatus		5									1				**6**
Plectorhyncha lanceolata		4					4	5							**13**
Malurus cyaneus			4			7				2					**13**
Neophema pulchella				2											**2**
Corvus orru				1		2									**3**
Daphoenositta chrysoptera		4				1									**5**
Smicrornis brevirostris		2		3	2	2	2	3	1	1	1	4			**21**
Gerygone fusca			1		1		2				1				**5**
Artamus leucorynchus											4				**4**
Gerygone olivacea										1					**1**
Cormobates leucophaea									3		1				**4**
Corcorax melanorhamphos		9			5			1							**15**
Rhipidura leucophrys		1	1		2		5	2				1			**12**
Acanthiza nana						6	9		4	1	1	4			**25**
Caligavis chrysops				4			2								**6**
Osphranter robustus													7		**7**
Macropus giganteus													11	3	**14**
Dromaius novaehollandiae													11	1	**12**
Capra hircus													12		**12**
Sus scrofa														3	**3**
Vulpes vulpes													2		**2**
Macropus rufogriseus													4		**4**
Wallabia bicolor													7		**7**
Total	**3**	**84**	**10**	**61**	**61**	**71**	**106**	**50**	**42**	**29**	**46**	**41**	**55**	**8**	**667**

Appendix E – *Surface Water Monitoring*

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
A1	16.01.2024	5423	<5	9.02	2	19	
	20.02.2024	6238	<5	9.43	8	44	
	19.03.2024	6271	<5	9.25	22	20	
	16.04.2024	6374	8	9.09	7	8	
	21.05.2024	6252	<5	8.89	11	11	
	18.06.2024	3647	<5	9.00	6	<5	
	17.07.2024	4585	<5	8.91	20	<5	
	20.08.2024	4363	<5	8.87	12	<5	
	17.09.2024	4225	<5	9.13	7	<5	
	21.10.2024	5654	<5	9.02	10	<5	
	20.11.2024	6404	<5	9.19	12	21	
	17.12.2024	5844	<5	9.25	8	10	
A2	16.01.2024	5081	<5	8.91	4	20	
	20.02.2024	6318	<5	9.26	11	12	
	19.03.2024	6137	26	8.88	44	16	
	16.04.2024	6339	11	8.98	32	14	
	21.05.2024	6444	<5	8.80	9	6	
	18.06.2024	6191	<5	8.97	8	9	
	17.07.2024	4344	8	8.84	12	16	
	20.08.2024	4031	<5	8.83	10	14	
	17.09.2024	3657	<5	8.78	4	10	
	21.10.2024	6365	<5	8.93	8	10	
	20.11.2024	6375	<5	9.13	8	<5	
	17.12.2024	5266	<5	9.14	9	16	
A3	16.01.2024	5160	<5	8.87	11	44	
	20.02.2024	5953	<5	9.04	14	24	
	19.03.2024	6251	27	8.92	47	37	
	16.04.2024	6427	9	8.83	9	38	
	21.05.2024	6474	<5	8.74	9	19	
	18.06.2024	6385	<5	8.95	5	32	
	17.07.2024	4186	8	8.86	35	36	
	20.08.2024	3903	6	8.67	10	28	
	17.09.2024	3589	<5	8.80	4	19	
	21.10.2024	6018	<5	8.98	9	27	
	20.11.2024	4143	<5	8.99	10	23	
	17.12.2024	5693	18	9.12	18	61	

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
B1	16.01.2024	724	<5	8.00	3	6	
	20.02.2024	820	<5	8.52	7	50	
	19.03.2024	757	<5	8.28	8	<5	
	16.04.2024	750	<5	7.84	5	<5	
	21.05.2024	941	<5	8.91	6	78	
	18.06.2024	671	<5	8.33	5	<5	
	17.07.2024	549	<5	8.17	5	6	
	20.08.2024	449	<5	7.91	6	<5	
	17.09.2024	460	<5	8.05	5	<5	
	21.10.2024	653	<5	7.71	5	<5	
	20.11.2024	804	<5	7.96	7	<5	
	17.12.2024	731	<5	8.05	7	<5	
B2	16.01.2024	–	–	–	–	–	Too Low to Sample
	20.02.2024	17870	<5	9.75	65	233	
	19.03.2024	10040	<5	9.65	44	480	
	16.04.2024	31200	<5	9.70	70	50	
	21.05.2024	26470	<5	9.66	66	74	
	18.06.2024	20760	<5	9.74	38	31	
	17.07.2024	15130	<5	9.68	324	94	
	20.08.2024	–	–	–	–	–	Too Low to Sample
	17.09.2024	–	–	–	–	–	Too Low to Sample
	21.10.2024	–	–	–	–	–	Too Low to Sample
	20.11.2024	–	–	–	–	–	Too Low to Sample
	17.12.2024	–	–	–	–	–	Too Low to Sample
Box Cut	09.01.2024	4725	7	8.75	22	318	
	22.02.2024	4453	94	8.77	9	868	
	13.03.2024	4971	44	8.85	41	405	
	09.04.2024	429	10	8.41	60	207	
	14.05.2024	8646	13	8.76	<1	252	
	12.06.2024	3440	10	8.69	16	1000	
	09.07.2024	2994	150	8.98	92	27800	
	13.08.2024	4915	94	8.7	165	474	
	11.09.2024	3918	<5	8.82	<1	242	
	09.10.2024	5742	14	8.87	1390	2850	
	13.11.2024	5532	<5	8.58	27	550	
	10.12.2024	6107	<5	8.8	7	719	

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
C	16.01.2024	34750	<5	9.71	34	124	
	20.02.2024	42570	<5	9.83	<1	470	
	19.03.2024	45880	<5	9.79	454	876	
	16.04.2024	48540	10	9.68	12	28	
	21.05.2024	45270	<5	9.72	79	44	
	18.06.2024	40010	<5	9.93	122	188	
	17.07.2024	27920	7	9.87	878	24	
	20.08.2024	18290	7	9.65	250	230	
	17.09.2024	18890	<5	9.66	<1	32	
	21.10.2024	29280	<5	9.76	57	36	
	20.11.2024	28640	<5	9.74	15	201	
	17.12.2024	25530	6	9.85	43	53	
D	16.01.2024	577	<5	8.27	<1	36	
	20.02.2024	596	<5	8.46	<1	52	
	19.03.2024	675	<5	8.46	6	36	
	16.04.2024	762	<5	8.26	4	34	
	21.05.2024	978	<5	8.08	3	28	
	18.06.2024	785	<5	8.38	<1	<5	
	17.07.2024	593	<5	8.10	4	17	
	20.08.2024	421	<5	7.92	7	<5	
	17.09.2024	454	<5	8.19	7	19	
	21.10.2024	646	<5	8.57	7	46	
	20.11.2024	668	<5	8.38	14	28	
	17.12.2024	695	<5	8.92	10	7	
SB1	09.01.2024	5170	<5	8.92	4	46	
	27.02.2024	5284	43	8.94	19	671	
	12.03.2024	5262	22	8.96	50	689	
	09.04.2024	–	–	–	–	–	No Access
	14.05.2024	6571	<5	8.81	16	49	
	12.06.2024	6366	<5	8.97	106	60	
	09.07.2024	3995	12	9.16	13	229	
	13.08.2024	4192	<5	8.93	6	50	
	11.09.2024	3897	<5	9.0	6	15	
	09.10.2024	4566	<5	8.88	10	78	
	12.11.2024	5895	<5	8.97	32	52	
	10.12.2024	5063	<5	9.03	8	110	

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
SB2	09.01.2024	5158	<5	8.99	15	133	
	27.02.2024	1600	6	9.23	23	53	
	12.03.2024	6404	37	9.02	40	80	
	09.04.2024	5818	11	9.0	22	35	
	14.05.2024	5510	<5	8.96	7	7	
	12.06.2024	4590	<5	9.06	4	7	
	09.07.2024	2966	<5	9.29	4	16	
	13.08.2024	3566	<5	9.04	4	22	
	11.09.2024	3541	<5	9.06	3	6	
	09.10.2024	3524	<5	9.08	8	22	
	12.11.2024	4785	<5	9.26	26	20	
	10.12.2024	3390	<5	9.29	37	<5	
SB3	09.01.2024	8070	<5	9.51	20	46	
	27.02.2024	10410	18	9.83	54	20	
	12.03.2024	11200	17	9.79	61	26	
	09.04.2024	9462	13	9.82	89	109	
	14.05.2024	2915	<5	9.73	66	48	
	12.06.2024	5688	<5	9.68	22	49	
	09.07.2024	2410	<5	9.28	13	67	
	13.08.2024	4522	<5	9.44	28	54	
	11.09.2024	4980	<5	9.58	28	48	
	09.10.2024	6104	<5	9.56	240	42	
	12.11.2024	–	–	–	–	–	Too Low to Sample
	10.12.2024	2572	<5	9.94	24	26	
SB4	09.01.2024	5197	<5	9.29	11	17	
	27.02.2024	6817	<5	9.63	15	85	
	12.03.2024	7304	<5	9.63	23	18	
	09.04.2024	6529	<5	9.54	17	15	
	14.05.2024	4896	<5	9.5	9	9	
	12.06.2024	4226	<5	9.7	8	11	
	09.07.2024	2918	<5	9.88	8	29	
	13.08.2024	2892	<5	9.59	43	28	
	11.09.2024	3003	<5	9.69	18	11	
	09.10.2024	3126	<5	9.42	10	35	
	12.11.2024	4611	<5	9.59	81	28	
	10.12.2024	2890	<5	9.47	10	32	

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
SD1	09.01.2024	607	<5	8.18	27	40	
	27.02.2024	930	<5	8.81	23	29	
	12.03.2024	1032	<5	8.62	25	40	
	09.04.2024	1790	<5	9.26	21	33	
	14.05.2024	1010	<5	8.18	39	40	
	12.06.2024	407	<5	7.94	12	44	
	09.07.2024	250	<5	8.77	14	34	
	13.08.2024	653	<5	8.18	15	16	
	11.09.2024	2080	<5	8.7	15	6	
	09.10.2024	2146	<5	8.76	20	29	
	12.11.2024	3398	<5	8.94	21	12	
	10.12.2024	632	<5	8.65	28	19	
SD2	09.01.2024	901	<5	8.68	30	92	
	27.02.2024	5500	46	9.03	55	96	
	12.03.2024	1943	<5	9.35	29	55	
	09.04.2024	1142	<5	8.74	36	94	
	14.05.2024	1116	<5	8.86	18	62	
	12.06.2024	430	<5	7.77	11	<5	
	09.07.2024	280	<5	7.73	13	<5	
	13.08.2024	314	<5	8.1	12	11	
	11.09.2024	462	<5	8.45	12	<5	
	09.10.2024	507	<5	8.59	12	6	
	12.11.2024	807	<5	8.48	13	<5	
	10.12.2024	448	<5	9.01	14	12	
SD3	09.01.2024	1098	<5	8.97	19	38	
	27.02.2024	1480	<5	9.09	21	33	
	12.03.2024	1406	<5	9.3	26	66	
	09.04.2024	1678	<5	8.88	22	63	
	14.05.2024	1332	<5	8.44	17	74	
	12.06.2024	749	<5	8.25	11	59	
	09.07.2024	469	<5	8.99	10	176	
	13.08.2024	508	<5	8.46	9	55	
	11.09.2024	590	<5	8.52	11	18	
	09.10.2024	599	<5	8.37	11	16	
	12.11.2024	977	<5	8.25	13	21	
	10.12.2024	424	<5	7.84	10	71	

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
SD4	09.01.2024	3709	<5	9.39	26	34	
	27.02.2024	4861	<5	9.6	30	39	
	12.03.2024	5221	<5	9.58	31	15	
	09.04.2024	5152	<5	9.48	22	17	
	14.05.2024	3889	<5	9.41	20	14	
	12.06.2024	1717	<5	9.23	<1	22	
	09.07.2024	1045	<5	9.08	10	42	
	13.08.2024	954	<5	8.71	10	7	
	11.09.2024	1146	<5	8.9	10	7	
	09.10.2024	1241	<5	8.99	9	24	
	12.11.2024	2033	<5	9.24	13	6	
	10.12.2024	806	<5	8.26	9	77	
SD6	09.01.2024	1081	<5	8.95	18	28	
	27.02.2024	1292	<5	9.16	22	37	
	12.03.2024	1282	<5	8.62	26	56	
	09.04.2024	1386	<5	8.75	24	8	
	14.05.2024	829	<5	8.67	21	<5	
	12.06.2024	1074	<5	8.52	17	<5	
	09.07.2024	671	<5	8.61	14	28	
	13.08.2024	721	<5	8.74	18	<5	
	11.09.2024	747	<5	9.09	16	6	
	09.10.2024	775	<5	8.92	19	16	
	12.11.2024	1171	<5	8.72	16	12	
	10.12.2024	825	<5	8.68	14	32	
SD7	09.01.2024	468	<5	8.18	11	77	
	27.02.2024	541	<5	8.7	10	26	
	12.03.2024	615	<5	8.49	13	12	
	09.04.2024	292	<5	8.36	10	92	
	14.05.2024	224	<5	8.7	6	295	
	12.06.2024	149	<5	8.77	5	128	
	09.07.2024	136	<5	9.22	5	519	
	13.08.2024	109	<5	9.15	5	52	
	11.09.2024	188	<5	8.58	8	57	
	09.10.2024	173	<5	8.68	2	140	
	12.11.2024	295	<5	8.61	7	37	
	10.12.2024	136	<5	8.23	6	152	

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
SD8	09.01.2024	1731	<5	10.42	11	68	
	27.02.2024	2774	<5	11.42	15	70	
	12.03.2024	2666	<5	11.2	20	42	
	09.04.2024	2107	<5	10.54	12	74	
	14.05.2024	1976	<5	10.36	11	53	
	12.06.2024	1667	<5	10.84	10	49	
	09.07.2024	1141	<5	10.60	9	73	
	13.08.2024	1129	<5	10.2	10	40	
	11.09.2024	1132	<5	9.93	9	<5	
	09.10.2024	1194	<5	9.6	11	19	
	12.11.2024	1762	<5	9.32	10	16	
	10.12.2024	519	<5	8.39	7	38	
SD9	09.01.2024	89	<5	9.05	5	280	
	27.02.2024	173	<5	8.58	<1	181	
	12.03.2024	146	<5	8.52	8	172	
	05.04.2024	396	<5	7.21	4	906	EPL Discharge Sample [1]
	06.04.2024	131	<5	8.33	5	239	EPL Discharge Sample [1]
	07.04.2024	132	<5	8.43	5	254	EPL Discharge Sample [1]
	08.04.2024	144	<5	7.76	5	142	EPL Discharge Sample [1]
	09.04.2024	167	<5	8.45	6	113	EPL Discharge Sample [1]
	13.05.2024	198	<5	7.73	–	219	EPL Discharge Sample [1]
	14.05.2024	112	<5	8.24	4	396	EPL Discharge Sample [1]
	16.05.2024	94	<5	8.14	4	143	EPL Discharge Sample [1]
	30.05.2024	89	<5	7.65	8	66	
	01.06.2024	47	<5	7.38	7	688	EPL Discharge Sample [1]
	02.06.2024	61	<5	8.31	7	723	EPL Discharge Sample [1]
	03.06.2024	83	<5	8.31	5	421	EPL Discharge Sample [1]
	04.06.2024	147	<5	7.94	3	343	EPL Discharge Sample [1]
	12.06.2024	–	–	–	–	–	Too Low to Sample
	09.07.2024	84	<5	8.47	3	589	
	13.08.2024	83	<5	8.33	4	90	
	11.09.2024	101	<5	8.61	4	124	
	09.10.2024	–	–	–	–	–	Too Low to Sample
	12.11.2024	–	–	–	–	–	Too Low to Sample
	30.11.2024	259	<5	8.4	9	175	EPL Discharge Sample [1]
	02.12.2024	1844	<5	7.51	28	466	

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
	02.12.2024	1694	<5	7.46	32	411	EPL Discharge Sample [1]
	03.12.2024	328	<5	7.38	9	1900	EPL Discharge Sample [1]
	04.12.2024	965	<5	7.25	14	950	EPL Discharge Sample [1]
	05.12.2024	884	<5	6.74	11	1670	EPL Discharge Sample [1]
	10.12.2024	–	–	–	–	–	Too Low to Sample
NRUS	03.01.2024	440	<5	7.49	7	74	
	02.07.2024	395	<5	7.52	7	31	
	05.03.2024	544	<5	8.02	23	26	
	03.04.2024	615	<5	7.98	7	22	
	08.05.2024	653		7.98	6	22	
	15.05.2024	671	<5	8.16	6	32	
	05.06.2024	874	<5	7.97	5	150	
	04.07.2024	899	<5	7.95	5	18	
	07.08.2024	167	<5	7.09	10	176	
	03.09.2024	396	<5	7.56	7	54	
	02.10.2024	396	<5	7.56	6	30	
	06.11.2024	787	<5	8.07	6	35	
	03.12.2024	336	<5	7.28	13	65	

1. In accordance with EPL 12789 Condition L 2.5 the Total Suspended Solids concentration limit specified may be exceeded from water discharged provided that the discharge occurs solely as a result of rainfall measured at the premises that exceeds 38.4 millimeters over any consecutive 5 day period immediately prior to the discharge occurring.

Appendix F – *Groundwater Review (AGE)*

Australasian Groundwater & Environmental Consultants

Report on

Narrabri Mine 2024 Groundwater Review

Prepared for

Narrabri Coal Operations Pty Ltd

Project No. NAR5018.001
March 2025

ageconsultants.com.au

ABN 64 080 238 642

Document details and history

Document details

Project number	NAR5018.001
Document title	Narrabri Mine 2024 Annual Groundwater Review
Site address	10 Kurrajong Creek Road BAAN BAA NSW 2390
File name	NAR5018.001 Narrabri Mine 2024 Annual Groundwater Review v02.02

Document status and review

Edition	Comments	Author	Authorised by	Date
v01.01	Draft	KJ/TR/AV	PL	17/03/2025
v01.02	Draft – internal review	KJ	PL	26/03/2025
v02.02	Final – updated after NCOPL	KJ	PL	28/03/2025

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Narrabri Mine 2024 Annual Groundwater Review

1 Introduction

The Narrabri Mine is an underground coal mine located in the Gunnedah Coalfield, approximately 25 km southeast of Narrabri and 60 km northwest of Gunnedah. The operation is situated within the Narrabri Shire Council (NSC) Local Government Area, in New South Wales (NSW). It is operated by Narrabri Coal Operations Pty Ltd (NCOPL), on behalf of the Narrabri Mine Joint Venture, which consists of two Whitehaven Coal Limited's (WHC) wholly owned subsidiaries (77.5% ownership), and three other joint-venture partners (each with 7.5% share).

Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) were engaged by NCOPL to review the available groundwater monitoring data and provide an annual review of the performance of the groundwater monitoring network. In addition to the annual review NCOPL also engaged AGE to review and report on water level and quality exceedances, these are included in sections 6.9 and 7.8. This review is conducted under the framework of the approved Stage 2 groundwater monitoring program (GWMP) which forms Attachment 5 of the Narrabri Mine Water Management Plan (WMP) (Whitehaven, 2013). This annual report describes the monitoring results for the period 1 January 2024 to 31 December 2024.

2 Background

2.1 Mining

Stage 1 of the Narrabri Mine was approved under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act, 1979) in 2007 and involved initial site establishment activities and continuous miner, mining operations. Project Approval (PA) 08_0144 for Stage 2 of the Narrabri Mine was issued under Part 3A of the EP&A Act in 2010 and allowed the Narrabri Mine to convert to a longwall mining operation. PA 08_0144 has subsequently been modified on seven occasions[1].

The Narrabri Mine, incorporating Stages 1 and 2, extracts coal from the Hoskissons Coal Seam. PA 08_0144 allows for the production and processing of up to 11 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal until July 2031. The approved Narrabri Mine comprises 20 longwall panels these include longwalls (LW) 101 to 111 and 201 to 209 (Figure 2.1). Longwall mining of LW101 commenced in 2012 and has progressed sequentially to LW110 (Table 2.1) followed by mining LW203. This annual report reviews groundwater monitoring for the 2024 calendar year during which time LW203 was mined.

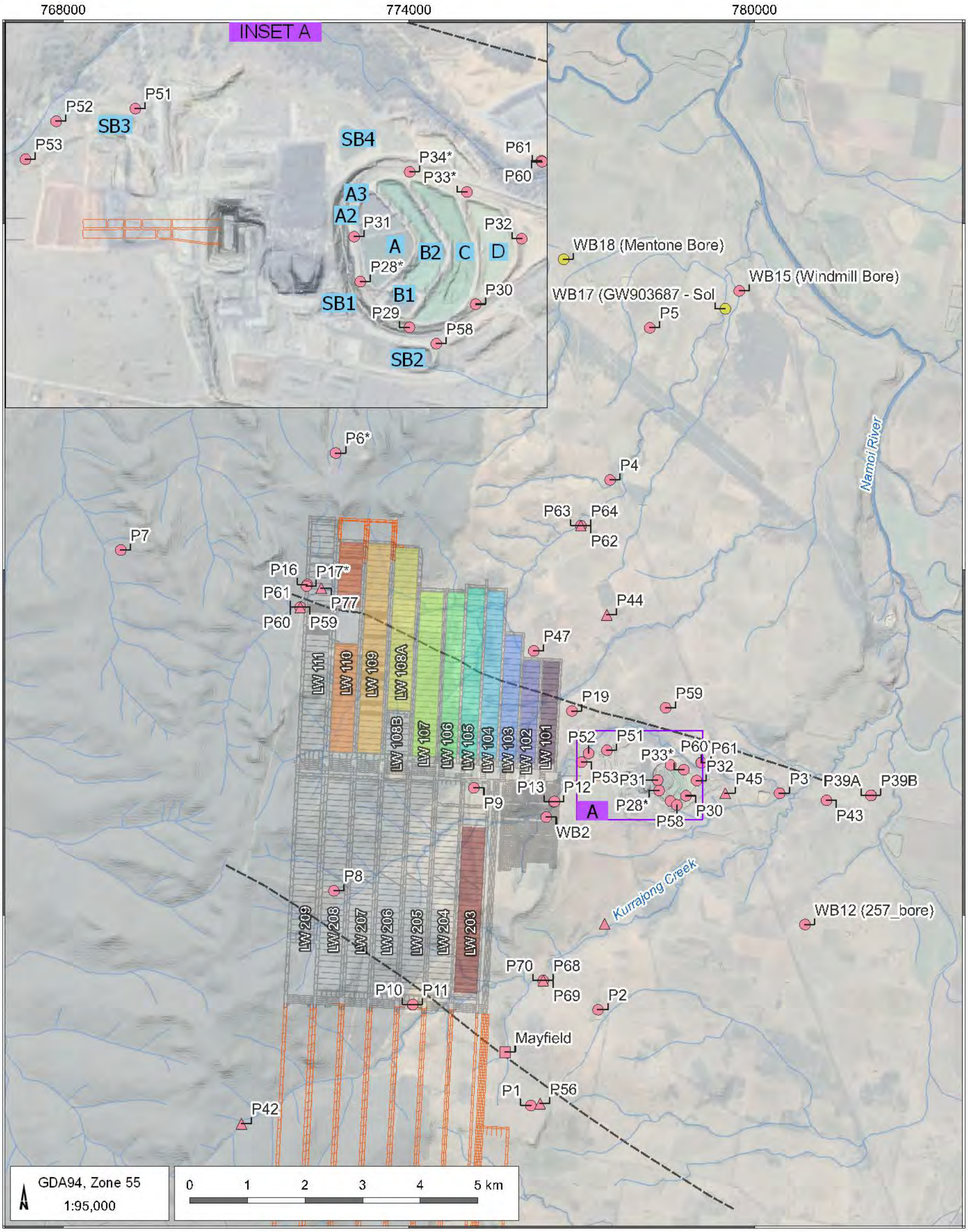
The Narrabri Underground Mine Stage 3 Extension Project (Stage 3) involves a southern extension to the previously approved Stage 2 mining area (approximately 609 hectares of additional surface development footprint) to gain access to additional areas of coal reserves within Mining Lease Application (MLA) 1 and 2 (Exploration Licence (EL) 6243), an increase in the mine life to 2044.

Table 2.1 Mining progression

Longwall	Start Date	Completion Date
LW 101	6 June 2012	1 June 2013
LW 102	22 July 2013	20 January 2014
LW103	3 March 2014	20 October 2014
LW 104	1 December 2014	4 August 2015
LW 105	10 September 2015	16 May 2016
LW 106	20 June 2016	10 March 2017
LW 107	19 April 2017	22 July 2018
LW 108	16 September 2018	17 November 2019
LW 109	6 January 2020	7 November 2021
LW 110A	22 December 2020	15 June 2022
LW 110B	21 July 2022	17 April 2023
LW 203	05 June 2023	31 January 2025*
LW 204	01 April 2024*	28 July 2026*
LW 205	11 September 2026*	23 September 2027*
LW 206	8 November 2027*	22 October 2028*

Note: *planned

[1] Consolidated Consent, Narrabri Coal Project – Stage 2. March 2011 (MOD 1), December 2011 (MOD 2), September 2015 (MOD 4), December 2015 (MOD 5), December 2016 (MOD 6) and November 2021 (MOD 7).



LEGEND

- Drainages
- Fault
- UG mine workings - Stage 2
- UG mine workings - Stage 3

Monitoring bores

- GDE
- Standpipe
- Standpipe (Stock and domestic)
- VWP

Mining Progression 100

- LW101 - JUN 2012 to JUN 2013
- LW102 - JUL 2013 to JAN 2014
- LW103 - MAR 2014 to OCT 2014
- LW104 - DEC 2014 to AUG 2015
- LW105 - SEP 2015 to MAY 2016
- LW106 - JUN 2016 MAR 2017
- LW107 - APR 2017 to JUL 2018
- LW108 - SEP 2018 to NOV2019
- LW109 - JAN 2020 to NOV2021
- LW110A - DEC 2020 to JUN 2022
- LW110B - JUL 2022 to APR 2023

Mining Progression 200

- LW203 - JUN 2023 to JAN 2025

Narrabri Mine 2024 Annual Groundwater Review (NAR5018.001)

Mining progression and stages

AGE

DATE 25/03/2025

FIGURE No: **2.1**

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2.2 Regulatory framework

In accordance with Schedule 6 Condition 2(b), Appendix A of this report provides a summary of the relevant regulatory requirements relating to groundwater. The relevant regulatory requirements include:

- Table A 1 - Project Approval conditions.
- Table A 2 - EPL 12789 compliance conditions.
- Table A 3 - Statement of Commitments.

A detailed overview of the statutory requirements relating to water management is described in Section 3 of the WMP.

2.2.1 Water sharing plans (WSPs)

NCOPL is located within the Namoi Water Management Area and comes under the jurisdiction of two specific WSPs under the Water Management Act 2000.

1. Water Sharing Plan for the NSW Murry Darling Basin (MDB) Porous Rock Groundwater Sources Order 2020. Part of which includes Gunnedah-Oxley Basin MDB Groundwater Source consisting of the Permian and Triassic rocks associated with the Gunnedah Basin and the overlying younger Jurassic and Cretaceous rocks associated with the Oxley Basin.
2. Water Sharing Plan for the NSW Great Artesian Basin (GAB) Groundwater Sources 2020 applies to management of the upper hard rock aquifers of the GAB. Of specific relevance to the NCOPL area is the Southern Recharge Groundwater Source. This occupies most of the non-artesian portion of the GAB in New South Wales and is limited to the sandstone aquifers of Jurassic age.

2.2.2 Water allocation licences (WAL)

A summary of the WALs held by NCOPL can be found in Table 2.2. An aquifer interference licence was obtained to dewater the underground workings and the remaining allocations are off-site licences from either the GAB or the Namoi River.

Table 2.2 Water allocation licences held by NCOPL

WSP	Water source	Licence	Water Access Licence &/or Groundwater Works	Nominal Allocation (ML/yr)
NSW Murray Darling Basin (MDB) Porus Rock Groundwater Sources Order 2020	Gunnedah Oxley Basin MDB Groundwater Source	90AL822538 (90MW833064*)	WAL29549	1468
		90AL836233 (90MW833064*)	WAL43017	403
NSW Great Artesian Basin (GAB) Groundwater Sources 2020	GAB Southern Recharge Groundwater Source	90AL811346 (90MW833068*)	WAL15922, GW062433	248
Namoi Alluvial Groundwater Sources Order 2020	Upper Namoi Zone 5 Groundwater Source	90AL807254 (90MW833065*)	WAL12822	43
		90AL812858 (90WA812891)	WAL20131, GW969667	150
		90AL807276 (90WA812891)	WAL12833	67

WSP	Water source	Licence	Water Access Licence &/or Groundwater Works	Nominal Allocation (ML/yr)
Upper Namoi and Lower Namoi Regulated Water Sources 2016	Lower Namoi Regulated River Water Source Regulated River (General Security)	90AL812863 90CA802130	WAL20152	600
		90AL802212 90CA802130	WAL2728	10
		90AL801995 (90WA833069*) 90CA802130	WAL2671	48
	Lower Namoi Regulated River Water Source Regulated River (High Security)	90AL802129 90CA802130	WAL6762	20

Notes: ML/yr – megalitres per year.

*applications submitted to NRAR Dec 2021 to change WAL nominated works to new miscellaneous work numbers for the purposes of water accounting associated with passive take.

There are additional WALS that currently undergoing purchase and/or transfer to NCOPL, including: WAL 36758 - 650ML Gunnedah Oxley Basin MDB Groundwater Source and WAL 44965- 40ML Eulah Creek Water Source.

2.3 Water management plan (WMP)

A draft Stage 2 groundwater monitoring program (GWMP) has been developed in accordance with Schedule 4, Condition 13 and Condition 18 of the Project Approval, and applicable regulatory requirements. The GWMP forms Attachment 5 of the Narrabri Mine WMP and has been reviewed a resubmitted for approval in November 2024.

The GWMP as part of the WMP was developed to ensure that both surface and subsurface mining operations are conducted in a manner which minimises the potential for adverse impacts on groundwater flow and quality, aquifer integrity, groundwater dependent ecosystems and other offsite groundwater related impacts. The key components of the groundwater monitoring program are:

- measurement of water levels in seepage, standpipe, and production bores;
- water quality sampling of seepage, standpipe and production bores;
- continuous measurement of water levels at the VWPs;
- continuous monitoring of water quality entering the underground mine workings;
- manual reading of the volume of groundwater pumped to surface from the box cut;
- water level and quality analysis at affected bores (with a >2m predicted drawdown) in accordance with the 'make good' agreement; and
- photographs and site observations at identified springs and high priority GDE sites.

The GWMP defines groundwater level and quality triggers to measure groundwater performance against as well as a trigger action response plan (TARP) which defines the actions and responses required when triggers are exceeded.

The Extraction Plan Water Management Plan (EP-WMP) for longwall panels LW203 to LW206 has been prepared in accordance with Schedule 3 Condition 4(h) of the Project Approval and the Department of Planning and Environment (DPE) Draft Extraction Plan Guideline (NSW Department of Planning and Environment, 2022). The groundwater level triggers presented for monitoring bores P7 was specifically calculated for the EP-WMP and adopted in this review (Section 6.2).

This annual review satisfies the requirements in the WMP as stated above.

3 Objectives

The primary objective of the annual groundwater review is to review the groundwater data collected from NCOPL to satisfy the conditions of the WMP. The annual groundwater review will include:

- A review of the monitoring data against the WMP's relevant groundwater related performance measures this includes:
  - Analysing the groundwater level monitoring data including:
    - observing trends over the course of the year and the life of the project considering mining progression and climatic changes;
    - investigating triggers exceedances as per approved GWMP and anomalies; and
    - comparing the observed data with the predicted drawdown from the numerical groundwater model.
  - Analysing the groundwater quality data, including:
    - observing trends over the course of the year and the life of the project considering mining progression and climatic changes;
    - investigating triggers exceedances as per approved GWMP and anomalies; and
    - comparing water quality results against the National Environmental Protection Measures (NEPM) livestock guidelines where relevant.
- Consideration of the requirements of statement of commitments (SOC) and address as needed.
- Identification of relationships between measured EC and TDS in mine water and groundwater in the Hoskissons Seam and adjoining aquifers.
- Establishment and assessment of the ongoing suitability of appropriate factors for converting EC to TDS for each sampling site with consideration of the influence of major ionic composition.
- Review of observed/estimated groundwater inflow rates for the year against the numerical groundwater model prediction.
- Review of trigger levels as additional monitoring information becomes available for newly installed bores and, if required, advise on updating the GWMP.

4 Site setting

4.1 Climate

Climate data was sourced from the Scientific Information for Landowners (SILO) dataset, for the coordinates 30.50° S, 149.85° E (Queensland Government Long Paddock, 2025). The SILO dataset is used to obtain location specific infilled and quality-controlled climate data and is calculated from surrounding weather stations and interpolated through splining and kriging techniques.

The mean annual rainfall recorded for 2024 was 612.5 millimetres. Excluding the month of June, potential evaporation rates (pan evaporation) generally exceed rainfall throughout the year with the highest moisture deficits are recorded in the summer months (Figure 4.1).

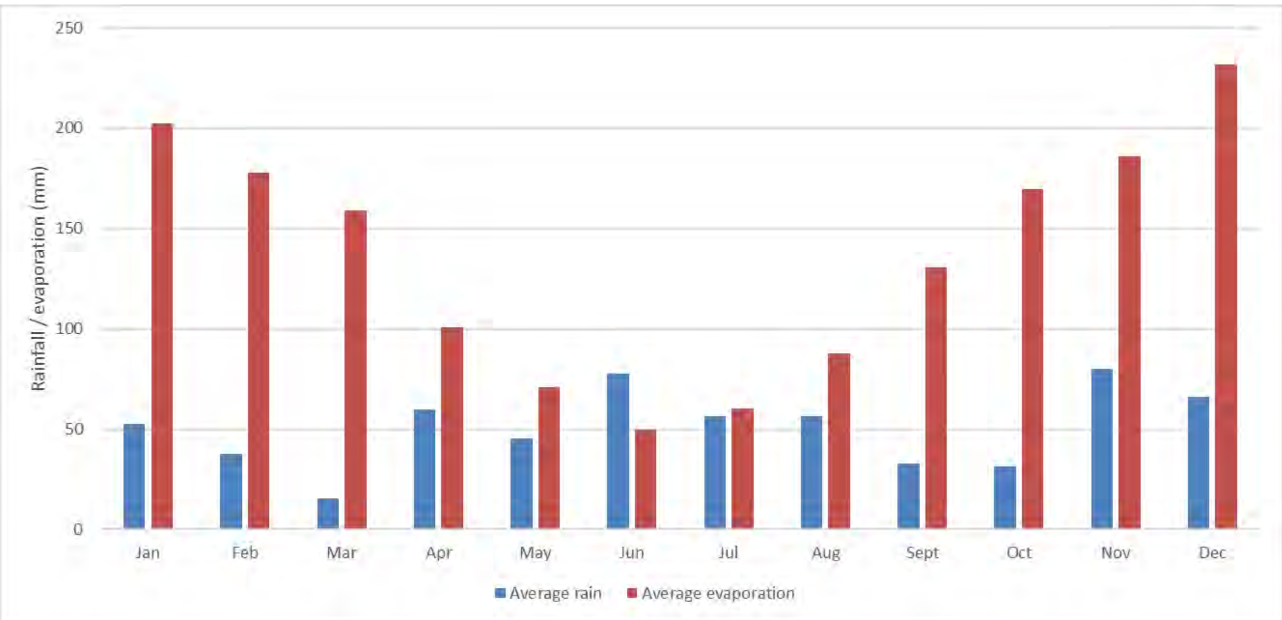


Figure 4.1 Average rainfall and evaporation for 2024 (SILO, 2025)

To place rainfall in the recent years into a historical context, the cumulative rainfall departure (CRD) (also referred to as the residual rainfall mass) was calculated (Figure 4.2). The CRD is calculated by subtracting the long-term average monthly rainfall from the actual monthly rainfall, providing a monthly departure from average conditions. A rising slope in the CRD plot indicates periods of above average rainfall, while a falling slope indicates below average rainfall.

Prior to mining commencing in 2012, the site experienced an increasing rainfall trend between 2003 and 2006 and again between 2007 and 2012 when a period of significantly higher rainfall occurred throughout most of Australia.

After the record 2012 rainfall event, there was a long-term decline and below average rainfall to 2020, most notably between 2017 and 2020 when NSW experienced the Tinderbox Drought, the driest three-year period recorded in the region (Devanand, et al., 2024). After the drought, rainfall increased significantly between 2020 and 2023, in 2022 Narrabri shire experienced flooding events due to ongoing heavy rainfall and overflowing of the Namoi River. Since 2023 rainfall has generally declined, with a small isolated increase during the 2024 reporting period.

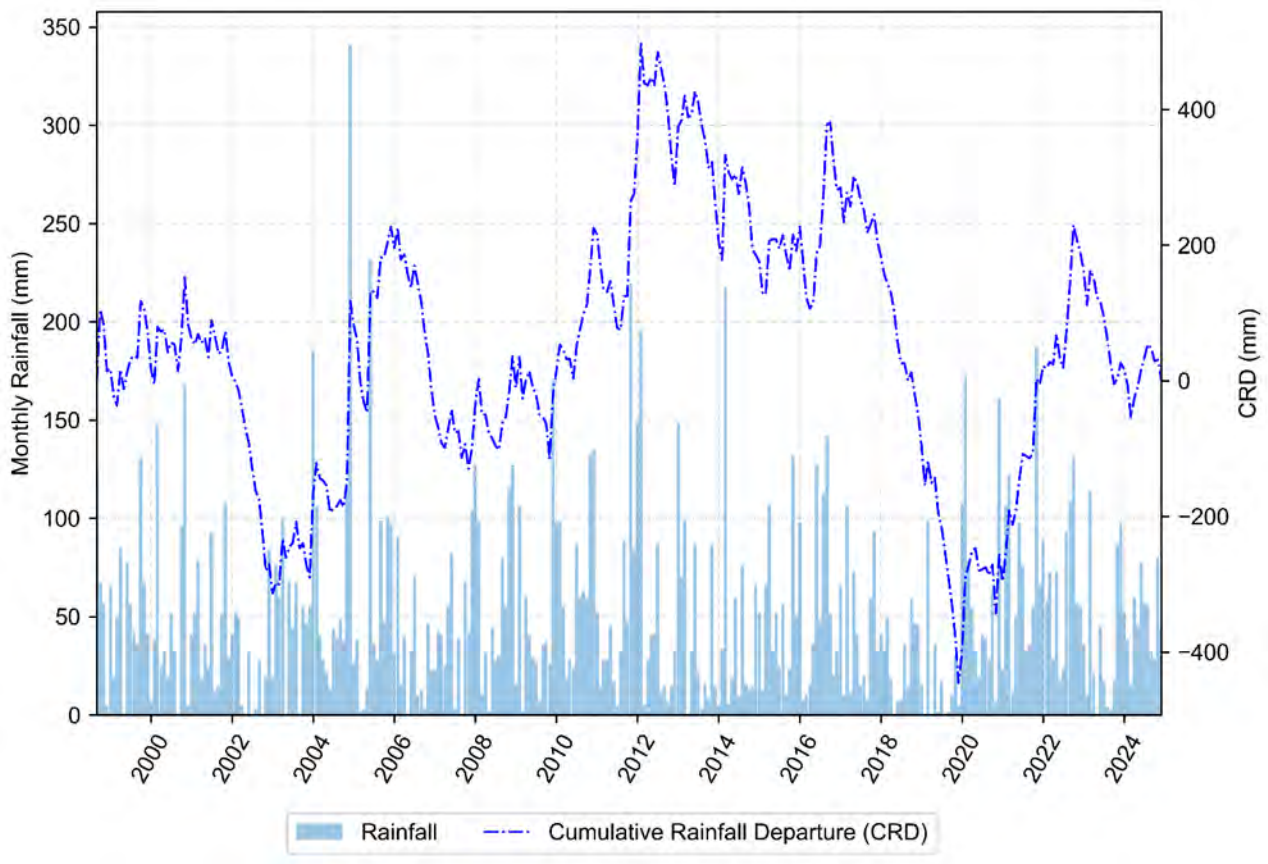


Figure 4.2 Cumulative rainfall departure

4.2 Hydrogeological regime

The topography of the Narrabri Mine slopes to the east and northeast from over 300 m AHD in the southwest of the site to 270 m AHD in the east. Surface contours reveal subtle undulations with surface drainage occurring across the site in a north-easterly direction.

The Narrabri Mine is located within the Mullaley Sub-basin, which forms part of the larger Gunnedah Basin. The western half of the mining lease is also located on the eastern margin of the Surat Basin. Generally, the Surat and Gunnedah Basin stratigraphic units are characterised by a dip to the west at an angle of less than 10 degrees and outcrops along the Namoi River valley.

The main stratigraphic units occurring in the vicinity of the Narrabri Mine are the:

- Quaternary alluvium consisting of unconsolidated clays, silts, sands, and gravels associated with the Namoi River and its tributaries.
- Surat Basin Units including:
  - Jurassic Pilliga Sandstone, Purlawaugh Formation and Garrawilla Volcanics.
- Gunnedah Basin Units including:
  - Triassic Napperby and Digby Formations; and
  - Permian Black Jack Group, including the Hoskissons Coal Seam, and Arkarula and Pamboola Formations (which are locally characterised by an east [shallowest] to the west [deepest] dip).

A conceptual cross section through the mine and key stratigraphic units is displayed in Figure 4.3.

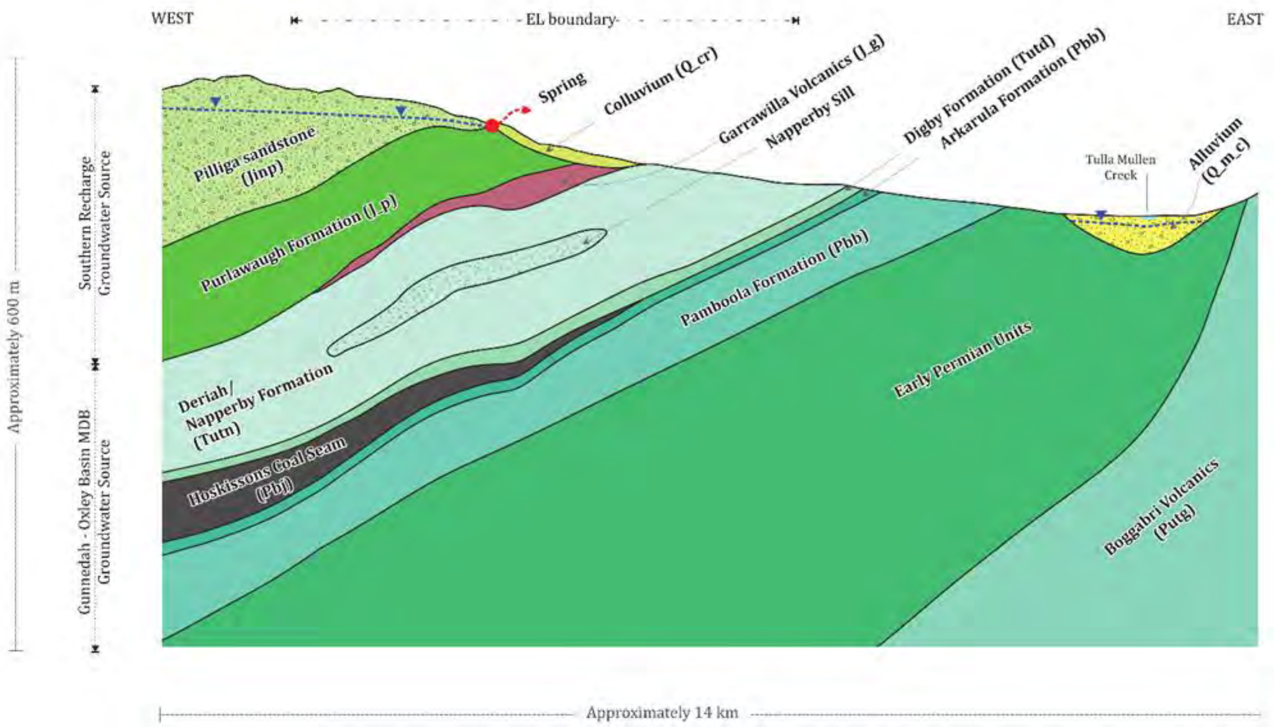


Figure 4.3 Conceptual geology cross-section (AGE, 2020)

Of the units listed above, only the Namoi River alluvium and Pilliga Sandstone are considered regionally significant aquifers ("highly productive" under the Aquifer Interference Policy [AIP][2]) (NSW Department of Primary Indsutries, 2012). The Namoi River alluvium is present and outcrops approximately 5.5 km east of the mine.

Whilst the remaining units may support minor extractions for stock and domestic purposes, they are relatively low-yielding aquifers ("less productive" unit under the AIP). Only the Pilliga Sandstone, Pulawaugh Formation and occasionally the Garrawilla Volcanics outcrop or subcrop in the area encapsulating the mine.

Other units present in the vicinity of the mine are considered 'less productive' aquifers, as they don't meet the appropriate criteria for salinity and/or yield to be considered 'highly productive'.

4.2.1 Baseline groundwater levels

NCOPL has historically undertaken monitoring of groundwater levels (pre-2012, before mining started) within the Namoi Alluvium, Pilliga Sandstone, Purlawaugh Formation, Garrawilla Volcanics, Napperby Formation, Digby Formation, Hoskissons Coal Seam, Arkarula Formation, Pamboola Formation and various older units.

Regional groundwater level contours for the Namoi Alluvium indicate that groundwater flows generally south to north along the Namoi River, consistent with topography and flow direction of the river (Hydrosimulations, 2015). Intensive groundwater uses for irrigation results in seasonal water table drawdown more than 15 m in areas of the Namoi Alluvium.

[2] A 'highly productive' source is defined by the Aquifer Interference Policy (AIP) as a groundwater source which has been declared in regulations and datasets, based on the following criteria:

- has a total dissolved solids (TDS) concentration less than 1,500 milligrams per litre (mg/L); and
- contains water supply works that can yield water at a rate greater than 5 litres per second (L/s).

Within the deeper hard rock aquifers, groundwater levels are generally in the range 25 m to 55 meters (m) below ground level (bgl). The shallower of the two hard rock groundwater systems occurs within the Jurassic sediments, which subcrops beneath the project area. The westerly dip on the strata exposes progressively younger units from east to west across the site. A deeper groundwater flow system occurs within the Permian-Triassic sediments which also dip in a westerly direction.

Regional groundwater flow directions in the Pilliga Sandstone are towards the northwest, show little or no temporal variation, and do not appear to be affected by climate, Narrabri Mine dewatering and other extraction. Groundwater levels in the Pilliga Sandstone are deeper near the Narrabri Mine (between 60 and 100 m bgl).

4.2.2 Baseline groundwater quality

Table 4.1 summarises the probability of exceedance levels of groundwater salinity using electrical conductivity (EC) measurements. Salinity has a significant influence on the beneficial use of groundwater. Generally, it correlates to electrical conductivity (EC), which can be used to categorise groundwater quality using the following ranges (FAO, 2013):

- Fresh water <700 μS/cm
- Brackish (slightly saline) 700 to 2,000 μS/cm
- Moderately saline 2,000 to 10,000 μS/cm
- Saline 10,000 to 25,000 μS/cm
- Highly saline 25,000 to 45,000 μS/cm
- Brine >45,000 μS/cm

Table 4.1 Summary statistics for field EC data organised by hydrostratigraphic units (AGE 2020)

Formation	No of bores	No of tests	Field EC (μS/cm)					
			Mean	Min	25%	50%	75%	Max
Alluvium	9	92	2,292	597	704	853	5,860	7,050
Pilliga Sandstone	4	93	1,410	129	256	393	2,900	5,440
Purlawaugh Formation	4	181	8,343	293	674	4,880	18,960	34,900
Garrawilla Volcanics	9	360	4,606	274	1,379	2,630	4,158	20,200
Napperby Formation	9	438	9,632	1,020	3,083	7,040	17,628	33,100
Hoskissons Coal Seam	1	5	5,580	1,410	4,070	6,180	7,490	8,750
Arkarula Formation	1	15	19,230	1,140	15,915	23,770	25,015	25,420
Pamboola Formation	3	174	14,785	1,050	3,468	17,175	25,025	27,340

4.2.3 Groundwater yield

The Narrabri Mine is mapped primarily as Jurassic sediments (Purlawaugh Formation), which are rarely considered as aquifers and have yields generally less than 0.5 L/s. There are small areas in the southeast portion of mining lease (ML) 1609 as part of the Gunnedah Basin sequence, with low yields similar to the Purlawaugh Formation. The geological unit in the Narrabri area with the highest potential yields is the Garrawilla Volcanics of the NSW GAB Groundwater Sources Southern Recharge Groundwater Source; however, this formation is not regionally extensive and not considered a highly productive groundwater source.

4.2.4 Groundwater use

There are more than 2,200 bores in the region surrounding Narrabri Mine, including approximately 1,500 water supply bores and 700 bores drilled for non-water supply purposes (e.g., monitoring, exploration, or dewatering). Registered water supply bores in the broader region are located predominantly within the Namoi Alluvium and include several bores used for irrigation purposes that tap into the 'highly productive' Namoi Alluvium aquifer.

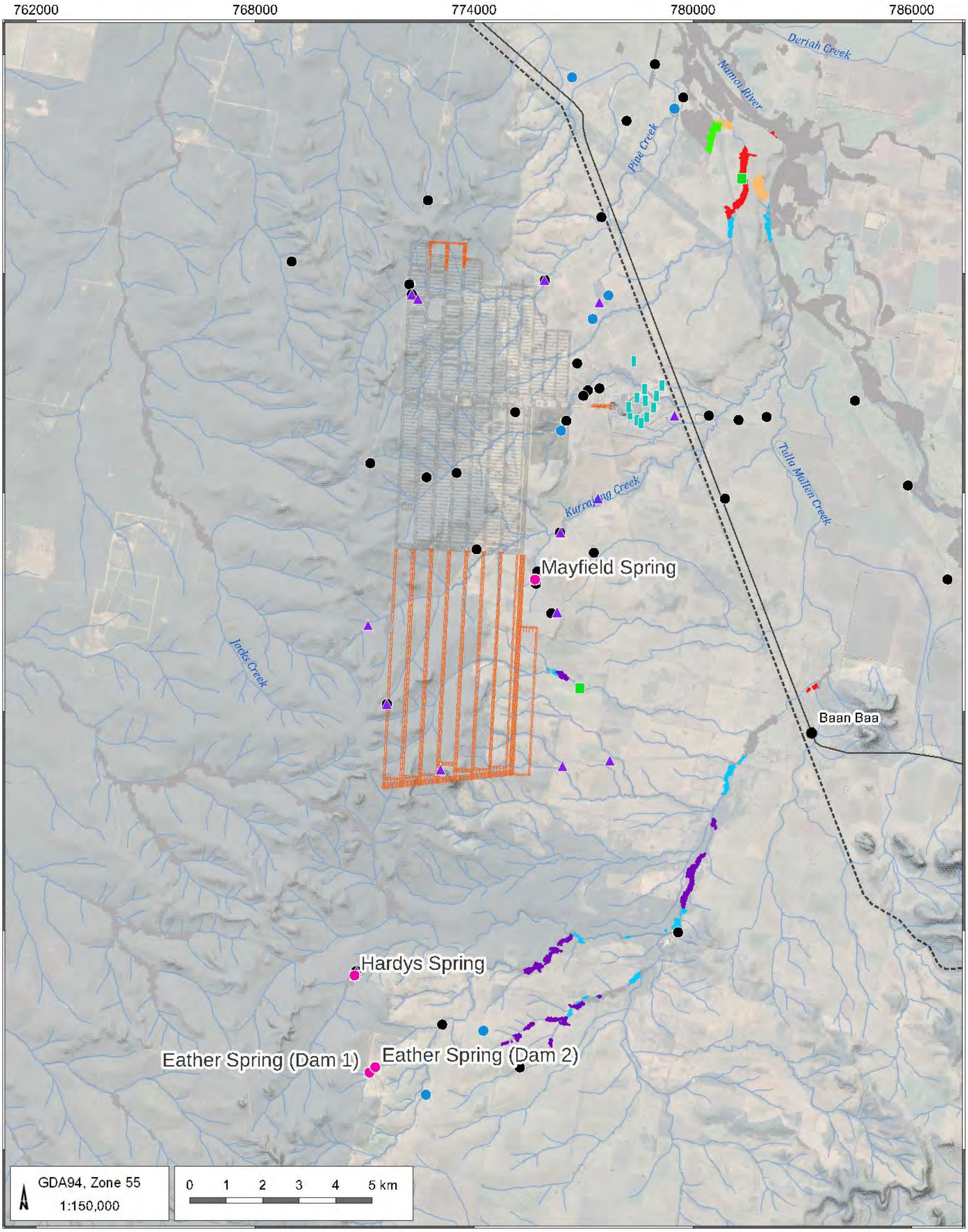
Closer to the site, groundwater use is less prevalent and less intensive. Privately-owned registered water supply bores in the immediate vicinity of the mine are predominantly used for stock and domestic purposes. NCOPL extracts groundwater from an alluvial bore (GW969667) when water supply from underground mining areas is insufficient and allocation from Namoi River is unavailable. The alluvial bore water is extracted in accordance with the relevant WAL held by NCOPL and the rules prescribed in the WSP.

4.2.5 Groundwater dependent ecosystems (GDEs)

At the time of the MOD 5 GIA no high priority groundwater dependent ecosystems (GDEs) or culturally significant sites were listed in Water Sharing Plans of relevance to the Narrabri Mine. The MOD 5 GIA (Hydrosimulations, 2015) therefore concludes that no impacts on either type of sensitive site are predicted. However, the Water Sharing Plan (WSP) documents were revised by DPIE-Water in June 2020 and now identify high priority GDEs within the predicted zone of influence of the Stage 2 operations (Figure 4.4). These GDEs are understood to be based on 'high potential' GDE areas identified in the National Groundwater Dependent Ecosystem Atlas (Bureau of Meteorology, 2018). As such the majority of the areas identified are potential GDE areas identified using satellite image analysis with limited ground truthing. In many cases, modelling completed for the Narrabri Stage 3 Extension Project (Australian Groundwater and Environmental Consultants, 2020) suggests that the mapped GDE areas are unlikely to be actual GDE areas since regional groundwater levels are thought to be more than 10 m below ground.

The Hardy's and Eather Springs which are located approximately 8.5 km and 10.5 km south of the mining lease area, respectively, are also listed as high priority spring GDE sites in the latest revision of the WSP for the GAB Southern Recharge Source. As shown in Figure 4.4, a third potential spring feature, the Mayfield Spring has also been identified close to the southern boundary of the mining lease. This spring is not mapped in the GDE Atlas (Bureau of Meteorology, 2018) or listed as a high priority GDE in the relevant WSPs.

All potential GDEs in the area, including the three springs, are thought to be sourced from shallow groundwater systems and/or perched surface water dominated systems.



LEGEND

- Drainages
- UG mine workings - Stage 2
- UG mine workings - Stage 3
- Rail
- Major road

Monitoring netowrk

- GDE
- Standpipe
- Standpipe (Stock and domestic)
- VWP
- Seepage monitoring

- Potential Groundwater Features

GDEs areas max ddn exceeds AIP 2m

- Box grassy woodland
- Narrow-leaved Ironbark
- Other High priority GDE areas
- Red Gum
- River Red Gum
- Shallow freshwater wetland sedgeland

Narrabri Mine 2024 Annual Groundwater Review (NAR5018.001)

GDEs and groundwater features

AGE

DATE 25/03/2025

FIGURE No: **4.4**

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4.2.6 Recharge, discharge, and receptors

Recharge to the hydrostratigraphic units occurs through diffuse rainfall and occasional seepage from the non-perennial Kurrajong Creek and its tributaries when flowing. There is no aquifer discharge from baseflow near the mining area, as groundwater levels are deep and below the ephemeral creeks. No alluvium is present along these creeks, which are either disconnected or only rarely connected to the Namoi Alluvium.

5 Groundwater monitoring network

The groundwater monitoring network at Narrabri Mine includes open standpipes monitoring bore which are used to measure groundwater levels and quality each month or quarter and multi-level vibrating wire piezometers (VWPs) which record pore pressures multiple times per day. Springs are also monitored for water quality and flow. A summary of the monitoring requirements (as per the GWMP, 2024) is shown in Table 5.1. Table B 1 in Appendix B details all the monitoring locations at NCOPL and the groundwater monitoring network is shown in Figure 5.1.

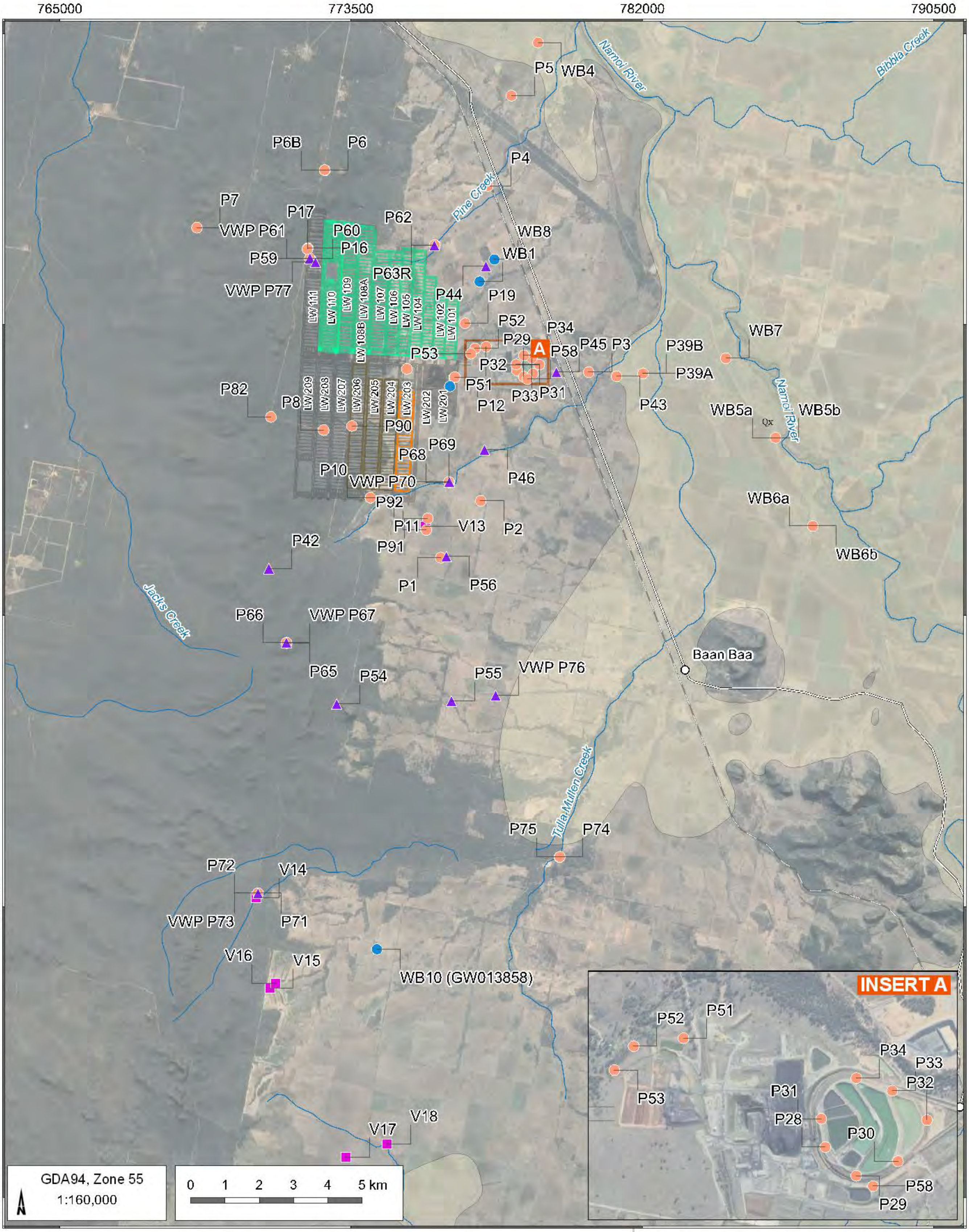
An additional 15 standpipes and 32 VWPs were added to the existing monitoring network in late 2023 in preparation for the Stage 3 expansion. These bores are not included in the original WMP 2013; however, are included in the updated GWMP 2024.

Table 5.1 Groundwater monitoring program (Whitehaven Coal, 2024)

Location	Parameters	Frequency
VWPs **Pilliga Sandstone sensors** P42, P54, P77 **All other sensors** P42, P44, P45, P46, P54, P55, P56, P76(b), P77, P80	• Pressure data.	**Pilliga Sandstone sensors** Continuous with monthly download of data. **All other sensors** Continuous with quarterly download of data.
Standpipes **Pilliga Sandstone** P6B, P7, P60, P66, P82, P90 **All other formations** P1, P2, P3, P4, P5, P8, P9, P10, P11, P12, P13, P16, P17, P19, P39A, P39B, P43, P47, P51, P52, P53, P59, P62, P65, P68, P71, P74, P75, P91, P92, WB2	• Water level. • Field EC and pH. • Laboratory analysis: - physical parameters (e.g., alkalinity, EC, TDS, TSS and pH); - cations (e.g., calcium, magnesium, sodium and potassium); - anions (e.g., carbonate, bicarbonate, sulphate, and chloride); - dissolved metals (e.g., aluminium, arsenic, boron, cobalt, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, selenium and zinc); and - nutrients (e.g., ammonia, nitrate, phosphorous and reactive phosphorous).	**Pilliga Sandstone** Monthly for water level Quarterly for water quality (EC and pH) Annually for all other parameters. **Other formations** Quarterly for water level and water quality (EC and pH) Annually for all other parameters.

Location	Parameters	Frequency
Seepage bores P28, P29, P30, P31, P32, P33, P34, P58, P83*, P84*, P85*, P88*, P89*	• Water level. • Field EC and pH. • Laboratory analysis: - physical parameters (e.g., alkalinity, EC, TDS, TSS and pH); - cations (e.g., calcium, magnesium, sodium and potassium); - anions (e.g., carbonate, bicarbonate, sulphate, and chloride); - dissolved metals (e.g., aluminium, arsenic, boron, cobalt, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, selenium and zinc); and - nutrients (e.g., ammonia, nitrate, phosphorous and reactive phosphorous).	Quarterly (in accordance with Condition M2.3, U2.1 and U3.1 of EPL 12789).
Additional monitoring of water quality entering the underground mine workings (i.e. within longwall panels)	• EC. • TDS.	Monthly for an initial 6-month period and annually thereafter.
Mine water pumping inflow and outflow	• Discharge rate.	Weekly meter read.
Private landholder bores WB12 and WB18	• Water level. • Field EC and pH. • Laboratory analysis: - physical parameters (e.g. alkalinity, ED, TDS, TSS and pH); - cations (e.g. calcium, magnesium, sodium and potassium); - anions (e.g. carbonate, bicarbonate, sulphate, chloride and fluoride); - dissolved metals (e.g. aluminium, antimony, arsenic, boron, cobalt, cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, silver, selenium and zinc); and - nutrients (e.g. ammonia, nitrate, phosphorous and reactive phosphorous).	Annually.

Note: * - Brine dam standpipes to be sampled monthly for first 4 months after initial use of the dam



LEGEND

- Populated place
- Road
- Rail
- Drainage
- UG workings - stage 3
- UG workings - Stage 2
- Mined goaf
- Current mining - LW203
- Underground mine workings

Monitoring Locations

- GDE
- Standpipe
- Standpipe (Stock and domestic)
- VWP

Gunnedah rock units 100k

- Qx - Quaternary Sediments

Narrabri Mine 2024 Annual Groundwater Review (NAR5018.001)

Groundwater monitoring network

AGE

DATE 25/03/2025

FIGURE No: 5.1

Source: 1 second SRTM Derived DEM-S - © Commonwealth of Australia (Geoscience Australia) 2011.; GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006.;
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5.1 Groundwater level triggers

Tiered water level trigger values for monitoring bores have been developed based on the 5th percentile of baseline data and modelled predicted drawdown and are defined in section 4.3.2 of the GWMP (2024). Methods for tiered triggers is listed in Table 5.2.

Table 5.2 Tiered trigger level description

Tier	Description	Trigger
Tier 1	Upper allowable limit (UAL): • Indicates trend is towards an unacceptable level but is still within reasonable expected levels.	5th percentile of baseline data.
Tier 2	Upper cut-off limit (UCL): • A detailed investigation is required for three consecutive exceedances. Model predicts yearly triggers to 2031.	Model prediction + 2 m (subtract predicted drawdown from selected baseline groundwater level and add 2 m to allow for model uncertainty).
Tier 3	Applies to Pilliga Sandstone monitoring bore P7 only.	Greater than 4 m drawdown.
Tier 4	Applies to Pilliga Sandstone monitoring bore P7 only.	Greater than 10 m drawdown.

A full list of triggers for monitoring bores is in Table 5.3. Reporting of trigger level exceedances and associated responses are outlined in the Trigger Action Response Plan (TARP) in the GWMP (2024).

Table 5.3 Groundwater level triggers (m AHD)

Bore	Formation	Tier 1	Tier 2								Tier 3	Tier 4
			2024	2025	2026	2027	2028	2029	2030	2031		
P1	Garrawilla	291.6	291.6	291.5	291.5	291.5	291.5	291.4	291.4	291.3	n/a	n/a
P2	Napperby	242.4	238.4	236.8	235.4	234.2	233.1	232.1	231.2	230.3	n/a	n/a
P3	Pamboola	222.3	221.6	221.4	221.2	221.0	220.8	220.6	220.4	220.2	n/a	n/a
P4	Napperby	226.7	225.8	225.7	225.5	225.4	225.2	225.1	225.0	224.8	n/a	n/a
P5	Pamboola	207.7	206.8	206.6	206.4	206.2	206.0	205.8	205.6	205.4	n/a	n/a
P7	Pilliga	224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4	222.4	216.4
P8	Purlawaugh	269.6	269.6	269.6	269.6	269.6	269.5	268.4	267.2	266.6	n/a	n/a
P9	Purlawaugh	264.2	260.8	260.6	260.3	259.4	258.9	258.6	258.4	258.2	n/a	n/a
P10	Napperby	275.2	273.9	272.4	270.9	269.8	267.3	263.9	260.9	258.7	n/a	n/a
P11	Purlawaugh	270.4	270.1	269.8	267.8	267.4	262.5	262.8	262.8	263.4	n/a	n/a
P12	Napperby	199.0	210.0	208.8	207.7	206.3	205.0	203.9	203.1	202.5	n/a	n/a
P13	Garrawilla	264.7	262.6	262.5	262.4	262.3	262.3	262.2	262.1	262.0	n/a	n/a
P39b	Alluvium	220.3	219.6	219.6	219.6	219.6	219.6	219.6	219.6	219.6	n/a	n/a
P42_90	Pilliga	244.7	244.2	244.2	244.2	244.2	244.2	244.2	244.2	244.2	n/a	n/a
P47	Garrawilla	262.4	261.3	261.1	261.0	260.9	260.8	260.7	260.7	260.6	n/a	n/a
P53	Garrawilla	254.8	253.5	253.5	253.5	253.4	253.4	253.4	253.3	253.3	n/a	n/a
P54_30	Pilliga	332.4	332.3	332.3	332.3	332.2	332.1	332.0	332.0	332.0	n/a	n/a
WB12	Arakula/Pamboola	208.3	208.6	208.6	208.6	208.6	208.6	208.6	208.6	208.6	n/a	n/a
WB18	Napperby	214.2	213.2	213.0	212.9	212.7	212.6	212.5	212.3	212.2	n/a	n/a

5.2 Groundwater quality triggers

Where suitable, the guideline water quality objectives for stock drinking water (beef cattle) and long-term irrigation have been adopted (ANZG 2018). These guideline values assume that groundwater is abstracted for the purpose associated with the identified environmental values and are based on guidance provided in OEH (2006) and ANZG (2018). However, because of the high variability in groundwater chemistry, groundwater quality may not meet the water quality objectives set in the ANZG (2018) at all locations and/or at all times.

Bore specific EC water quality triggers are used for bores identified to have high variability in groundwater chemistry or quality identified in historical data (AGE 2021). The monitoring locations have been selected based on the suitability of the water quality (e.g. irrigation or stock [beef cattle] drinking) and monitoring purpose. EC triggers for these bores are calculated as a rolling median calculated from the eight most recent data points and plotted against the 80th and 95th percentiles of the long-term dataset.

EC and pH water quality triggers for each bore is listed in Table 5.4. If pH is outside the range of 6.0 to 8.5 for three consecutive readings or the EC trigger value of 5,970 (µS/cm) is exceeded for three consecutive readings, the TARP (Level 2) will be initiated.

For those monitoring locations where water quality is unsuitable for use as irrigation/stock watering or where the intended purpose is seepage monitoring, two tiered EC triggers will be utilised.

Two triggers are then identified as follows:

- Tier 1 – where the rolling median exceeds the 80th percentile of long-term data; and
- Tier 2 – where three consecutive exceedances of the 95th percentile of the long-term data occur. If this occurs, the TARP (Level 2) will be initiated.

The Tier 1 trigger provides a method for assessing a gradual change in groundwater quality over the medium term via use of the rolling median, whilst the Tier 2 trigger is intended to detect an event related change over the short term.

Groundwater quality triggers are listed in Table 5.4

Table 5.4 Groundwater quality pH and EC triggers

Location ID	Coordinates (MGA55)		Bore depth (m)	Screen interval (m bgl)	Formation	Trigger criteria	EC		pH^	
	Easting	Northing					Tier 1 (80th)	Tier 2 (95th)	Min	Max
Seepage monitoring bores										
P51	777437	6620859	18	9-12	Garrawilla Volcanics	EC two tiered	19,500	19,860	6.0	8.5
P53	776994	6620655	24	18-21	Garrawilla Volcanics	EC two tiered	1,107	1,169	6.0	8.5
P29	778541	6619978	25	19-25	Napperby Formation (above sill)	EC two tiered	9,732	11,337	6.0	8.5
P31	778318	6620343	15	9-15	Napperby Formation (above sill)	EC two tiered	7,110	7,195	6.0	8.5
P32	778993	6620335	15	9-15	Napperby Formation (above sill)	EC two tiered	2,170	2,938	6.0	8.5
P52	777117	6620807	24	18-21	Napperby Formation	EC two tiered	2,300	2,533	6.0	8.5
Strata likely to experience drawdown impacts										
P8	772697	6618421	65	57-63	Purlawaugh Formation	ANZG (stock)	5,970		6.0	8.5
P9	775127	6620209	36	24-36	Purlawaugh Formation	EC two tiered	20,330	21,190	6.0	8.5
P11	774066	6616447	40	34-40	Purlawaugh Formation	EC two tiered	6,052	6,546	6.0	8.5
P1	776116	6614694	50	44-50	Garrawilla Volcanics	ANZG (stock)	5,970		6.0	8.5
P13	776526	6619972	30	24-30	Garrawilla Volcanics	ANZG (stock)	5,970		6.0	8.5
P16	772233	6623740	146	137-146	Garrawilla Volcanics	ANZG (stock)	5,970		6.0	8.5
P47	776166	6622586	30.5	8-30.5	Garrawilla Volcanics	ANZG (stock)	5,970		6.0	8.5
WB2	776382	6619701	26	22-26	Garrawilla Volcanics	ANZG (stock)	5,970		6.0	8.5
P2	777282	6616355	50	44-50	Napperby Formation	EC two tiered*	19,342	19,731	6.0	8.5
P4	777490	6625553	30	24-30	Napperby Formation	EC two tiered*	24,912	25,610	6.0	8.5
P10	774063	6616444	130	118-130	Napperby Formation (no sill)	EC two tiered*	8,894	9,426	6.0	8.5

Location ID	Coordinates (MGA55)		Bore depth (m)	Screen interval (m bgl)	Formation	Trigger criteria	EC		pH^	
	Easting	Northing					Tier 1 (80th)	Tier 2 (95th)	Min	Max
P12	776513	6619964	90	84-90	Napperby Formation (above sill)	ANZG (stock)	5,970		6.0	8.5
P3	780433	6620115	40	34-40	Pamboola Formation	EC two tiered*	18,016	18,564	6.0	8.5
P39a	782024	6620076	80	72-80	Watermark Formation	ANZG (stock)	5,970		6.0	8.5
P43	781248	6619992	65	59-65	Watermark Formation	EC two tiered*	11,162	11,412	6.0	8.5
Strata unlikely to experience drawdown impacts										
P39b	782018	6620077	32	15-30	Alluvium	ANZG (irrigation), bore specific	6,546	-	6.0	8.5
P7	768998	6624338	90	78-90	Pilliga Sandstone	ANZG (irrigation)	2,327		6.0	8.5
Private bores with predicted drawdown >2 m[2]										
WB12	780874	6617836	100	60-75	Arkarula and Pamboola Formations	ANZG (stock)	5,970		6.0	8.5
WB18	776686	6629386	16.69	-	Napperby Formation	ANZG (stock)	5,970		6.0	8.5

Notes: * Review of EC data suggests that salinity (EC) values for groundwater at these locations is unsuitable for use as livestock drinking water, these locations are recommended for exclusion from ongoing assessment against the livestock drinking water trigger values.

1 - Converted from TDS trigger using equation 4.6 (ANZECC, 2000). ANZG (2018) Irrigation.

2 – No historic data currently available, initial EC value based on ANZG (2018) beef cattle watering guidelines until sufficient baseline data is collected.

^ ANZG (2018) irrigation, long term application.

m bgl – metres below ground level.

5.2.1 TDS to EC conversion for stock watering applications

As indicated in the GWMP (2024), EC trigger values for stock watering applications are based on the TDS limit for livestock drinking water (beef cattle) after ANZG (2018) by a conversion factor applied (equation 4.6, ANZECC 2000 using a factor of 0.67). The validity of the factor applied was cross-checked with all data (Nov 2007 to Jan 2025) and bore specific ratios were confirmed and presented in Figure 5.2. It is evident from the box-and-whisker-plot[3] (Figure 5.2) that the mean of the datasets plots below the 0.67 factor. The trigger value applied is therefore confirmed as still relevant.

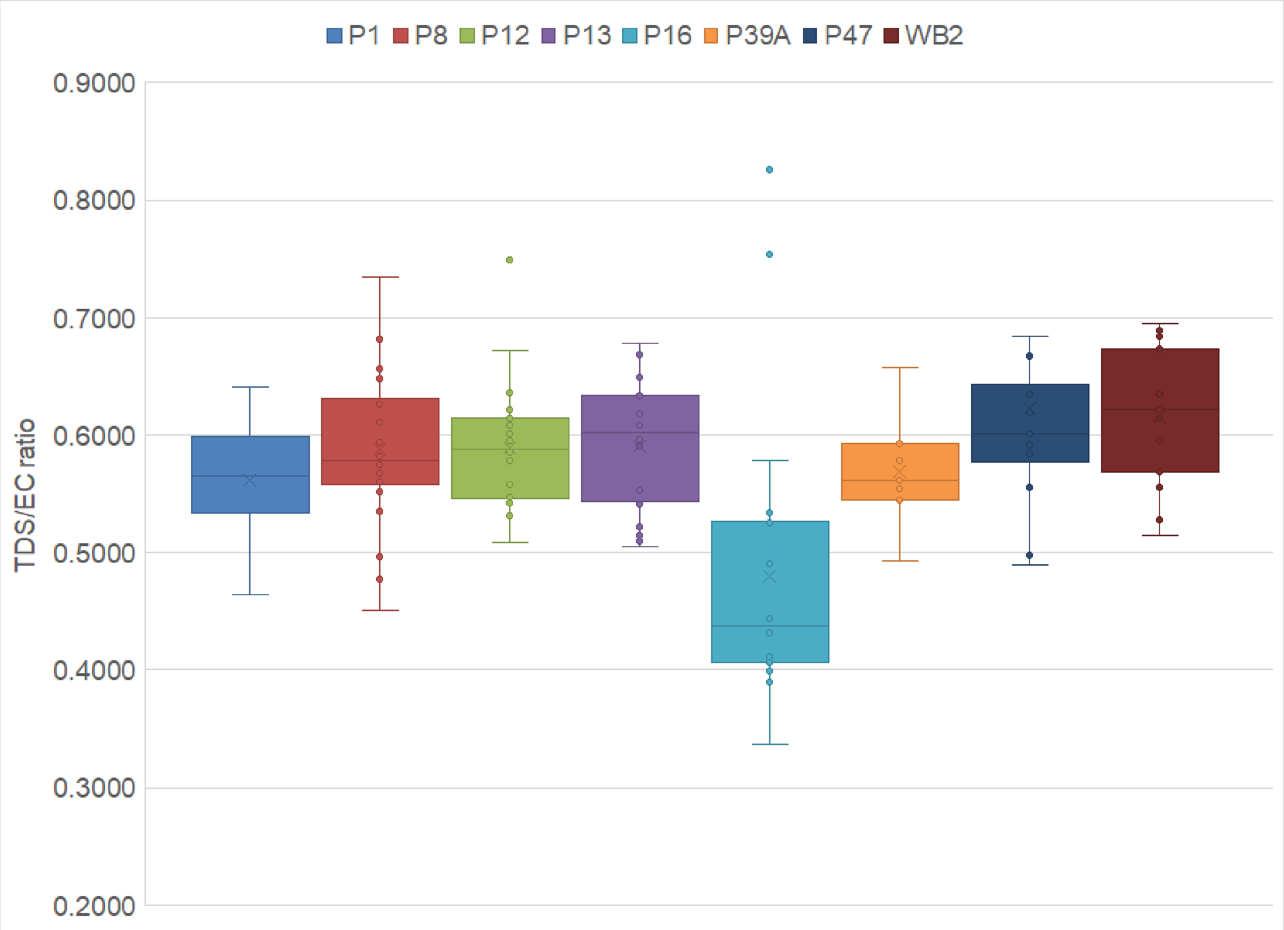


Figure 5.2 TDS/EC ratio for bores with stock water EC trigger

[3] The box-and-whisker-plots include min, max, median, interquartile range [25th percentile to 75th percentile] and any outliers

6 Groundwater level analysis

Groundwater levels are monitored by a network of standpipe and VWP monitoring bores. Water levels for standpipe bores are grouped by formation and plotted with CRD and are presenting in Sections 6.1 to 6.7. The CRD, when plotted with hydrographs, can be used to assess if changes in groundwater levels are correlated with climatic conditions. Individual bores are plotted with their respective trigger levels in Appendix B. A summary water levels recorded by the VWP network is provided in Section 6.8.

6.1 Alluvium

The alluvium is monitored by bore P39B which is located 5.3 km east of mining in the Tulla Mullen alluvium on the eastern side of the Namoi Alluvium. An additional network of “WB” series bores are installed along the Namoi River thee bores (WB3a, WB3b, WB4, WB5a, WB5b, WB6a, WB6b, and WB7) are managed by Water NSW, a copy of historical hydrographs are included in Appendix B for reference only. Three bores located between mining and the Namoi Alluvium (P3, P4, and P5) have been adopted as early warning detection bores. These bores are discussed in their relevant sections and are plotted together with P39B in Figure 6.1.

A summary of the recent data collected at the alluvium monitoring bore P39B is listed in Table 6.1. Time series groundwater elevation data is plotted with the CRD curve in Figure 6.2. The groundwater data for each bore is also plotted individually in Appendix B.

Table 6.1 Alluvium data summary

Bore ID	Location	Monitoring guidelines met?	Trigger		Recent water levels				TARP	Trend*
			Tier 1	Tier 2	Q1 2024	Q2 2024	Q3 2024	Q4 2024		
P39B	5.3 km east of mining	Yes	220.3	219.6	223.2	223.0	223.1	223.2	-	D/F

Notes: All water levels reported in meters Australian Height Datum (m AHD).
Trends: (S) stable, (D) declining, (F) fluctuating, (I) increasing.
* Visual approximation of trend of data relative to historical measurements.

The water levels recorded in bore P39B are influenced by natural rainfall patterns, the overall declining trend that is recorded from 2023 to mid- 2024 which is consistent with a decrease in rainfall.

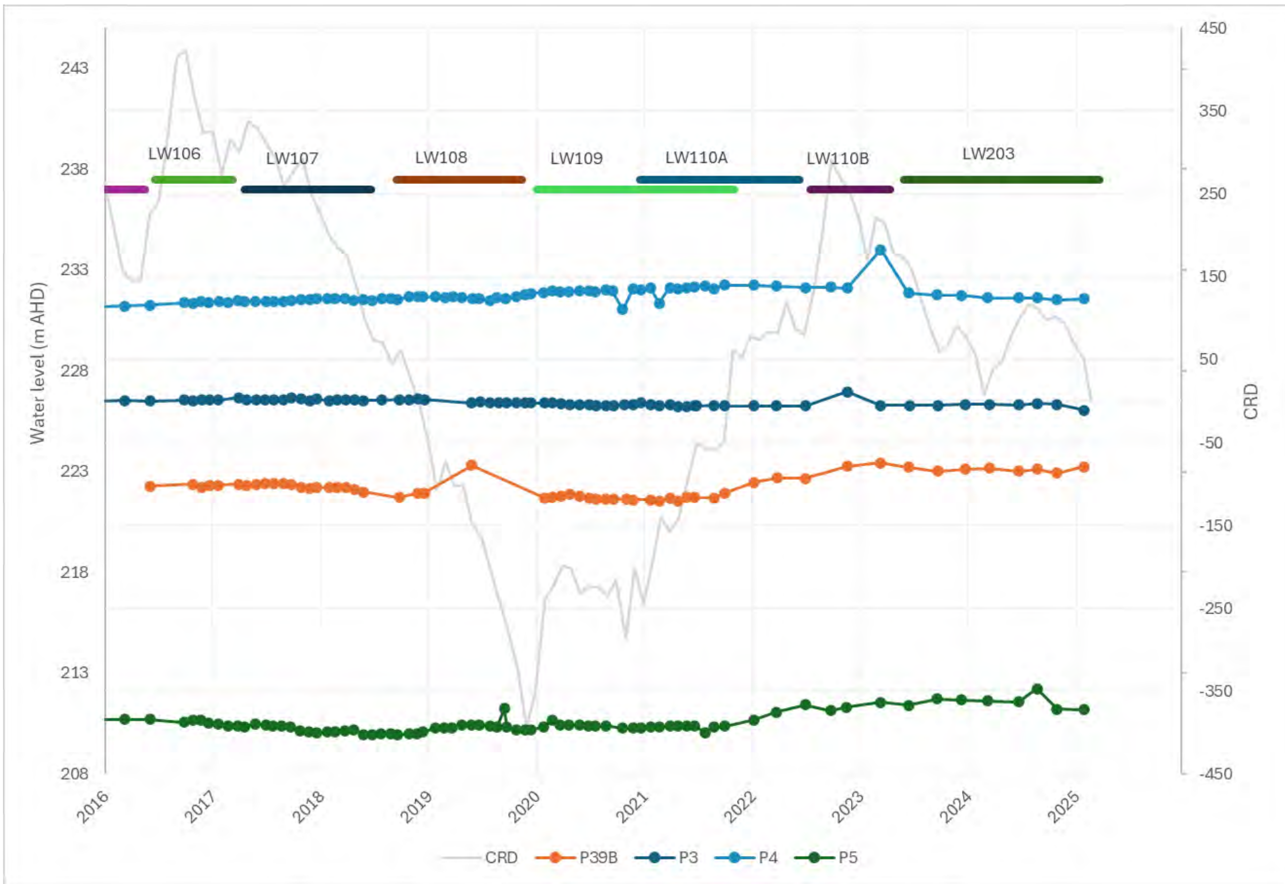
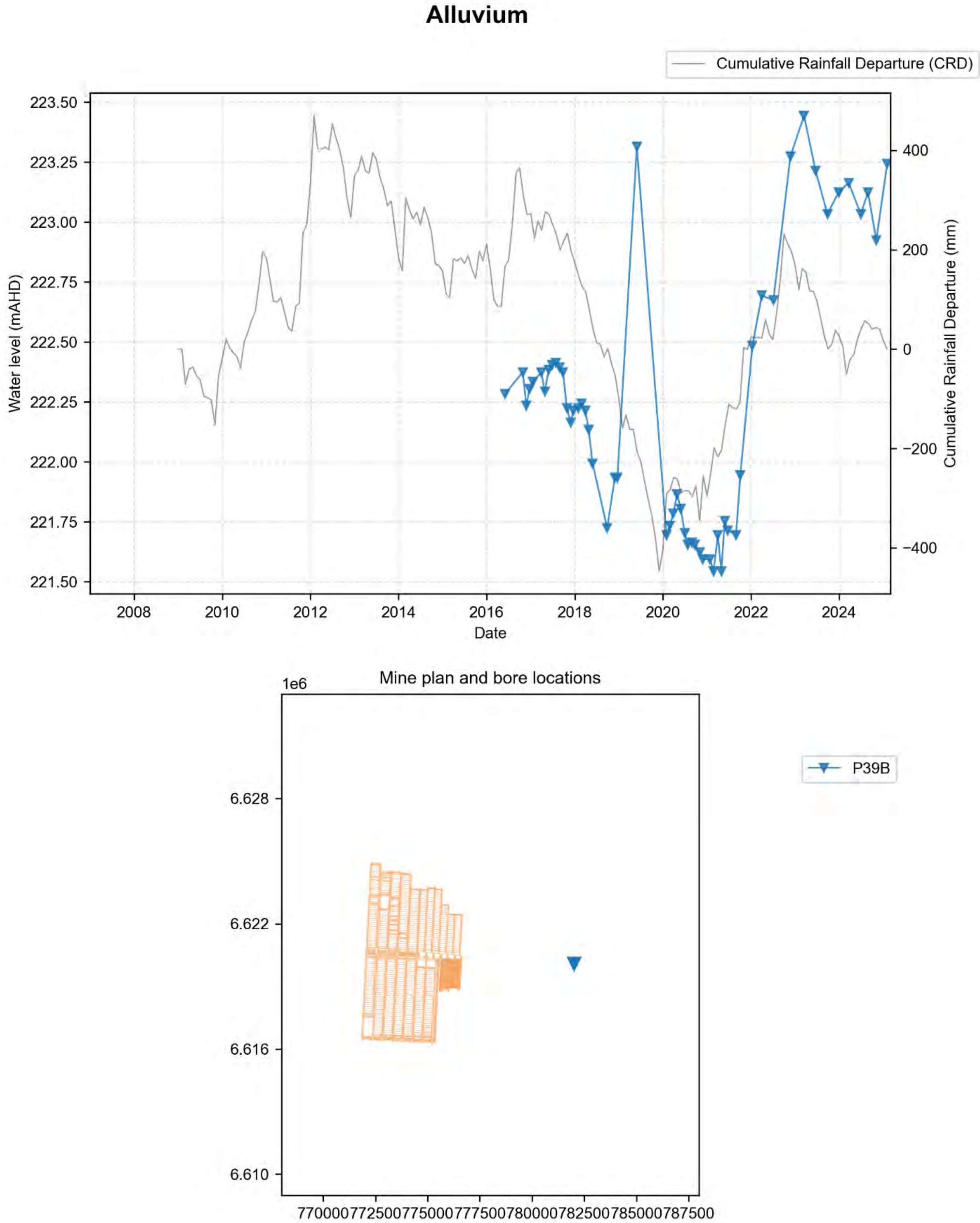


Figure 6.1 Alluvium early warning bores (P3, P4, P5) and alluvium monitoring bore (P39B)



* mAHD - metres Australian Height Datum

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Water level plots - Alluvium

Figure 6.2 Alluvium monitoring bore hydrographs and location

6.2 Pilliga Sandstone

The Pilliga Sandstone is monitored by seven standpipe bores these include P6B, P7, P60, P66, P82, and P90, VWP bores also monitor water levels in the Pilliga at VWP42 and VWP54. Of these bores, only P7 is currently monitored as part of the Stage 2 GWMP (2024). Bore P6 has been recorded as dry since 2013 and was recently replaced by P6B which was installed at the base of the Pilliga Sandstone.

Table 6.2 Pilliga Sandstone data summary

Bore ID	Location	Monitoring guidelines met?	Trigger		Recent water levels				TARP	Trend*
			Tier 1	Tier 2	Q1 2024	Q2 2024	Q3 2024	Q4 2024		
P6B	1 km north of LW111	N/A[2]	-	-	-	-	dry		-	
P7	5 km west and up dip of UG workings	No*	224.4	224.4[1]	226.5	226.5	226.4	223.5*	Level 1	S
P60	above LW111	N/A[2]	-	-	-	-	dry	-	-	-
P66	5.5 km south of LW209	N/A[2]	-	-	-	-	dry	-	-	-
P82	2.3 km southwest of LW111	N/A[2]	-	-	-	-	dry	-	-	-
P90	above LW206	N/A	-	-	278.3	284.6	285.0	284.6	-	D[2]

Notes: All water levels reported in meters Australian Height Datum (m AHD).
Trends: (S) stable, (D) declining, (F) fluctuating, (I) increasing.
[1] P7 has 4 Tier triggers, Tier 3 is 222.4 and Tier 4 is 216.4.
[2] no historical data for comparison.
* Bore to be monitored monthly after approval date of Extraction Plan LW203-206 (07/03/2025) .

Groundwater levels at P7 have remained steady since 2012. A value of 223.5 m AHD was recorded in November 2024, this is an outlier or possible measurement error, water level recorded in January 2025 returned back to stable levels of 226.4 m AHD. Groundwater level at P7 is neither impacted by mining nor influenced by climatic variations.

The Pilliga Sandstone is also monitored by VWP bores P42, P54 and P77, a combined plot of all available Pilliga bores is included in Figure 6.3.

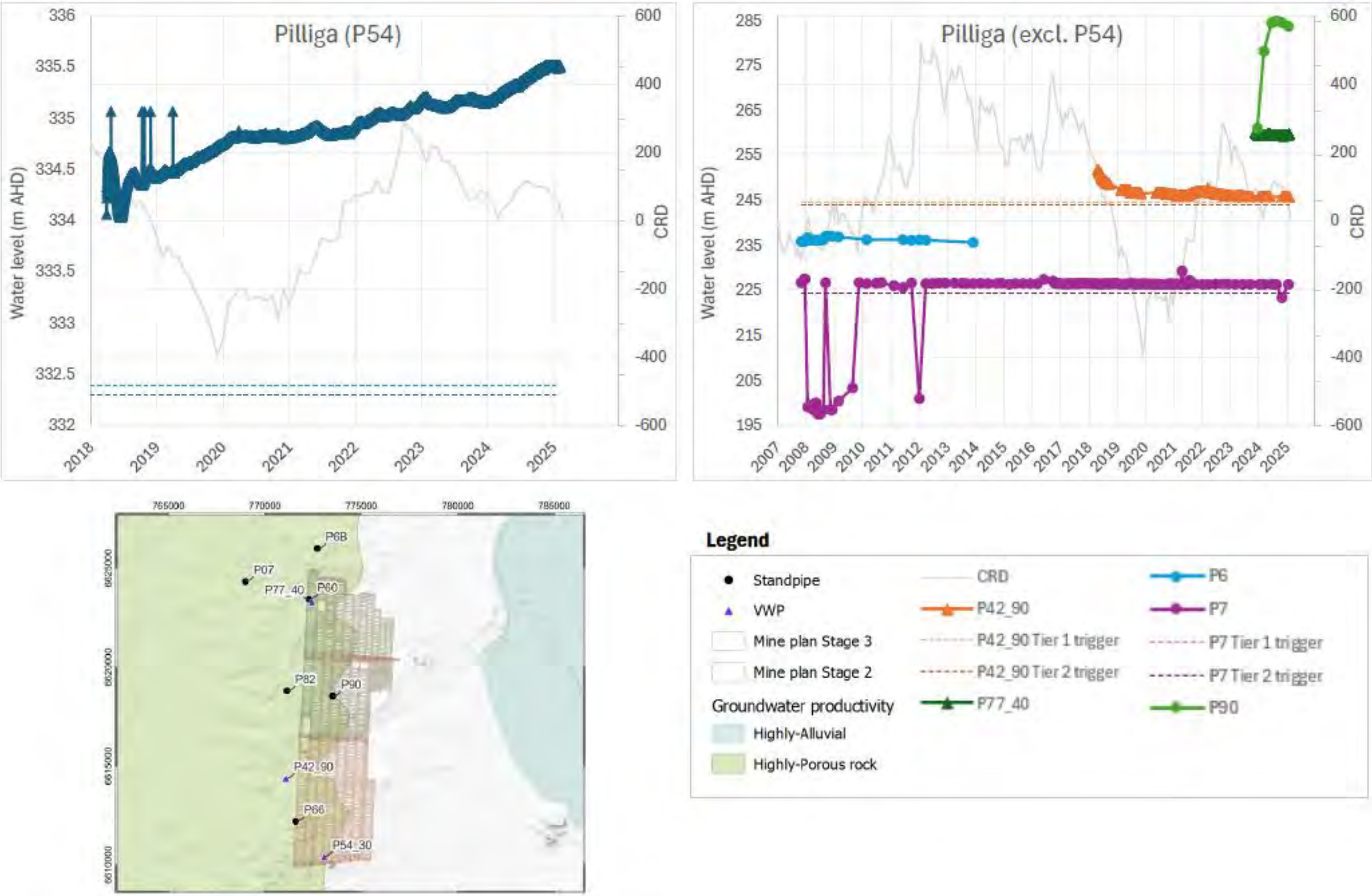


Figure 6.3 Pilliga Sandstone standpipe and VWP monitoring bore hydrographs

6.3 Purlawaugh Formation

Three active Stage 2 monitoring bores are installed in the Purlawaugh Formation, an additional bore (P72) was installed in late 2023 and as such does not yet have an associated water level trigger. Additional monitoring is conducted with VWP sensors (P42_185, P54_60, P54_100, P61_92, P67_115, P67_170, P77_90) summaries are in Section 6.8. Table 6.3 outlines the location for each bore with associated triggers and recent water levels. Time series groundwater elevation data is plotted with the cumulative rainfall departure curve in Figure 6.4. The groundwater data for each bore is also plotted individually in Appendix B.

Table 6.3 Purlawaugh Formation summary

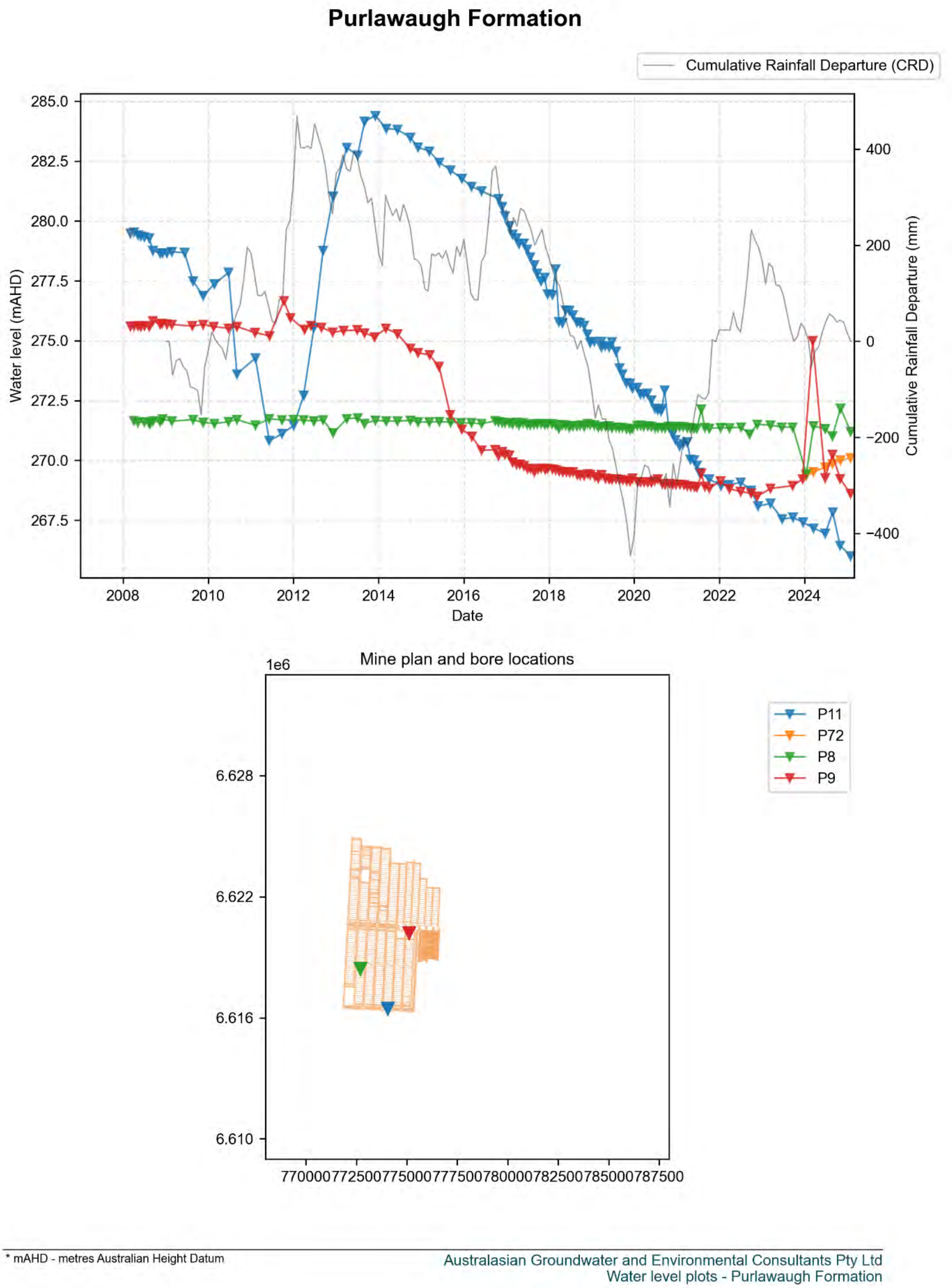
Bore ID	Location	Monitoring guidelines met?	Trigger		Recent water levels				TARP	Trend*
			Tier 1	Tier 2	Q1 2024	Q2 2024	Q3 2024	Q4 2024		
P8	Middle of LW208	Yes	269.6	269.6	271.4	271.3	271.0	272.2	-	D
P9	Central mains on LW203	Yes	264.2	260.8	275	269.3	270.2	269.2	-	F
P11	Southern boundary of LW205	Yes	270.4	270.1	267.2	266.9	267.8	266.4	Level 2	D
P72*	16 km south of the mine	Yes	-	-	269.5	269.7	269.9	270.0	-	S/I

Notes: All water levels reported in meters Australian Height Datum (m AHD).
Trends: (S) stable, (D) declining, (F) fluctuating, (I) increasing.
* Stage 3 monitoring bore, no triggers assigned, insufficient data for trend analysis.

Bore P8 has been steadily declining since 2014 at an average rate of 1.7 cm per month, from March 2024 to August 2024 the rate of decline has increased to 6.8 cm per month. P8 shows some signs of fluctuations with variations in climate; however, the recent increase in the rate of decline is not consistent with decreases in rainfall. Water levels in P8 remains above Tier 1 and 2 triggers.

Bore P9 declined rapidly from 2014 to 2016 after which the rate of decline slowed; this slower rate of decline coincides with a period of below average rainfall from late 2016 to 2023. From 2023 water levels have commenced recovering; however, remain below the Tier 1 trigger level. The delayed recovery is likely due to the prolonged below average rainfall from 2016 to 2020, water levels appear to be recovering, and no further action is required at this stage.

Bore P11 remains below the Tier 2 trigger level, and continues a steady rate of decline, investigations into water level decline have been conducted with results reported in Section 6.9.



Note: bore P72 is not plotted on the bore location map, this bore is located 16km south of LW111, off the map.

Figure 6.4 Purlawaugh Formation monitoring bore hydrographs and location

6.4 Garrawilla Volcanics

Four active monitoring bores are installed in the Garrawilla Volcanics, of these, bores P1, P13 and P47 have water level triggers defined in the GWMP (2024). Additional monitoring is conducted with VWP sensors (P61_138, P73_90 and P77_145) summaries are in Section 6.8. A summary of recent data is listed in Table 6.4. Time series groundwater elevation data is plotted with the cumulative rainfall departure curve in Figure 6.5. The groundwater data for each bore is also plotted individually in Appendix B.

Table 6.4 Garrawilla Volcanics summary

Bore ID	Location	Monitoring guidelines met?	Trigger		Recent water levels				TARP	Trend*
			Tier 1	Tier 2	Q1 2024	Q2 2024	Q3 2024	Q4 2024		
P1	3.6 km south of Cut and Fill panel 201	Yes	291.6	291.6	295.6	295.5	299.0	295.2	-	S
P13	South of LW101	Yes	264.7	262.6	264.4	263.9	263.9	263.9	Level 1	S
P16	West of LW111	N/A	-	-	208.6	208.8	207.9	207.5	-	D
P47	north of LW101	Yes	262.4	261.3	265.3	265.3	265.3	265.4	-	S

Notes: All water levels reported in meters Australian Height Datum (m AHD).
Trends: (S) stable, (D) declining, (F) fluctuating, (I) increasing.

Bore P13 indicates a clear correlation between rainfall and water levels, which range from approximately 261 m AHD to 271 m AHD. A significant decline in groundwater levels occurred in mid to late 2013, largely because of mining activities associated with the completion of LW101 and LW102, resulting in a drop of approximately 6 m. No further decline related to underground mining have been observed. Three consecutive measurements below the Tier 1 trigger level have been recorded; however, this appears to be due to fluctuations associated with variations in rainfall.

The groundwater decline observed in P16 was investigated previously, it was found that groundwater decline was due to goaf fracturing caused by the collapse of LW107 and LW109. In 2023 additional VWP monitoring sensors were installed these are P61, installed at 138 m bgl and located 413 m south of P16, and P77, installed at 145 m bgl and located 252 m east of P16 (Figure 6.6). Groundwater pressure readings from these VWP sensors have either remained relatively stable (P77_145) or have increased (P61_138) (Figure 6.6). No decline was recorded throughout the reporting period which consistent with conclusions that water level decline is isolated around P16 and likely attributable to fracturing within the goaf.

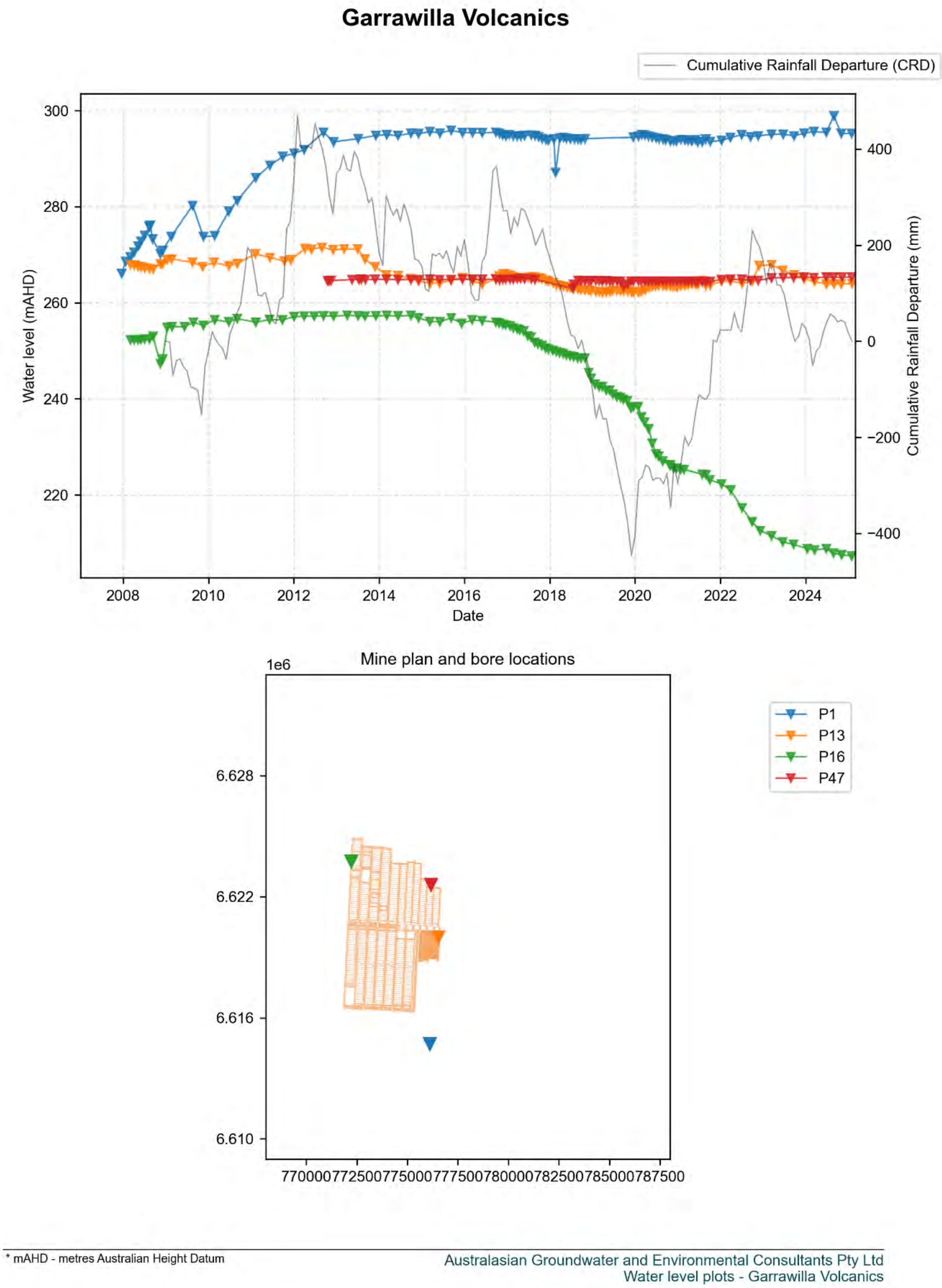


Figure 6.5 Garrawilla Formation monitoring bore hydrographs and location

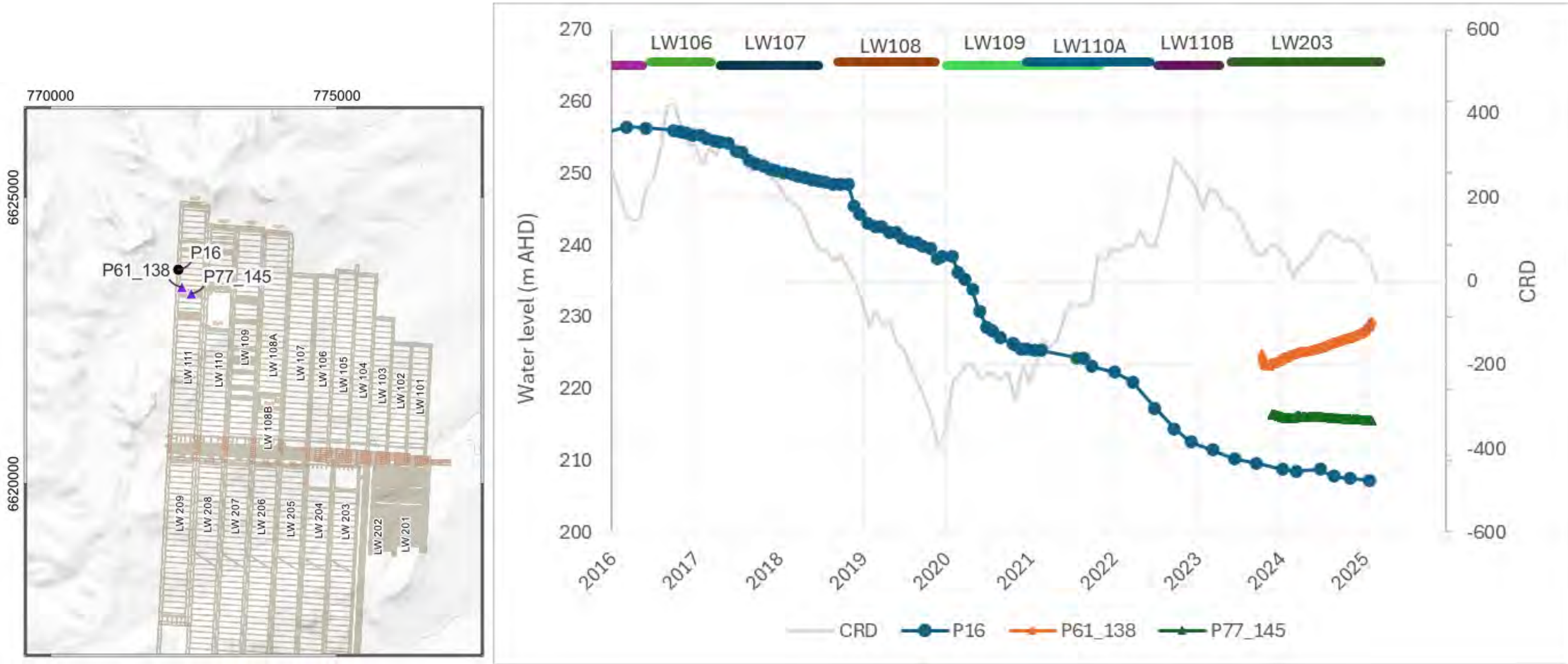


Figure 6.6 Garrawilla hydrographs for bores P16, P61 and P77

6.5 Napperby Formation

Seven active (P2, P4, P10, P12, P63R, P69 and P75) monitoring bores are installed in the Napperby Formation. A summary of the data collected during 2024 is listed in Table 6.5. Water levels are also monitored with a network of VWP sensors which are summarised in Section 6.8. An additional five bores (P29, P30, P31, P32 and P58) are installed in the Napperby Formation monitoring the rail loop water storages, data for these are presented in Section 8. One bore (P52) are installed in the Napperby Formation monitoring the reject emplacement. Time series groundwater elevation data is plotted with the cumulative rainfall departure curve in Figure 6.7. The groundwater data for each bore is also plotted individually in Appendix B.

Table 6.5 Napperby Formation summary

Bore ID	Location	Monitoring guidelines met?	Trigger		Recent water levels				TARP	Trend*
			Tier 1	Tier 2	Q1 2024	Q2 2024	Q3 2024	Q4 2024		
P2	2 km east of LW203	Yes	242.4	238.4	248.0	248.0	248.0	250.2	-	S
P4	3 km northeast of LW101	Yes	226.7	225.8	231.6	231.6	231.6	231.5	-	S
P10	southern edge of LW205	Yes	275.2	273.9	277.1	275.3	276.9	274.2	Level 1	F
P12	near CF201, 650 m south of LW101	Yes	199.0	210.0	231.5	231.6	231.4	231.1	-	S
P63R	1 km north of LW103	Yes[1]	-	-	212.4	221.74	224.0	225.6	-	I
P69	3.5 km south of LW101	Yes[1]	-	-	253.0	252.2	252.3	253.1	-	S
P75	16 km southeast of the active mining area	Yes[1]	-	-	247.0	245.8	246.3	244.1	-	F

Notes: All water levels reported in meters Australian Height Datum (m AHD).

[1] Bores installed late 2023 as part of the Stage 3 preparations, minimal data collection has occurred.

Trends: (S) stable, (D) declining, (F) fluctuating, (I) increasing.

* Insufficient data to determine trend.

Bores P63R, P69 and P75 were installed in late 2023 as part of preparations for Stage 3. Monitoring has commenced at these bores; however, no baseline data or triggers exist, bores are included in Figure 6.7 for reference only. Future monitoring will help establish trends and assess any impacts from mining activities.

Bore P10 shows fluctuations in water levels that are generally consistent with variations in rainfall, since 2023 a declining trend in water levels has been observed; however, this is during a period of below average rainfall and is expected. One exceedance of the Tier 1 trigger was recorded in Q4 2024, one exceedance of Tier 1 trigger is considered normal and does not require further investigation.

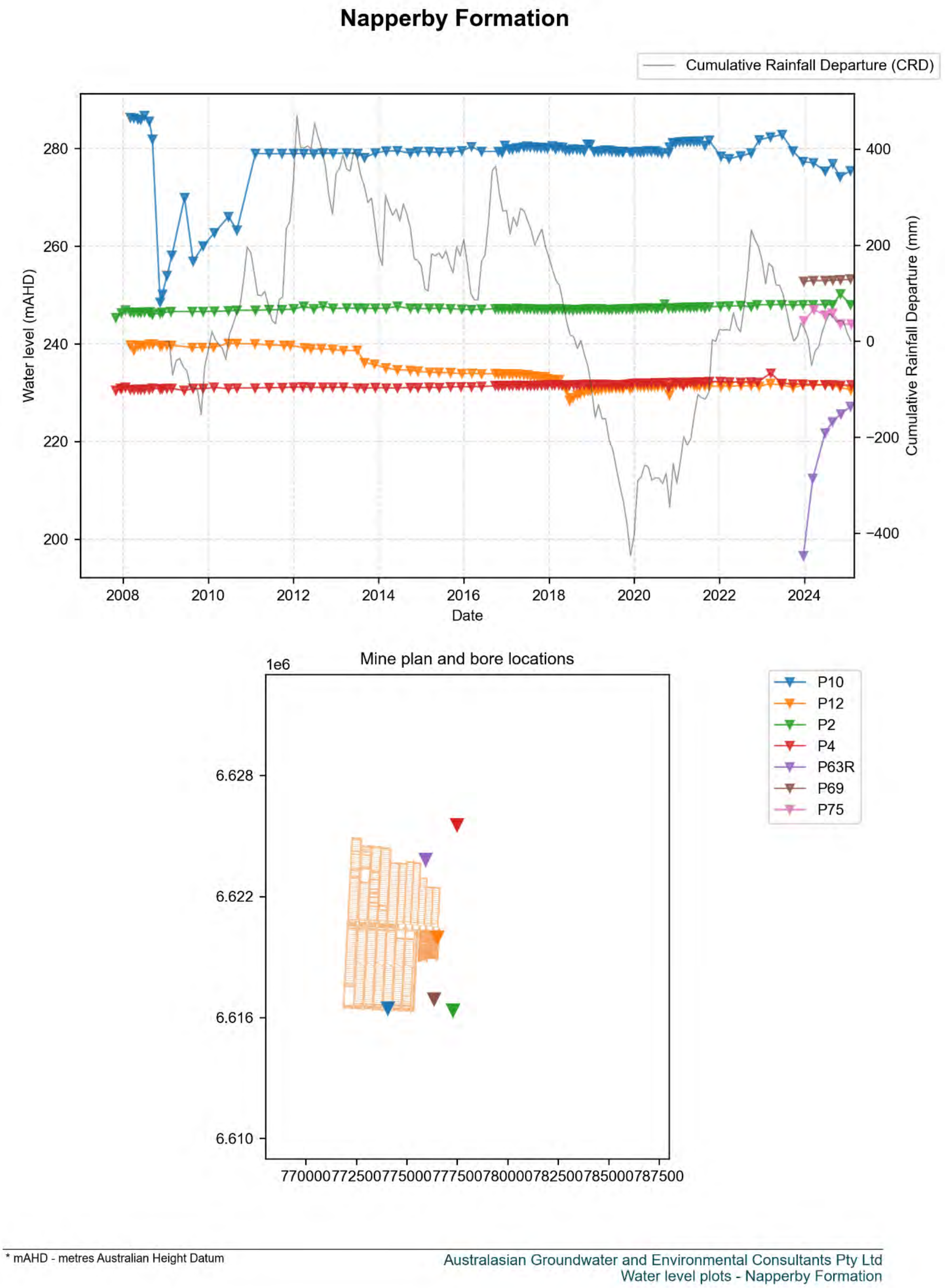


Figure 6.7 Napperby Formation monitoring bore hydrographs and location

6.6 Watermark Formation

Two active monitoring bores are installed in the Watermark Formation, a summary of the data collected during 2024 is listed in Table 6.6. Time series groundwater elevation data is plotted with the cumulative rainfall departure curve Figure 6.8. The groundwater data for each bore is also plotted individually in Appendix B.

Table 6.6 Watermark Formation summary, water levels in m AHD

Bore ID	Location	Monitoring guidelines met?	Trigger		Recent water levels				TARP	Trend*
			Tier 1	Tier 2	Q1 2024	Q2 2024	Q3 2024	Q4 2024		
P39A	5.3 km east of the mine	Yes	-	-	222.8	223.1	223.1	223.1	-	S
P43	780 m west of P39A	Yes	-	-	225.4	225.4	225.3	225.2	-	S

Notes: All water levels reported in meters Australian Height Datum (m AHD).
Trends: (S) stable, (D) declining, (F) fluctuating, (I) increasing.

Groundwater levels in the Watermark Formation monitoring bores P39A and P43 are stable with some fluctuations attributed to changing climatic conditions. Bore P39A and P43 do not have groundwater level triggers associated with them in the GWMP (2024).

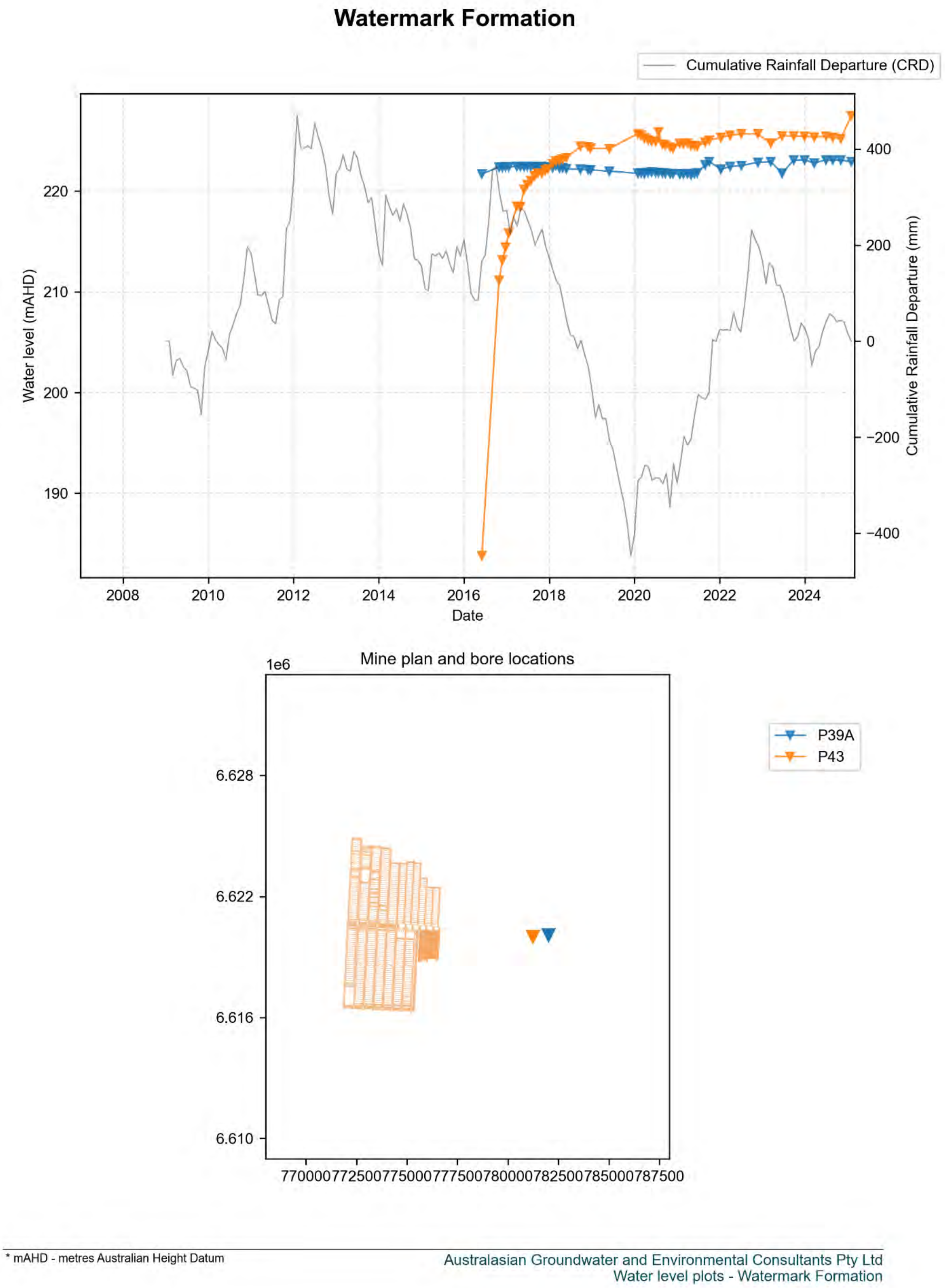


Figure 6.8 Watermark Formation monitoring bore hydrographs and location

6.7 Pamboola Formation

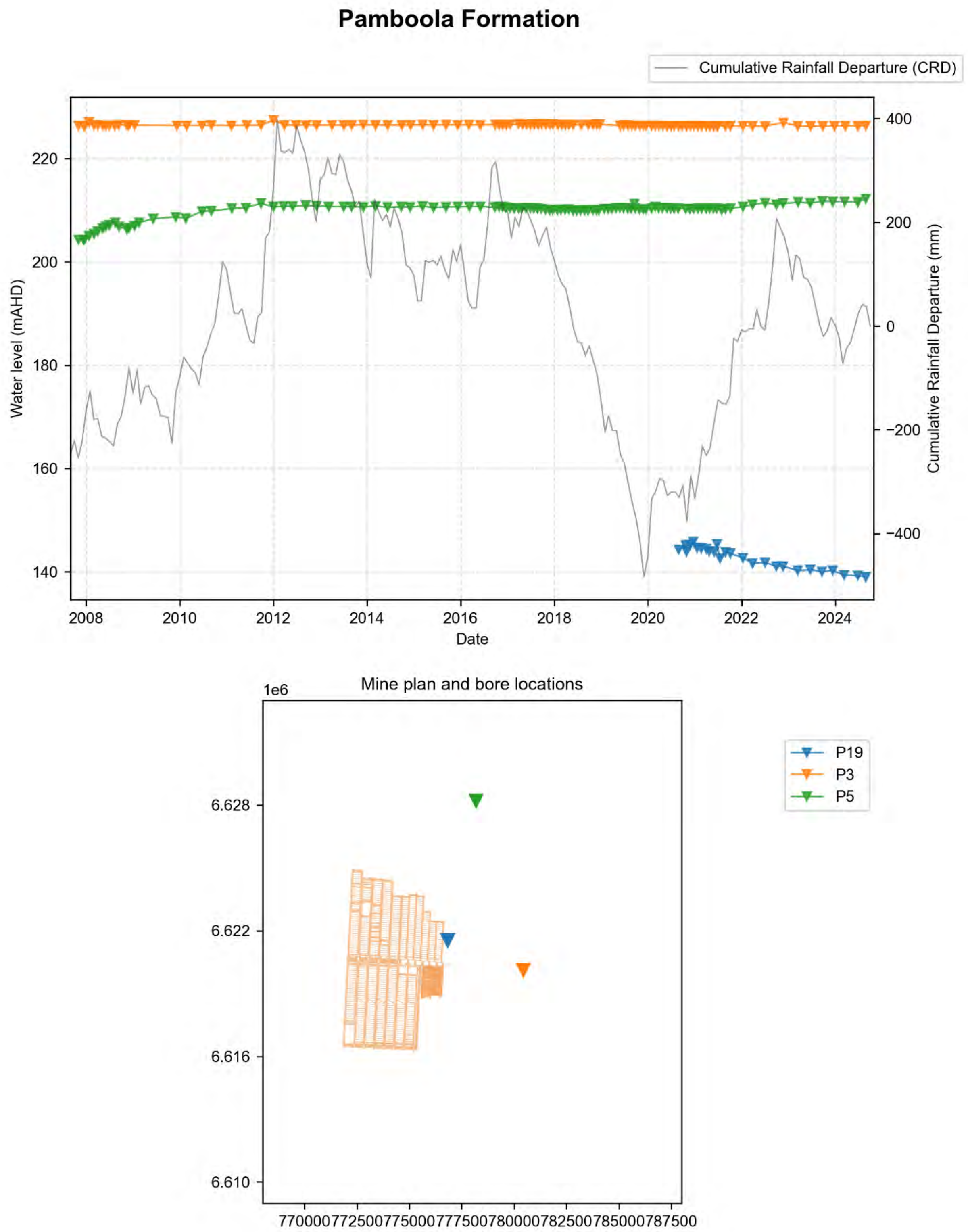
Three active monitoring bores are installed in the Pamboola Formation, a summary of the data collected is listed in Table 6.7. Time series groundwater elevation data is plotted with the cumulative rainfall departure curve in Figure 6.9. The groundwater data for each bore is also plotted individually in Appendix B.

Table 6.7 Pamboola Formation summary

Bore ID	Location	Monitoring guidelines met?	Trigger		Recent water levels				TARP	Trend*
			Tier 1	Tier 2	Q1 2024	Q2 2024	Q3 2024	Q4 2024		
P3	3.7 km east of LW101	Yes	222.3	221.6	226.3	226.3	226.3	226.3	-	S
P5	6 km north of the mine	Yes	207.7	206.8	211.6	211.6	212.2	211.2	-	S
P19	200 m east of LW101	Yes	-	-	139.3	139.3	139.0	139.3	-	D

Notes: All water levels reported in meters Australian Height Datum (m AHD).
Trends: (S) stable, (D) declining, (F) fluctuating, (I) increasing.

Bores P3 and P5 did not record any significant decrease during the 2024 reporting period. Bore P19 is located just east of LW101, prior to August 2020 the wrong bore was sampled at P19 therefore no data is used prior to this date. The impacts at this location are not directly evident in this bore as LW101 was mined from June 2012 to June 2013. From 2020 to 2024 groundwater levels have declined a total of 5 m from 144.3 m AHD in August 2020 to 139.3 m AHD in December 2024.



* mAHD - metres Australian Height Datum

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Water level plots - Pamboola Formation

Figure 6.9 Pamboola Formation monitoring bore hydrographs and location

6.8 VWP monitoring network

Multi-level vibrating wire piezometers (VWPs) were first installed at Narrabri Mine in 2008. The network is constantly evolving with VWPs being mined out and replaced as monitoring requirements and locations change. A summary of the data collected at the operational VWPs at Narrabri is in Table 6.8. VWP hydrographs are available in Appendix C.

Table 6.8 VWP monitoring network

VWP ID	Sensor depth (m bgl)	Sensor depth (m AHD)	Formation	Average pressure head Q4 (m AHD)	Trigger (m AHD)	Comments
P42	90	245.9	Pilliga	245.9	244.7	Stable
	185	150.9	Purlawaugh	275.9	-	Slight decline, generally stable
	345	-9.1	Digby	164.3	-	Erratic data, invalid
	375	-39.1	Benelabri	167.4	-	Stable
	395	-59.1	Hoskissons	164.6	-	Slight decline
	415	-79.1	Arkarula	161.5	-	Fluctuations
P44	95.5	172.7	Napperby	205.7	-	Gradual decline
	134	134.2	Digby	208.3	-	Gradual decline
	245	23.2	Pamboola	240.4	-	Stable
	330	-61.9	Watermark	273.5	-	Watermark Formation is drifting, results unrealistic
	375	-106.9	Porcupine	206.4	-	Increasing becoming stable
	445	-176.9	Maules Creek	282.8	-	Increasing trend
P45	42.5	204.8	Digby	206.3	-	Increasing over time
	80	167.3	Arkarula	224.8	-	Fluctuating
	150	97.3	Watermark / Porcupine	228.9	-	-
	200	47.3	Maules Creek	219.2	-	Sensor drift, values unrealistic
	240	7.3	Maules Creek	234.1	-	Historical results erratic
	276	-29.7	Maules Creek	249.2	-	Declining
P46	70	193	Napperby	238.4	-	Increasing
	87	176	Digby	249.3	-	Fluctuating with climate variations
	151	112	Pamboola	221.6	-	Decline
	250	13	Watermark	220.4	-	Noise in data, unreliable
	308	-45	Porcupine	257.7	-	Decline
	343	-80	Maules Creek	278.2	-	Decline

VWP ID	Sensor depth (m bgl)	Sensor depth (m AHD)	Formation	Average pressure head Q3 (m AHD)	Trigger (m AHD)	Comments
P54	28	335.1	Pilliga	335.4	332.4	Stable
	58	305.1	Napperby	307.9	-	Stable
	98	265.1	Napperby	293.6	-	Declining
	138	225.1	Napperby	269.7	-	Stable
	178	185.1	Pamboola	260.4	-	Increasing
	218	145.1	Pamboola	253.2	-	Increasing
	258	105.1	Pamboola	250.4	-	Fluctuating
	298	65.1	Porcupine	258.8	-	Long term decline, local fluctuations
	336	27.1	Porcupine	253.9	-	Declining
P55	25	249.6	Purlawaugh	249.4	-	Sensor is unsaturated
	44	230.6	Purlawaugh	230.3	-	Sensor is unsaturated
	75	199.6	Napperby	228.6	-	Stable
	98	176.6	Digby	247.2	-	Long term stable trend with local fluctuations
	110	164.6	Hoskisson Coal	248.4	-	Gradual pressure decline
	135	139.6	Pamboola	247.4	-	Stable
	159	115.6	Pamboola	254.2	-	Increasing
	195	79.6	Porcupine	207.4	-	Data unreliable, sensor drift
	228	46.6	Porcupine	242.4	-	Stable
P56	55	260.4	Napperby	261.1	-	Sensor is unsaturated
	85	230.4	Napperby	255.1	-	Long term stable with local fluctuations
	115	200.4	Napperby	246.5	-	Fluctuating, possible sensor error
	145	170.4	Napperby	238.2	-	Declining
	175	140.4	Pamboola		-	Sensor failed 2021
	205	110.4	Pamboola		-	Sensor failed 2021
	235	80.4	Pamboola		-	Sensor failed 2021
	265	50.4	Porcupine		-	Sensor failed 2021
	300	15.4	Porcupine	262.9	-	Stable
P61	92	207.6	Purlawaugh	234.0	-	Stable
	138	161.6	Garrawilla	225.9	-	Increasing
	205	94.6	Napperby	202.9	-	Stable
	260	39.6	Basalt Sill	181.81	-	Increasing
	300	-0.4	Digby	176.7	-	Stable

VWP ID	Sensor depth (m bgl)	Sensor depth (m AHD)	Formation	Average pressure head Q3 (m AHD)	Trigger (m AHD)	Comments
P64*	104	159.6	Basalt Sill	304.0	-	Connection between Basalt Sill and Napperby Formation
	120	143.6	Napperby	304.8	-	Connection between Basalt Sill and Napperby Formation
	150	113.6	Digby	274.7	-	Stable
	159	104.6	Hoskissons Coal	181.9	-	Increasing, possible pressure stabilising after drilling
P67	115	262.3	Purlawaugh	276.8	-	Fluctuating
	170	207.3	Purlawaugh	283.2	-	Steady decline
	240	137.3	Napperby	273.1	-	Steady decline
	300	77.3	Napperby	260.3	-	Stable
	371	6.3	Digby	259.4	-	Data recording errors, some data removed as anomalous
P70	85	188.0	Napperby	253.1	-	Declining
	118	155.0	Digby	250.5	-	Declining
	124	149	Hoskissons Coal	245.5	-	Installed late 2023, Increasing water levels indicate possibly still recovering from drilling
P73	90	227.0	Garrawilla	275.4	-	Declining
	175	142.0	Napperby	276.9	-	Stable
	310	7.0	Digby	264.4	-	Stable
	320	-3.0	Arkarula	264.7	-	Stable
P76	11	252.6	Napperby	251.5	-	Unsaturated
	40	223.6	Napperby	224.8	-	Stable
	81	182.6	Digby	227.0	-	Stable
	105	158.6	Arkarula	225.3	-	Stable
P77	40	262.5	Pilliga	259.6	-	Unsaturated
	90	212.5	Purlawaugh	231.5	-	Stable
	145	157.5	Garrawilla	215.9	-	Stable
	205	97.5	Napperby	195.0	-	Stable
	245	57.5	Basalt Sill	166.8	-	Stable
	265	37.5	Napperby	157.0	-	Possible connection with Digby
	295	7.5	Digby	156.1	-	Possible connection with Napperby

6.9 Groundwater level exceedances

6.9.1 Pilliga Sandstone

In December 2024, bore P7 recorded one measurement of 223.5 m AHD, below the Tier 2 trigger level of 224.4 m AHD. As outlined in the TARP in the GWMP (2024) a Level 1 trigger is actioned when “monthly data review indicates one single exceedance of the Tier 2 trigger level.” This triggers the action “conduct preliminary quality assurance and analysis of data to confirm exceedance.” A review of the monitoring data indicates this is a single outlier, water levels recorded in January 2025 have returned to stable trends.

6.9.2 Purlawaugh Formation

Bore P11, located on the southern edge of LW205, has exceeded its Tier 2 threshold since 2021 and has continued to decline at a steady rate (Figure 6.10). During groundwater model updates an improved match between observations and model predictions was unable to be achieved at this location. It was concluded likely that the drawdown at P11 is not associated with mining activity given the distance of this monitoring point from the active mine workings and lack of drawdown at nearby monitoring bores.

Figure 6.10 Bores P10 and P11 groundwater levels and triggers

In November 2024 a bore census was conducted to determine if pumping from nearby bores could lead to the earlier than planned decline, the results of the bore census are in Appendix E. No unauthorised or increased pumping was noted in the area. The nearest active groundwater extraction bore was GW966839, this bore is located 4 km north of P11 and extracts an estimated 250,000 to 300,000 litres per year. No other active pumping bores were recorded in the area.

A downhole camera survey and collar survey was conducted during the census to determine if declining water levels and high EC was due to a compromised bore. The downhole survey did not discover any compromise with bore, finding the casing to be intact. The bore top of casing and collar was resurveyed along with bores P9 and P10. Previously the ground elevation was recorded as 302.5 m AHD and top of casing (TOC) 303.6 m AHD, after the survey the ground elevation was updated to 301.8 m AHD and TOC updated to 302.8 m AHD.

An additional ventilation shaft is currently being drilled near P11, drilling commenced on 23 October 2024, it is uncertain if drilling activities caused any depressurisation in the direct surrounds.

Recommended actions

Bores P9 and P8 are installed in the Purlawaugh Formation, P9 is installed north of LW203, P8 is installed 2.2 km east and down gradient of LW203 (Figure 5.1). Neither bore demonstrates similar groundwater declines indicating the decline at P11 is localised, no further work is required, continued monitoring is recommended.

6.9.3 Napperby Formation

Napperby bore P10 previously exceeding groundwater levels, as with P11 a down hole camera survey was conducted and a new survey completed for the top of casing. The resurveyed points found that previous elevations were incorrect, since being updated the water level records do not exceed triggers.

7 Groundwater quality

Groundwater quality samples are collected from the Narrabri Mine open standpipe monitoring bores monthly or quarterly in accordance with the WMP 2013 and the GWMP 2024. EC is used to monitor the salinity of groundwater which varies significantly between different formations, with some formations namely the Napperby formation, having a wide range of salinities (see Section 4.2.2). pH is also monitored to understand any potential acidification.

EC field measurements and their respective triggers are summarised in Table 7.1, one bore, P7, recorded pH exceedances for 2024. These are discussed in Sections 7.2 and 7.8.

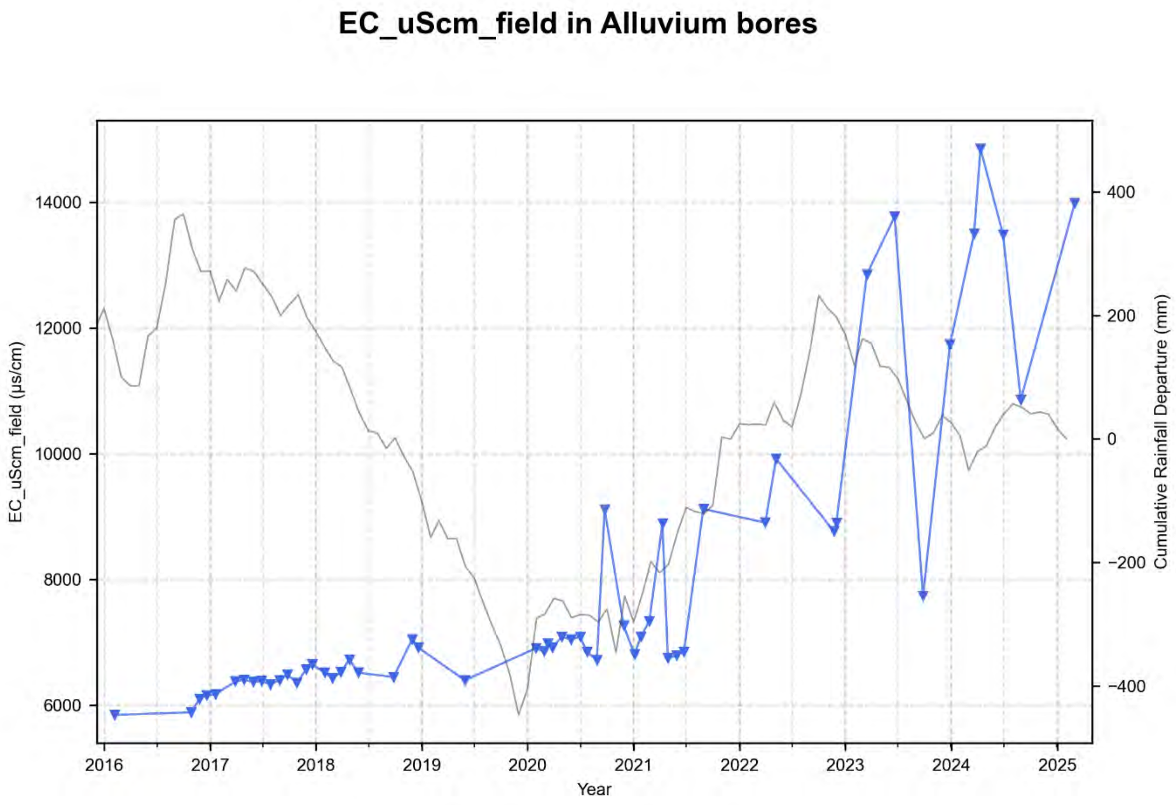
Table 7.1 EC summary

Bore ID	Formation	Monitoring guidelines met?	Trigger		Recent EC measurements				Rolling median	TARP	Trend
			Tier 1	Tier 2	Q1 2024	Q2 2024	Q3 2024	Q4 2024			
P1	Garrawilla	Yes	5,970	-	4,740	4,750	4,730	4,450	4,565	-	I
P2	Napperby	Yes	19,342	19,731	18,990	20,680	19,470	20,680	19,595	Level 1	F
P3	Pamboola	Yes	18,016	18,564	18,030	21,350	18,240	18,660	18,135	Level 1	F
P4	Napperby	Yes	24,912	25,610	24,480	26,700	27,100	28,400	26,900	Level 2	F
P7	Pilliga	-	2,327	-	137.6	123.9	122.9	128.9	123.4	-	-
P8	Purlawaugh	Yes	5,970	-	940	901	978	1,016	965	-	-
P9	Purlawaugh	Yes	20,330	21,190	20,200	21,970	20,160	22,090	20,850	Level 1	-
P10	Napperby	Yes	8,894	9,426	15,820	15,920	15,940	17,090	15,930	Level 2	S
P11	Purlawaugh	Yes	6,052	6,546	7,580	7,010	7,210	6,900	7,000	Level 2	F
P12	Napperby	Yes	5,970	-	3,110	3,050	3,070	3,160	3,060	-	S
P13	Garrawilla	Yes	5,970	-	1,928	2,121	16,15	2,210	2,197	-	F
P16	Garrawilla	Yes	5,970	-	3,650	3,360	3,860	3,590	3,815	-	F
P39A	Watermark	Yes	5,970	-	7,710	7,590	7,650	7,920	7,620	Level 2	F
P39B	Alluvium	Yes	6,546	-	13,500	13,480	10,860	14,850	13,165	Level 2	F
P43	Watermark	Yes	11,162	11,412	11,830	13,390	12,020	11,550	11,820	Level 2	F
P47	Garrawilla	Yes	5,970	-	5,960	6,760	6,230	6,800	6,095	Level 2	F
WB2	Garrawilla	Yes	5,970	-	2,122	2,144	2,163	2,384	2,279	-	F
WB12	Arkarula	No*	5,970	-	-	-	-	-	-	-	-
WB18	Napperby	No*	-	-	-	-	-	-	-	-	-

Notes: All electrical conductivities were reported in µS/cm.
Trends: (S) stable, (D) declining, (F) fluctuating, (I) increasing.
* Bore are currently inaccessible, no data available.

7.1 Alluvium

Groundwater quality in the alluvium is monitored by bore P39B, several other monitoring bores are installed; however, these are managed by WaterNSW. EC steadily increased from 2016 to mid-2021 when EC began to increase at a higher rate (Figure 7.1). pH has remained within the acceptable range of 6 to 8.5; however, some trends are visible in the data (Figure 7.2), pH became more basic (increasing pH) during the Tinderbox Drought followed by a trend to more acidic (lower pH) during periods of above average rainfall post drought.



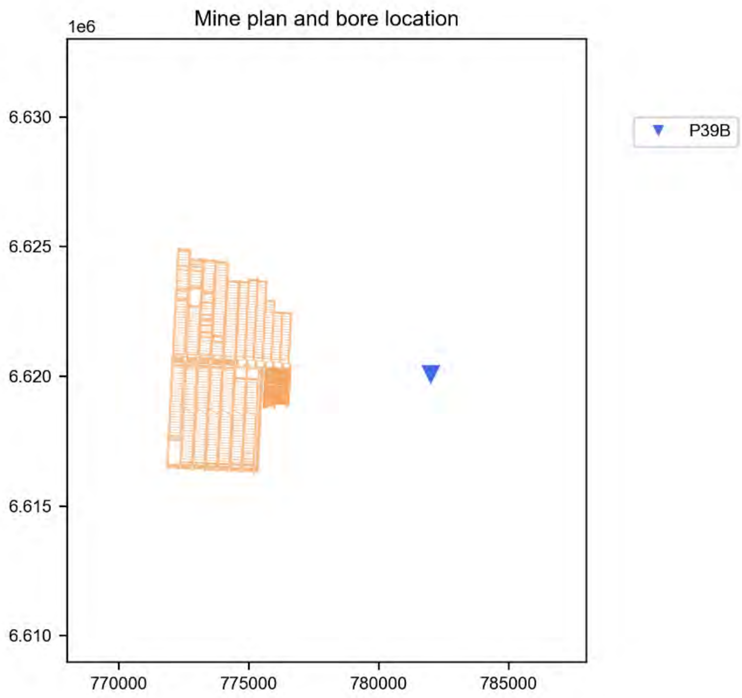


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Figure 7.1 EC plot Namoi Alluvium

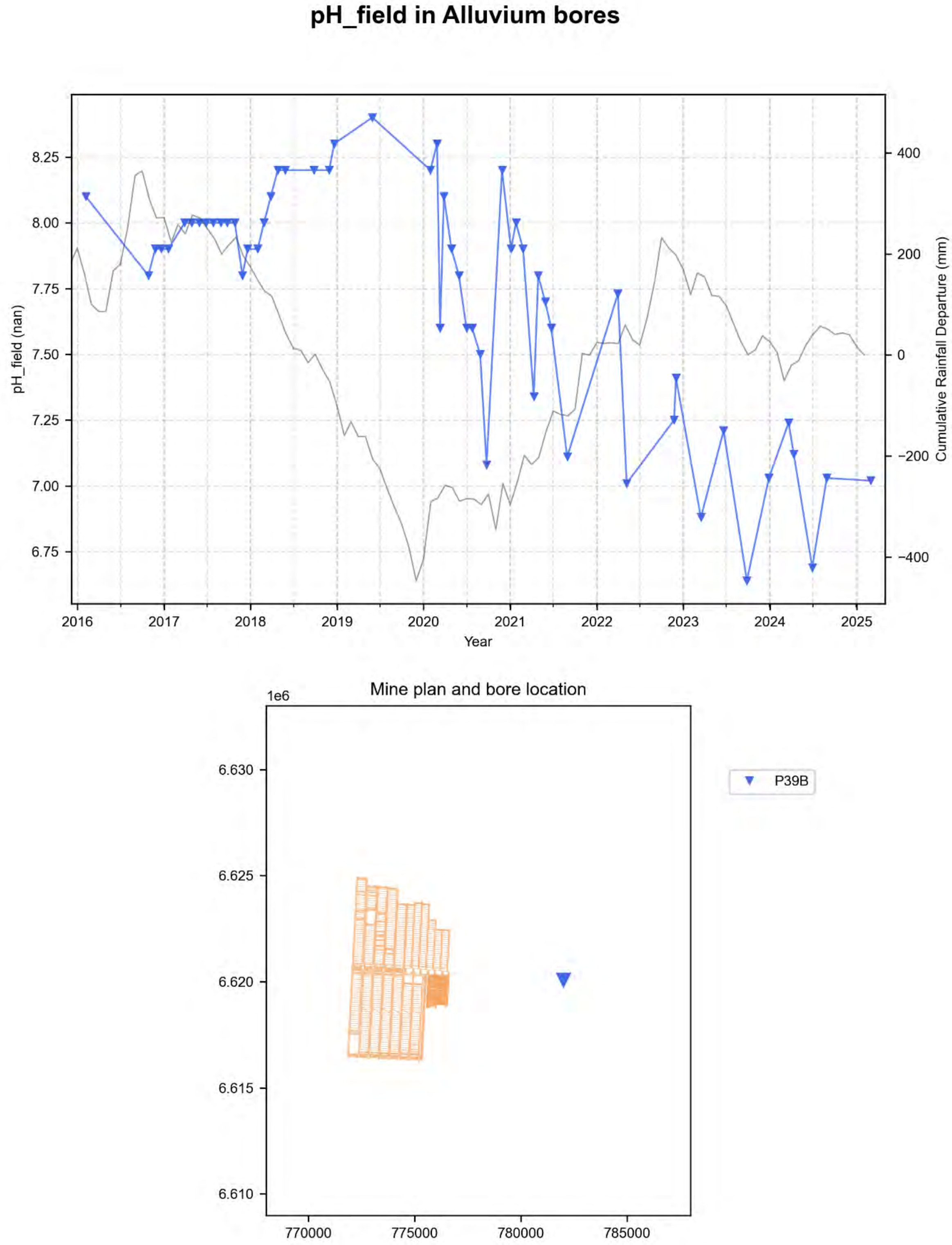

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Figure 7.2 pH plot Namoi Alluvium

7.2 Pilliga Sandstone

The Pilliga Sandstone is monitored by six bores, four of which are currently dry or do not provide sufficient water for a water sample. Currently active bores with sufficient water to provide samples include:

- P7 – located 5km west and up dip of the underground workings at the mine; and
- P90 – located 2.2 km south of LW108.

Bore P90 was installed in 2023 and does not have sufficient baseline data. Bore P7 has recorded a stable EC measurement since 2023, prior to 2023 EC generally fluctuated between 120 µS/cm to 500 µS/cm (Figure 7.3). From late 2020 until mid-2024 pH decreased from 6.5 to 5.5 (Figure 7.4) thereby exceeding the pH trigger level of 6. This decrease in pH coincides with the high rainfall events that followed the Tinderbox Drought and are discussed further in Section 7.8.2.

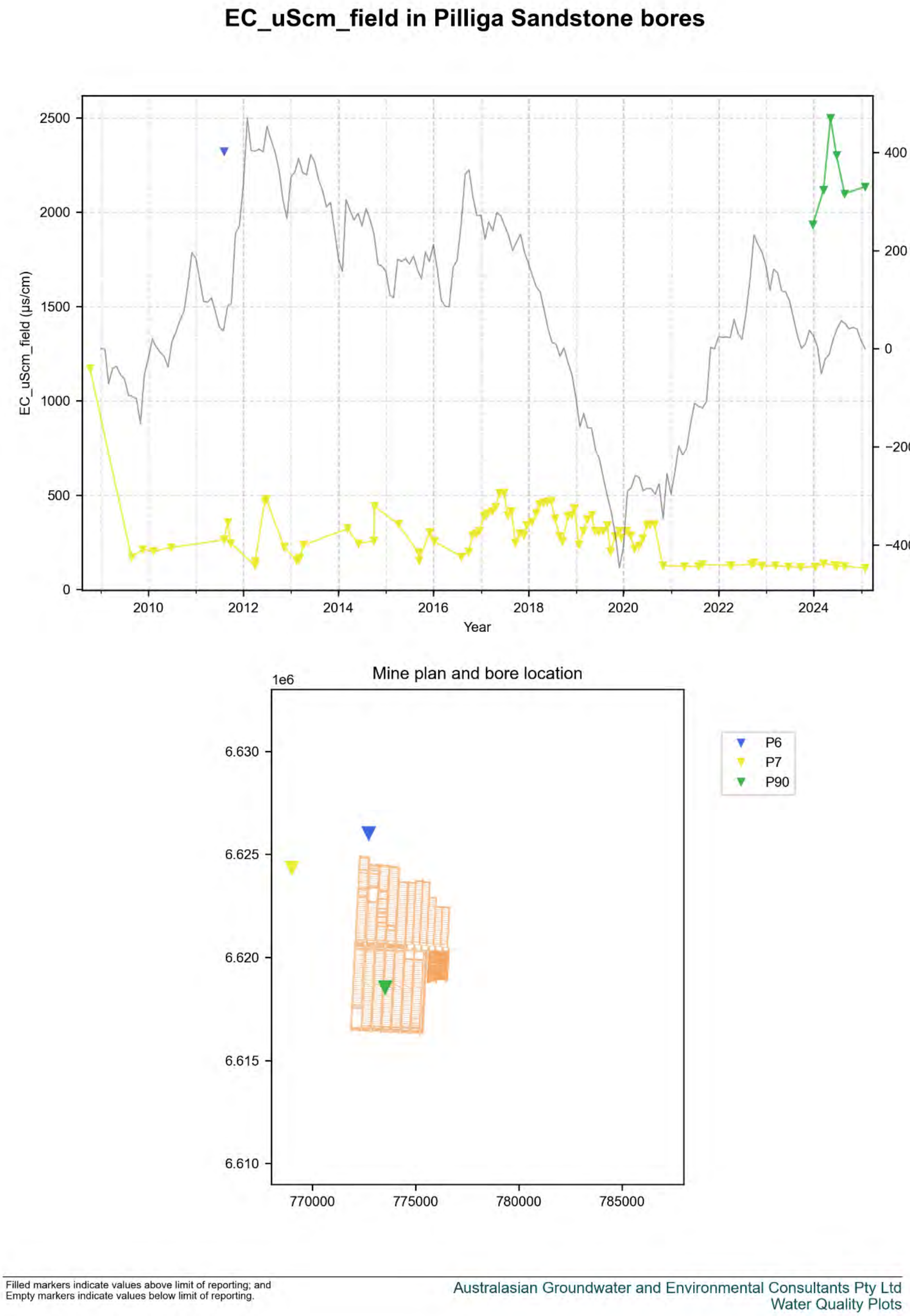

Figure 7.3 EC plot Pilliga Sandstone

Figure 7.4 pH plot Pilliga Sandstone

7.3 Purlawaugh Formation

Four active monitoring bores are installed in the Purlawaugh formation these include:

- P8 – located in the middle of LW208;
- P9 – located near the central mains on LW203;
- P11 – located at the southern edge of LW205; and
- P72 – located ~16km south of the mine.

Since installation in 2009, EC for bores P11 and P9 has generally increased, the highest rates of increase occurred during the two major climate events for the region, the Tinderbox Drought and the preceding period of above average rainfall. From 2022 onwards EC values have stabilised with some small fluctuations recorded, EC at P9 fluctuates between 20,000 µS/cm and 25,000 µS/cm from 2020 until now, while at bore P11 EC has fluctuated between 6,100 µS/cm and 8,000 µS/cm.

During the same time period pH value appear to fluctuate more erratically with greater ranges in consecutive measurements that previously recorded. pH ranges between 6 and 7.75 within ANZECC guideline ranges.

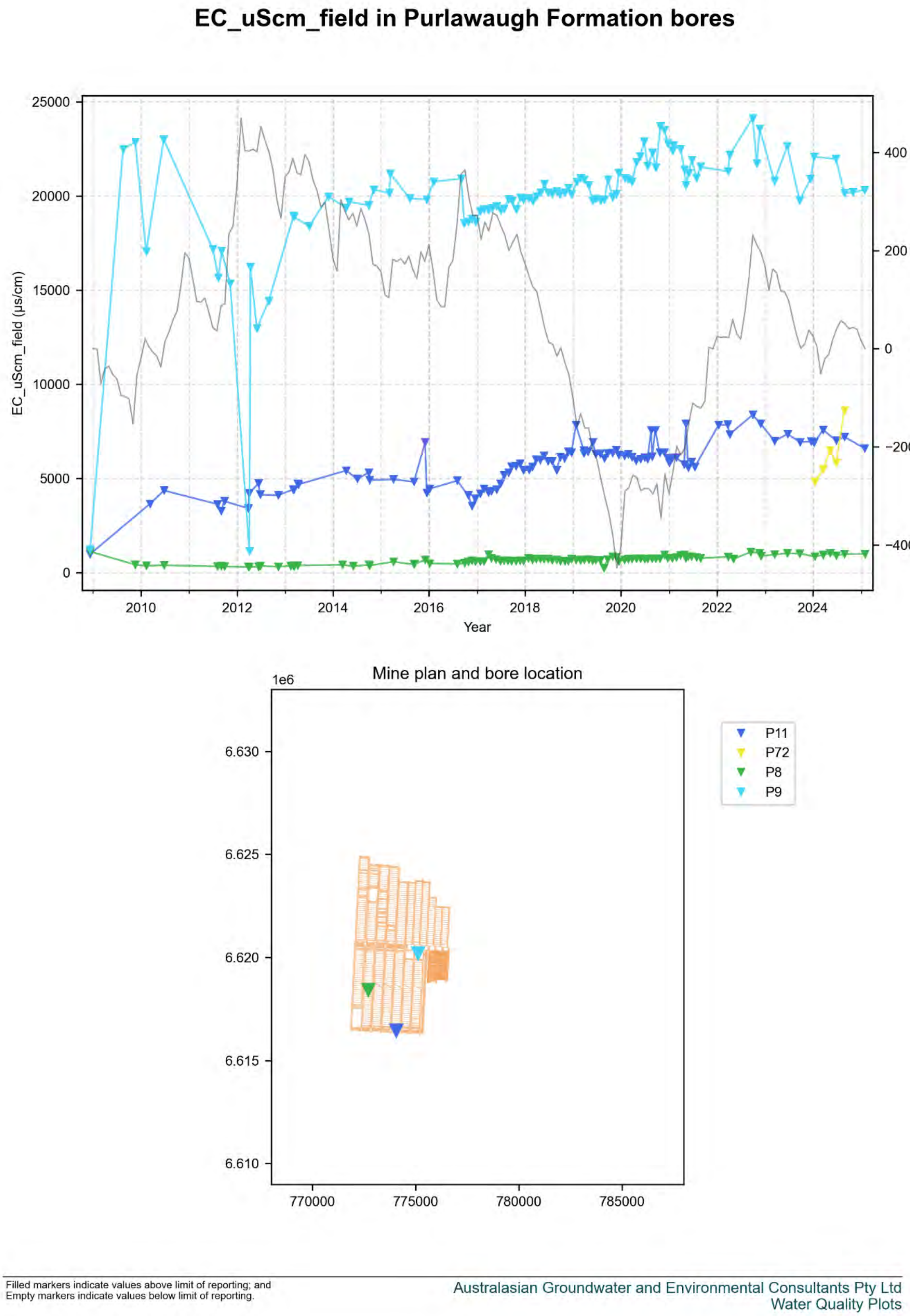

Figure 7.5 EC plot Purlawaugh Formation

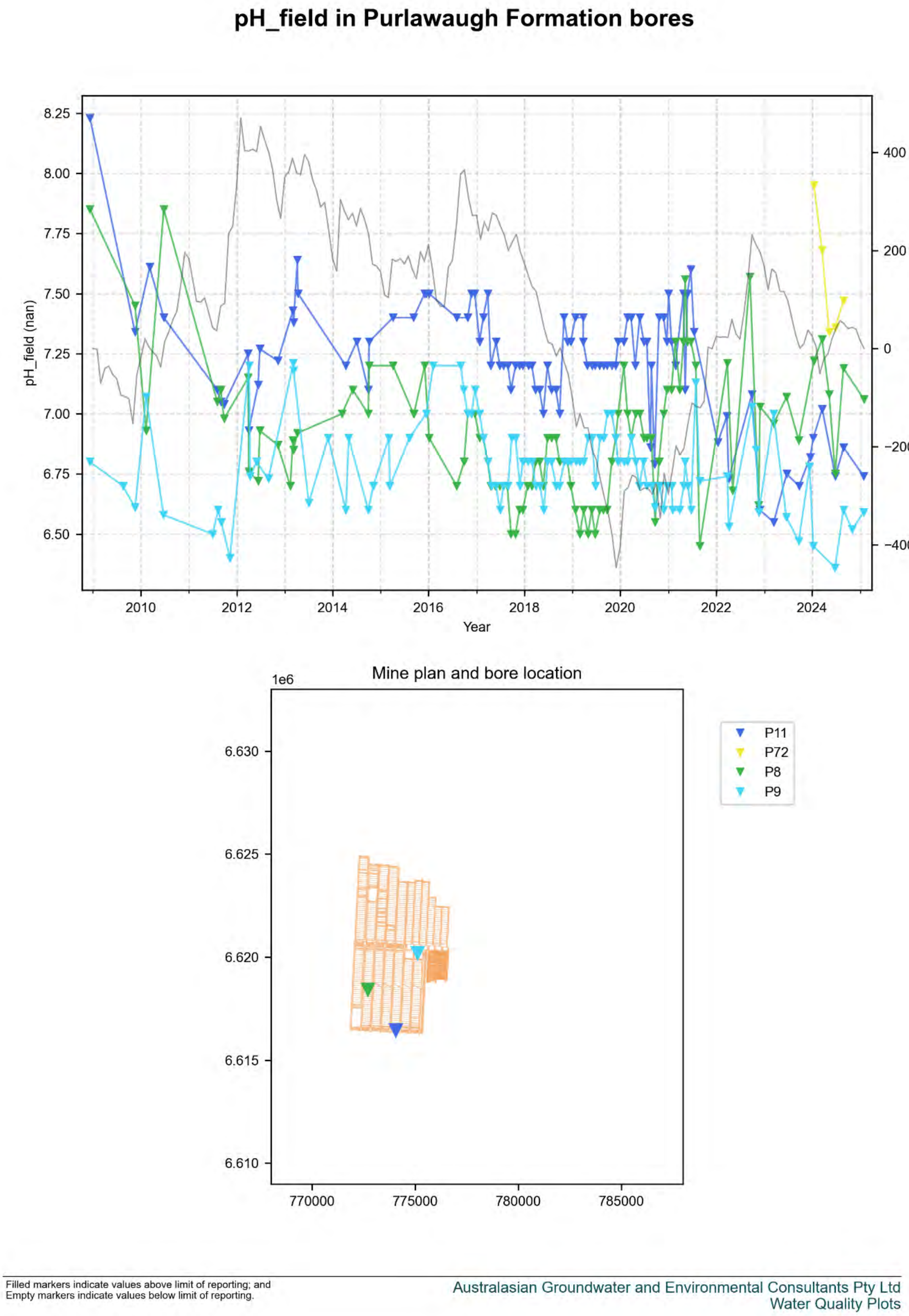

Figure 7.6 pH plot Purlawaugh Formation

7.4 Garrawilla Volcanics

There are six active monitoring bores in the Garrawilla Volcanics these include:

- P1 – located 3.6 km south of the Cut and Fit (CF) panel 201;
- P13 – located south of LW101;
- P16 – located at the western edge of LW111;
- P47 – located north of LW101;
- P51 – located north of the reject emplacement area (REA); and
- P53 – located north of the REA.

Bore P51 and P53 are both installed in the vicinity of the REA; however, these bores have considerably different EC values with P51, the eastern most bore, recording EC values ranging around 20,000 µS/cm similar to bores installed in the Napperby Formation. All other Garrawilla bores (P1, P13, P16, P47 and P53) have salinity ranging from fresh brackish (700 to 2,000 µS/cm) to moderately saline (2,000 to 10,000 µS.cm) (FAO, 2013).

Bore P47, located north of LW101, has experienced an increasing EC trend since records began in 2013. From mid-2021 recorded EC values have fluctuated significantly with values between consecutive measurements ranging anywhere up to approximately 2,000 µS/cm. P47 regularly exceeds its EC trigger of 5,970 µS.cm. This is further discussed in Section 7.8.4.7.8.4.

As with P47, bores P51 and P53 installed near the REA have demonstrated significant EC fluctuations when compared with values recorded prior to 2022. P51 appears to peak in EC close to the end of the Tinderbox Drought and is on an overall downwards trend. Contrary to this, P53 started its most significant increases from 2022, although showing significant fluctuations, the overall EC is generally increasing and remains above Tier 1 and Tier 2 triggers.

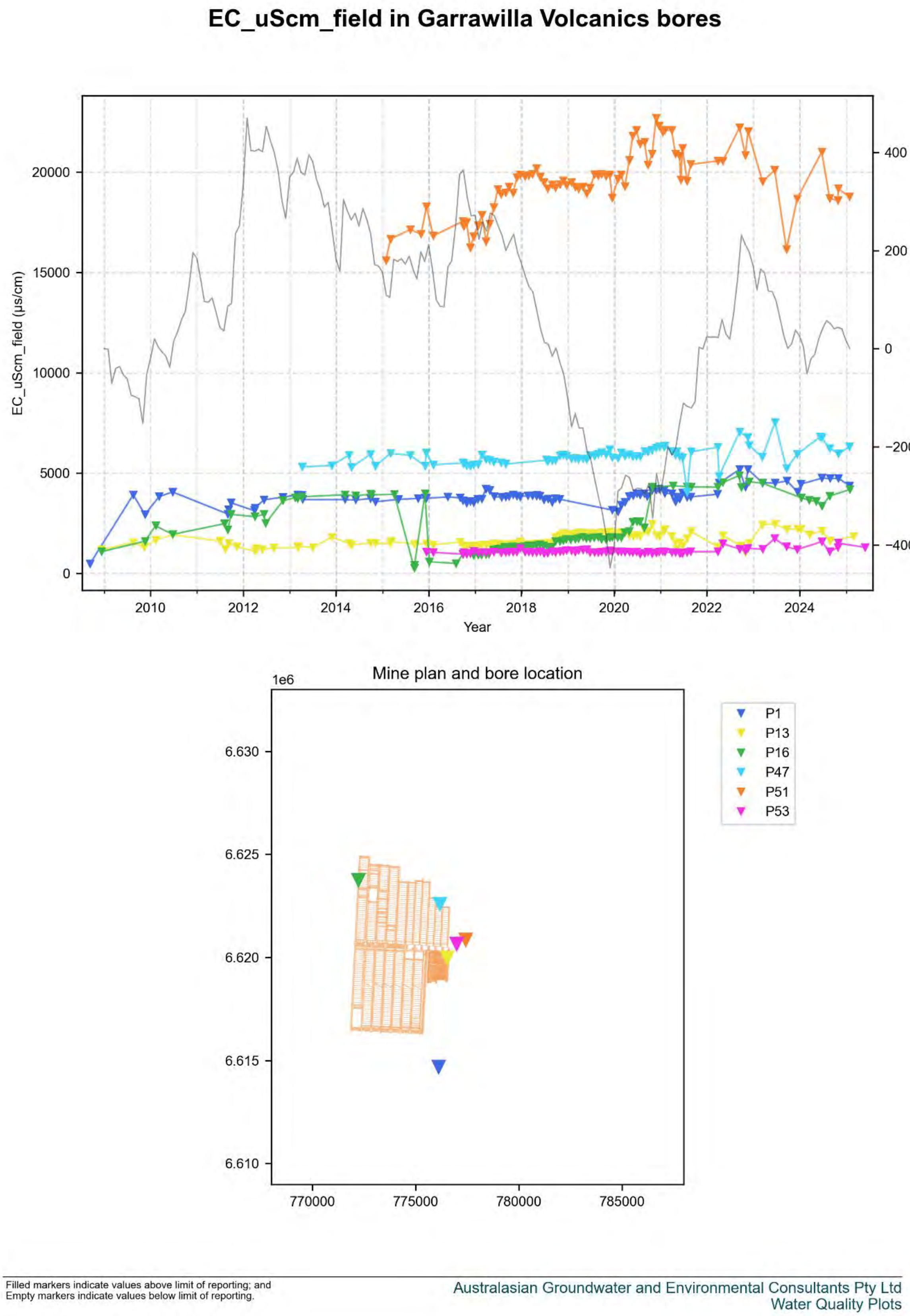

Figure 7.7 EC plot Garrawilla Volcanics

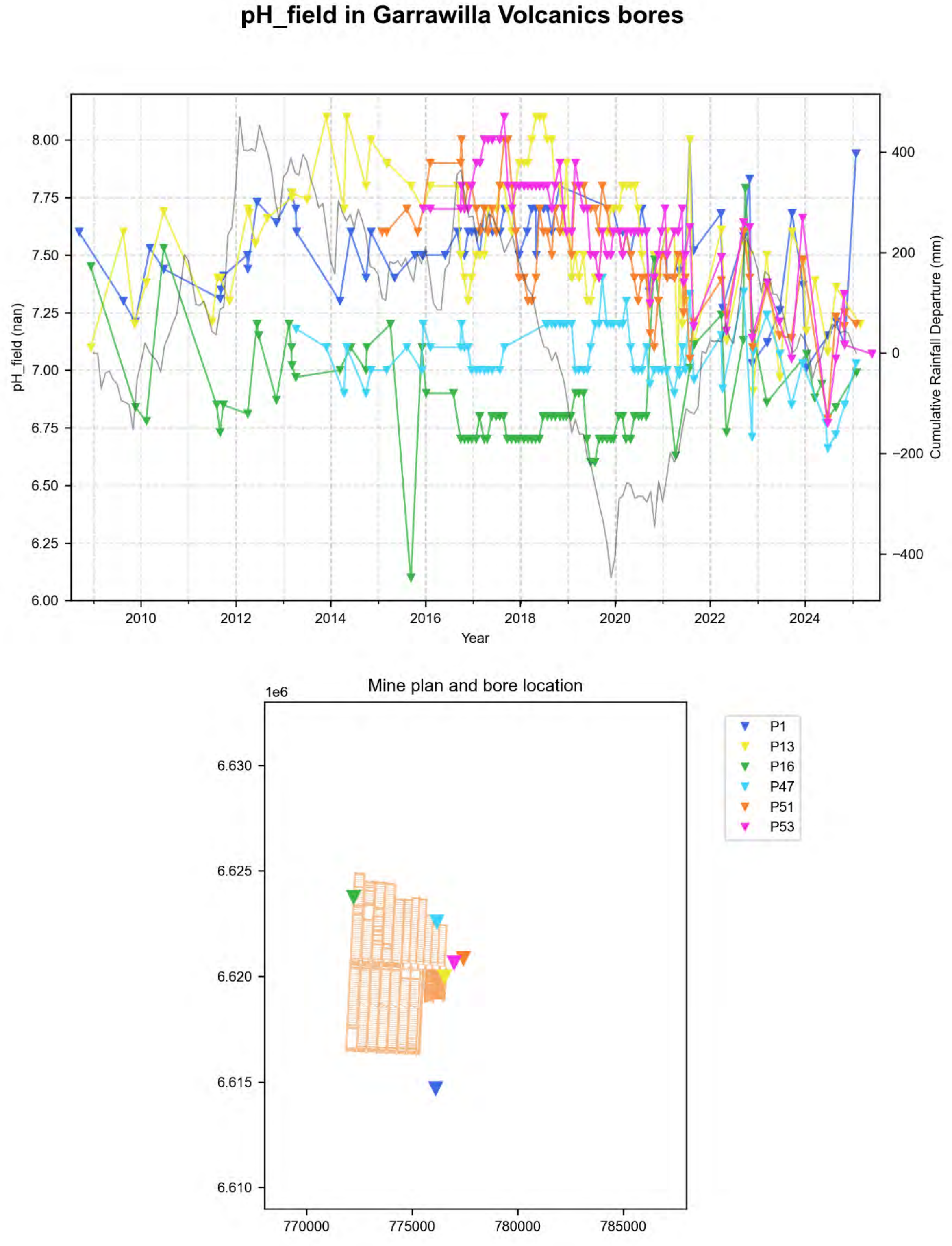

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Figure 7.8 pH plot Garrawilla Volcanics

7.5 Napperby Formation

Napperby Formation bores have variable salinities ranging from brackish to highly saline. The EC data collected in the Napperby Formation bores is highly variable and ranges between 1,500 µS/cm to 29,000 µS/cm.

Bores P12 and P52, located immediately east of mining have stable EC records with values consistently remaining below ANZEC guidelines of 4,950 µS/cm.

Bores P2 and P4, located northeast and southeast of mining respectively have historically recorded highly saline water quality with EC measurements generally around 20,000 to 25,000 µS/cm. In 2020 both bores increased suddenly and have fluctuated since. Similar to P2 and P4, P10 also increased suddenly in 2020, EC measurements after the sudden increase in 2020 have remained relatively stable at elevated salinity levels.

Bore P63R and P75 were installed in late 2023 and do not have sufficient baseline data to establish trends.

The pH of most bores demonstrates greater fluctuations post 2020 with a slightly decreasing trend. No bores exceeded pH trigger values.

Figure 7.9 EC plot Napperby Formation

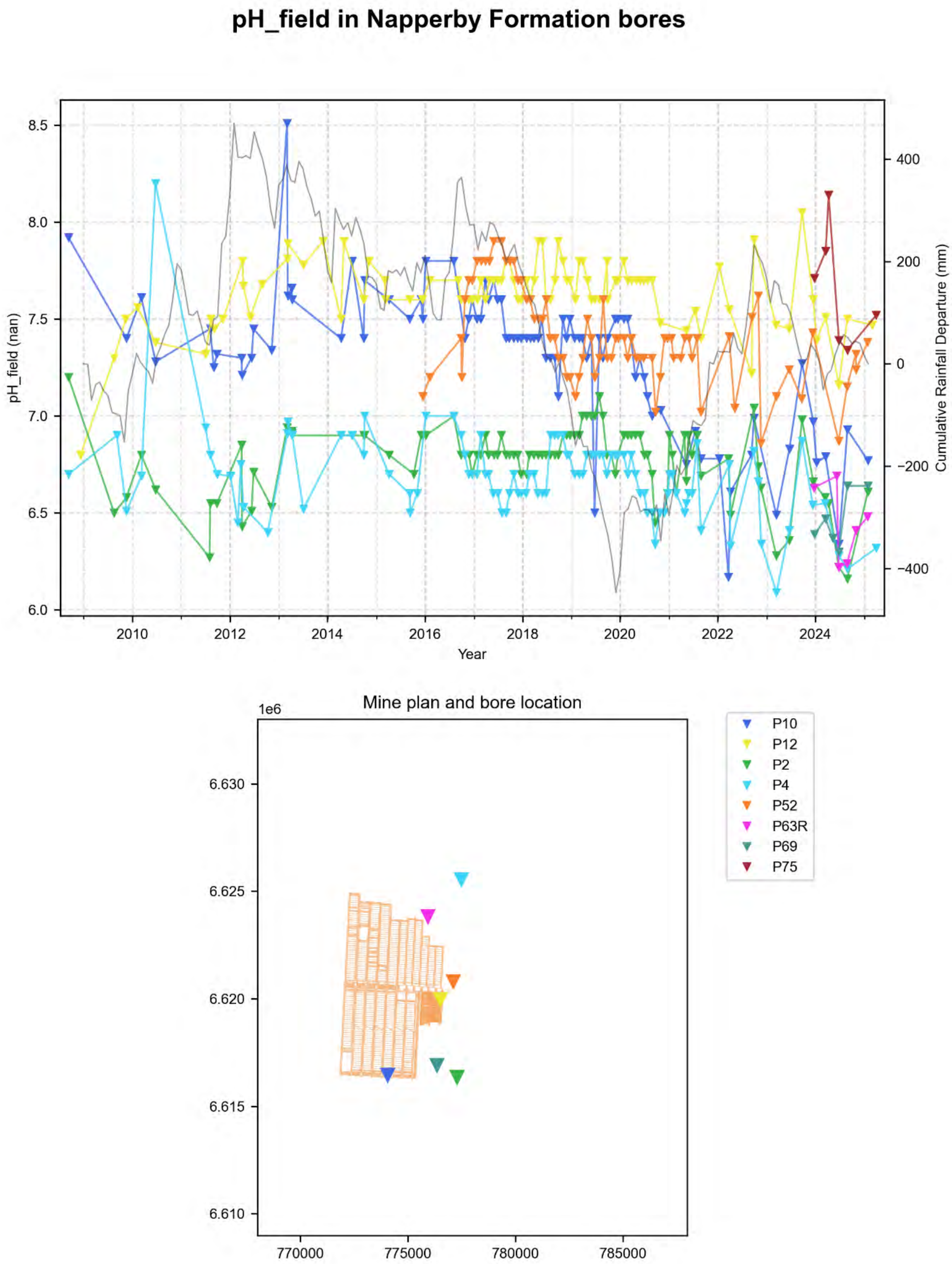

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Figure 7.10 pH plot Napperby Formation

7.6 Watermark Formation

There are two standpipe monitoring bores screened in the Watermark Formation, both bores were installed in 2016:

- P39A – located 5.5 km east of LW201; and
- P43 – located approximately 5 km east of the mine.

From 2016 to mid-2020 both bores experience a steadily increasing trend in salinity, from mid-2020 salinity increased more significantly at the same time both bores saw a drop in pH. P39A decreased in pH from approximately 8 to 7, at the same time P43 dropped from approximately 7.5 to 7. Both bores have recorded similar pH since mid-2020.

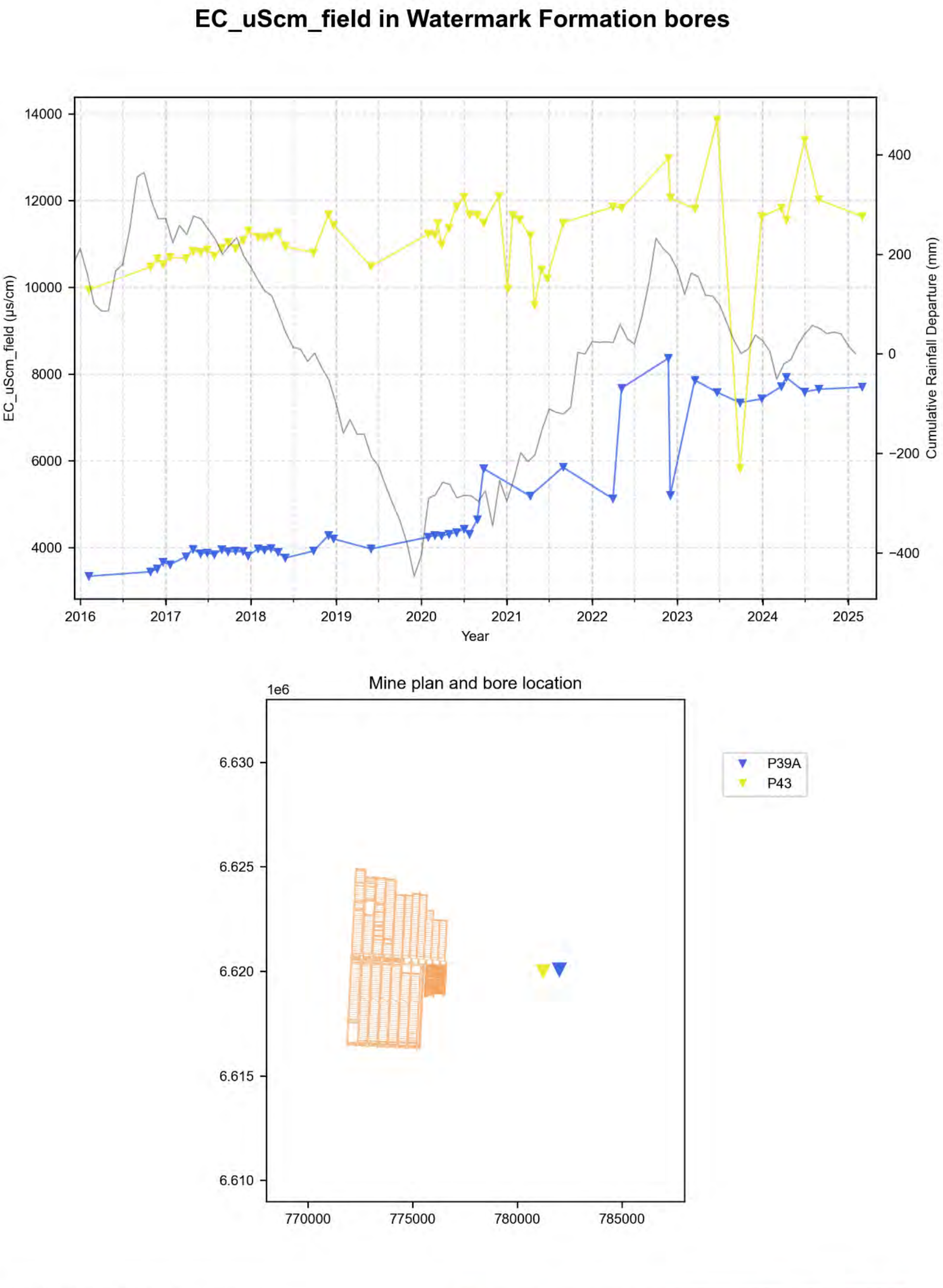

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Figure 7.11 EC plot Watermark Formation

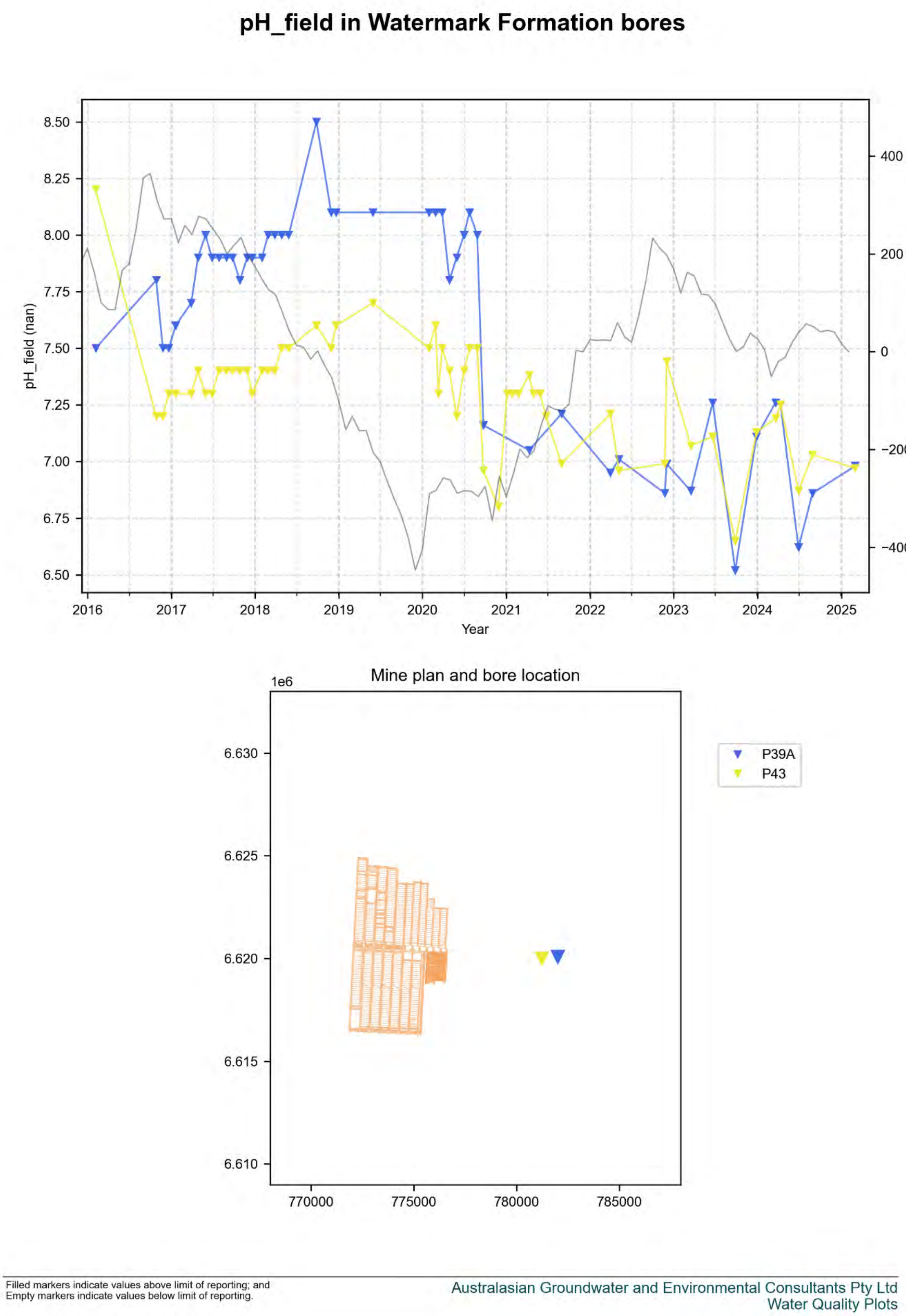

Figure 7.12 pH plot Watermark Formation

7.7 Pamboola Formation

There are three standpipe monitoring bores screened in the Pamboola Formation:

- P3 – located up dip of the project located to the east of the highway;
- P5 – located 6 km north of the Narrabri mine; and
- P19 – located near early mining activities located just east of LW101.

Due to an error in the wrong bore being monitored, all groundwater level data prior to August 2020 is unusable as it is not representative of the Pamboola Formation at P19. Recorded measurements from 2020 until now are moderately stable.

Bores P3 and P5 have recorded stable EC and pH from 2012 to 2021 after which pH measurements become increasingly erratic and with an overall decreasing trend and EC began to increase and fluctuate. A similar trend has been noted in other formations, the trend generally coincides with the end of the Tinderbox Drought. Bore P3 exceeded its Tier 1 trigger for three consecutive times, a review of this bore has been conducted.

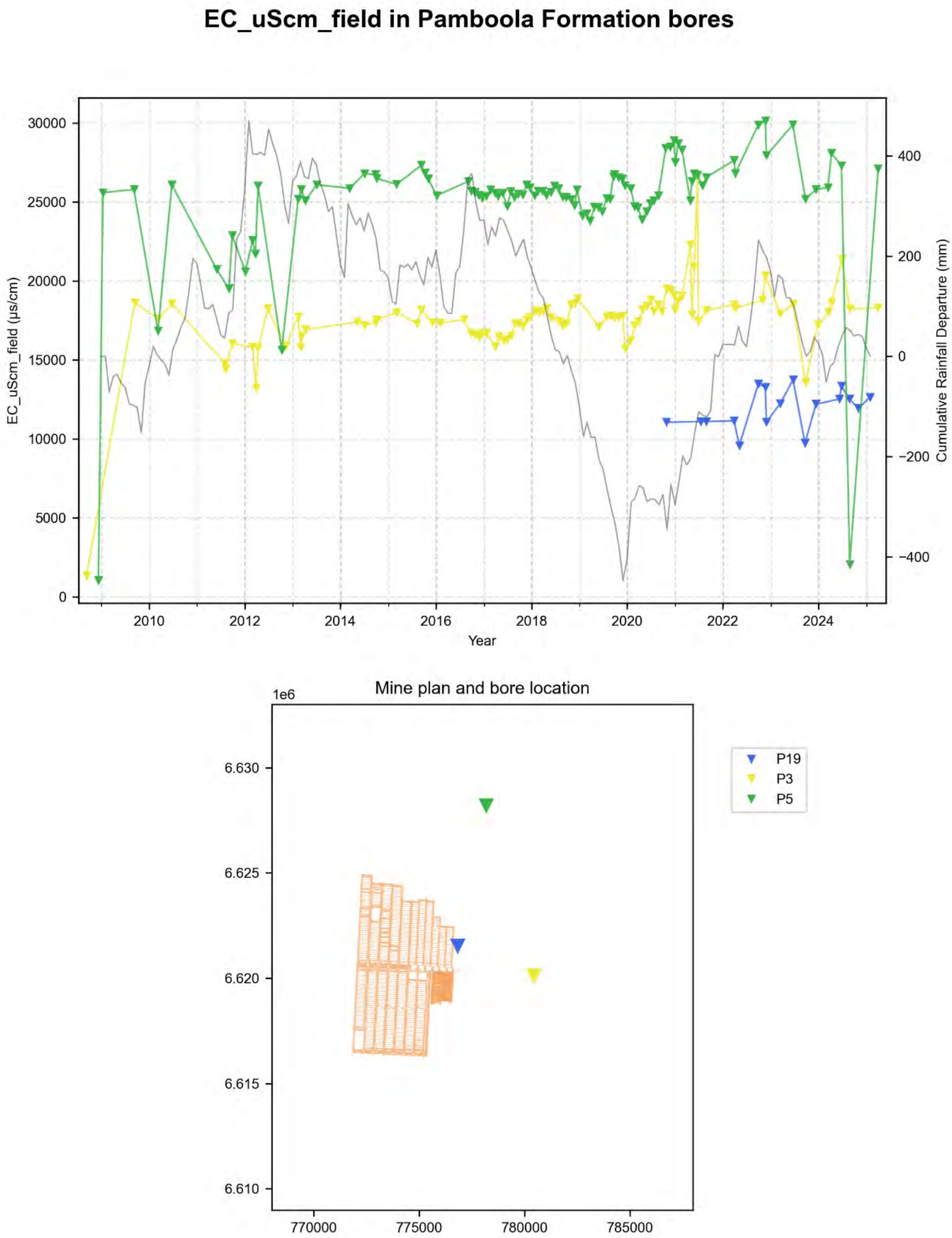

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Figure 7.13 EC plot Pamboola Formation

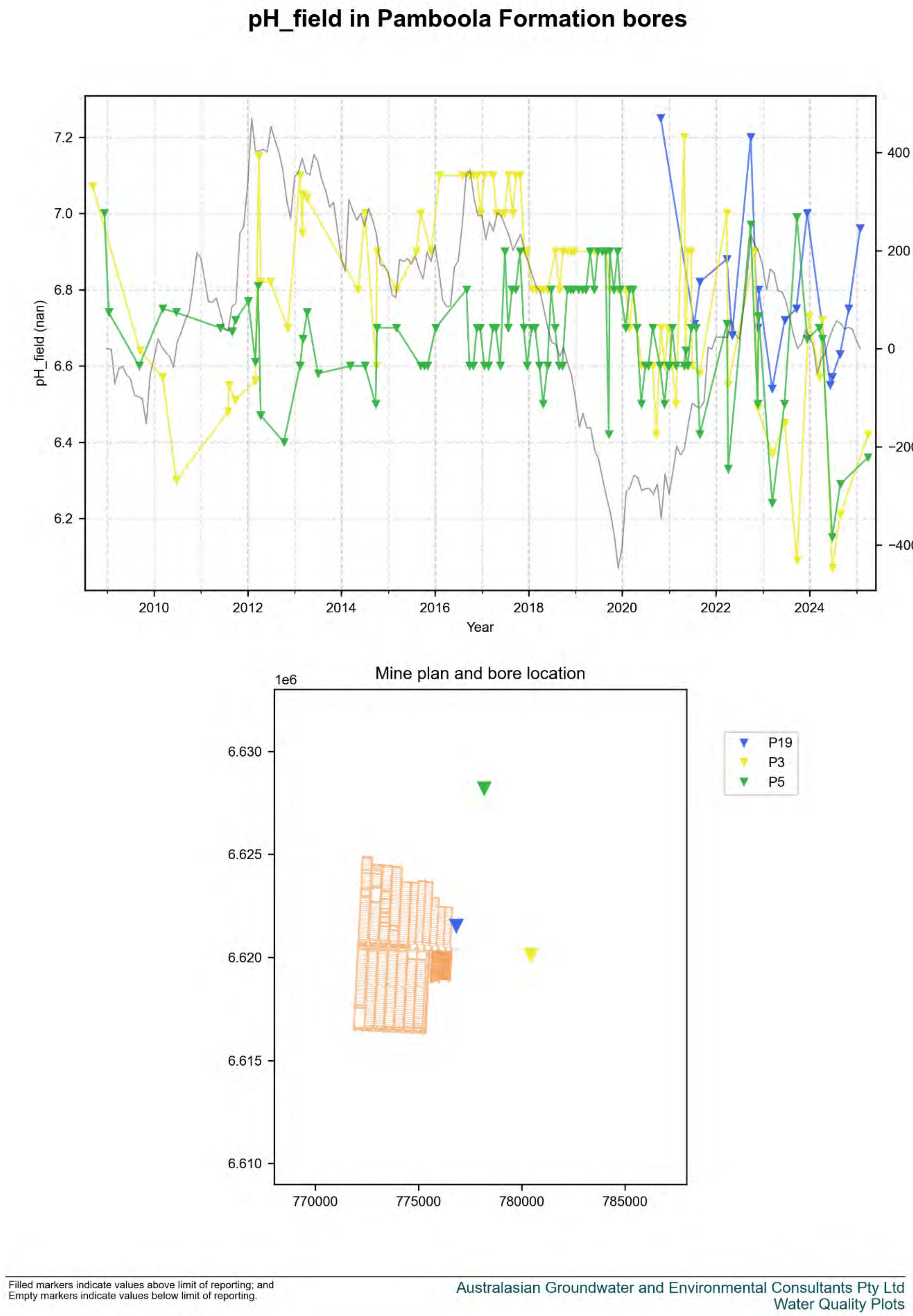

Figure 7.14 pH plot Pamboola Formation

7.8 Groundwater quality exceedances

Groundwater quality is monitored by comparing EC and pH with historical trends, baseline data and trigger exceedance levels. Common causes for changes in groundwater quality include:

- climate factors such as a natural reduction in recharge (causing less dilution) and/or an increase in evaporation (causing more concentration);
- seepage from surfaces sources of water that have EC elevated above groundwater levels;
- mixing with water from adjacent areas of hydrostratigraphic units due to dewatering that causes changes or reversals in hydraulic gradient; and
- solute release due to oxidation and acid-rock drainage.

7.8.1 Alluvium

Bore P39B is installed in the alluvium between Kurrajong and Tulla Mullen creeks from 15 to 30 mbgl and has exceeded its Tier 1 EC trigger since 2020. A steadily increasing trend was recorded from 2016 to mid-2021 when values increased more significantly (Figure 7.15). In addition to the steep overall increasing trend, EC measurements have fluctuated considerably with up to approximately 3,500 µS/cm variations between measurements.

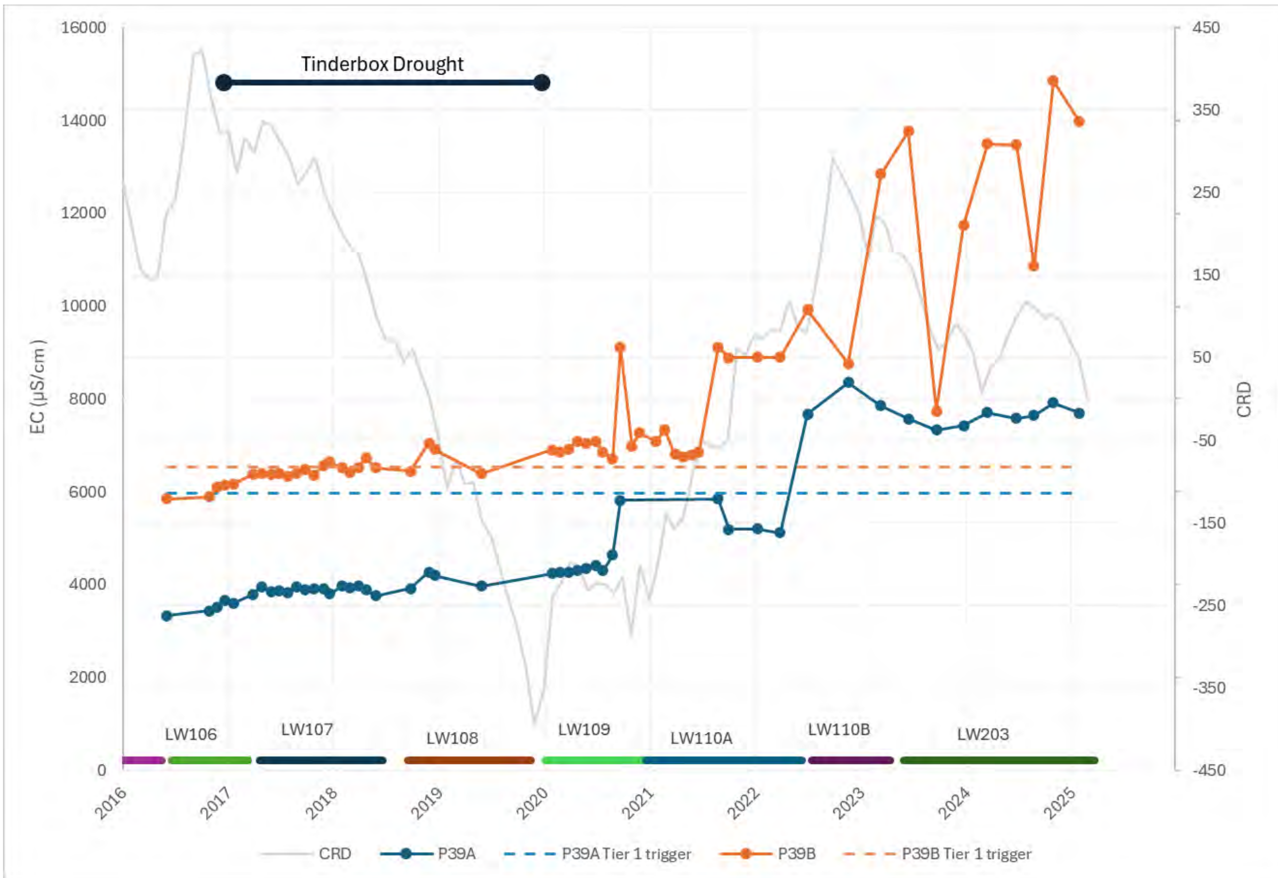

Figure 7.15 Timeseries EC plots with mining progression bore P39A and P39B

Climate factors

Water levels recorded at bore P39B demonstrate a strong relationship with rainfall (Figure 7.16) whereby water levels generally decrease during periods of below-average rainfall and increase during times of above-average rainfall. Monitoring at this bore commenced in 2016 just prior to the onset of the Tinderbox Drought. This drought, as discussed in Section 4.1, was the driest three-year period recorded in the region.

EC field measurements for both P39A (Watermark, 72 to 78 m bgl) and P39B (Alluvium, 15 to 30 m bgl) increased concurrently with an increase in water levels during 2021 (Figure 7.15). Predictably, water levels in the deeper Watermark Formation lagged the alluvium in response to an increase in precipitation. Close to the end of 2021 the hydraulic gradient changed to an upwards gradient from the deeper Watermark Formation to the Alluvium. Groundwater from the Watermark formation entering the alluvium could provide a source of higher EC; although, the hydraulic gradient changes after the initial EC increases.

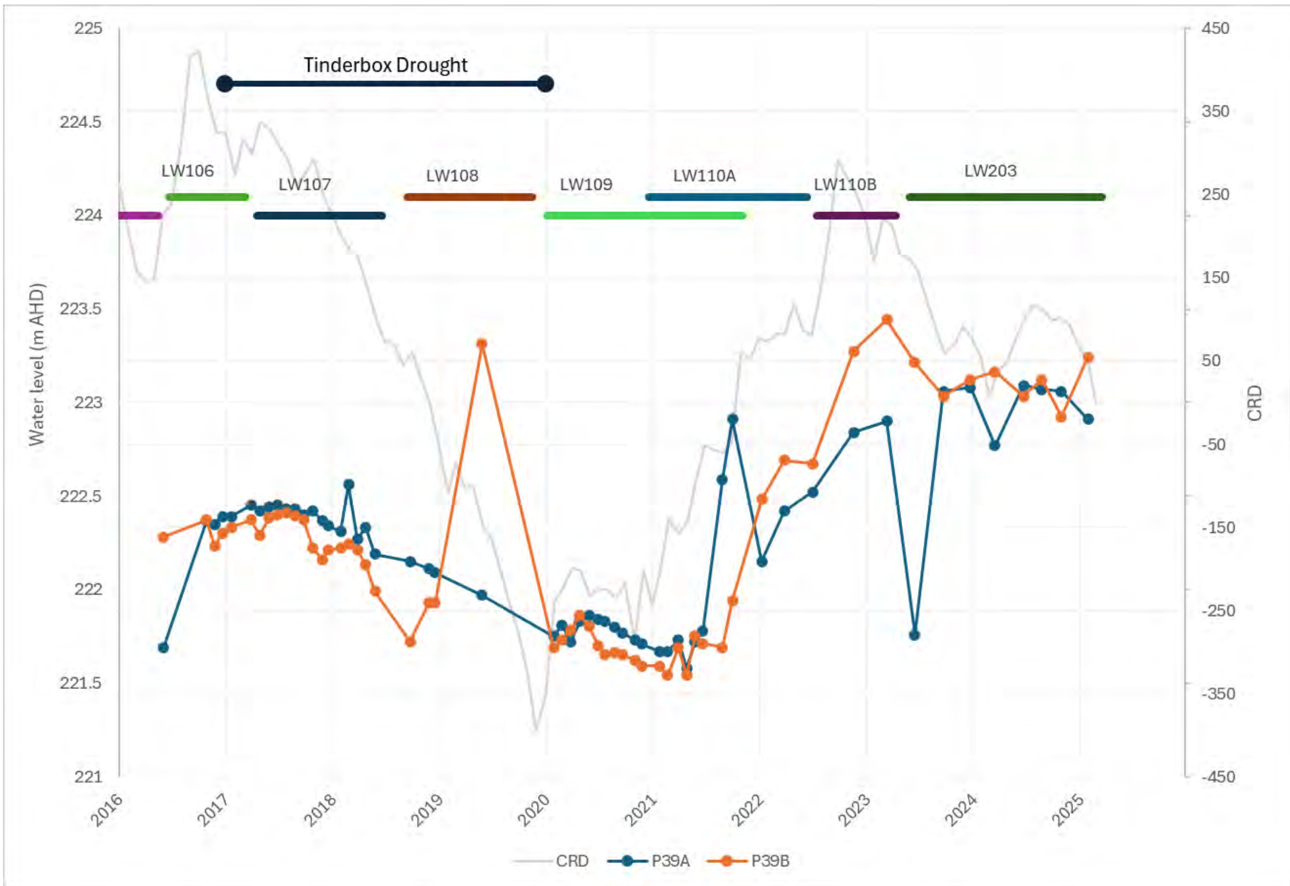

Figure 7.16 Hydrographs with mining progression bores P39A and P39B

The timing of increasing EC after the Tinderbox Drought and during the period of prolonged above average rainfall indicates the EC increases are likely attributable to dissolution of salts and minerals and as such exceedances are related to climatic conditions.

Seepage from surface water

Bore P39A is located approximately 600 m east of Kurrajong Creek and 500 m west of Tulla Mullen Creek. The nearest surface water monitoring location along Kurrajong Creek is KC2DS located approximately 2 km west of P39B. Results from this monitoring indicate no surface water flow occurred from 2007 to Dec 2020, after which periodic flows occurred. EC measurements during periods of flow ranged from approximately 50 to 550 μS/cm. The periods of flow coincide with the end of the Tinderbox Drought, EC measurements of surface flows are well below groundwater EC levels and are unlikely to contribute directly to increasing groundwater salinity. Recharge through the previously dry creek bed could contribute to increased salinity and acidity due to dissolution of minerals in the unsaturated zone.

Mixing with other groundwater sources

Alluvial bore P39B plots as a Na-Cl type water, no mixing trends are identifiable in the Piper plot (Figure 7.17), bore P39A has some variations in chloride-bicarbonate ratios.

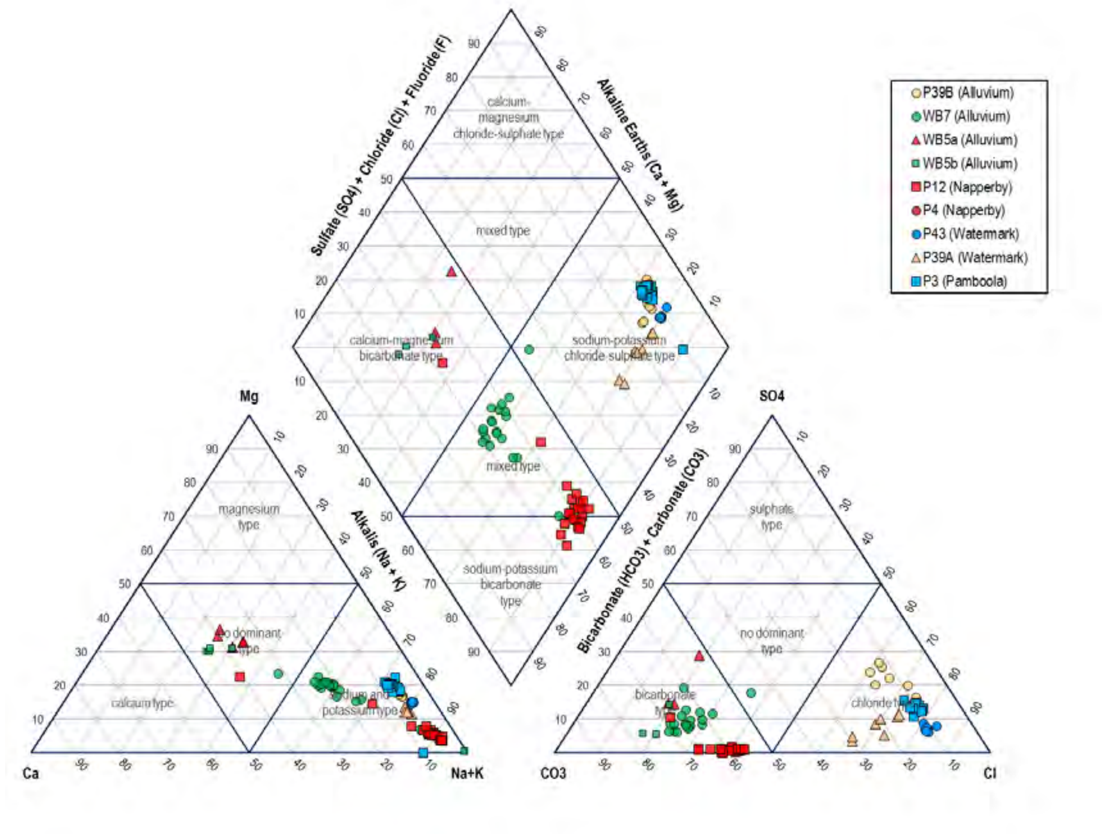

Figure 7.17 Piper plot bores surrounding P39B

Solute release

Bores are located up gradient from mining, solute release from mining is not considered likely.

Recommendation

Trends observed in the data indicate that the likely cause of EC increases is due to two significant climate events, the Tinderbox Drought from 2017 to 2020 followed by a period of increases rainfall from 2020 to late 2022. During prolonged above average rainfall, accumulated and concentrated salts (as a result of preceding dry spells) may seep from near surface strata to deeper strata within the unsaturated zone into saturated hydrostratigraphic units due to increased recharge or seepage from surface runoff drainage lines. Given the natural causes of these mechanisms no immediate action is required. Further monitoring is recommended and once measurements reach a new equilibrium a review of triggers should be undertaken.

7.8.2 Pilliga Sandstone

Bore P7, installed from 78 to 90 m bgl in the Pilliga Sandstone has recorded stable water levels and EC measurements for the past 5 years. From mid-2020 pH levels have decreased and have dropped below the minimum pH threshold of 6. Lab pH measurements decreased from 2022 to 2025; however, are more consistent with historical ranges. A report prepared by CSIRO for the gas industry social and environmental research alliance (GISERA) discuss distinct spatial zonation within the Pilliga Sandstone (Raiber, Martinez, Suckow, Deslandes, & Gerber, 2022). Characteristics of the Pilliga sandstone within this zone include low EC (less than 150 µS/cm), low pH (less than 6) and generally low major ion concentrations.

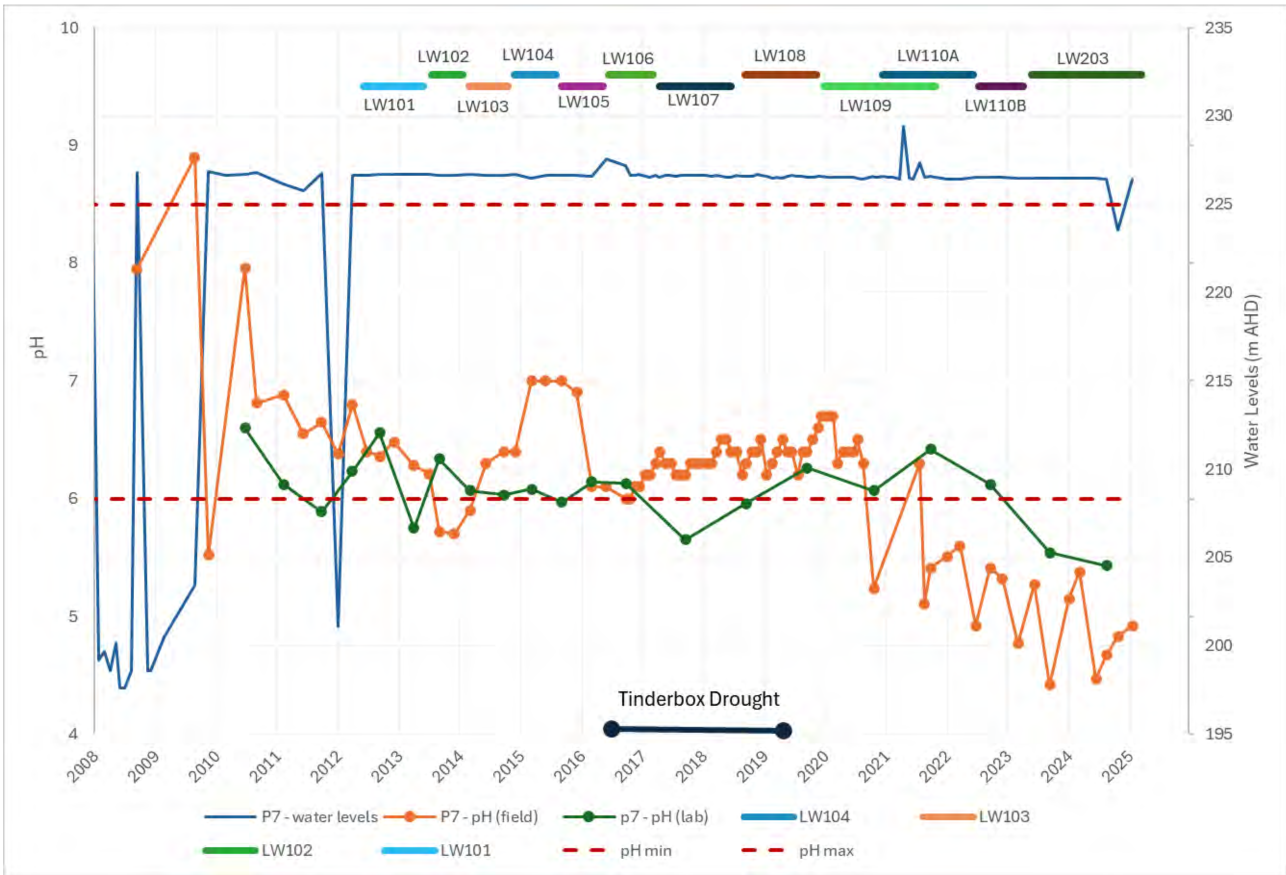

Figure 7.18 Timeseries pH plot and hydrograph bore P7

Climate factors

The decrease in pH coincides with the end of the Tinderbox Drought; however, no changes in water levels or EC are recorded at the same time. The increase in precipitation provides a possible source of acidity from soils during recharge. This is unlikely as soil types mapped in the area are Sodosols which are not strongly acidic and water levels are unaffected by climate variations.

Seepage from surface water

No surface water is located near this bore.

Mixing with other groundwater sources

Groundwater chemistry recorded at bore P7 plots as a sodium-chloride (Na-Cl) type water, a linear mixing trend in the anions is visible with a relative increase in bicarbonate. The linear mixing trend does not coincide with the decreasing field pH trend.

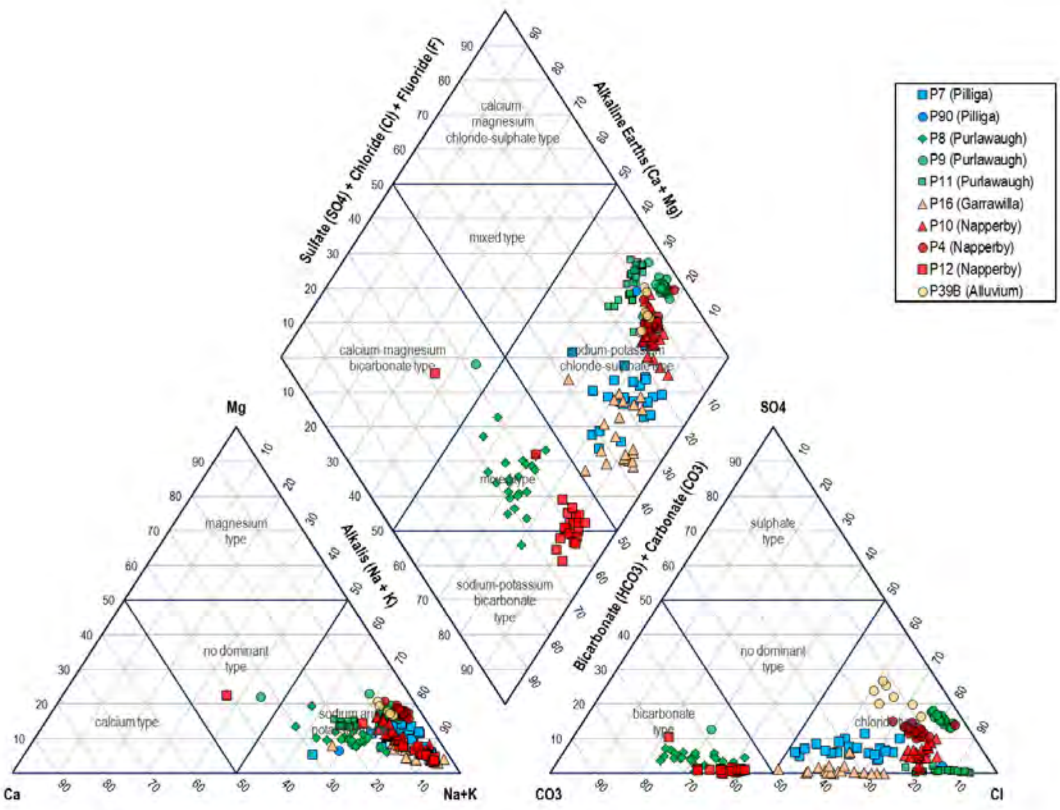

Figure 7.19 Piper plot groundwater monitoring bores

Solute release

Pilliga Sanstone is not predicted to have significant impacts from mining in part due to the presence of multiple formations between the Hoskissons Coal and the Pilliga Sandstone including the Digby, Napperby, Garrawilla Volcanics and Purlawaugh formation (AGE, 2020).

Recommendation

Groundwater within the Pilliga at P7 has low baseline pH, decreases in pH subsequently trigger the lower trigger level with small decreases in pH. Multiple monitoring bores within the mining area have also recorded a decreasing pH trend with associate high fluctuations. Sensor drift for field equipment is a possible means for the decreasing field trend; however, in most cases have an associated decreasing pH recorded in laboratory measurements indicating that the decreasing trend is real. The timing of the decreasing pH across the site with the end of the Tinderbox drought indicates causes are likely attributable to recharge. Additionally, reported pH in this zone of the Pillga Sandstone is generally lower than 6 and as such recorded pH are within expected ranges for this zone.

Exceedances recorded at P7 are considered within natural variations, current monitoring is sufficient to monitor this.

7.8.3 Purlarwaugh Formation

Bore P11 is located next to P10 south of LW 205, the bore is installed in the Purlawaugh Formation at 44 to 50 m bgl. Prior to mining commencing in 2012 groundwater EC at P11 fluctuated between 1,000 to 4,000 µS/cm. EC values have fluctuated since installation with broad fluctuating trends spanning ~6-year periods. A steep increase is recorded during the Tinderbox Drought from 2017 to 2019, before decreasing. In late 2021, EC value jumped from 5,601 to 7,902 µS/cm then commenced trending down. The water levels at P11 have shown decreasing trends since 2014 and are now lower than those in the nested bore P10.

To further understand recorded changes at P11 and P10 a bore census of the surrounding bores and groundwater features was conducted. The results of this census is included in Appendix E. No unknown pumping was discovered.

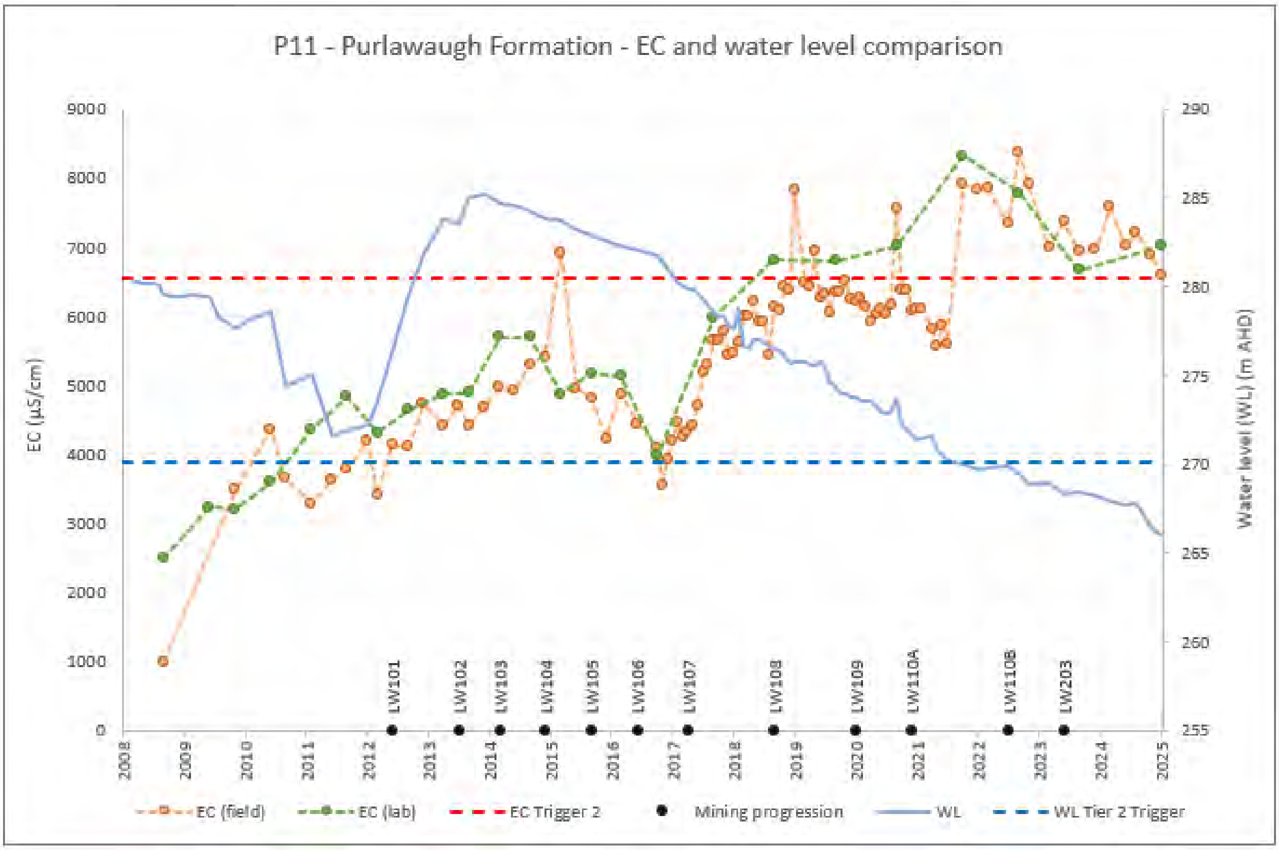

Figure 7.20 Timeseries EC plot with mining progression bore P11

Climate factors

From 2010 to 2020 water levels at bore P11 show fluctuations consistent with changes in rainfall with a lag of approximately one year. From 2020 onwards groundwater levels continue to decline contrary to increasing rainfall. At the conclusion of the Tinderbox Drought EC commences a downwards trend which abruptly stops in Mid-2021 when EC increases by approximately 2,000 µS/cm before commencing another downwards trend. There does not appear to be any close correlation between changes in climate and EC.

Seepage from surface water

The nearest surface water are the Longsight dams, these dams are located 2.6 km south of the bore and are an unlikely source of contamination.

Mixing with other groundwater sources

Chemical composition of solutes at P11 indicates a sodium-chloride type water, which is similar to bores P9 (Purlawaugh), P2 (Napperby), and P10 (Napperby). As with bore P10, the HCO3/Cl mass ratio at P11 (Figure 7.21) decreases over time, indicating a change in overall chemistry and likely mixing with water more strongly dominated by chloride. Therefore, lateral migration of groundwater from adjacent areas of the Purlawargh Formation is a possible cause of the EC change.

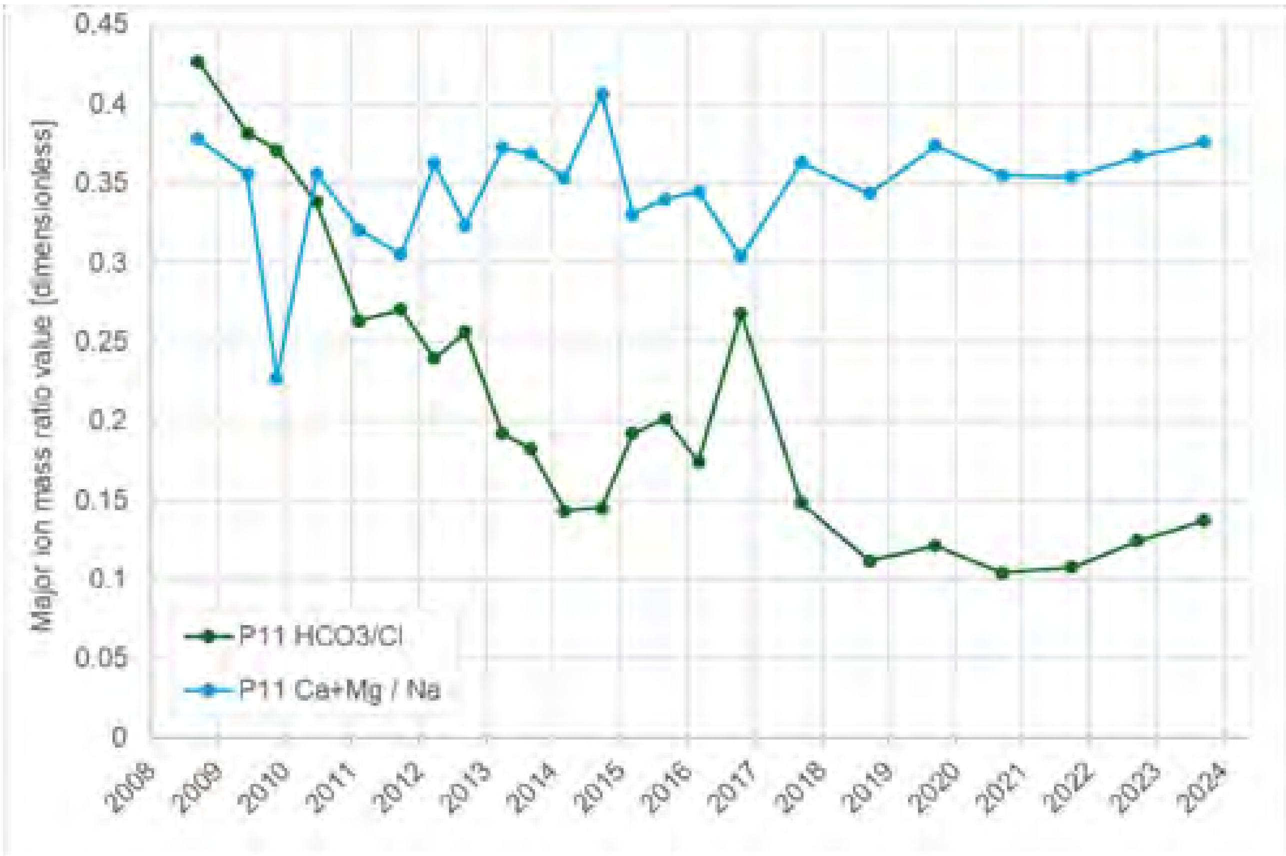

Figure 7.21 Ratios of bicarbonate to chloride and calcium + magnesium to sodium bore P11

Solute release

The hydraulic gradient at P11 indicates flow toward the mining zone, indicating that there is no viable pathway for solutes to reach P11, if they were being produced.

Recommendation

Increases in EC are likely attributable to the significant climatic events including the Tinderbox Drought and the following period of above average rainfall. No actions are currently needed. Further monitoring is recommended.

7.8.4 Garrawilla Volcanics

Bore P47 exceeded its EC trigger for three consecutive measurements, additionally, the rolling median also exceeds the EC trigger (Figure 7.22). Salinity recorded at bore P47 has seen a steady increase from 2017 until 2021 after which, large fluctuations are recorded.

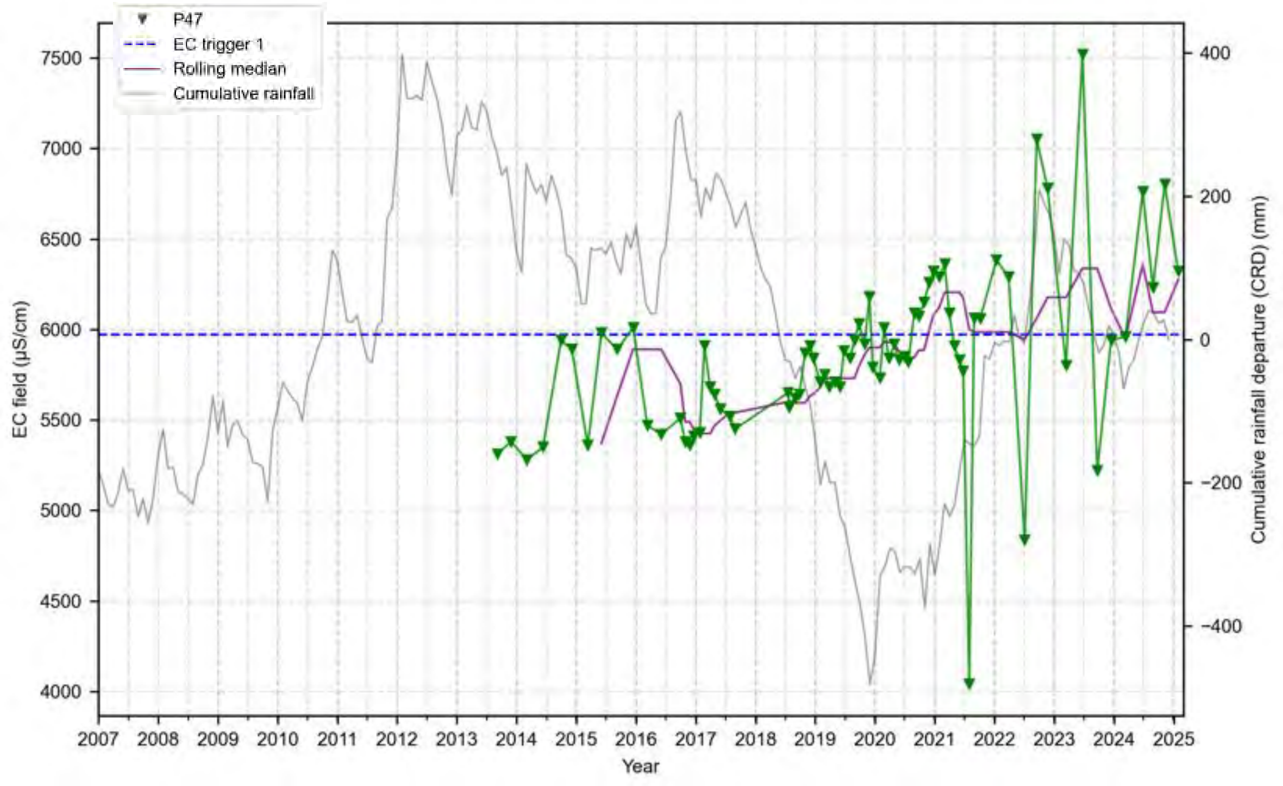

Figure 7.22 Timeseries EC plot bore P47

Climate factors

EC measurements have increased since records began in 2013, the rolling median indicates small fluctuations or short periods of higher EC none of which coincide with any variations in climate. High fluctuations in EC measurements have been recorded from mid-2021. Variations in climate are a likely contributing factor to EC fluctuations after the end of the Tinderbox Drought in 2020 this is also reflected in the fluctuating and generally decreasing pH observed in multiple bores and formations.

Seepage from surface water

Bore P47 is located 1 km south of Pine Creek and 2.1 km north of surface water storage, seepage from surface water is unlikely to cause the increasing EC recorded.

Mixing with other groundwater sources

Groundwater chemistry indicates water sampled at P47 is a Na-Cl type, no mixing trends are identified in the data therefore mixing with other groundwater sources nearby is unlikely.

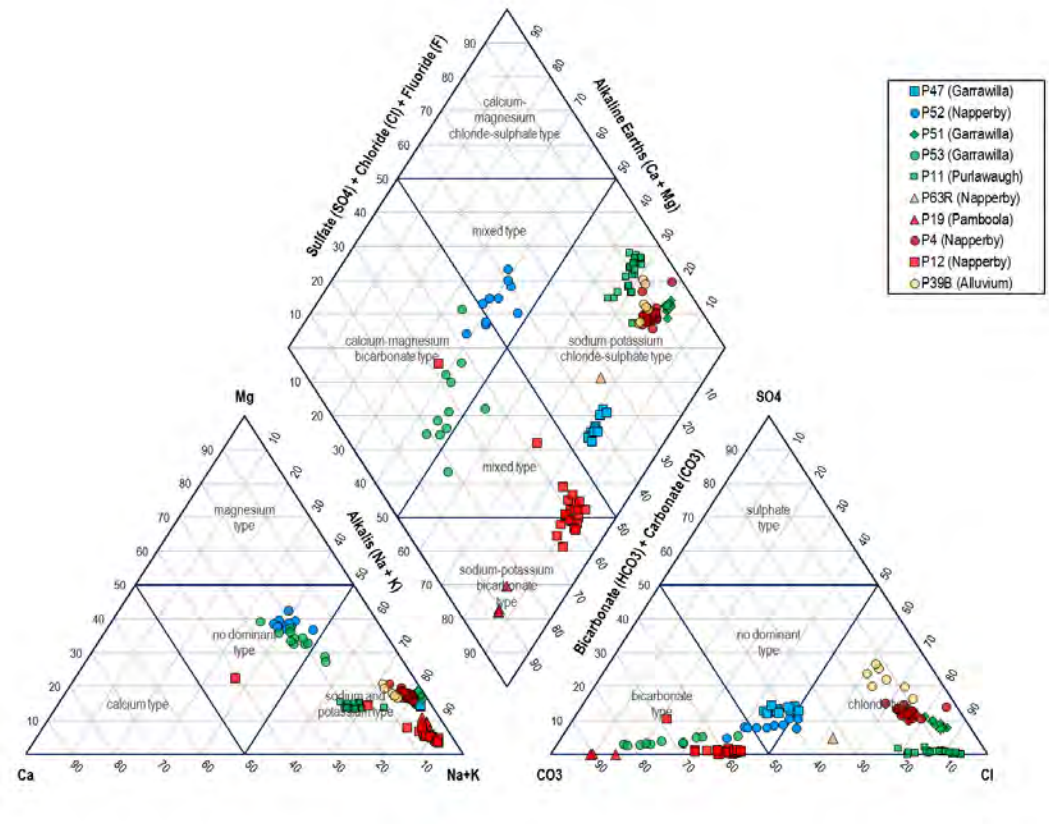

Figure 7.23 Piper plot bores surrounding P47

Solute release

Bore P47 is located immediately north of LW102 which was mined from July 2013 to January 2014, monitoring commenced around the same time therefore no pre-mining data is available for this bore.

Recommendation

Multiple climate events have acted on this bore causing an increase in EC and high fluctuations since mid-2021. Continued monitoring is recommended with a review of baseline groundwater quality parameters once EC and pH measurements stabilise.

7.8.5 Napperby Formation

Bores P10 and P4 have exceeded their Tier 2 triggers for three consecutive measurements while P2 has exceeded its Tier 1 trigger for three consecutive measurements. All three bore have similar trends whereby EC gradually increases from 2017 to mid-2020 after which EC measurements increase more significantly, P10 demonstrates the most rapid change in EC with a change from approximately 10,000 to 15,000 µS/cm in mid-2020.

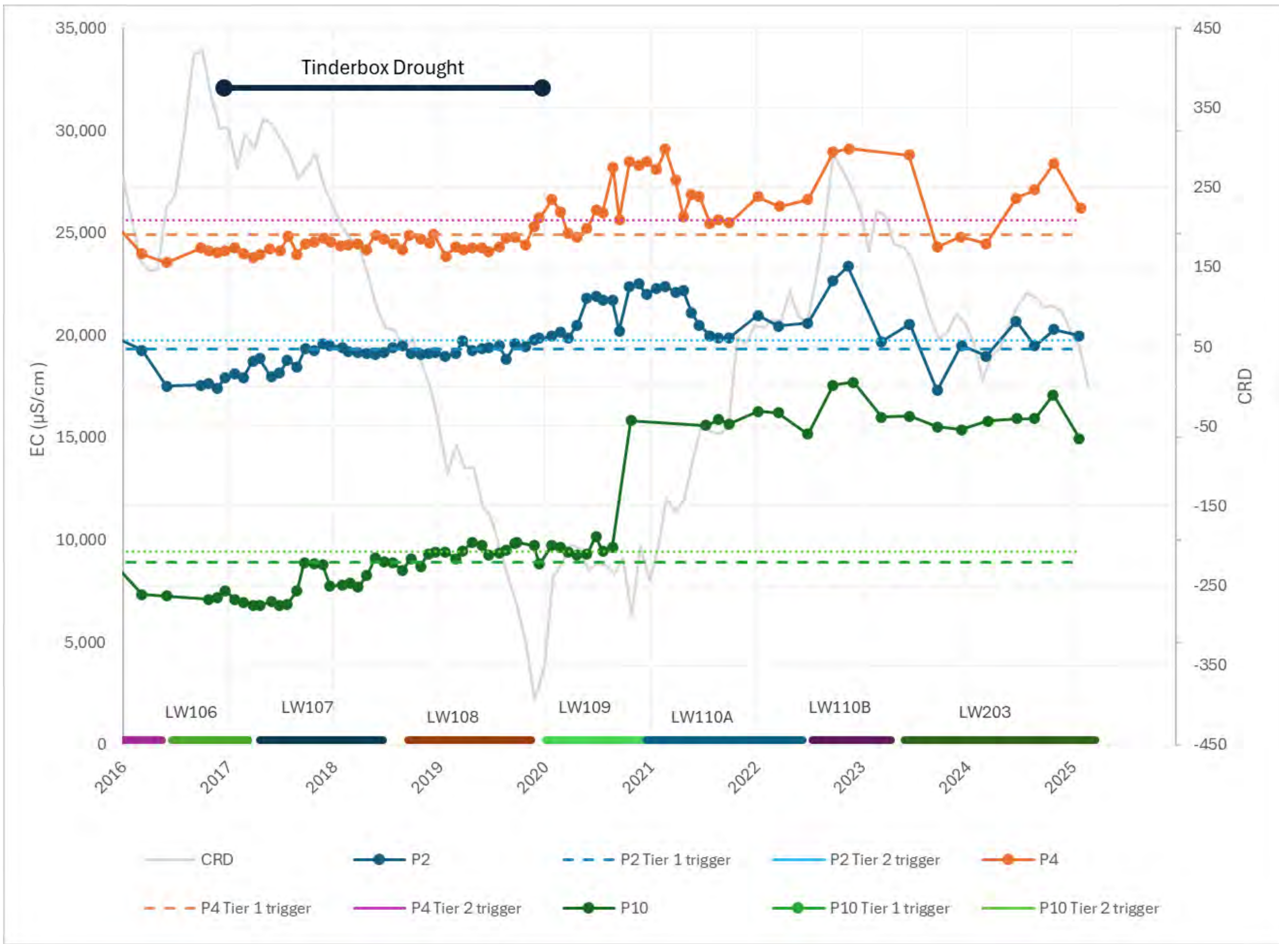

Figure 7.24 Time Series EC Plot for Bores P2, P4, P10

Climate factors

A lag in the response of each bore to change is evident, bore P4 (the shallowest bore screened from 24 to 30 mbgl) changes first at the end of 2019, P2 (screened from 44 to 50 m bgl) changes in early 2020 followed by P10 (screened from 118 to 130 m bgl) which changes in mid-2020. The delay in change may be attributed to recharge lag times due to depth and lithology differences (hydraulic properties) between the sites. Further confirming that the change is related to the increase in precipitation and recharge after a prolonged dry period (Tinderbox Drought).

Seepage from surface water

Bores P10 and P2 are located south of mining near Kurrajong Creek, P4 is located north of mining near Pine Creek. Recorded EC measurements at Kurrajong Creek monitoring station KCUS ranges from 64 to 660 µS/cm. EC measured at Pine Creek when flowing is approximately 120 µS/cm. Neither creek is a likely source of increased salinity.

Mixing with other groundwater sources

Chemical analysis has been conducted at P10 previously finding that water at P10 is becoming more sodium-chloride dominated with time. Mixing trends with P2 were identified as a likely cause of changing water quality and increasing salinity. Therefore, exceedances at P10 could in part be attributed to the lateral mixing of water within the Napperby Formation.

Solute release

Solute release from underground workings is possible for bore P10 which is located near active mining; however, bores P2 and P4 are located up gradient from mining. Given the distance the bores are from each other (P4 north of mining, P10 and P2 south of mining) and similar trend indicates solute release as an unlikely cause of increased salinity.

Recommendation

The two significant climate events (Tinderbox Drought followed by above average rainfall) have disrupted the equilibrium and caused EC fluctuations due to lateral head changes in the Napperby Formation. Further monitoring is required initially to ensure stable EC (equilibrated) measurements after which triggers should be reviewed given adjusted baseline data.

7.8.6 Watermark Formation

Two bores are installed in the Watermark Formation (P43 and P39A) both recorded EC trigger exceedances (Figure 7.25). Similar to bores installed in the Napperby formation, both Watermark bores recorded gradual increases in EC from 2017 to mid-2020 after which a sharp increase was recorded.

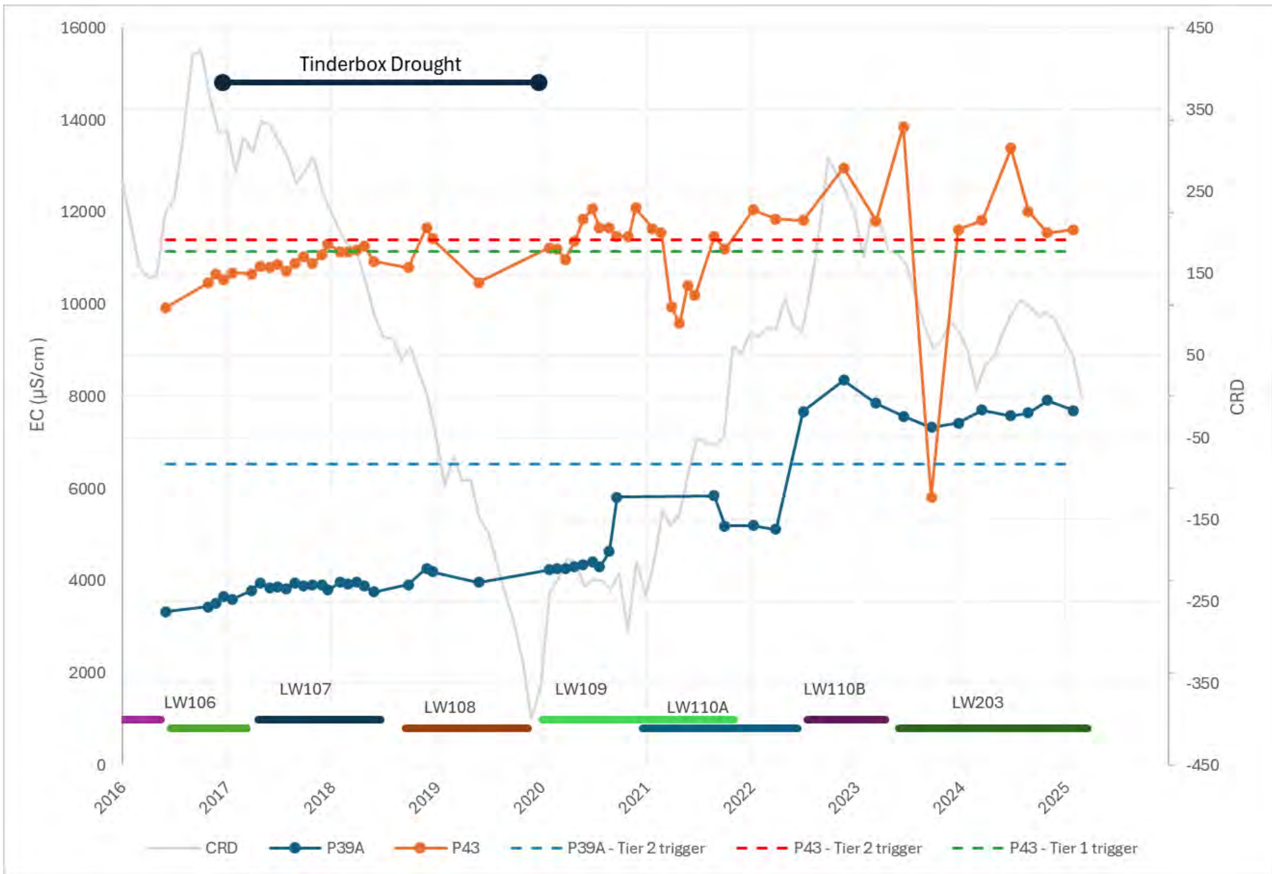

Figure 7.25 Timeseries EC plot bores P43 and P39A

Climate factors

As with bores installed in the Napperby Formation a lag in response to the change in climate is evident. The shallower bore (P43 screened 59 to 65 mbgl) experienced changes in associated with changes in climate first followed by P39A which experiened an approximate 6 month lag before sharp increases in EC.

Seepage from surface water

EC measurements of surface flows from Kurrajong and Tulla Mullen Creeks are well below groundwater levels and are unlikely to contribute directly to increasing groundwater salinity. Recharge through the previously dry creek bed could contribute to increased salinity dissolution of salts in the unsaturated zone that are mobilised during periods of recharge.

Mixing with other groundwater sources

As discussed in section 7.8.1 and show in Figure 7.17 no mixing trends are identified.

Solute release

Bores are up gradient of mining, solute release unlikely cause of increasing EC.

Recommendation

Mechanisms for change with the Watermark bores appear to be the same as with other formations experiencing EC exceedances. Groundwater EC trends are similar to those recorded in the Napperby formation, as such, recommendations are the same as for Napperby which include continued monitoring followed by a review of EC baseline once bores have reached a new equilibrium.

7.8.7 Pamboola Formation

Bore P3, installed in the Pamboola formation from 34 to 40 m bgl exceeded its Tier 1 trigger for three consecutive measurements (Figure 7.26). A separate review has been conducted for this bore (AGE 2025), this found that the likely cause of the EC exceedances was likely a delayed response to the two major climate events (Tinderbox Drought and following prolonged period of above average rainfall). Water levels at P3 decreased at the same time EC began to increase at the commencement of the Tinderbox Drought.

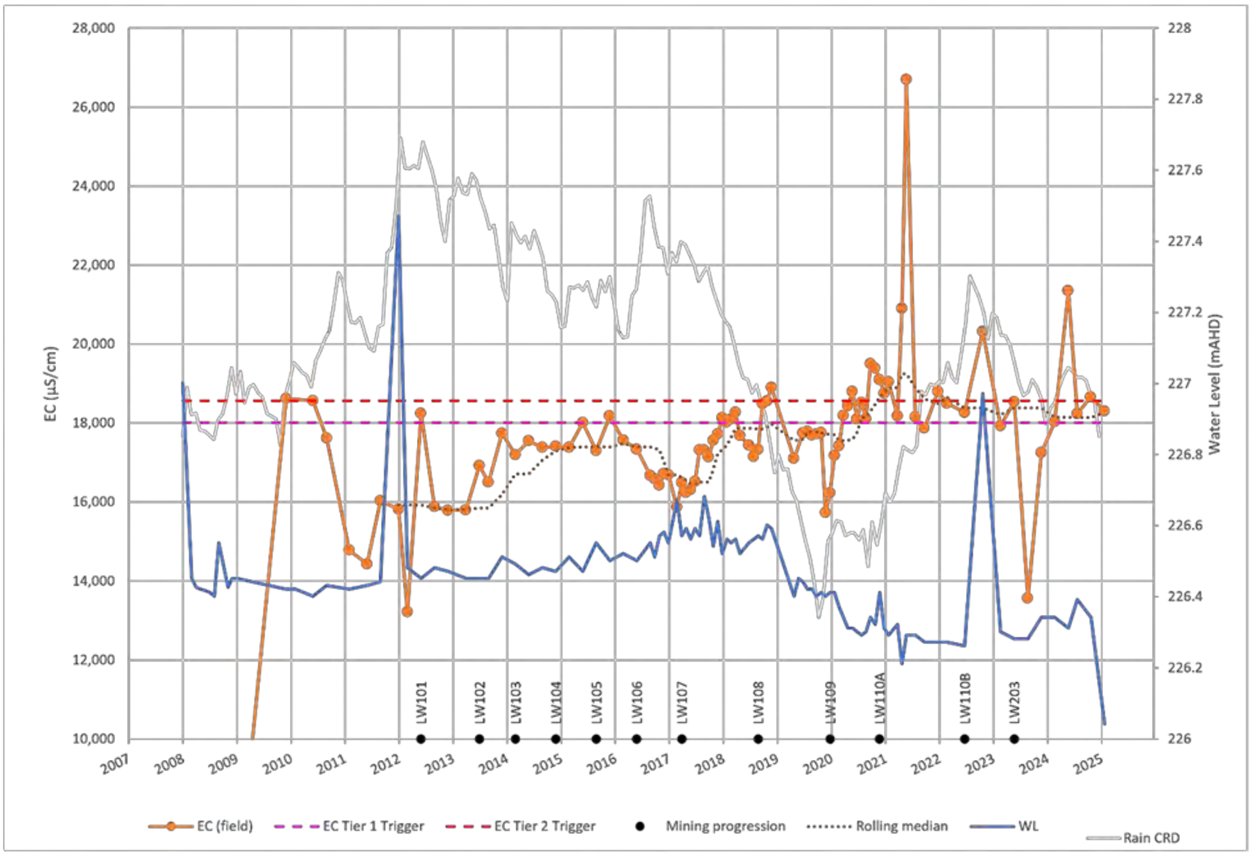

Figure 7.26 Timeseries EC and water level plot bore P3

Climate factors

Water levels recorded at P3 indicate a lagged response to changes in recharge with the reduction in groundwater commencing approximately one year into the Tinderbox drought. The lagged response is attributable to the low permeability of Pamboola Formation. CMB recharge estimates range from 0.2 to 0.5 mm/year (AGE, 2020; Bioregional Assessment Programme, 2016). Although more erratic measurements are recorded from 2021, the rolling median demonstrates a generally increasing EC trend also coincident with the two major climate events.

Seepage from surface water

Bore P3 is located north of Kurrajong Creek, as discussed in Sections 6.1 and 6.6 EC recorded during flow events at Kurrajong Creek is too low to be a plausible source of increased EC recorded in the bore.

Mixing with other groundwater sources

Relative chemical composition of bore P3 is plotted with surrounding bores in Figure 7.17. No mixing trends were observed.

Solute release

The low permeability of the formation, distance from mining and drawdown predictions from AGE (2020) suggest solute release from mining is not a likely cause of EC increases.

Recommendation

The current monitoring frequency and regime is considered sufficient to monitor changes, once an equilibrium is reached a review of baseline data for trigger levels may be required.

7.9 Overall salinity and chemical composition

Figure 7.27 presents EC measurements in monitoring bores from hydrostratigraphic units as a box and whisker plot which shows the spread of the data and a range of statistics (including min, max, median, interquartile range [25th percentile to 75th percentile] and any outliers). The plot is used here to illustrate the distribution of salinity data within each of the hydrostratigraphic units. No EC data are currently available for Digby Formation. The salinity categories described previously are shown with equivalent EC measurements.

As indicated in AGE (2020), all sub-surface strata will show some degree of variability since salinity can be affected by a range of factors including sampling depth, aquifer residence time and evapo-concentration processes occurring in near surface areas. However, in general, higher permeability aquifer units (especially where they occur at shallow depths) are typically characterised by relatively low salinity, whilst relatively high salinity and variability would normally be expected in low permeability aquitard units. As expected, both the main aquifers in the area the Namoi Alluvium and the Pilliga Sandstone are characterised by relatively low salinities and variability (Figure 7.27). The median EC for both of these aquifers is less than 700 µS/cm suggesting relatively fresh water predominates. Data for the Garrawilla Volcanics also suggest relatively fresh water and return a median EC of 2,630 µS/cm, suggesting brackish to moderately saline.

Median EC values for the Purlawaugh and Napperby Formations suggest moderately saline conditions on average, but show a high degree of variability and relatively fresh waters in some cases, suggesting that potentially useful fresh water aquifers can be encountered within these formations.

Data for the Hoskissons Coal Seam suggest moderately saline conditions based on the median EC value of 6,180 µS/cm, whilst data for the two deepest units monitored in the Project Area, the Arkarula and Pamboola Formation, suggest median EC values of in excess of 15,000 µS/cm suggesting saline groundwater. The relatively high salinity values recorded in samples taken from the Arkarula Formation may reflect the depth of this unit and the lack of any known outcrop areas. Residence times with the strata may therefore be substantial resulting in relatively high salinity groundwater (AGE, 2020).

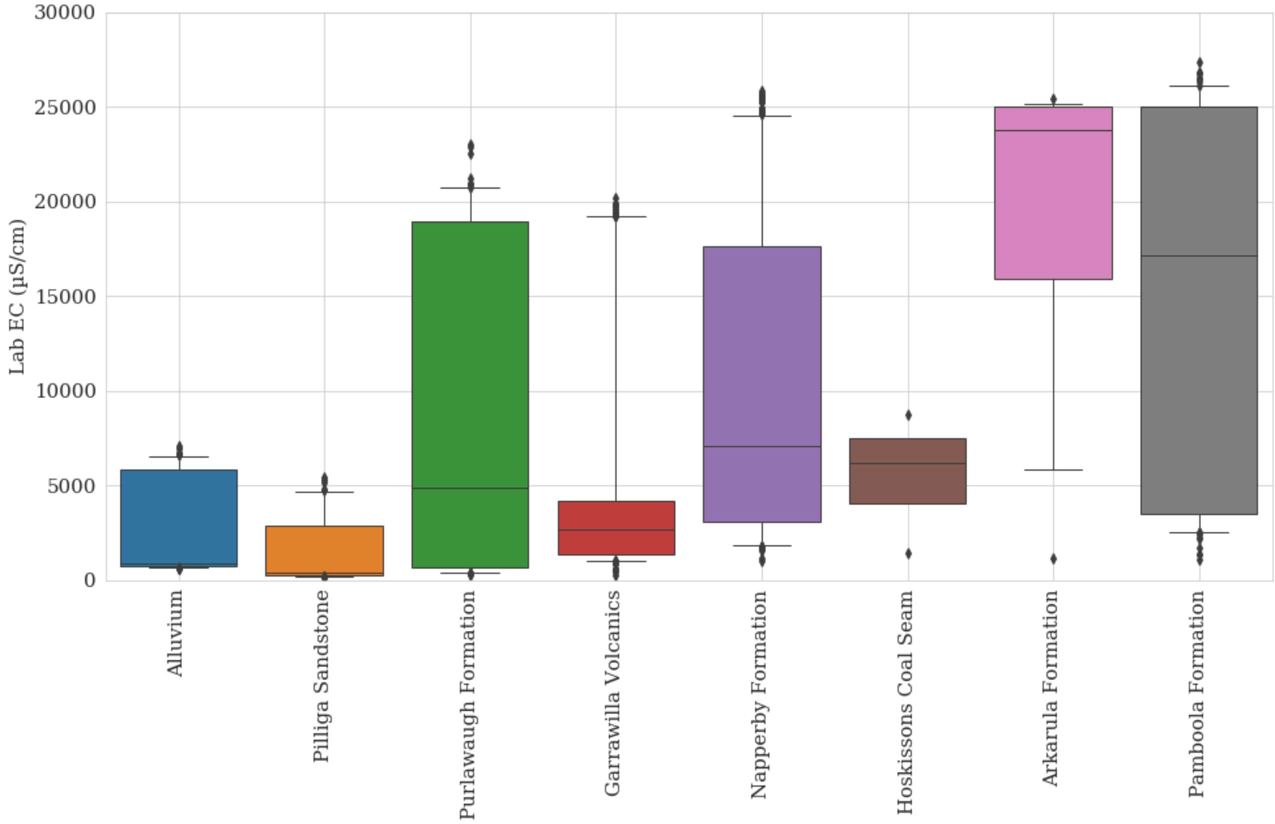

Figure 7.27 Distribution of groundwater field EC data by hydrostratigraphic unit

Results for the majority of the samples tested suggest relatively low proportions of sulphate, but a broad distribution from bicarbonate to chloride dominance among the other anions. Chloride dominances tend to occur in higher salinity waters from deeper formations, with bicarbonate dominance more prevalent in fresher groundwater samples from shallower formations. However, as shown in Figure 7.28, some water samples from the Hoskissons Seam and Arkarula Formation suggest bicarbonate dominance, which may be indicative of mineralisation source in the Permian sequence (Aquaterra, 2009).

In 2024, fourteen water samples were obtained from the 203 LW underground area. The field measurements indicate variable salinity; TDS varies between 114 and 7,100 mg/l and EC between 247 and 14,200 uS/cm. pH varies between 5.29 and 7.67.

The relationship between EC and TDS in mine water and groundwater in the Hoskissons Seam and adjoining aquifers are not clear, and ongoing monitoring will provide more clarity in this regard.

Similarly, the cation and anion composition does not indicate clear patterns. As shown on the piper-plot in Figure 7.28, the mine water inflow samples mainly plot in the Ca-Mg-$HC0_3$ quadrant and the Na-K-HCO_3 quadrant. Evidently, there is a strong HCO_3 dominance, similar to historical coal seam data.

More statistical assessments will be conducted during the 2025 period when more underground inflow samples become available.

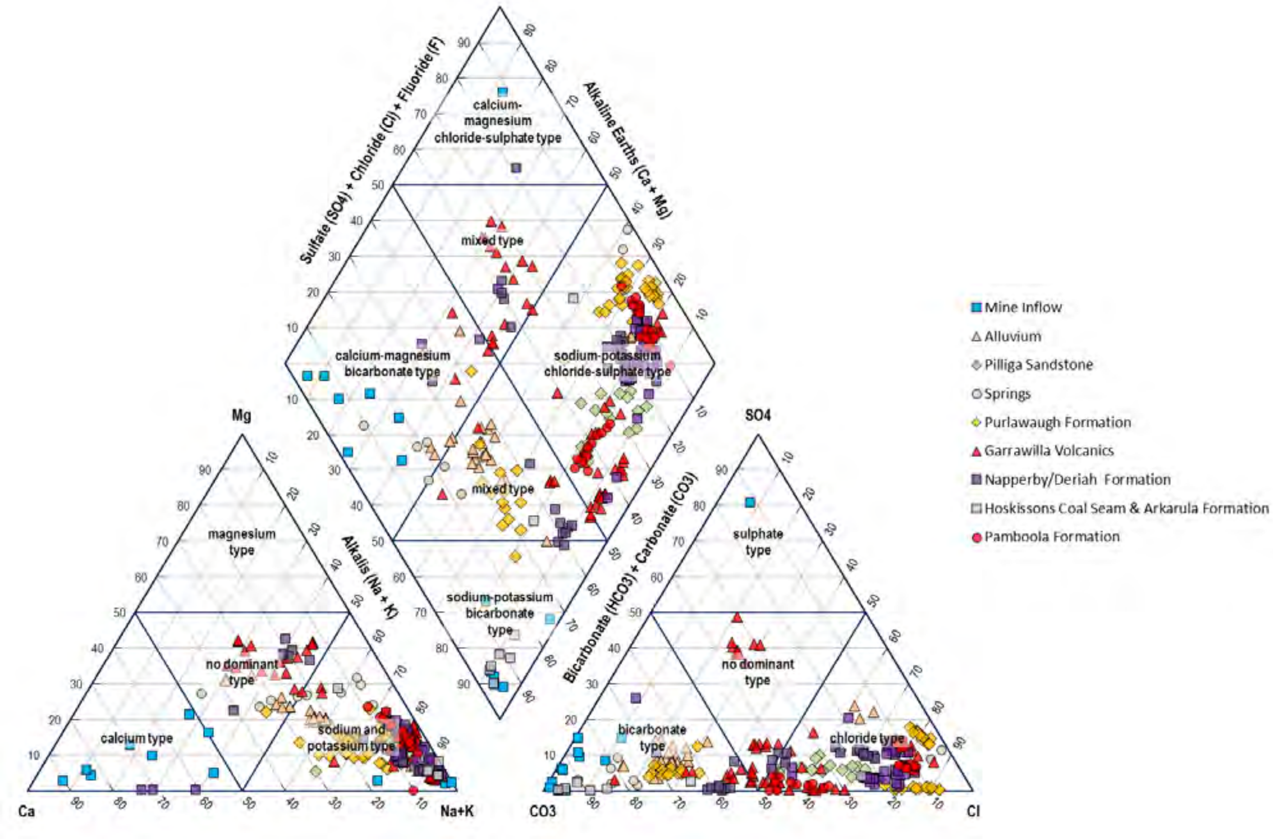

Figure 7.28 Piper plot Mine inflow and formations

8 Seepage monitoring

The rail loop and brine storage dam complexes consist of eight dams ranging in capacity from approximately 30 ML to 450 ML. Water stored in the RLDs includes saline/brackish water pumped from the underground workings, site runoff from disturbed areas (stockpile and laydown areas), and fresh water from licensed sources. Dam BR1 is a turkey's nest constructed as cut to fill along (and offset from) a tributary of Kurrajong Creek, with a capacity of 450 ML and is lined with a primary HDPE (High Density Polyethylene resin), a laminated geotextile drainage layer and a secondary HDPE layer.

The Reject Emplacement Area (REA) is located immediately west of the box cut. Three shallow standpipe monitoring bores (P51, P52 and P53) are installed north of the REA. It is expected that 8.2 million tonnes (or approximately 5.7 million m3) will be managed within the REA over the 30-year mine life. One reclaimed water dam (SB3) is located north of the REA to capture surface water runoff.

Surface water storage dams are monitored for seepage by a network of thirteen standpipe bores installed at depths ranging from 9 to 39 m bgl. A comprehensive review of the monitoring network is conducted quarterly and annually and is reported in the Annual and Quarterly Seepage Monitoring Reviews. A summary of data collected is presented in Table 8.1, Table 8.2 and Table 8.3 with EC and pH plotted in Figure 8.1 and Figure 8.2.

Table 8.1 Rail loop dam (RLD) seepage monitoring bores

Bore ID	Easting	Northing	Elevation	TD	Install depth (m BGL)	Formation	Water level (m AHD) January 2025
P28	778343	6620162	262.46	25	19-25	Napperby Formation	dry
P29	778541	6619978	256.84	25	19-25	Napperby Formation	253.23
P30	778808	6620071	254.95	15	9-15	Napperby Formation	245.18
P31	778318	6620343	264.39	15	9-15	Napperby Formation	248.86
P32	778993	6620335	252.49	15	9-15	Napperby Formation	246.06
P33	778772	6620523	253.56	15	9-15	Napperby Formation	241.69
P34	778542	6620604	255.96	15	9-15	Napperby Formation	dry
P58	778649	6619912	254.65	42	33-39	Napperby Formation	240.97

Notes: TD = termination depth.

Table 8.2 Brine storage dam (BSD) seepage monitoring bores

Bore ID	Easting	Northing	Elevation	TD	Install depth (m BGL)	Formation	Water level (m AHD) January 2025
P83	778453	6621599	265.534	38	35-38	Napperby Formation	dry
P84	779072	6620649	247.812	24	21-24	Napperby Formation	234.7
P85	779075	6620645	247.725	11	7-10	Near surface strata	dry
P88	778744	6620835	250.9	11	7-10	Near surface strata	dry
P89	779221	6620940	247.43	11	7-10	Near surface strata	dry

Note: TD = termination depth.

Table 8.3 REA seepage monitoring bores

Bore ID	Easting	Northing	Elevation	TD	Install depth (m BGL)	Formation	Water level (m AHD) Jan-Feb 2025
P51	777437	6620859	267.15	18	9-12	Garrawilla Formation	262.18
P52	777117	6620807	268.85	24	18-21	Napperby Formation	262.79
P53	776994	6620655	270.98	24	18-21	Garrawilla Volcanics	262.56

Note: TD = termination depth.

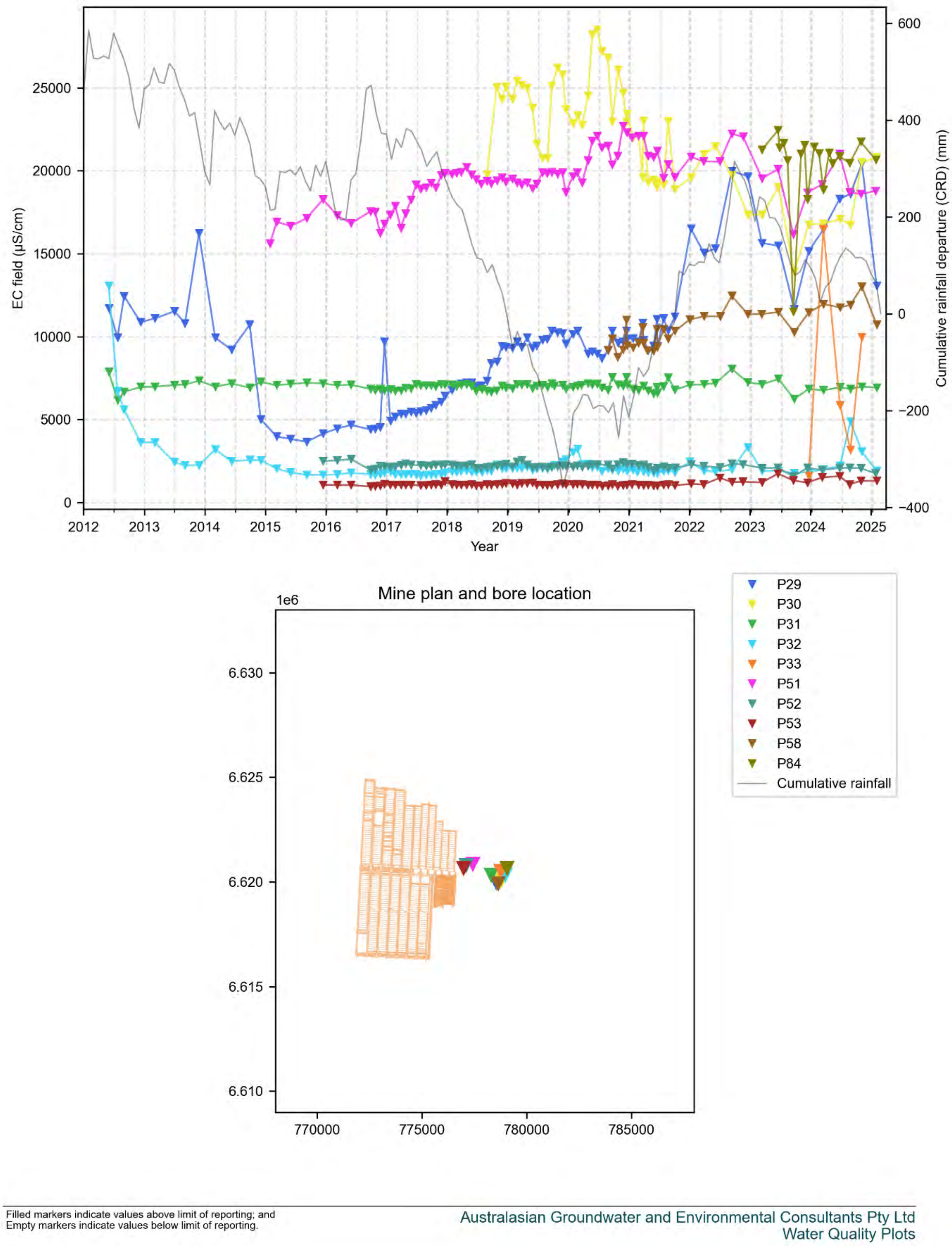

Figure 8.1 EC plot seepage monitoring bores

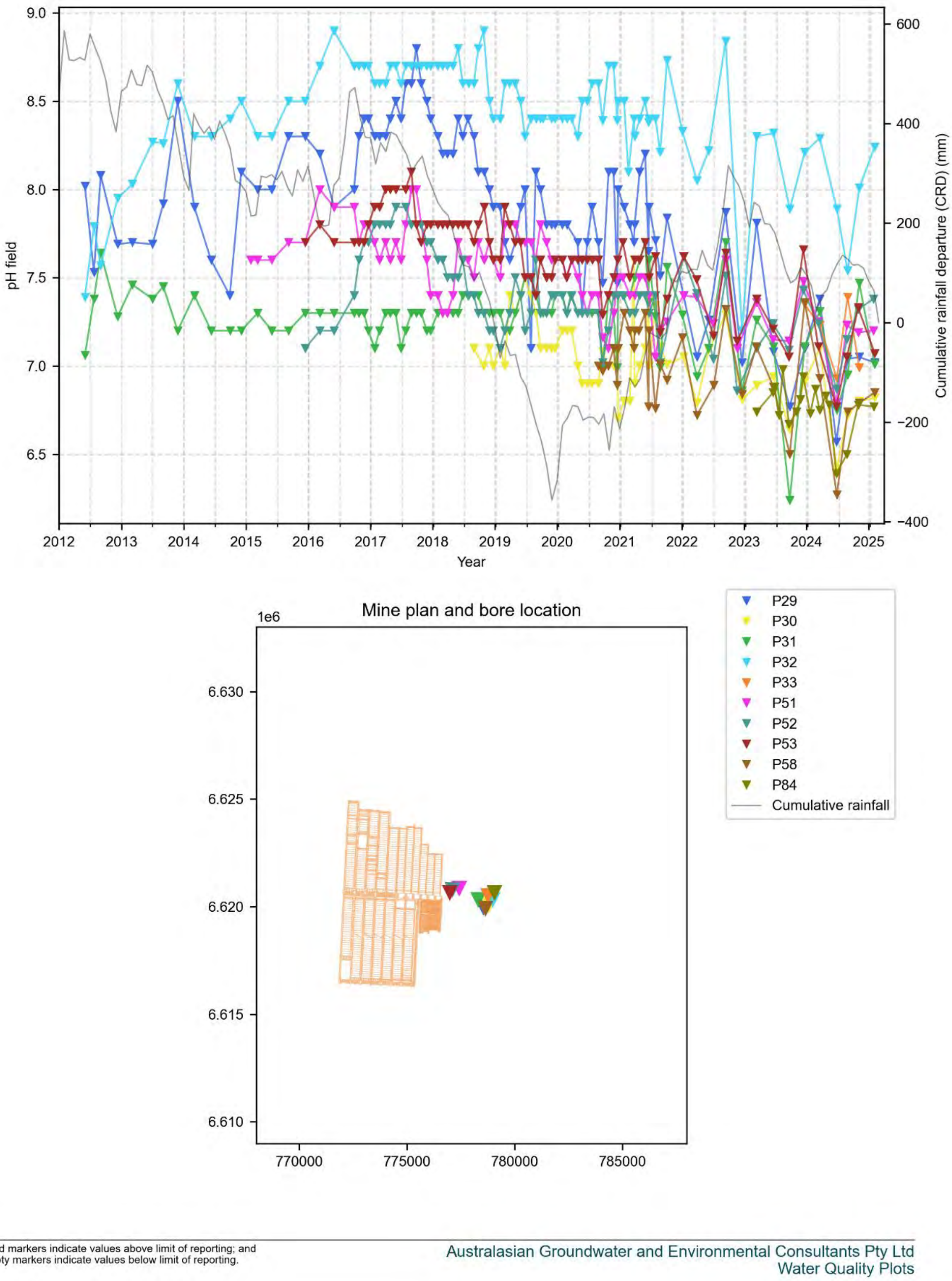

Figure 8.2 pH plot seepage monitoring bores

8.1 Groundwater exceedance

8.1.1 Rail loop dams

Bore P29 has exceeded its EC trigger since mid-2021 (Figure 8.3) when, after a period slowly increasing EC, the measurements increased significantly. Two periods of increasing water levels have been recorded, the first from 2014 to 2017 (prior to the Tinderbox Drought), water levels stabilised until 2021 when they increased again. Previous work (AGE, 2024) examined natural climate factors and seepage from nearby RLDs as possible sources of increasing EC and water levels.

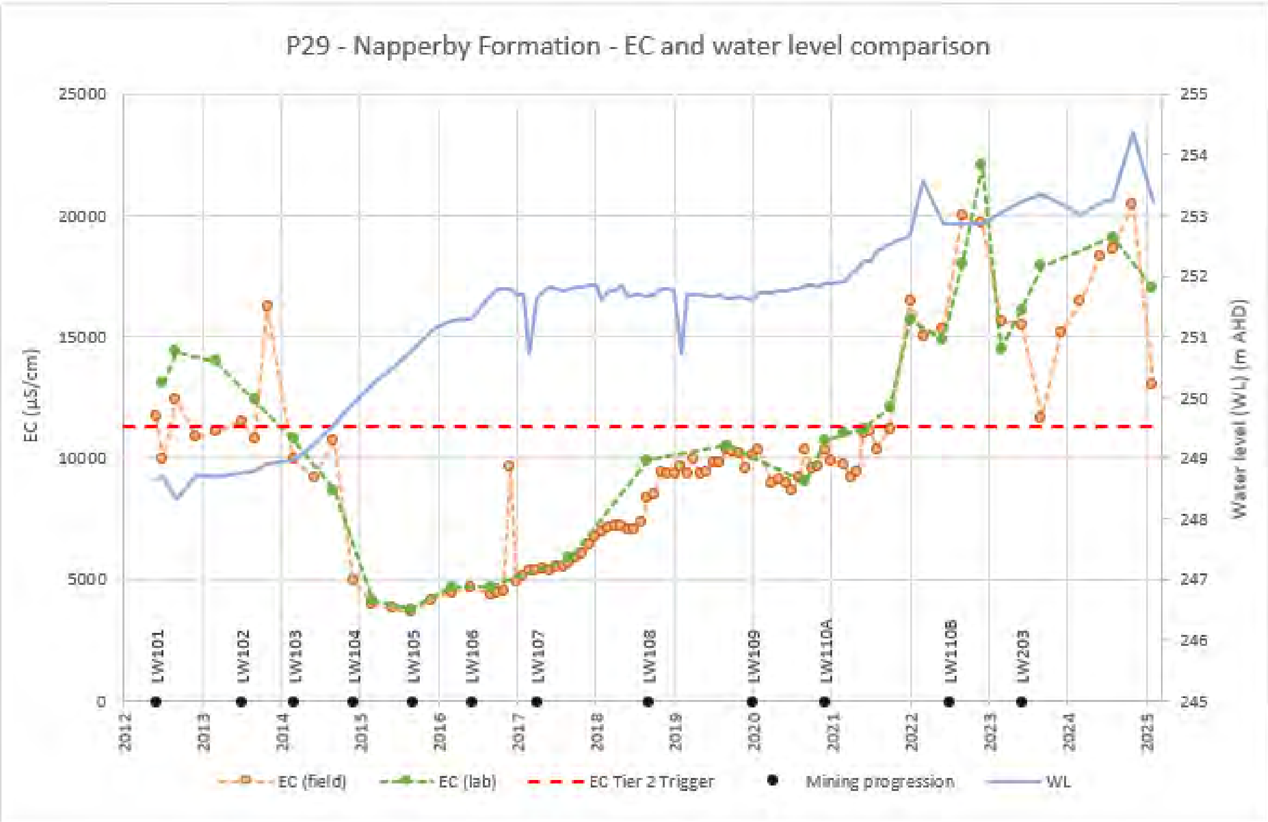

Figure 8.3 P29 EC

Seepage from surface water

Although a mixing trend had been identified in historical data around 2015, the major ions plotted in recent years show no mixing trend. Water type at P29 plots as sodium-chloride type while nearby Dam C, the likely source of increased EC, plots as a sodium-bicarbonate type (Figure 8.4).

Further soil samples were collected in January 2025 to determine if saturation of previously unsaturated soils is a possible cause for increased salinity. Sample S1 was collected from the top 1 m of soil next to bore P29, sample S2 was collected south of BR1. Sodium Absorption Ratio (SAR) is a measure of the relative concentration of sodium compared to calcium and magnesium in soil solution. When the SAR is high, the water can increase the exchangeable sodium percentage (ESP) of the soil. Sample S1 has a SAR ranged from 4.94 to 7.47 while SAR for sample S2 ranged from 0.54 to 1.99. SAR of 6 to 8 is considered medium sodium hazard while less than 3 is considered ideal. Given the high SAR in soils near P29 the elevated EC could be attributed to mobilisation of salts and minerals present in the previously unsaturated soils.

Recommendation

Saturation of previously unsaturated soils is considered the most likely cause of elevated EC, the lack of mixing trend indicates the source of water leading to elevated groundwater levels is not sourced from nearby highly saline Na-HCO3 water as is characterised by water stored in nearby surface water dams.

It is recommended to continue current monitoring ensuring comparison of groundwater chemical data with surface water.

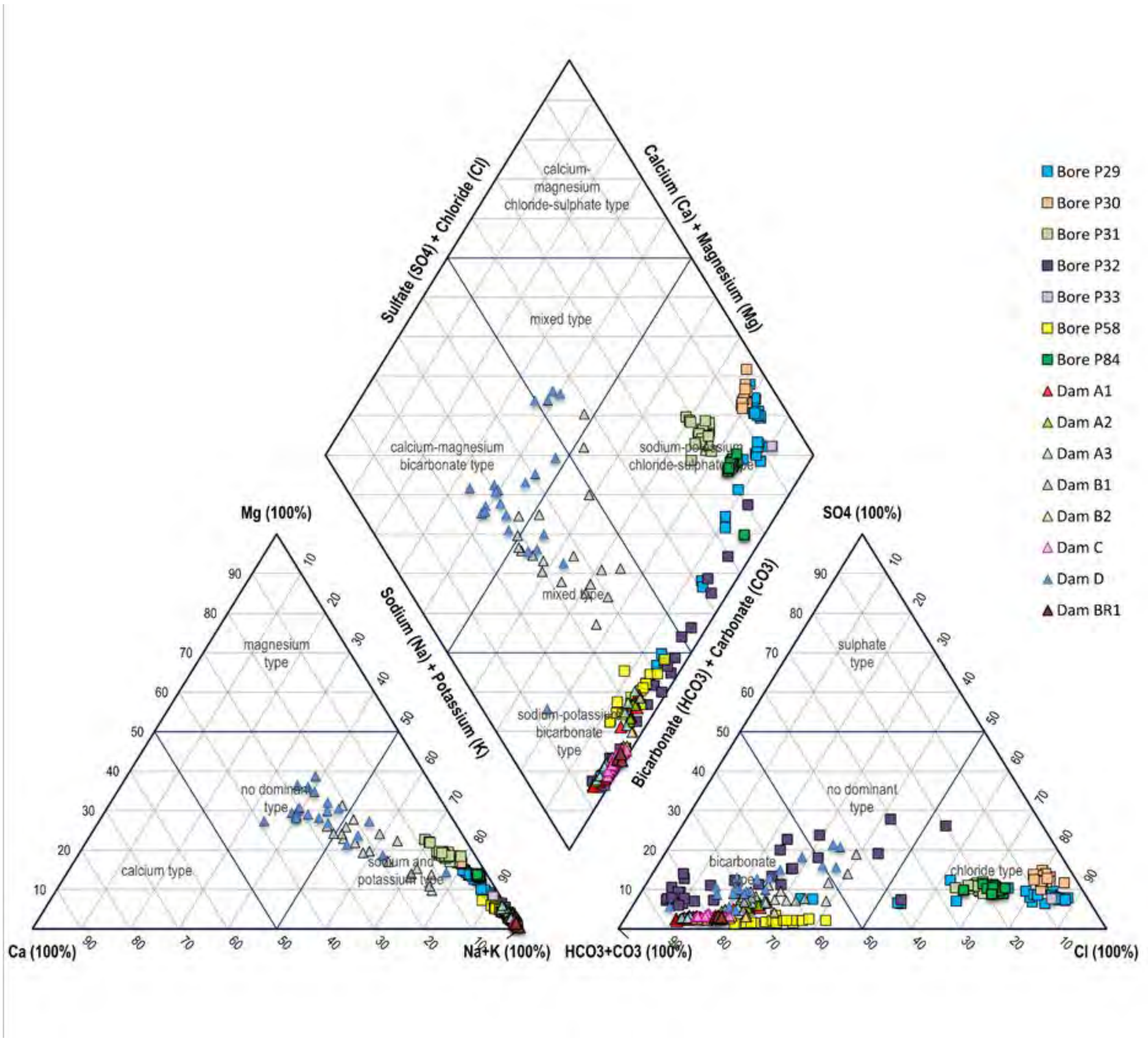

Figure 8.4 RLD and seepage bores Piper plot

8.1.2 Reject emplacement area (REA)

Bore P53 is one of three REA monitoring bores and is located adjacent to a tributary to Kurrajong Creek (Figure 5.1). In late 2021 EC values began to increase, with fluctuation up to ~700 µS/m (Figure 8.5). Concurrently, water levels in P53 increased up to mid-2022, and have since declined.

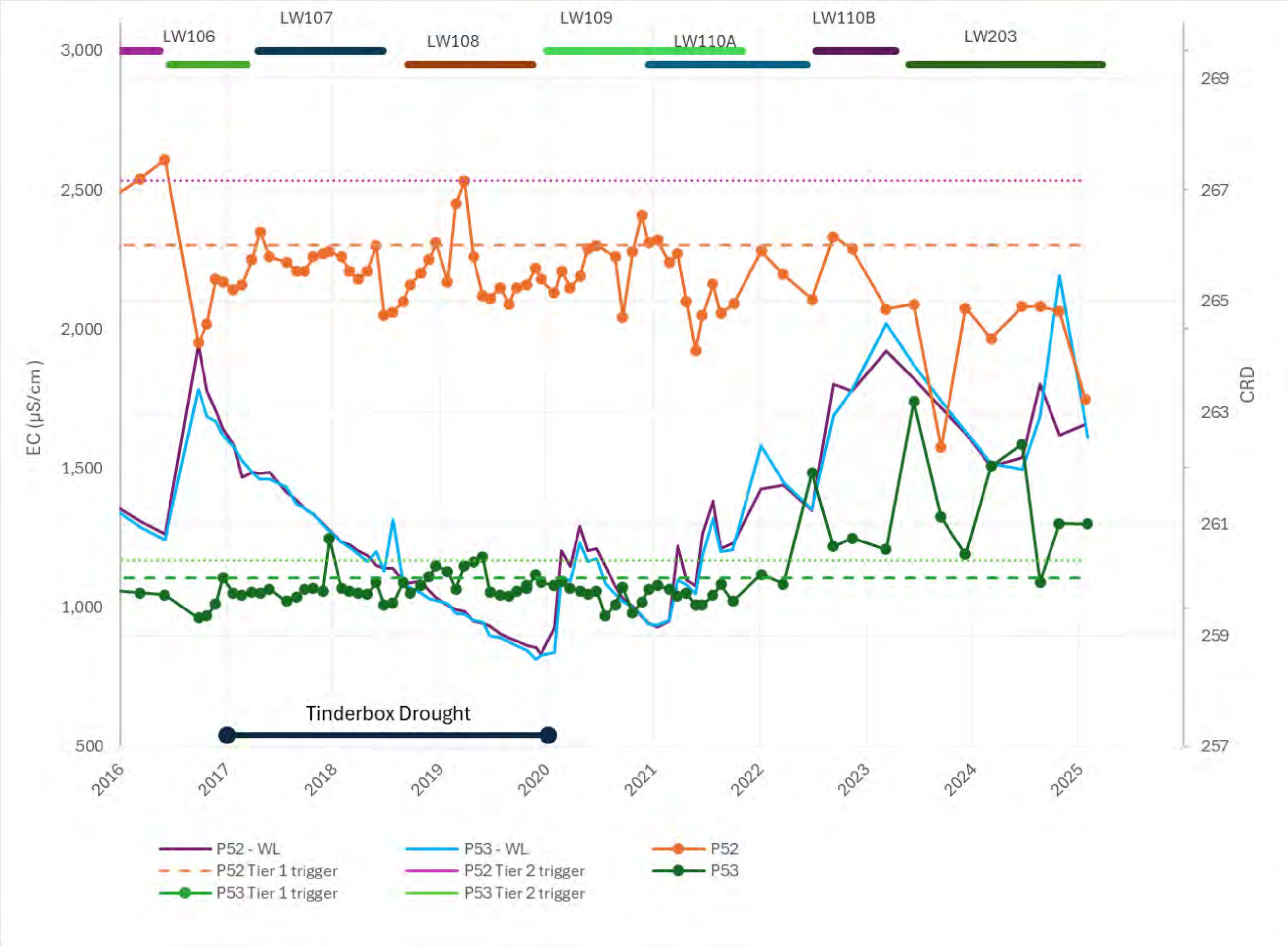

Figure 8.5 Bore P53 and P52 EC and water levels

Climate factors

Both P53 and adjacent bore P52 had increased water levels consistent with changes in rainfall from 2020 to 2023, and during this time P53 groundwater increased in salinity, while that of P52 decreased. This may indicate that natural climate factors are not likely to be the cause of EC change at P53, as a consistent EC compared to past values (e.g. 1,100 µS/cm) would be expected due to the water level increase. Alternatively, the increase in EC at P53 may be a very delayed response to decreased recharge as a result of the Tinderbox Drought. However, given the shallow depth of P53, and the decrease in salinity at P52, this scenario is also considered unlikely.

Seepage from surface water

No surface water data for major ions is available for the nearby creek or reject emplacements. The EC records for the creek monitoring location on the adjacent drainage line (KC1US) range from: 54 to 148 µS/cm. Therefore, it is not possible that mixing with naturally present groundwater below the creek is the cause of the exceedance.

Sediment dam SB3 is located immediately south of P51 and 400m north east of P53.Recent sampling recorded a field EC of 590 µS/cm, mixing of water from SB3 is not considered a likely cause in the change of EC.

It is not possible to determine with certainty if mixing with leachate from the REA interstitial water is occurring. It is a plausible process given the observations at P53 and further data collection is needed for better understanding.

Mixing with other groundwater sources

Water chemistry recorded at P53 is mixed type for cations, and bicarbonate-dominated for anions (Figure 8.6) P53 plots similar to P52 although P52 has higher relative portions of chloride. A linear mixing trend in the anions is visible with an increase in relative chloride. This trend, coupled with the higher EC recorded in P52 (2000-2400 µS/cm) indicates possible mixing with P52, likely caused by changing water flow paths.

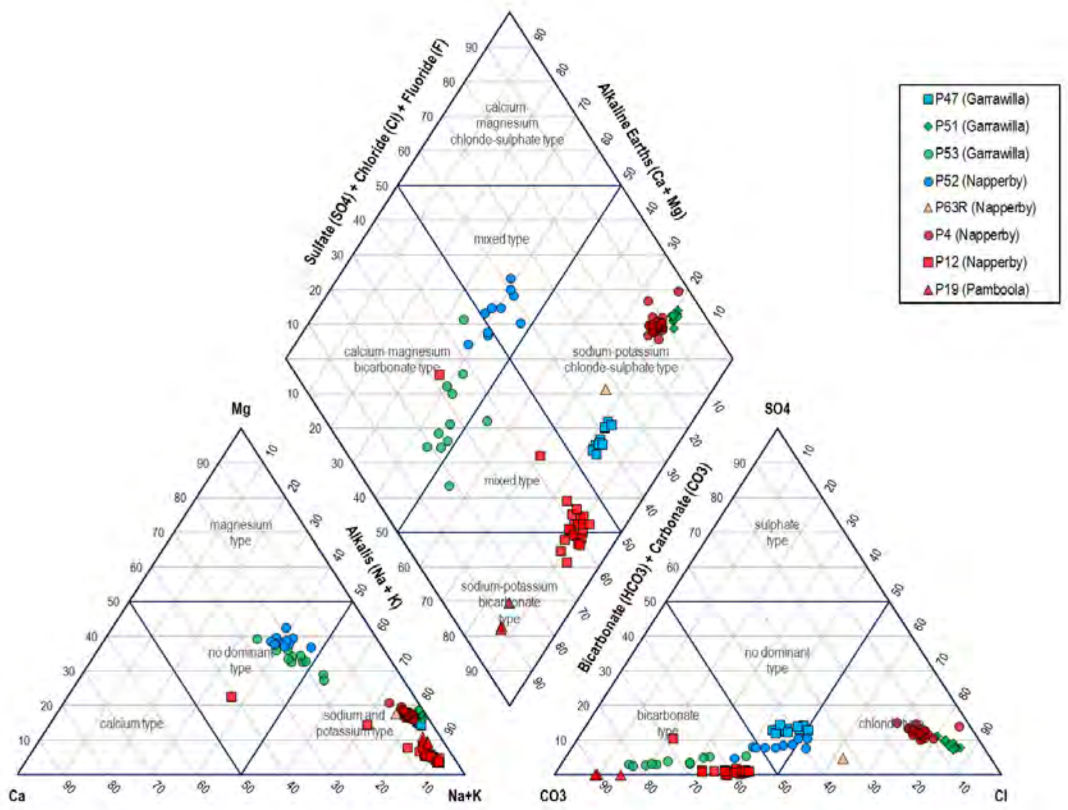

Figure 8.6 REA and surrounding bore Piper plots

Solute release

The hydraulic gradient at P53 indicates flow toward the mining zone, indicating that there is no viable pathway for solutes to reach P53, if they were being produced.

Recommendation

Bore P53 has a mixing trend indicating that changes in water composition are likely attributable to mixing of other groundwater sources. No further work is required, recommendation is to continue monitoring.

9 Mine inflows

The modelled predicted groundwater inflows for 2024 predicted groundwater inflows of 1.5 ML/day (or 558 ML) (AGE, 2024) (Table 9.1). The water take for the reporting period is lower than predicted at 0.8 ML/day (or 300 ML).

Table 9.1 Predicted water take

Water Sharing Plan	Water Source/ Licence category	Water Access Licence	Allocation (Unit Shares)	Annual Use Limit	Active (Pumped) Take	Indirect Take[2]	Total Take
Namoi Alluvial Groundwater Sources Order 2020	Upper Namoi Zone 5 Groundwater Source	WAL 12833	67	134	58	-	58
		WAL 20131	150	300	0	-	
		WAL 12822	43	86	n/a[1]	0	
NSW Great Artesian Basin (GAB) Groundwater Sources 2020	GAB Southern Recharge Groundwater Source	WAL15922	248	322.4	n/a[1]	9	9
NSW Murray Darling Basin (MDB) Porous Rock Groundwater Sources Order 2020	Gunnedah Oxley Basin MDB Groundwater Source	WAL 29549	818	1,526.3	n/a[1]	549	549
		WAL43017	403				
Upper Namoi and Lower Namoi Regulated Water Sources 2016	Lower Namoi Regulated River Water Source Regulated River (High Security)	WAL 6762	20	20	0	-	0
	Lower Namoi Regulated River Water Source Regulated River (General Security)	WAL 2671	48	60	0	-	278
		WAL 2728	10	12.5	n/a[1]	0	
		WAL 20152	600	750	278	-	

Notes: ML – Megalitres.

[1] No active pumping for water usage purposes, Water Access Licences have been assigned to miscellaneous work approvals to account for indirect take from the individual water sources as a result of mining impacts.

[2] Predicted maximum indirect take during 2024 from Narrabri Coal Mine Groundwater Model - Re-calibration Stage 2 MOD7, Australasian Groundwater and Environmental Pty Ltd (AGE) 2024.

10 Conclusion and recommendations

Several bores have exceeded their Tier 1 or Tier 2 EC triggers during the 2024 reporting period, one bore (P7) installed in the Pilliga Sandstone has exceeded its pH lower trigger level. Most bores experiencing EC exceedances demonstrate a similar trend whereby EC measurements increase rapidly at the end of the Tinderbox Drought (end 2019). Bores screened in deeper formations or those with lower hydraulically conductivities experience a lag in response due to the time for recharge to reach the aquifer. The extended dry period (Tinderbox Drought from 2017 to 2019) allows for the accumulation and concentration of salts which then seep from the unsaturated zone into the saturated hydrostratigraphic units during increased recharge or due to seepage from surface runoff drainage lines. In parallel with these recharge contributing factors, lateral leakage within hydrostratigrpahic units occurred as a result of regional head changes after the prolonged drought period.

The Tinderbox Drought and subsequent prolonged period of above average rainfall appears to have disrupted the natural groundwater conditions. The baseline groundwater quality measurements which are used to determine trigger levels are based on pre-drought conditions.

The current groundwater monitoring program is considered sufficient to monitor changes in the groundwater system, future quarterly reviews should include a short review of each bore with recorded exceedances to considering the following;

- does the conclusion that changes are associated with these climatic events remain true; and
- has a new adjusted baseline been established, if so, a review of the baseline data and trigger levels is recommended.

As indicated in this review, there are also exceedances that may be regarded as isolated with other potential causes. For example, the exceedances recorded at P11 indicated isolated drawdown which did not propagating away from P11. Although additional field work did indicate potential depressurisation of a newly drilled ventilation shaft in the area, continued monitoring is recommended.

Overall, the review indicated that the GWMP was followed and that none of the exceedances resulted in potential risk of environmental impacts to sensitive receptors. Trends observed in the groundwater level and quality data is generally consistent with natural climatic conditions.

11 References

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Appendix A

Groundwater monitoring network details

Table B 1 Groundwater monitoring locations

Location ID	Monitoring type	Owner	Eastings (MGA55)	Northings (MGA55)	Ground elevation (m AHD)	Bore depth (m)	Screen interval (m bgl)	Formation	Monitoring purpose
Springs									
Mayfield	GDE	NCOPL	775670	6615617	-	NA	NA	Pilliga Sandstone	Flow rate and surface conditions
Eather (Dam 1)	GDE	-	771133	6602103	-	NA	NA	NA	Flow rate and surface conditions
Eather (Dam 2)	GDE	-	771292	6602251	-	NA	NA	NA	Flow rate and surface conditions
Hardy's	GDE	-	770726	6604763	-	NA	NA	NA	Flow rate and surface conditions
Blairmore Feature 1	GDE	-	773353	6597177	-	NA	NA	NA	Flow rate and surface conditions
Blairmore Feature 2	GDE	-	774557	6597554	-	NA	NA	NA	Flow rate and surface conditions
Standpipe monitoring bores									
P1	Standpipe	NCOPL	776116	6614694	316.06	50	44-50	Garrawilla Volcanics	Level and quality
P2	Standpipe	NCOPL	777282	6616355	275.92	50	44-50	Napperby Formation	Level and quality
P3	Standpipe	Private	780433	6620115	236.31	40	34-40	Pamboola Formation	Level and quality
P4	Standpipe	Private	777490	6625553	248.96	30	24-30	Napperby Formation	Level and quality
P5	Standpipe	Stock Route	778180	6628195	233.41	30	24-30	Pamboola Formation	Level
P6	Standpipe	Private	772726	6626021	326.19	90	78-90	Pilliga Sandstone	Level and quality
P7	Standpipe	State Forest	768998	6624338	289.69	90	78-90	Pilliga Sandstone	Level and quality
P8	Standpipe	State Forest	772697	6618421	322.11	65	57-63	Purlawaugh Formation	Level and quality

Location ID	Monitoring type	Owner	Eastings (MGA55)	Northings (MGA55)	Ground elevation (m AHD)	Bore depth (m)	Screen interval (m bgl)	Formation	Monitoring purpose
P9	Standpipe	State Forest	775127	6620209	295.51	36	24-36	Purlawaugh Formation	Level and quality
P10	Standpipe	State Forest	774063	6616444	301.78	130	118-130	Napperby Formation (no sill)	Level and quality
P11	Standpipe	NCOPL	774066	6616447	301.62	40	34-40	Purlawaugh Formation	Level and quality
P12	Standpipe	NCOPL	776513	6619964	276.48	90	84-90	Napperby Formation (above sill)	Level and quality
P13	Standpipe	NCOPL	776526	6619972	276.48	30	24-30	Garrawilla Volcanics/Napperby	Level and quality
P16	Standpipe	State Forest	772233	6623740	303.51	146	137-146	Garrawilla Volcanics	Level and quality
P17	Standpipe	State Forest	772222	6623712	303.24	56	47-56	Purlawaugh Formation	Level and quality
P19	Standpipe	NCOPL	776827	6621543	275.09	187	184-187	Pamboola Formation	Level and quality
P28	Standpipe	NCOPL	778343	6620162	262.46	25	19-25	Napperby Formation (above sill)	Seepage
P29	Standpipe	NCOPL	778541	6619978	256.84	25	19-25	Napperby Formation (above sill)	Seepage
P30	Standpipe	NCOPL	778808	6620071	254.95	15	9-15	Napperby Formation (above sill)	Seepage
P31	Standpipe	NCOPL	778318	6620343	264.39	15	9-15	Napperby Formation (above sill)	Seepage
P32	Standpipe	NCOPL	778993	6620335	252.49	15	9-15	Napperby Formation (above sill)	Seepage
P33	Standpipe	NCOPL	778772	6620523	253.56	15	9-15	Napperby Formation (above sill)	seepage
P34	Standpipe	NCOPL	778542	6620604	255.96	15	9-15	Napperby Formation (above sill)	Seepage

Location ID	Monitoring type	Owner	Eastings (MGA55)	Northings (MGA55)	Ground elevation (m AHD)	Bore depth (m)	Screen interval (m bgl)	Formation	Monitoring purpose
P39A	Standpipe	NCOPL	782024	6620076	228.25	80	72-78	Watermark Formation	Levels and quality
P39B	Standpipe	NCOPL	782017	6620077	228.33	32	15-30	Alluvium	Levels and quality
P51	Standpipe	NCOPL	777437	6620859	267.15	17	9-12	Garrawilla Volcanics	-
P52	Standpipe	NCOPL	777118	6620808	268.85	24	18-21	Napperby Formation	-
P53	Standpipe	NCOPL	776995	6620655	270.98	24	18-21	Garrawilla Volcanics	-
P58	Standpipe	NCOPL	778649	6619912	254.65	40	32-38	Napperby Formation¶	-
P59*	Standpipe	NCOPL	772297	6623437	300.0	6	4-6	Alluvium	Level and quality
P60*	Standpipe	NCOPL	772292	6623441	300.0	37.2	29-35	Pilliga Sandstone	Level and quality
P62*	Standpipe	NCOPL	775947	6623827	263.0	6	4-6	Alluvium/Colluvium	Level and quality
P63R*	Standpipe	NCOPL	775937	6623827	263.0	78.4	72-78	Napperby Formation	Level and quality
P65*	Standpipe	NCOPL	771617	6612196	378.0	4.6	2.6-4.6	Alluvium/Colluvium	Level and quality
P66*	Standpipe	NCOPL	771612	6612210	377.0	63	57-63	Pilliga Sandstone	Level and quality
P68*	Standpipe	NCOPL	776364	6616888	273.0	6	2-6	Alluvium/Colluvium	Level and quality
P69*	Standpipe	NCOPL	776354	6616909	273.0	72.3	63.3-72.3	Napperby	Level and quality
P71*	Standpipe	NCOPL	770780	6604887	317.0	6	3-6	Alluvium/Colluvium	Level and quality
P72*	Standpipe	NCOPL	770777	6604888	317.0	48	42-48	Purlawaugh	Level and quality
P74*	Standpipe	NCOPL	779584	6605944	252.0	5.9	2.9-5.9	Alluvium/Colluvium	Level and quality
P75*	Standpipe	NCOPL	779591	6605950	252.0	18.4	12.4-18.4	Napperby Formation	Level and quality

Location ID	Monitoring type	Owner	Eastings (MGA55)	Northings (MGA55)	Ground elevation (m AHD)	Bore depth (m)	Screen interval (m bgl)	Formation	Monitoring purpose
P82*	Standpipe	NCOPL	771156	6618806	368.0	110	104-110	Pilliga Sandstone	Level and quality
P6B*	Standpipe	NCOPL	772735	6626015	326.0	108	93-102	Pilliga Sandstone	Level and quality
P90*	Standpipe	NCOPL	773523	6618540	315.0	80	70-76	Pilliga Sandstone	Level and quality
P91*	Standpipe	NCOPL	775736	6615843	289.0	15	9-15	Alluvium	-
P92*	Standpipe	NCOPL	775694	6615503	295.0	15	9-15	Alluvium	-
Private bores									
WB1	Standpipe (Stock and domestic)	-	777251	6622763	265.84	-	-	Garrawilla Volcanics	Level and quality
WB2	Standpipe (Stock and domestic)	NCOPL	776382	6619701	281.0	26	22-26	Garrawilla Volcanics	Level and quality
WB3a	Standpipe	-	779133	6631524	226.0	-	8.2-8.5	Alluvium	Level and quality
WB3b	Standpipe	-	779133	6631524	226.0	-	35.1-36.3	Alluvium	Level and quality
WB4	Standpipe	-	778957	6629746	224.0	-	11.3-15.9	Alluvium	Level and quality
WB5a	Standpipe	-	785892	6618196	233.0	-	11-14.5	Alluvium	Level and quality
WB5b	Standpipe	-	785892	6618196	233.0	-	26.5-28	Alluvium	Level and quality
WB6a	Standpipe	-	786976	6615621	234.0	-	11.5-13	Alluvium	Level and quality
WB6b	Standpipe	-	786976	6615621	234.0	-	76.7-78	Alluvium	Level and quality
WB7	Standpipe	-	784440	6620521	230.0	-	-	Alluvium	Level and quality
WB8	Standpipe (Stock and domestic)	-	777682	6623409	-	-	27.4-29.8	Alluvium	Level and quality

Location ID	Monitoring type	Owner	Eastings (MGA55)	Northings (MGA55)	Ground elevation (m AHD)	Bore depth (m)	Screen interval (m bgl)	Formation	Monitoring purpose
WB10 (GW013858)	Standpipe (Stock and domestic)	Private	774254	6603250	-	33.5	24.3-30.3	Napperby Formation	Level
WB11 (House bore)	Standpipe (Stock and domestic)	Private	772678	6601496	-	58	unknown	Garrawilla Volcanics	Level
WB12 (257_bore)	Standpipe	Private	780874	6617836	240.0	100	60-75	Arkarula Formation and Pamboola Formation	level
WB13 (GW008634)	Standpipe (Stock and domestic)	Private	772930	6597095	-	78.3	25.9-30.4 and 70.7-78.2	Garrawilla Volcanics/Napperby Formation	Level
WB14 (GW026121)	Standpipe	Private	773126	6603421	-	20.1	unknown	Garrawilla Volcanics	Level
WB15 (Windmill Bore)	Standpipe	Private	779733	6628836	-	20	Unknown	Napperby Formation	Level
WB16 (South Caloola)	Standpipe	Private	775254	6602244	-	41	Unknown	Napperby Formation	Level
WB17 (GW903687 - Solar Bore)	Standpipe (Stock and domestic)	Private	779491	6628525	-	23.88	Unknown	Napperby Formation	Level
WB18 (Mentone Bore)	Standpipe (Stock and domestic)	Private	776686	6629386	-	16.69	Unknown	Napperby Formation	Level
Vibrating wire piezometers									
P42_185	VWP	NCOPL	771092	6614376	335.92	427	185	Purlawaugh Formation	Level
P42_345	VWP	NCOPL	771092	6614376	335.92	427	345	Digby Formation	Level
P42_375	VWP	NCOPL	771092	6614376	335.92	427	375	Benelabri Formation	Level

Location ID	Monitoring type	Owner	Eastings (MGA55)	Northings (MGA55)	Ground elevation (m AHD)	Bore depth (m)	Screen interval (m bgl)	Formation	Monitoring purpose
P42_395	VWP	NCOPL	771092	6614376	335.92	427	395	Hoskissons Coal Seam	Level
P42_415	VWP	NCOPL	771092	6614376	335.92	427	415	Arkarula Formation	Level
P42_90	VWP	NCOPL	771092	6614376	335.84	121	90	Pilliga Sandstone	Level
P44_134	VWP	NCOPL	777434	6623212	268.15	471	134	Digby Formation	Level
P44_245	VWP	NCOPL	777434	6623212	268.15	471	245	Arkarula Formation	Level
P44_330	VWP	NCOPL	777434	6623212	268.15	471	330	Arkarula Formation	Level
P44_375	VWP	NCOPL	777434	6623212	268.15	471	375	Arkarula Formation	Level
P44_445	VWP	NCOPL	777434	6623212	268.15	471	445	Arkarula Formation	Level
P44_95	VWP	NCOPL	777434	6623212	268.09	98	95	Napperby Formation	Level
P45_42	VWP	NCOPL	779491	6620117	247.27	291	42.5	Digby Formation	Level
P45_80	VWP	NCOPL	779491	6620117	247.27	291	80	Arkarula Formation	Level
P45_150	VWP	NCOPL	779491	6620117	247.27	291	150	Watermark Formation	Level
P45_200	VWP	NCOPL	779491	6620117	247.27	291	200	Watermark Formation	Level
P45_240	VWP	NCOPL	779491	6620117	247.27	291	240	Watermark Formation	Level
P45_276	VWP	NCOPL	779491	6620117	247.27	291	276	Watermark Formation	Level
P46_70	VWP	NCOPL	777395	6617847	262.33	396	70	Napperby Formation	Level
P46_87	VWP	NCOPL	777395	6617847	262.33	396	87	Digby Formation	Level

Location ID	Monitoring type	Owner	Eastings (MGA55)	Northings (MGA55)	Ground elevation (m AHD)	Bore depth (m)	Screen interval (m bgl)	Formation	Monitoring purpose
P46_151	VWP	NCOPL	777395	6617847	262.33	396	151	Pamboola Formation	Level
P46_250	VWP	NCOPL	777395	6617847	262.33	396	250	Watermark Formation	Level
P46_308	VWP	NCOPL	777395	6617847	262.33	396	308	Porcupine Formation	Level
P46_343	VWP	NCOPL	777395	6617847	262.33	396	343	Leard Formation	Level
P54_30	VWP	State Forest	773079	6610419	363.07	348	30	Pilliga Sandstone	Level
P54_60	VWP	State Forest	773079	6610419	363.07	348	60	Purlawaugh Formation	Level
P54_100	VWP	State Forest	773079	6610419	363.07	348	100	Purlawaugh Formation	Level
P54_140	VWP	State Forest	773079	6610419	363.07	348	140	Napperby Formation	Level
P54_180	VWP	State Forest	773079	6610419	363.07	348	180	Napperby Formation	Level
P54_220	VWP	State Forest	773079	6610419	363.07	348	220	Napperby Formation	Level
P54_260	VWP	State Forest	773079	6610419	363.07	348	260	Napperby Formation	Level
P54_300	VWP	State Forest	773079	6610419	363.07	348	300	Benelabri Formation	Level
P54_338	VWP	State Forest	773079	6610419	363.07	348	338	Arkarula Formation	Level
P55_68	VWP	NCOPL	776425	6610503	274.56	230	68	Napperby Formation	Level
P55_91	VWP	NCOPL	776425	6610503	274.56	230	91	Napperby Formation	Level
P55_103	VWP	NCOPL	776425	6610503	274.56	230	103	Digby Formation	Level
P55_128	VWP	NCOPL	776425	6610503	274.56	230	128	Arkarula Formation	Level
P55_152	VWP	NCOPL	776425	6610503	274.56	230	152	Pamboola Formation	Level

Location ID	Monitoring type	Owner	Eastings (MGA55)	Northings (MGA55)	Ground elevation (m AHD)	Bore depth (m)	Screen interval (m bgl)	Formation	Monitoring purpose
P55_188	VWP	NCOPL	776425	6610503	274.56	230	188	Pamboola Formation	Level
P55_221	VWP	NCOPL	776425	6610503	274.56	230	221	Pamboola Formation	Level
P56_55	VWP	NCOPL	776277	6614725	315.38	368	55	Napperby Formation	Level
P56_85	VWP	NCOPL	776277	6614725	315.38	368	85	Napperby Formation	Level
P56_115	VWP	NCOPL	776277	6614725	315.38	368	115	Napperby Formation	Level
P56_145	VWP	NCOPL	776277	6614725	315.38	368	145	Napperby Formation	Level
P56_175	VWP	NCOPL	776277	6614725	315.38	368	175	Arkarula Formation	Level
P56_205	VWP	NCOPL	776277	6614725	315.38	368	205	Pamboola Formation	Level
P56_235	VWP	NCOPL	776277	6614725	315.38	368	235	Pamboola Formation	Level
P56_265	VWP	NCOPL	776277	6614725	315.38	368	265	Watermark Formation	Level
P56_300	VWP	NCOPL	776277	6614725	315.38	368	300	Porcupine Formation	Level
P61_92*	VWP	NCOPL	772294.83	6623437.5	299.56	303	92	Purlawaugh Formation	Level
P61_138*	VWP	NCOPL	772294.83	6623437.5	299.56	303	138	Garrawilla Volcanics	Level
P61_205*	VWP	NCOPL	772294.83	6623437.5	299.56	303	205	Napperby Formation	Level
P61_260*	VWP	NCOPL	772294.83	6623437.5	299.56	303	260	Basalt Sill	Level
P61_300*	VWP	NCOPL	772294.83	6623437.5	299.56	303	300	Digby Formation	Level
P64_104*	VWP	NCOPL	775929.23	6623827.5	263.59	162	104	Napperby Formation (upper)	Level

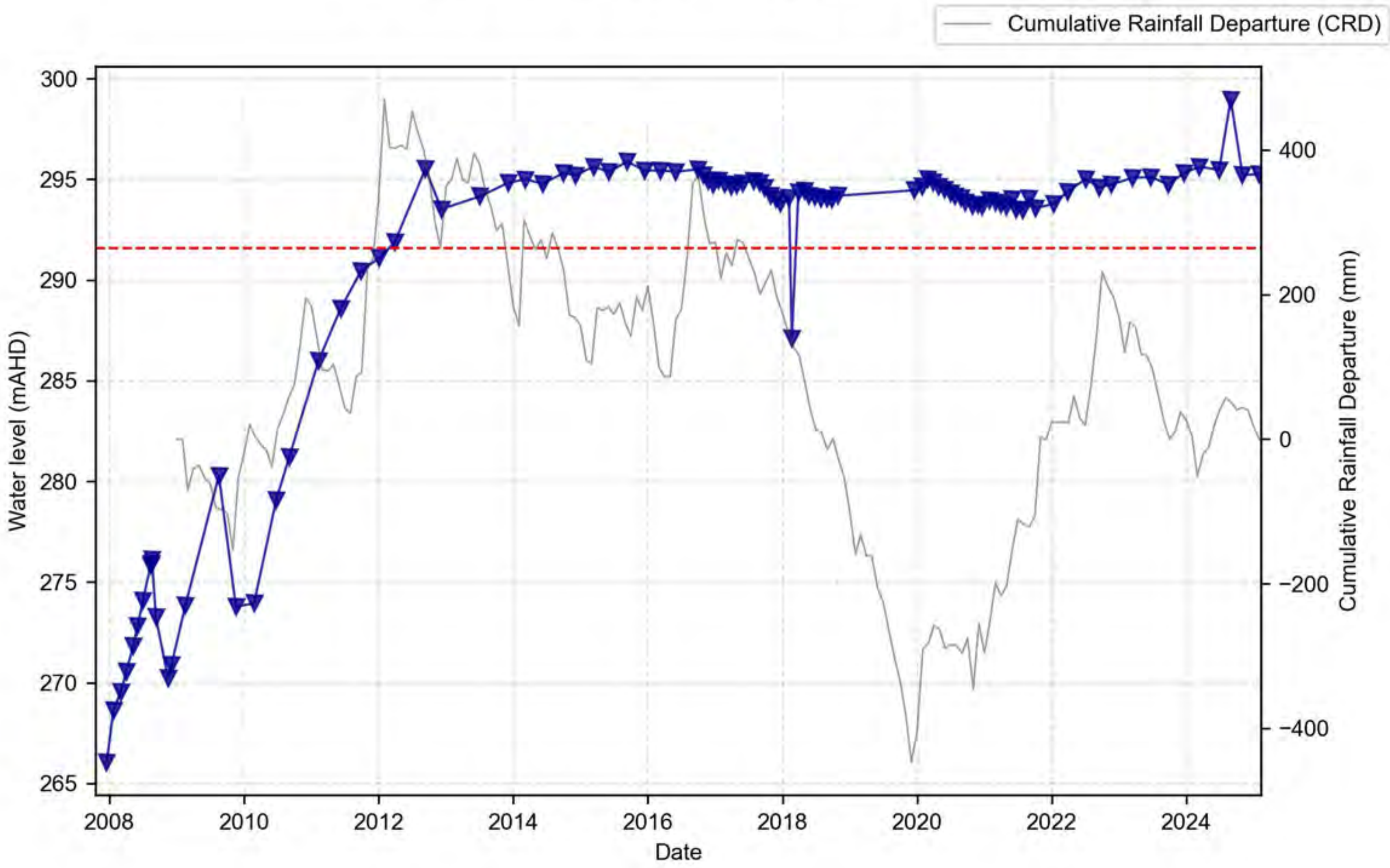
Location ID	Monitoring type	Owner	Eastings (MGA55)	Northings (MGA55)	Ground elevation (m AHD)	Bore depth (m)	Screen interval (m bgl)	Formation	Monitoring purpose
P64_120*	VWP	NCOPL	775929.23	6623827.5	263.59	162	120	Napperby Formation (lower)	Level
P64_150*	VWP	NCOPL	775929.23	6623827.5	263.59	162	150	Digby Formation	Level
P64_159*	VWP	NCOPL	775929.23	6623827.5	263.59	162	159	Hoskissons coal seam	Level
P67_115*	VWP	NCOPL	771606.69	6612207	377.29	374	115	Purlawaugh Formation (upper)	Level
P67_170*	VWP	NCOPL	771606.69	6612207	377.29	374	170	Purlawaugh Formation (lower)	Level
P67_240*	VWP	NCOPL	771606.69	6612207	377.29	374	240	Napperby Formation (upper)	Level
P67_300*	VWP	NCOPL	771606.69	6612207	377.29	374	300	Napperby Formation (lower)	Level
P67_371*	VWP	NCOPL	771606.69	6612207	377.29	374	371	Digby Formation	Level
P70_85*	VWP	NCOPL	776364.49	6616908.8	272.98	127	85	Napperby Formation	Level
P70_118*	VWP	NCOPL	776364.49	6616908.8	272.98	127	118	Digby Formation	Level
P70_124*	VWP	NCOPL	776364.49	6616908.8	272.98	127	124	Hoskissons coal seam	Level
P73_90*	VWP	NCOPL	770782.24	6604886.2	316.95	323	90	Garrawilla Volcanics	Level
P73_175*	VWP	NCOPL	770782.24	6604886.2	316.95	323	175	Napperby Formation	Level
P73_310*	VWP	NCOPL	770782.24	6604886.2	316.95	323	310	Digby Formation	Level
P73_320*	VWP	NCOPL	770782.24	6604886.2	316.95	323	320	Arkarula Formation	Level
P76_11*	VWP	NCOPL	777720.05	6610667.5	263.01	108	11	Napperby Formation (upper)	Level

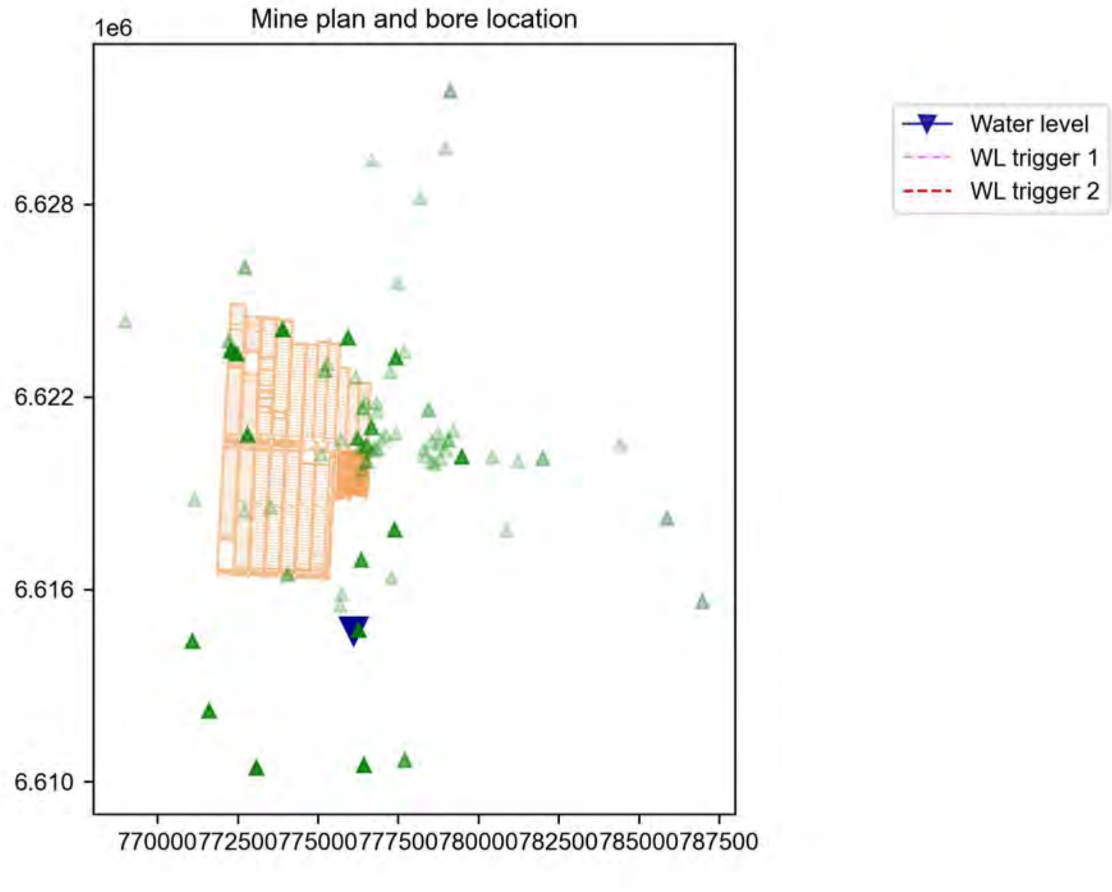
Location ID	Monitoring type	Owner	Eastings (MGA55)	Northings (MGA55)	Ground elevation (m AHD)	Bore depth (m)	Screen interval (m bgl)	Formation	Monitoring purpose
P76_40*	VWP	NCOPL	777720.05	6610667.5	263.01	108	40	Napperby Formation (lower)	Level
P76_81*	VWP	NCOPL	777720.05	6610667.5	263.01	108	81	Digby Formation	Level
P76_105*	VWP	NCOPL	777720.05	6610667.5	263.01	108	105	-	Level
P77_40*	VWP	NCOPL	772459.43	6623324.8	302.54	298	40	Pilliga Sandstone	Level
P77_90*	VWP	NCOPL	772459.43	6623324.8	302.54	298	90	Purlawaugh Formation	Level
P77_145*	VWP	NCOPL	772459.43	6623324.8	302.54	298	145	Garrawilla Volcanics	Level
P77_205*	VWP	NCOPL	772459.43	6623324.8	302.54	298	205	Napperby Formation (upper)	Level
P77_245*	VWP	NCOPL	772459.43	6623324.8	302.54	298	245	Napperby Formation (middle)	Level
P77_265*	VWP	NCOPL	772459.43	6623324.8	302.54	298	265	Napperby Formation (lower)	Level
P77_295*	VWP	NCOPL	772459.43	6623324.8	302.54	298	295	Digby Formation	Level

Appendix B

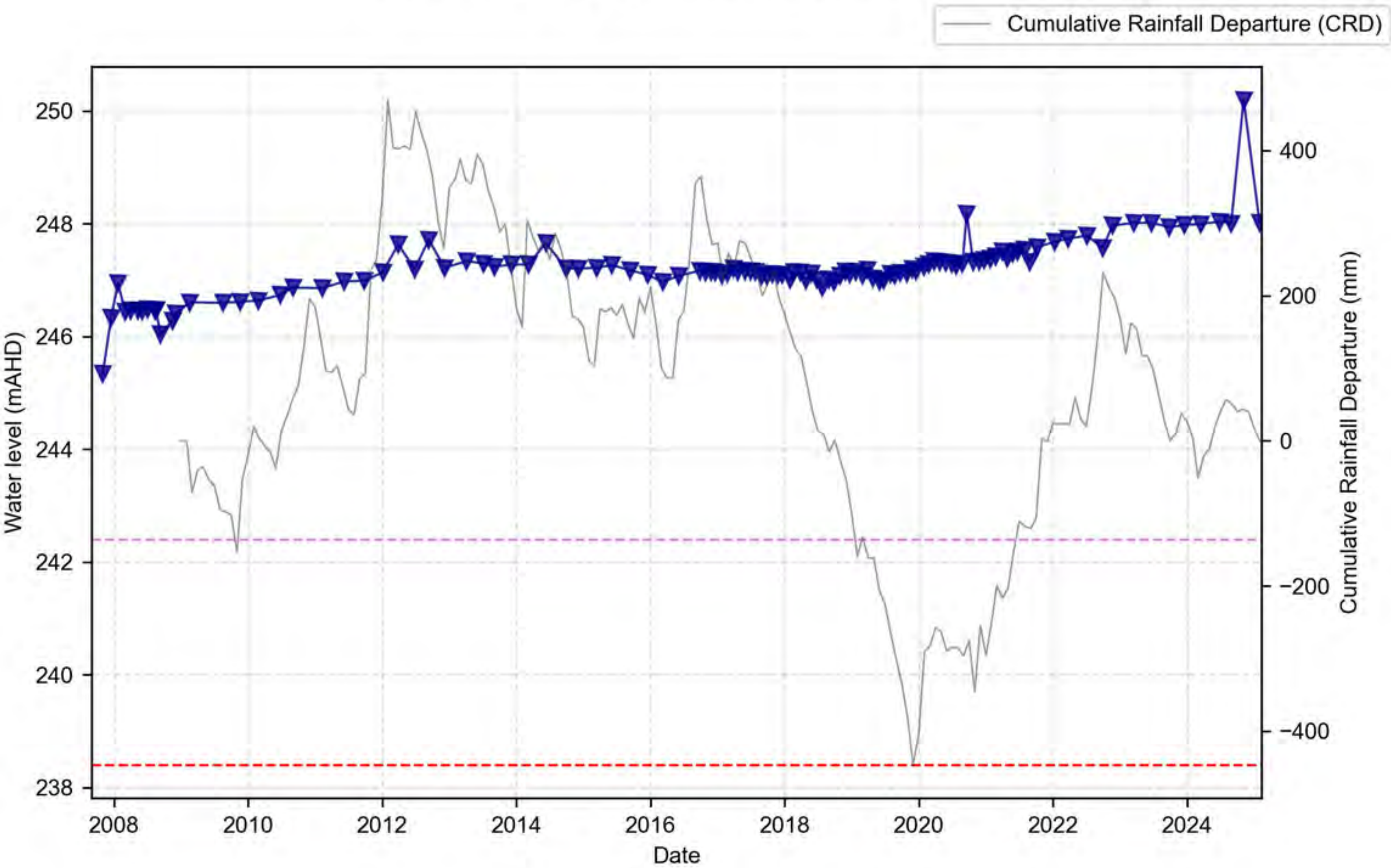
Hydrographs

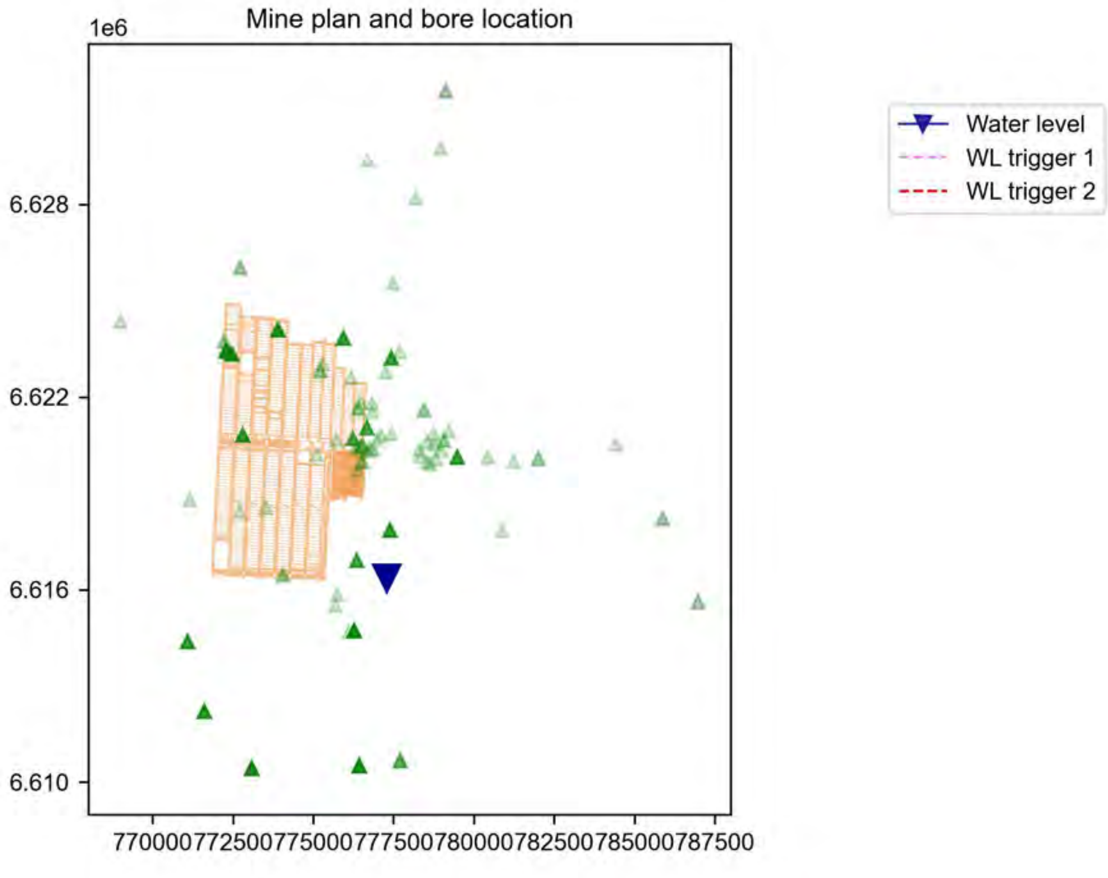
P1 (Garrawilla Volcanics; Subcrop)





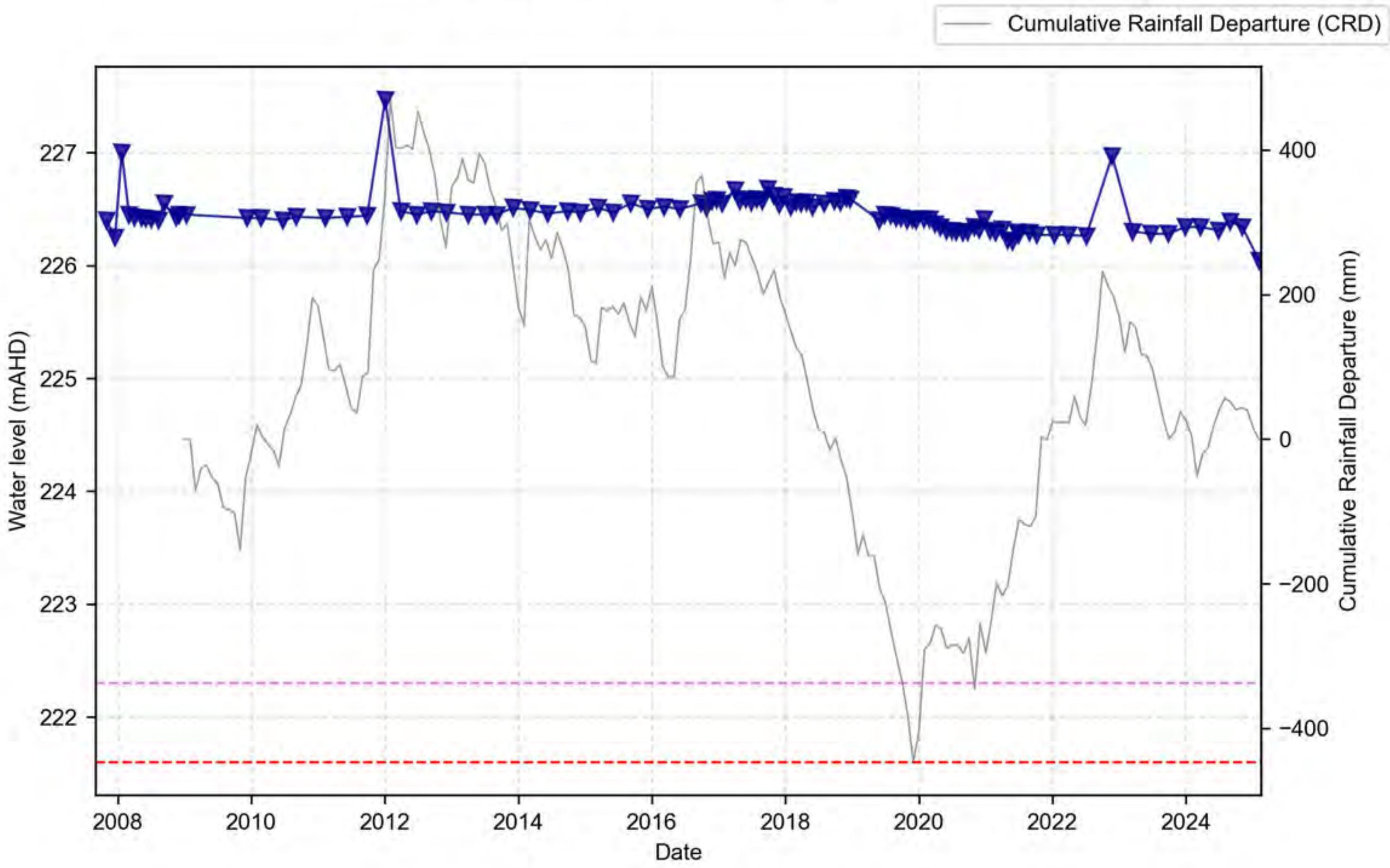
P2 (Napperby Formation; Subcrop)

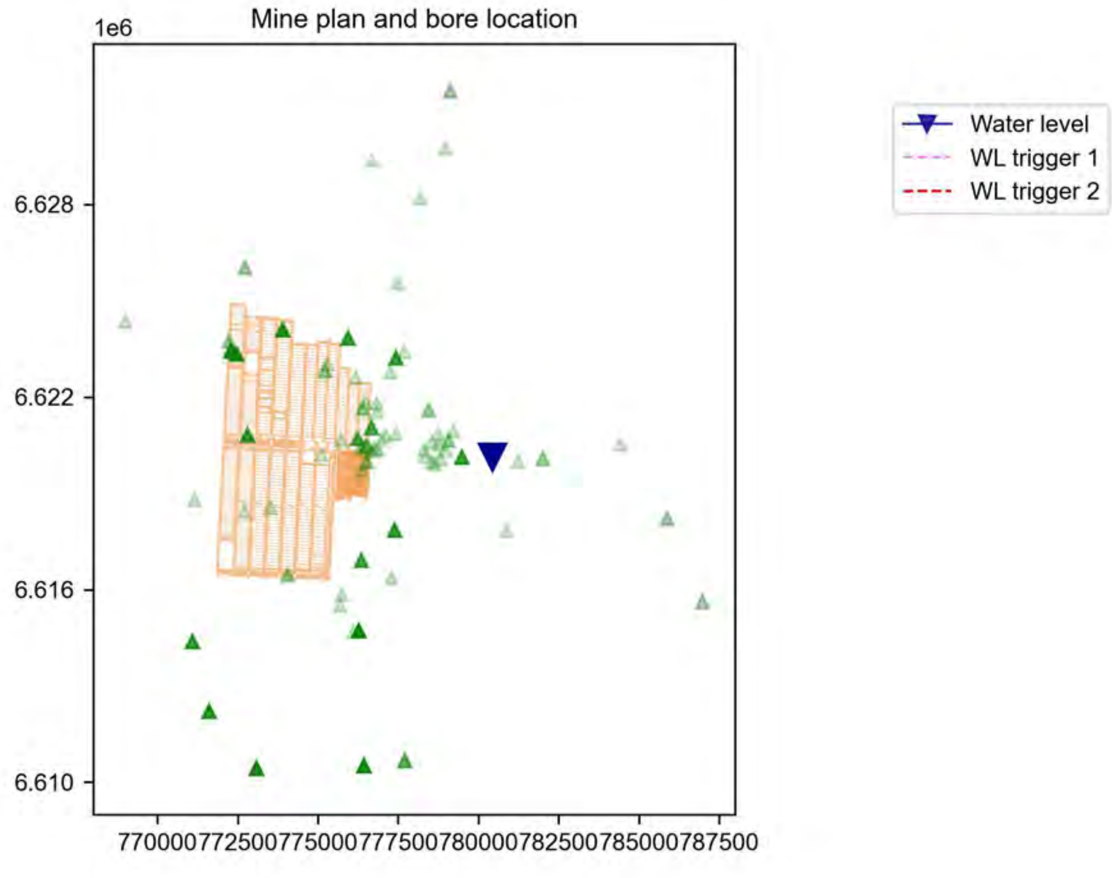




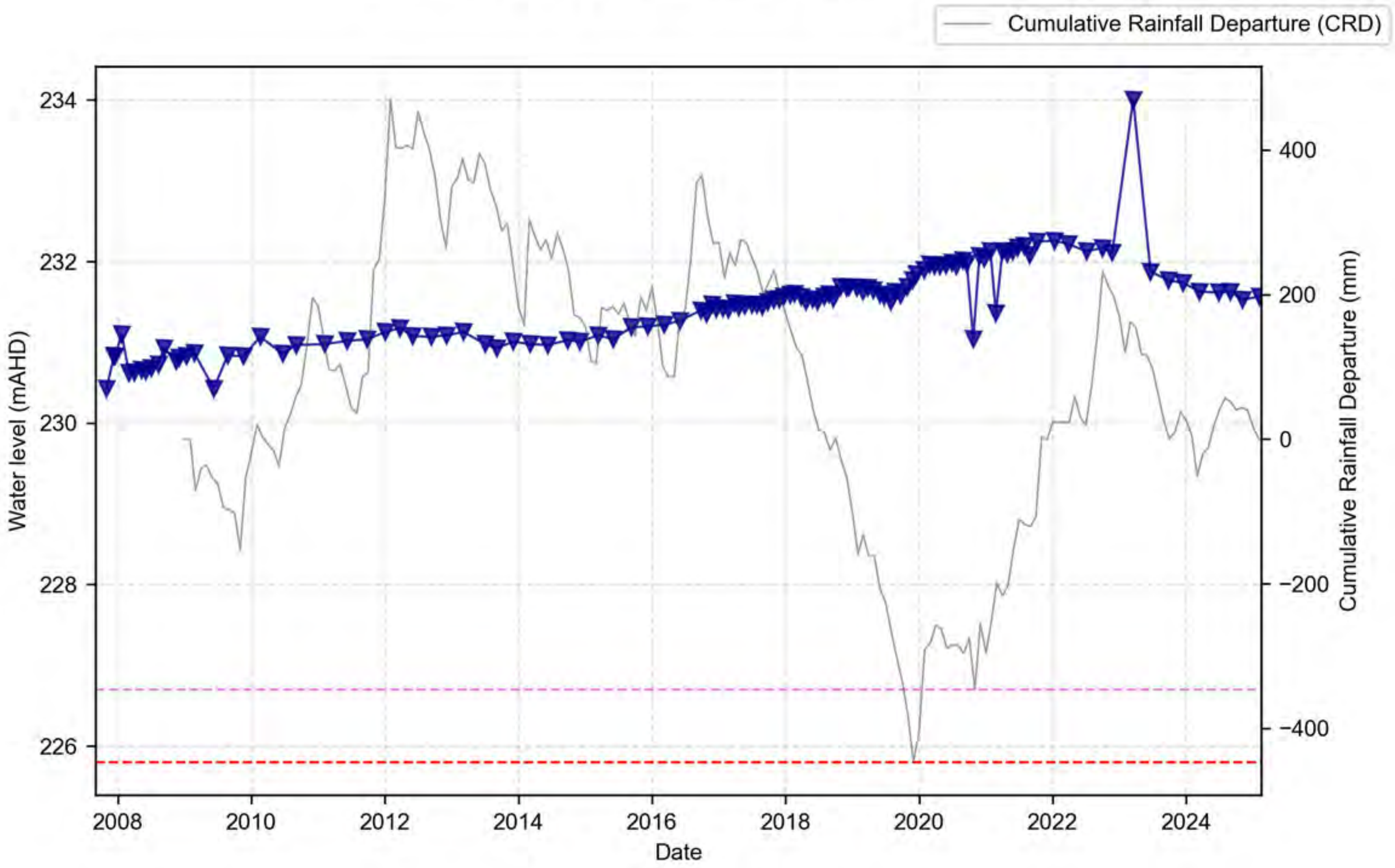
* mAHD - metres Australian Height Datum

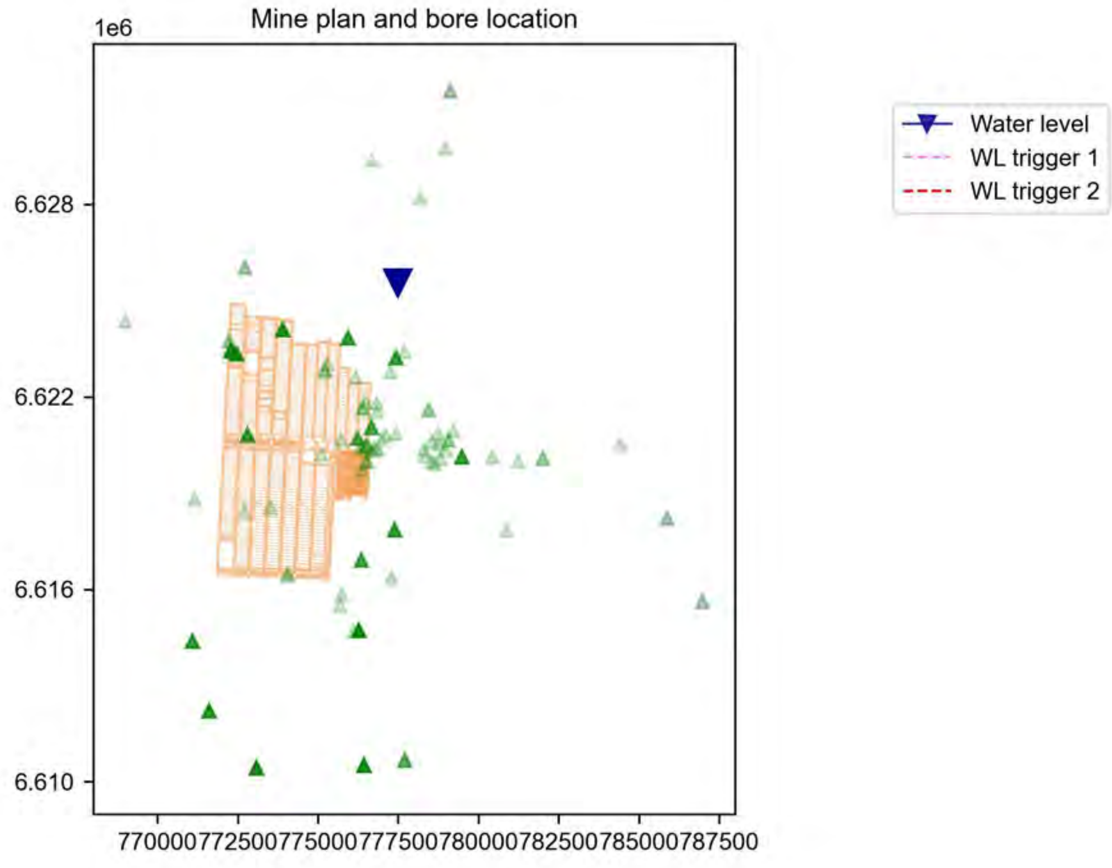
P3 (Pamboola Formation; Outcrop)





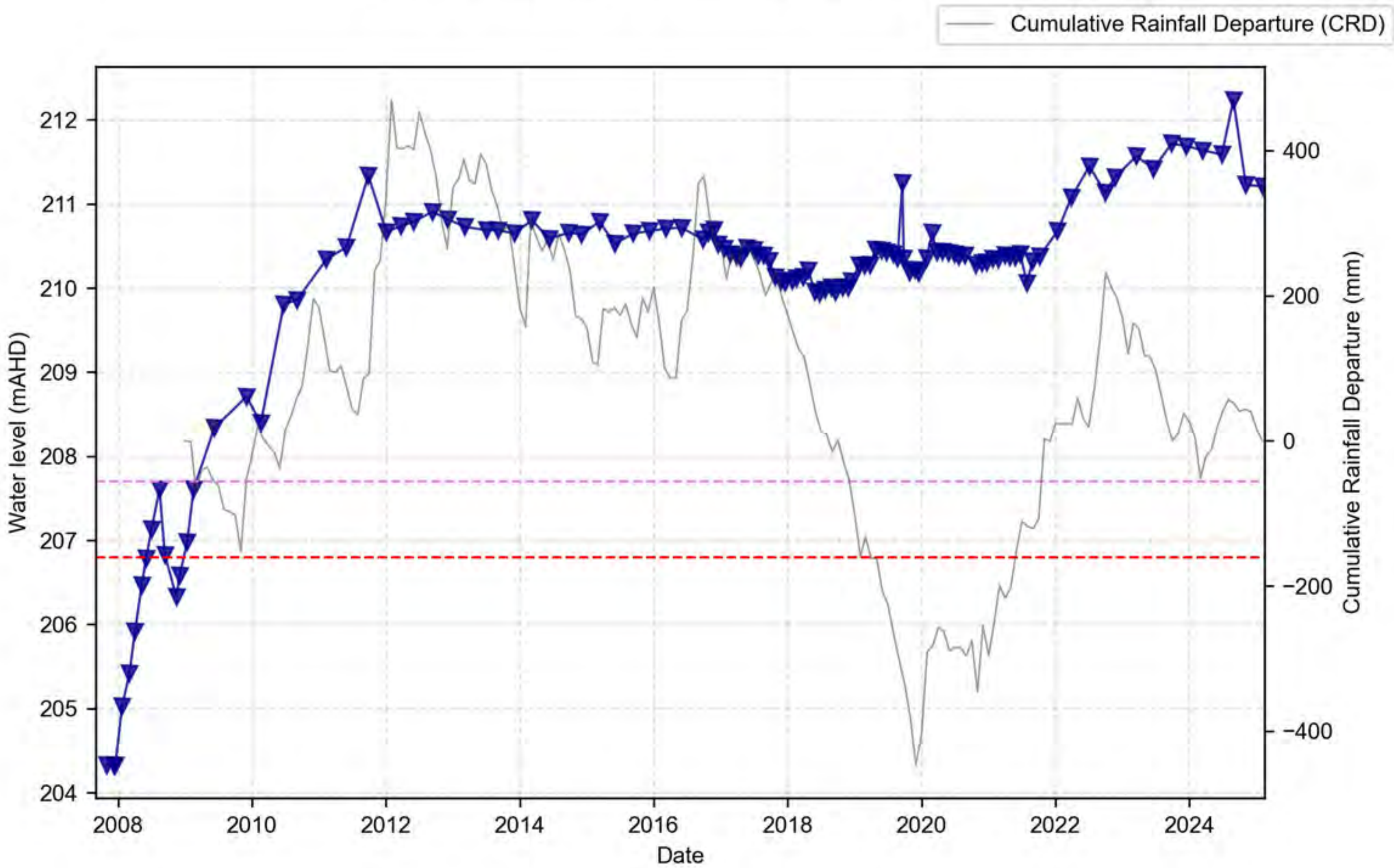
P4 (Napperby Formation; Outcrop)

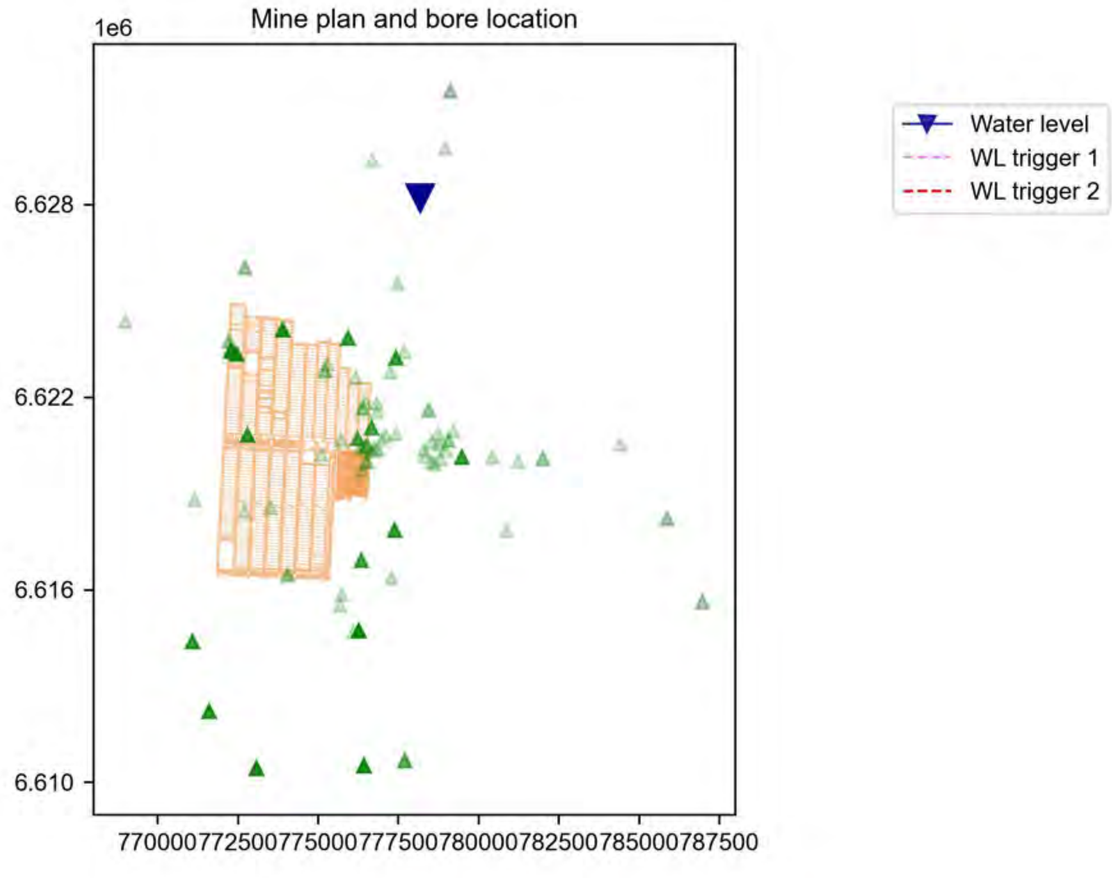




* mAHD - metres Australian Height Datum

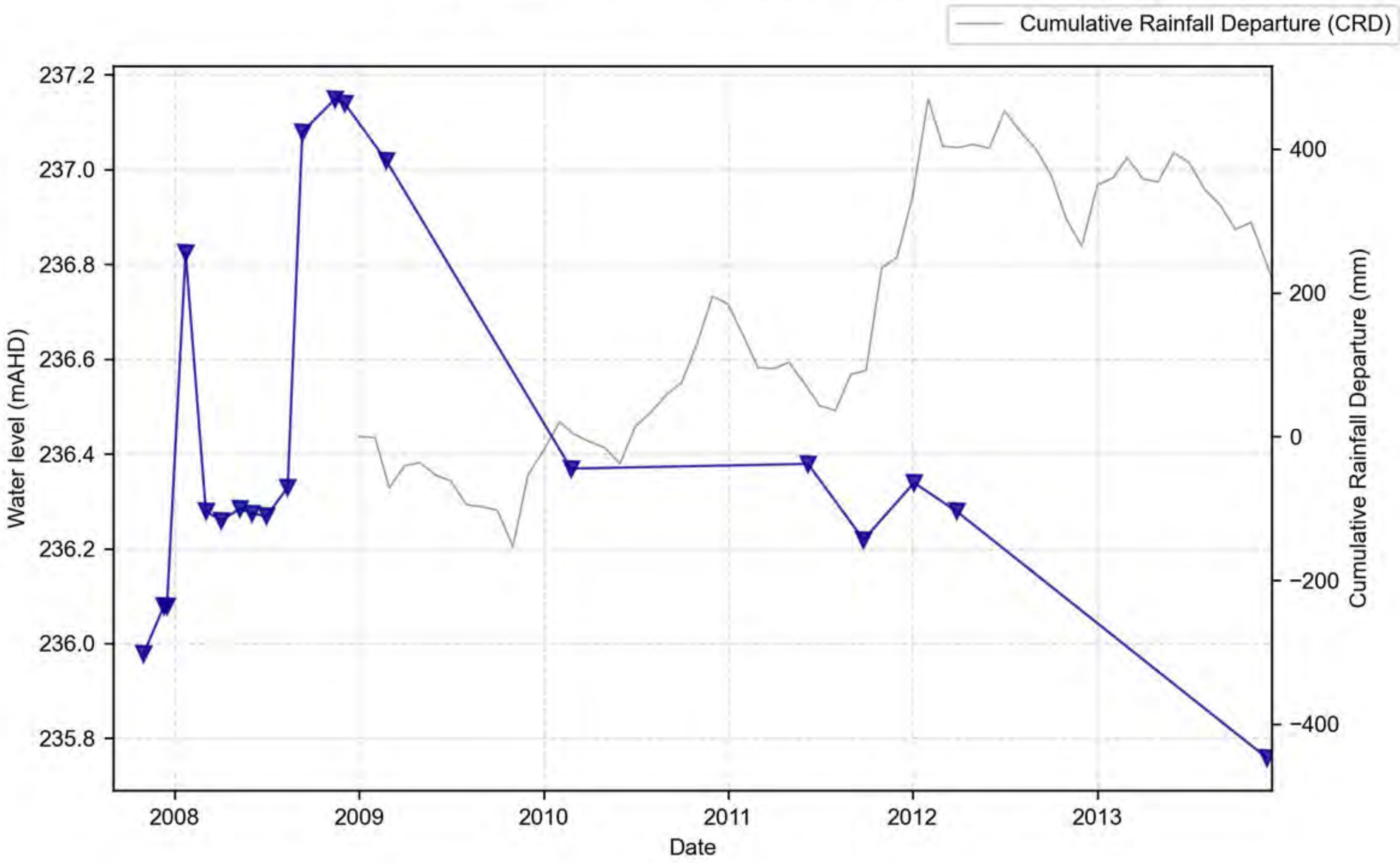
P5 (Pamboola Formation; Outcrop)

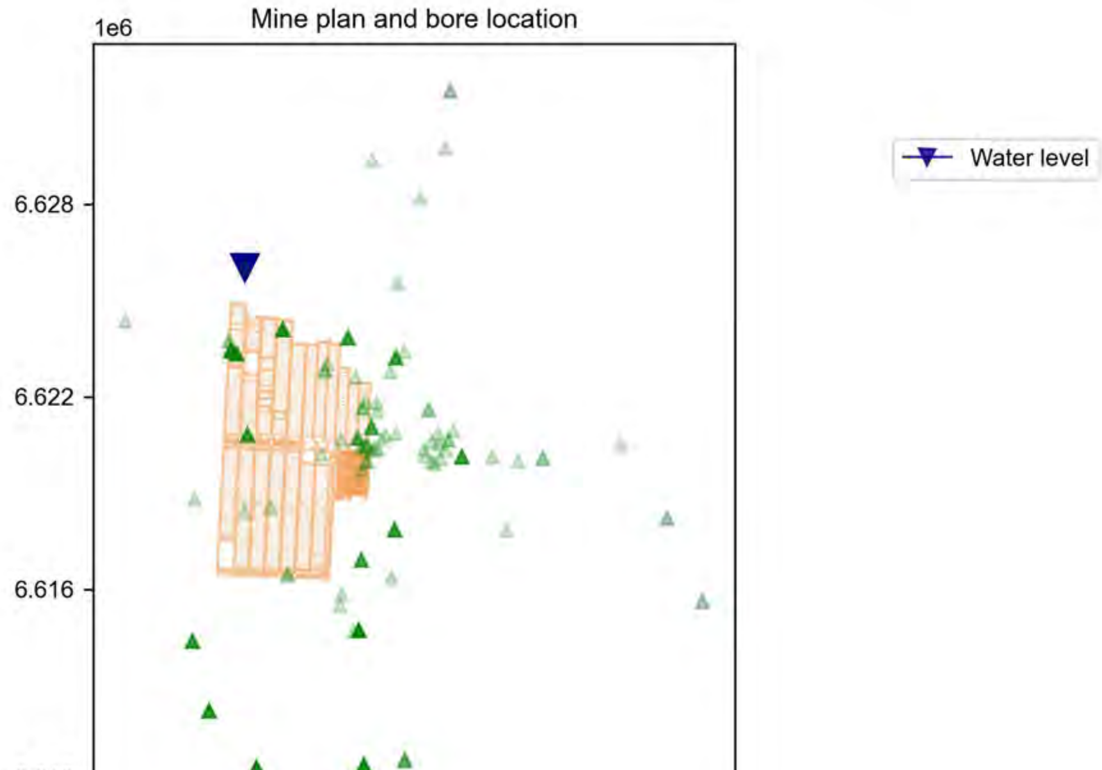




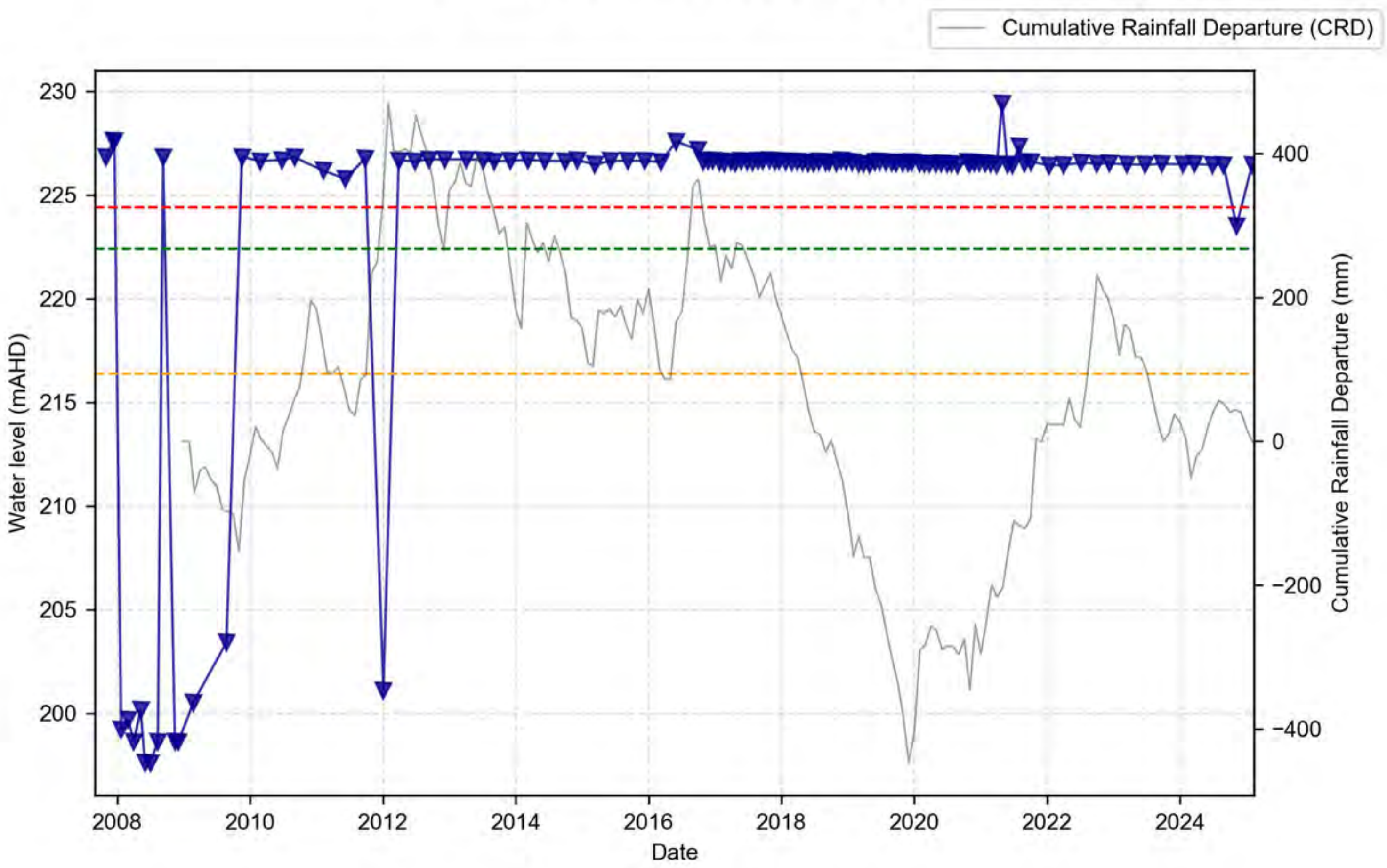
* mAHD - metres Australian Height Datum

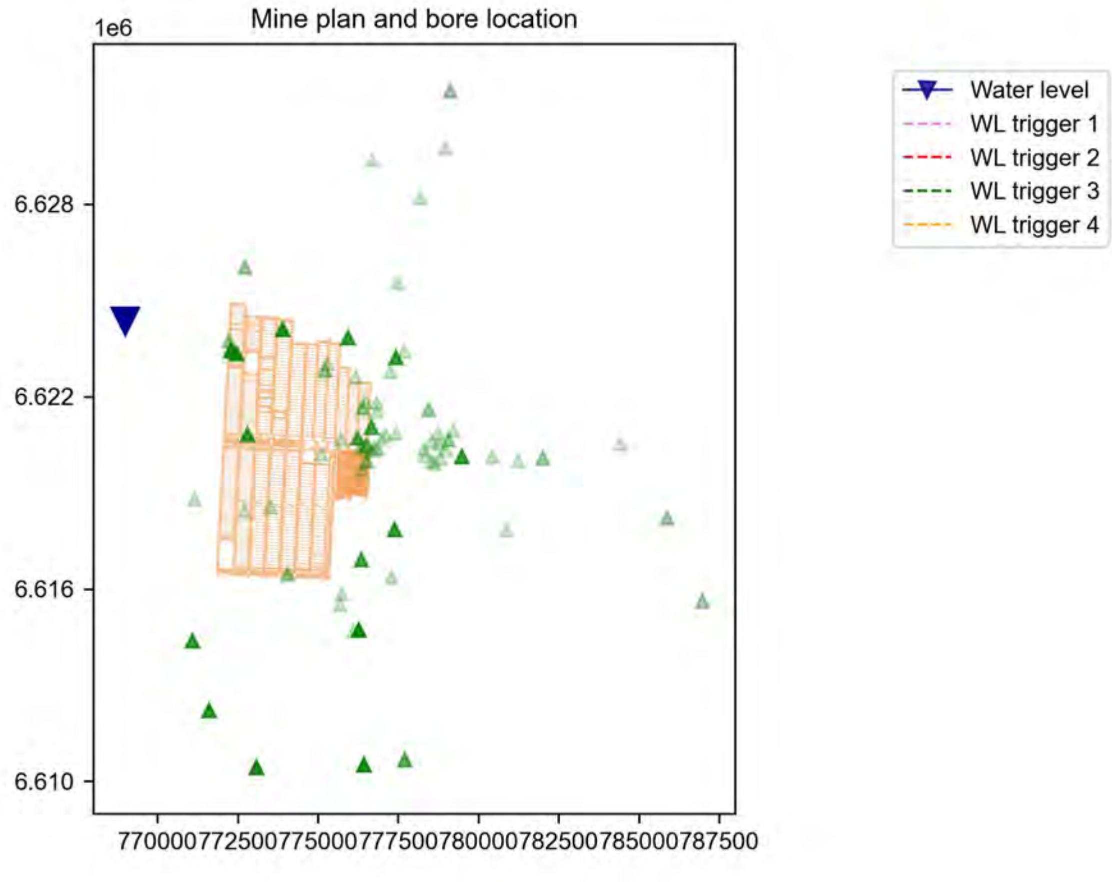
P6 (Pilliga Sandstone; Outcrop)





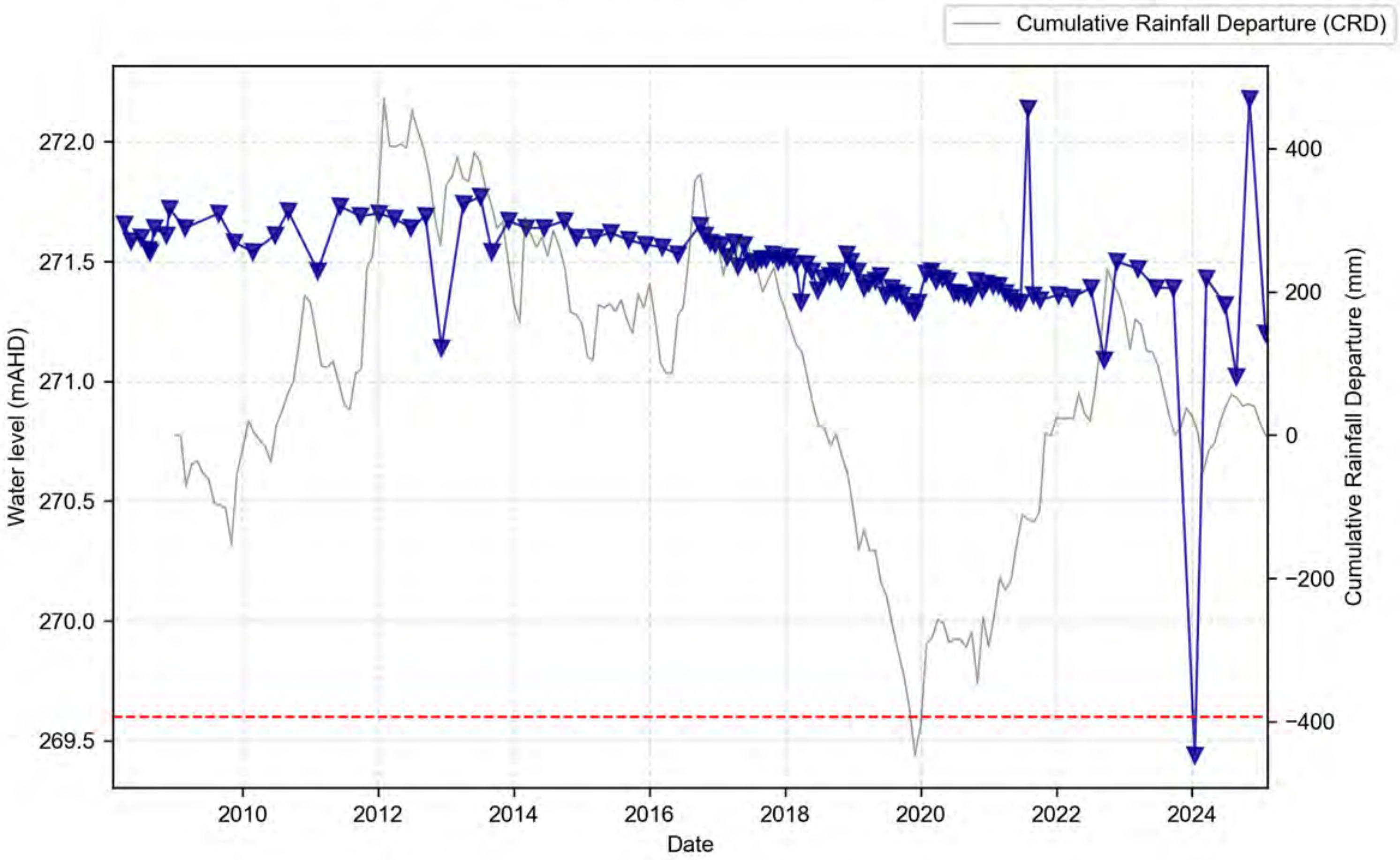
P7 (Pilliga Sandstone; Outcrop)

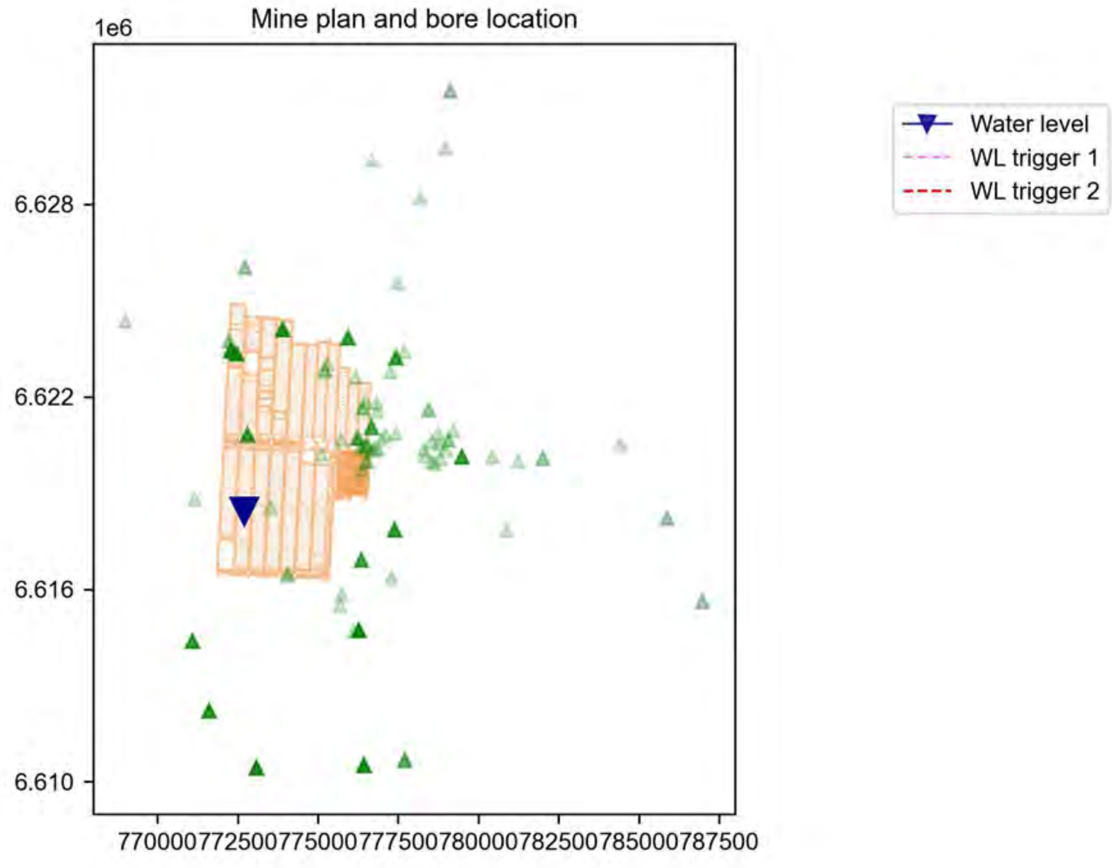




* mAHD - metres Australian Height Datum

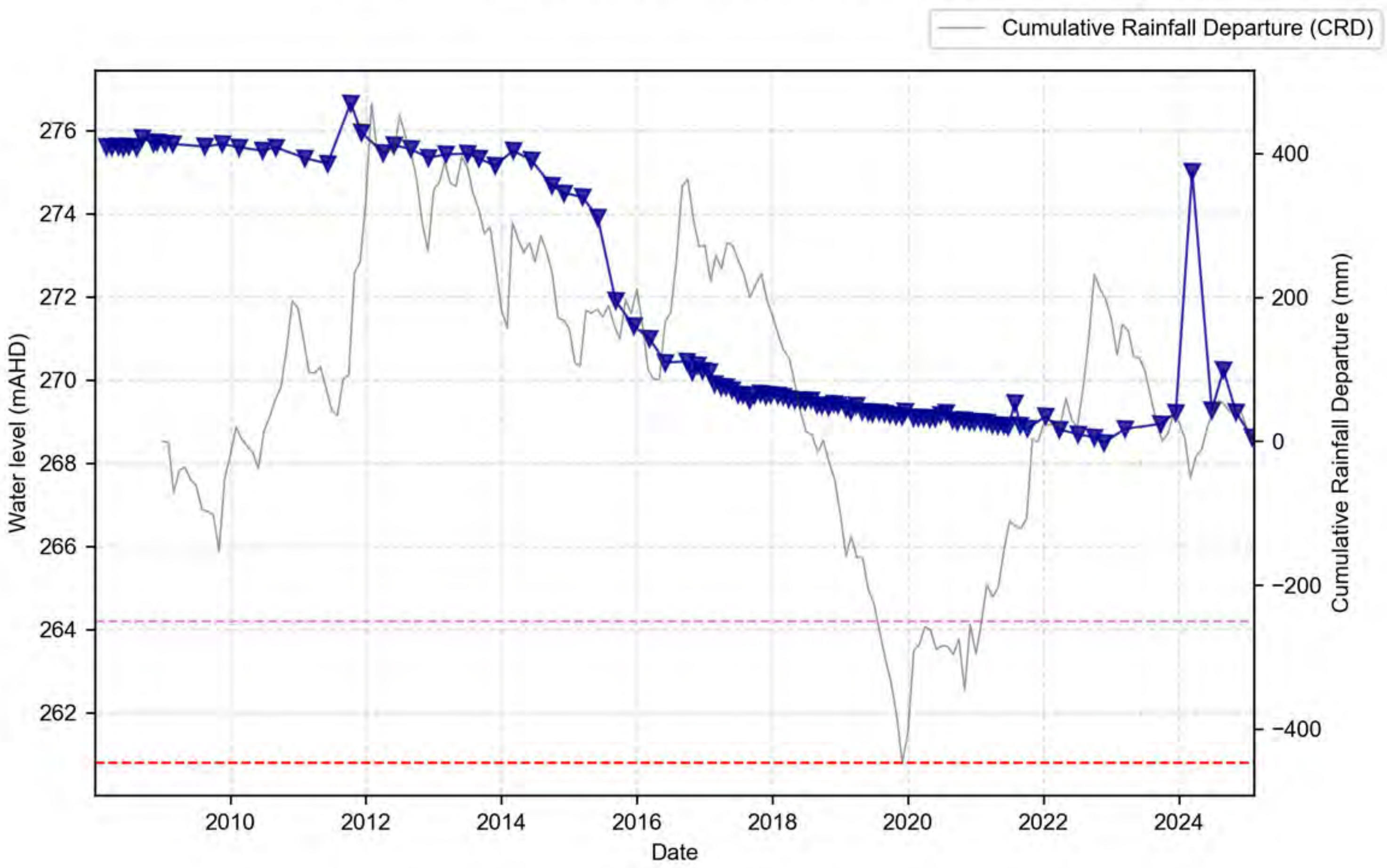
P8 (Purlawaugh Formation; Outcrop)

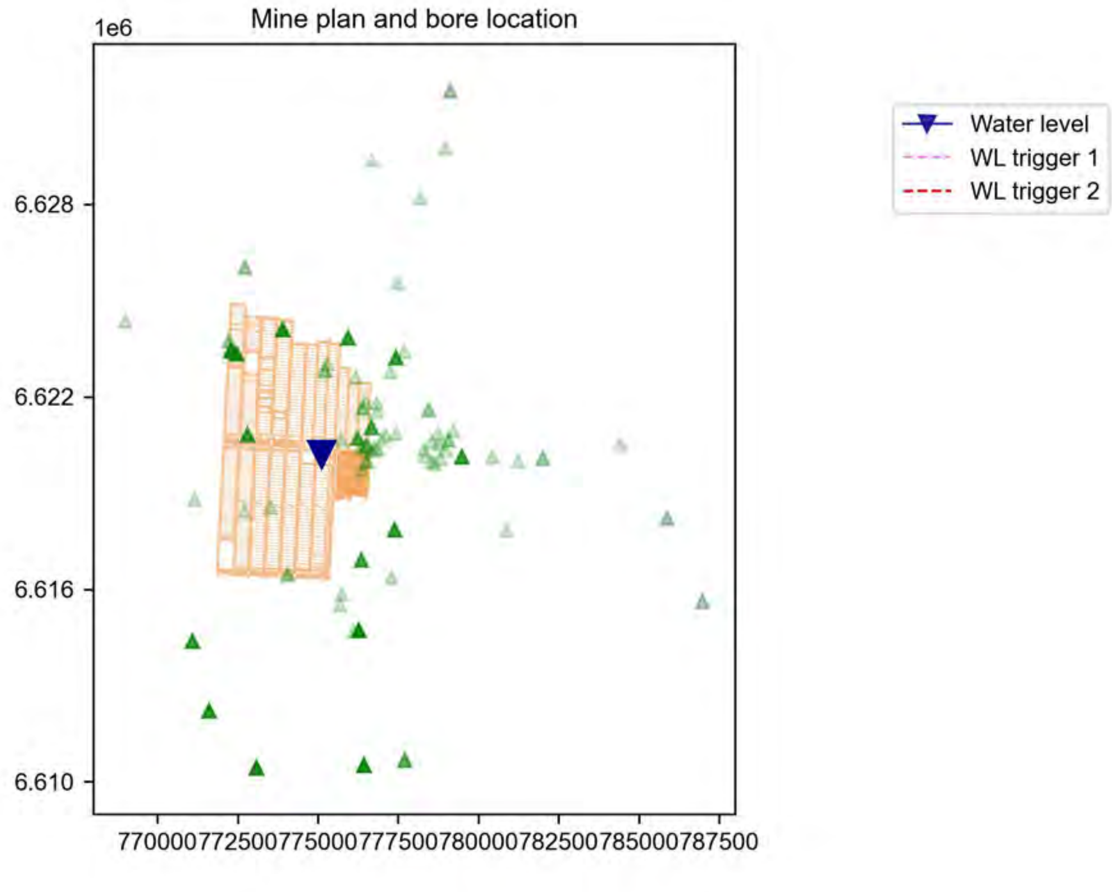




* mAHD - metres Australian Height Datum

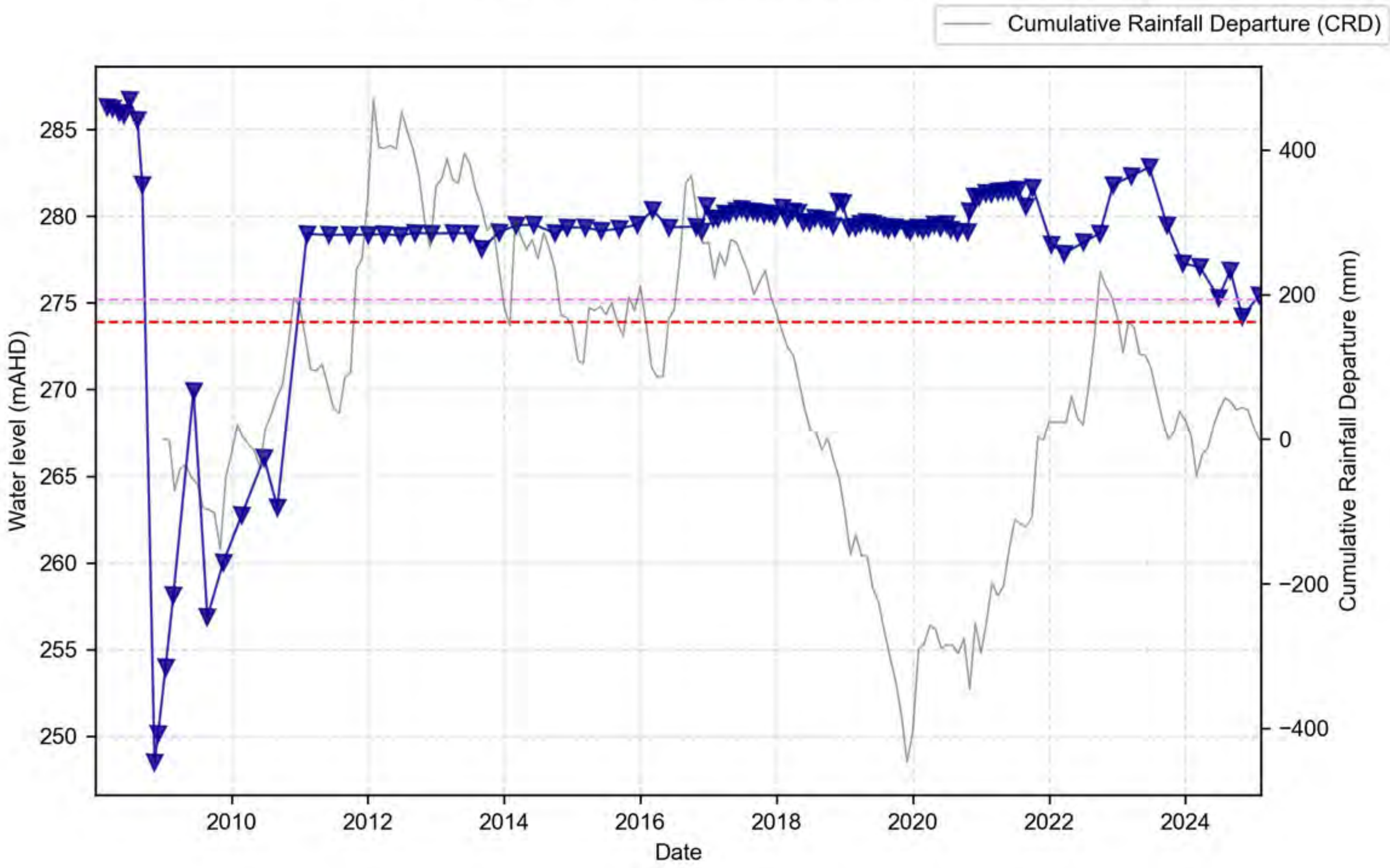
P9 (Purlawaugh Formation; Outcrop)

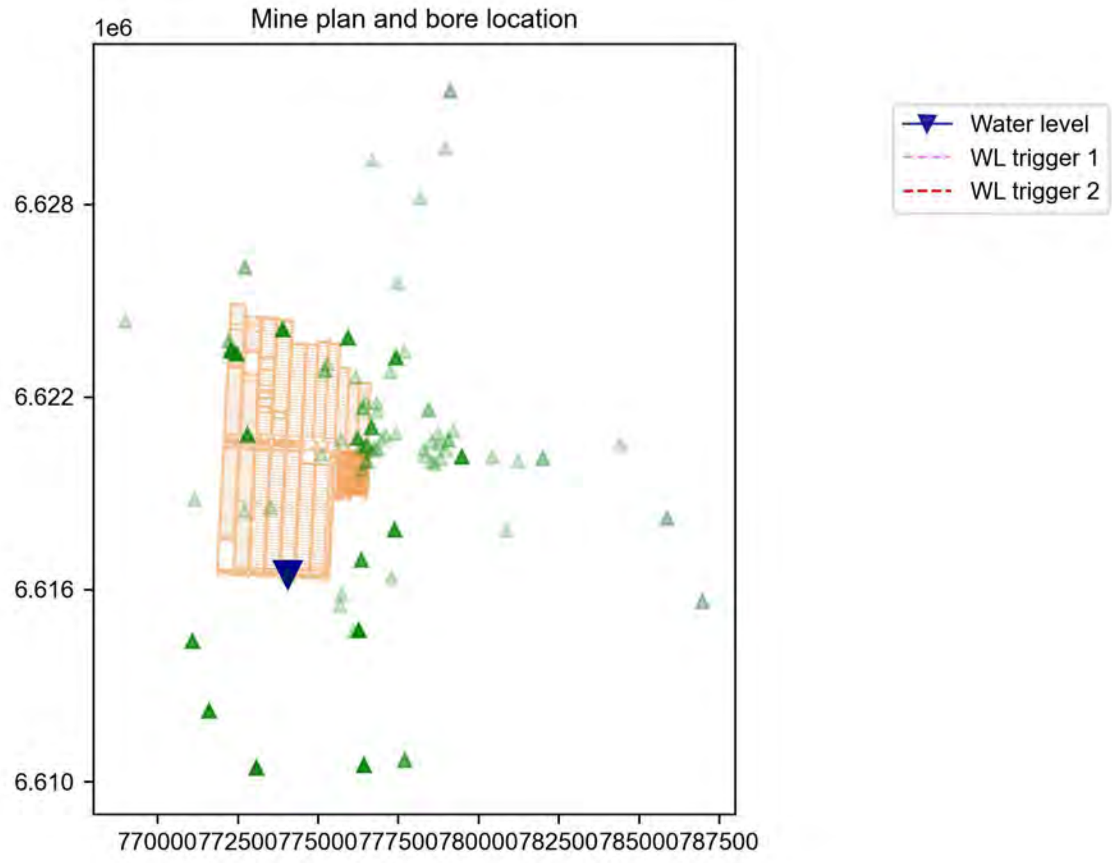




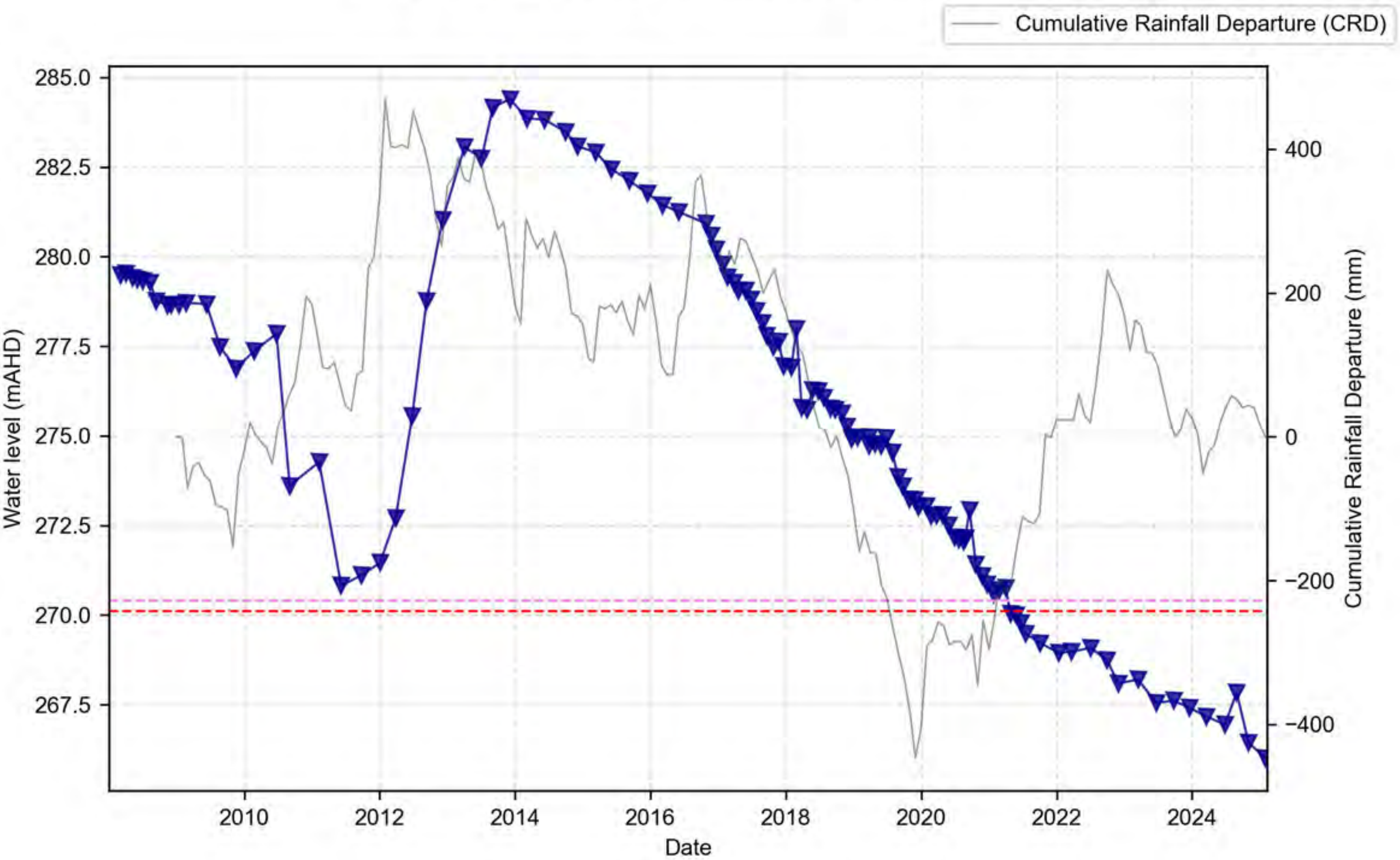
* mAHD - metres Australian Height Datum

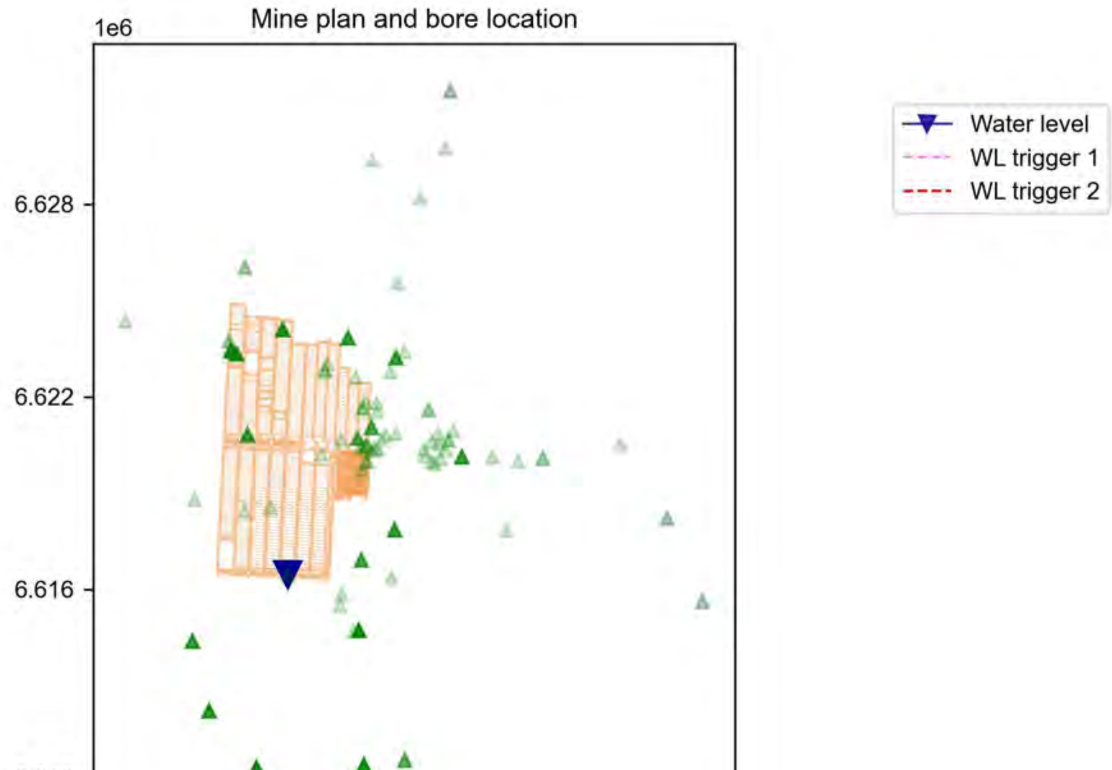
P10 (Napperby Formation; Subcrop)





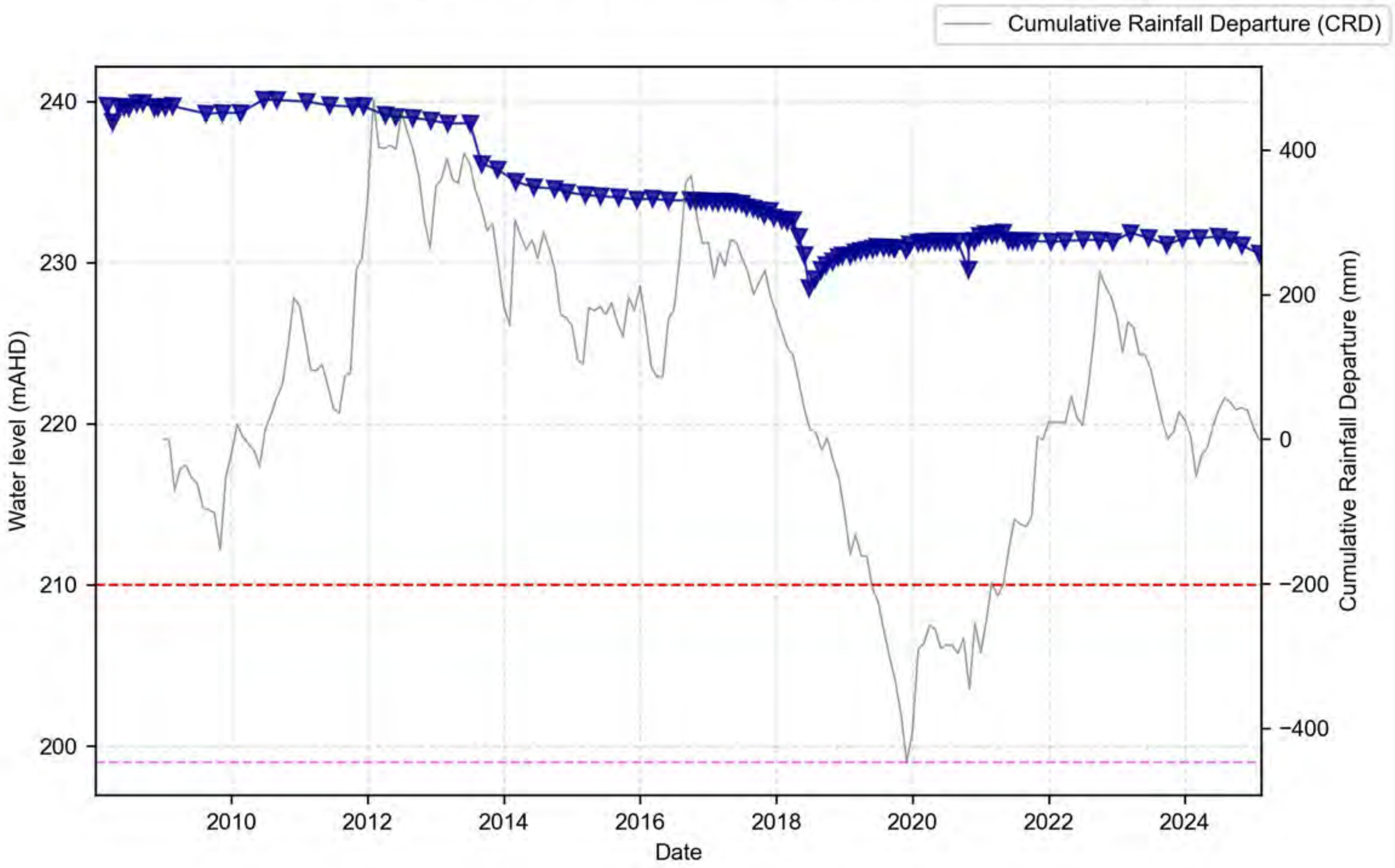
P11 (Purlawaugh Formation; Subcrop)

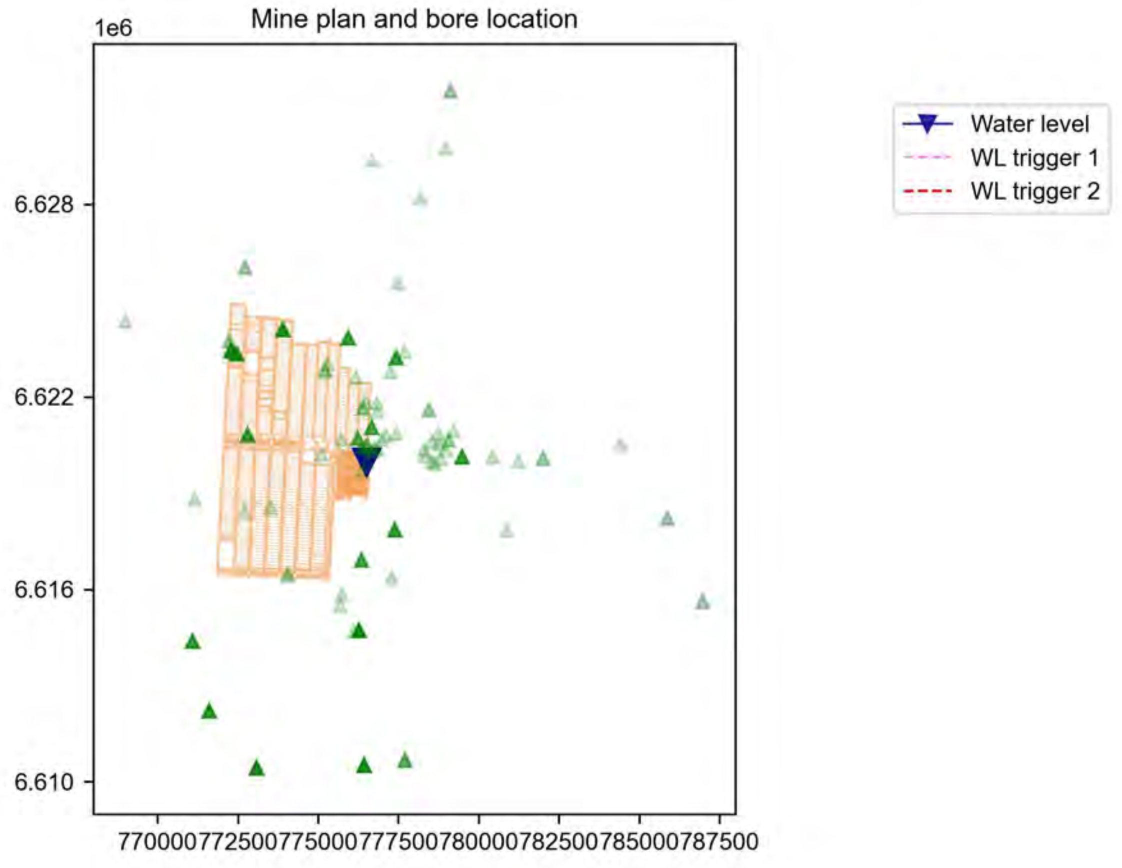




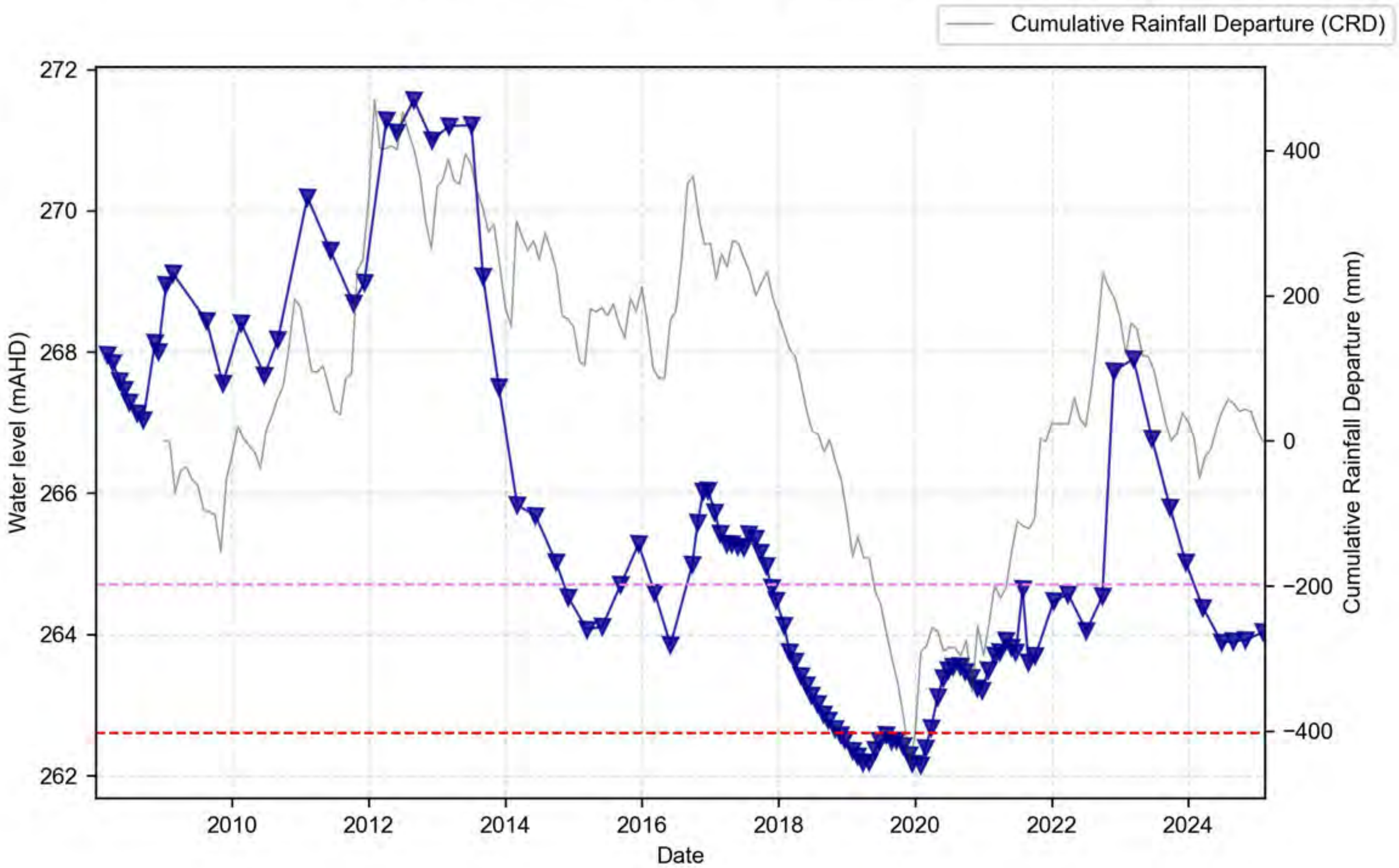
* mAHD - metres Australian Height Datum

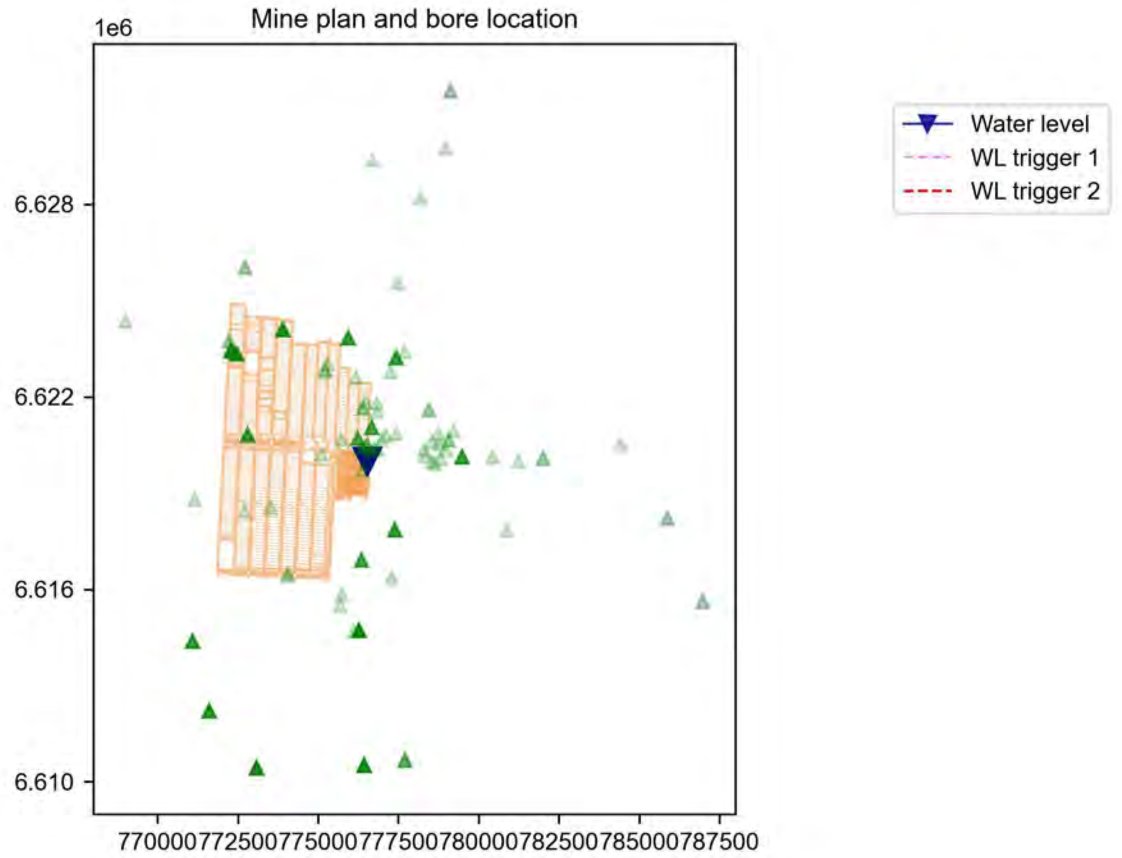
P12 (Napperby Formation; Subcrop)





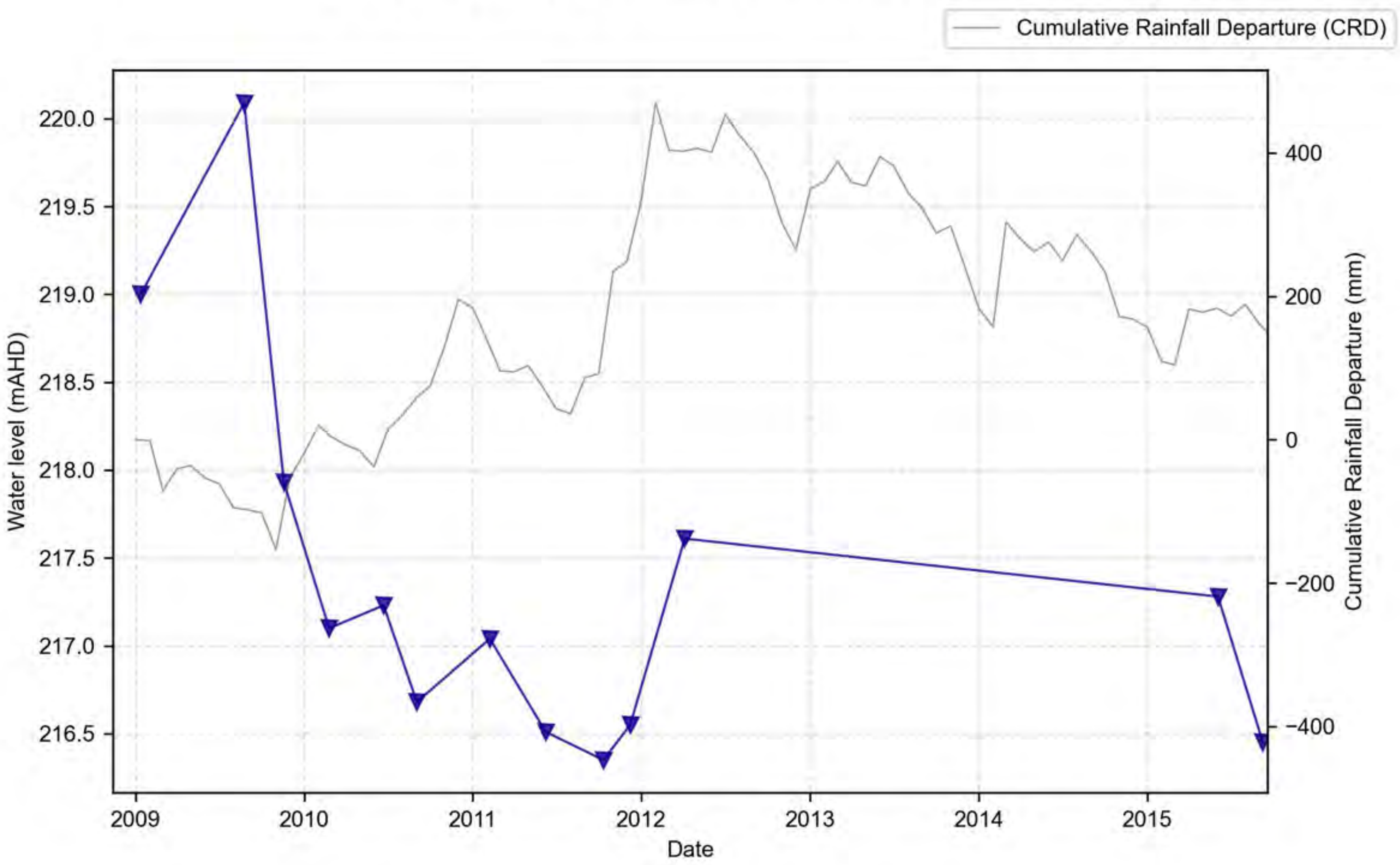
P13 (Garrawilla Volcanics; Subcrop)

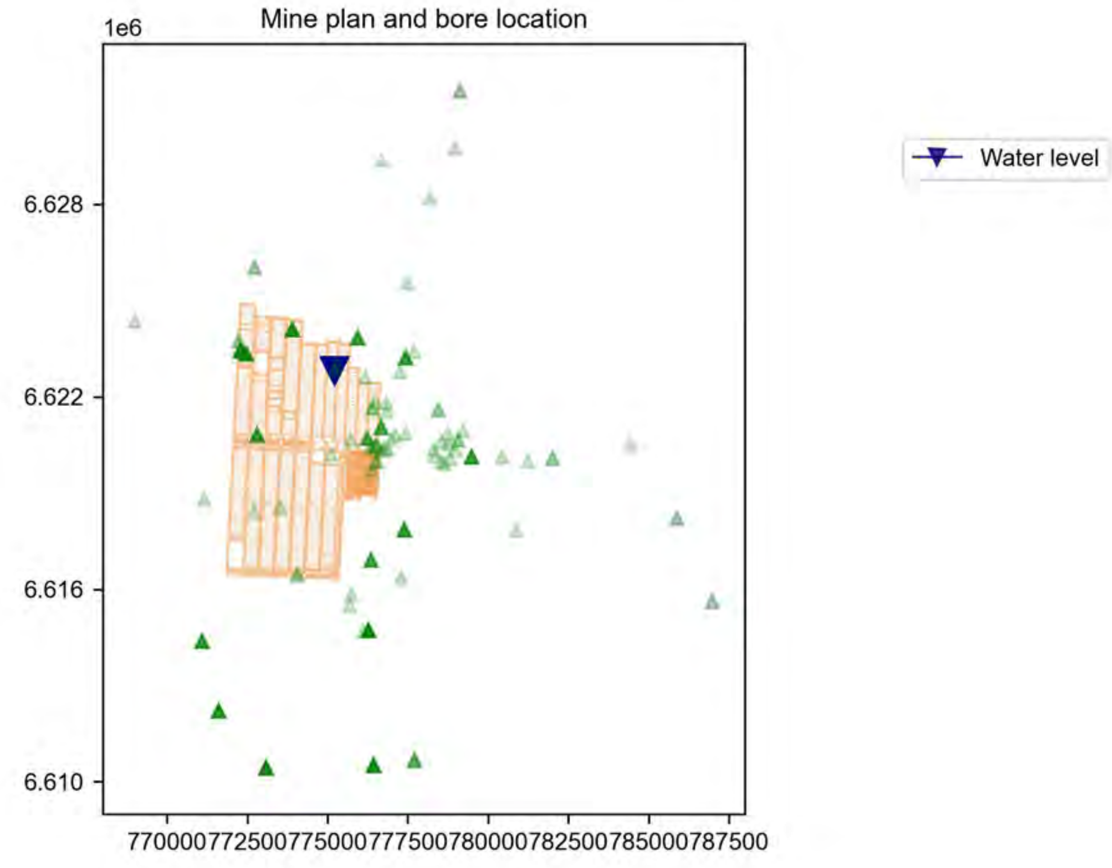




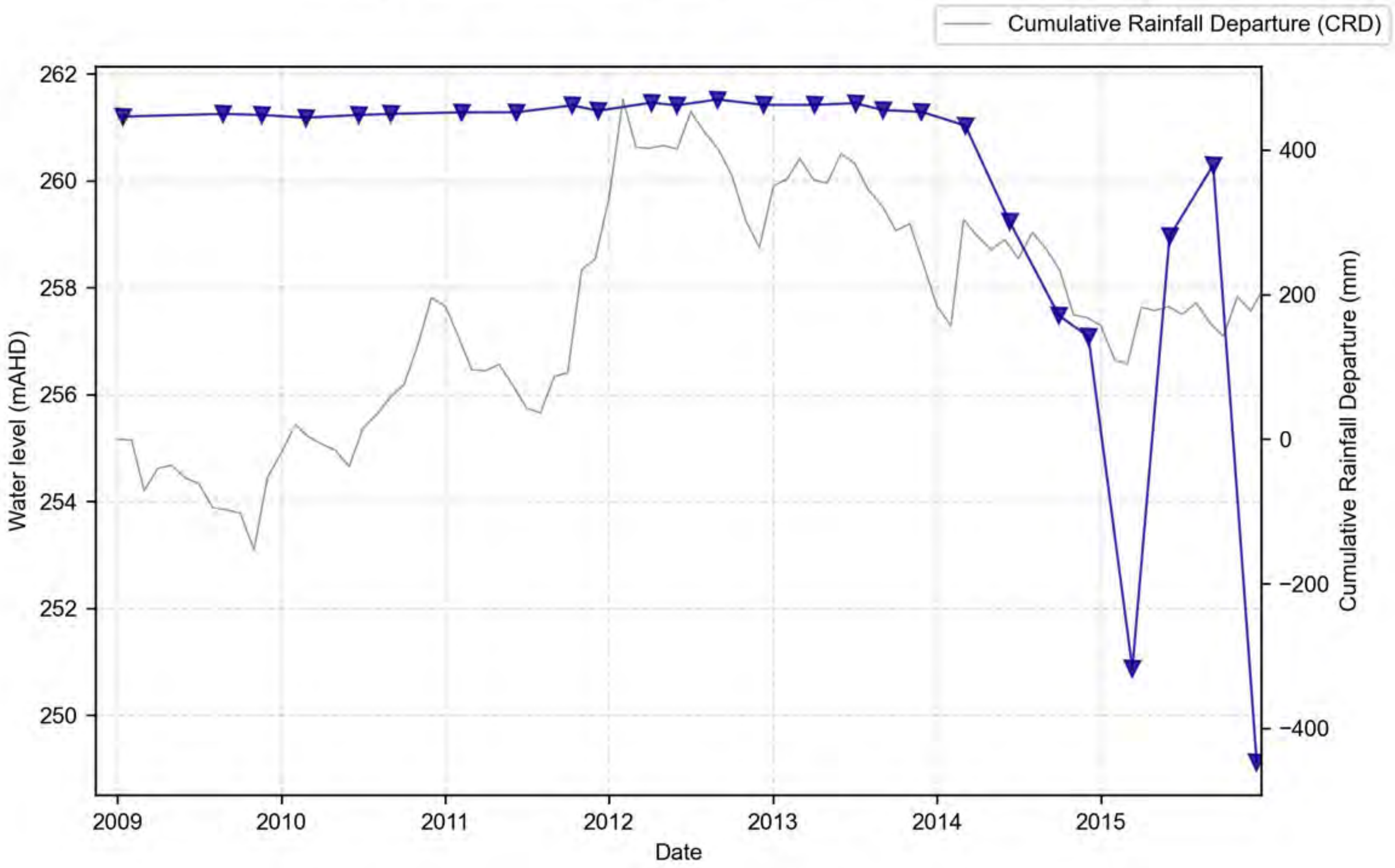
* mAHD - metres Australian Height Datum

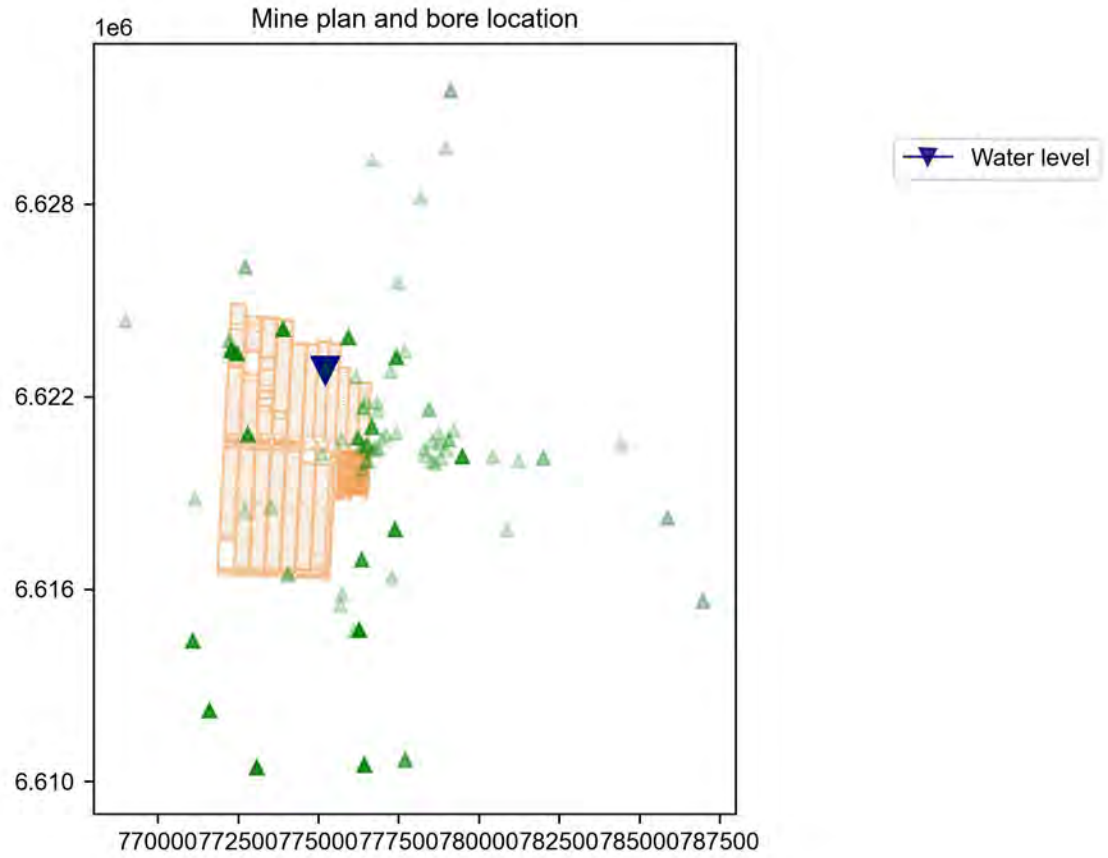
P14 (Napperby Formation - old; Subcrop)



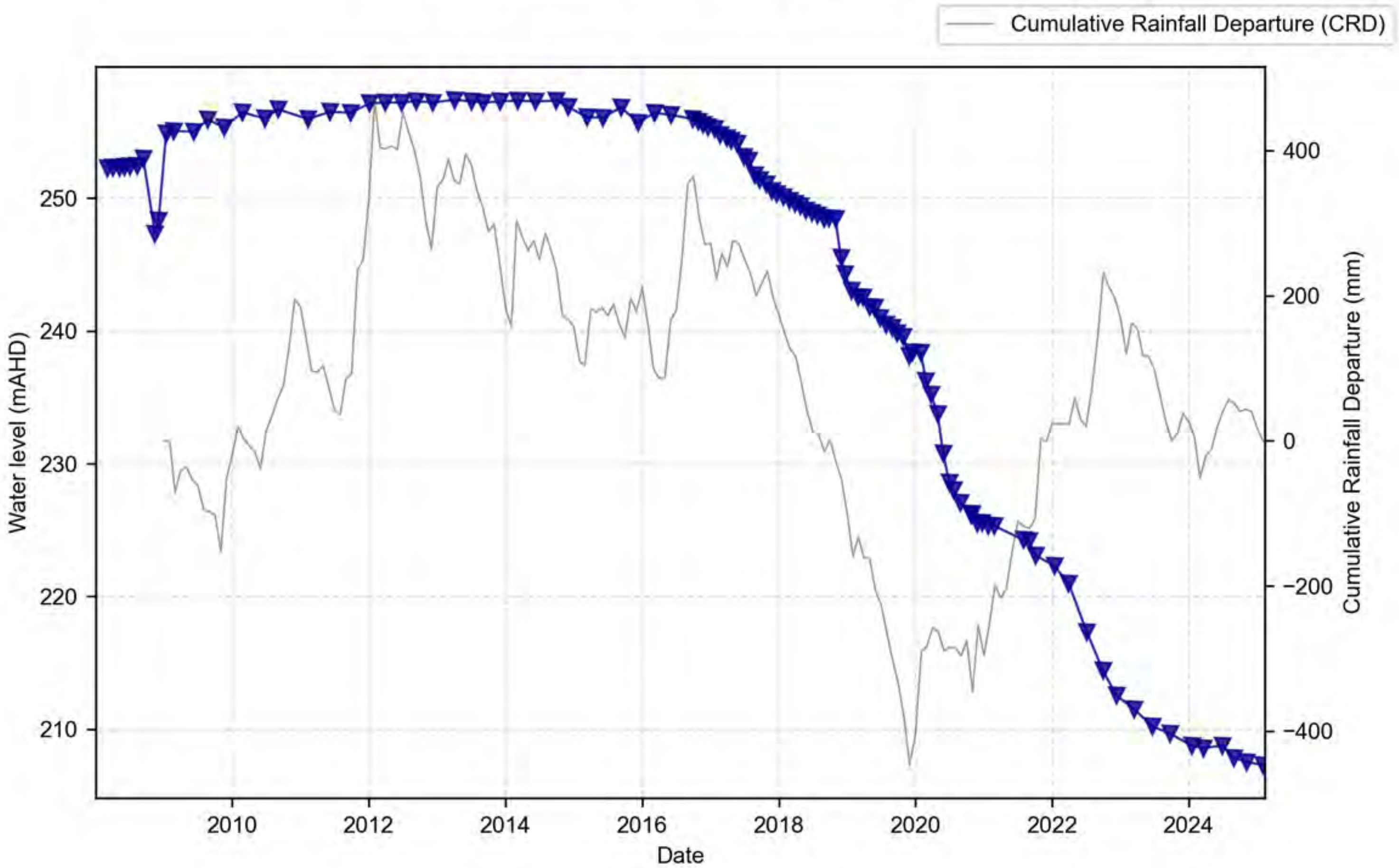


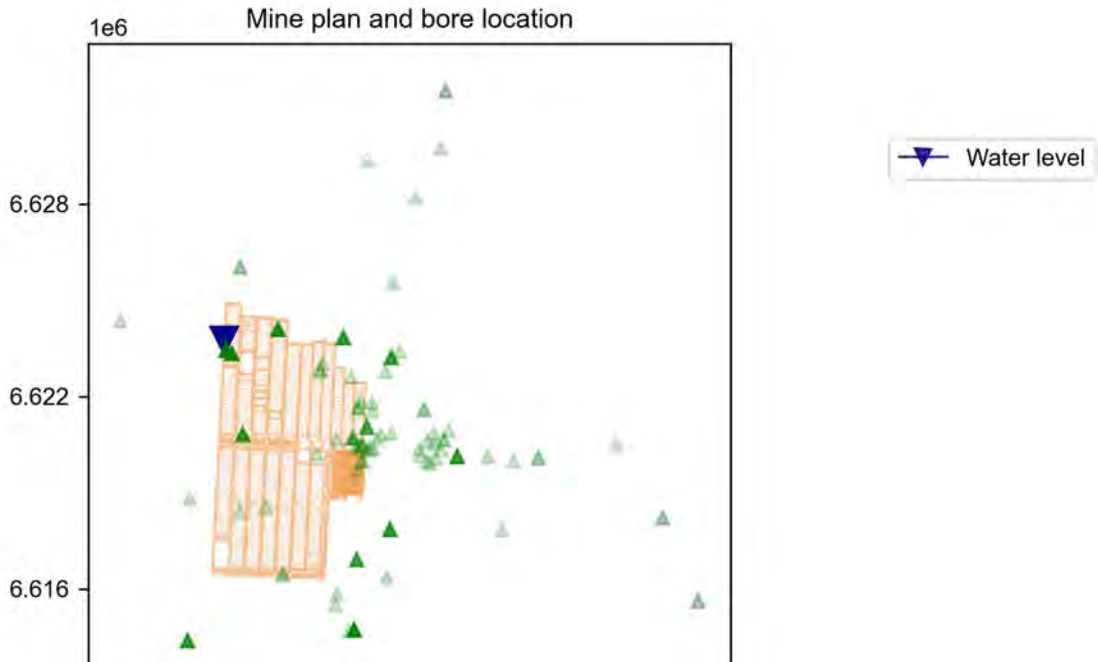
P15 (Garrawilla Volcanics - old; Subcrop)





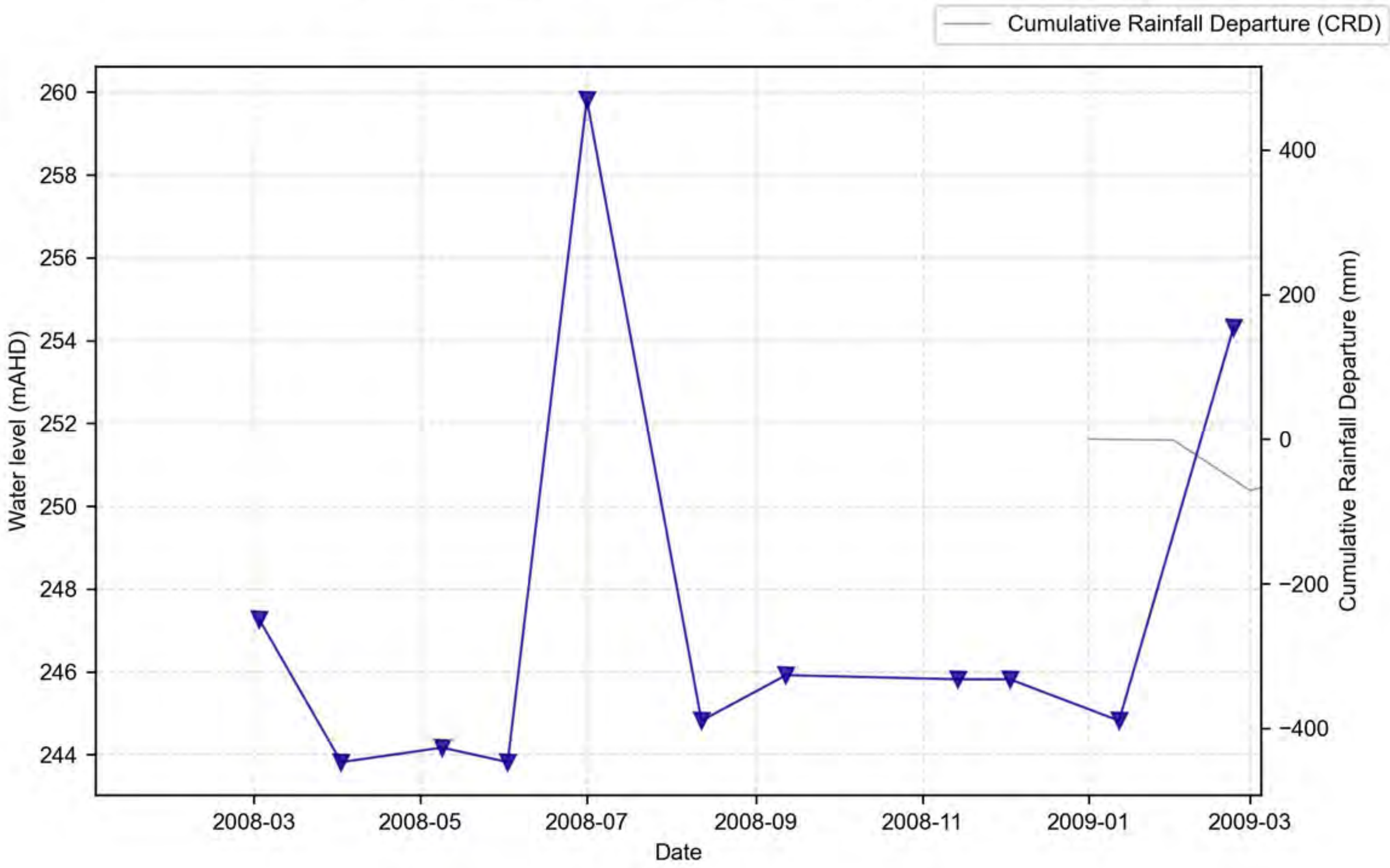
P16 (Garrawilla Volcanics; Subcrop)

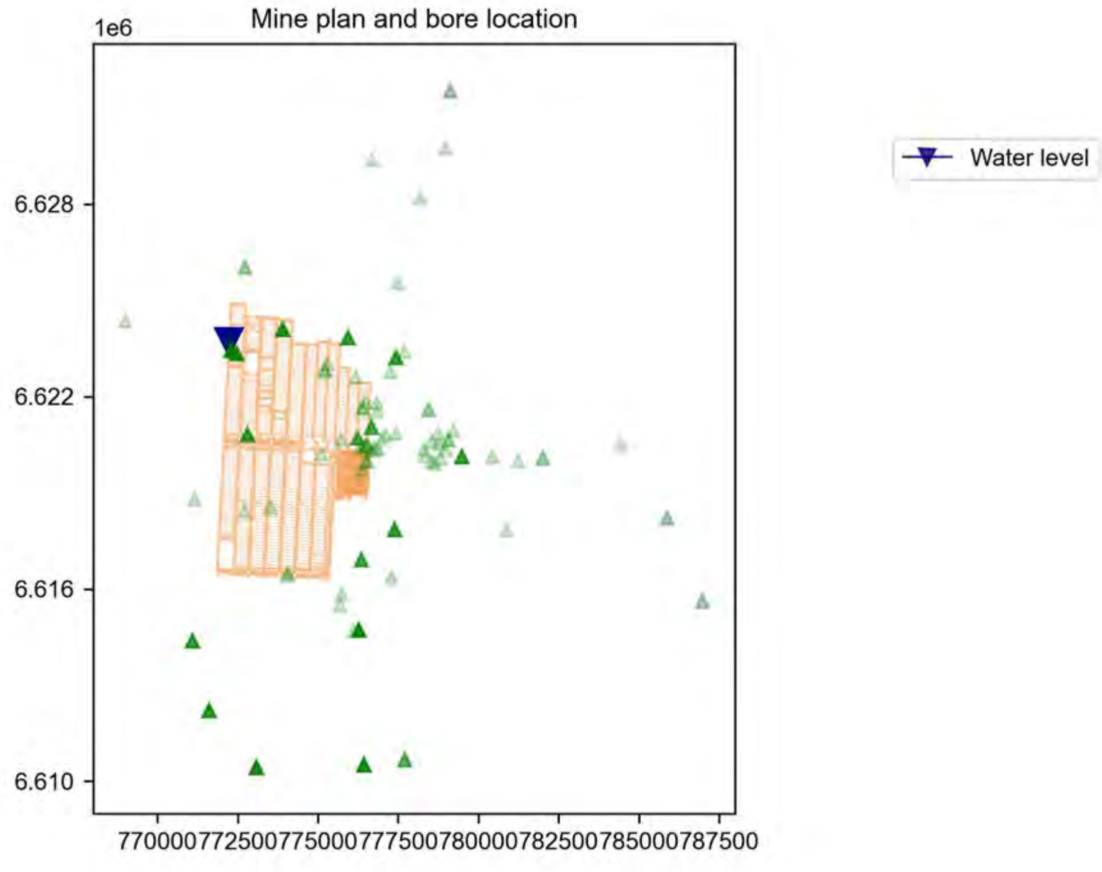


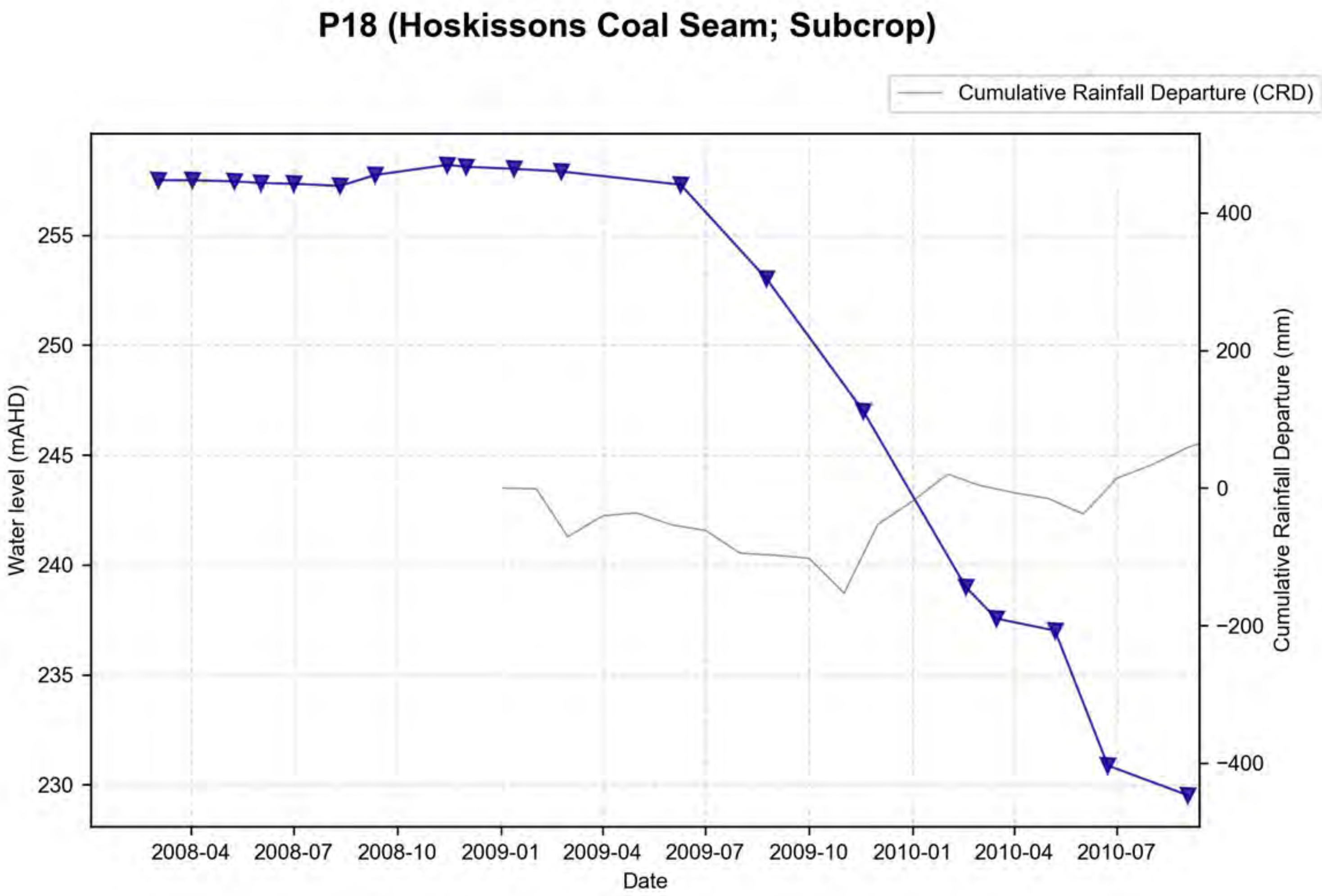


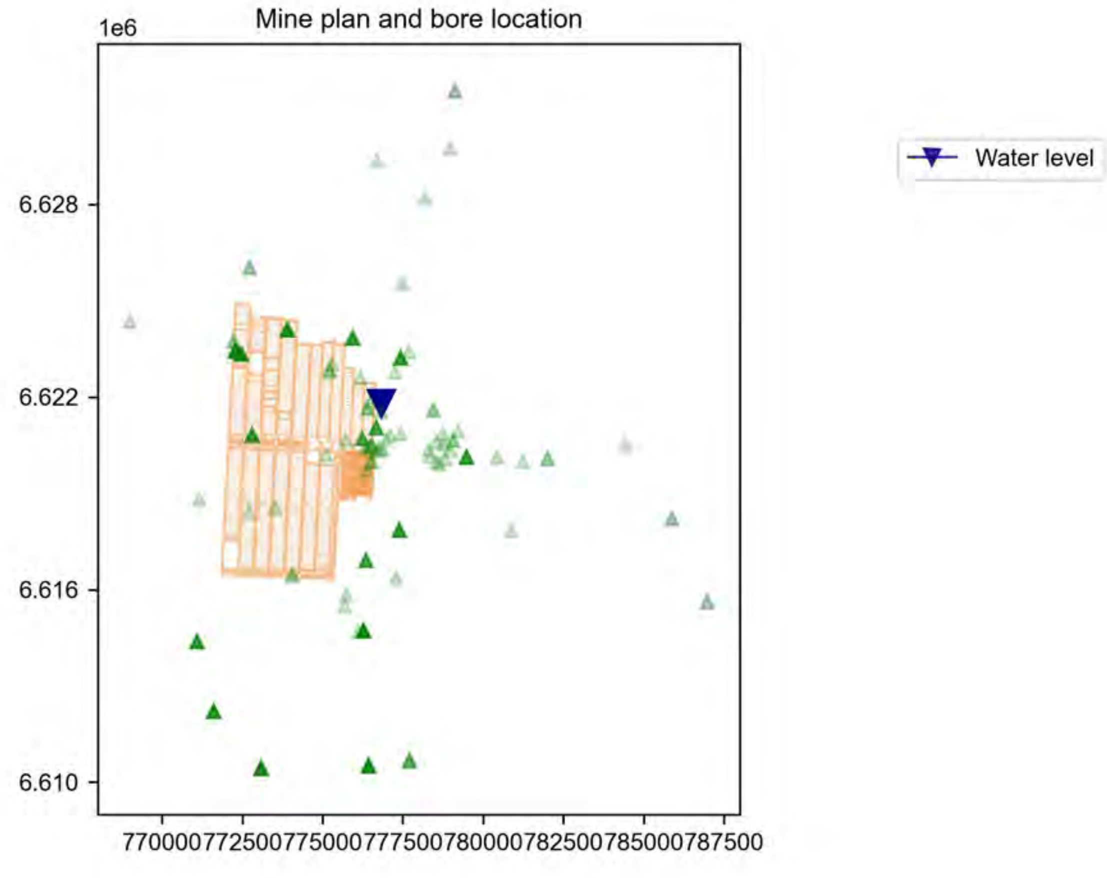
* mAHD - metres Australian Height Datum

P17 (Purlawaugh Formation - old; Subcrop)

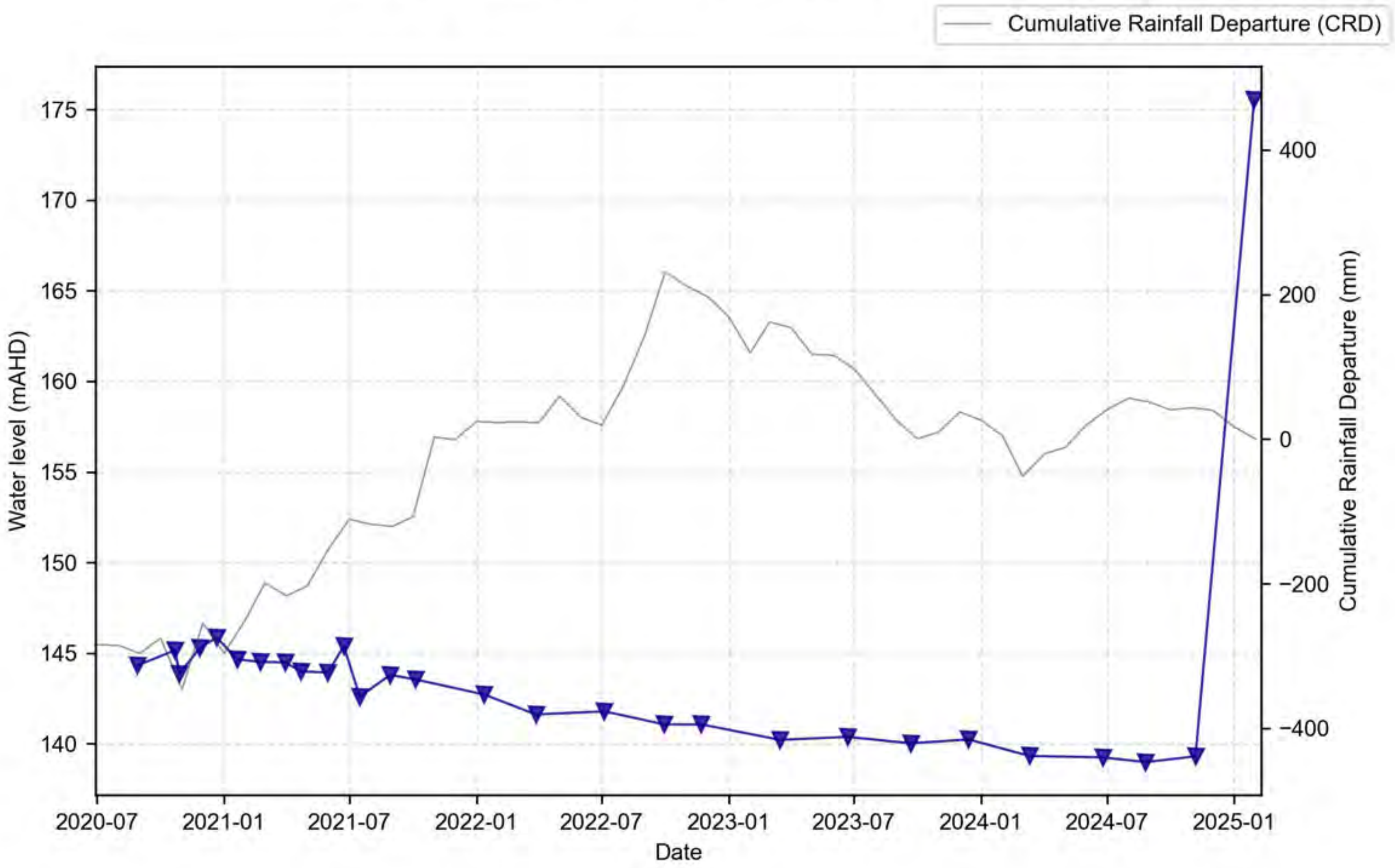


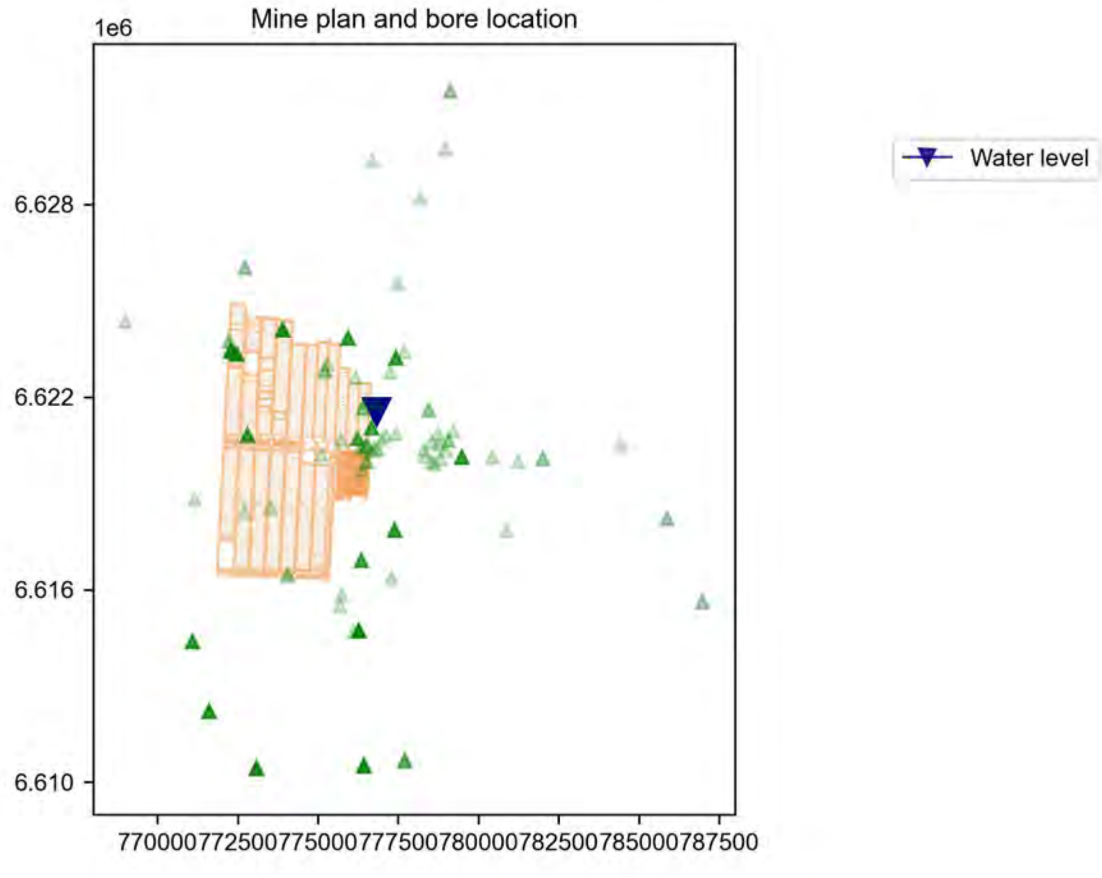



P18 (Hoskissons Coal Seam; Subcrop)
Cumulative Rainfall Departure (CRD)
Water level (mAHD)
Cumulative Rainfall Departure (mm)
Date
255
250
245
240
235
230
400
200
0
−200
−400
2008-04
2008-07
2008-10
2009-01
2009-04
2009-07
2009-10
2010-01
2010-04
2010-07

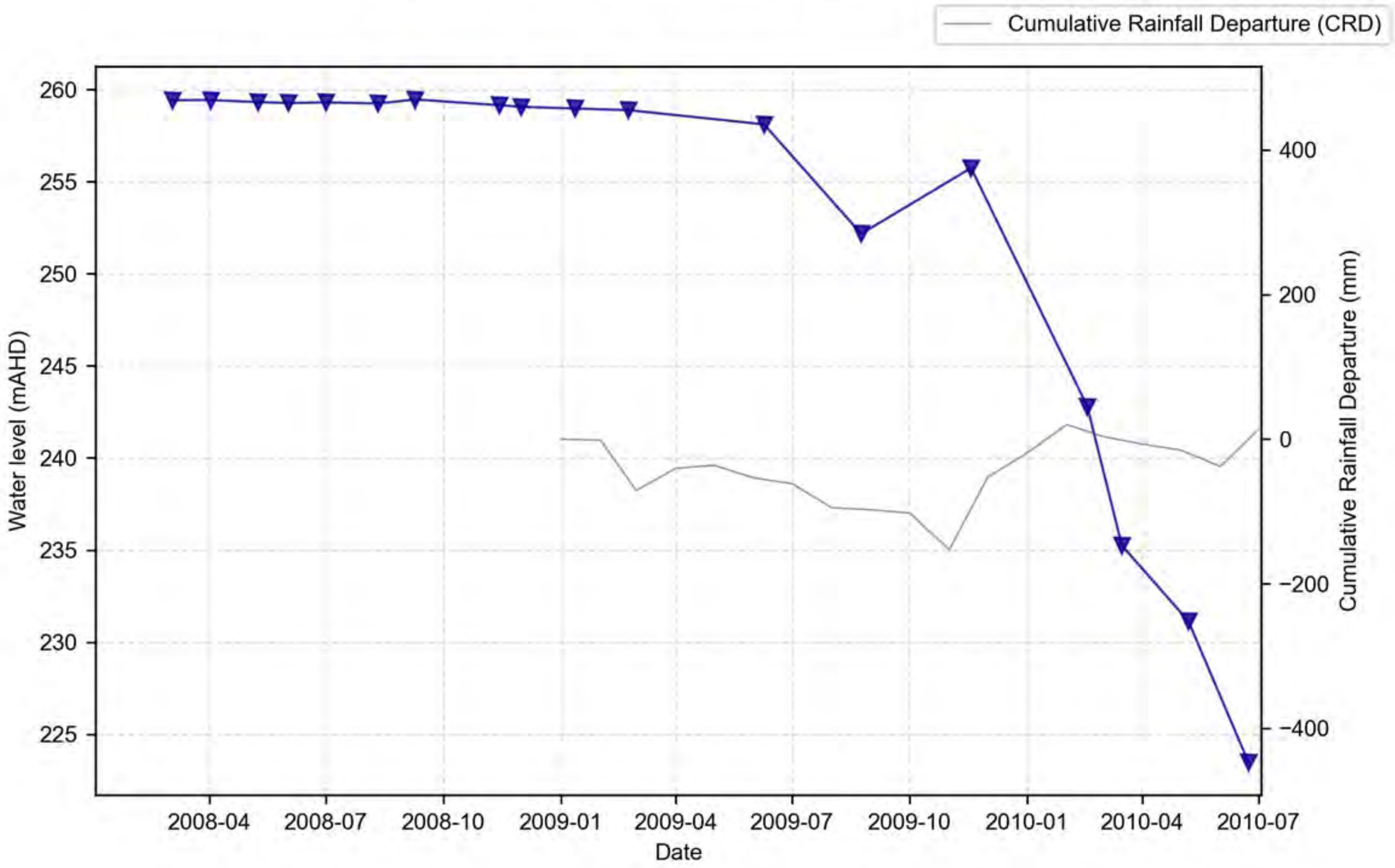

Mine plan and bore location
1e6
6.628
6.622
6.616
6.610
770000772500775000777500780000782500785000787500
Water level

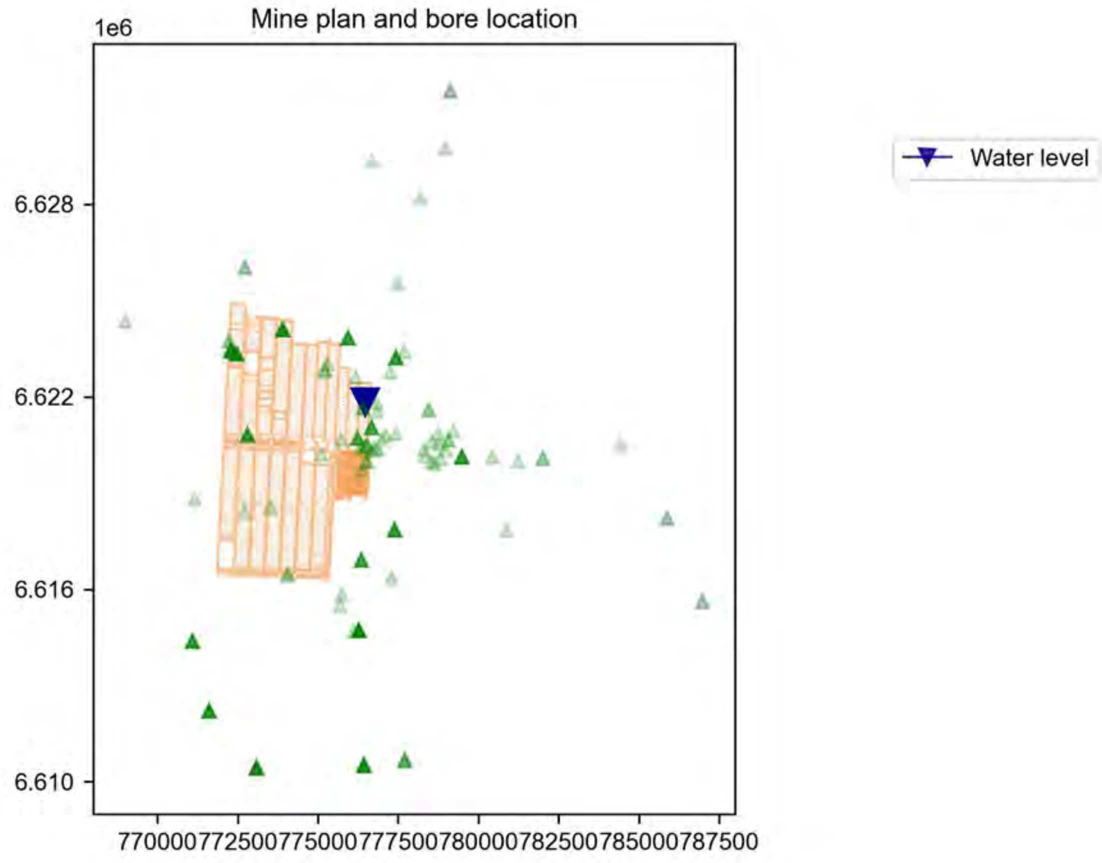
P19 (Pamboola Formation; Subcrop)



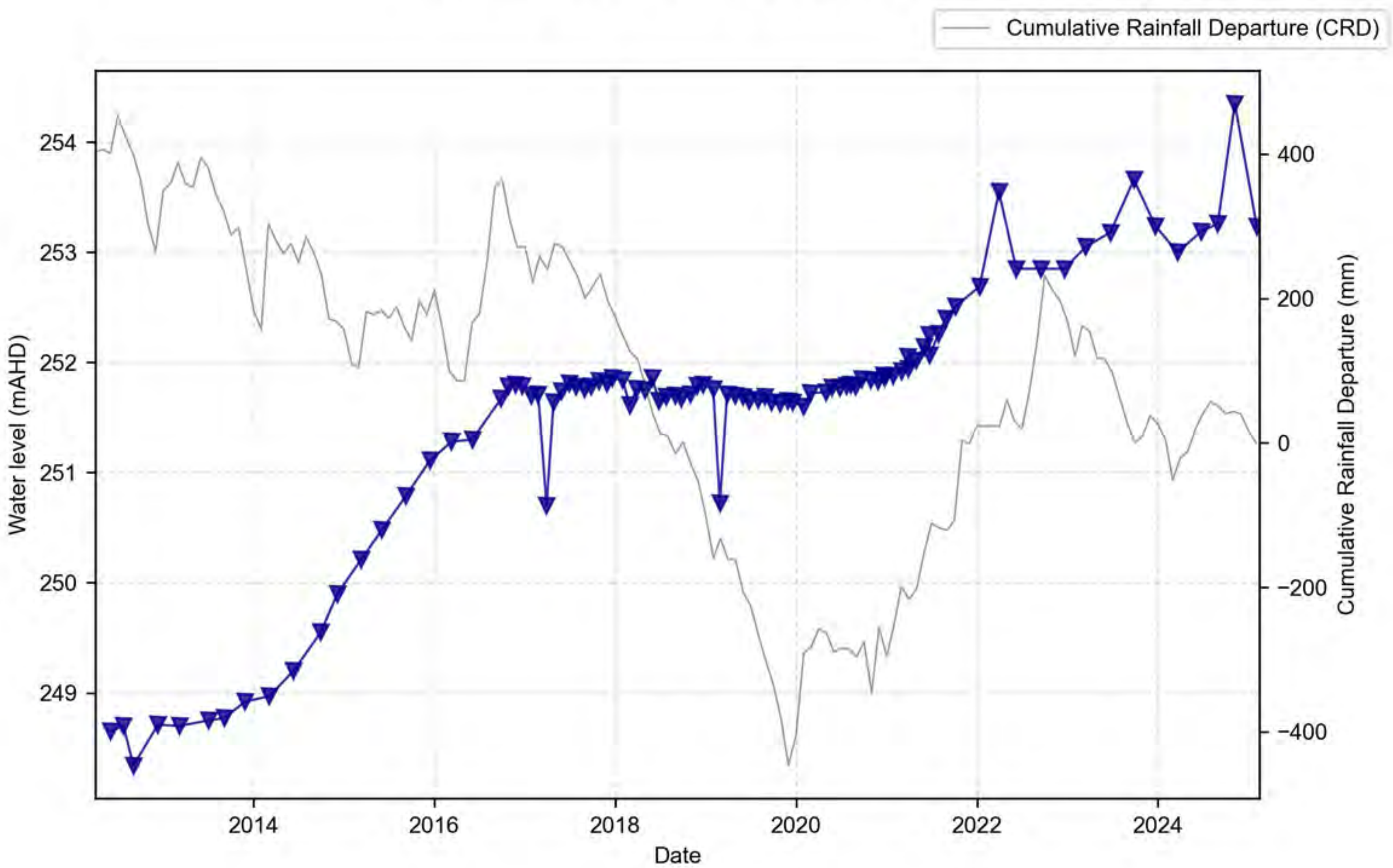


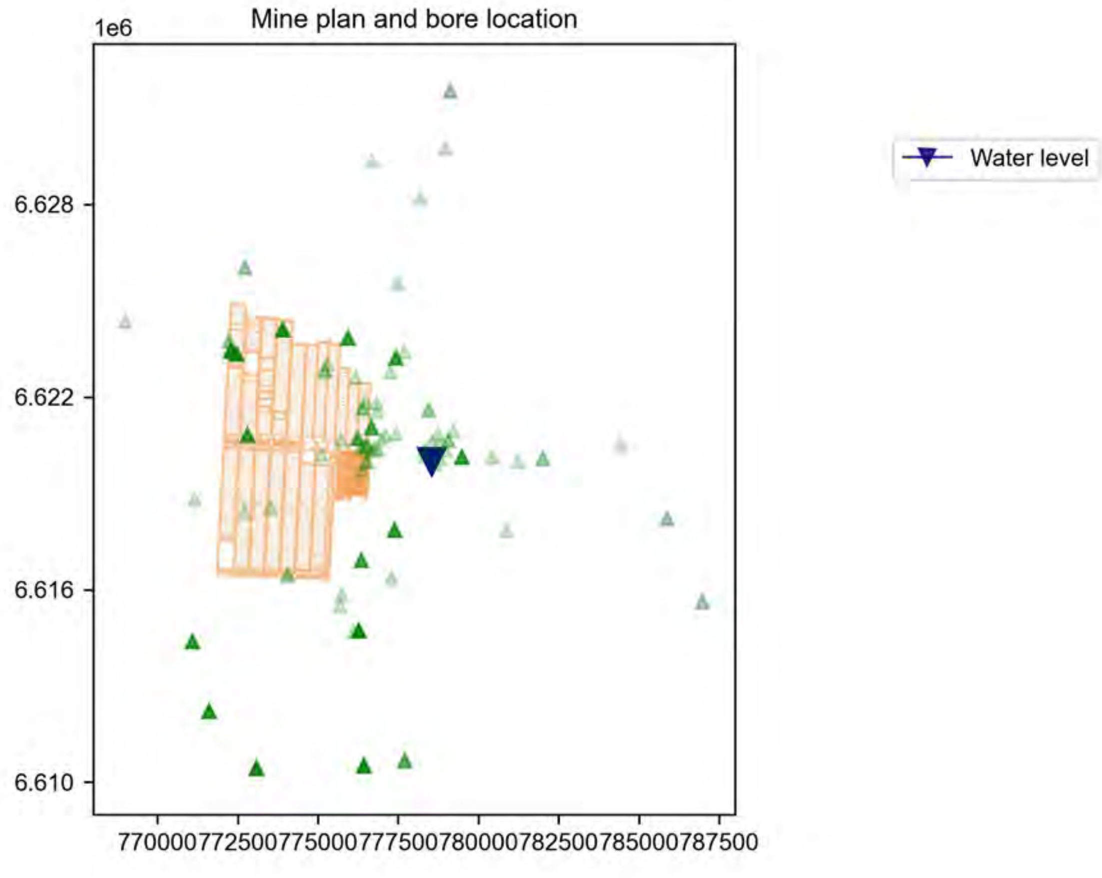
P20 (Arkarula Formation; Outcrop)





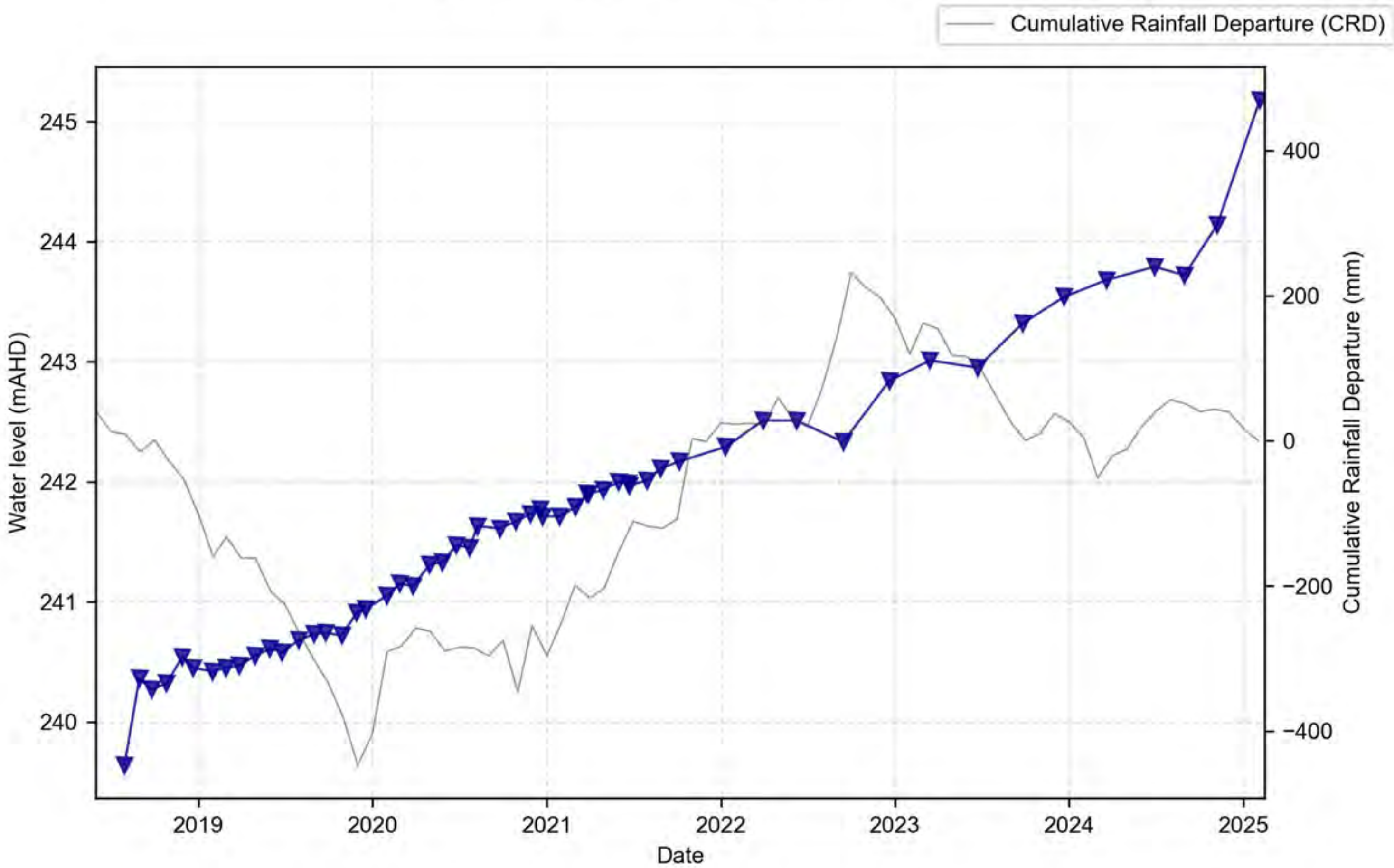
P29 (Rail Loop Dams; Outcrop)

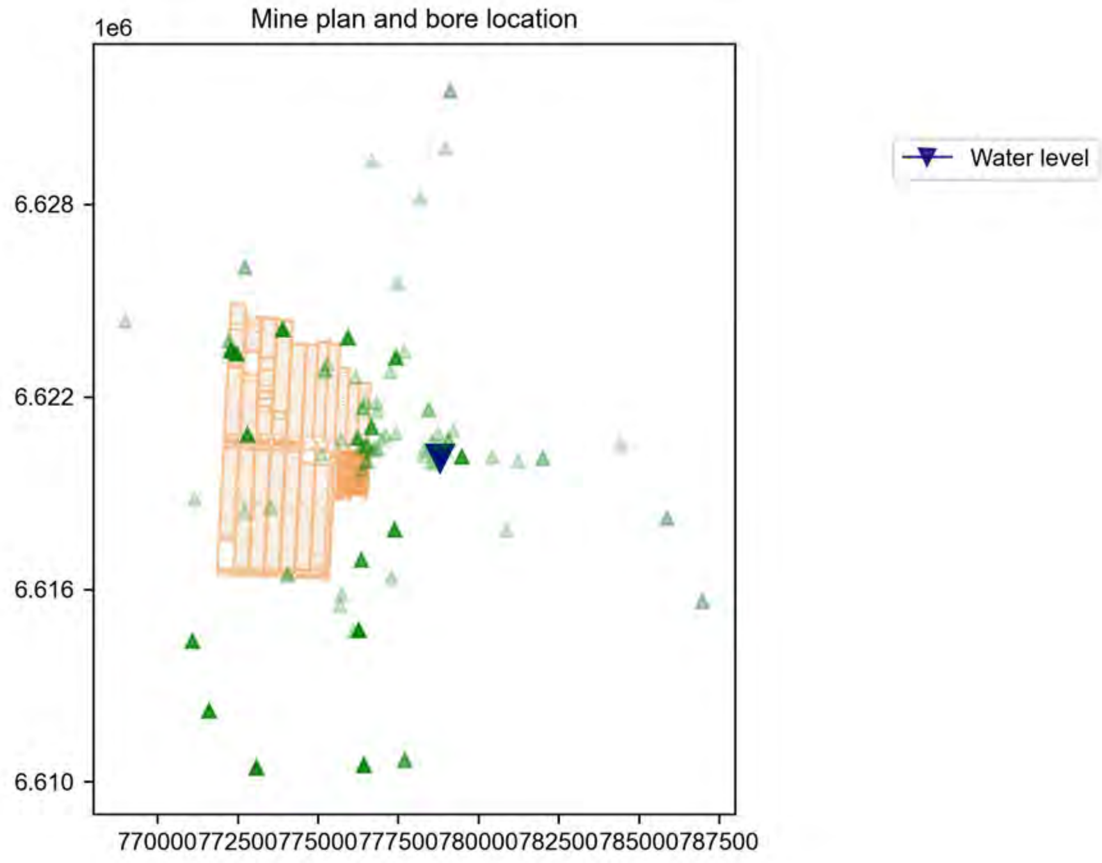




* mAHD - metres Australian Height Datum

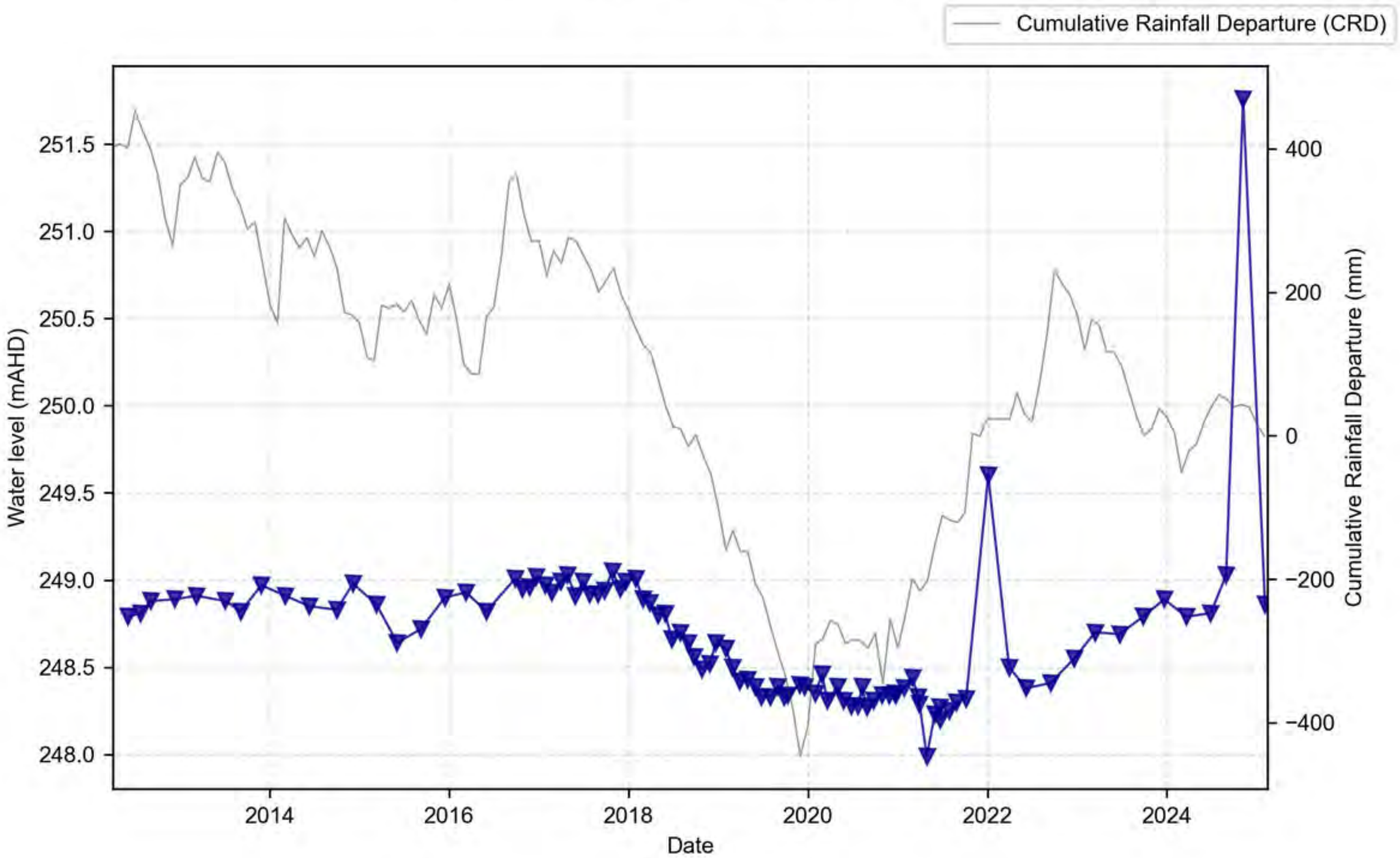
P30 (Rail Loop Dams; Outcrop)

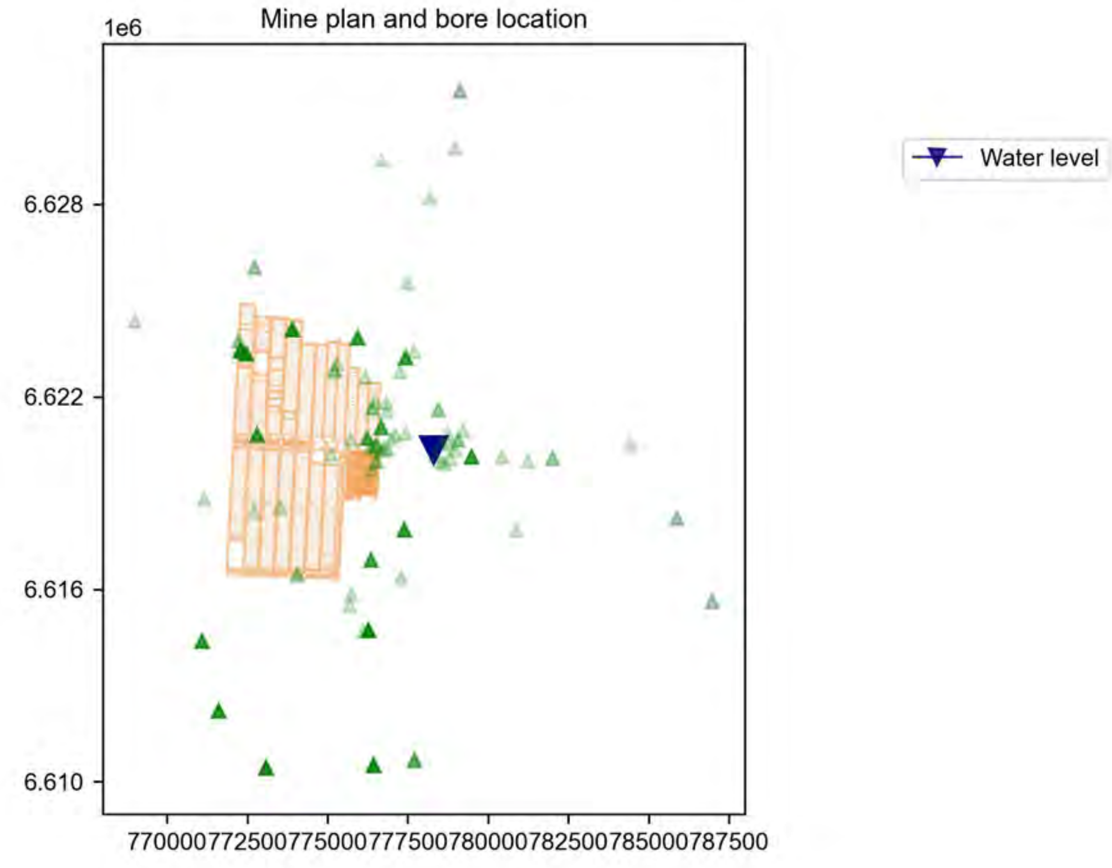




* mAHD - metres Australian Height Datum

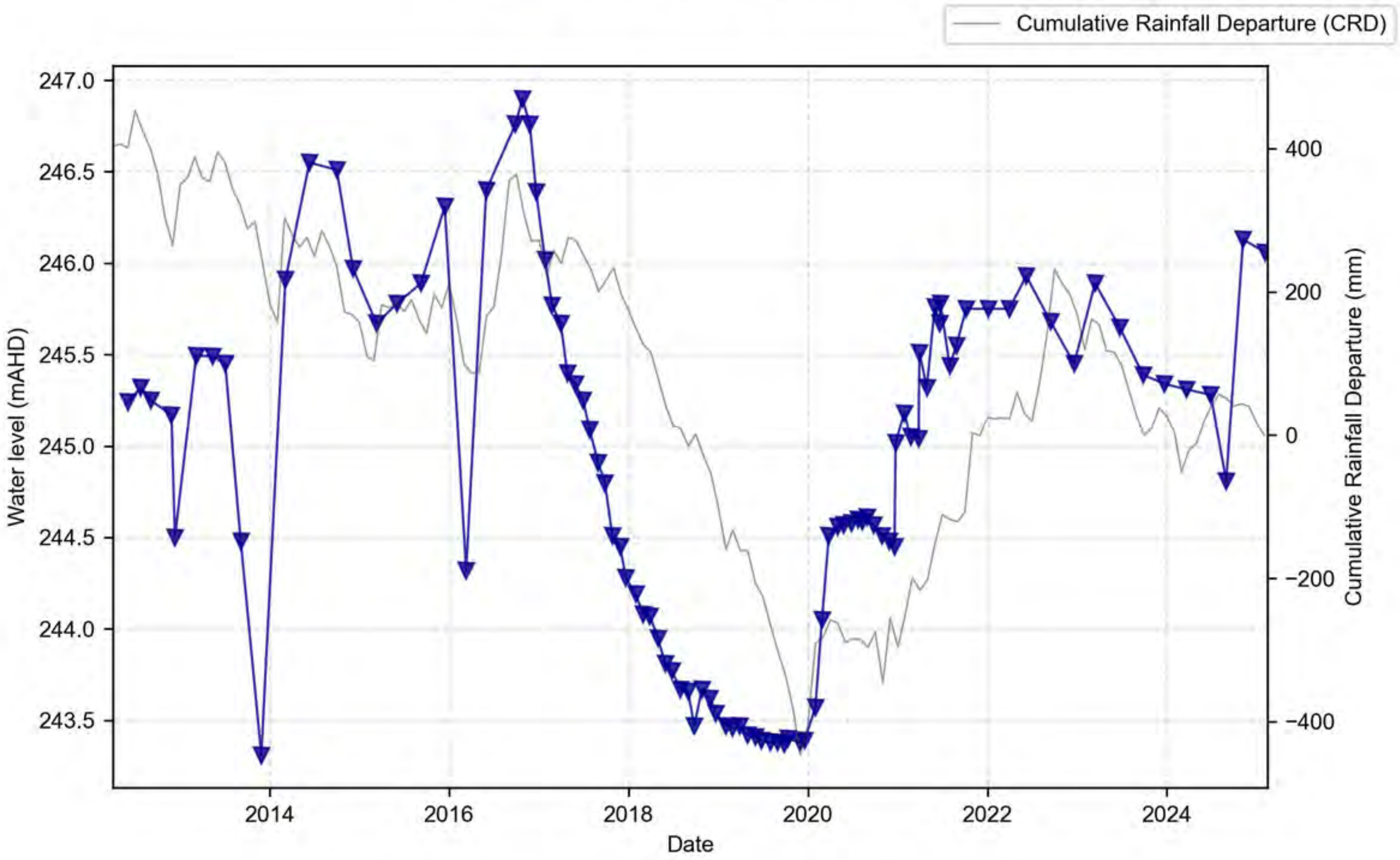
P31 (Rail Loop Dams; Outcrop)

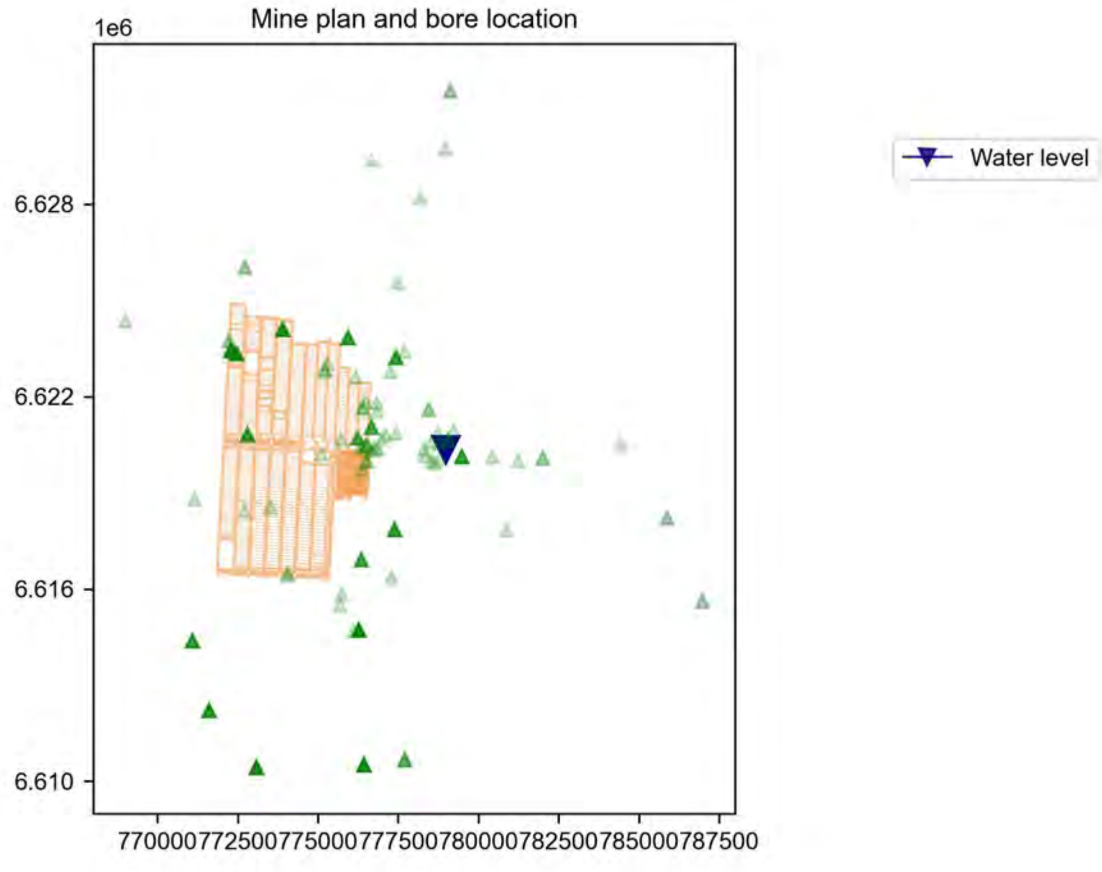




* mAHD - metres Australian Height Datum

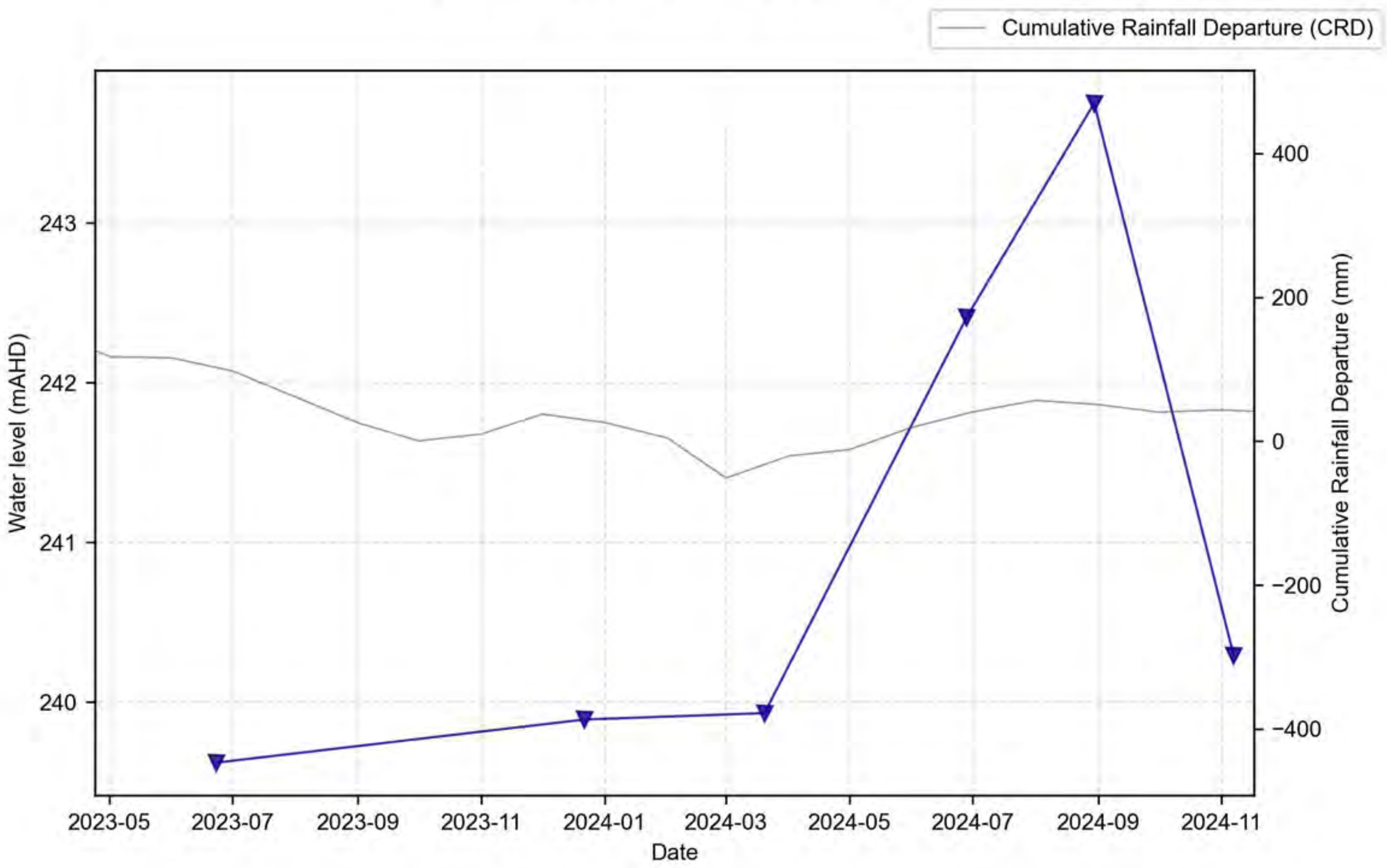
P32 (Rail Loop Dams; Outcrop)

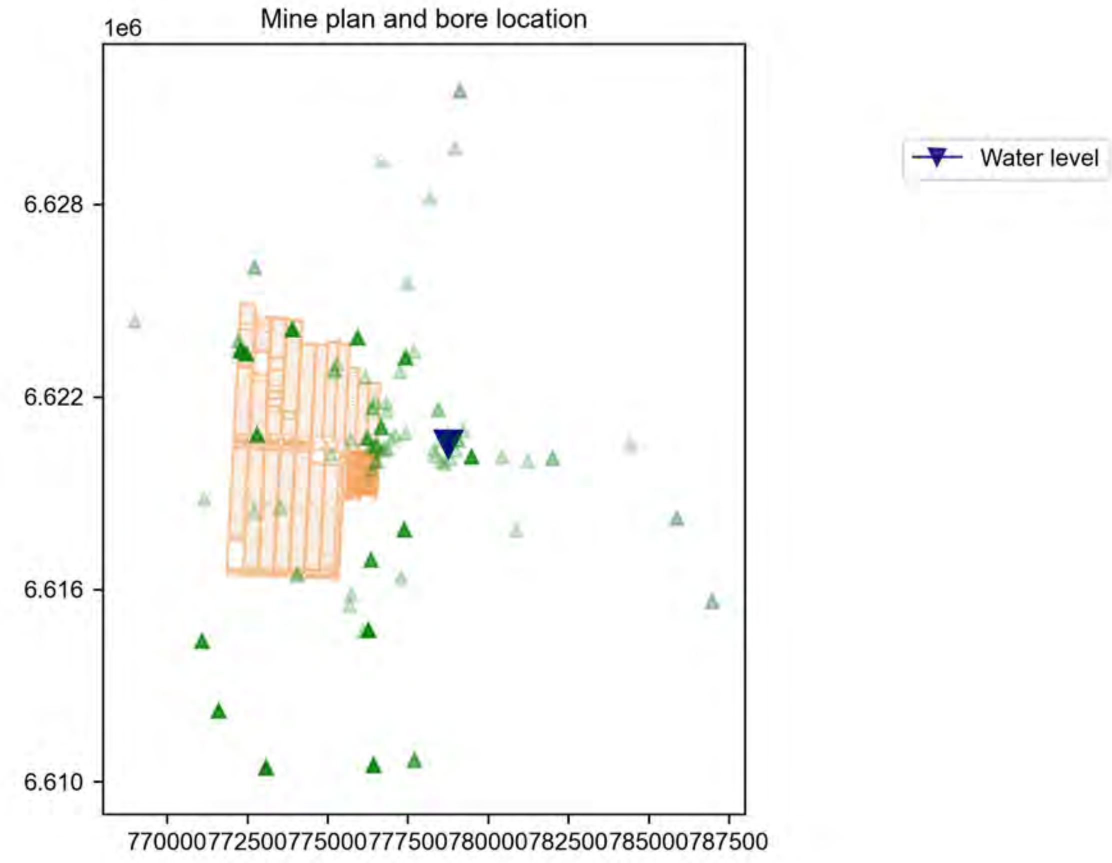




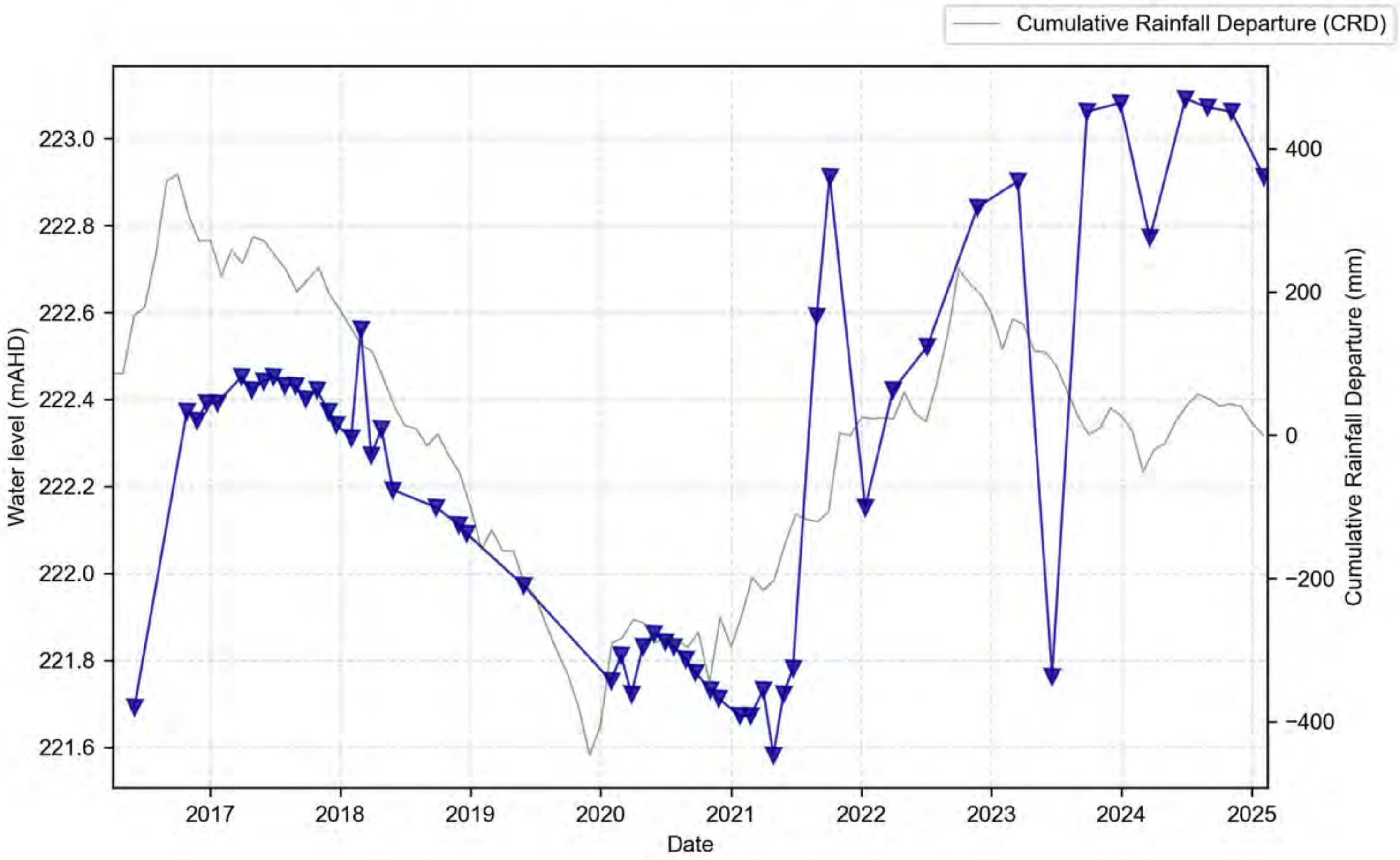
* mAHD - metres Australian Height Datum

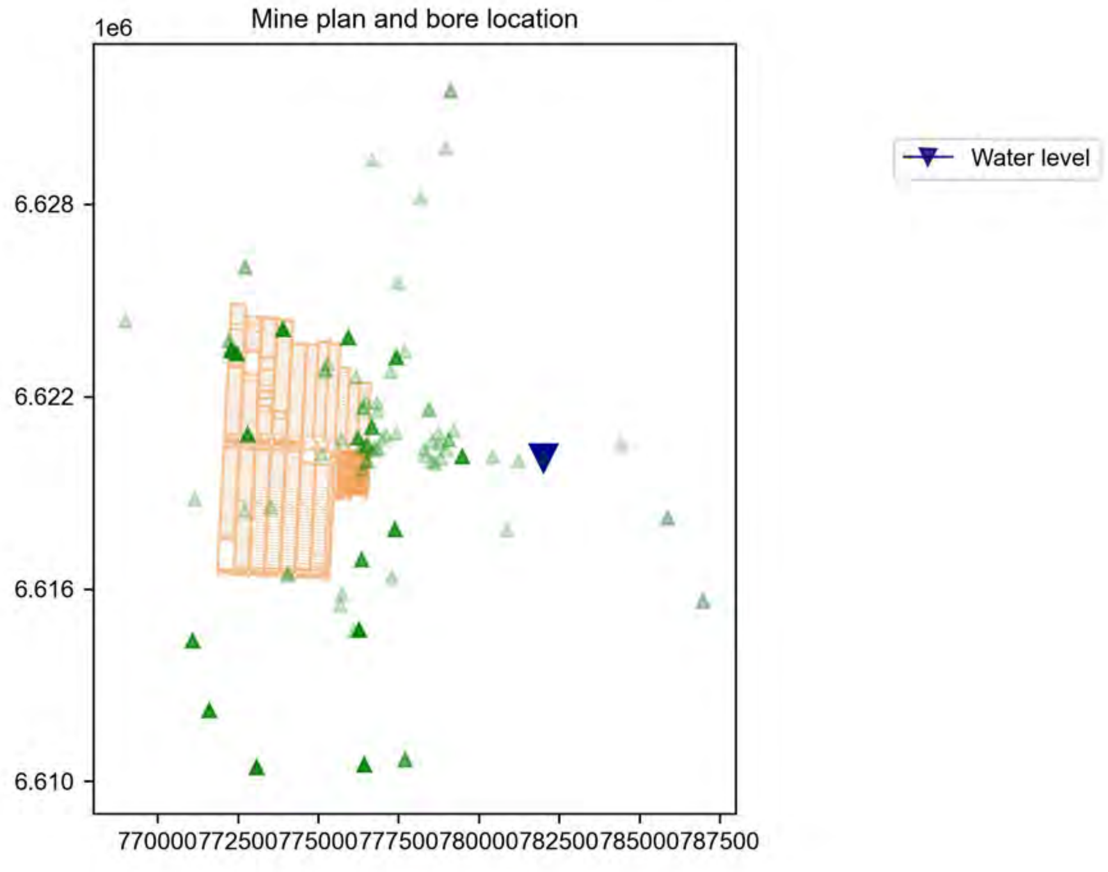
P33 (Rail Loop Dams; Outcrop)





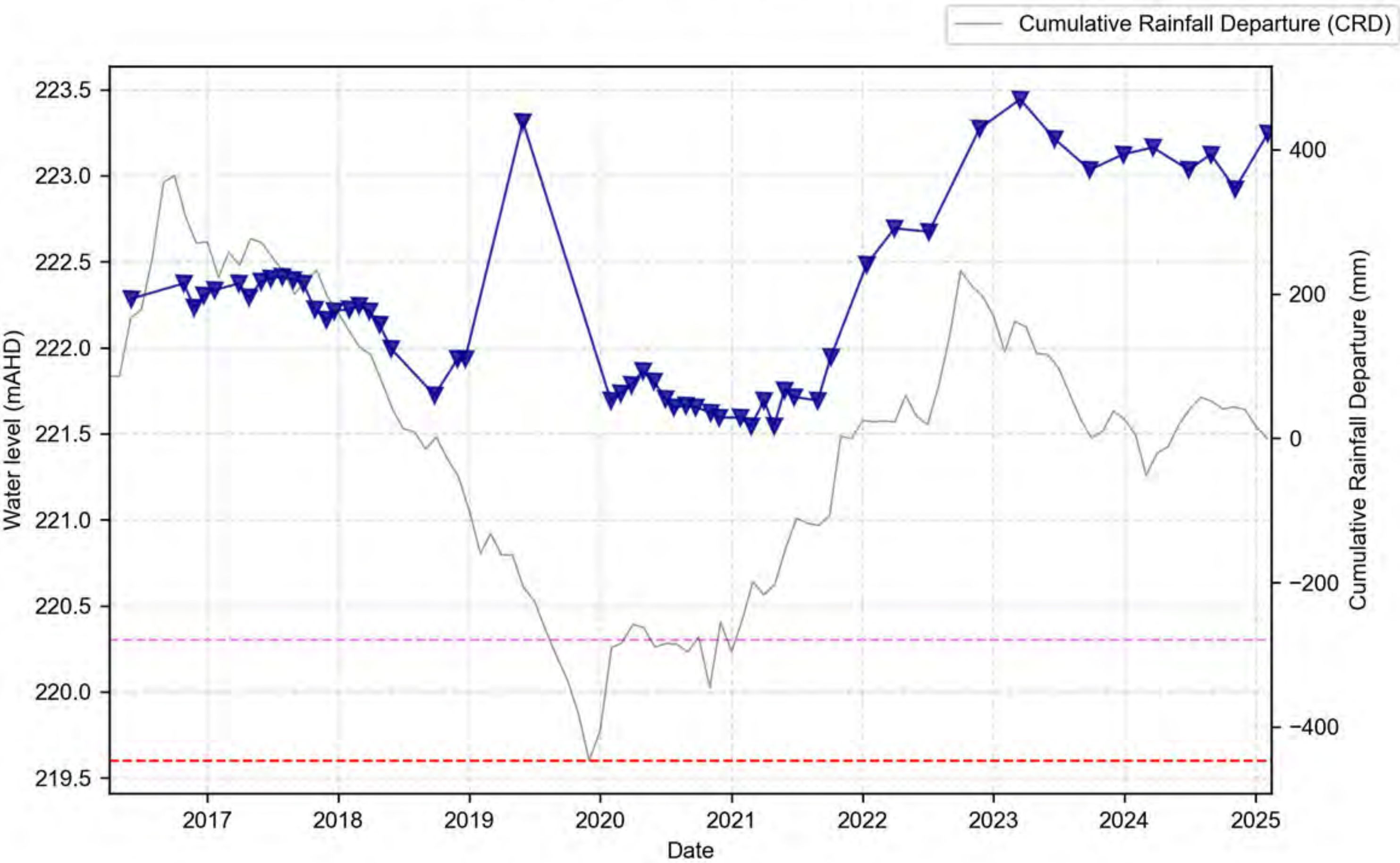
P39A (Watermark Formation; Outcrop)

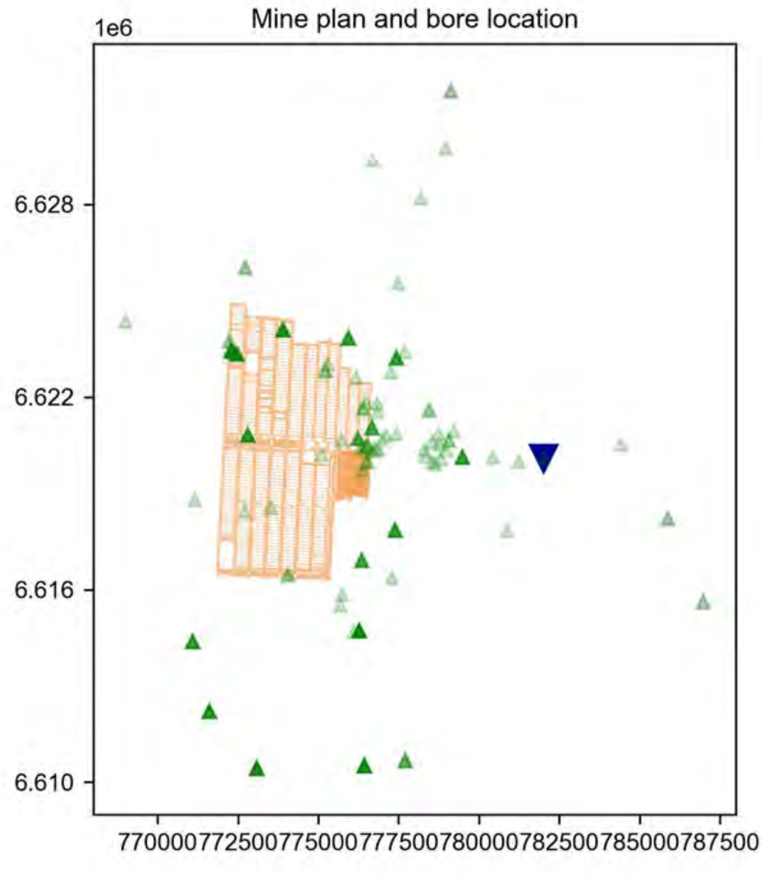




* mAHD - metres Australian Height Datum

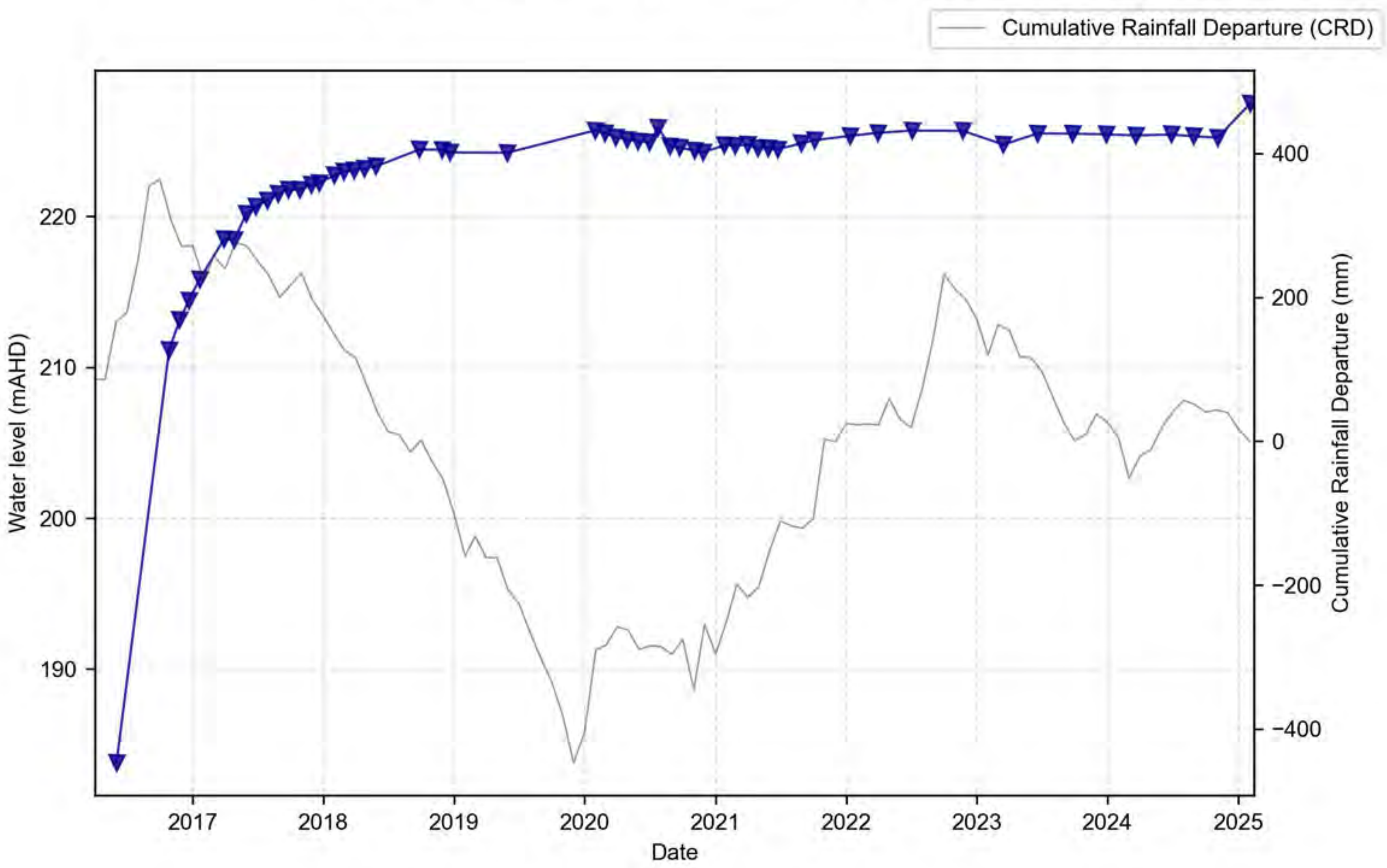
P39B (Alluvium; Outcrop)

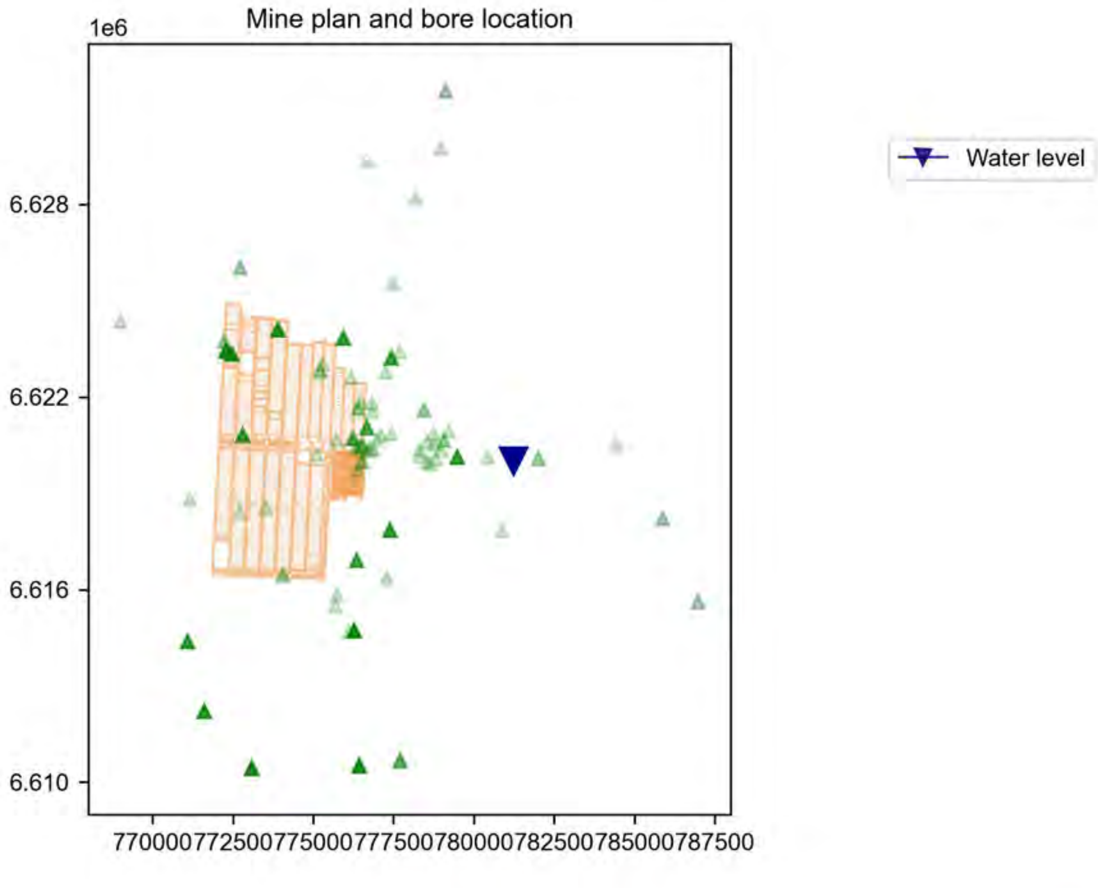




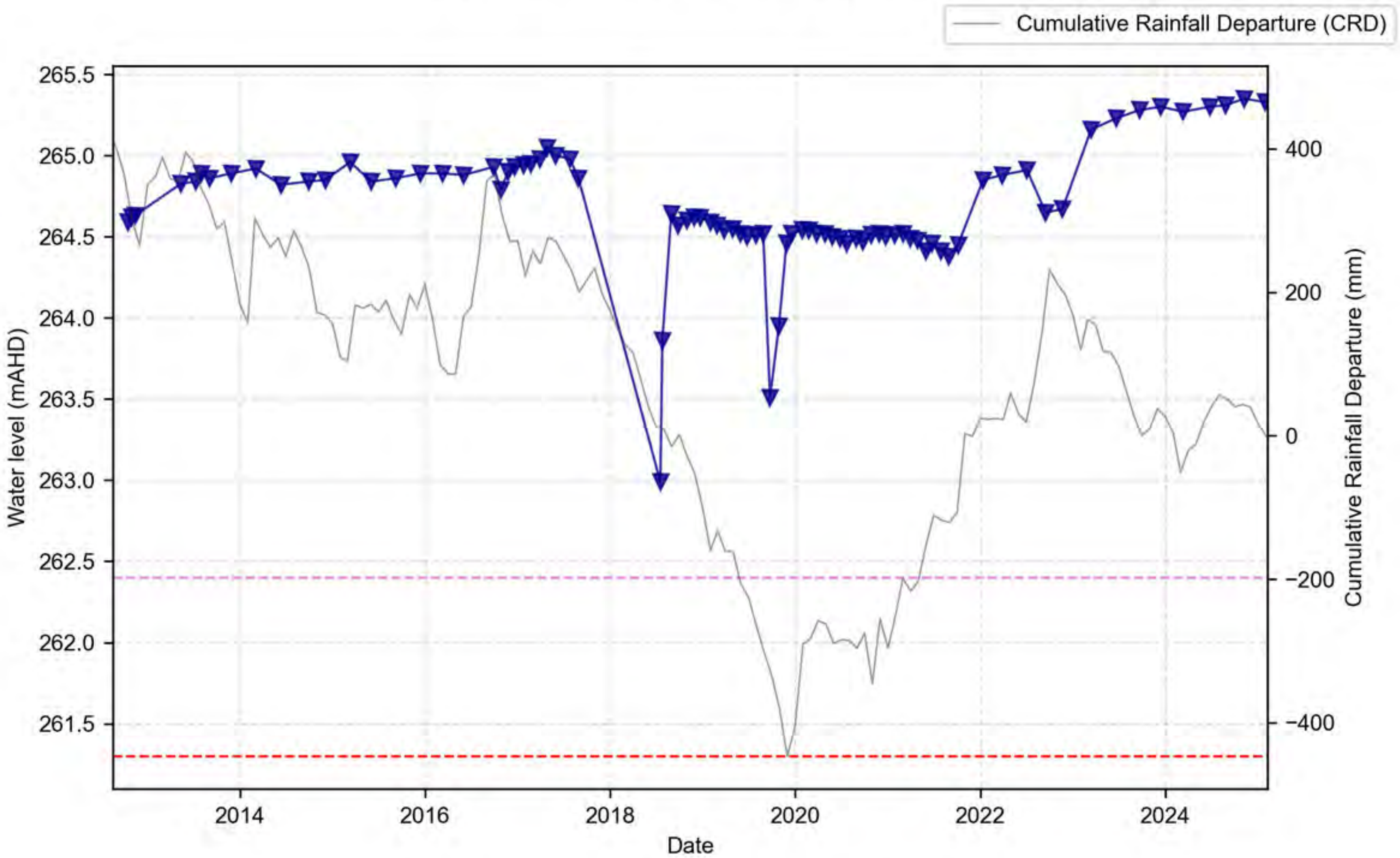
* mAHD - metres Australian Height Datum

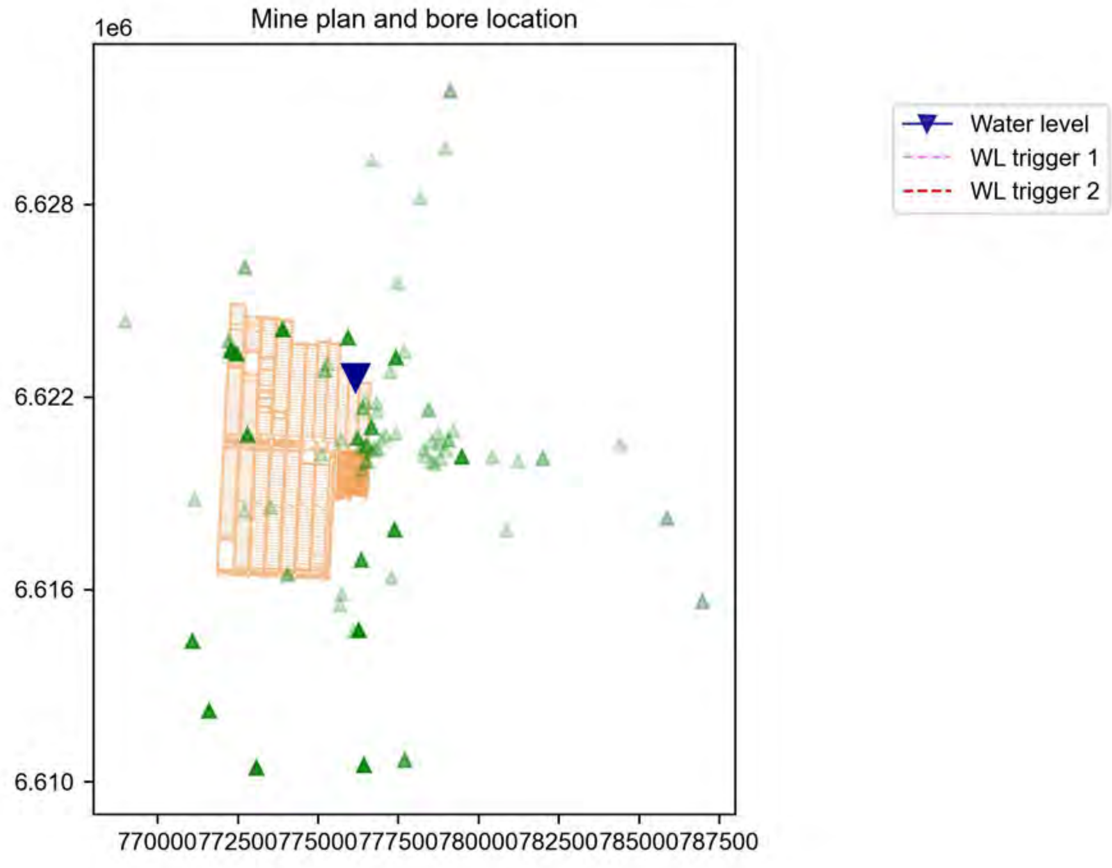
P43 (Watermark Formation; Outcrop)



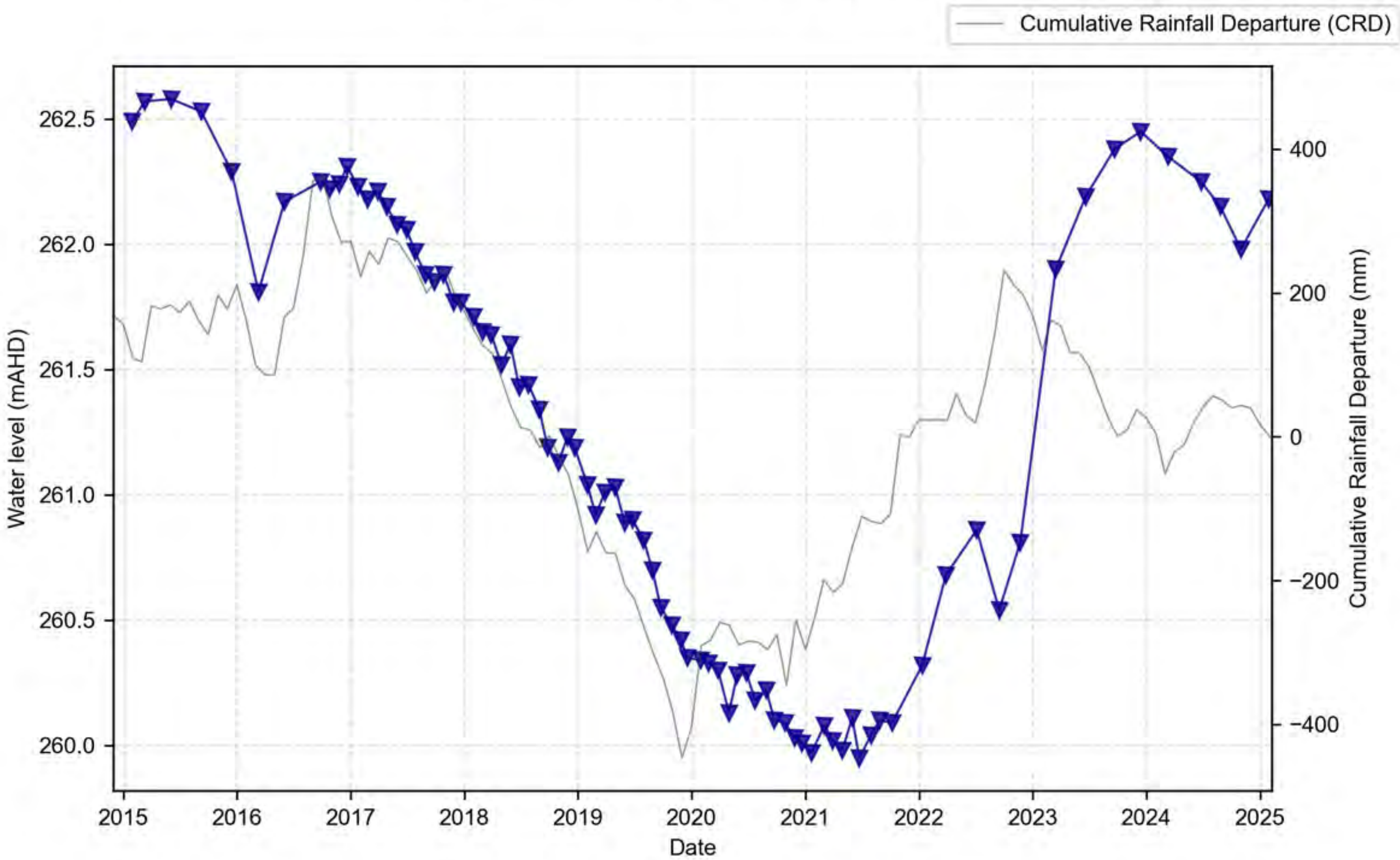


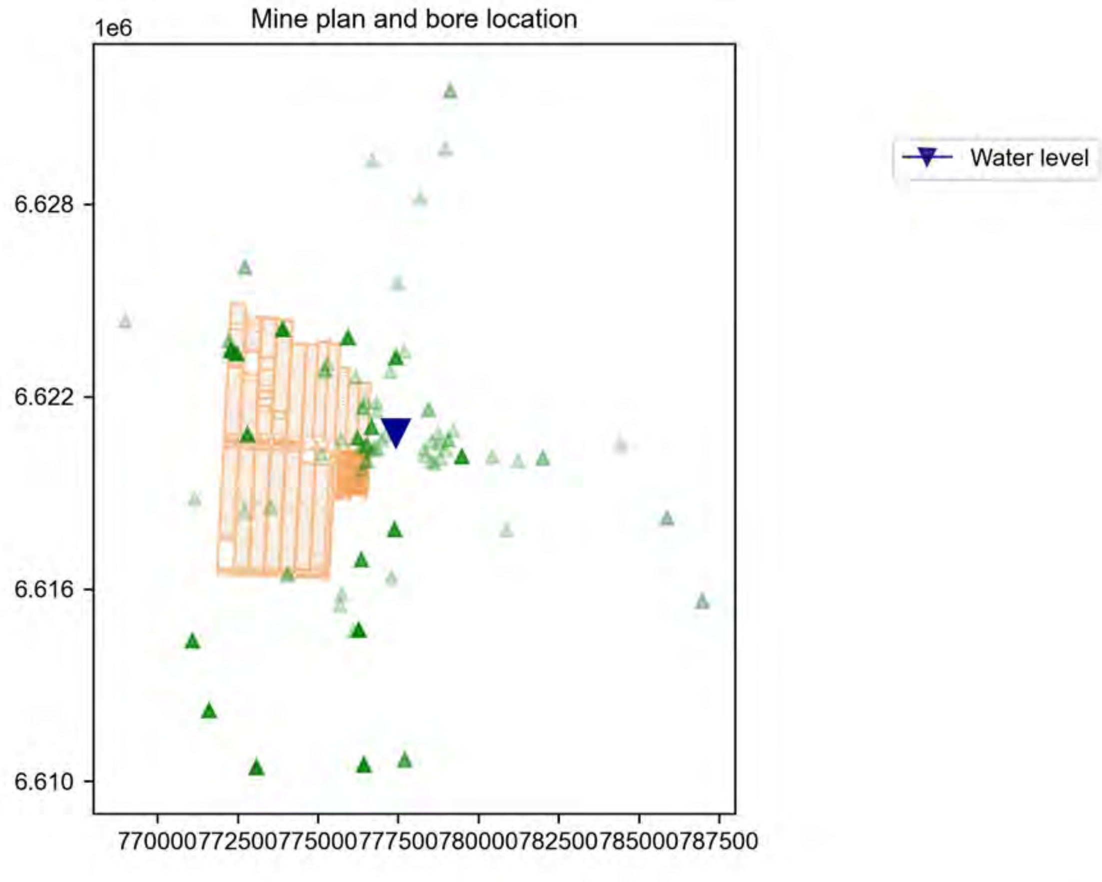
P47 (Garrawilla Volcanics; Outcrop)

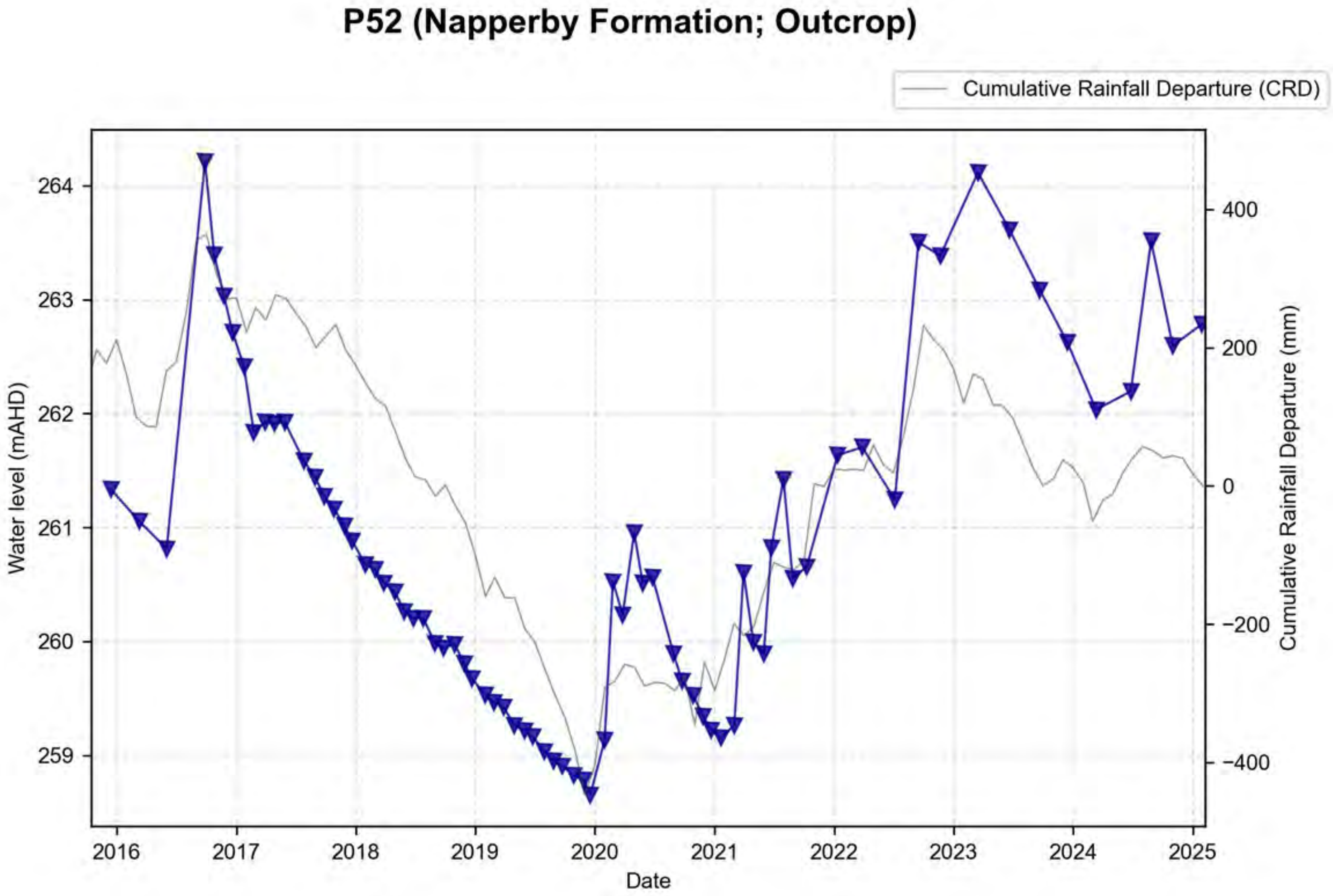


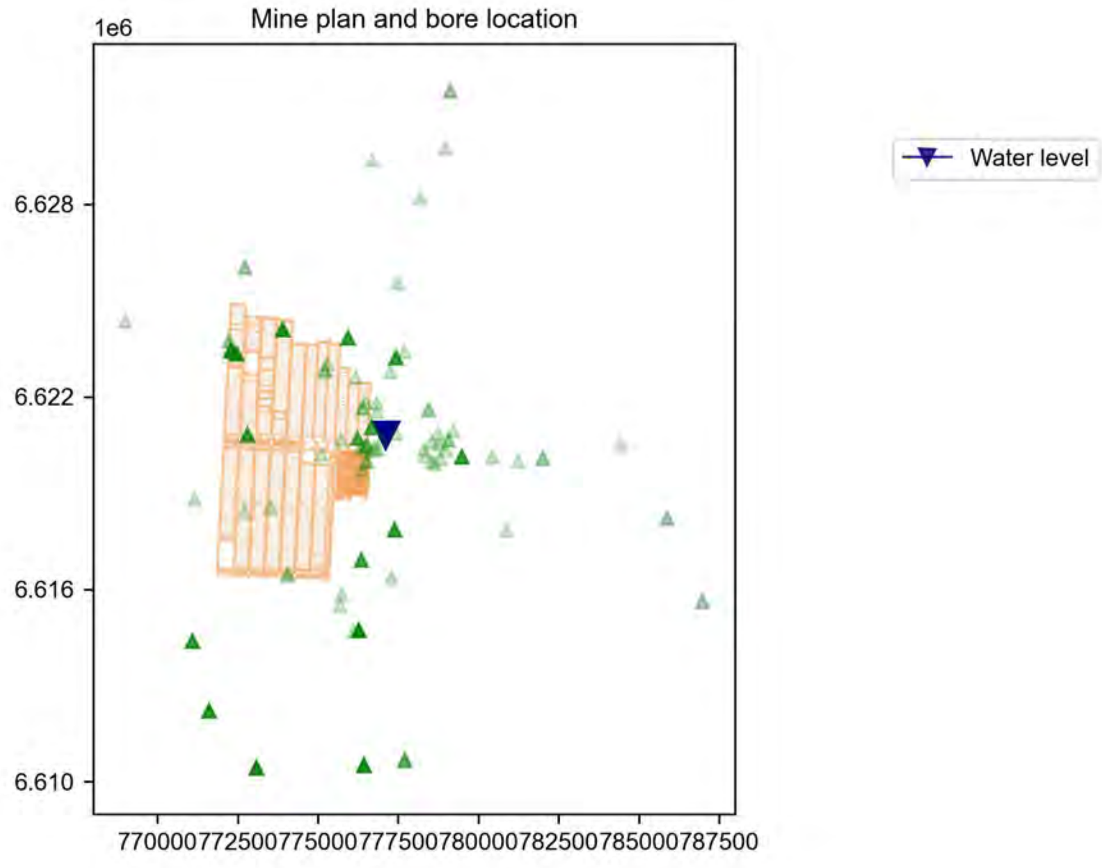


P51 (Garrawilla Volcanics; Outcrop)

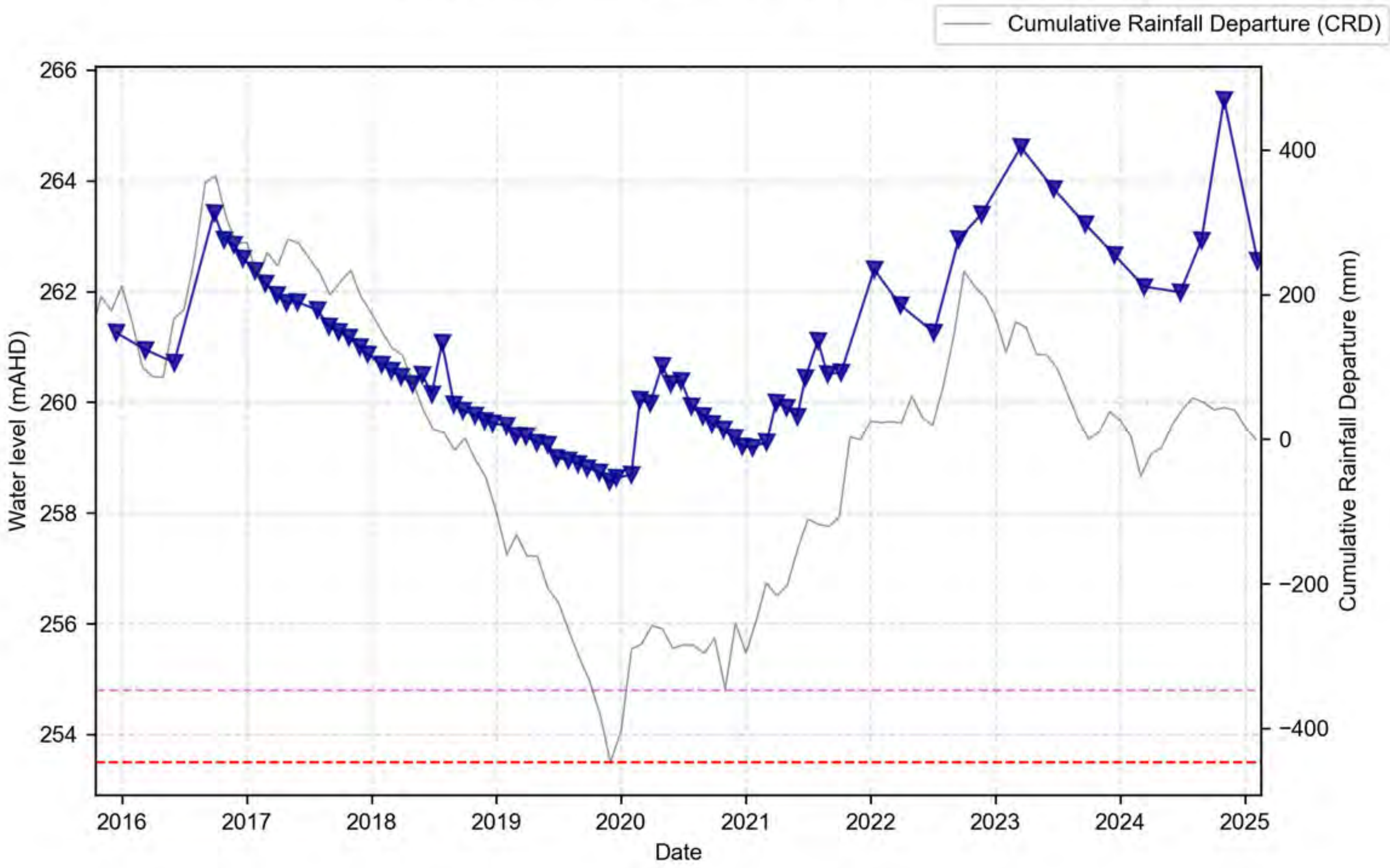


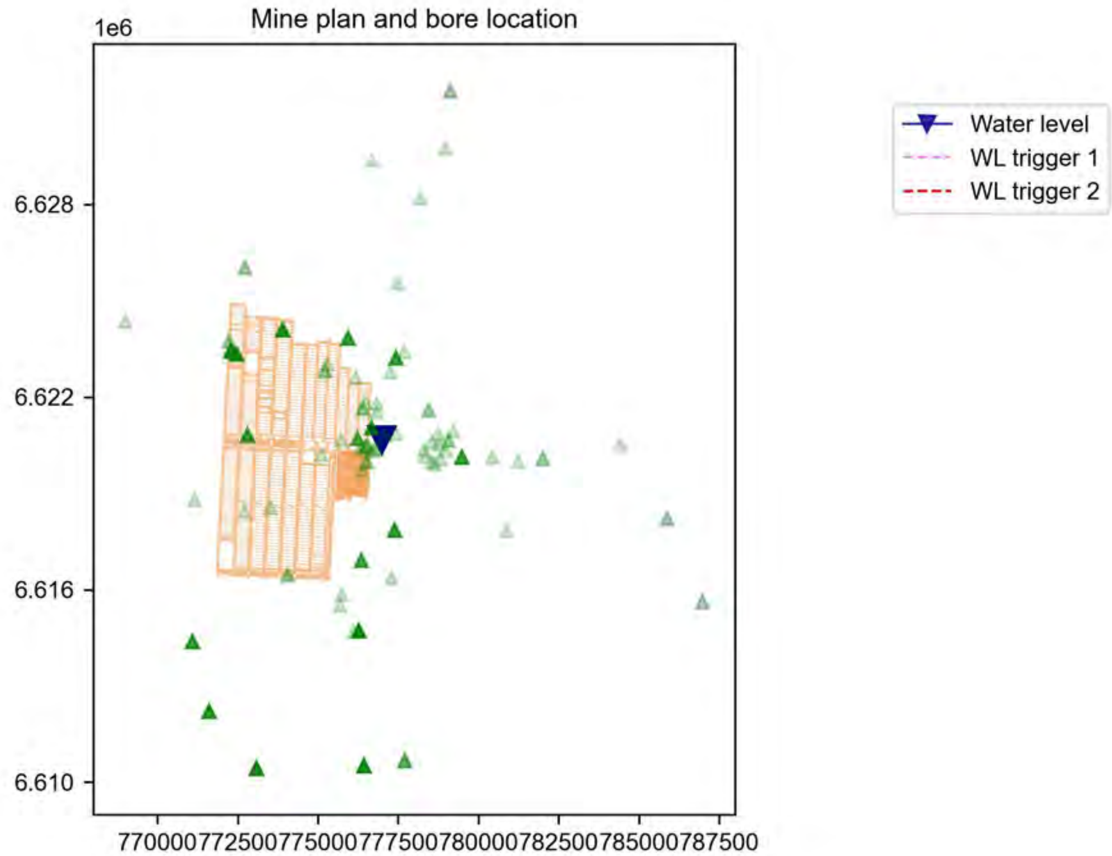



P52 (Napperby Formation; Outcrop)
Cumulative Rainfall Departure (CRD)
Water level (mAHD)
Cumulative Rainfall Departure (mm)
Date
264
263
262
261
260
259
400
200
0
−200
−400
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025

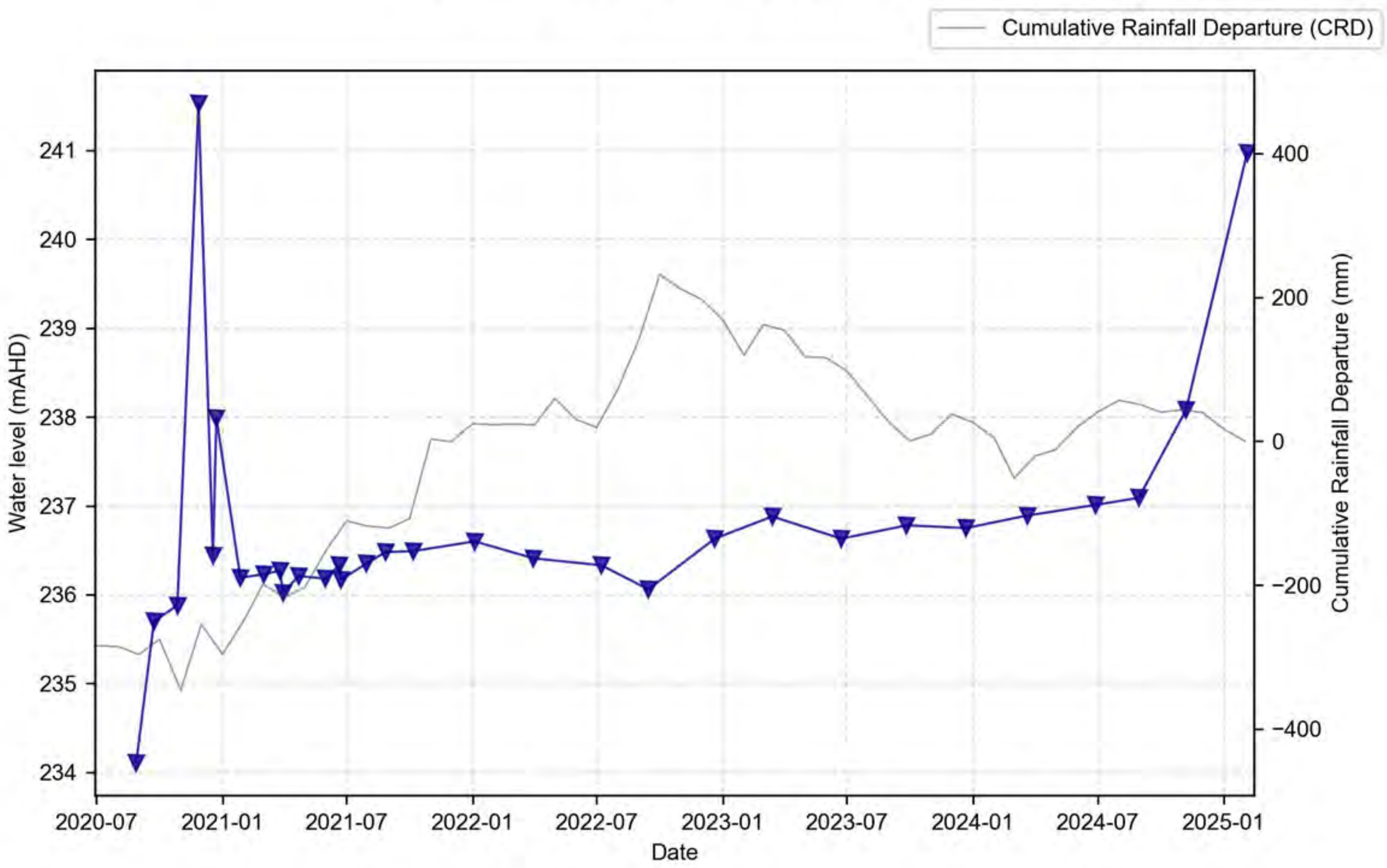

Mine plan and bore location
1e6
6.628
6.622
6.616
6.610
770000
772500
775000
777500
780000
782500
785000
787500
Water level

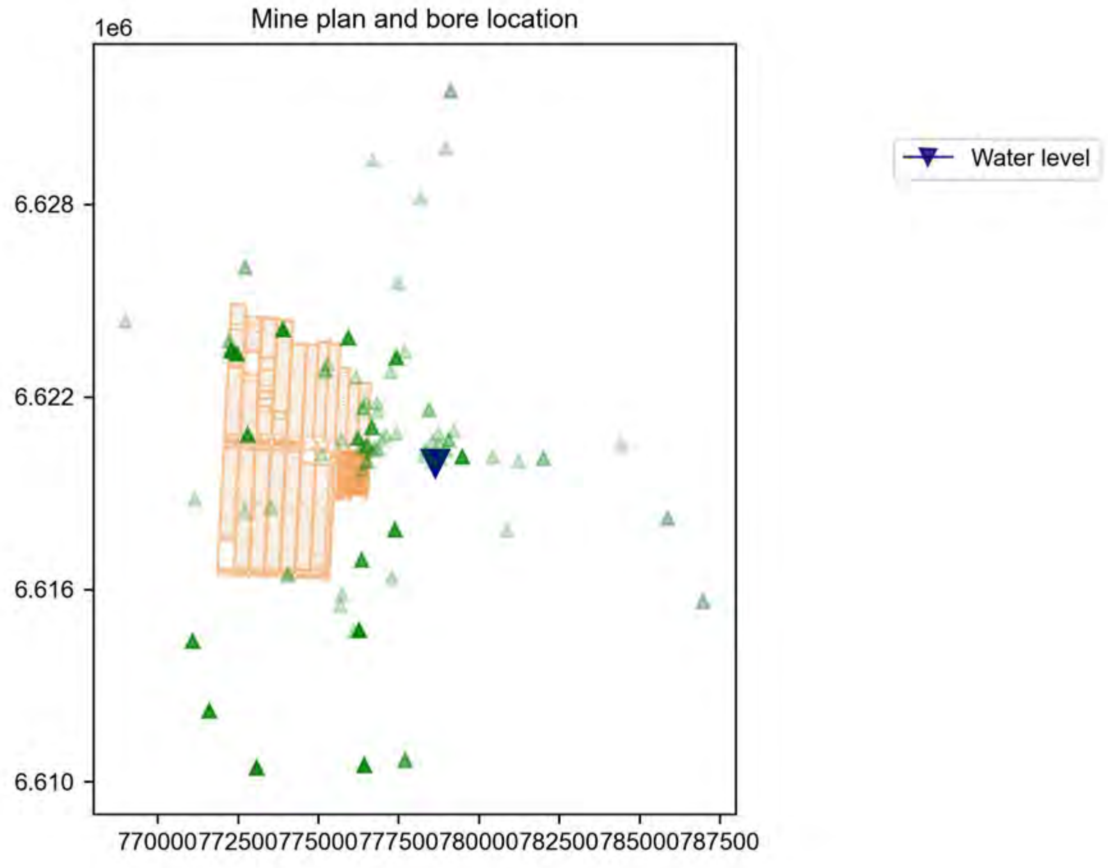
P53 (Garrawilla Volcanics; Outcrop)



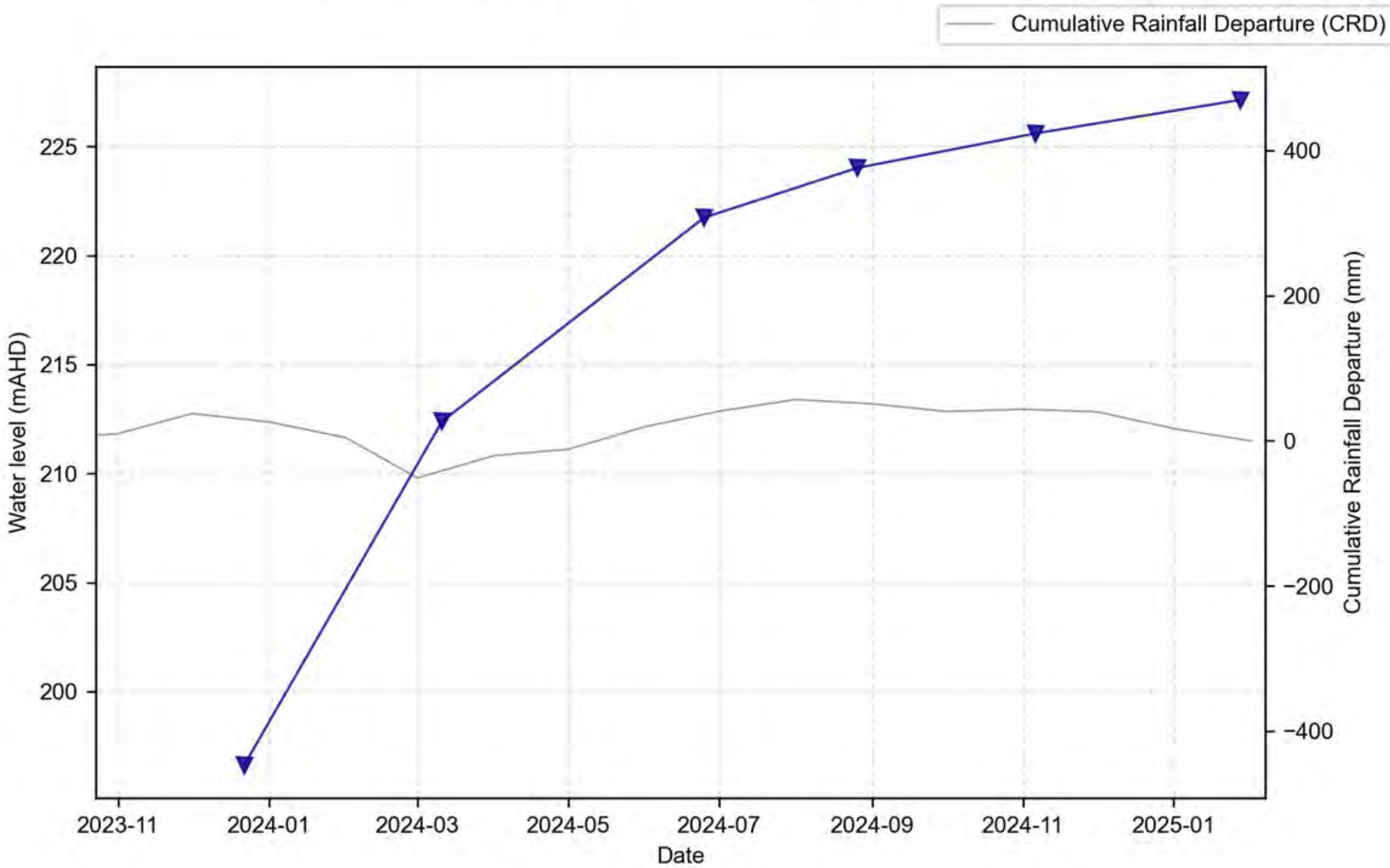


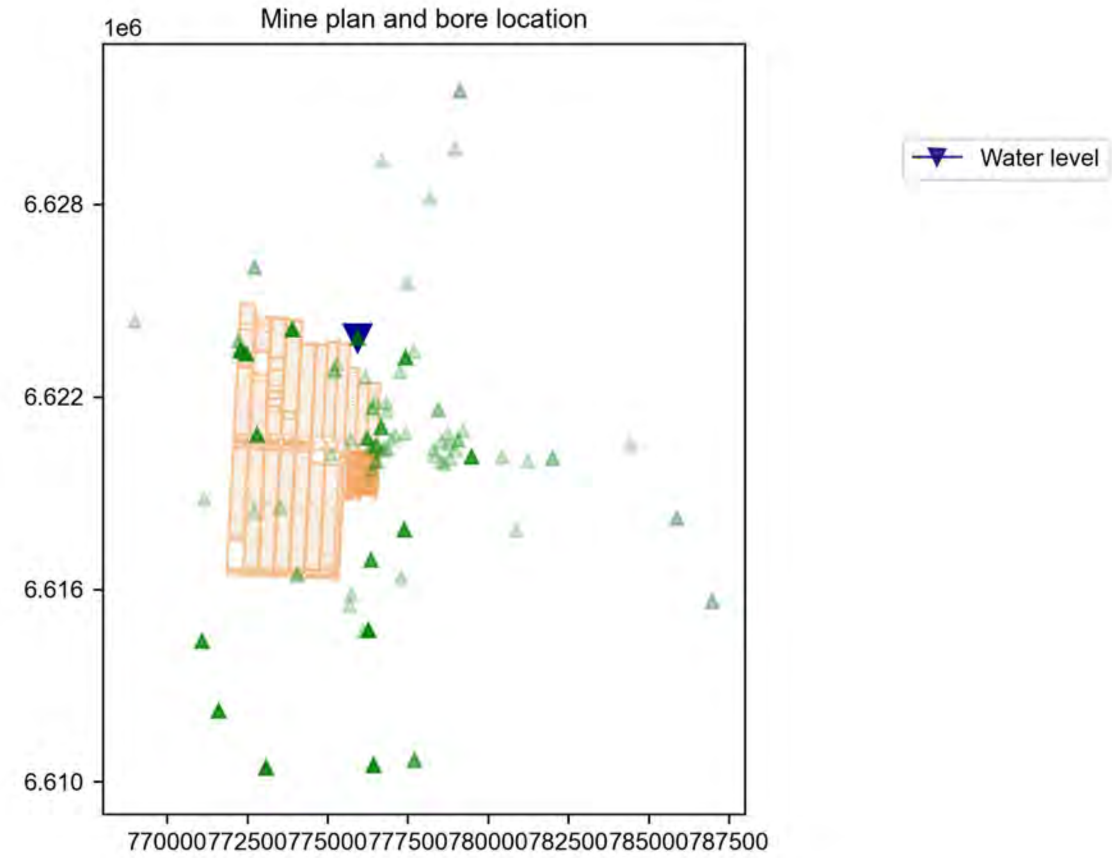
P58 (Rail Loop Dams; Outcrop)



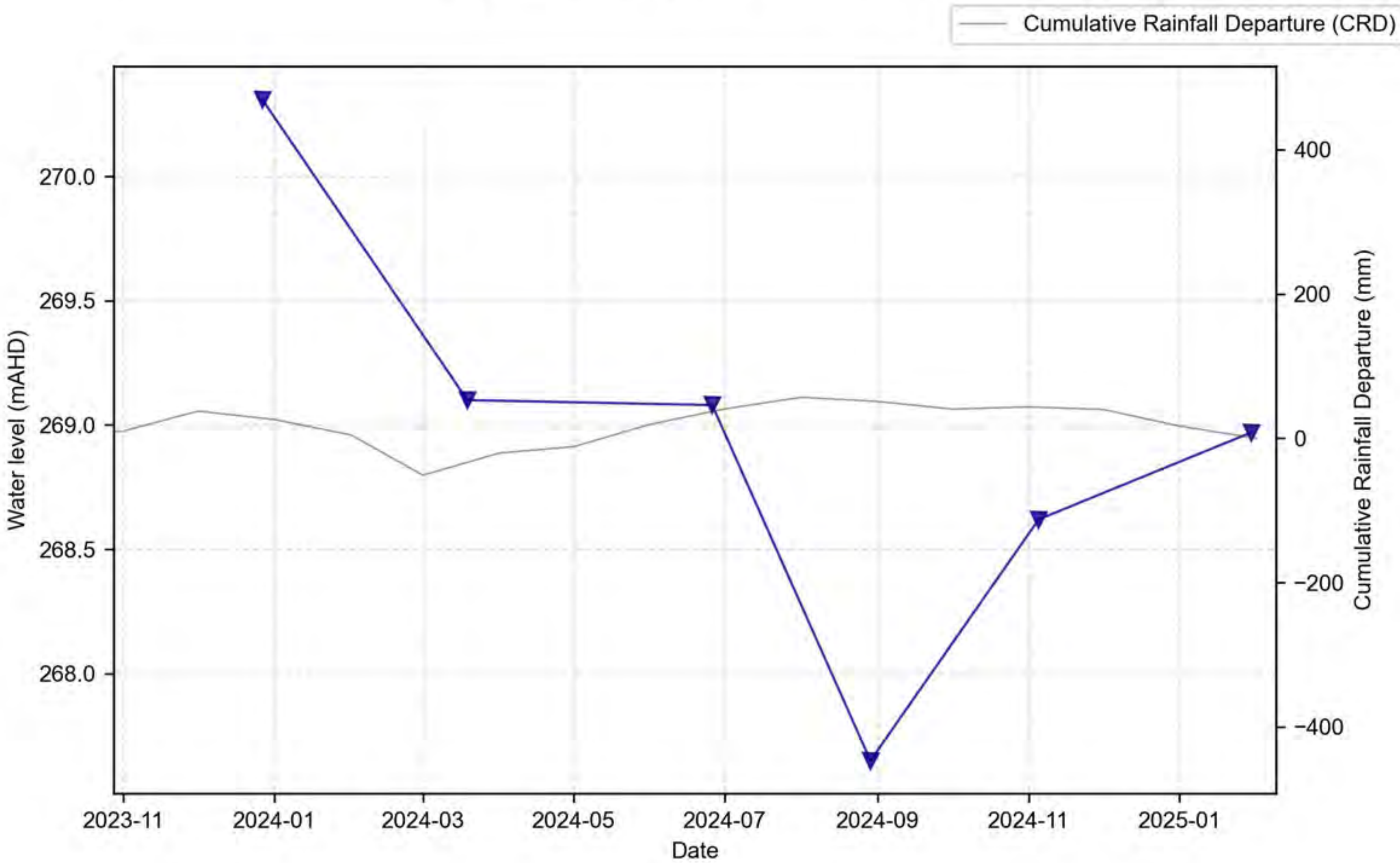


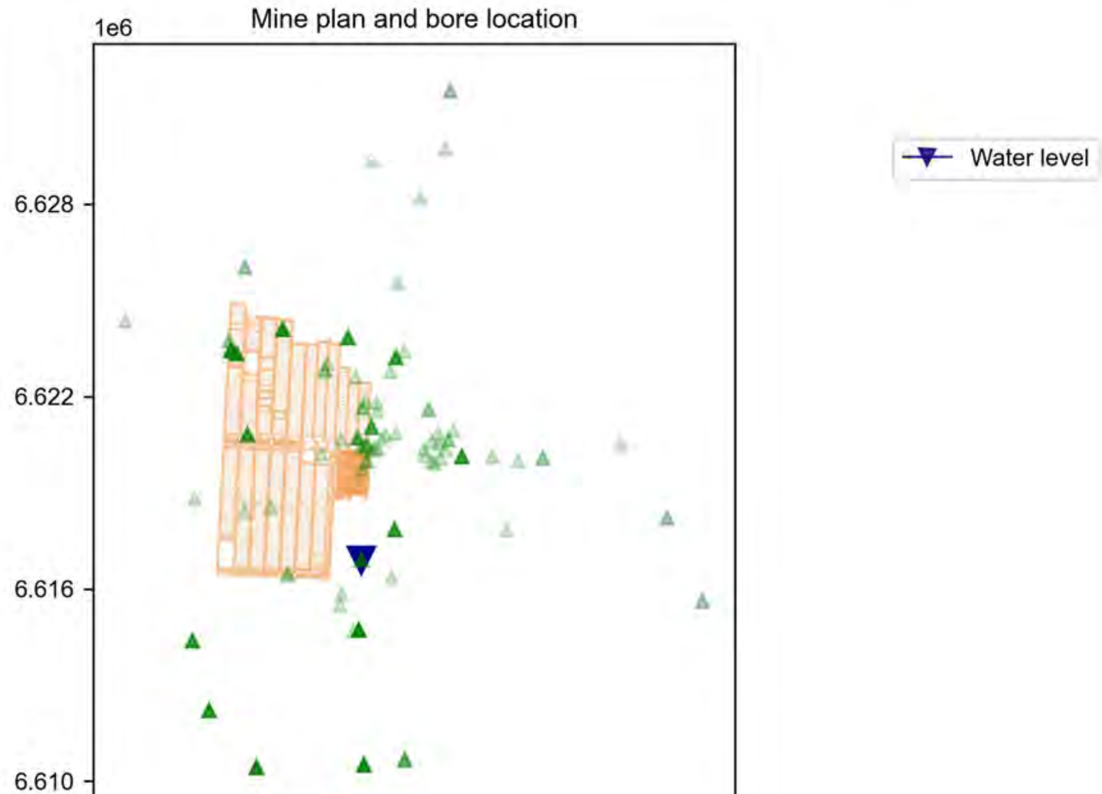
P63R (Napperby Formation; No outcrop info)



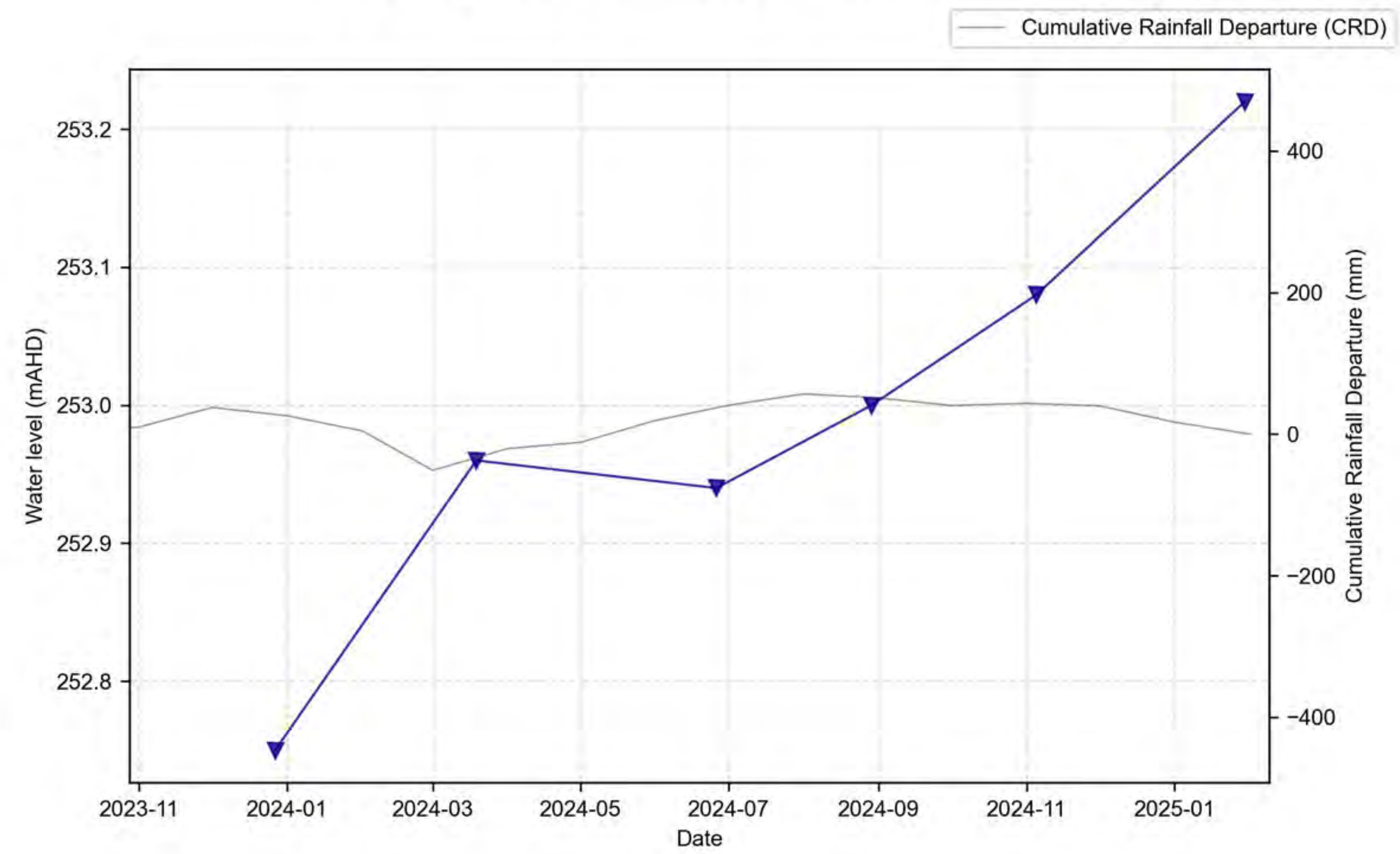


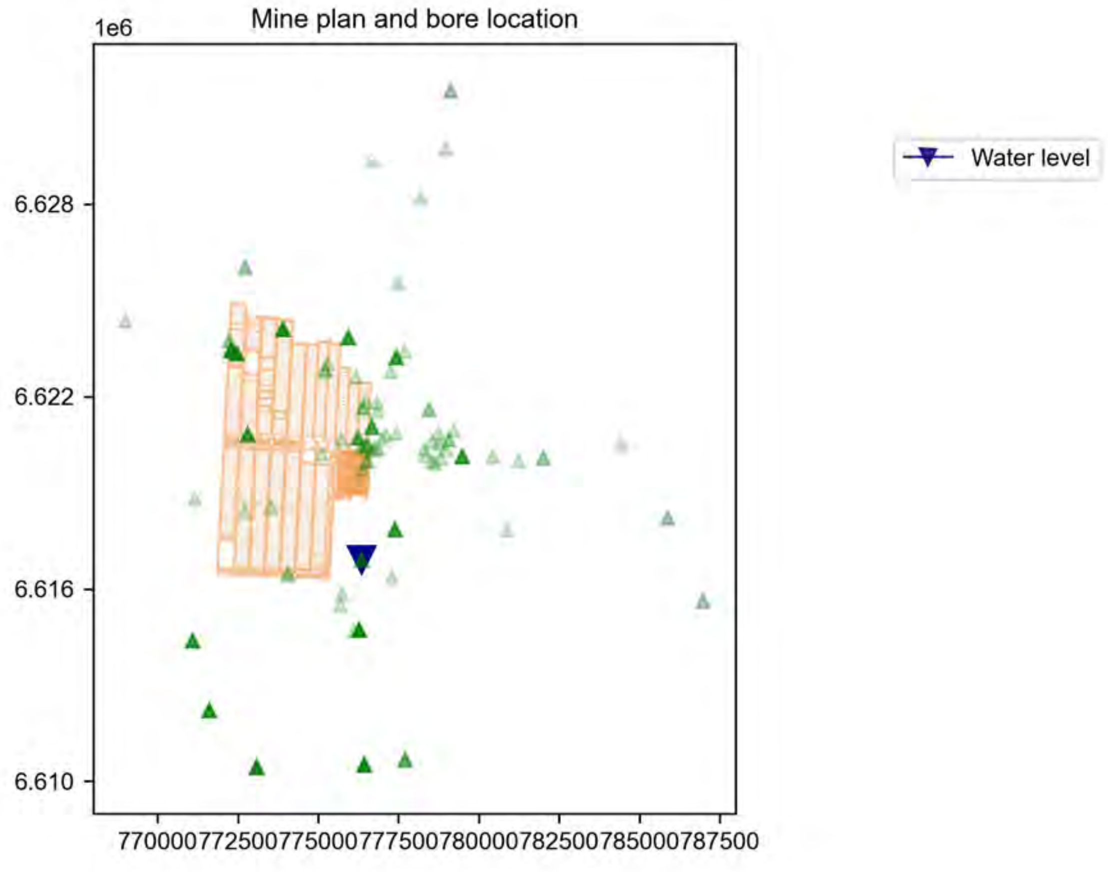
P68 (Colluvium; No outcrop info)



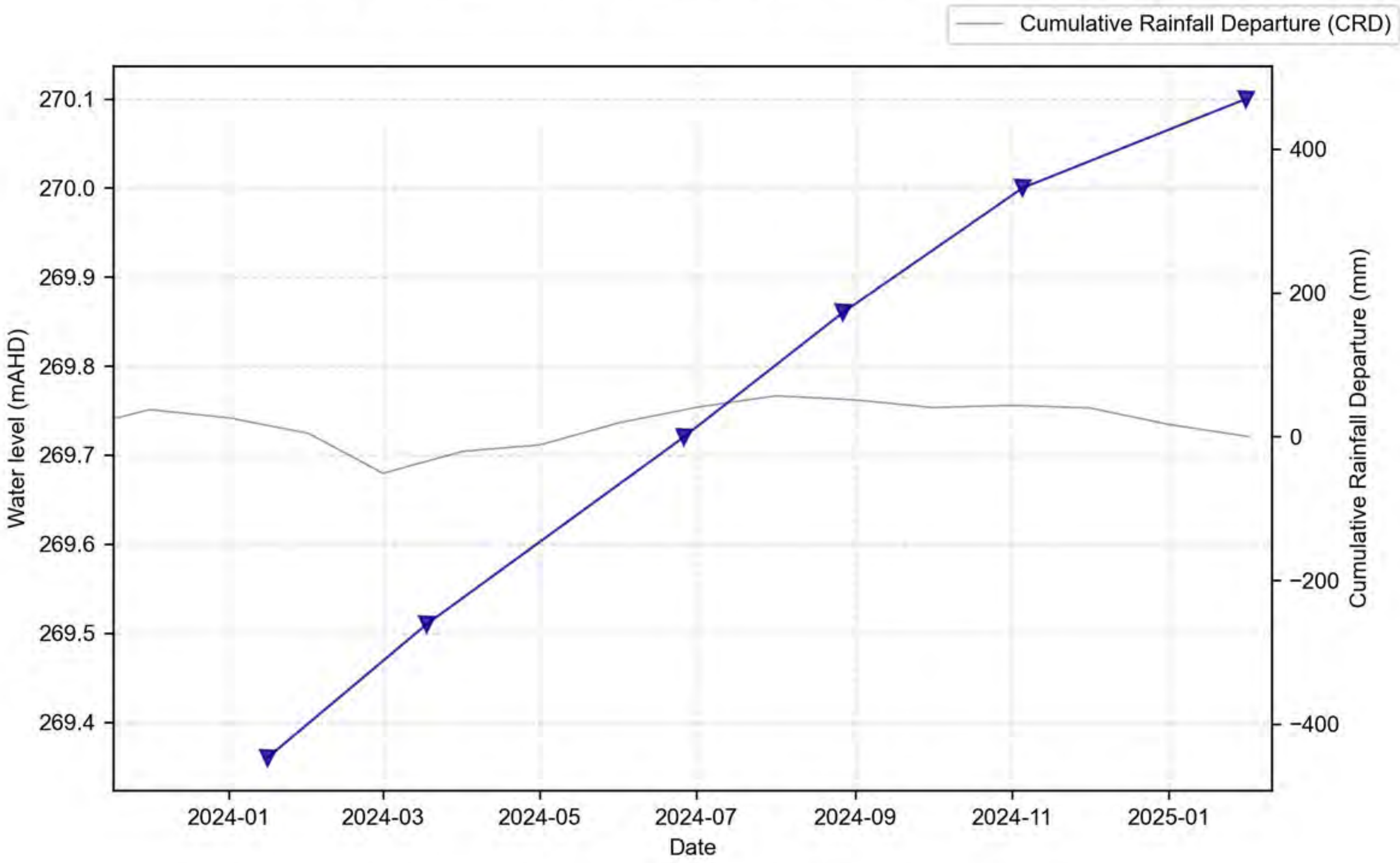


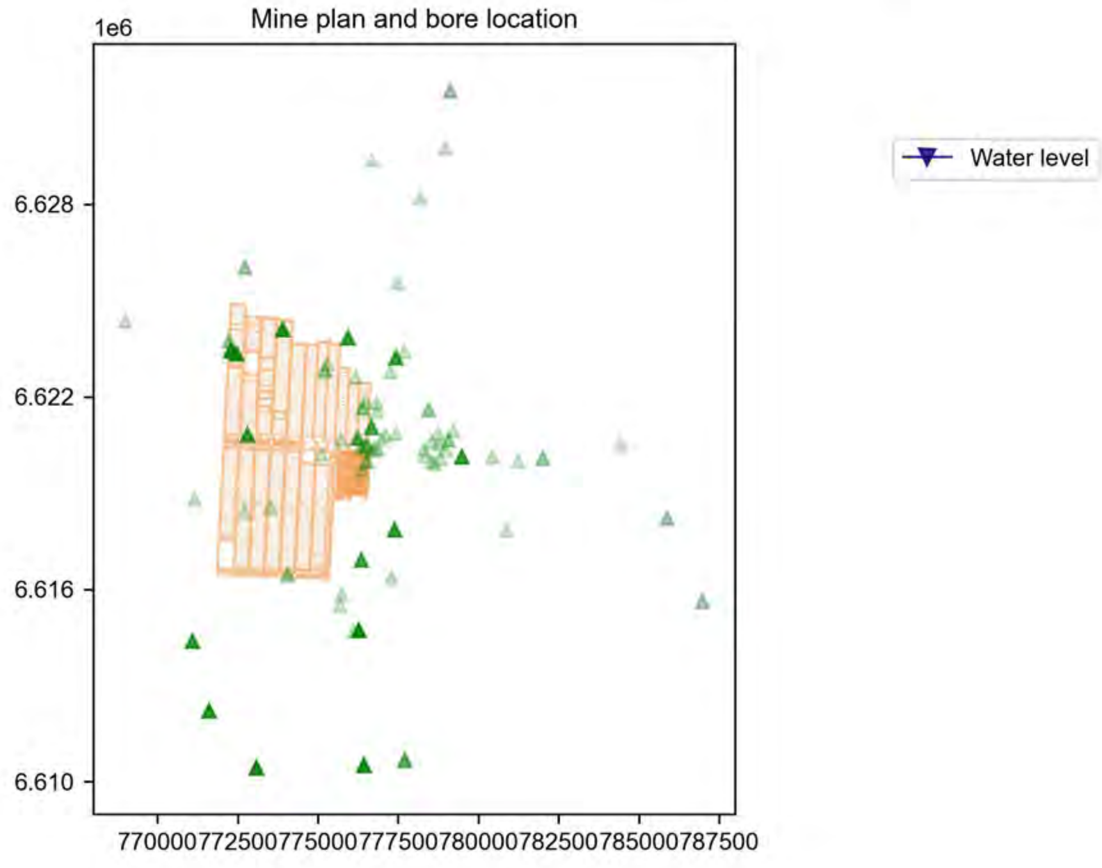
P69 (Napperby Formation; No outcrop info)



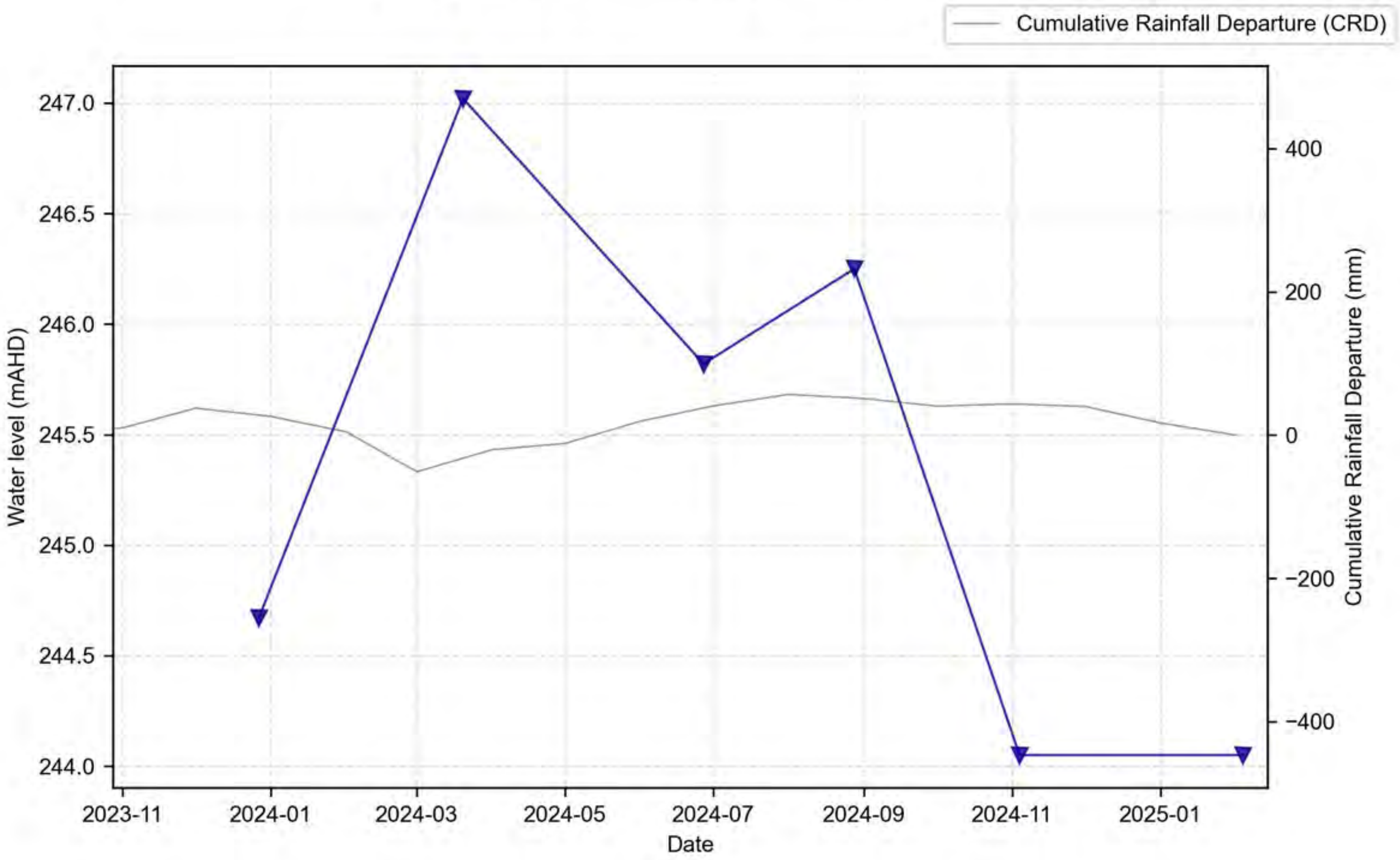


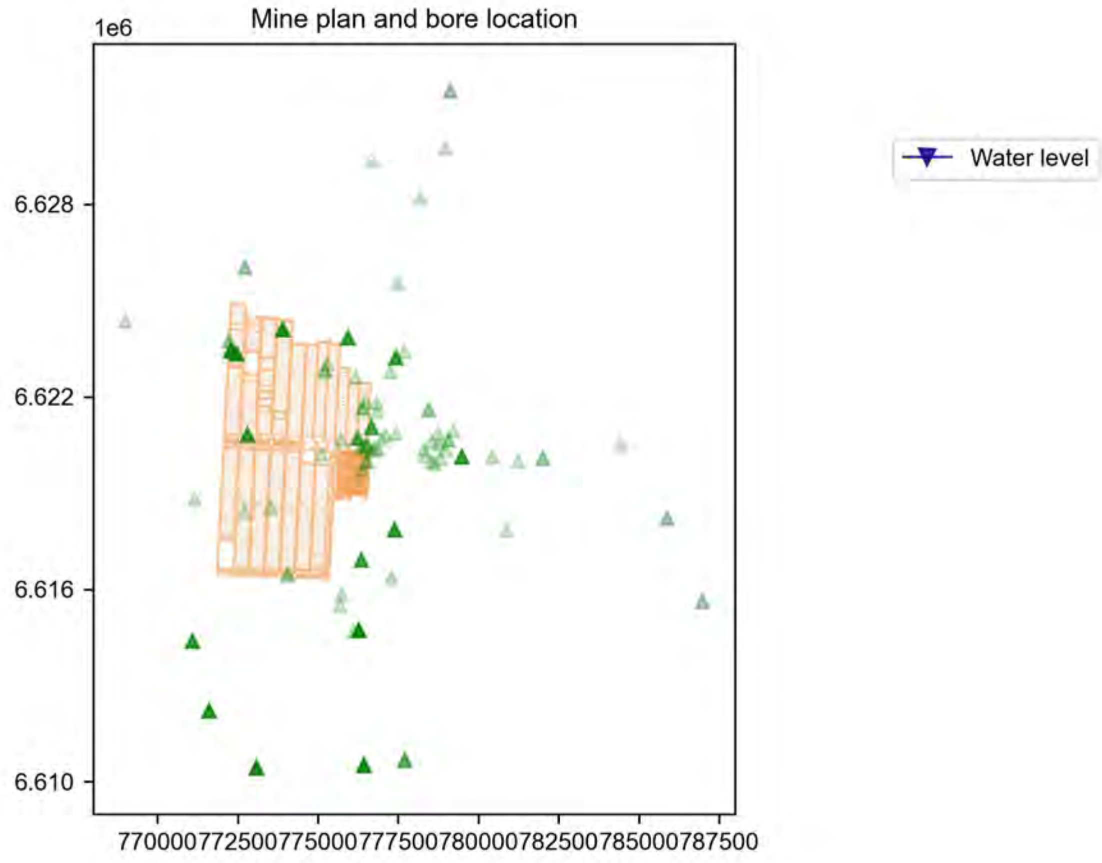
P72 (Purlawaugh Formation; No outcrop info)



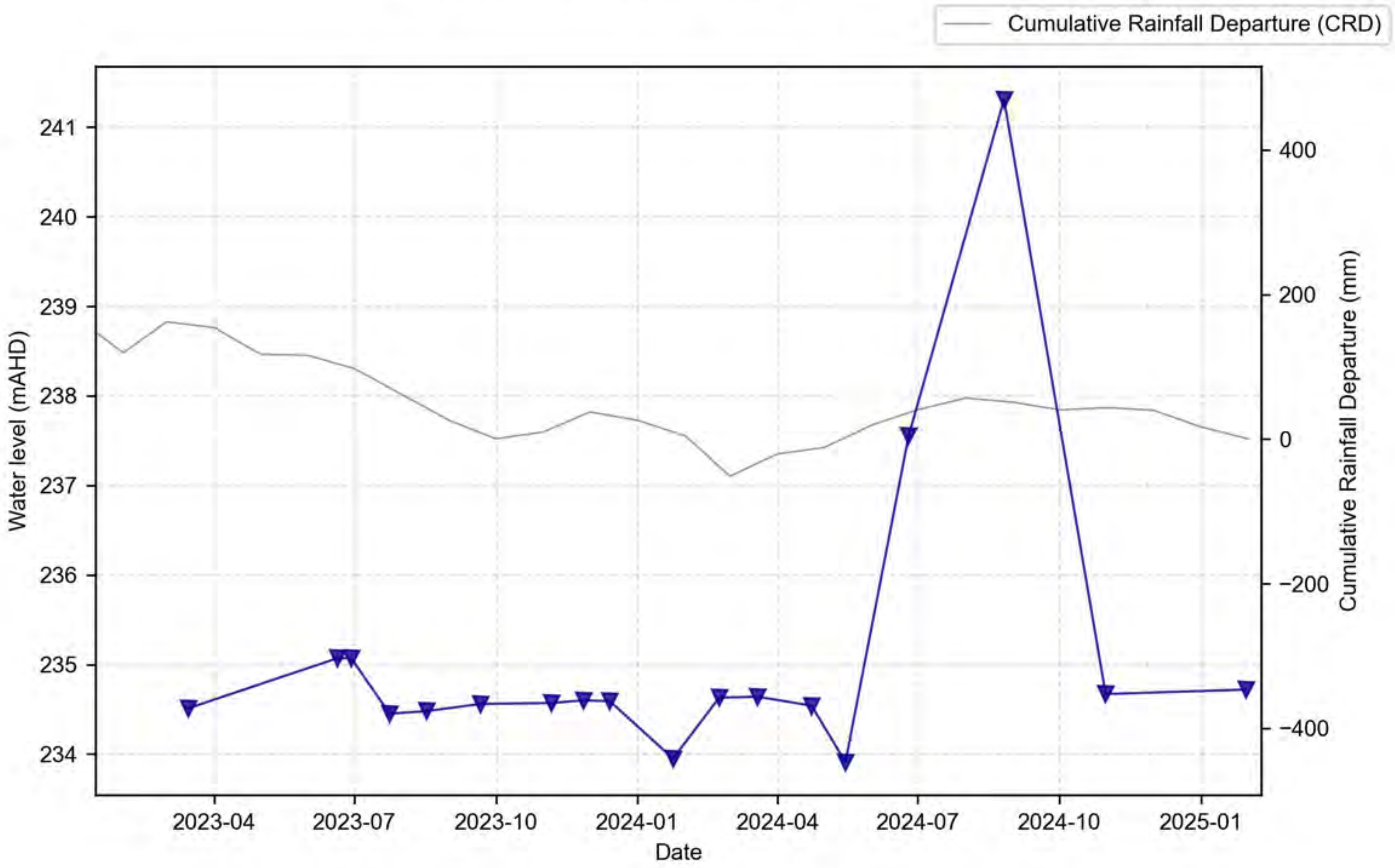


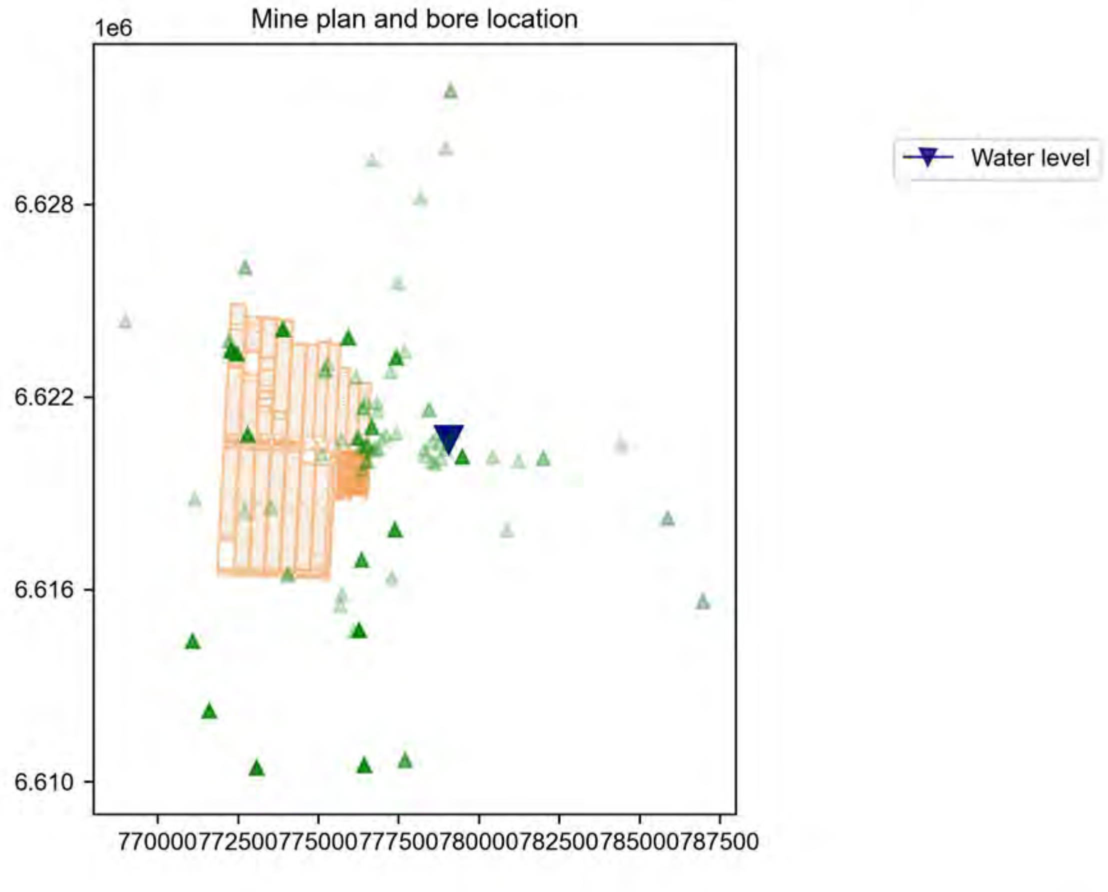
P75 (Napperby Formation; No outcrop info)





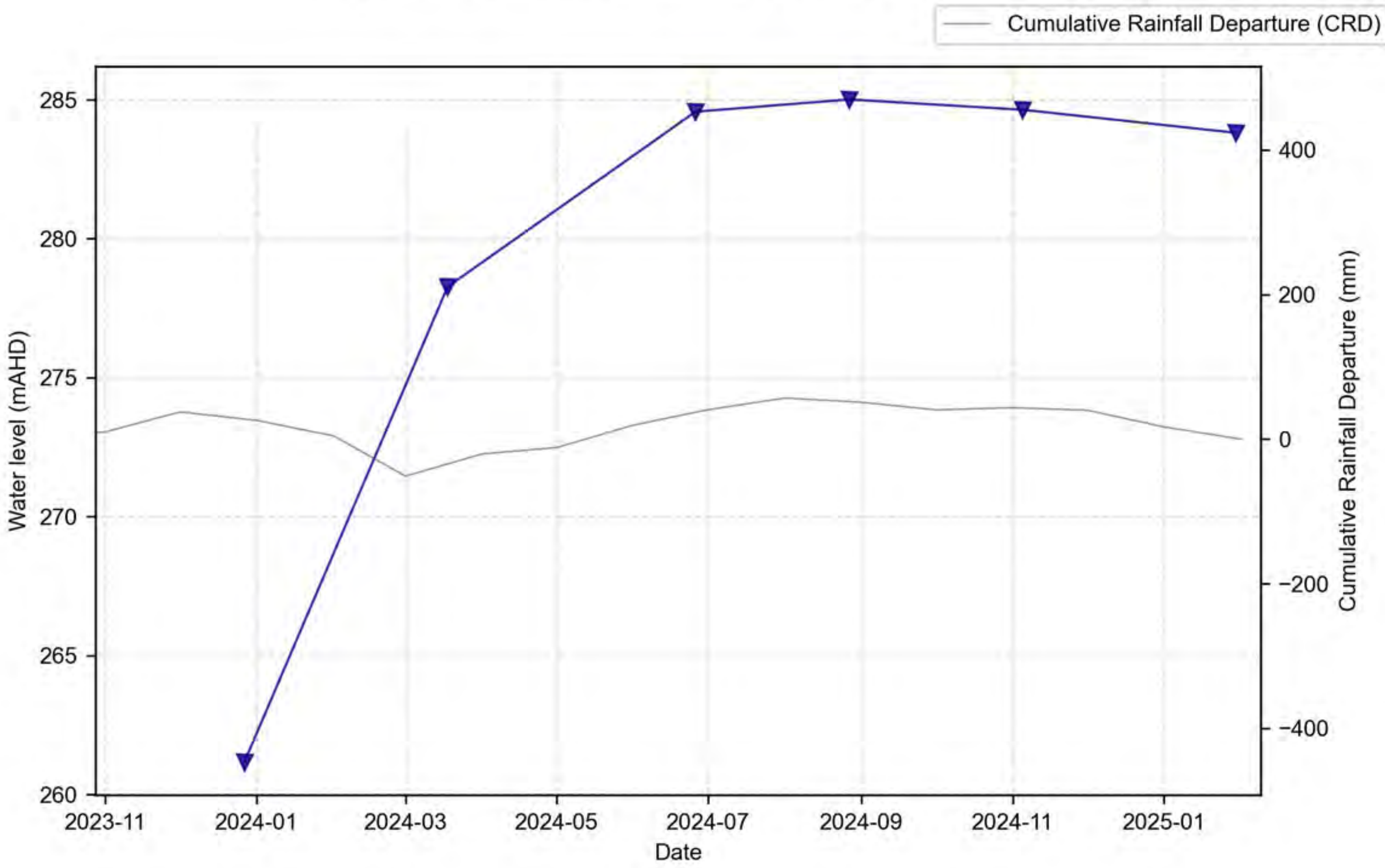
P84 (Siltstone; No outcrop info)

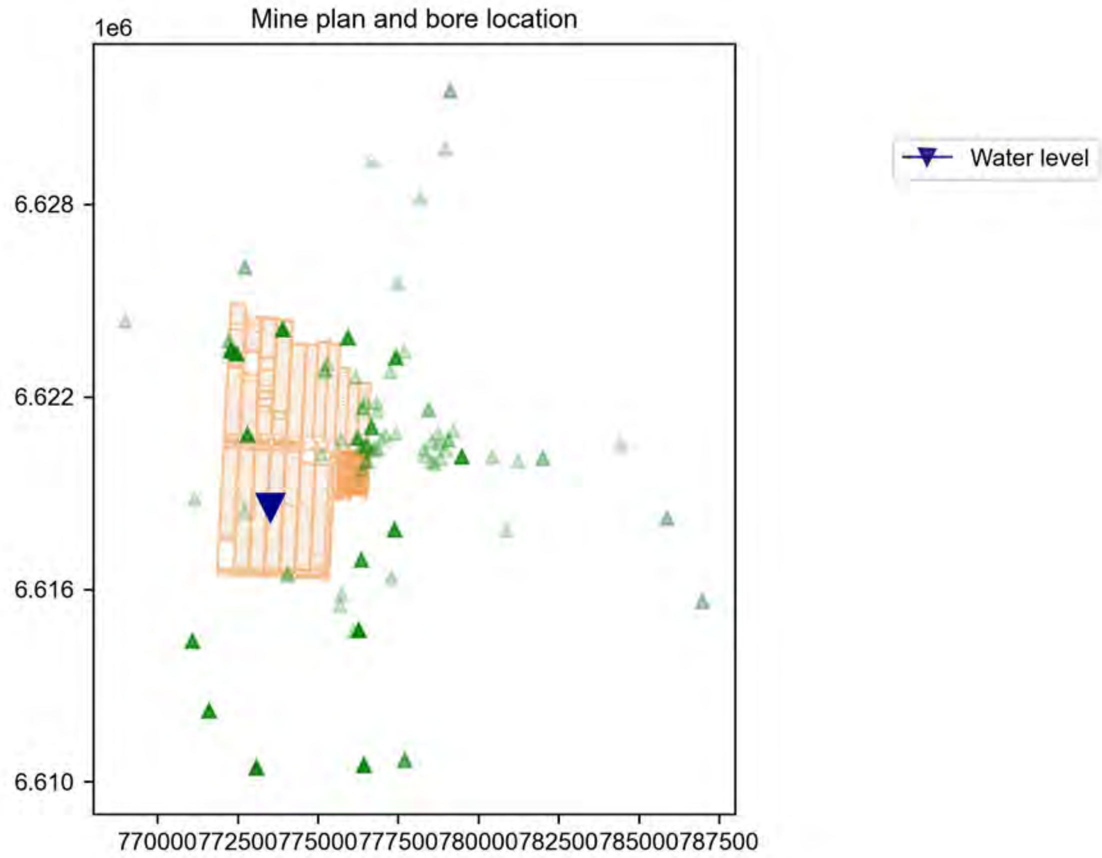




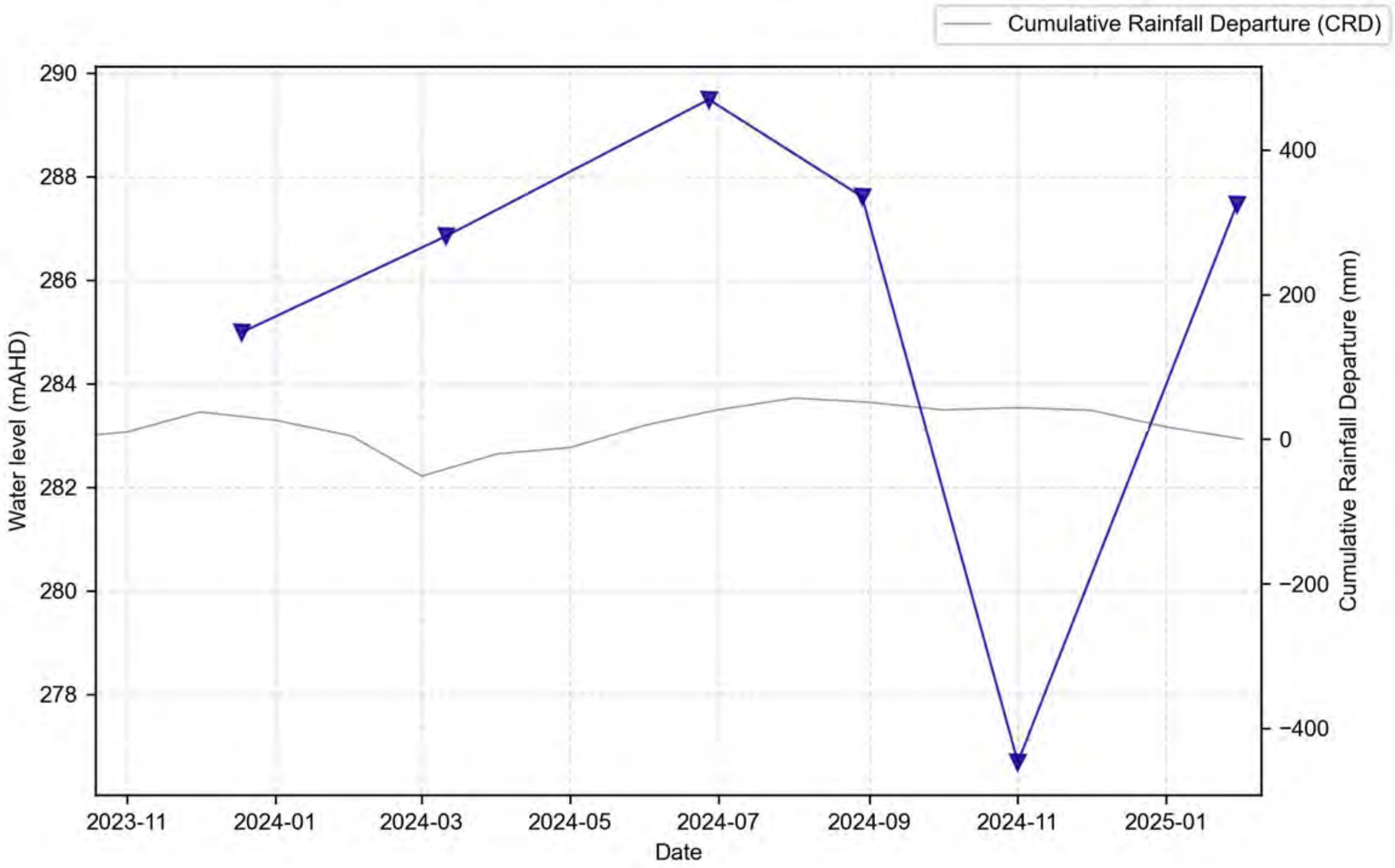
* mAHD - metres Australian Height Datum

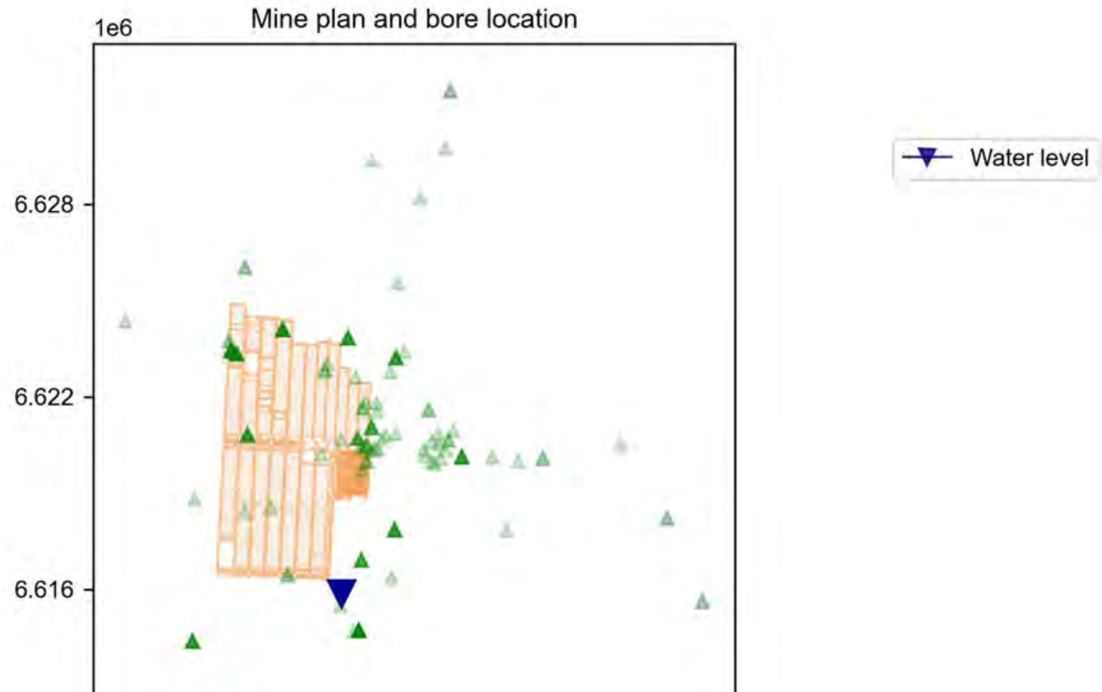
P90 (Pilliga Sandstone; No outcrop info)



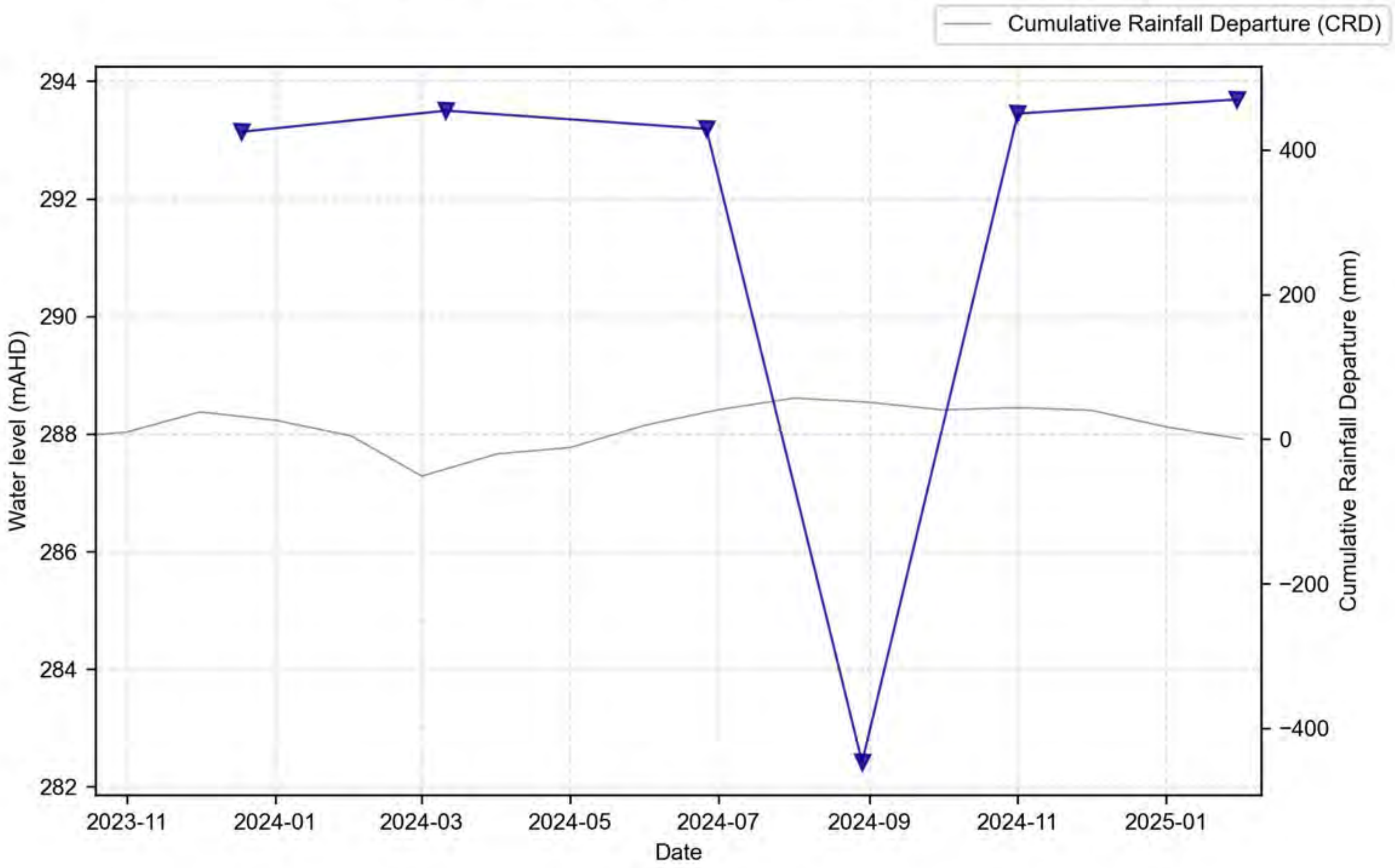


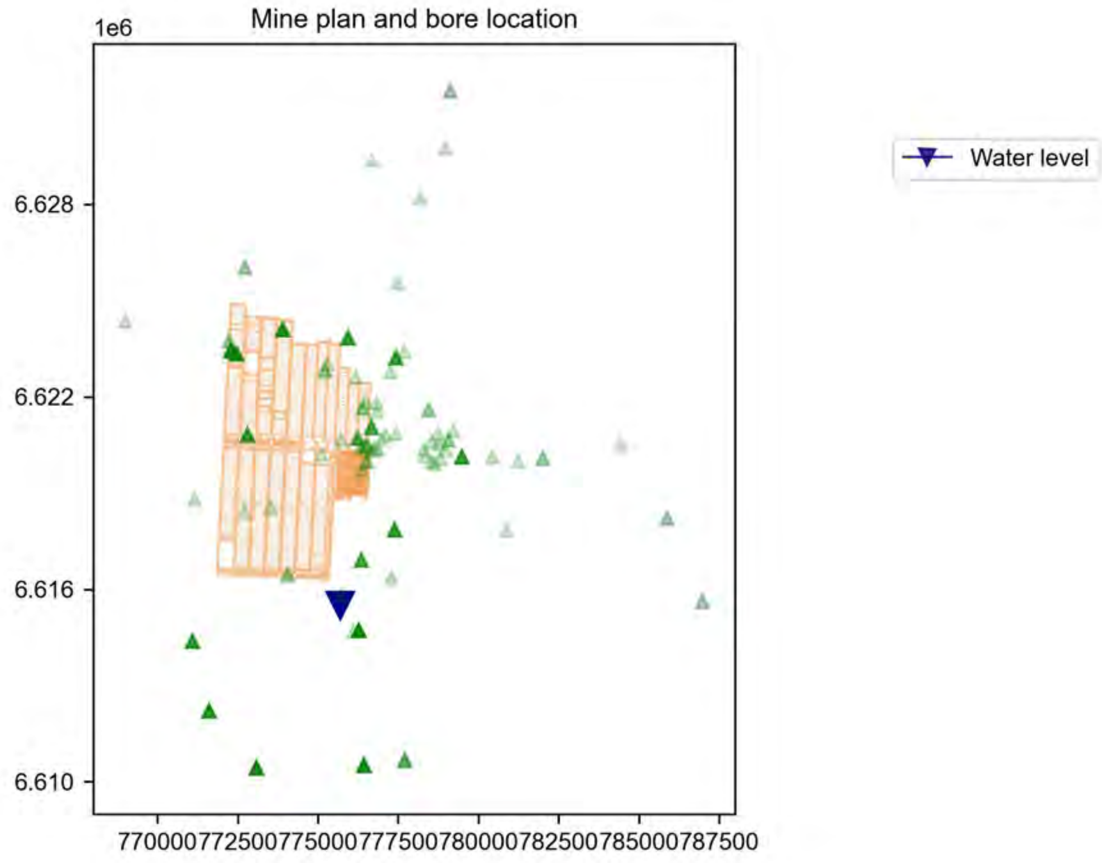
P91 (Mayfield Spring; No outcrop info)





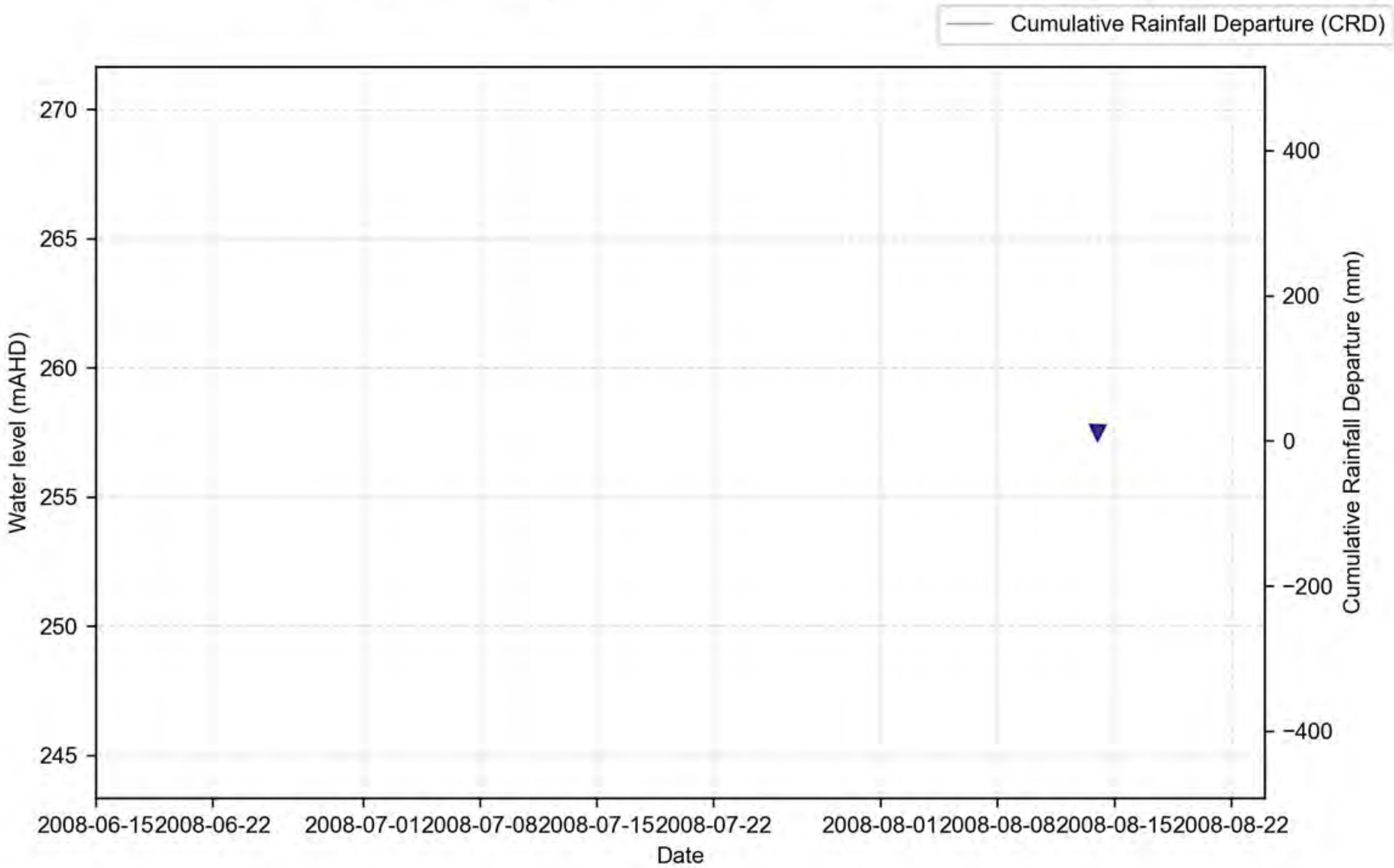
P92 (Mayfield Spring; No outcrop info)

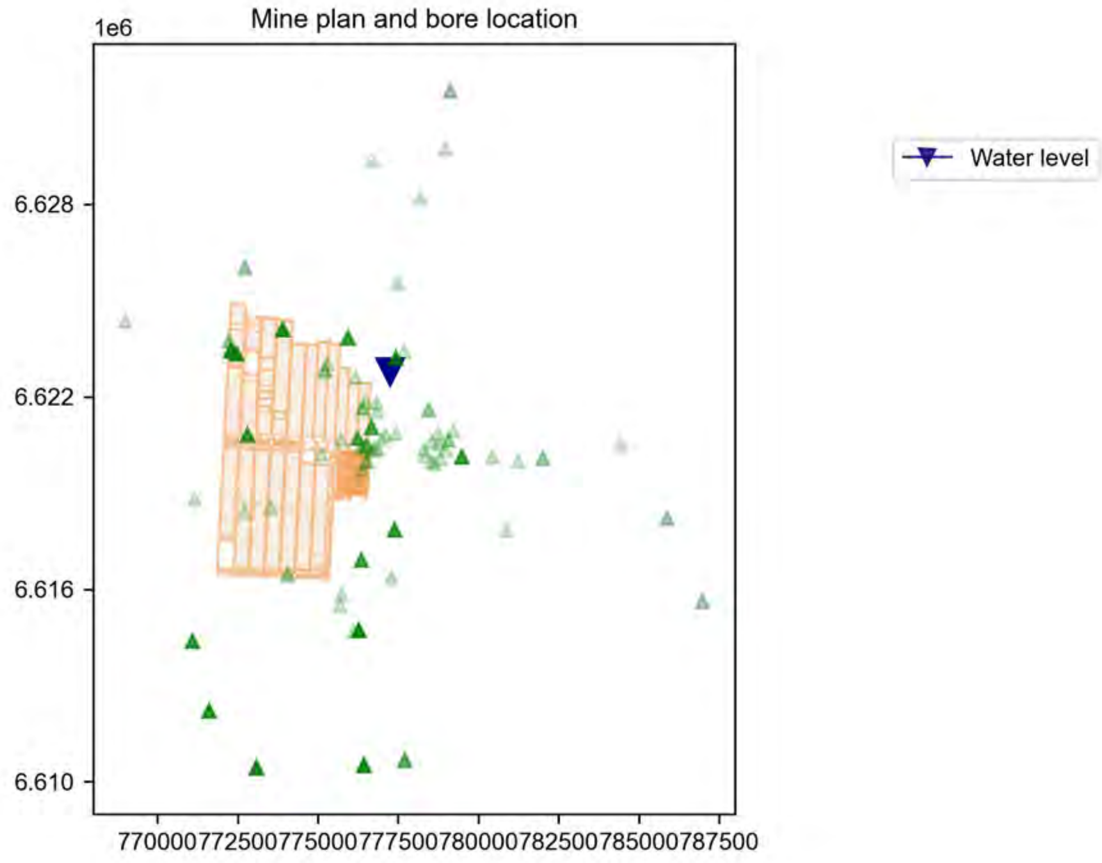




* mAHD - metres Australian Height Datum

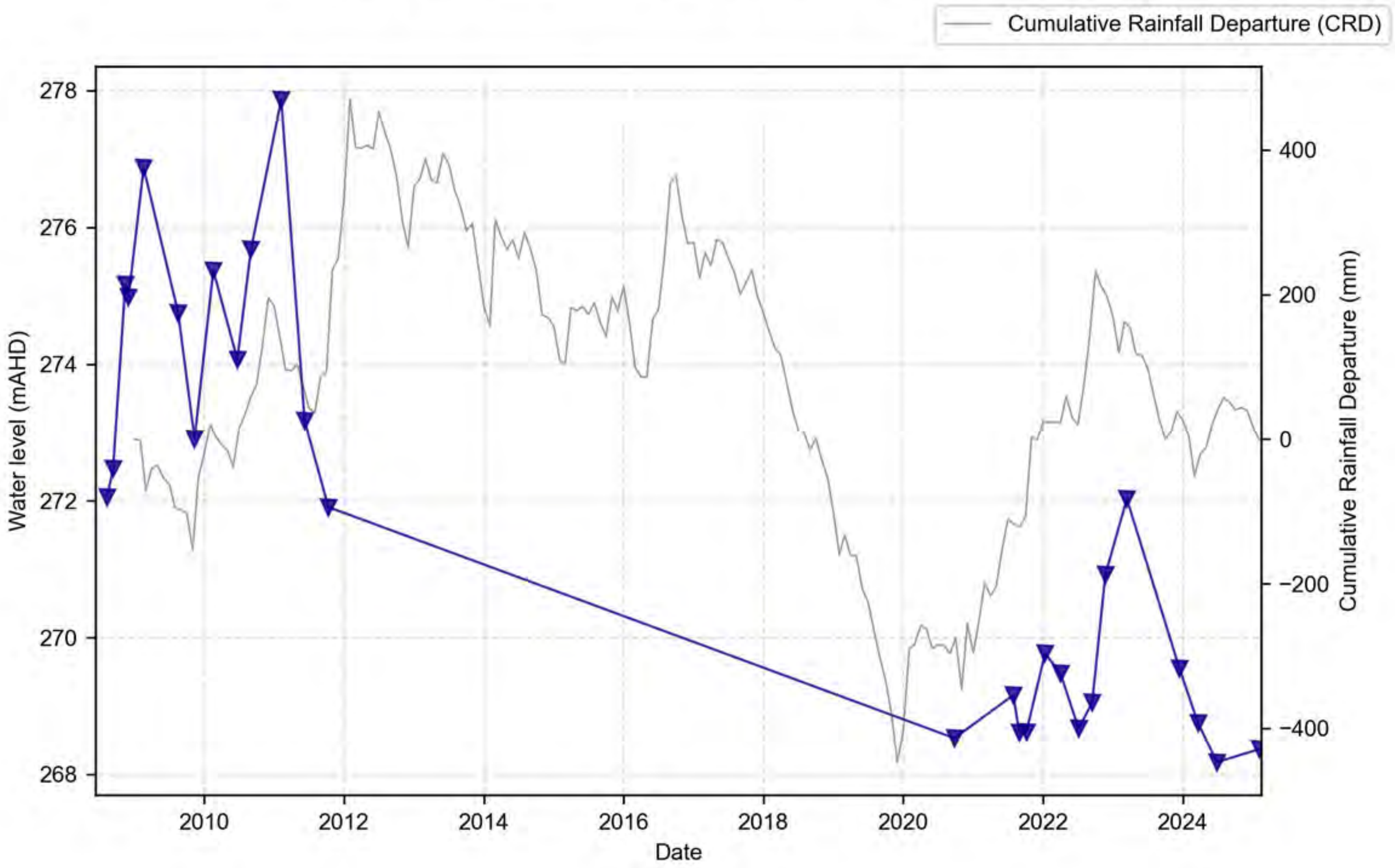
WB1 (Garrawilla Volcanics - old; No outcrop info)

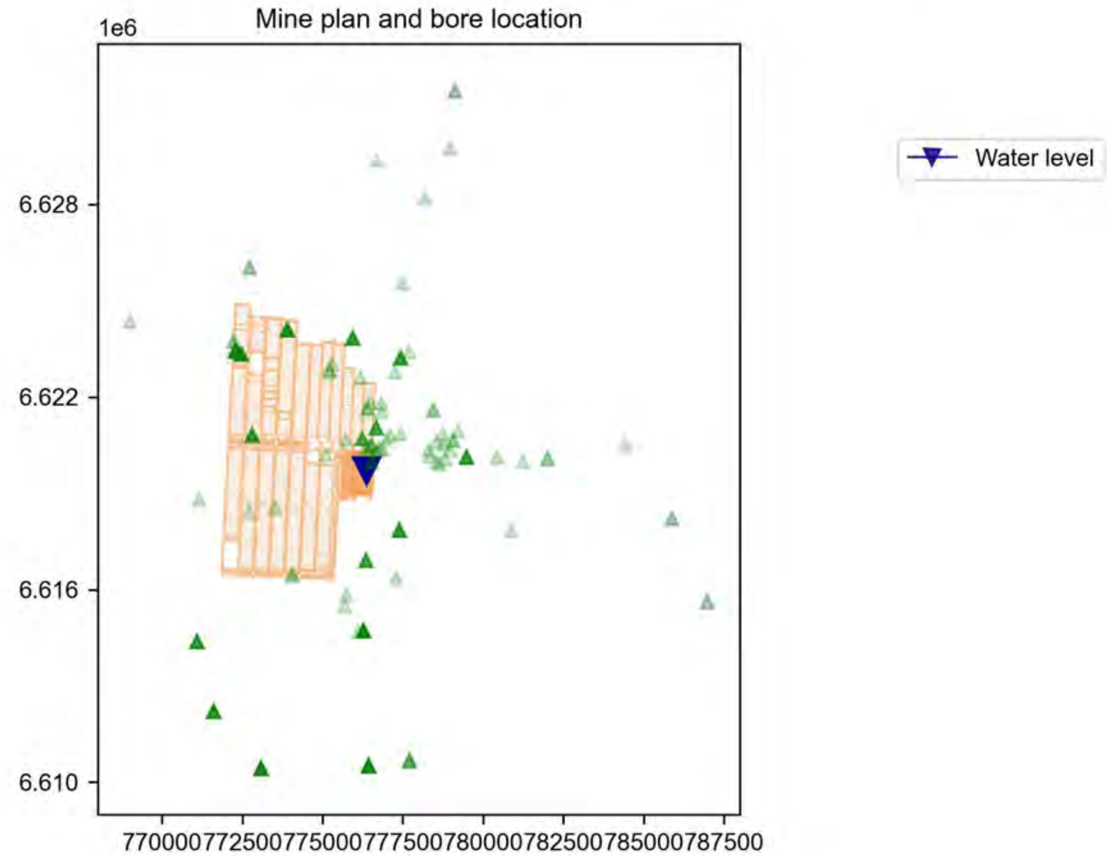




* mAHD - metres Australian Height Datum

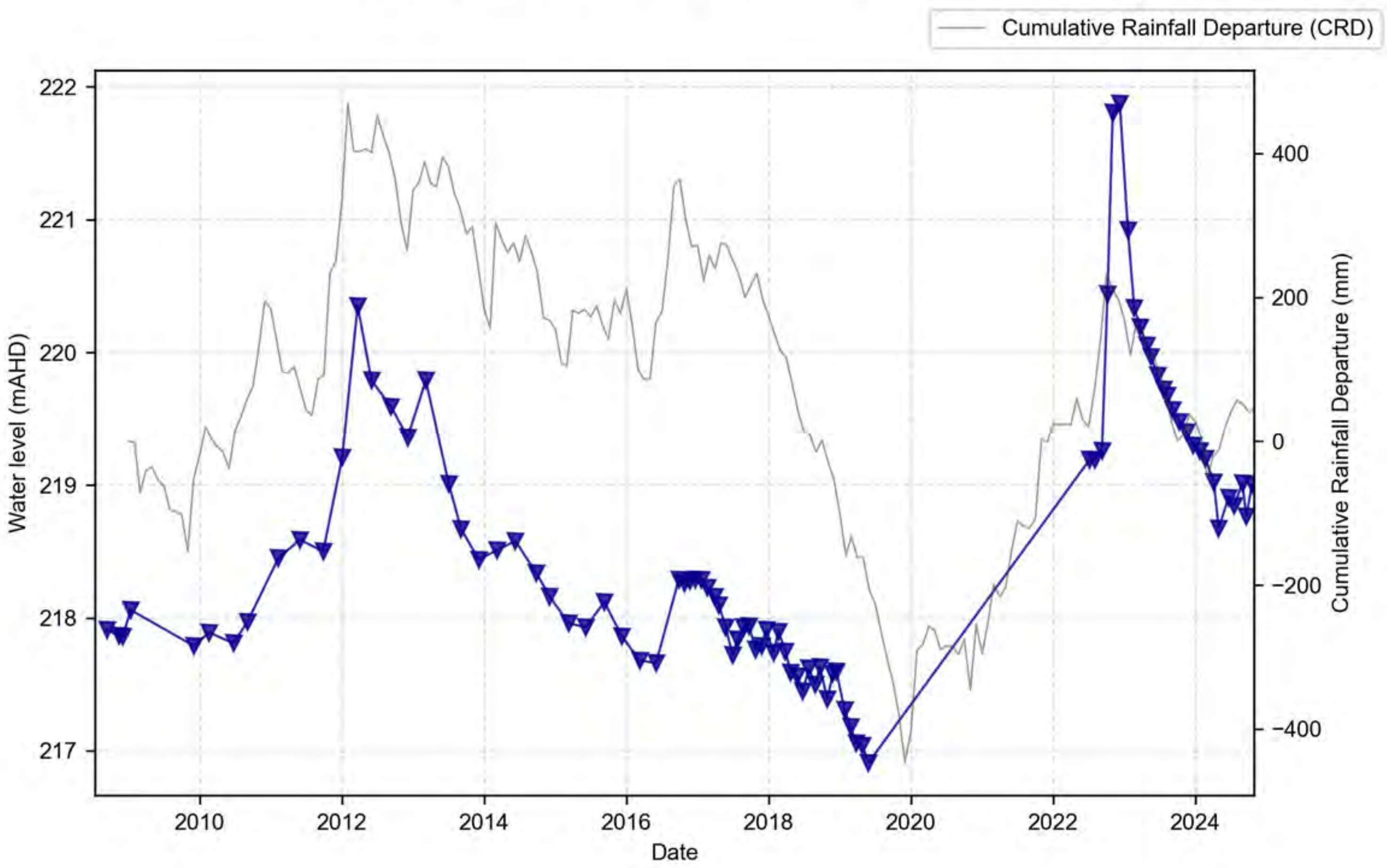
WB2 (Garrawilla Volcanics - old; Outcrop)

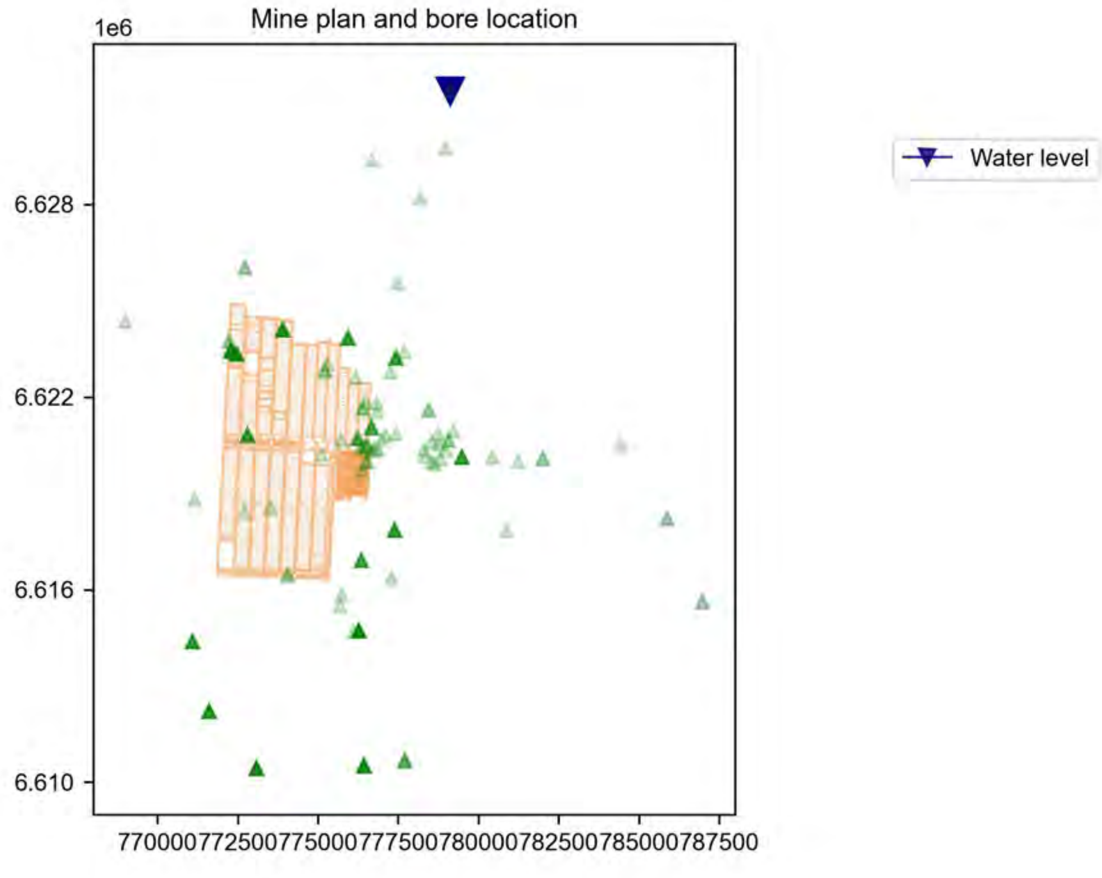




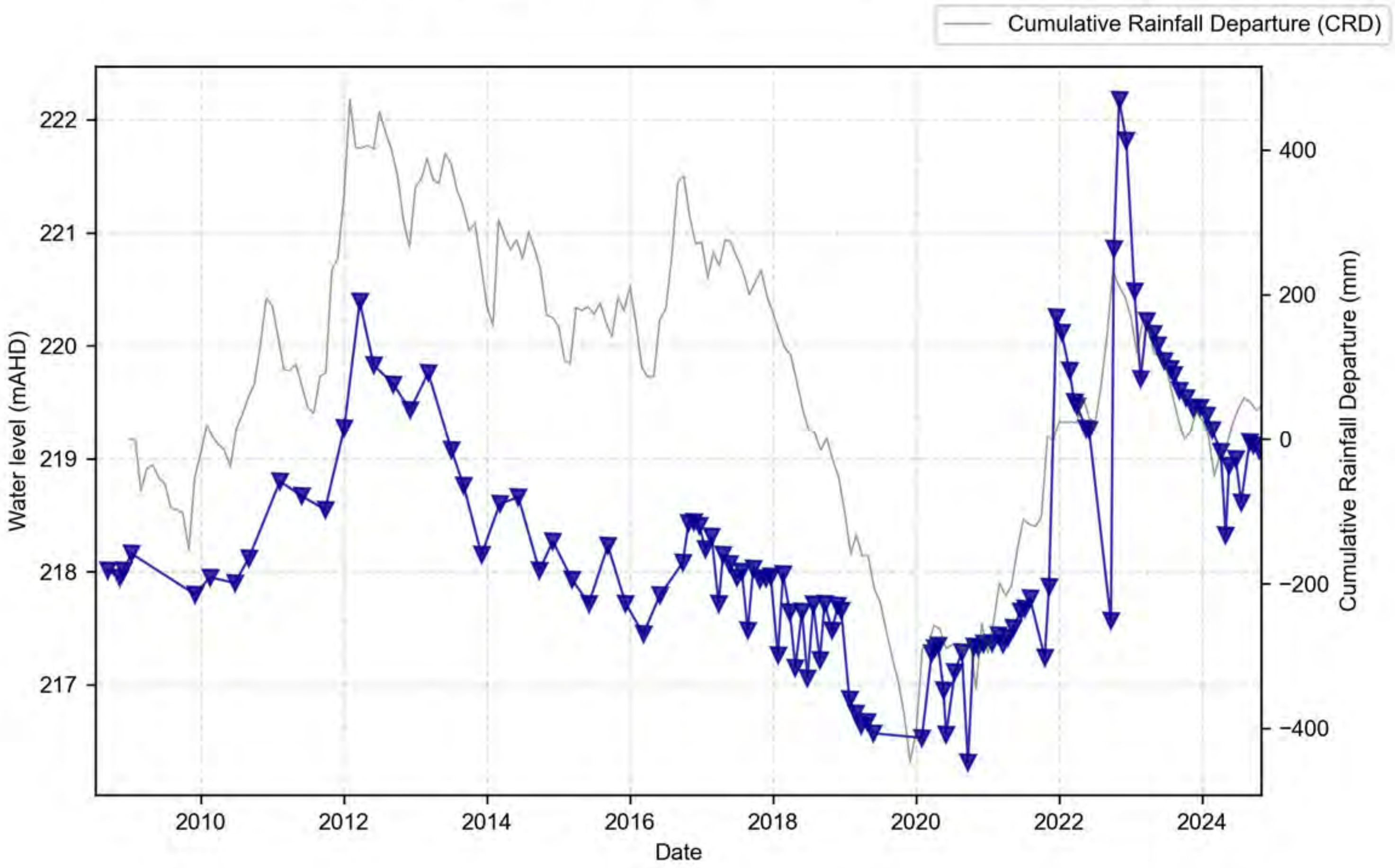
* mAHD - metres Australian Height Datum

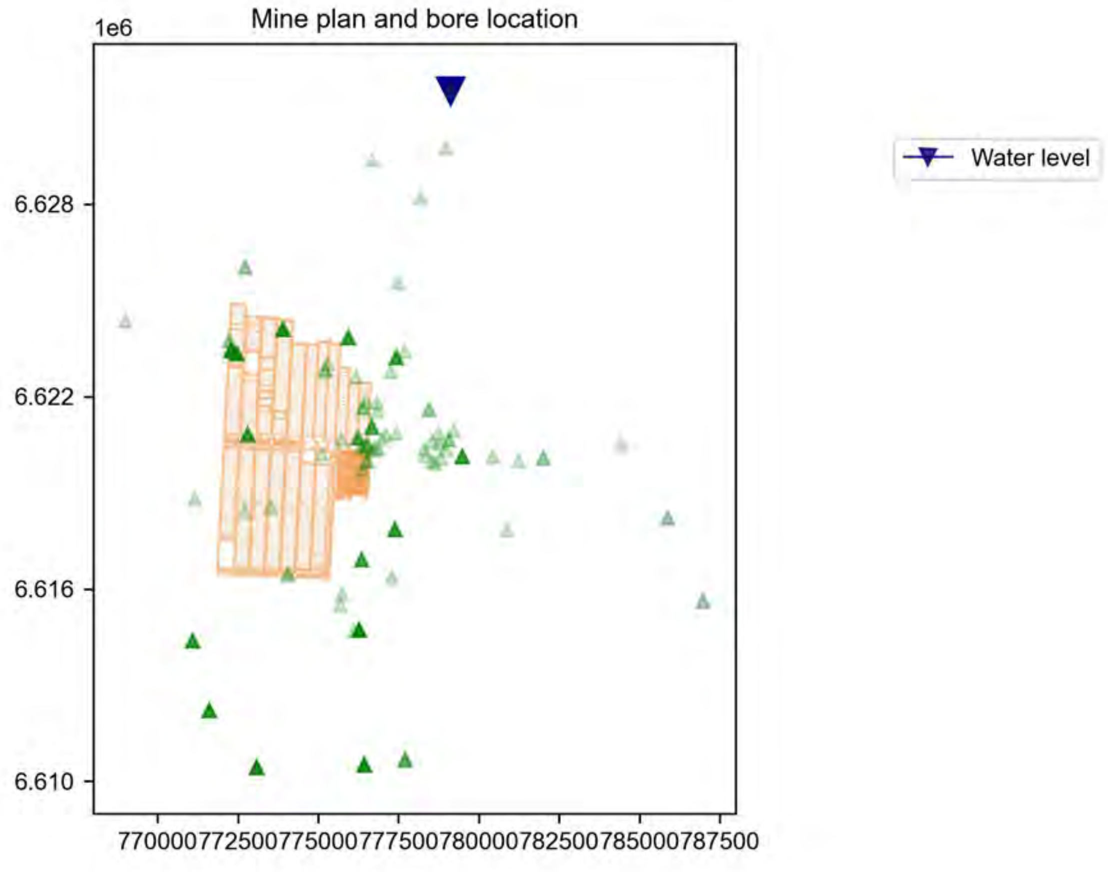
WB3a (Alluvium - Water NSW; Outcrop)





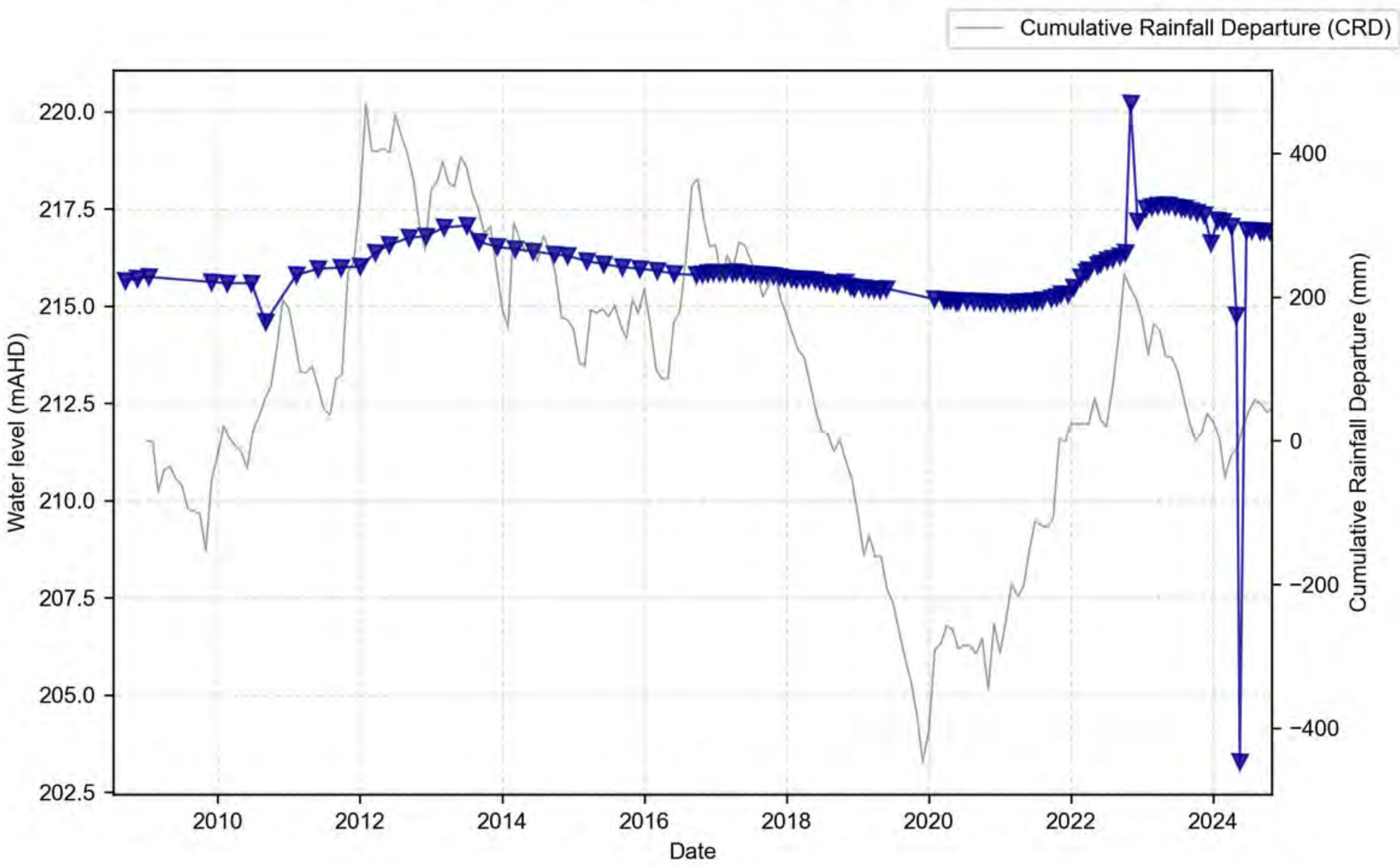
WB3b (Alluvium - Water NSW; Outcrop)

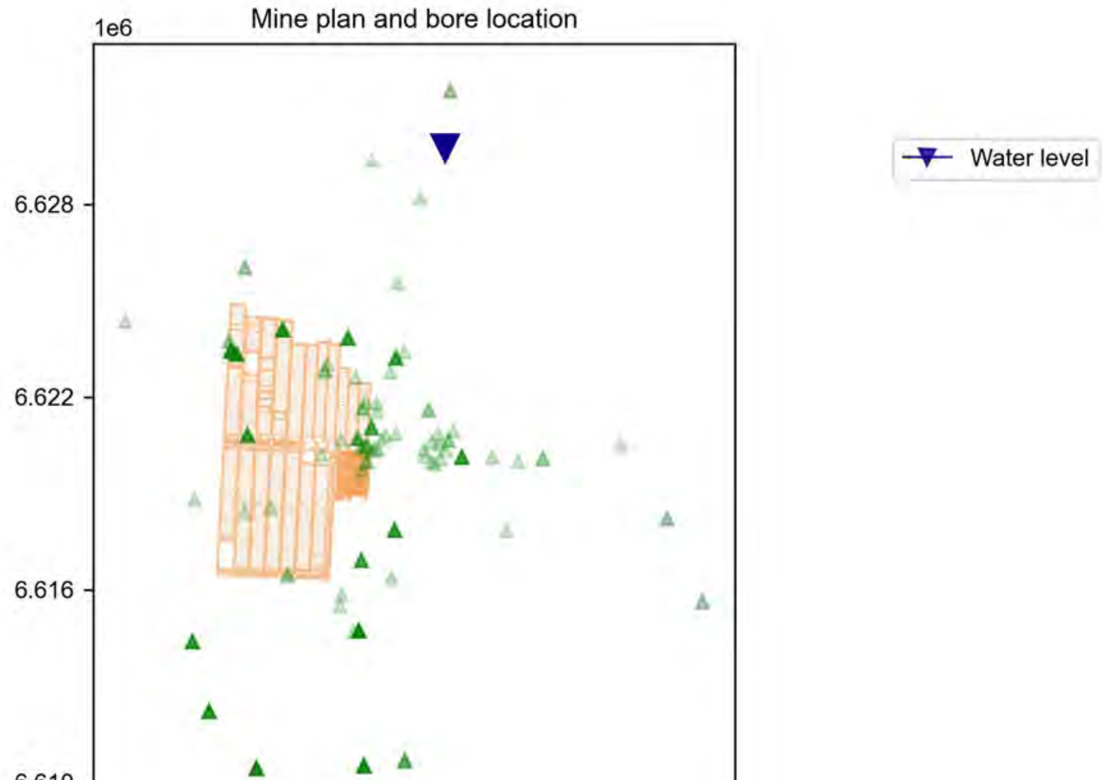




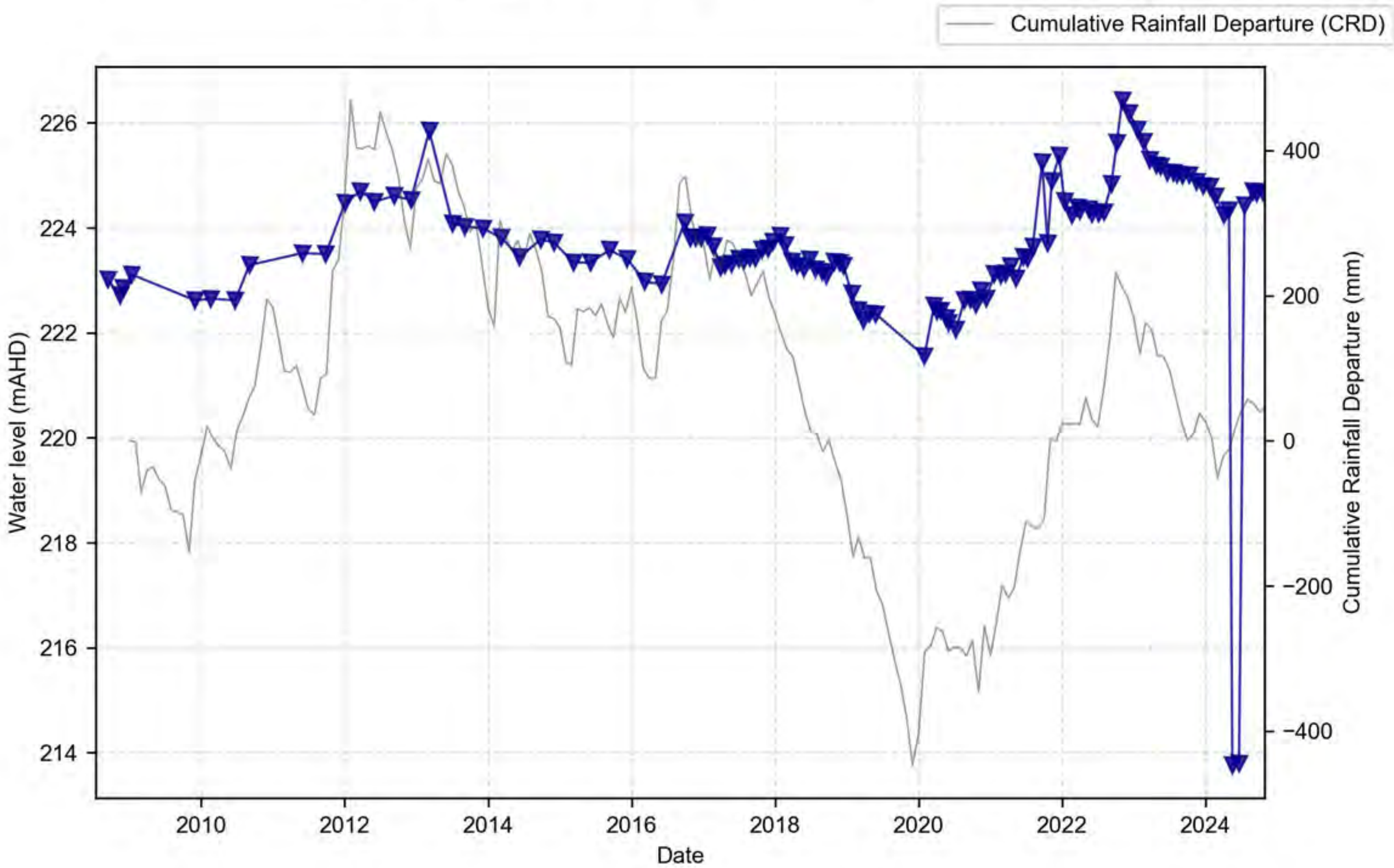
* mAHD - metres Australian Height Datum

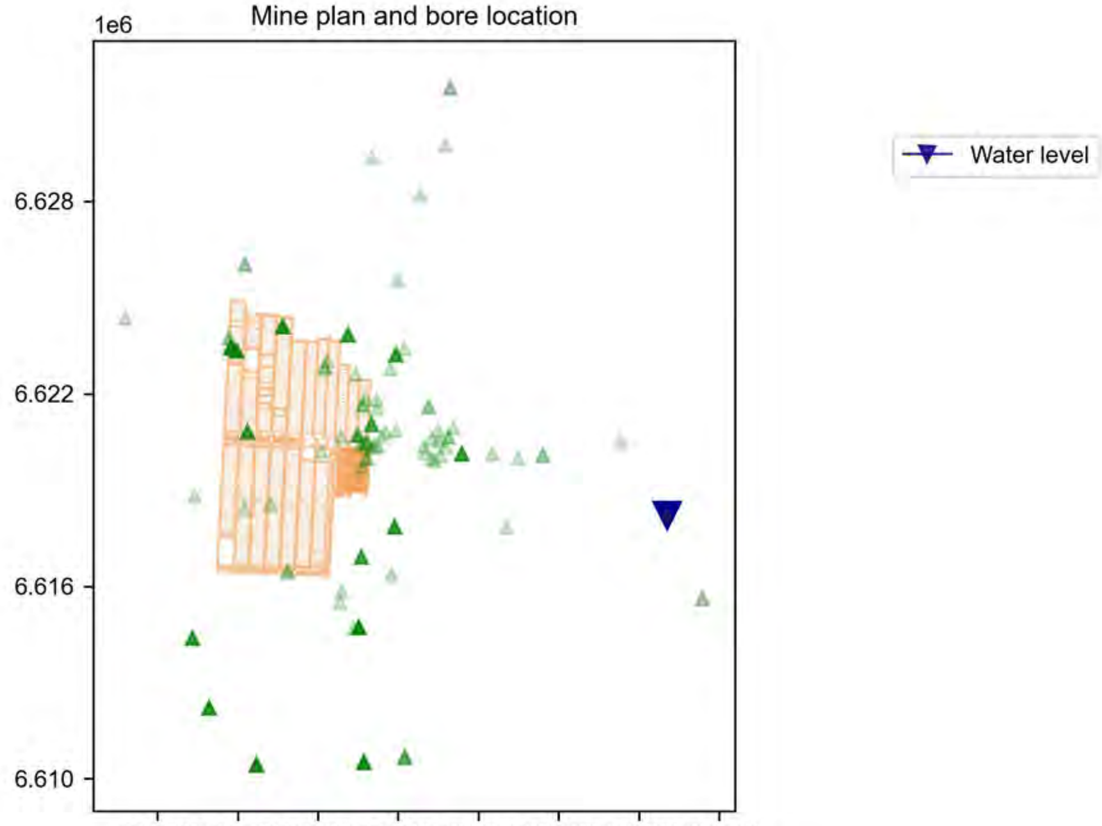
WB4 (Alluvium - Water NSW; Outcrop)



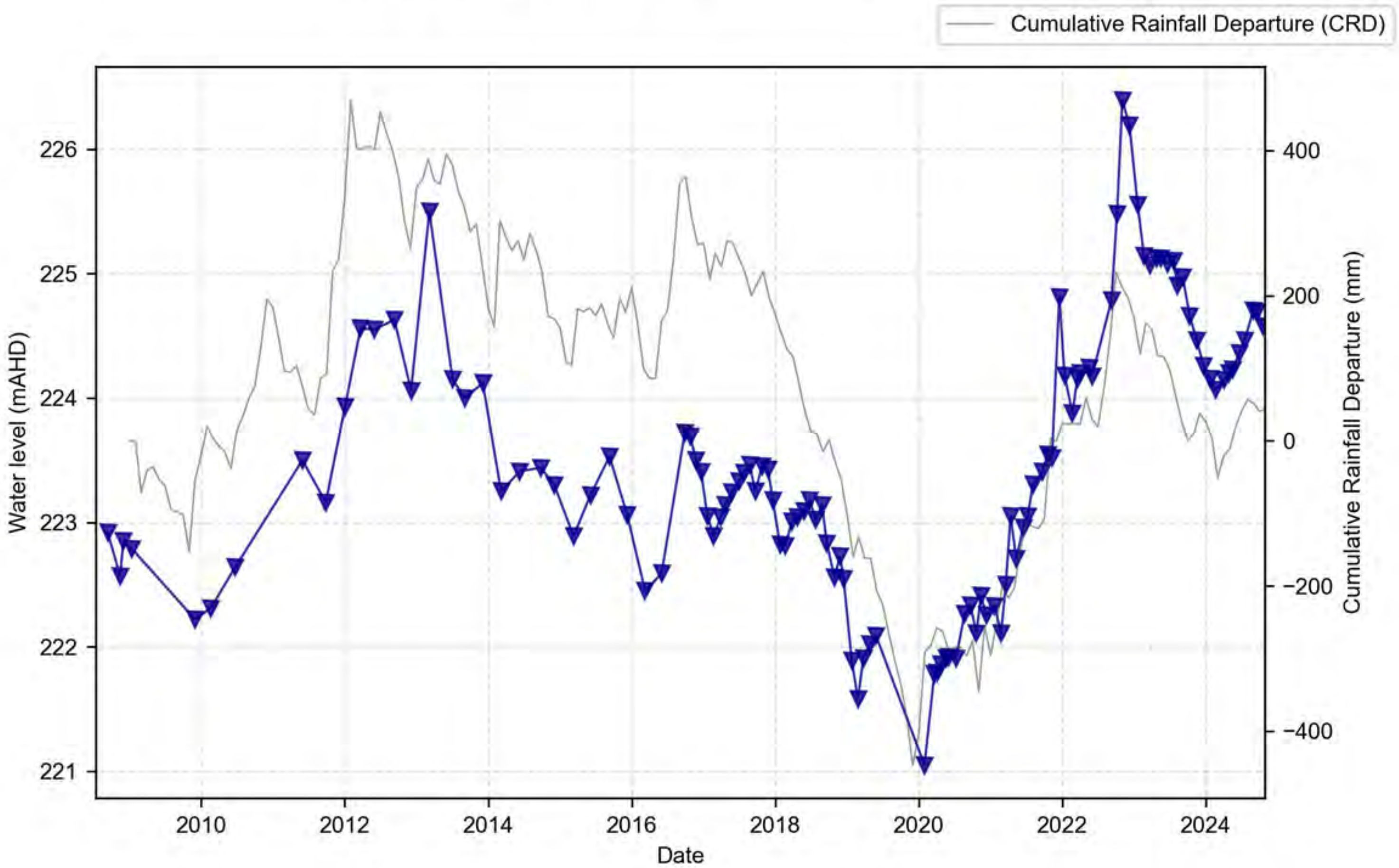


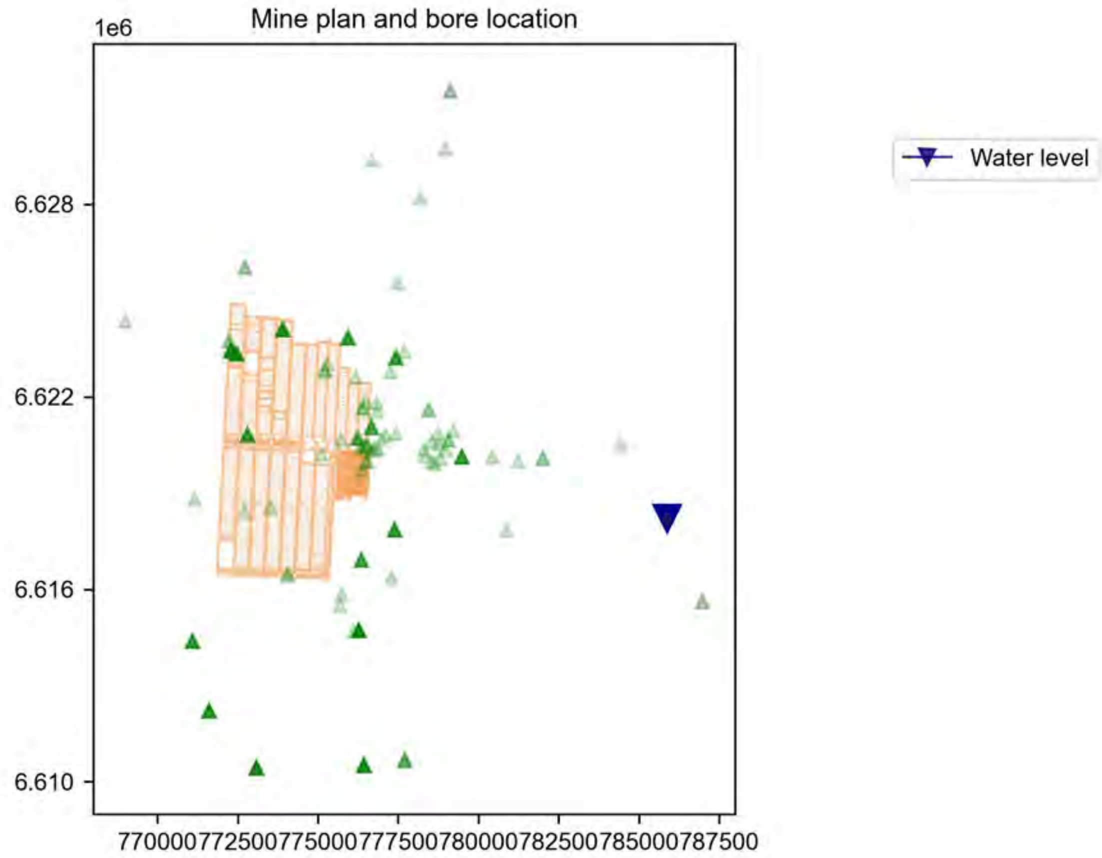
WB5a (Alluvium - Water NSW; Outcrop)



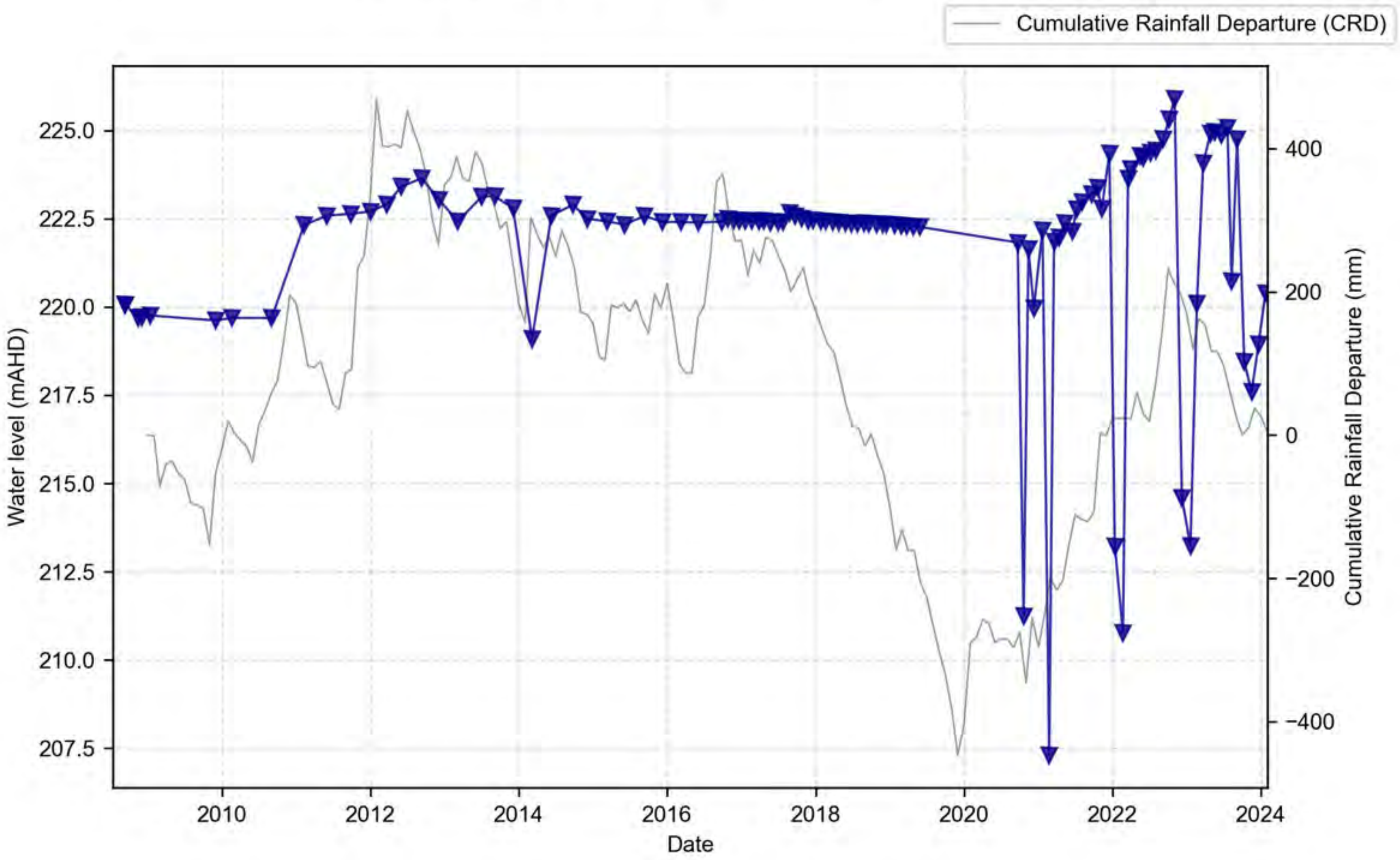


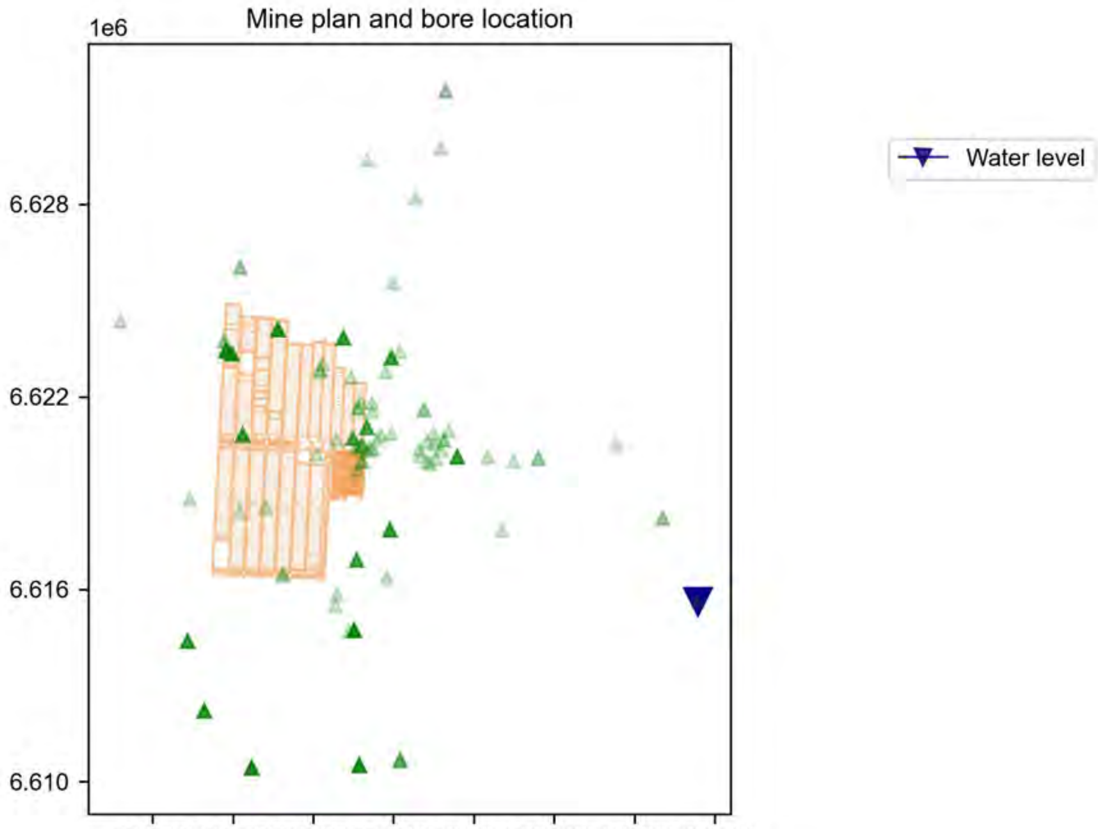
WB5b (Alluvium - Water NSW; Outcrop)



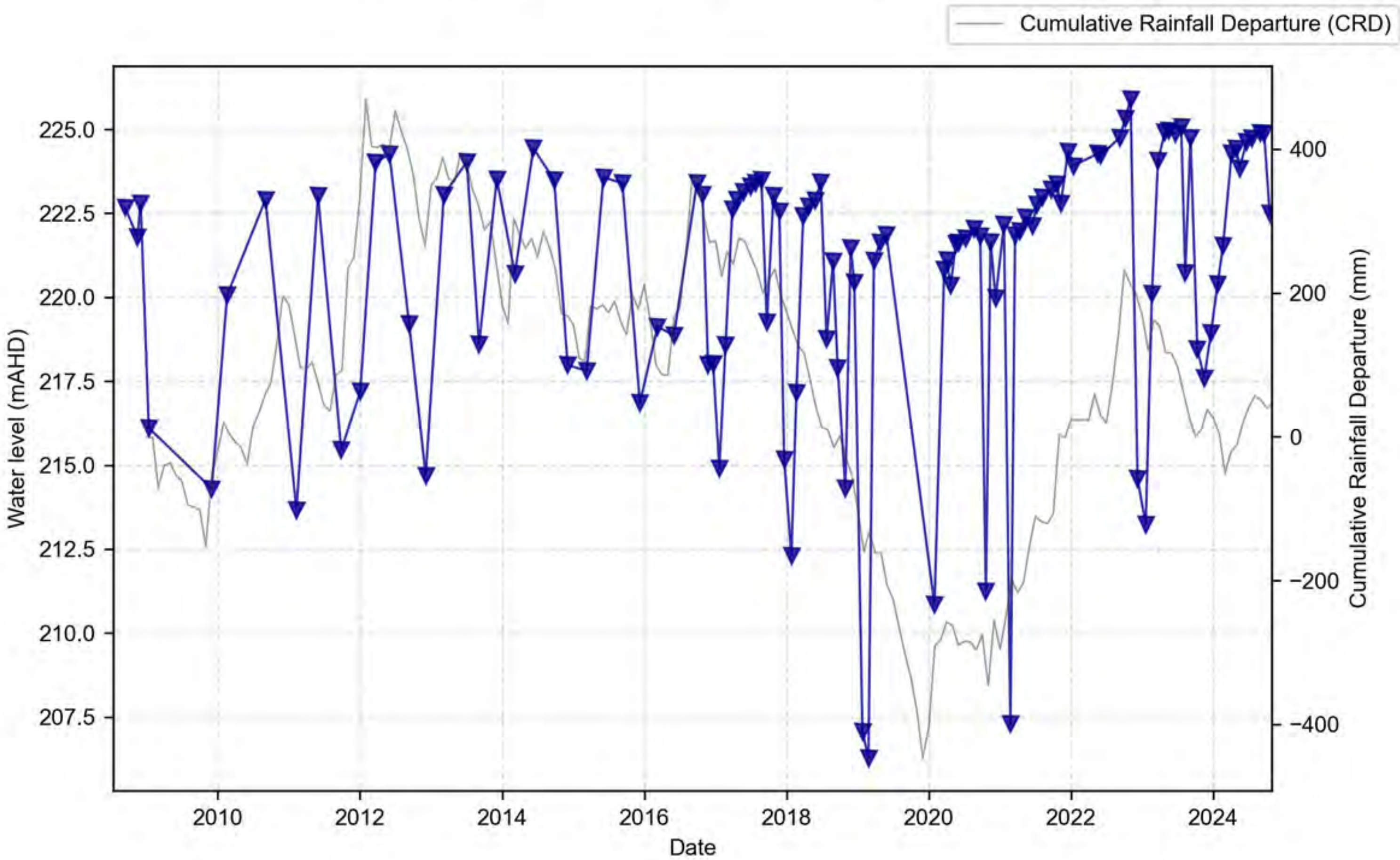


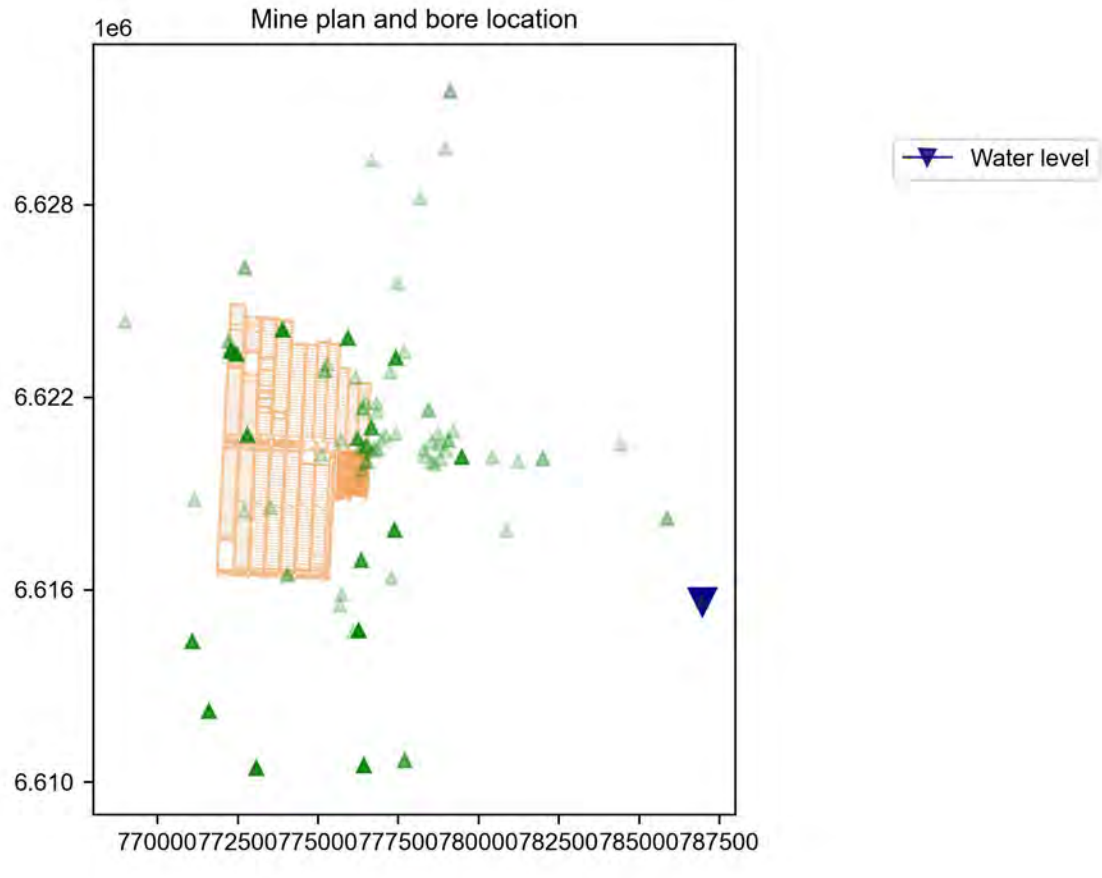
WB6a (Alluvium - Water NSW; Outcrop)



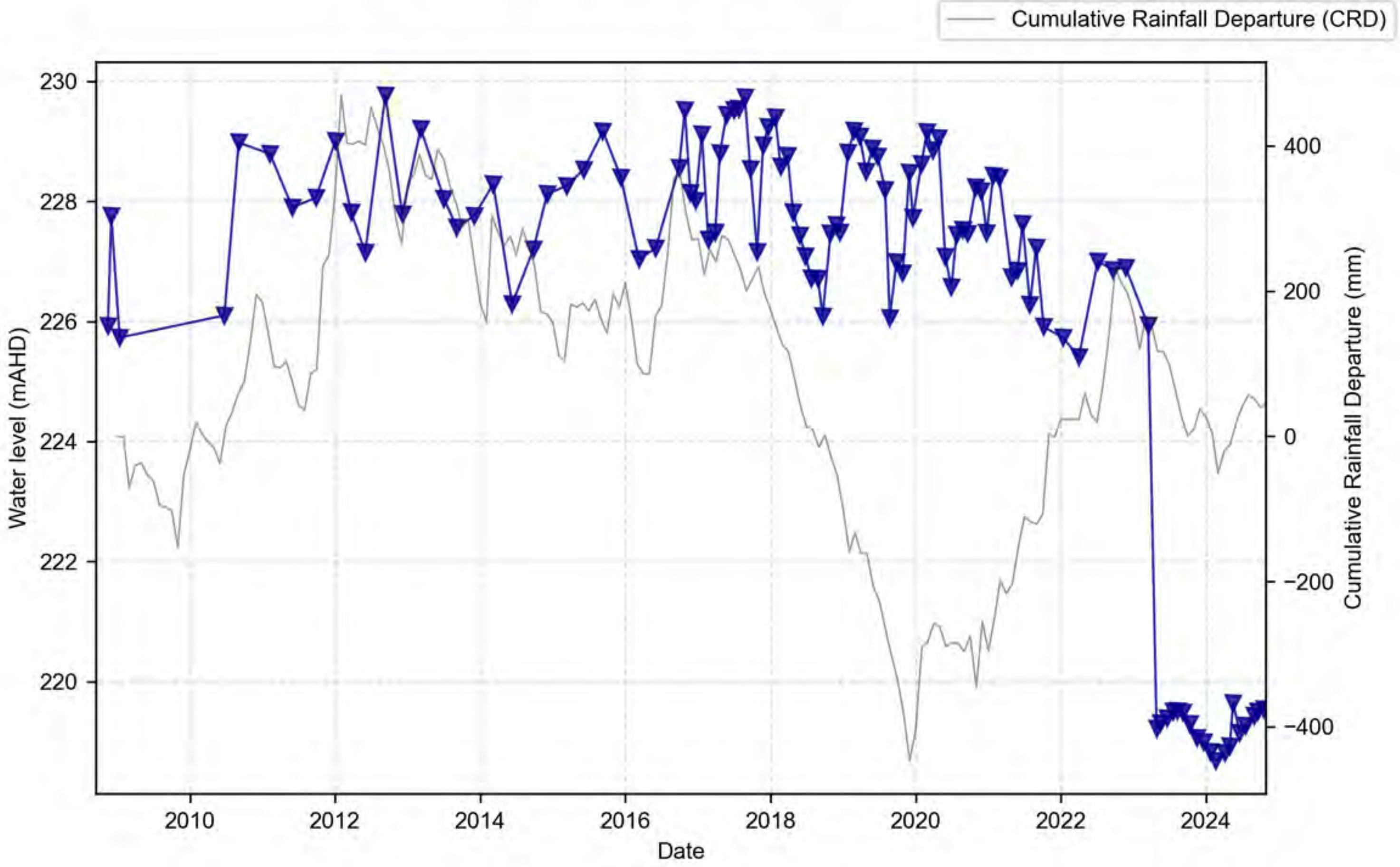


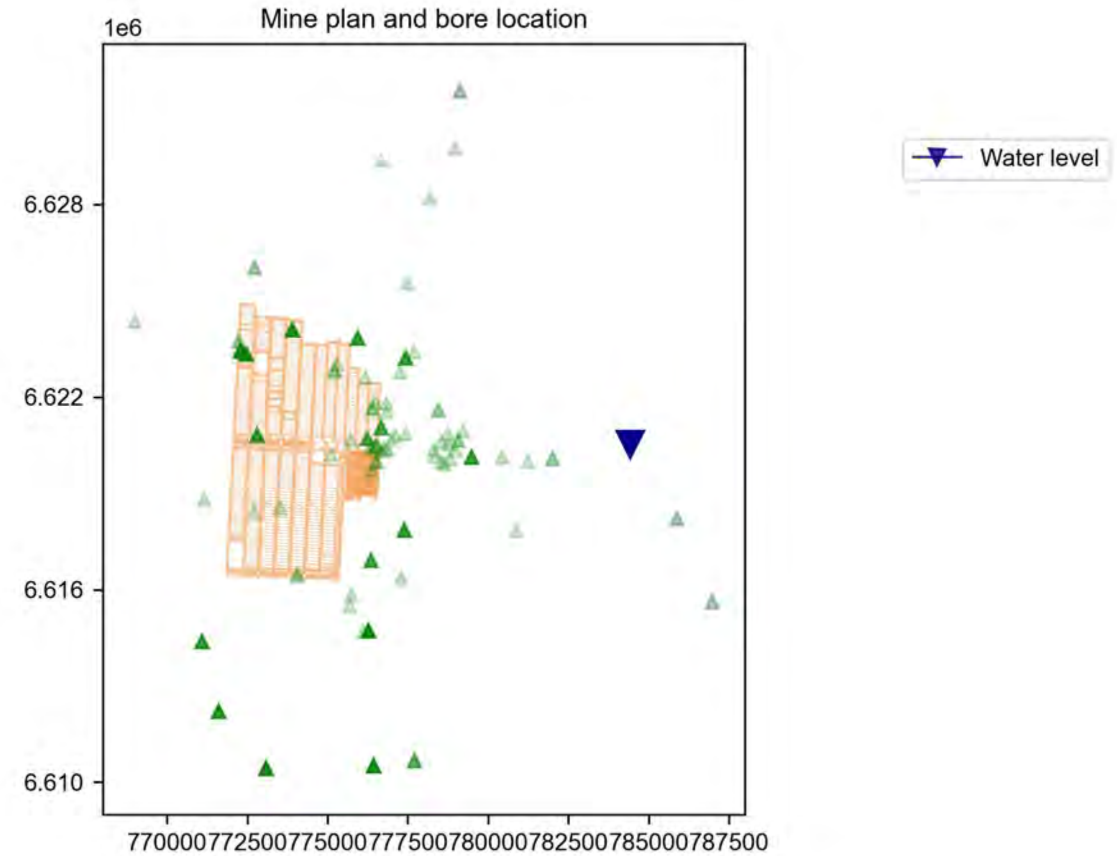
WB6b (Alluvium - Water NSW; Outcrop)





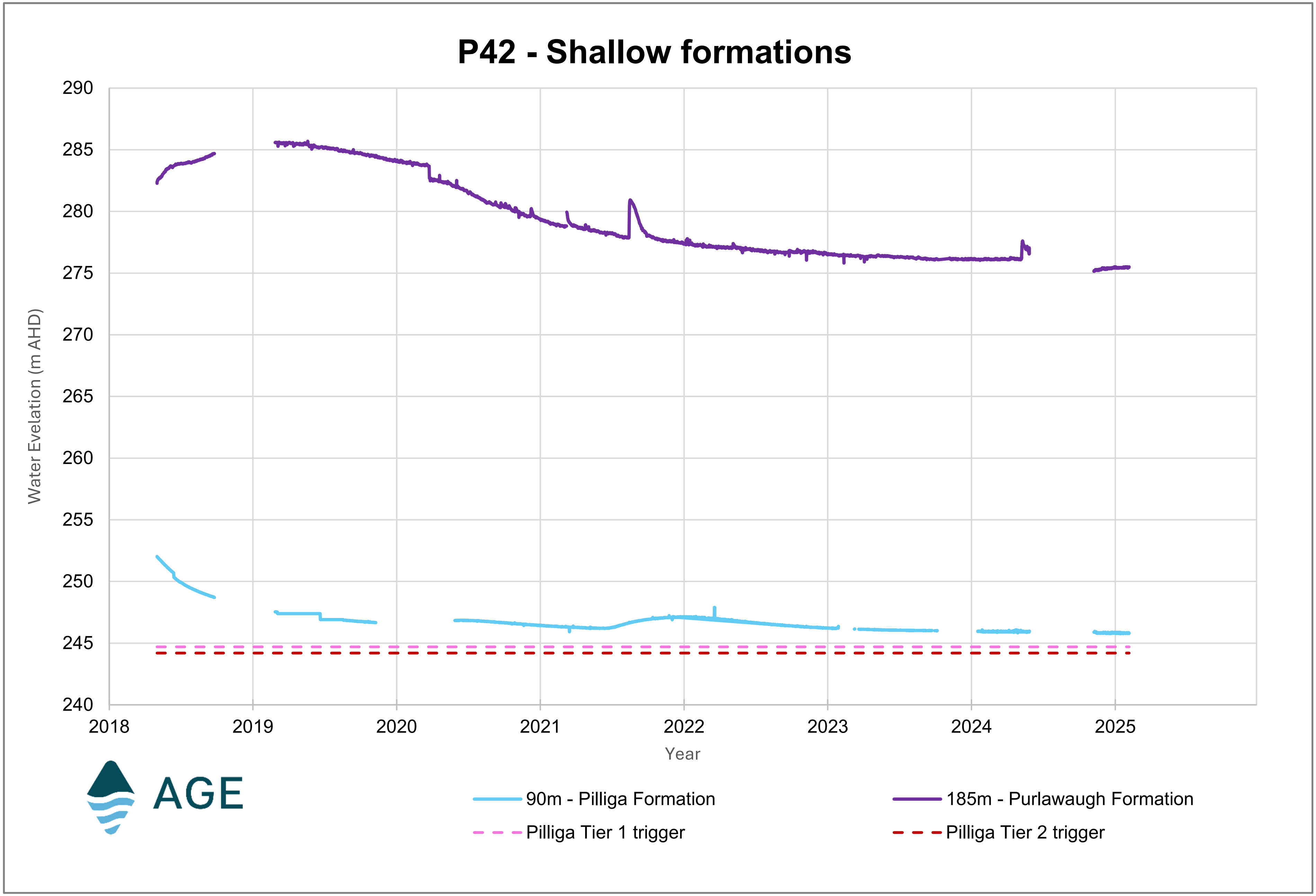
WB7 (Alluvium - Water NSW; Outcrop)

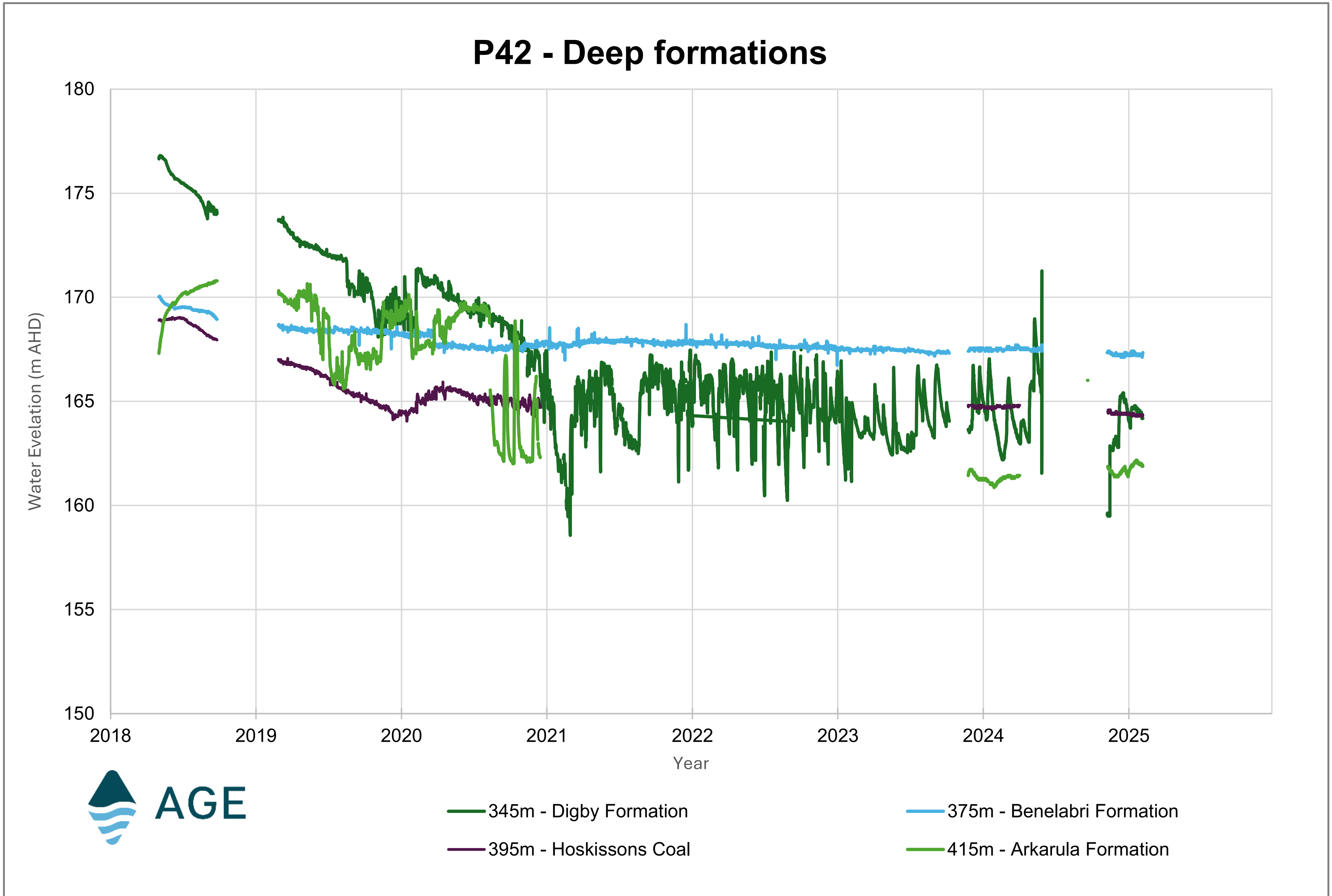




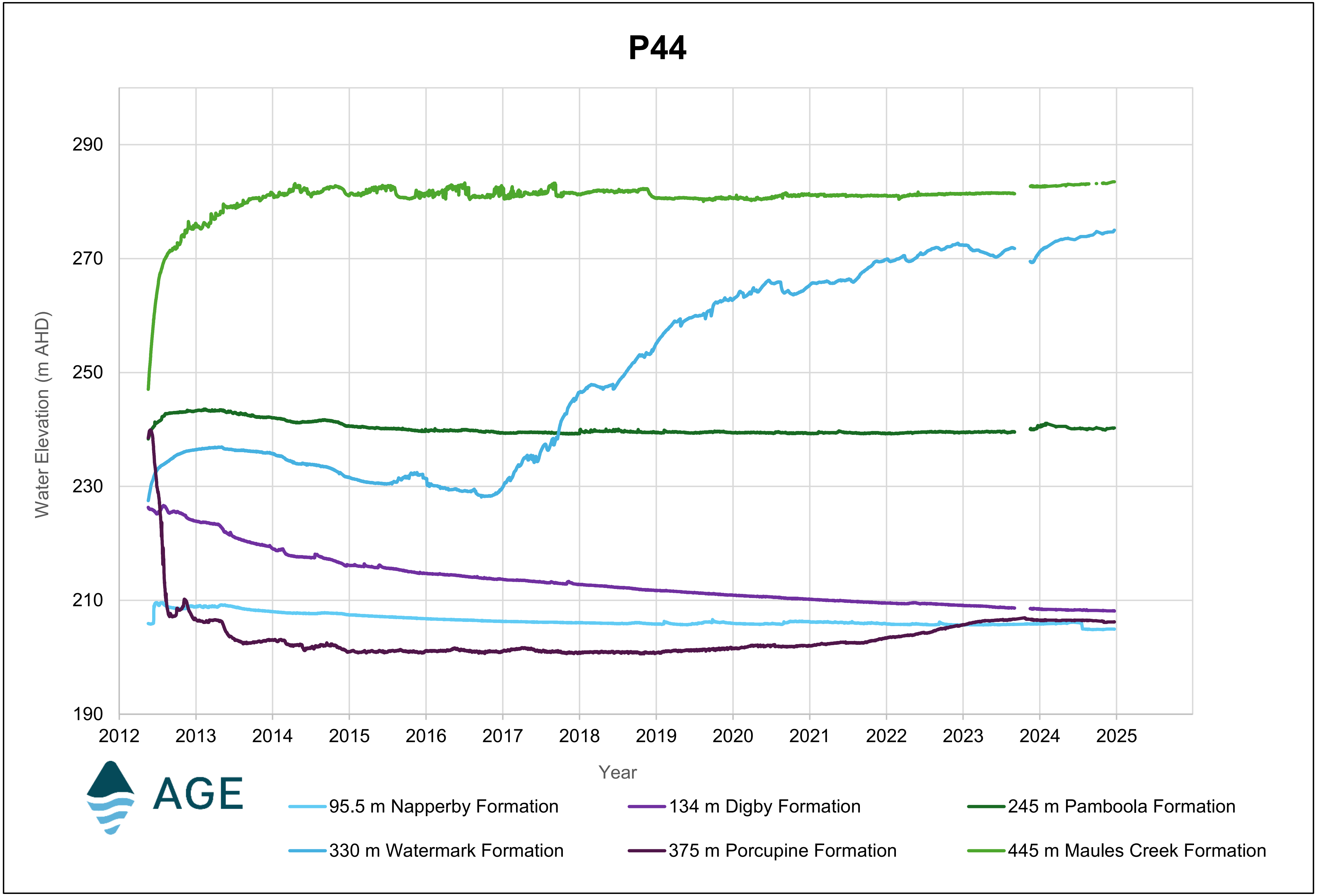
Appendix C

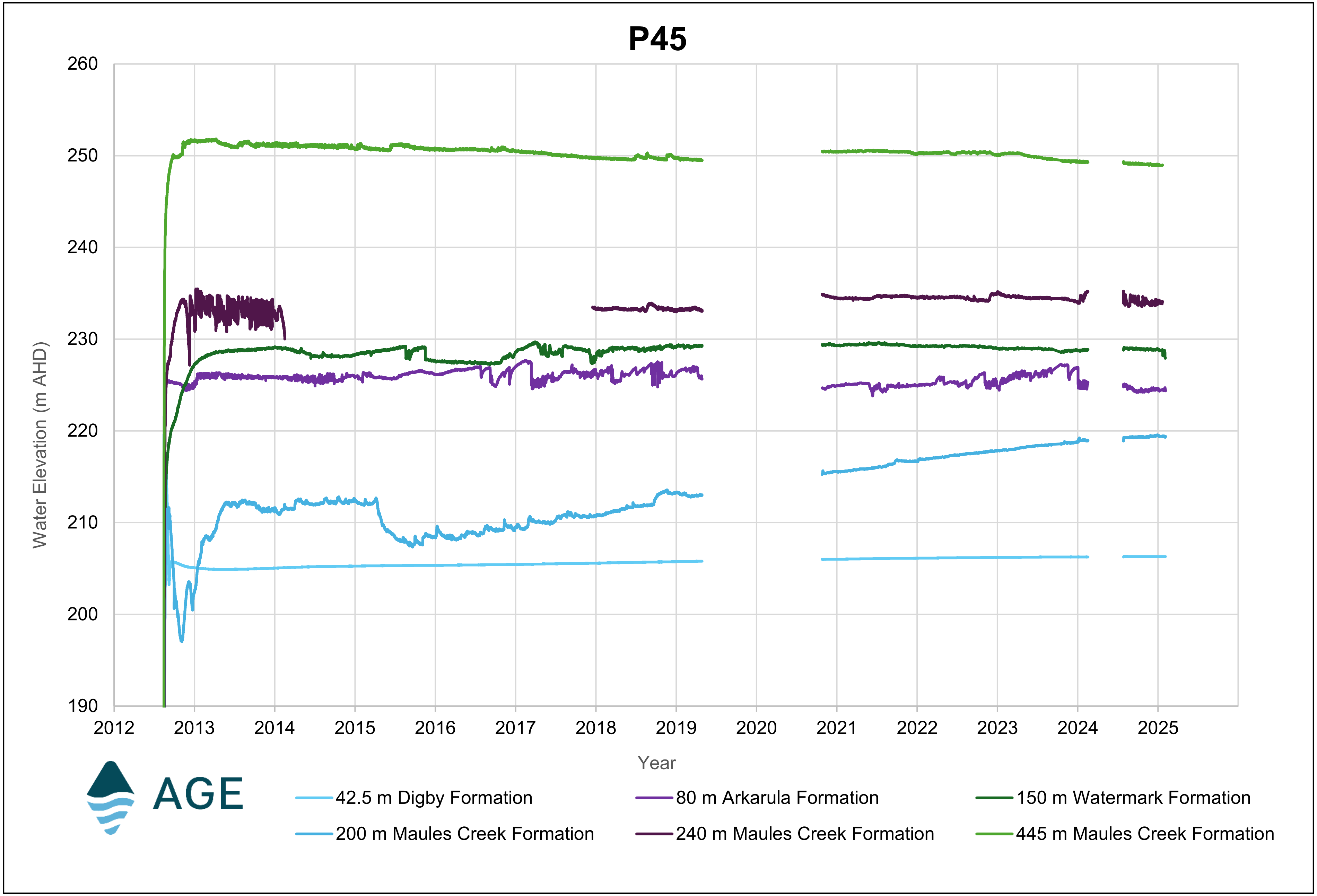
VWP hydrographs

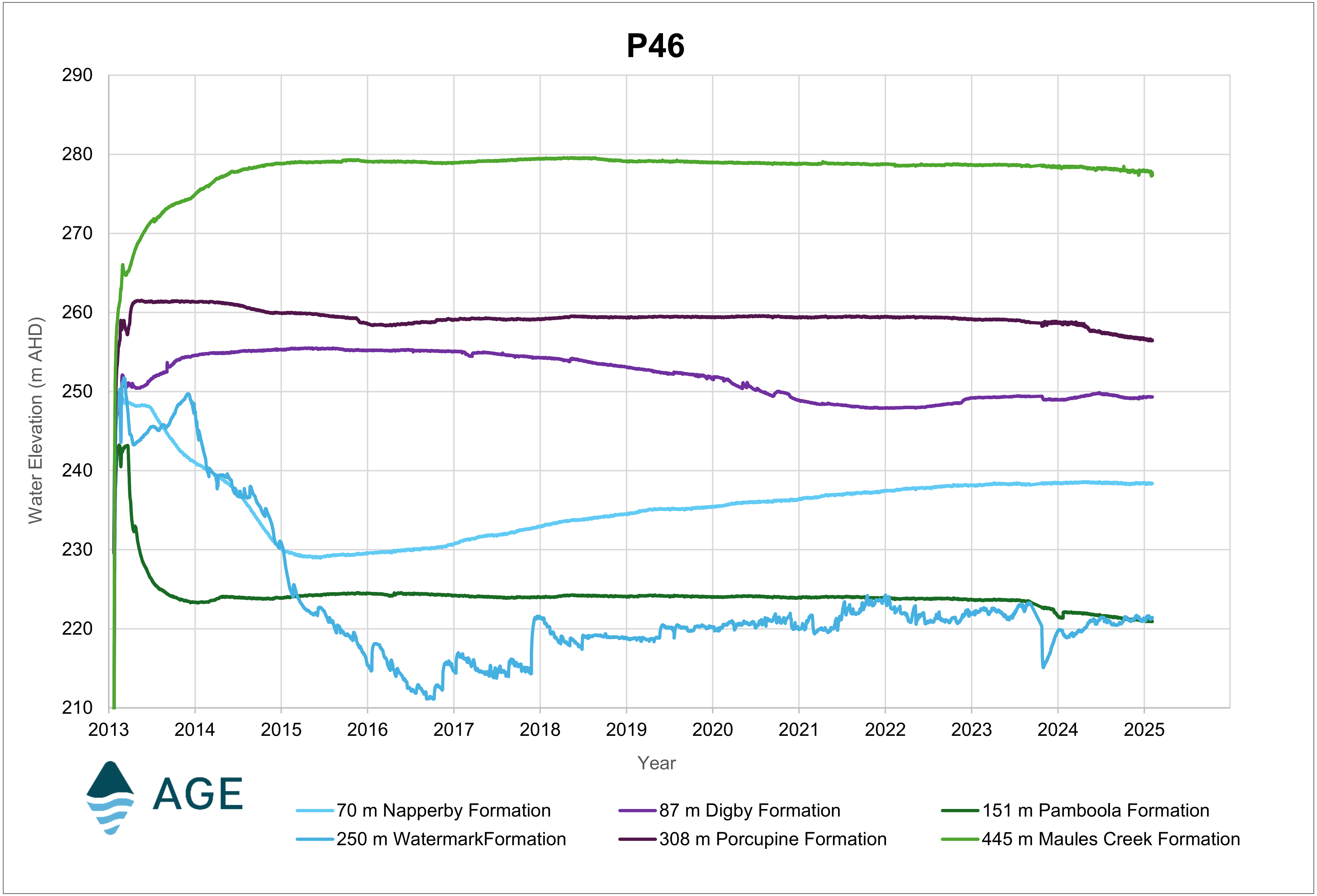

P42 - Shallow formations
Water Evelation (m AHD)
290
285
280
275
270
265
260
255
250
245
240
2018
2019
2020
2021
2022
2023
2024
2025
Year
AGE
90m - Pilliga Formation
185m - Purlawaugh Formation
Pilliga Tier 1 trigger
Pilliga Tier 2 trigger

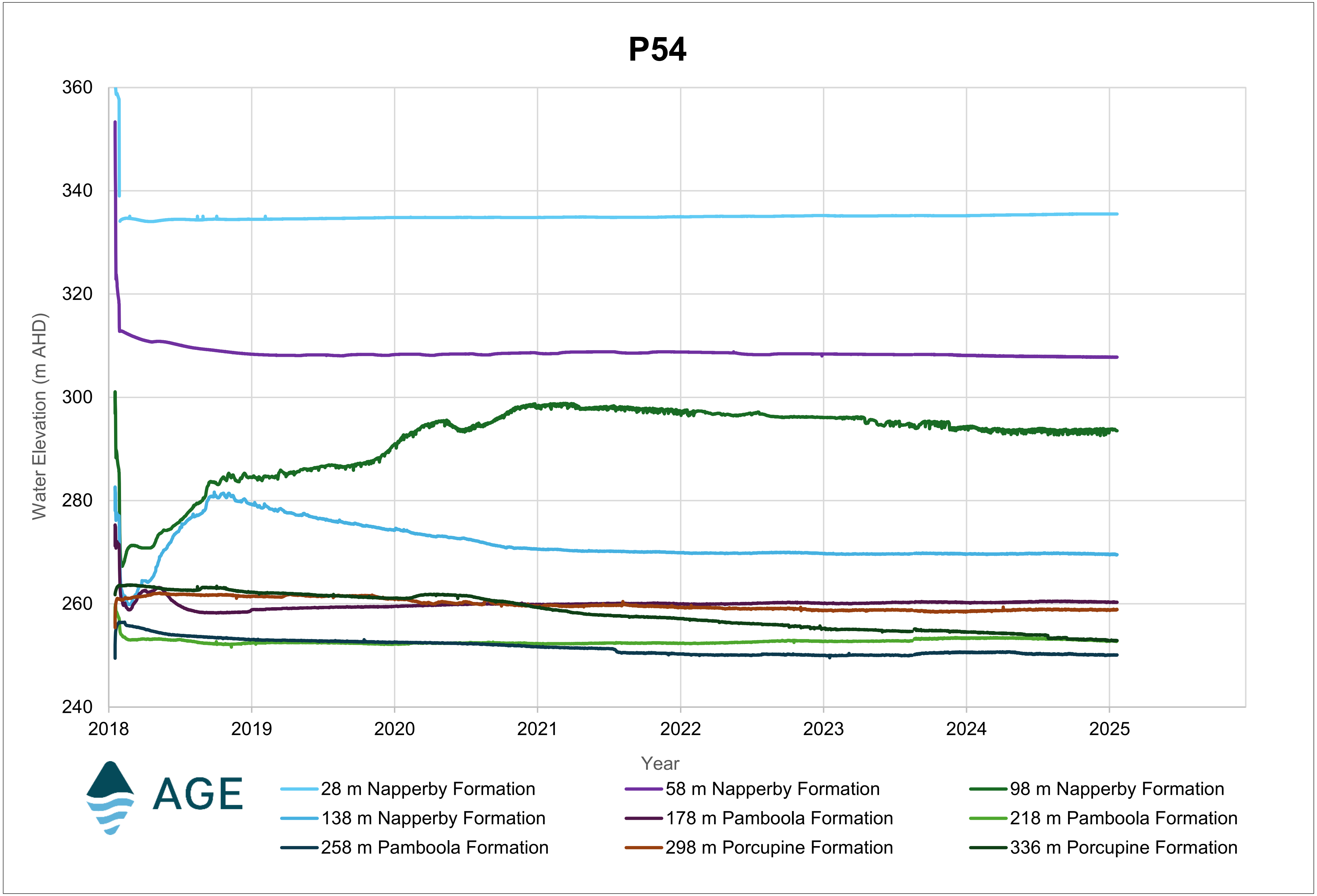


P42 - Deep formations
Water Evelation (m AHD)
180
175
170
165
160
155
150
2018
2019
2020
2021
2022
2023
2024
2025
Year
345m - Digby Formation
375m - Benelabri Formation
395m - Hoskissons Coal
415m - Arkarula Formation

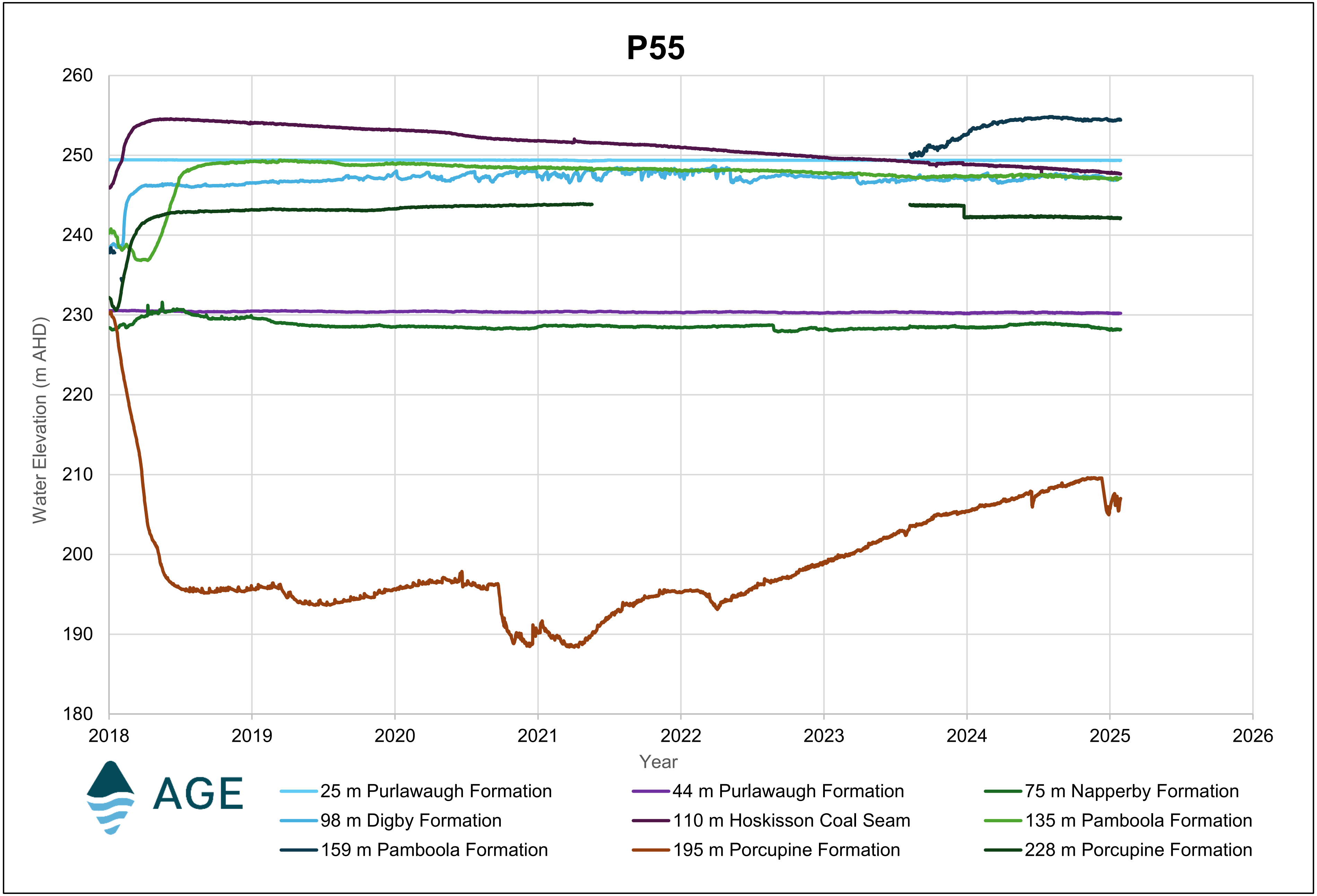

P44
Water Elevation (m AHD)
290
270
250
230
210
190
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Year
AGE
95.5 m Napperby Formation
134 m Digby Formation
245 m Pamboola Formation
330 m Watermark Formation
375 m Porcupine Formation
445 m Maules Creek Formation


P45
260
250
240
230
220
210
200
190
Water Elevation (m AHD)
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Year
AGE
42.5 m Digby Formation
80 m Arkarula Formation
150 m Watermark Formation
200 m Maules Creek Formation
240 m Maules Creek Formation
445 m Maules Creek Formation

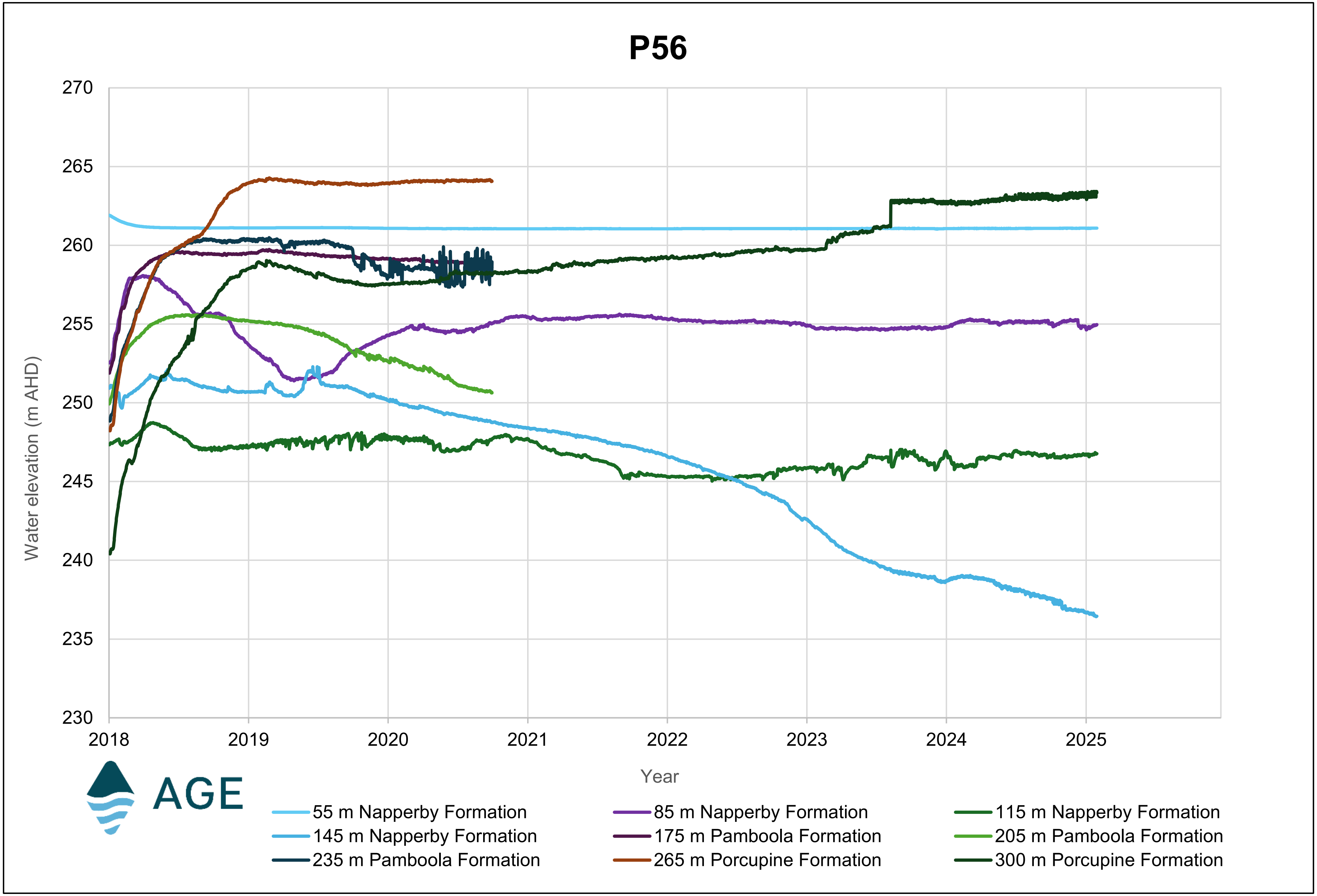

P46
290
280
270
260
250
240
230
220
210
Water Elevation (m AHD)
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Year
AGE
70 m Napperby Formation
87 m Digby Formation
151 m Pamboola Formation
250 m WatermarkFormation
308 m Porcupine Formation
445 m Maules Creek Formation

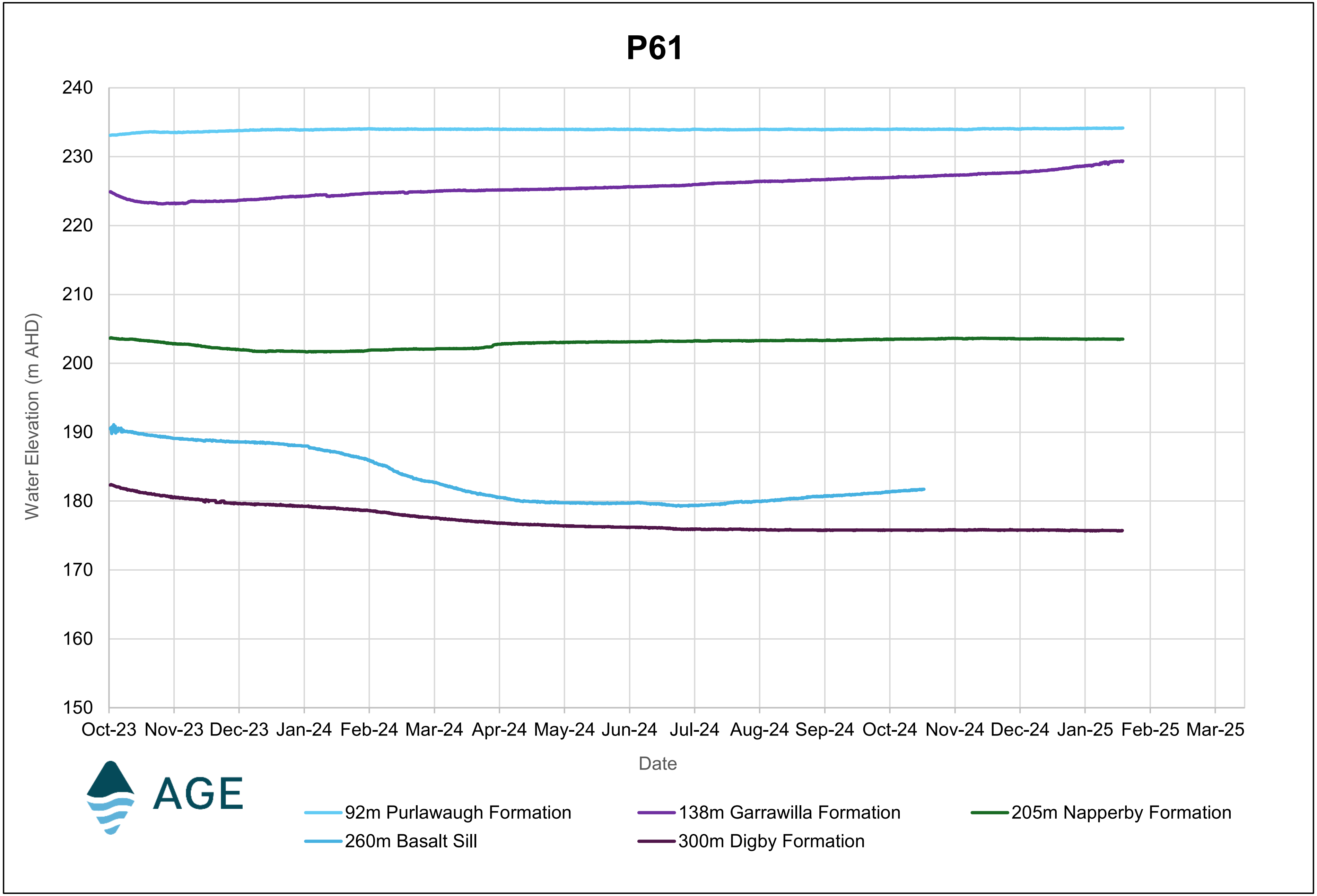


P54
Water Elevation (m AHD)
360
340
320
300
280
260
240
2018
2019
2020
2021
2022
2023
2024
2025
Year
AGE
28 m Napperby Formation
58 m Napperby Formation
98 m Napperby Formation
138 m Napperby Formation
178 m Pamboola Formation
218 m Pamboola Formation
258 m Pamboola Formation
298 m Porcupine Formation
336 m Porcupine Formation

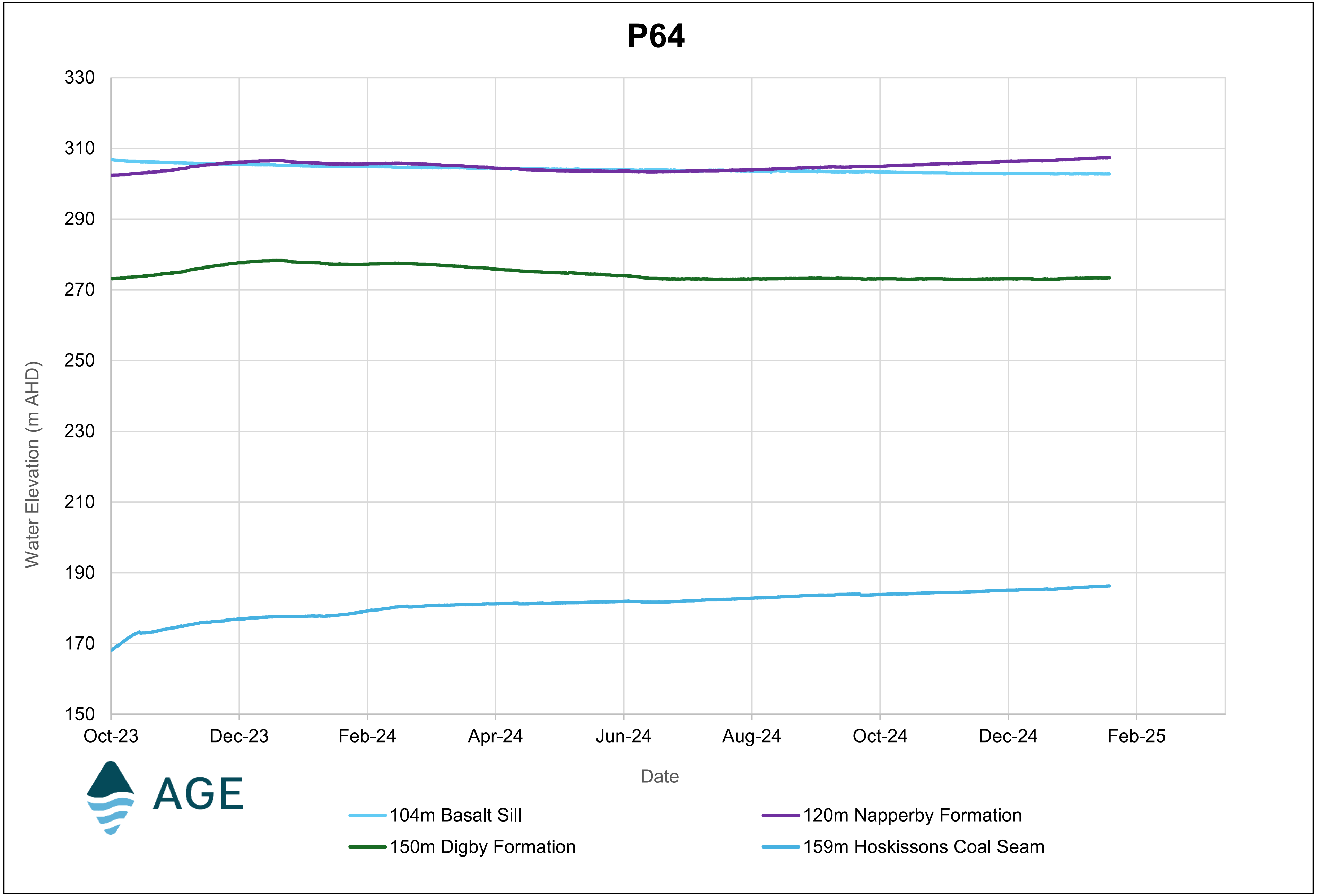


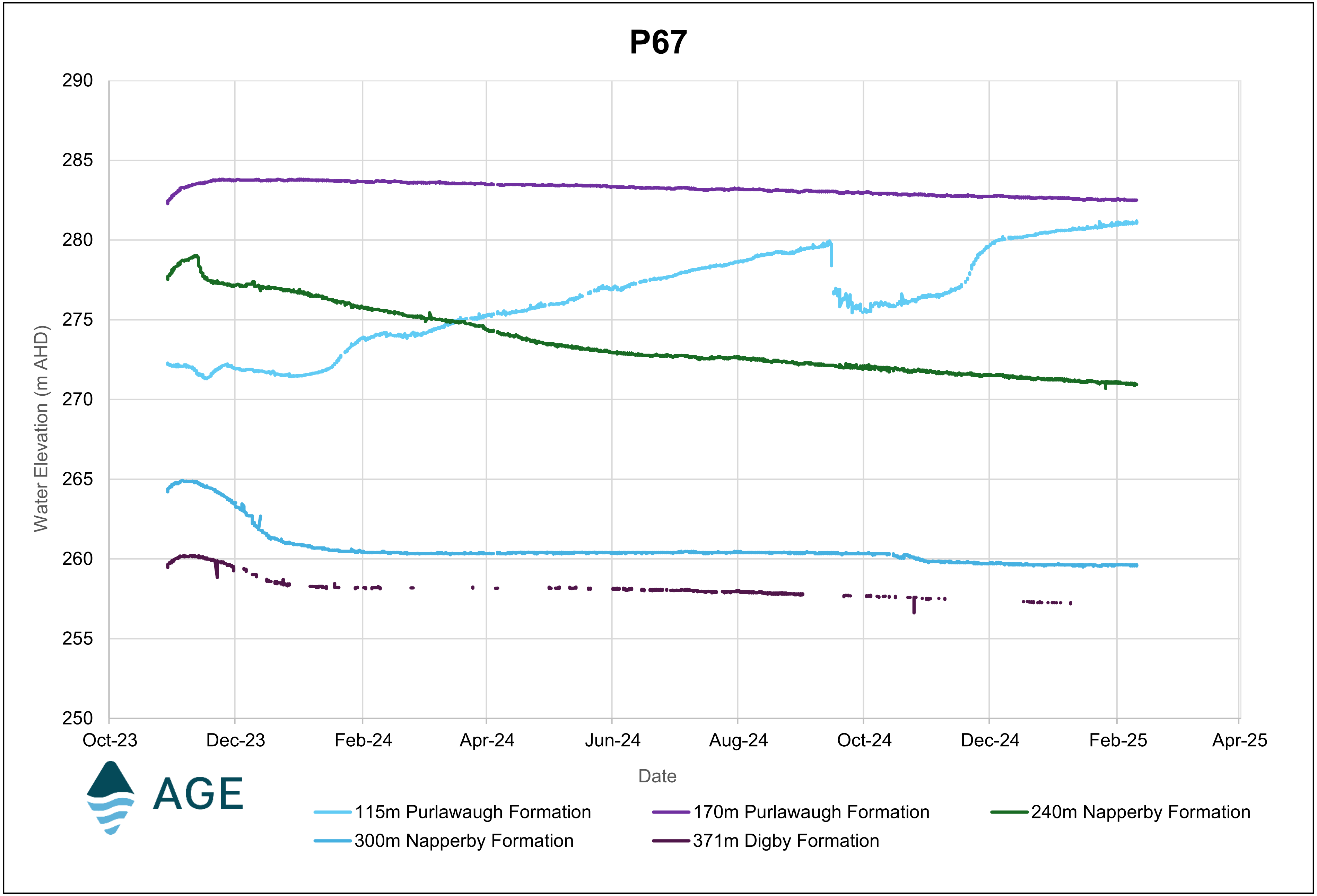
P55
Water Elevation (m AHD)
260
250
240
230
220
210
200
190
180
2018
2019
2020
2021
2022
2023
2024
2025
2026
Year
AGE
25 m Purlawaugh Formation
44 m Purlawaugh Formation
75 m Napperby Formation
98 m Digby Formation
110 m Hoskisson Coal Seam
135 m Pamboola Formation
159 m Pamboola Formation
195 m Porcupine Formation
228 m Porcupine Formation


P56
Water elevation (m AHD)
270
265
260
255
250
245
240
235
230
2018
2019
2020
2021
2022
2023
2024
2025
Year
AGE
55 m Napperby Formation
85 m Napperby Formation
115 m Napperby Formation
145 m Napperby Formation
175 m Pamboola Formation
205 m Pamboola Formation
235 m Pamboola Formation
265 m Porcupine Formation
300 m Porcupine Formation

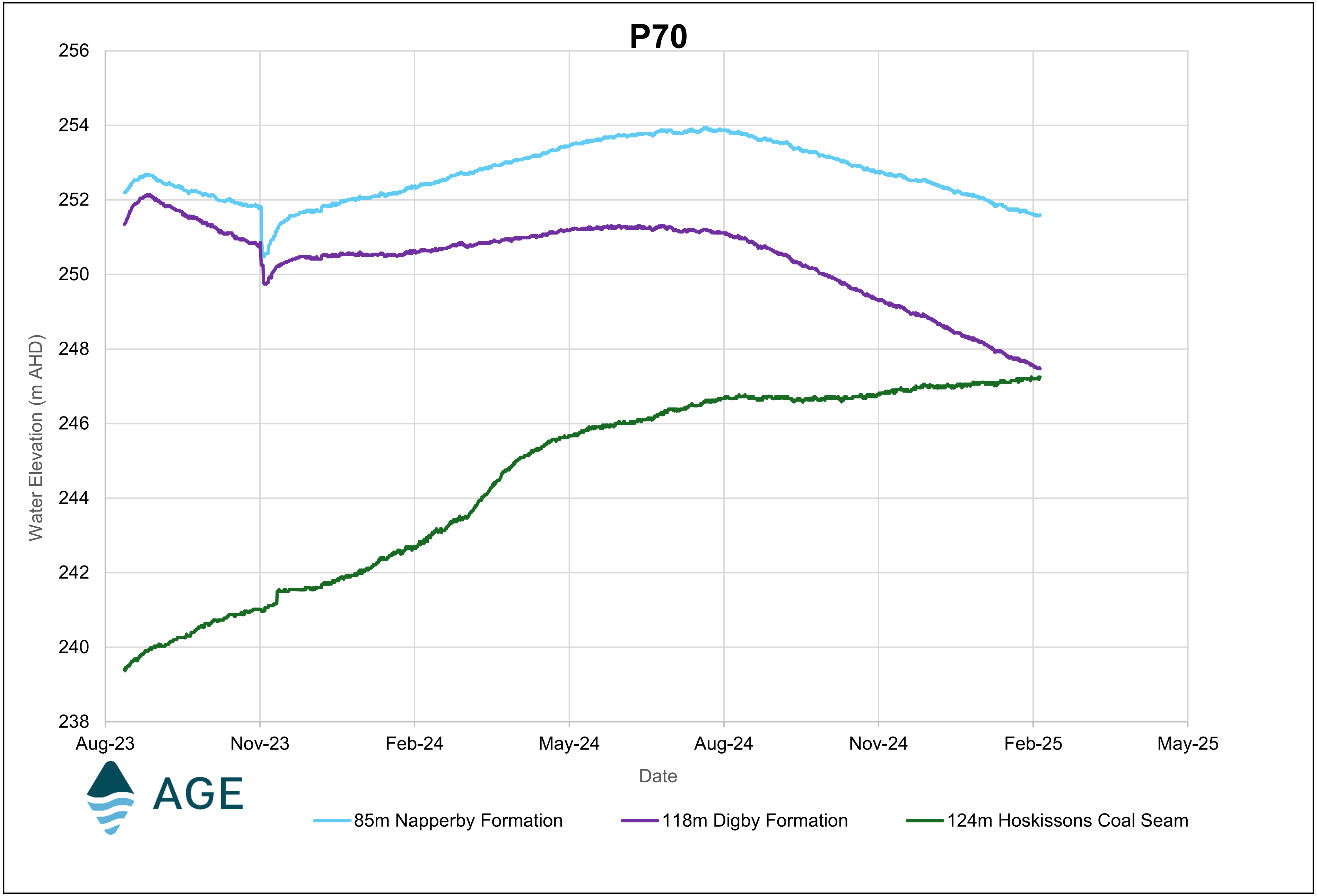


P61
Water Elevation (m AHD)
240
230
220
210
200
190
180
170
160
150
Oct-23
Nov-23
Dec-23
Jan-24
Feb-24
Mar-24
Apr-24
May-24
Jun-24
Jul-24
Aug-24
Sep-24
Oct-24
Nov-24
Dec-24
Jan-25
Feb-25
Mar-25
Date
AGE
92m Purlawaugh Formation
138m Garrawilla Formation
205m Napperby Formation
260m Basalt Sill
300m Digby Formation

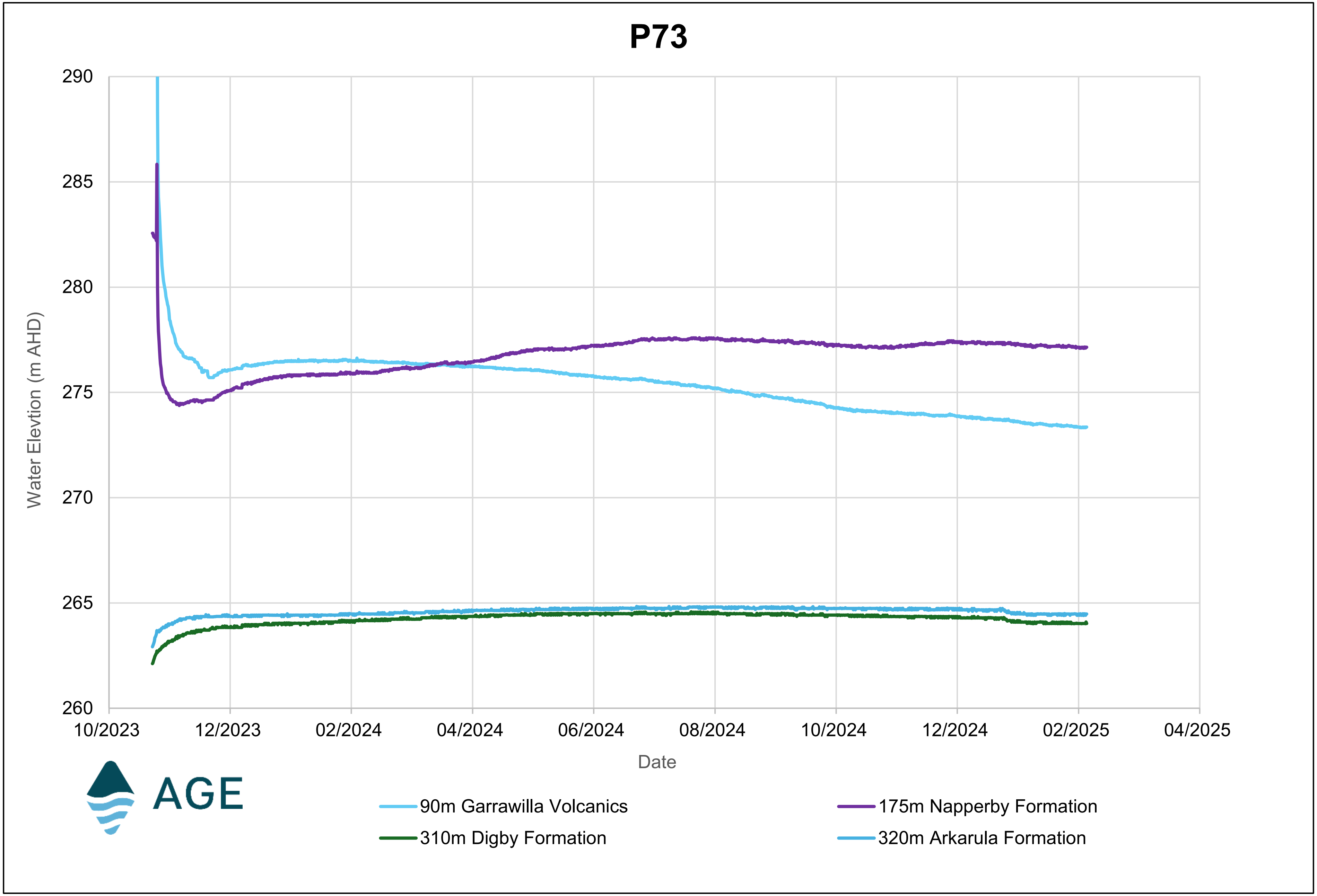

P64
Water Elevation (m AHD)
330
310
290
270
250
230
210
190
170
150
Oct-23
Dec-23
Feb-24
Apr-24
Jun-24
Aug-24
Oct-24
Dec-24
Feb-25
Date
104m Basalt Sill
120m Napperby Formation
150m Digby Formation
159m Hoskissons Coal Seam



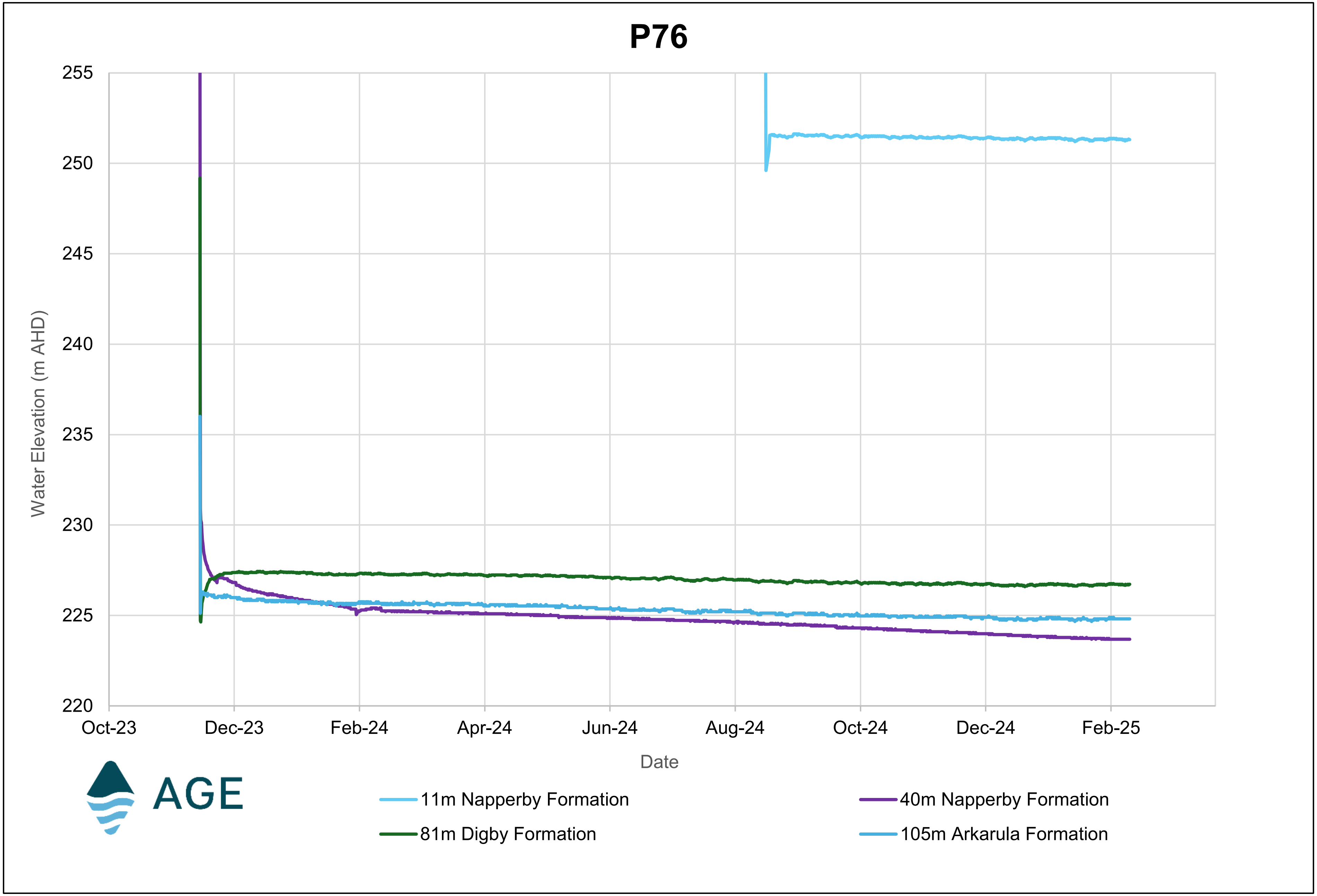
P67
Water Elevation (m AHD)
290
285
280
275
270
265
260
255
250
Oct-23
Dec-23
Feb-24
Apr-24
Jun-24
Aug-24
Oct-24
Dec-24
Feb-25
Apr-25
Date
AGE
115m Purlawaugh Formation
170m Purlawaugh Formation
240m Napperby Formation
300m Napperby Formation
371m Digby Formation



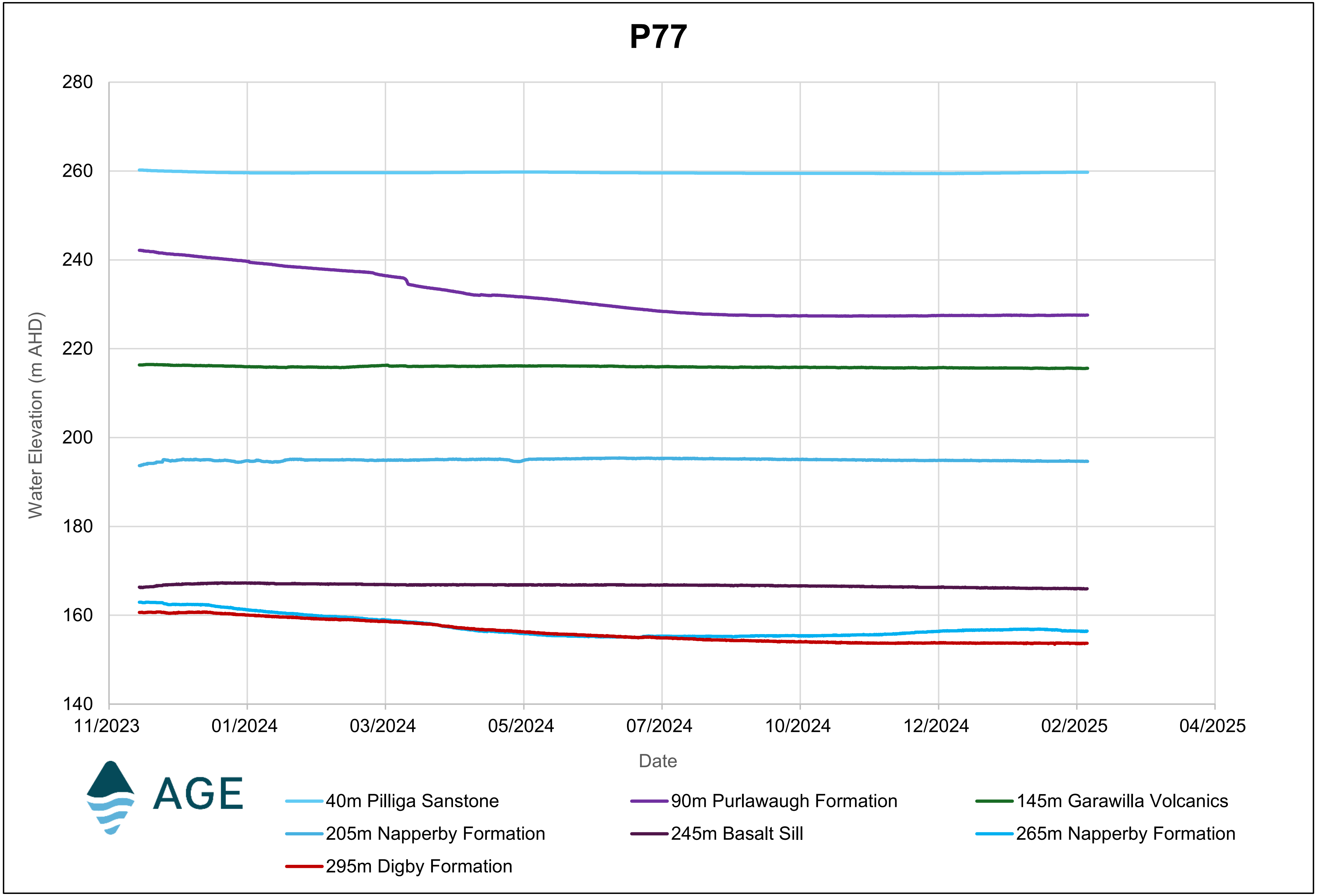
P70
256
254
252
250
248
246
244
242
240
238
Water Elevation (m AHD)
Aug-23
Nov-23
Feb-24
May-24
Aug-24
Nov-24
Feb-25
May-25
Date
AGE
85m Napperby Formation
118m Digby Formation
124m Hoskissons Coal Seam



P73
290
285
280
275
270
265
260
Water Elevtion (m AHD)
10/2023
12/2023
02/2024
04/2024
06/2024
08/2024
10/2024
12/2024
02/2025
04/2025
Date
AGE
90m Garrawilla Volcanics
175m Napperby Formation
310m Digby Formation
320m Arkarula Formation



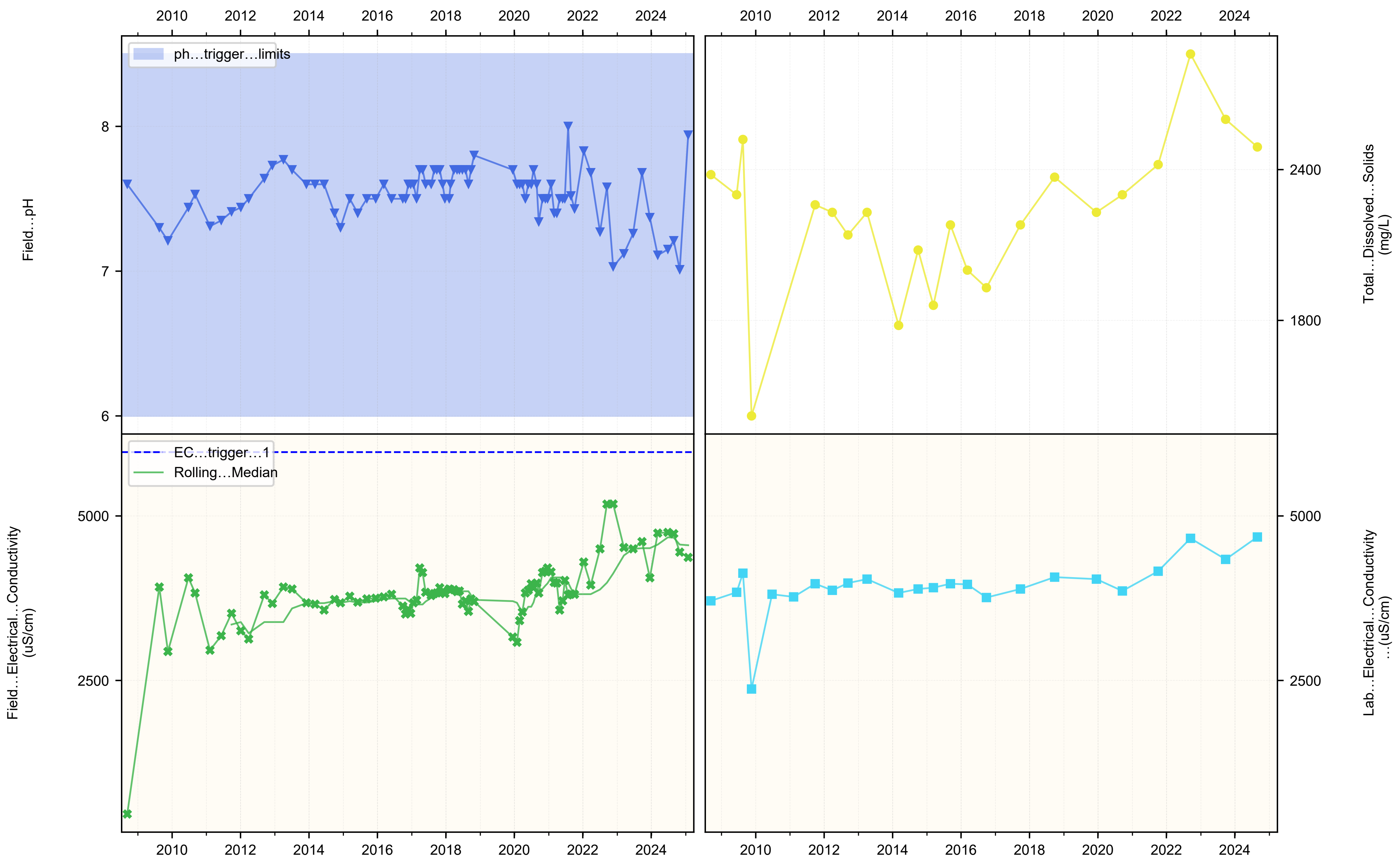
P76
Water Elevation (m AHD)
255
250
245
240
235
230
225
220
Oct-23
Dec-23
Feb-24
Apr-24
Jun-24
Aug-24
Oct-24
Dec-24
Feb-25
Date
AGE
11m Napperby Formation
40m Napperby Formation
81m Digby Formation
105m Arkarula Formation


P77
280
260
240
220
200
180
160
140
Water Elevation (m AHD)
11/2023
01/2024
03/2024
05/2024
07/2024
10/2024
12/2024
02/2025
04/2025
Date
AGE
40m Pilliga Sanstone
90m Purlawaugh Formation
145m Garawilla Volcanics
205m Napperby Formation
245m Basalt Sill
265m Napperby Formation
295m Digby Formation

Appendix D

Water quality plots

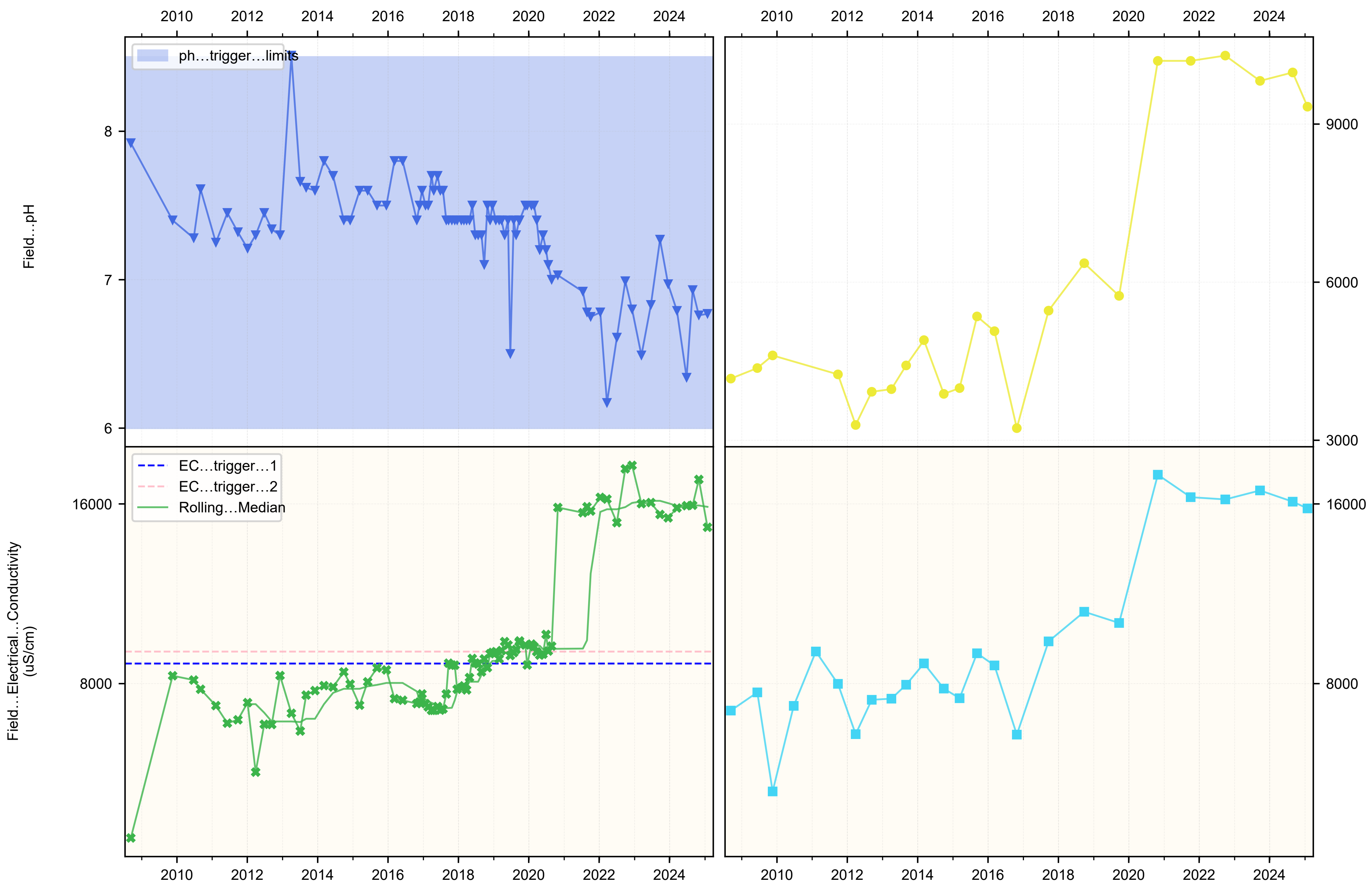
P1…(Garrawilla…Volcanics;…Subcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
ANZG…(stock)…used…for…triggers

Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

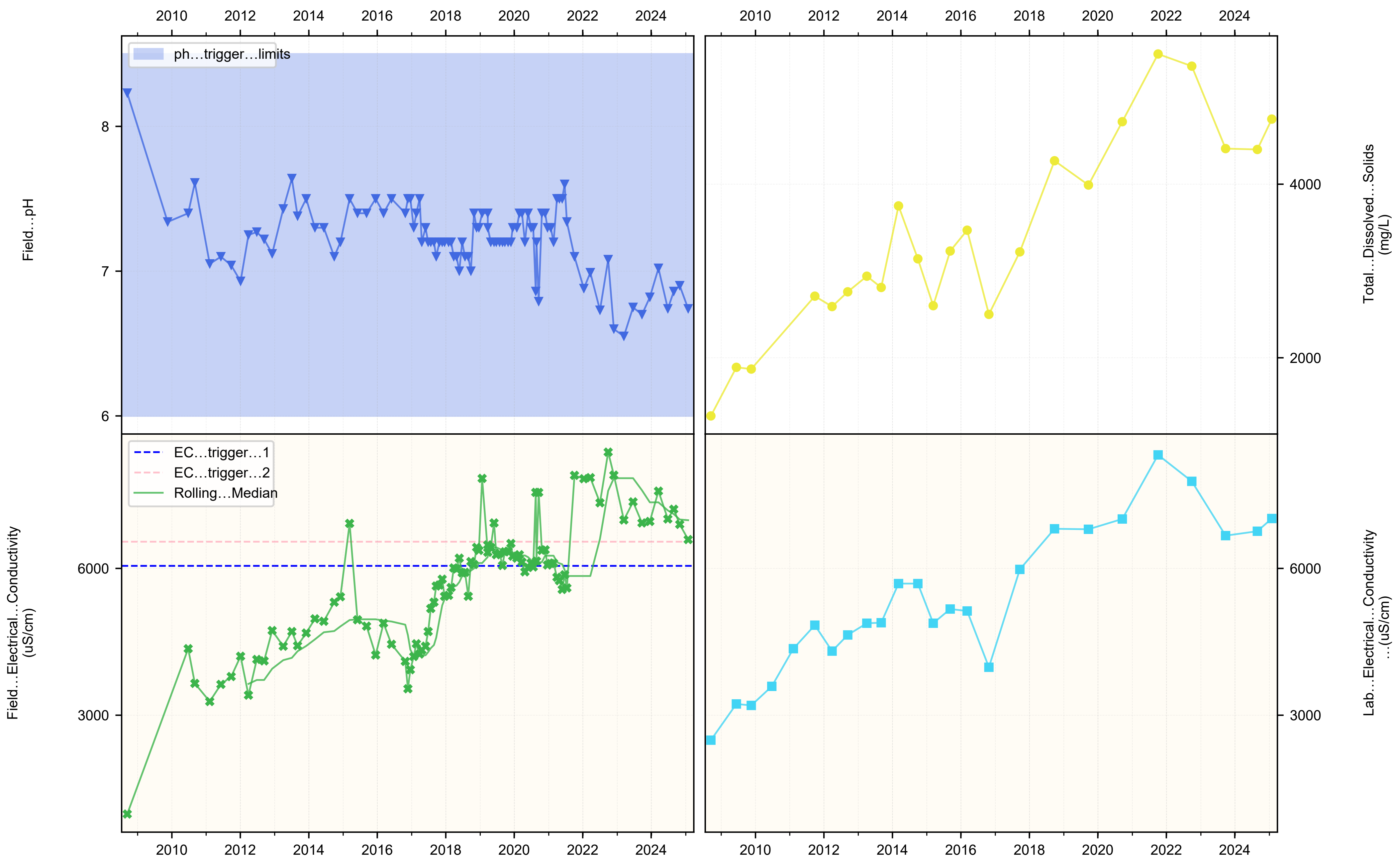
P10 (Napperby Formation; Subcrop)



Filled markers indicate above limit of reporting, empty markers indicate below limit of reporting
EC two tiered used for triggers

Australasian Groundwater and Environmental Consultants Pty Ltd
Water Quality Plots - General Parameters

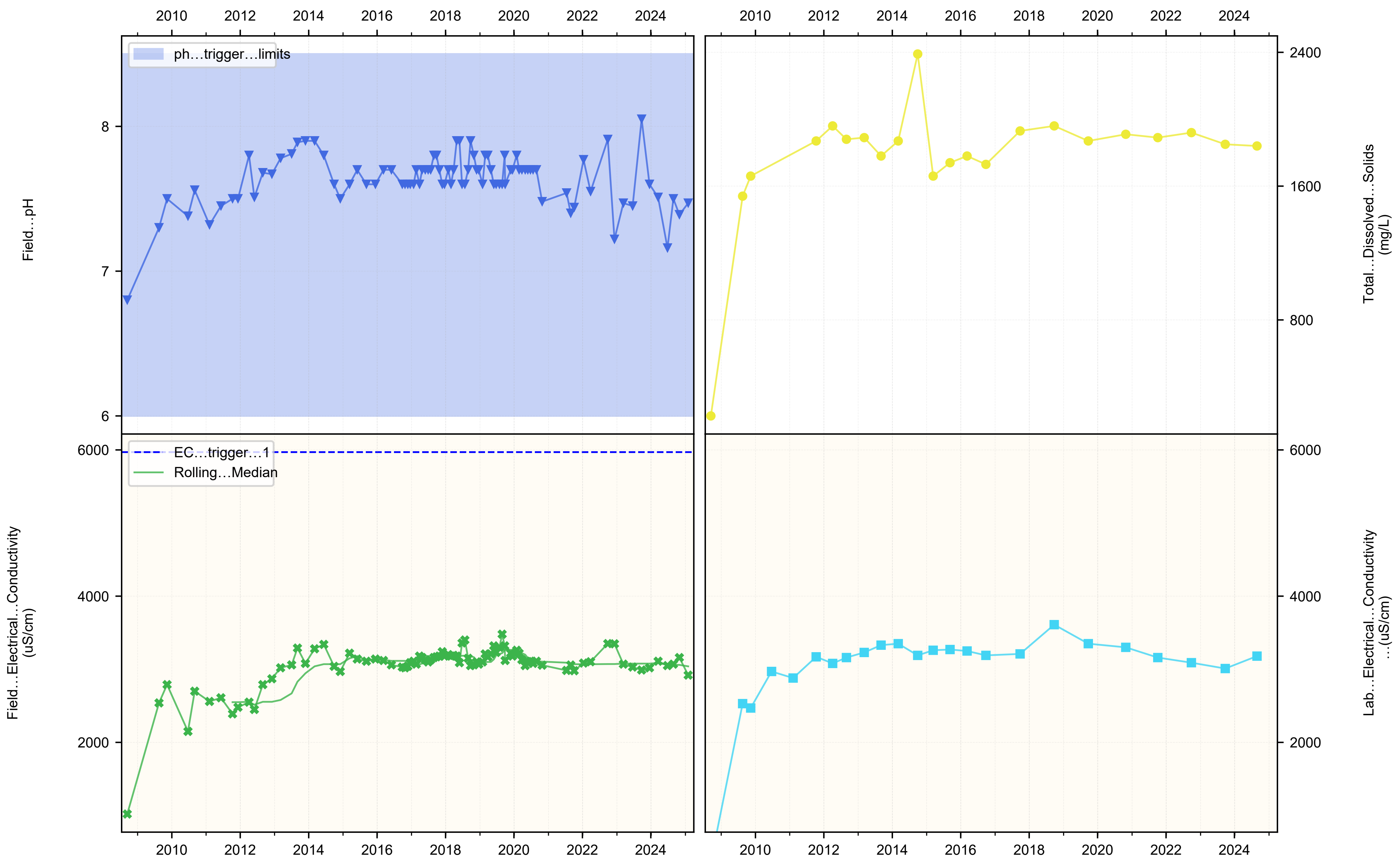
P11…(Purlawaugh…Formation;…Subcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
EC…two…tiered…used…for…triggers

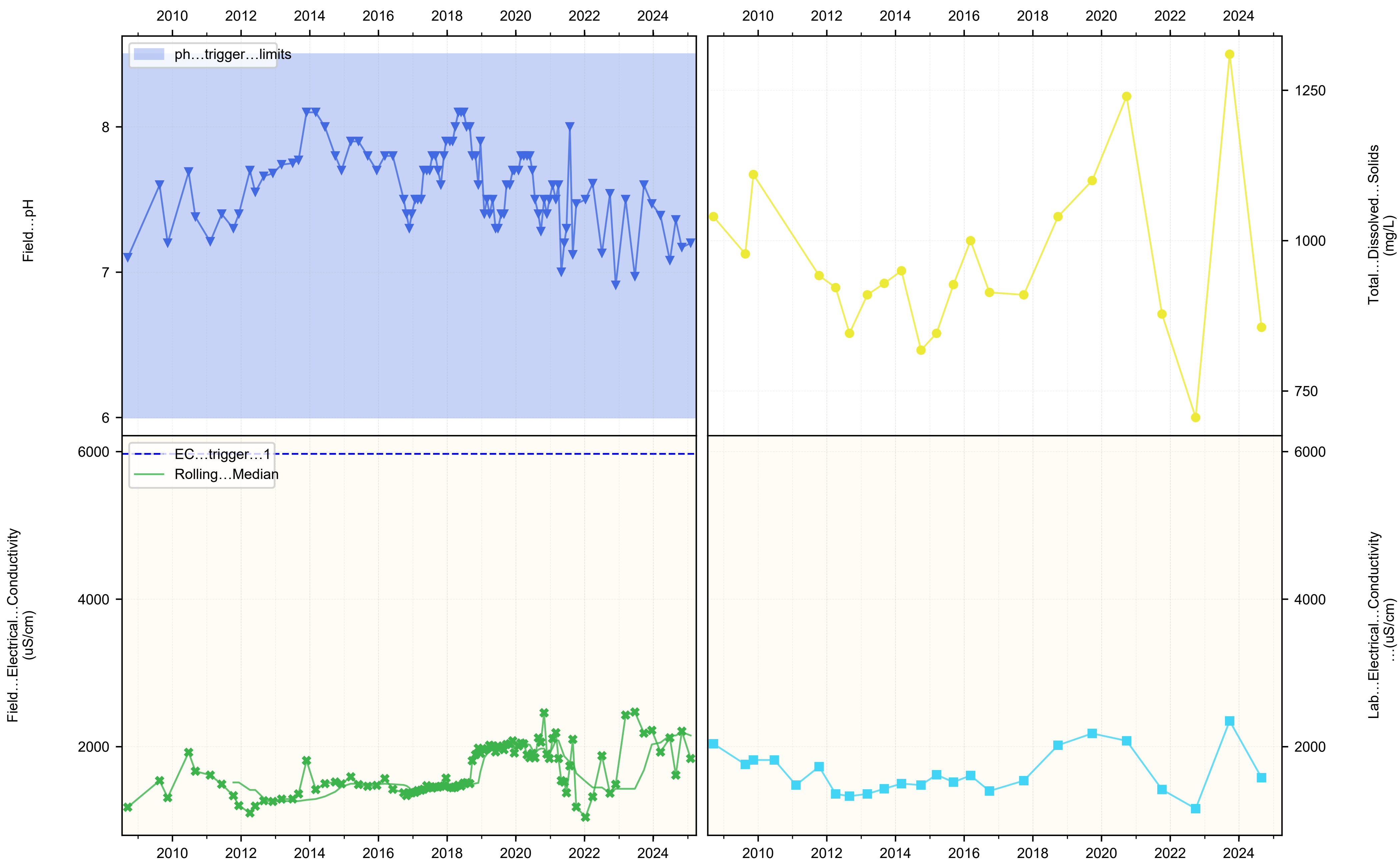
Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

P12 (Napperby Formation; Subcrop)



Filled markers indicate above limit of reporting, empty markers indicate below limit of reporting
ANZG (stock) used for triggers

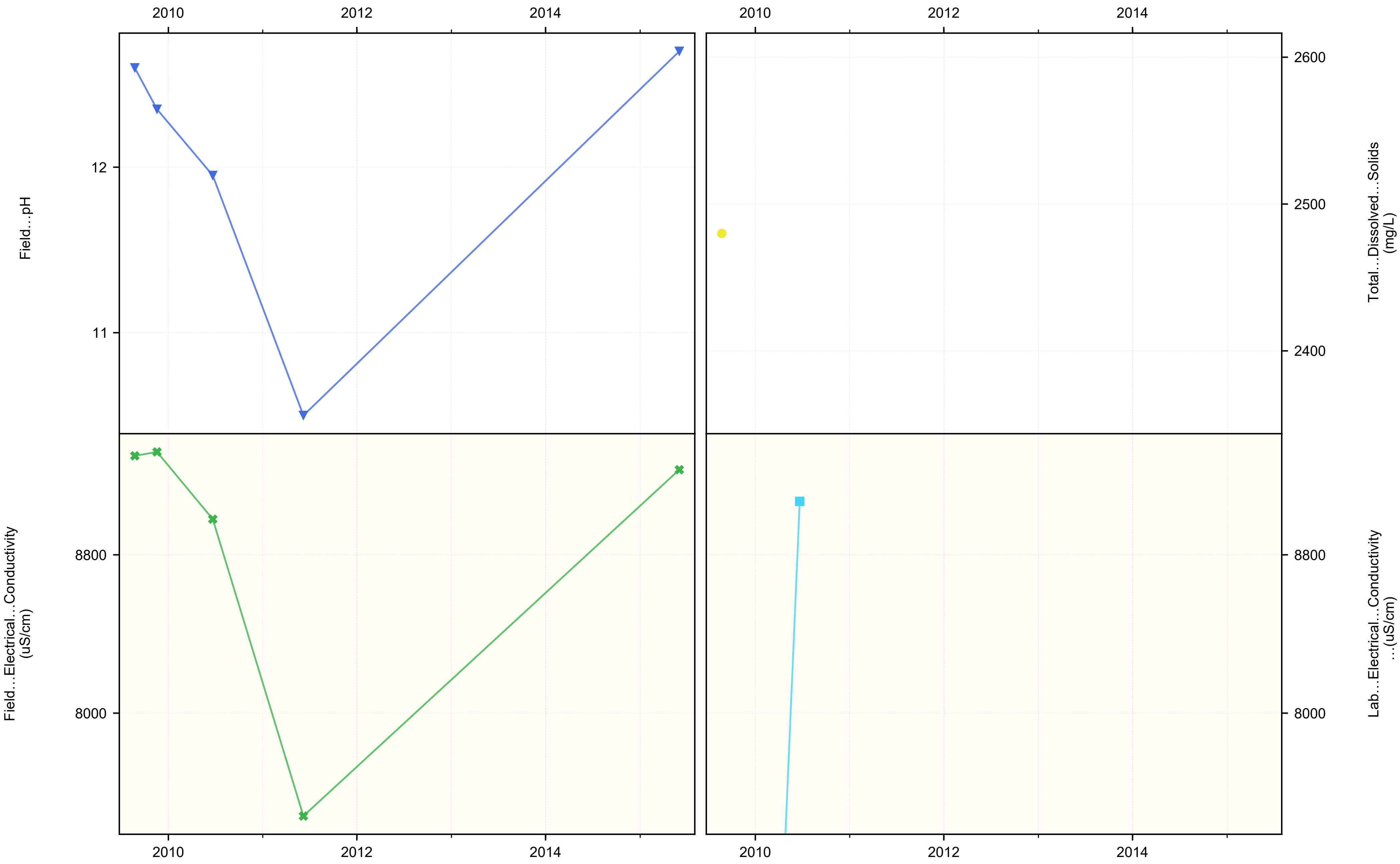
P13…(Garrawilla…Volcanics;…Subcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
ANZG…(stock)…used…for…triggers

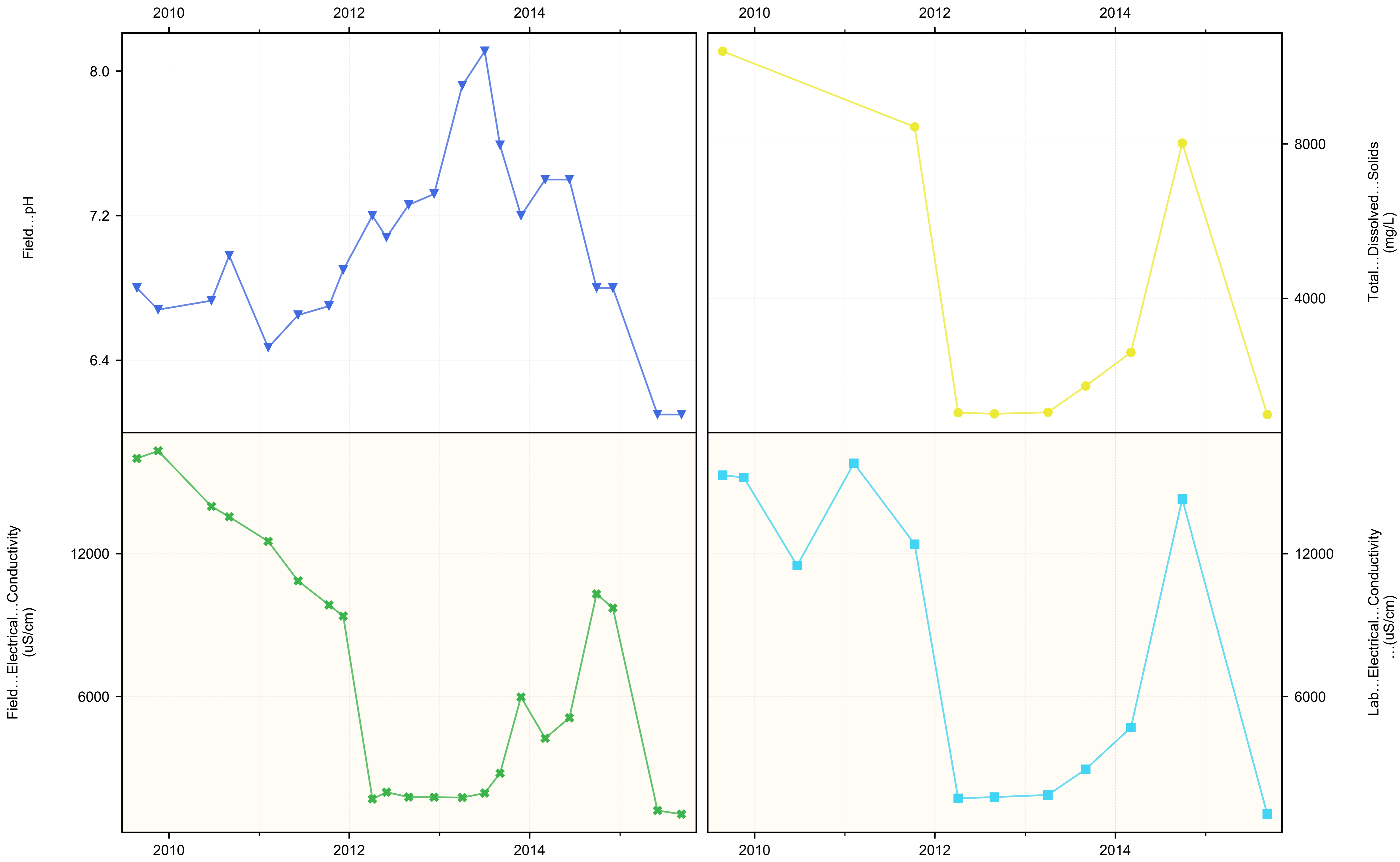
Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

P14…(Napperby…Formation…-…old;…Subcrop)



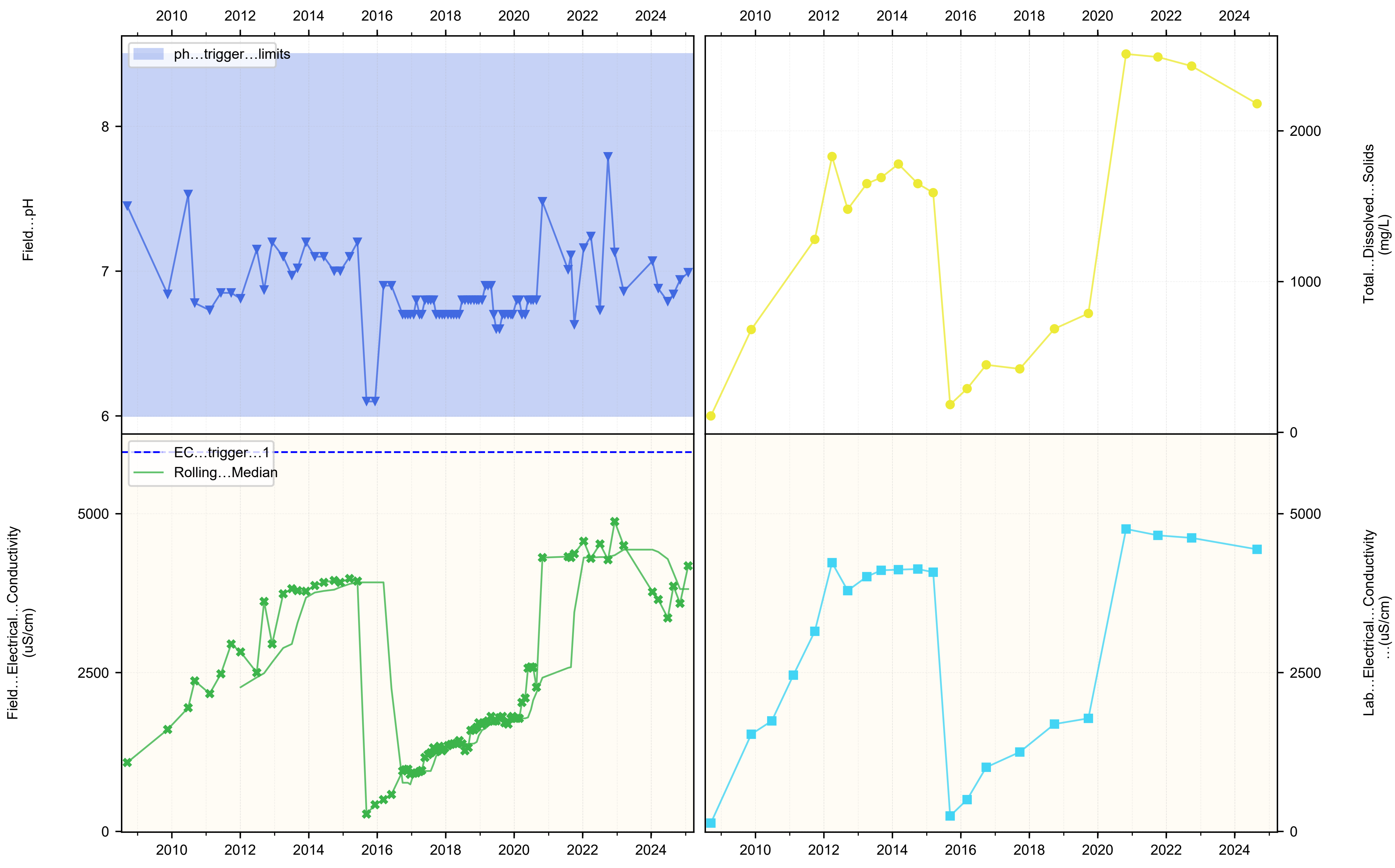
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

P15…(Garrawilla…Volcanics…-…old;…Subcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

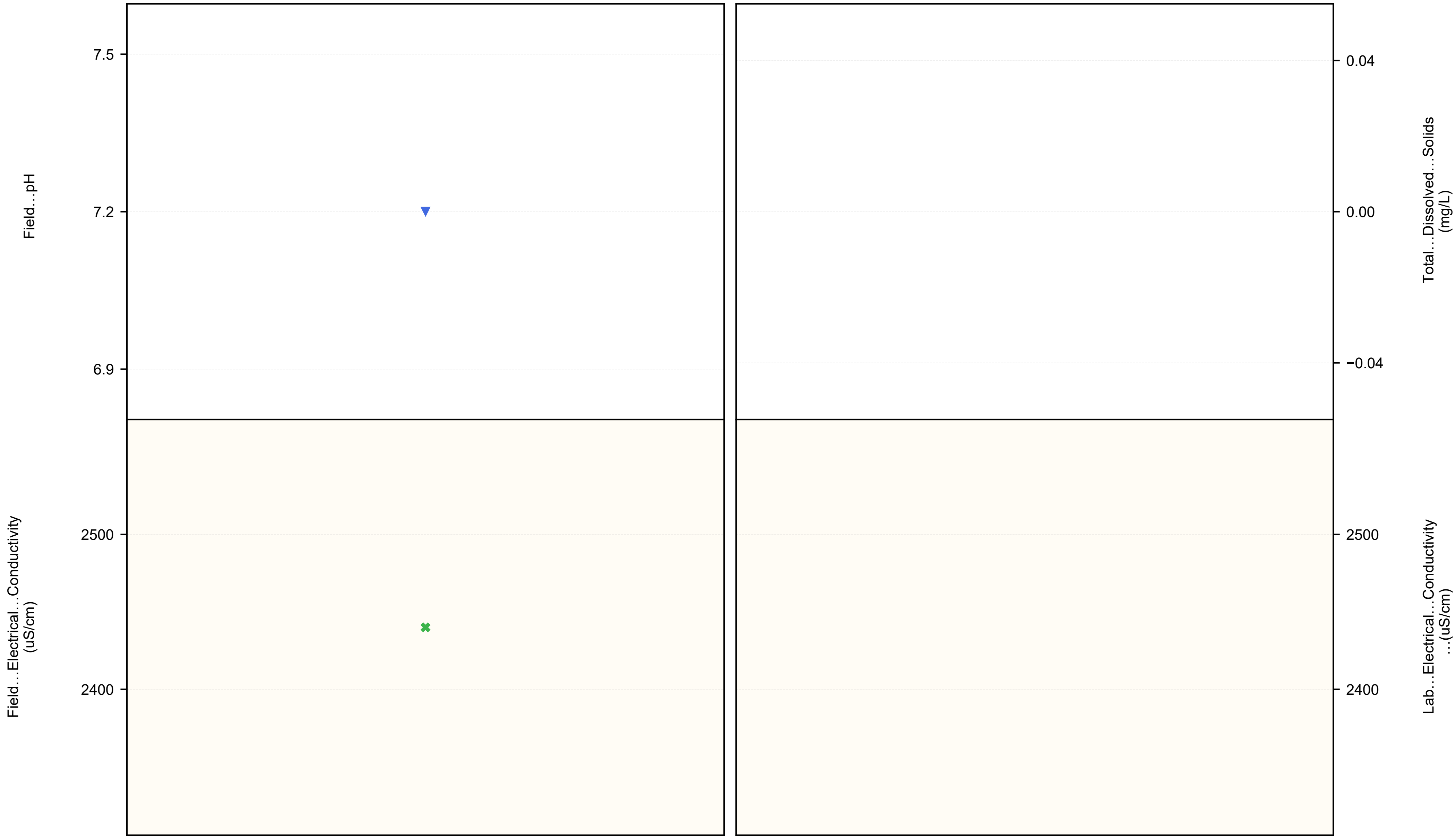
P16…(Garrawilla…Volcanics;…Subcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
ANZG…(stock)…used…for…triggers

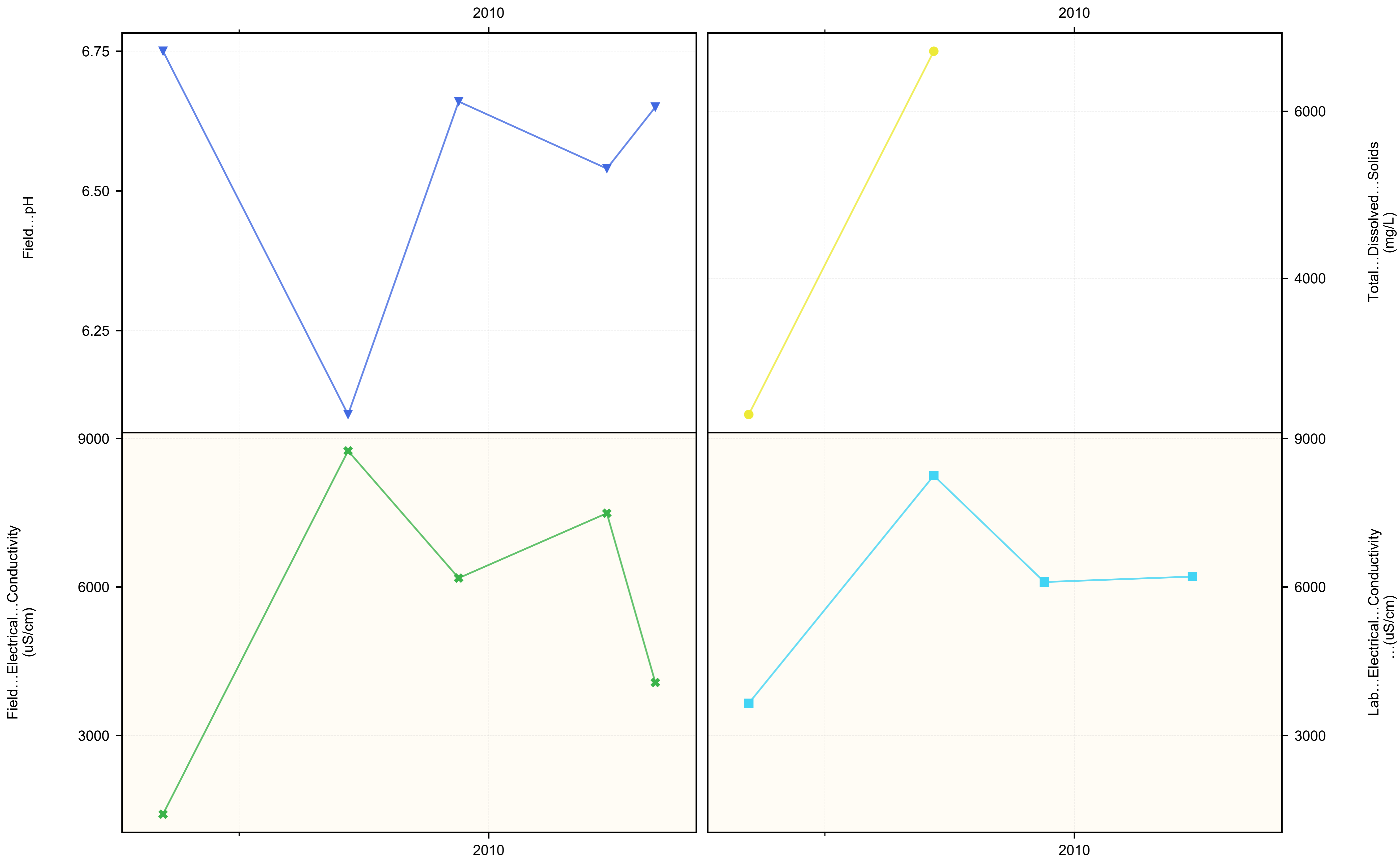
Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

P17…(Purlawaugh…Formation…-…old;…Subcrop)



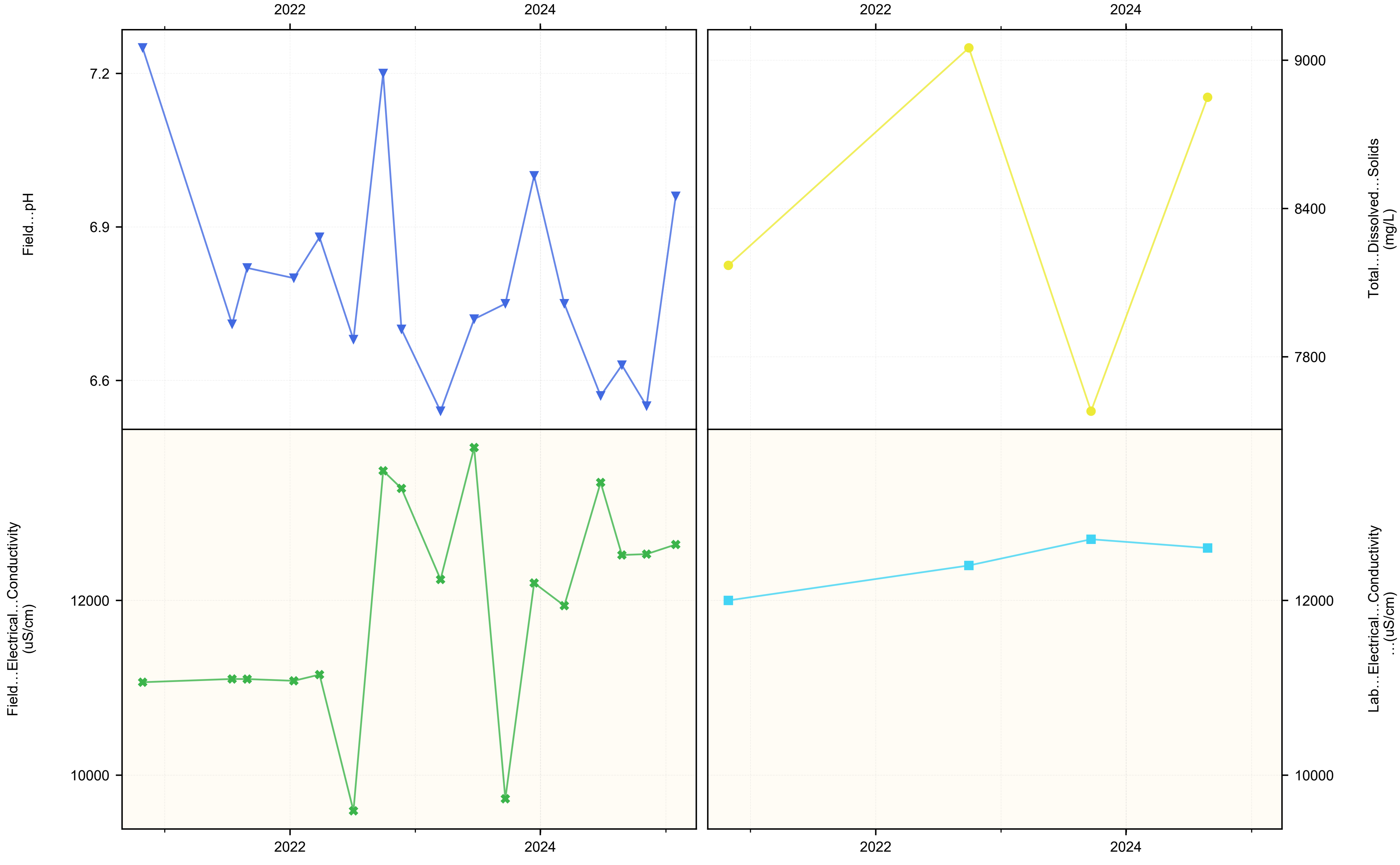
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

P18…(Hoskissons…Coal…Seam;…Subcrop)



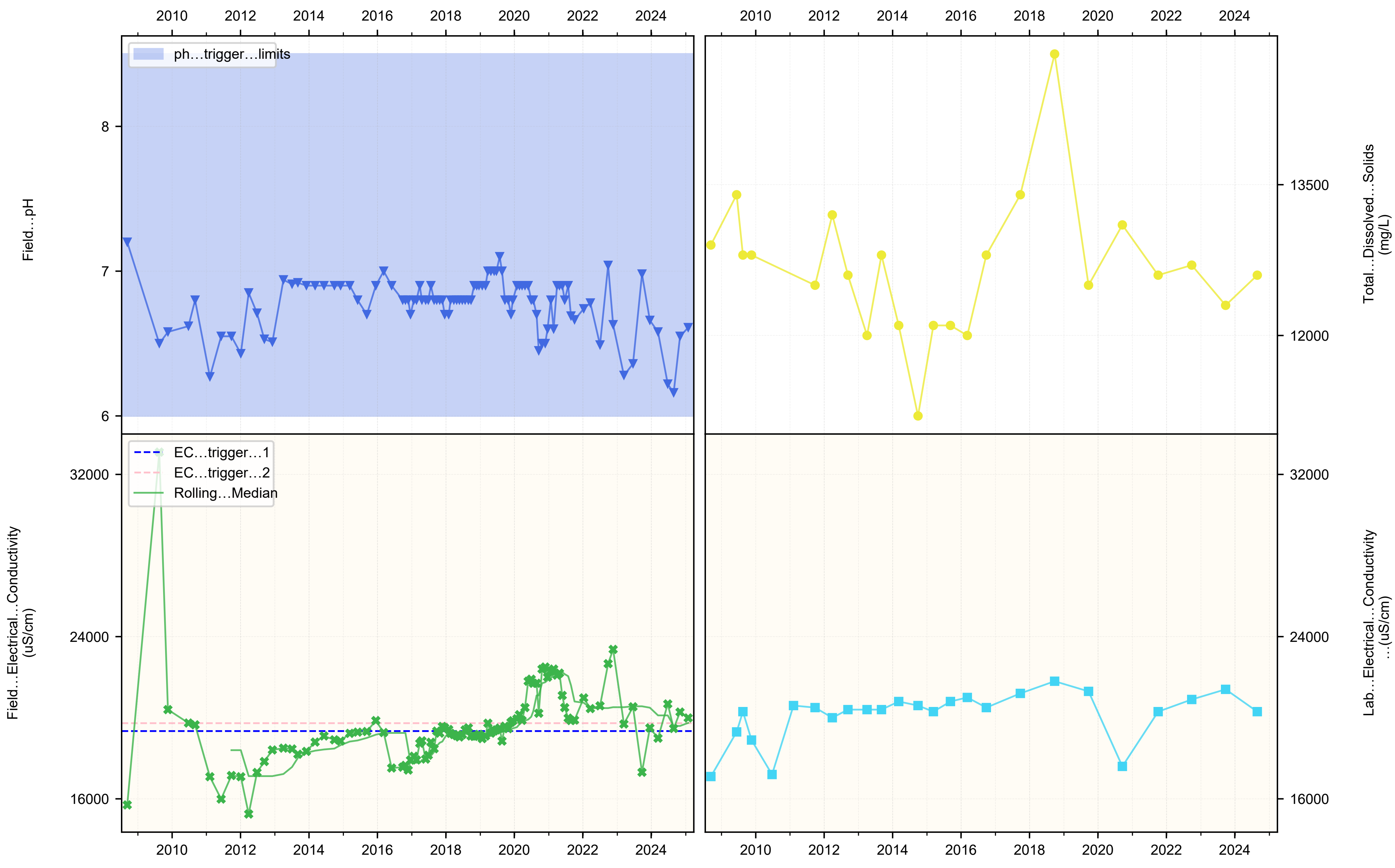
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

P19…(Pamboola…Formation;…Subcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

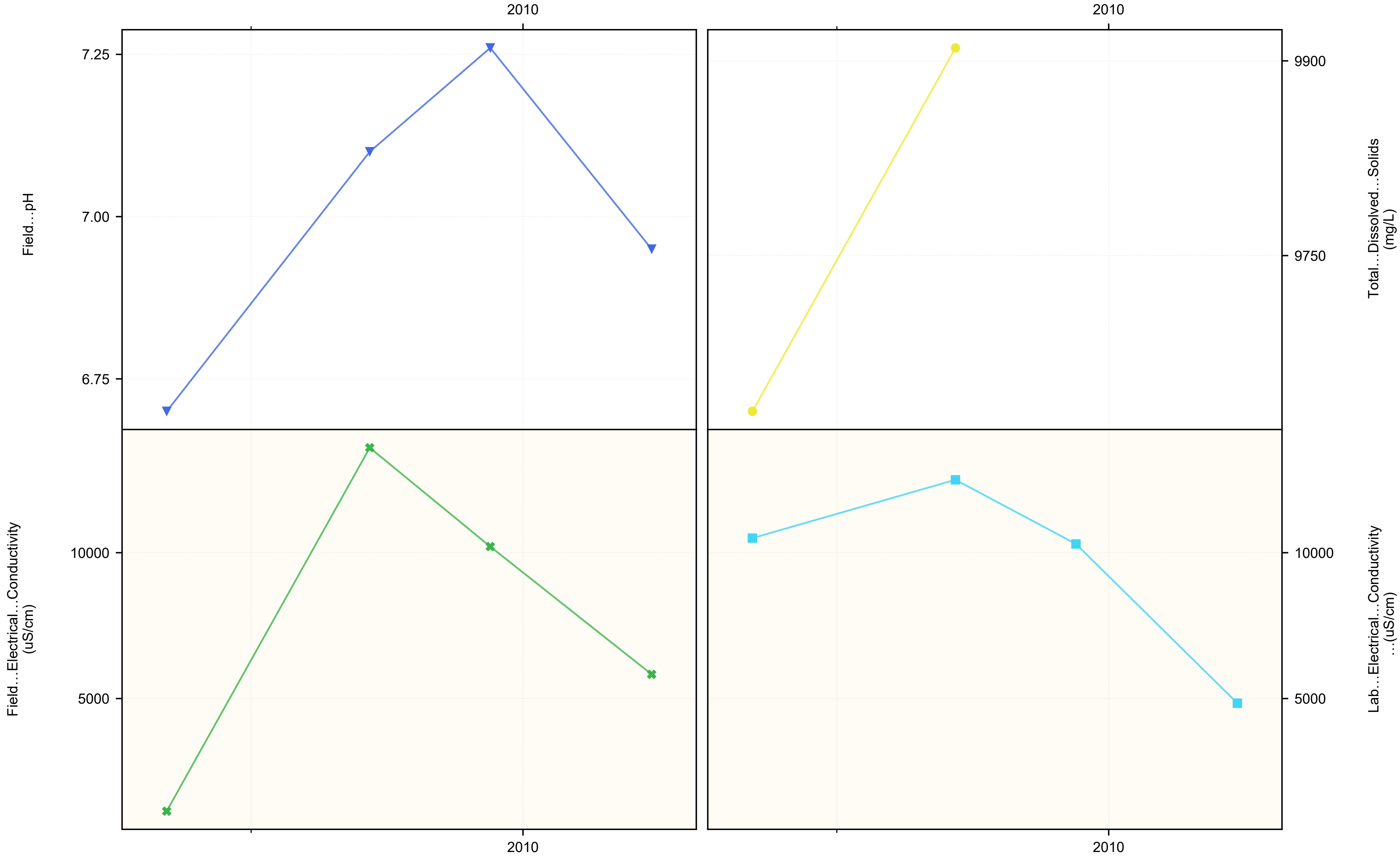
P2…(Napperby…Formation;…Subcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
EC…two…tiered…used…for…triggers

Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

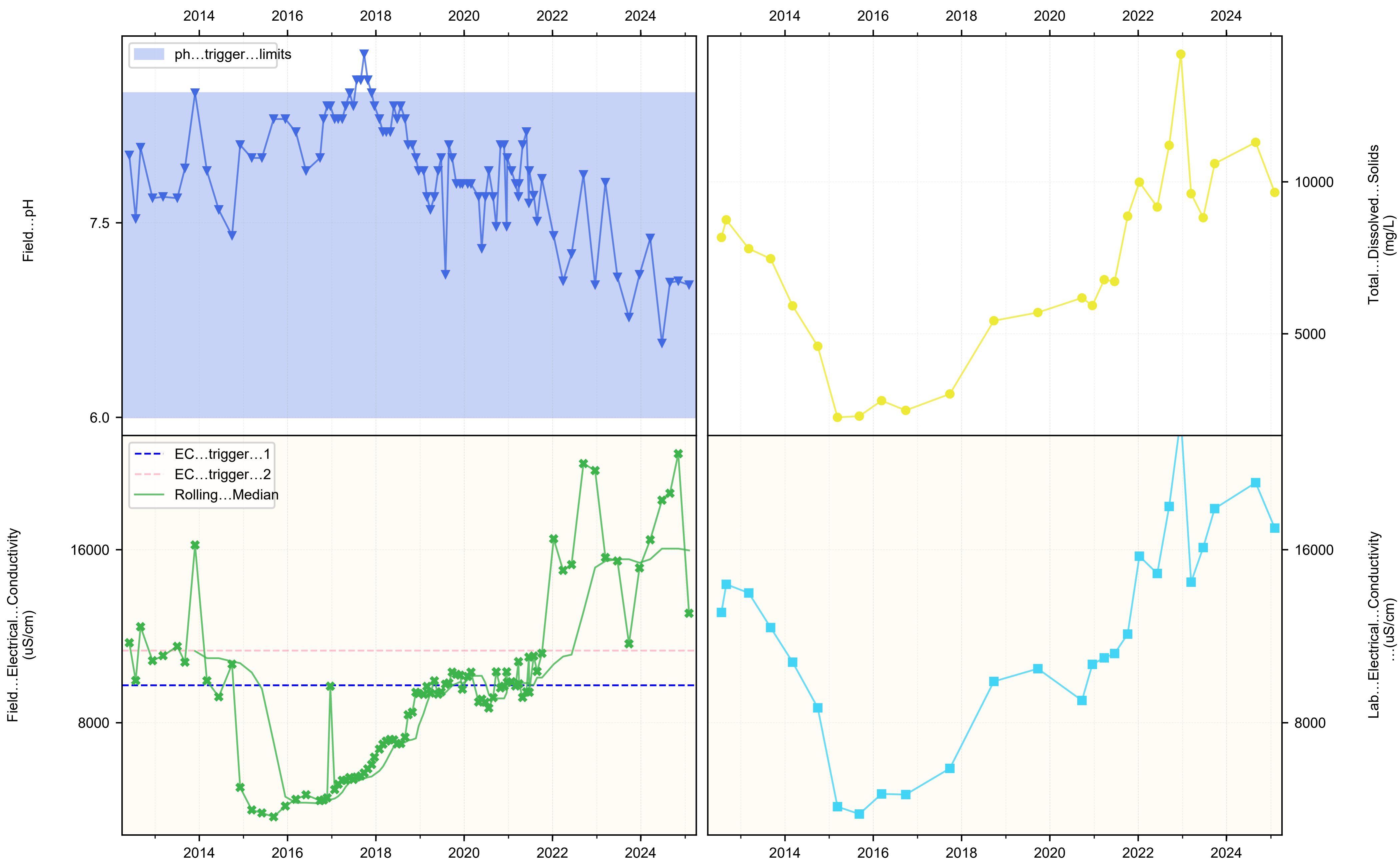
P20…(Arkarula…Formation;…Outcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

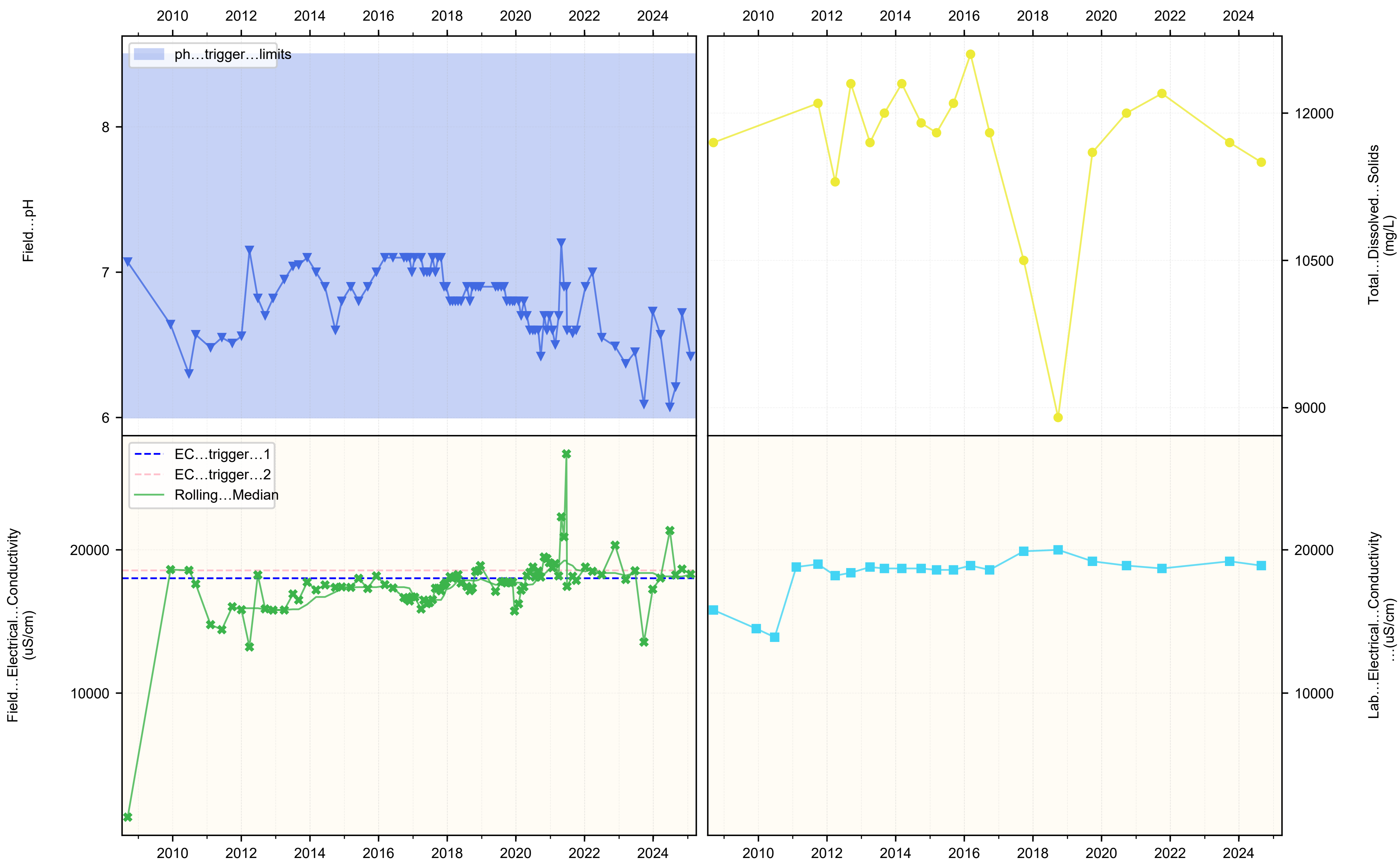
P29…(Rail…Loop…Dams;…Outcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
EC…two…tiered…used…for…triggers

Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

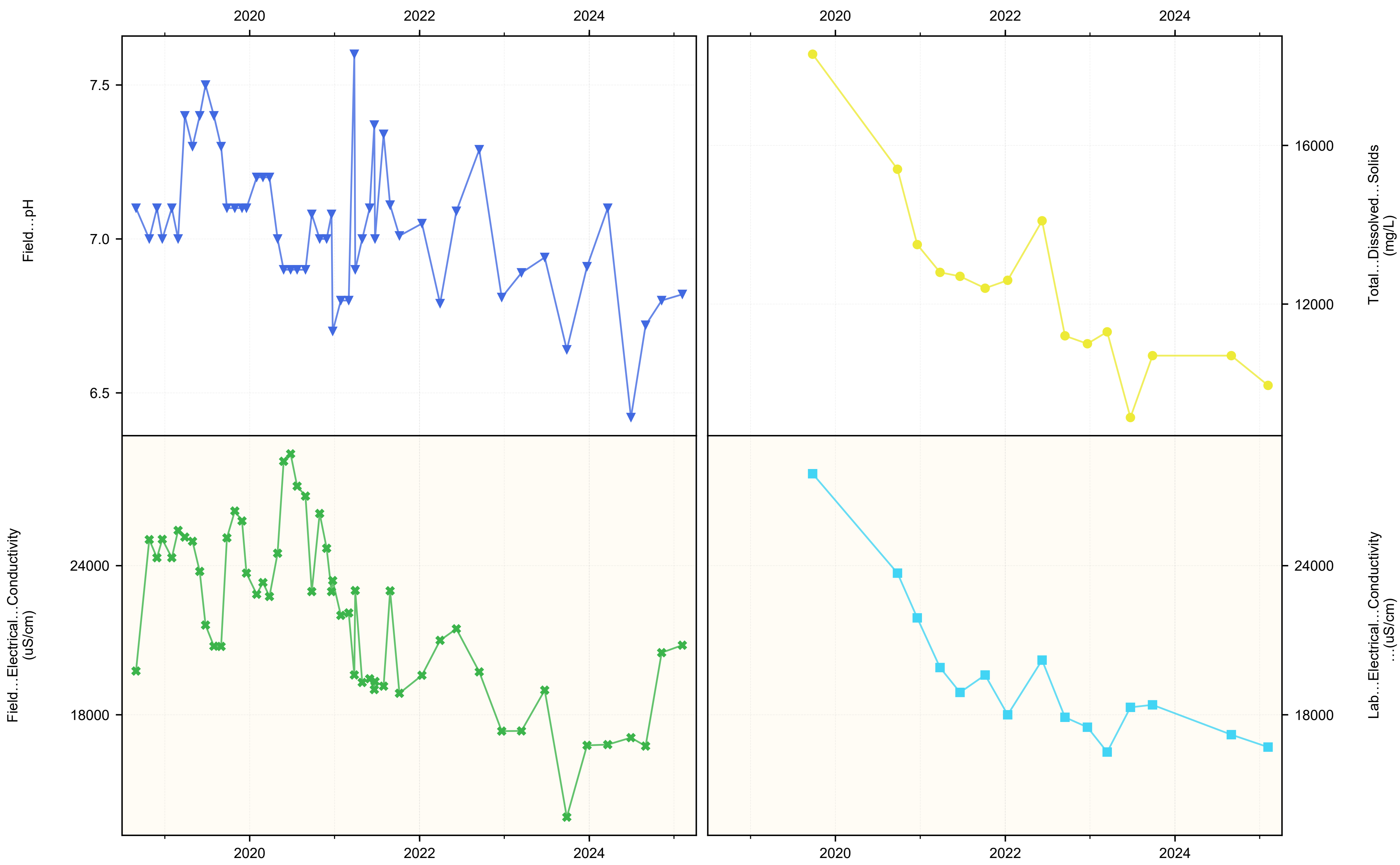
P3…(Pamboola…Formation;…Outcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
EC…two…tiered…used…for…triggers

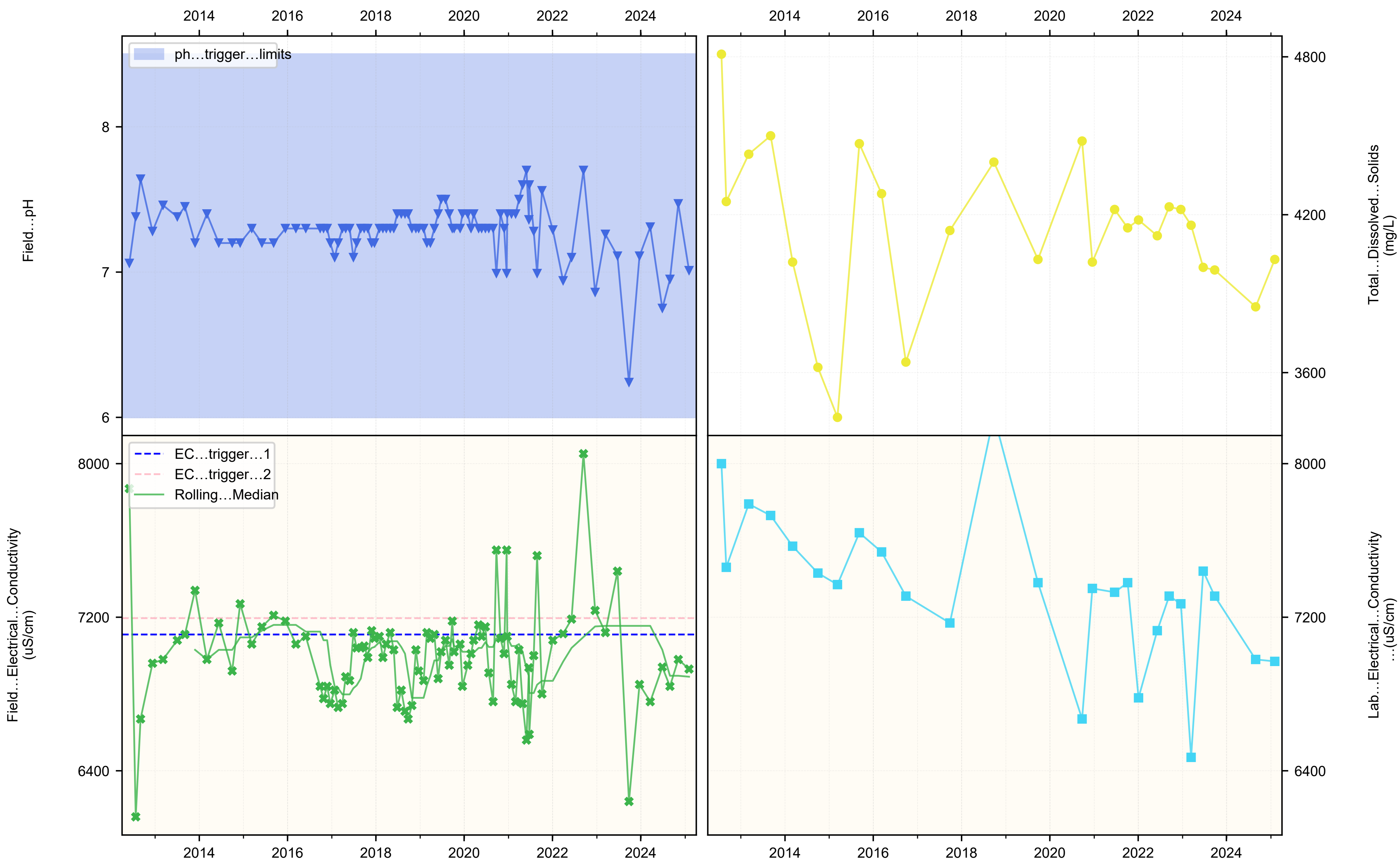
Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

P30…(Rail…Loop…Dams;…Outcrop)



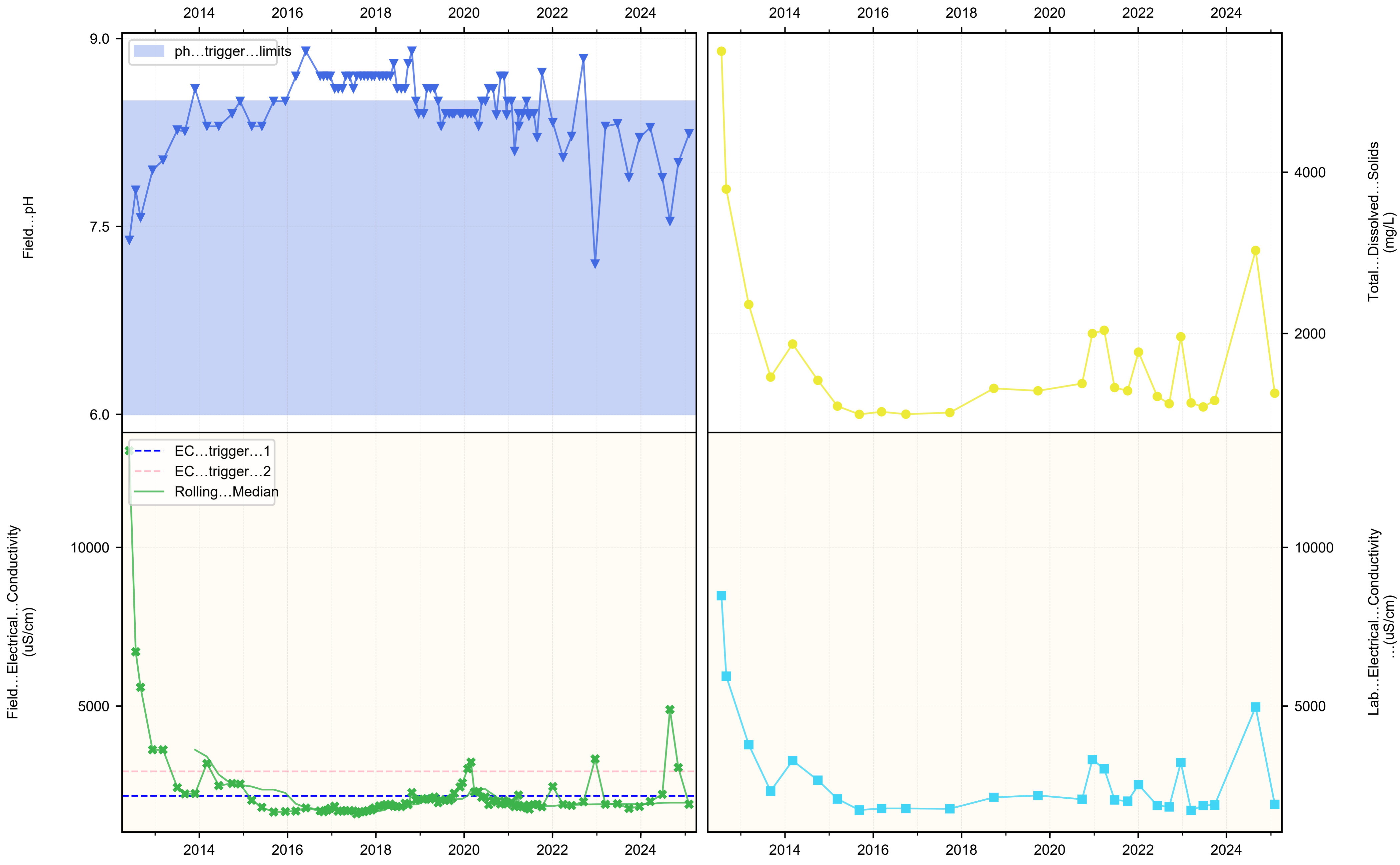
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

P31…(Rail…Loop…Dams;…Outcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
EC…two…tiered…used…for…triggers

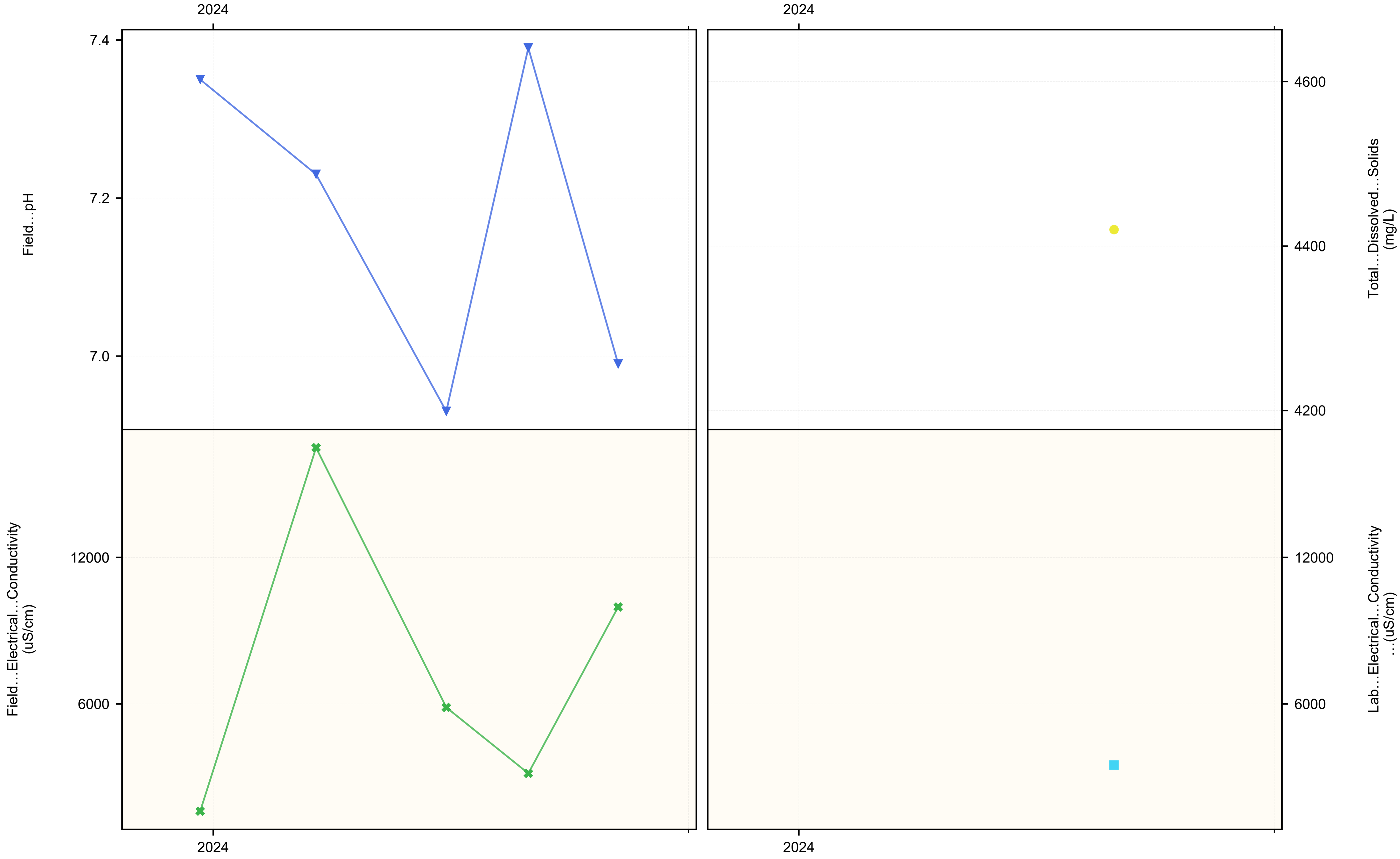
P32…(Rail…Loop…Dams;…Outcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
EC…two…tiered…used…for…triggers

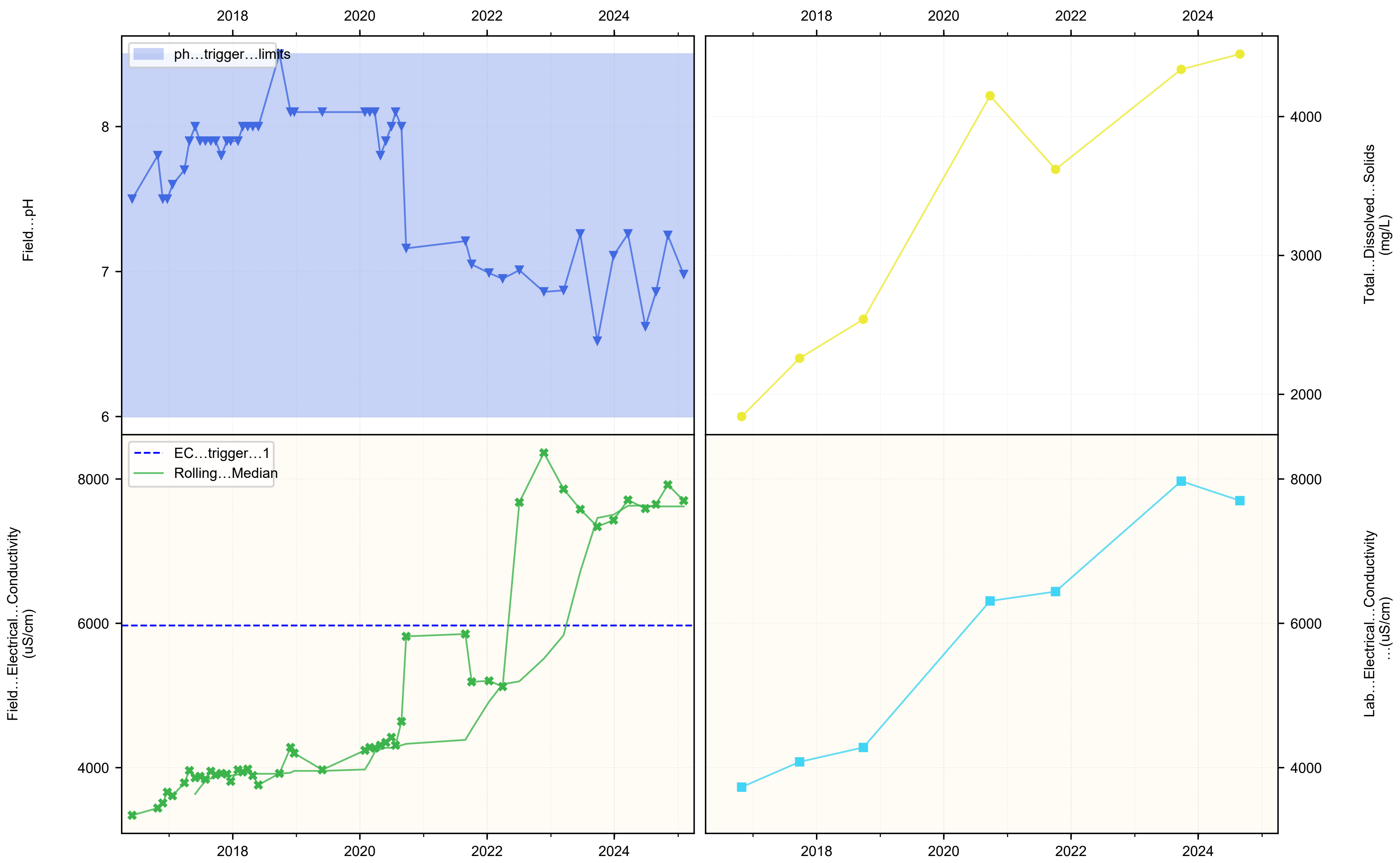
Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

P33…(Rail…Loop…Dams;…Outcrop)



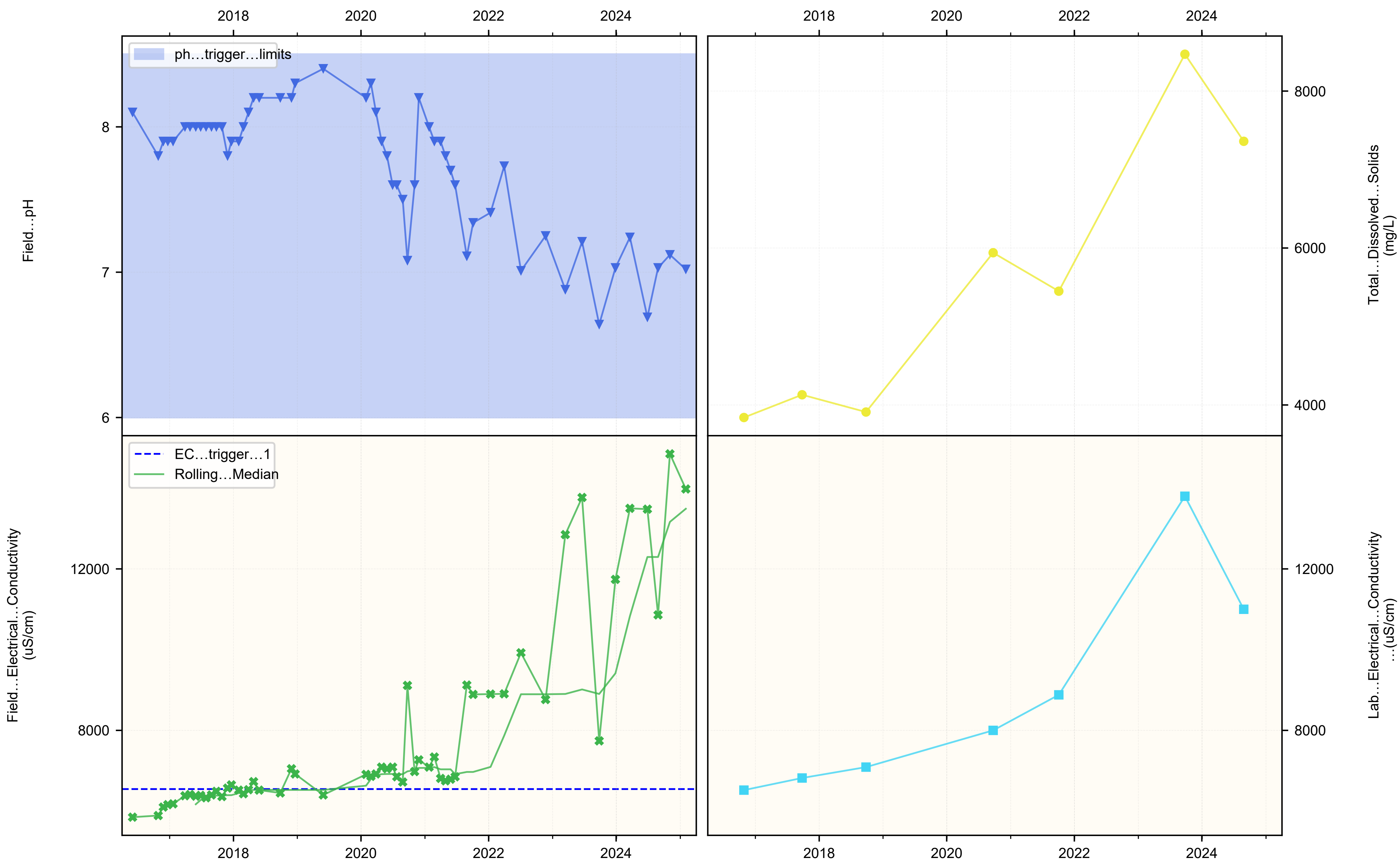
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

P39A…(Watermark…Formation;…Outcrop)



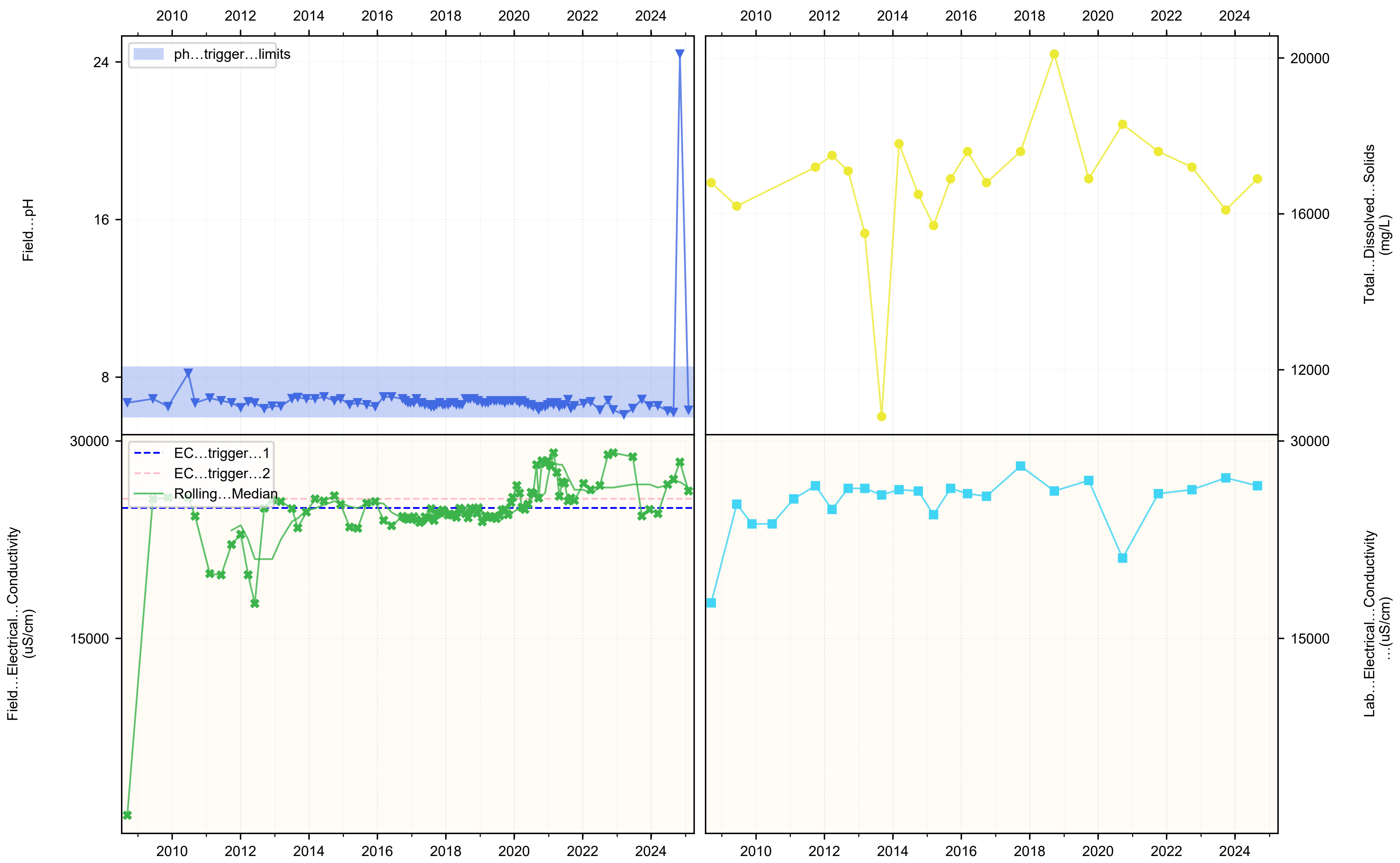
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
ANZG…(stock)…used…for…triggers

P39B…(Alluvium;…Outcrop)



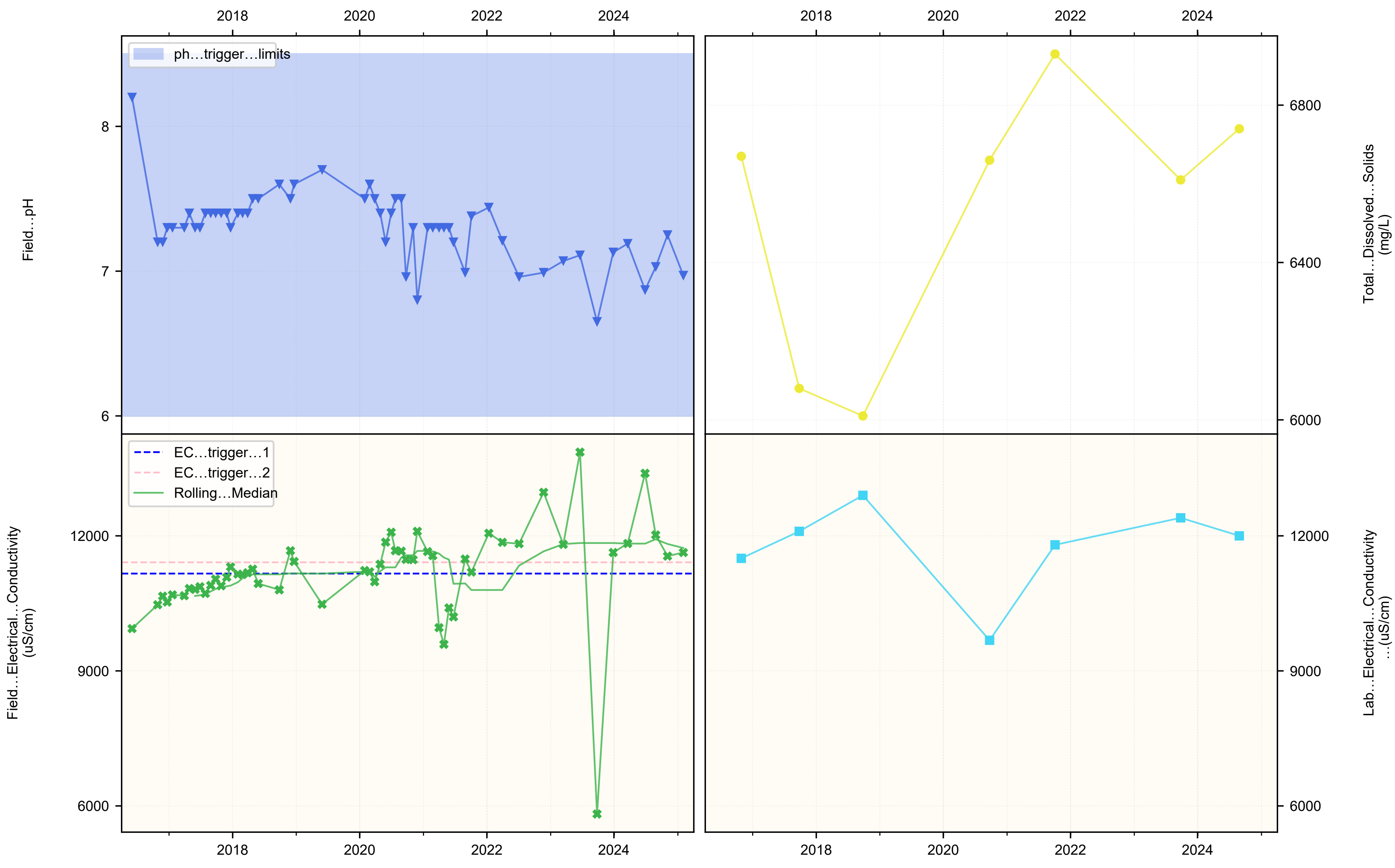
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
ANZG…(irrigation)…used…for…triggers

P4…(Napperby…Formation;…Outcrop)



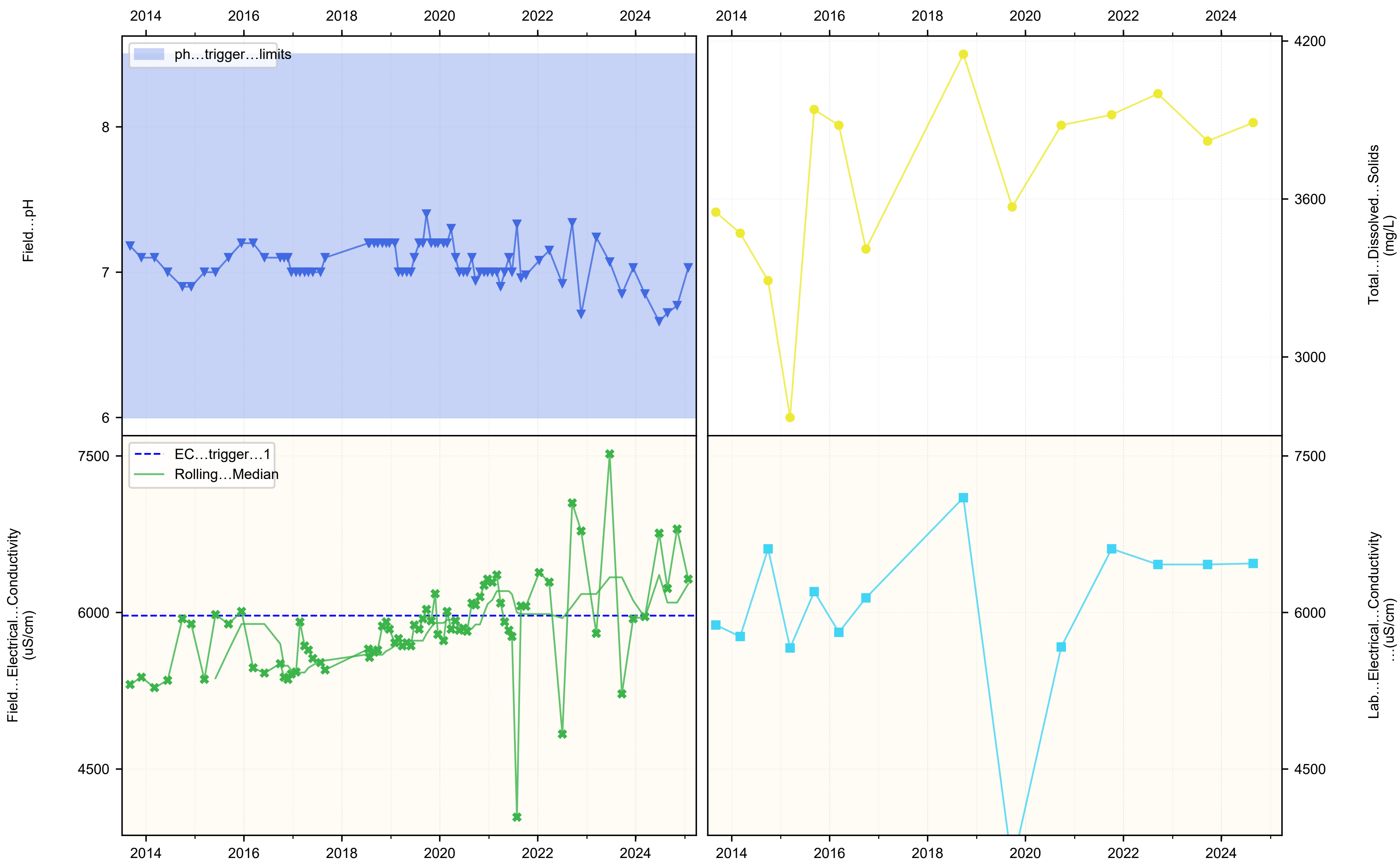
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
EC…two…tiered…used…for…triggers

P43…(Watermark…Formation;…Outcrop)



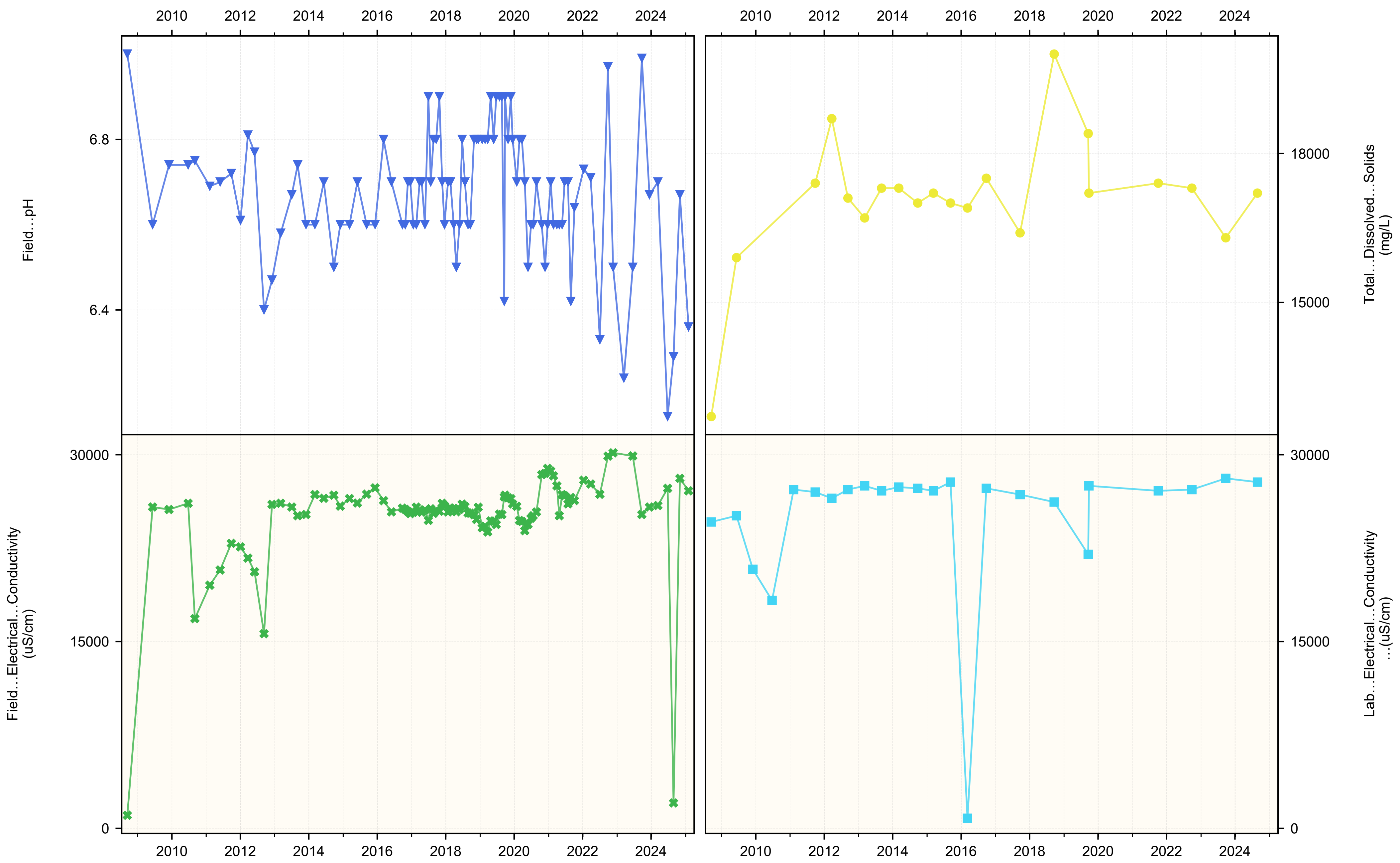
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
EC…two…tiered…used…for…triggers

P47…(Garrawilla…Volcanics;…Outcrop)



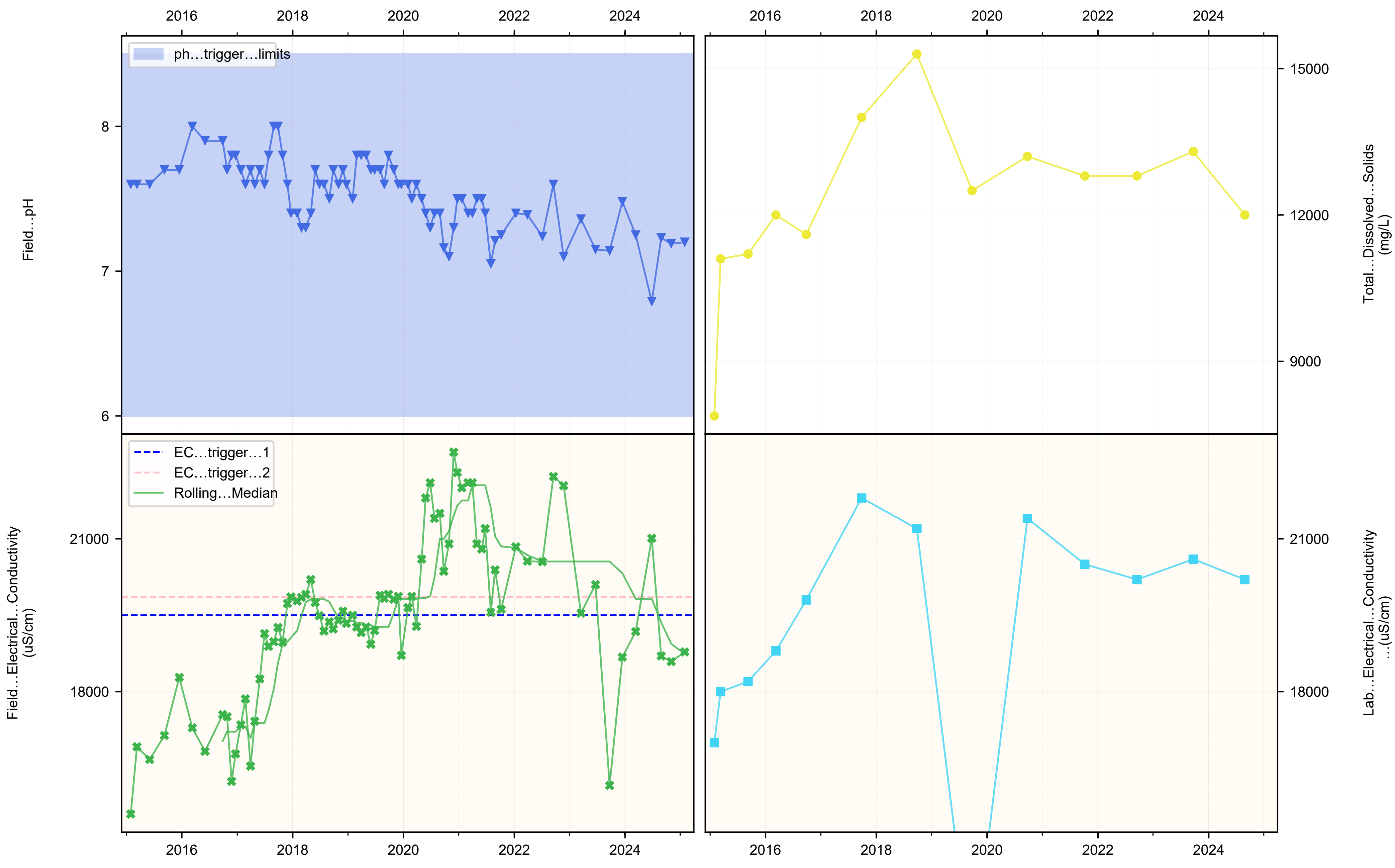
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
ANZG…(stock)…used…for…triggers

P5…(Pamboola…Formation;…Outcrop)



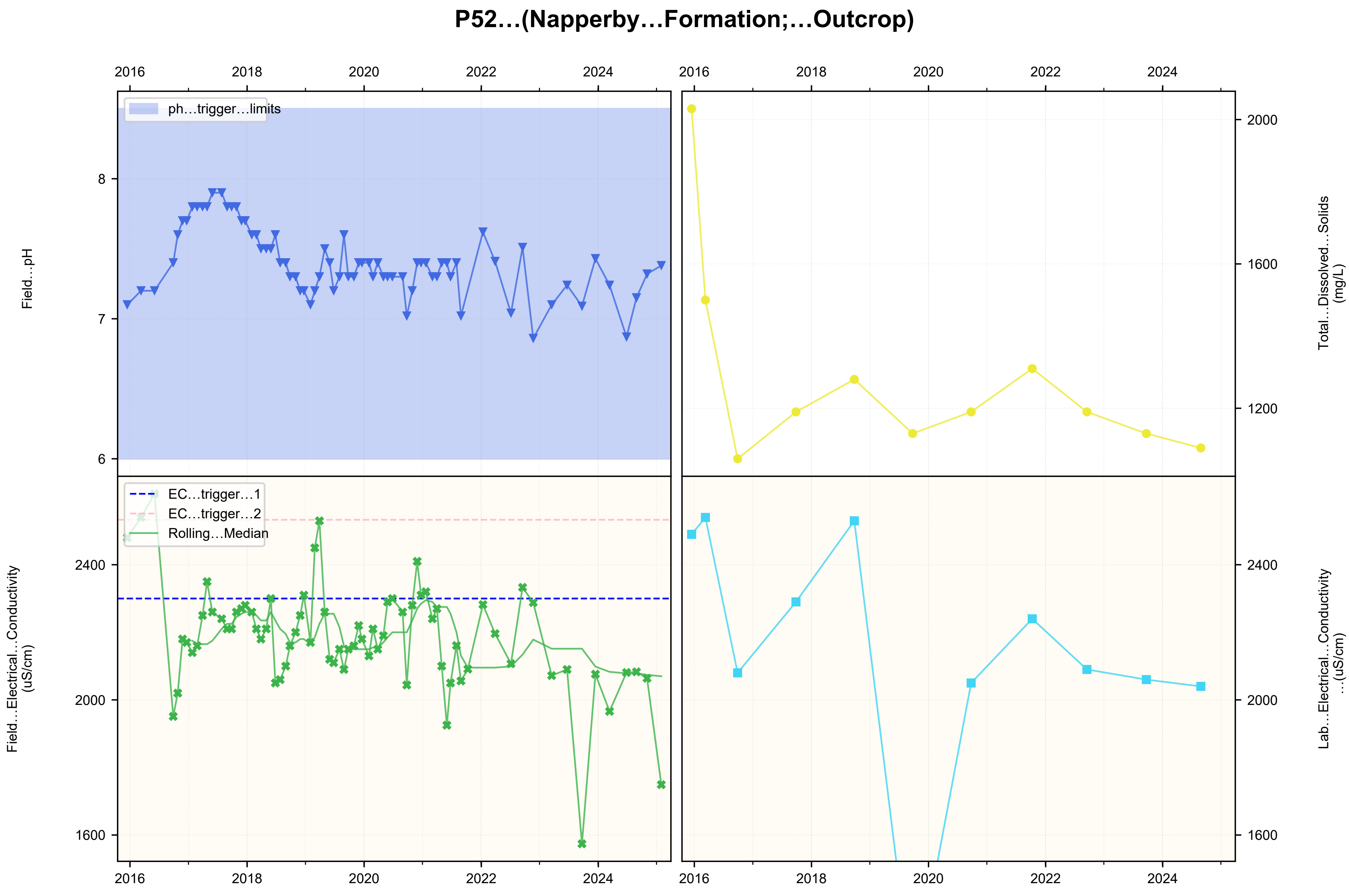
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

P51…(Garrawilla…Volcanics;…Outcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
EC…two…tiered…used…for…triggers

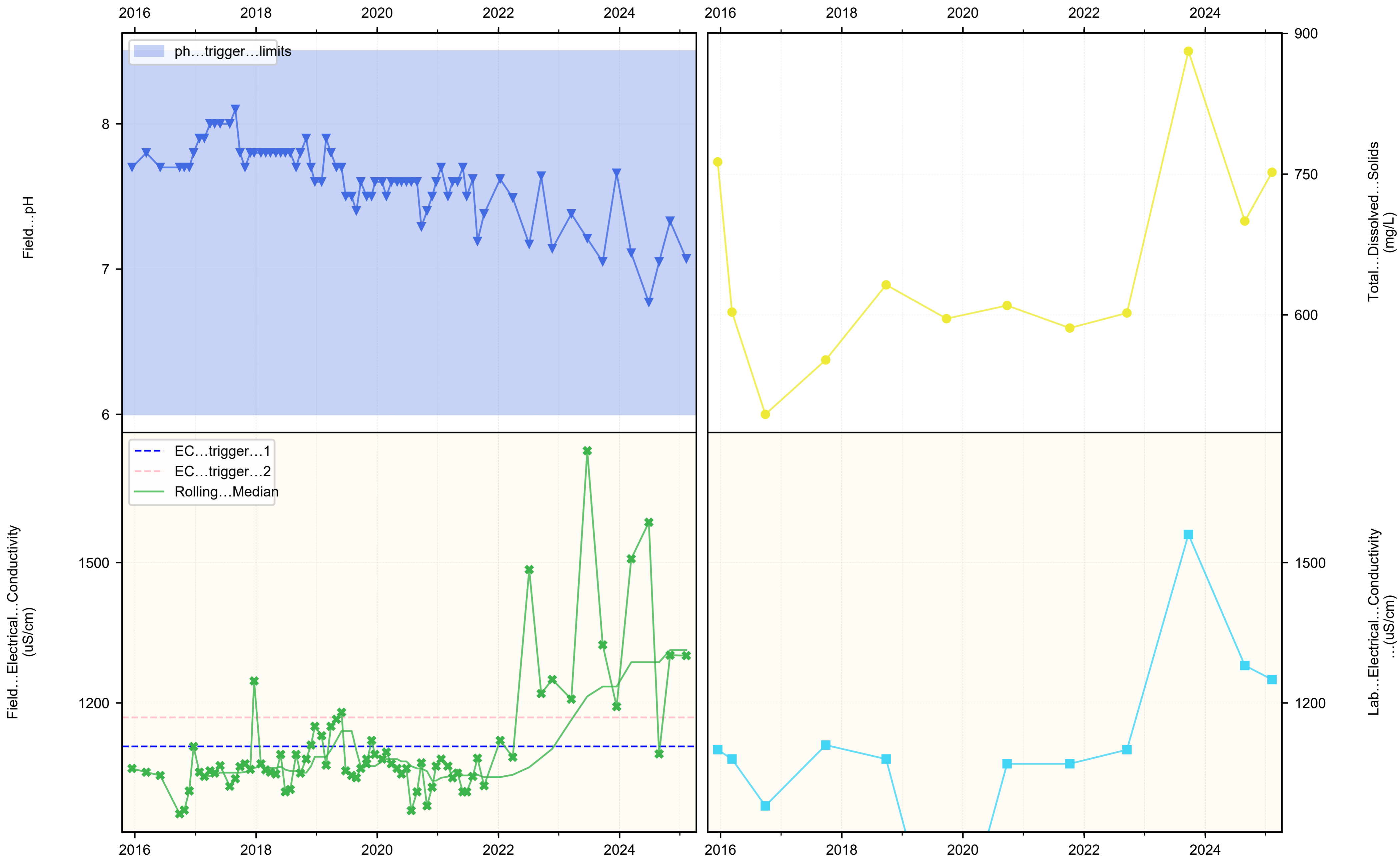
Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
EC…two…tiered…used…for…triggers

Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

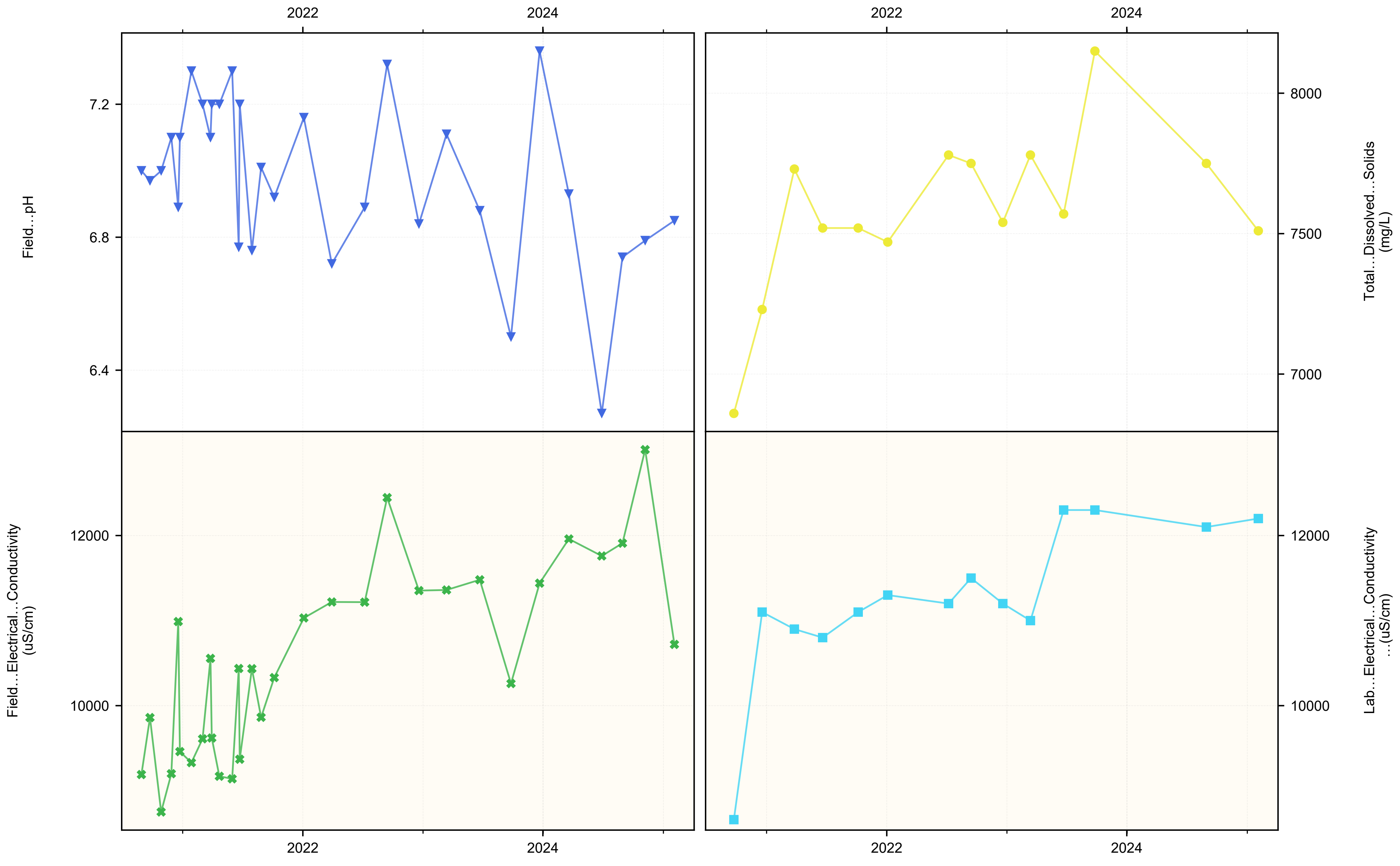
P53…(Garrawilla…Volcanics;…Outcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
EC…two…tiered…used…for…triggers

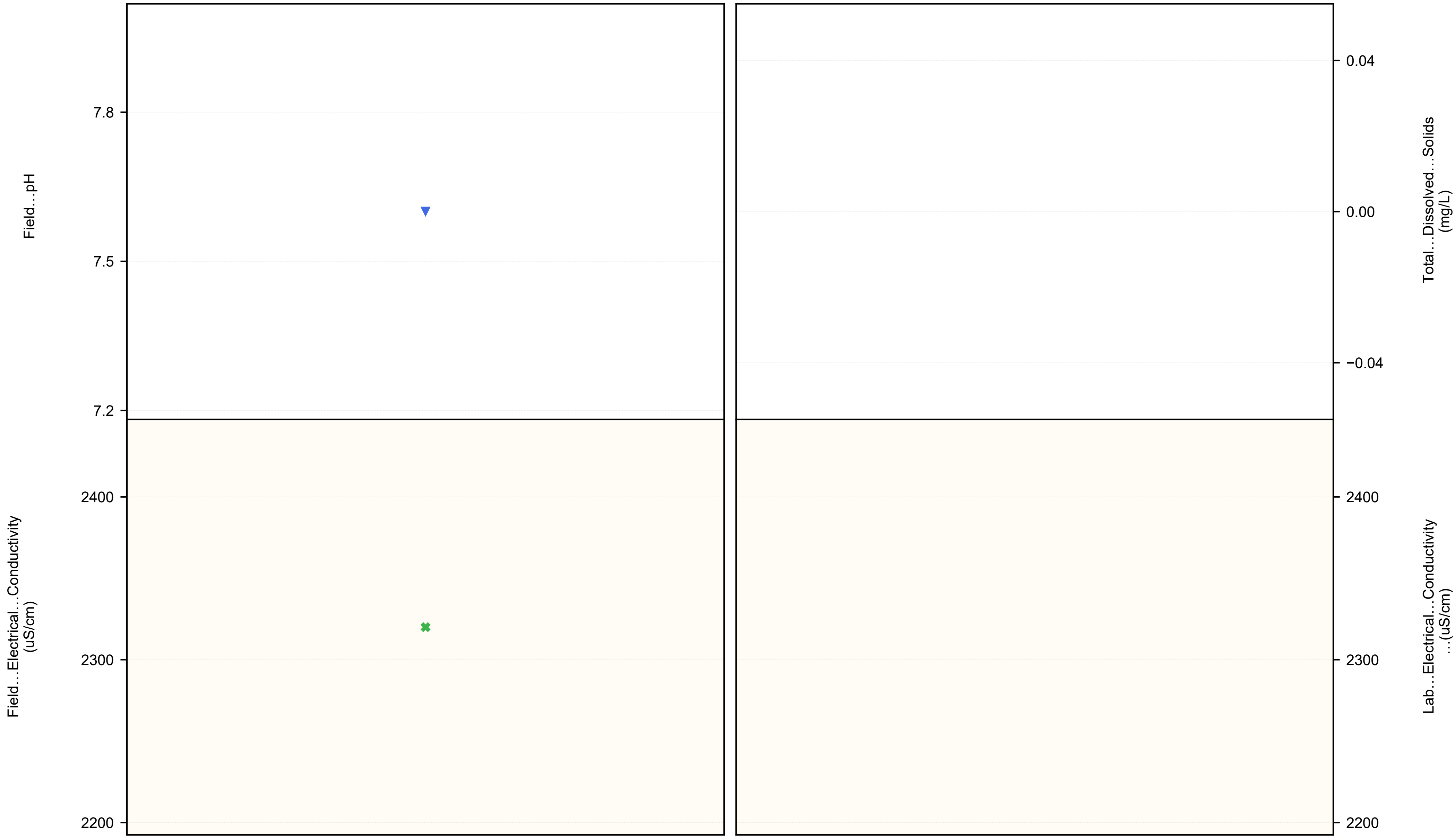
Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

P58…(Rail…Loop…Dams;…Outcrop)



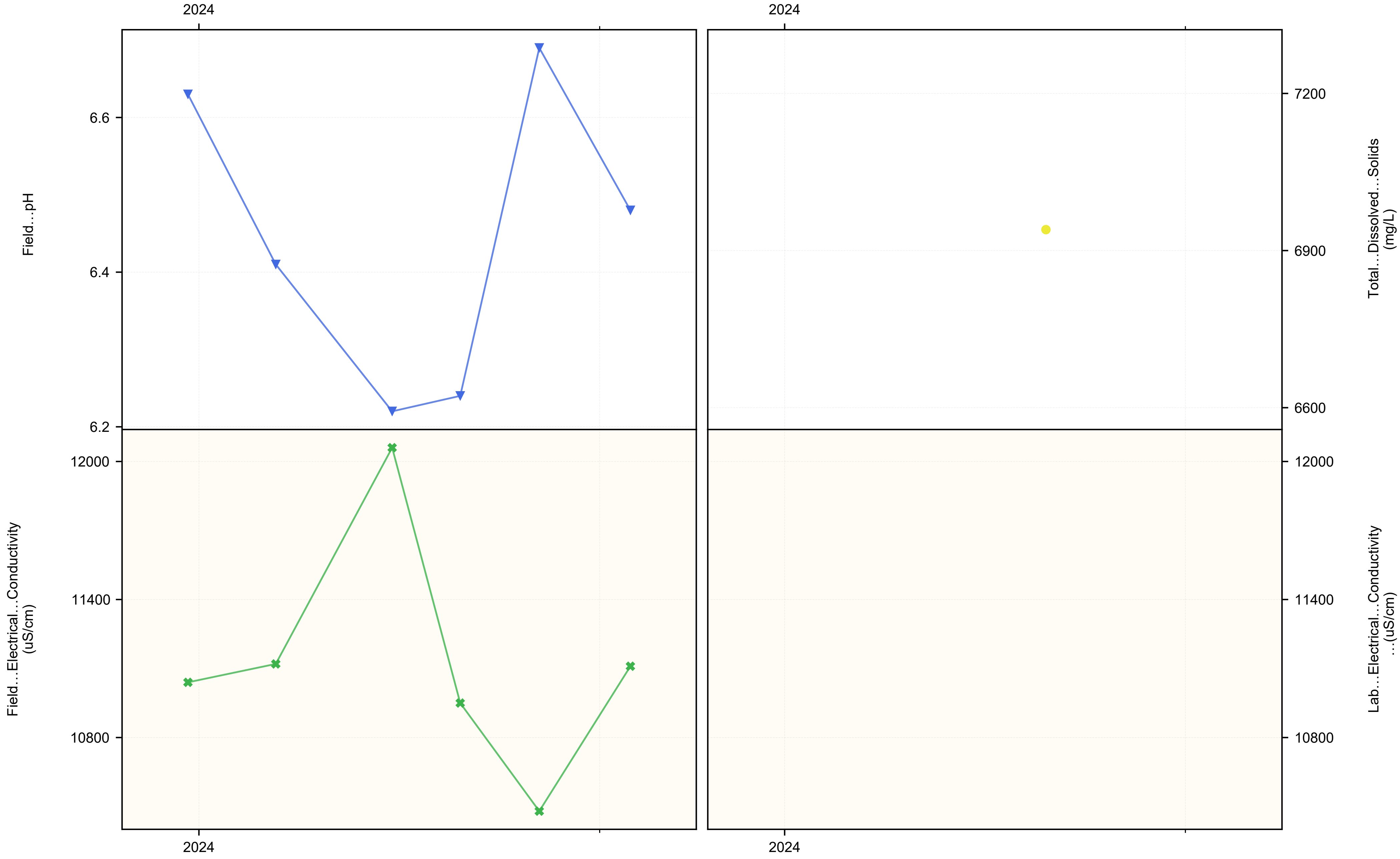
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

P6…(Pilliga…Sandstone;…Outcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

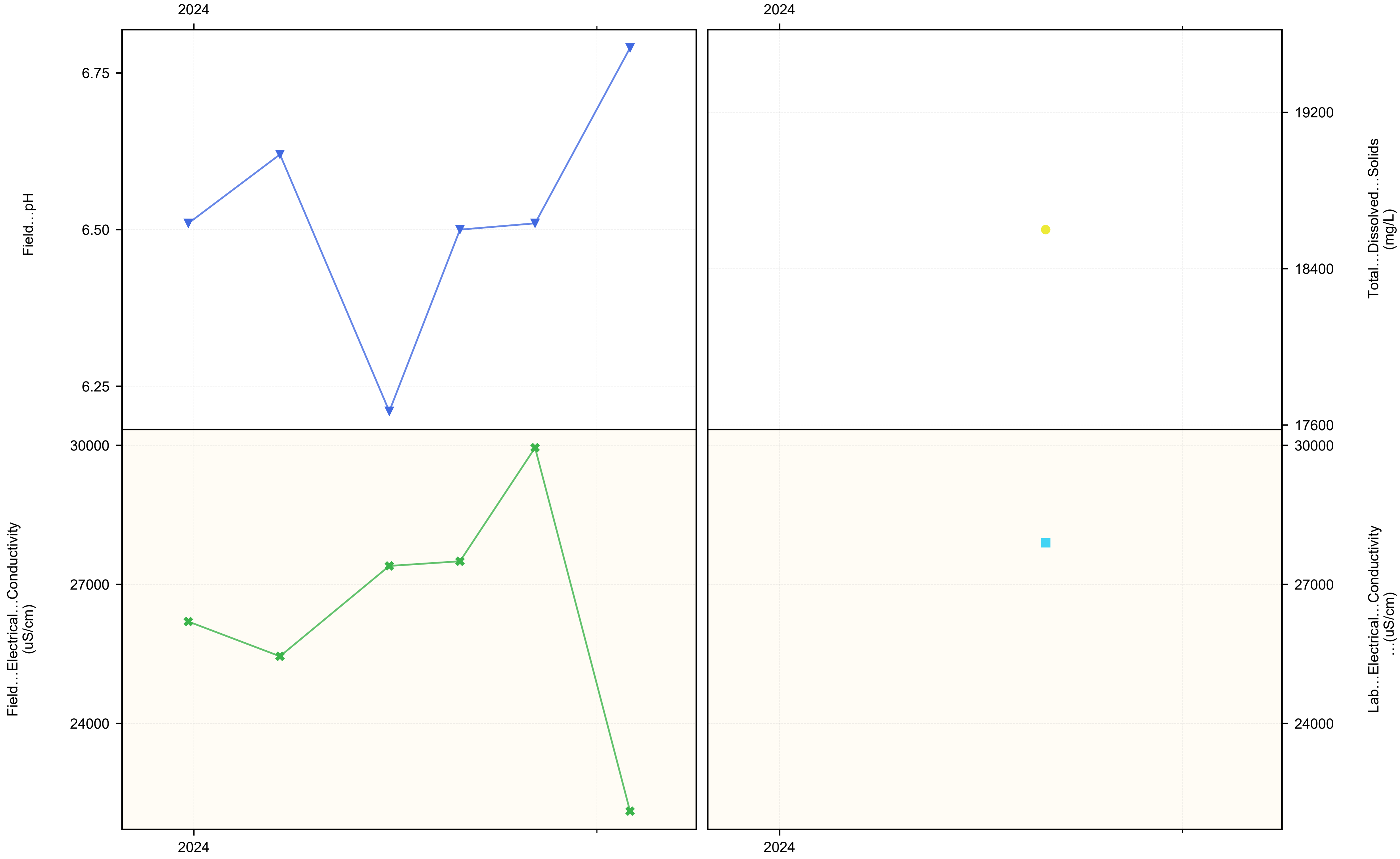
P63R (Napperby Formation; No structure info)



Filled markers indicate above limit of reporting, empty markers indicate below limit of reporting

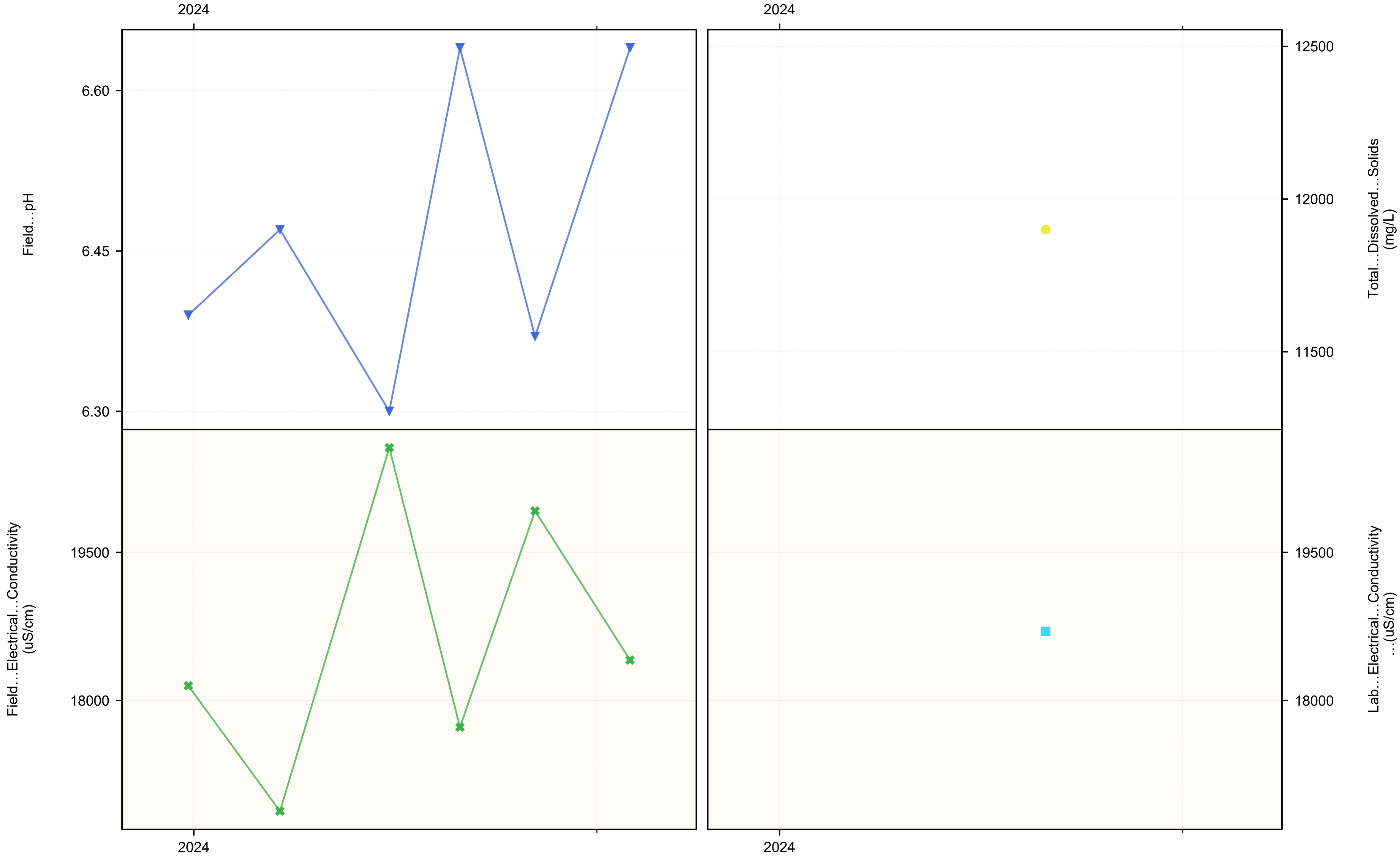
Australasian Groundwater and Environmental Consultants Pty Ltd
Water Quality Plots - General Parameters

P68…(Colluvium;…No…structure…info)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

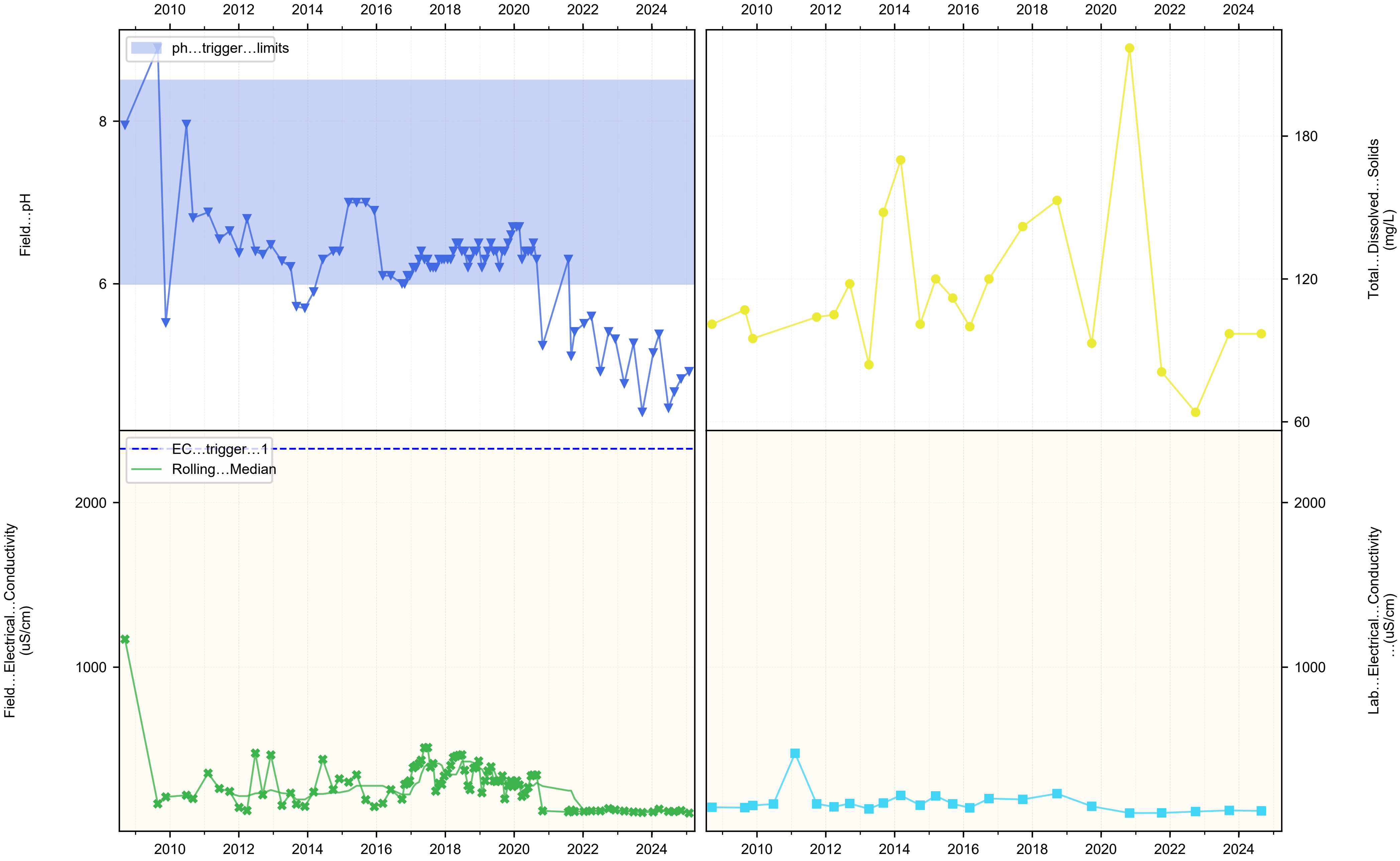
P69…(Napperby…Formation;…No…structure…info)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

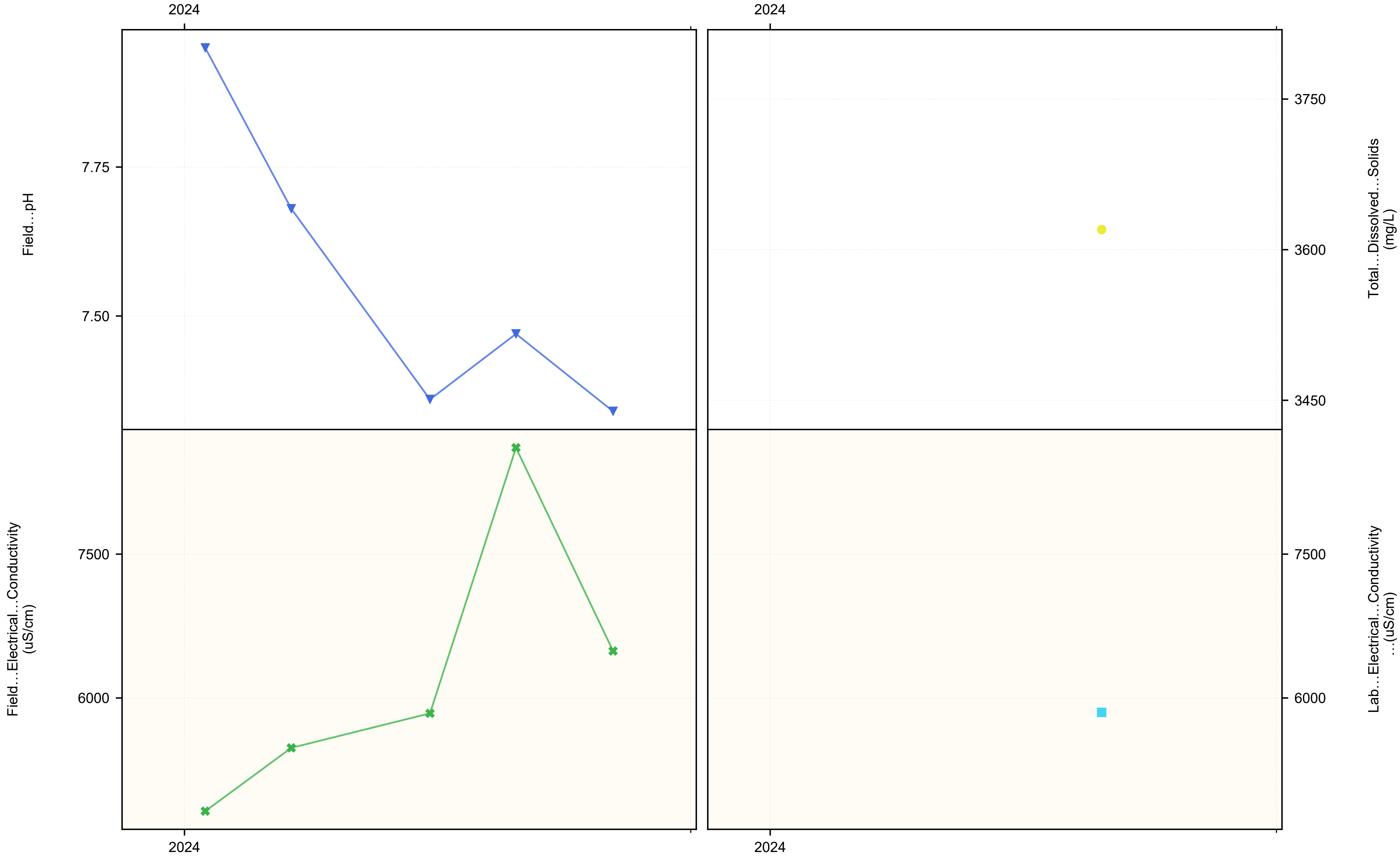
Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

P7…(Pilliga…Sandstone;…Outcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
ANZG…(irrigation)…used…for…triggers

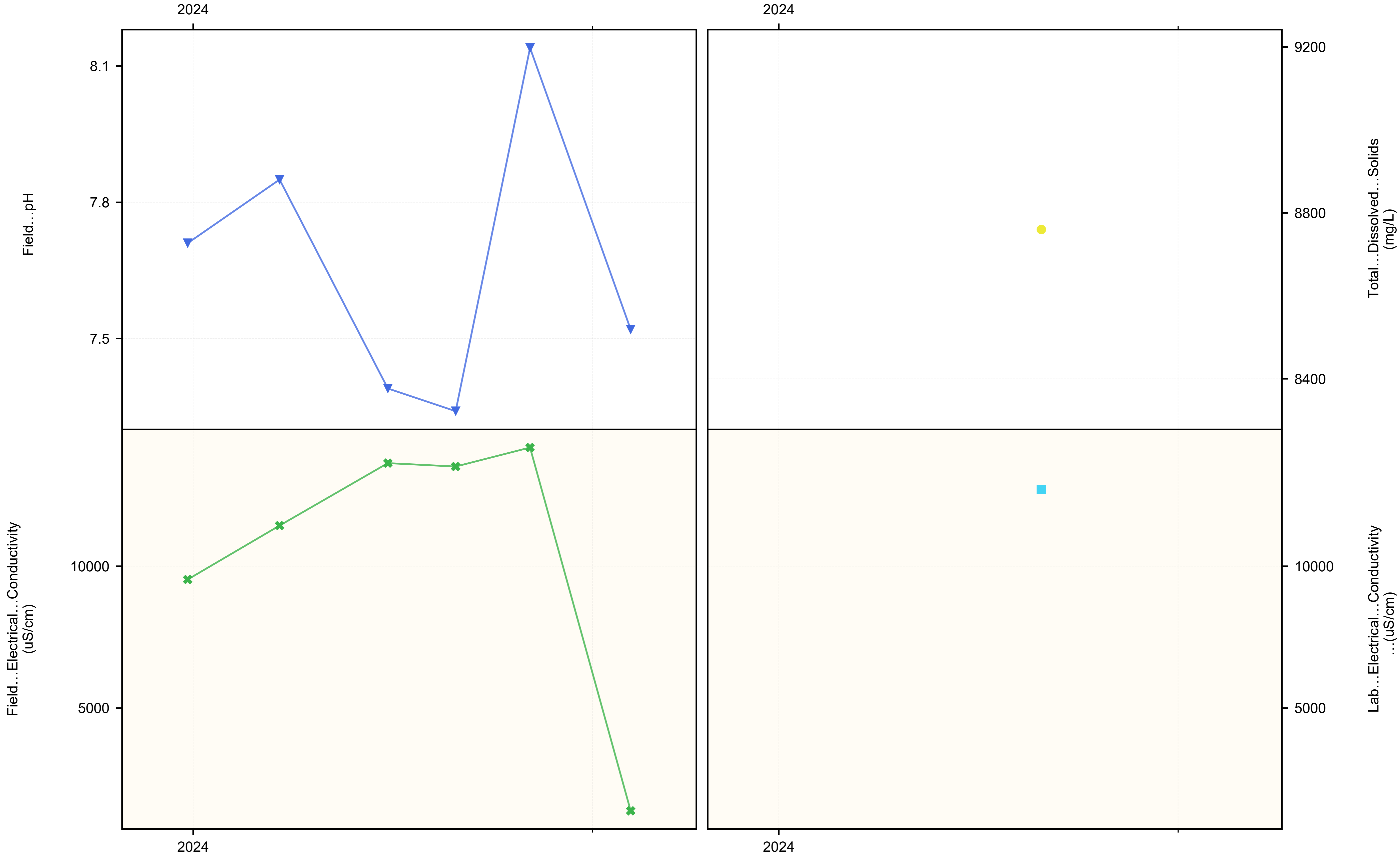
P72…(Purlawaugh…Formation;…No…structure…info)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

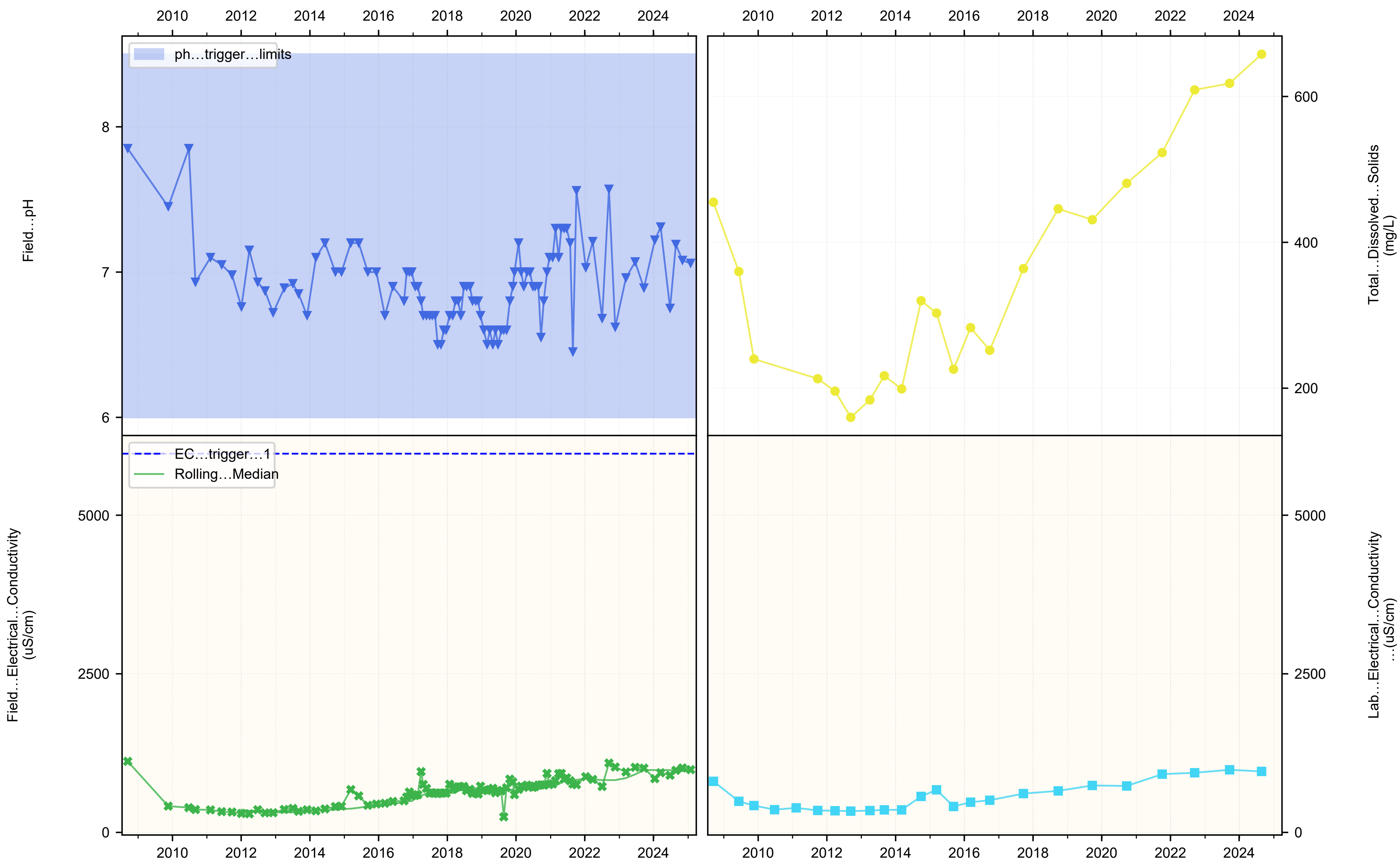
P75 (Napperby Formation; No structure info)



Filled markers indicate above limit of reporting, empty markers indicate below limit of reporting

Australasian Groundwater and Environmental Consultants Pty Ltd
Water Quality Plots - General Parameters

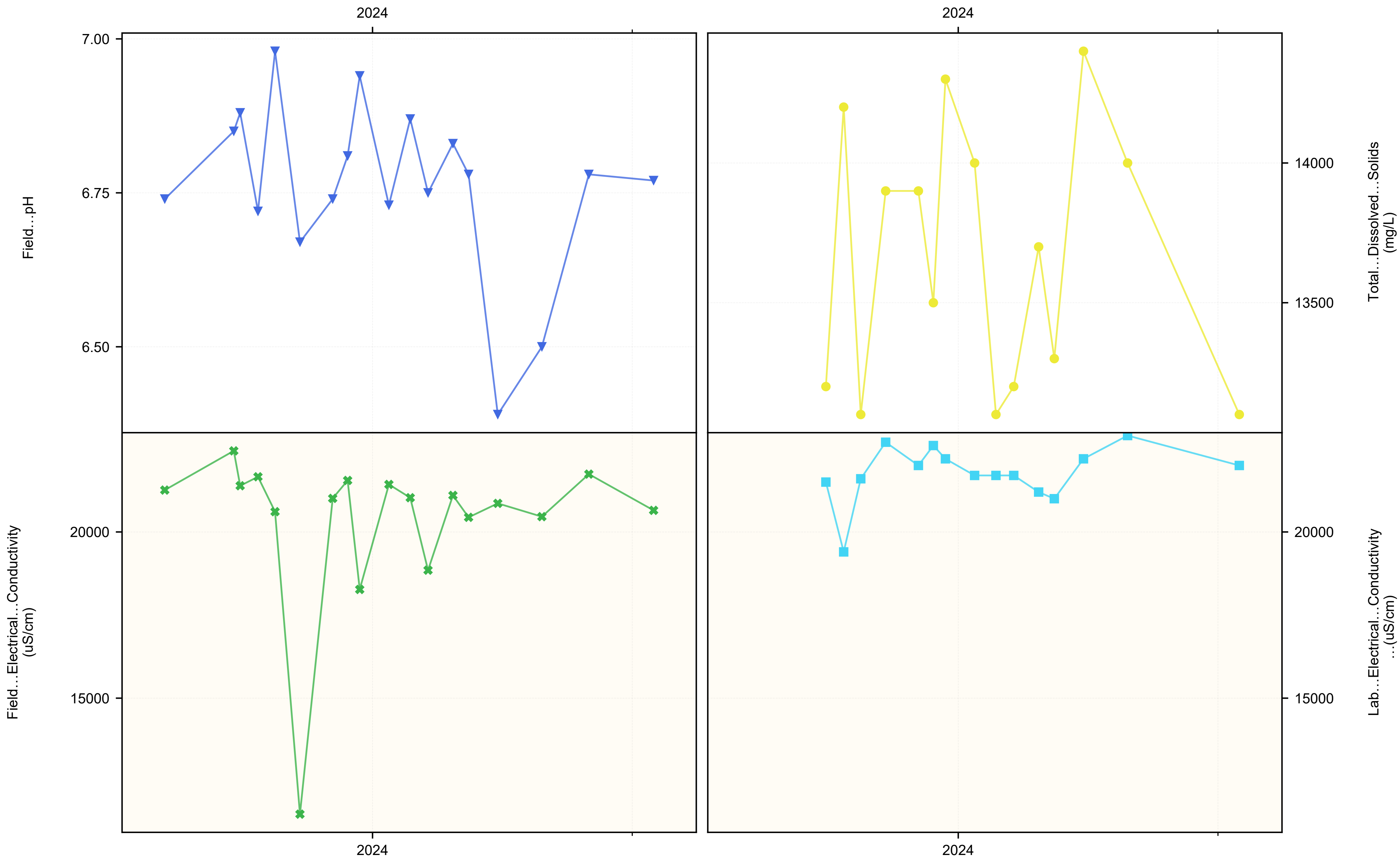
P8…(Purlawaugh…Formation;…Outcrop)



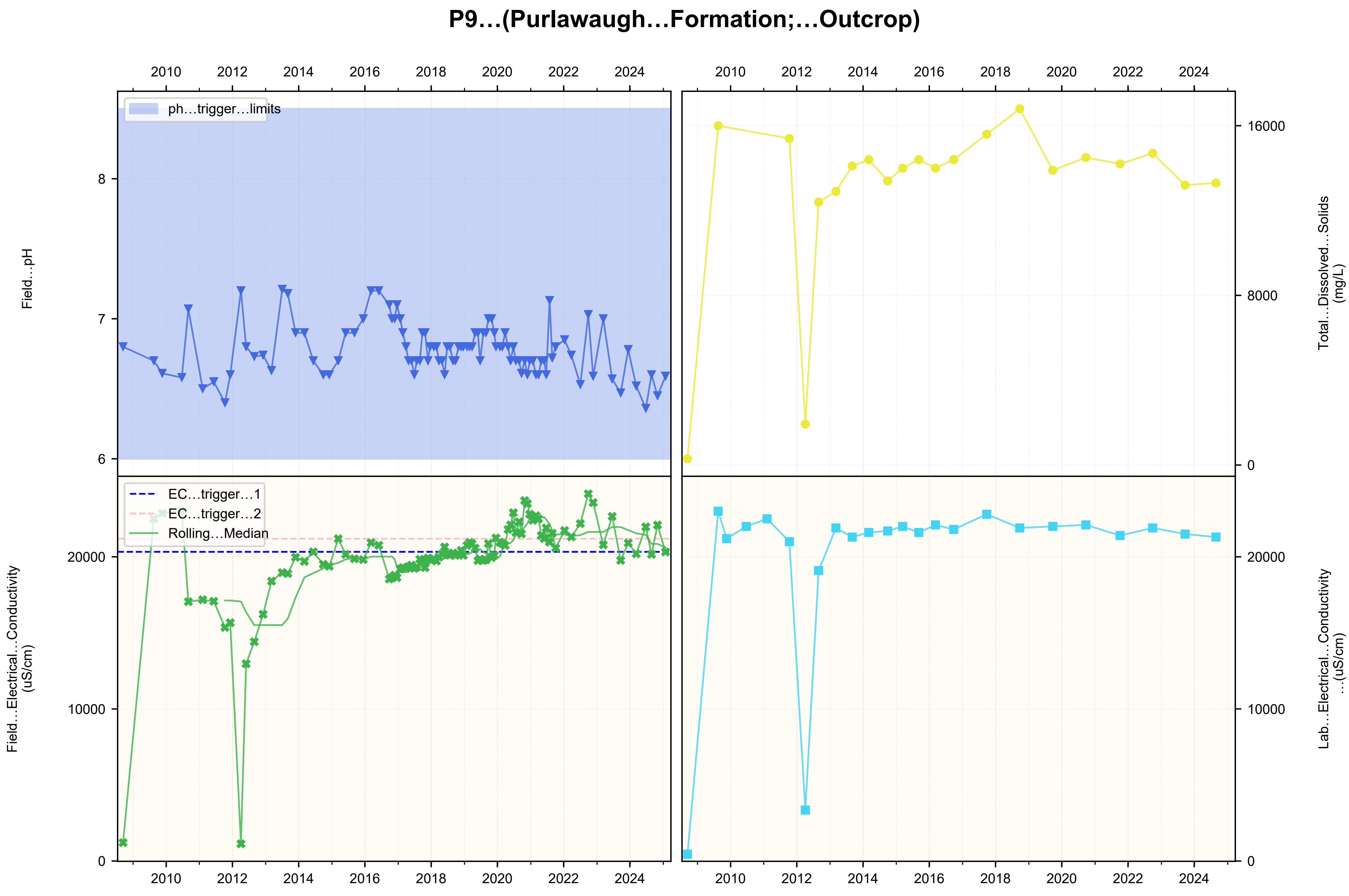
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
ANZG…(stock)…used…for…triggers

Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

P84…(Siltstone;…No…structure…info)



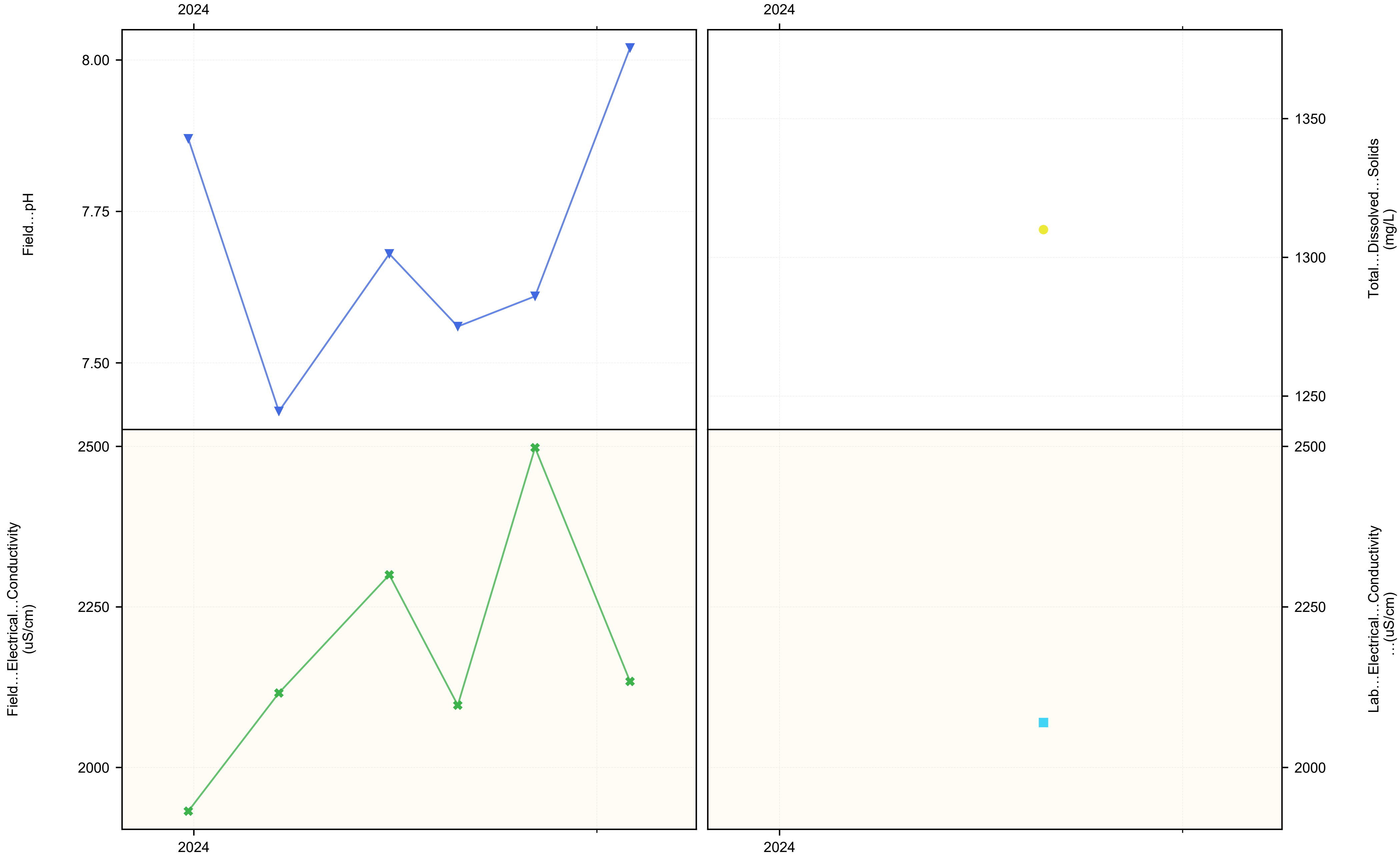
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting
EC…two…tiered…used…for…triggers

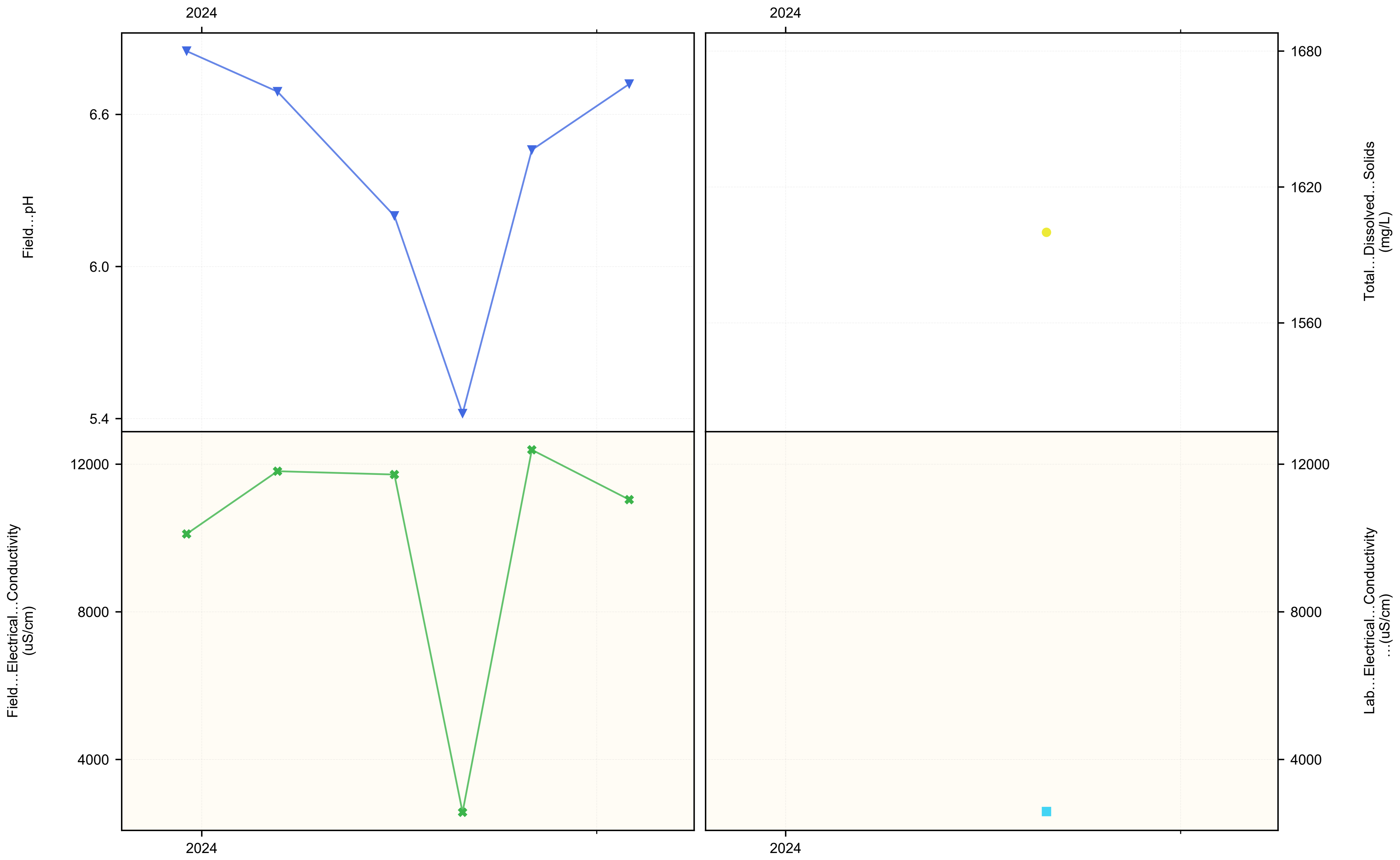
Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

P90 (Pilliga Sandstone; No structure info)



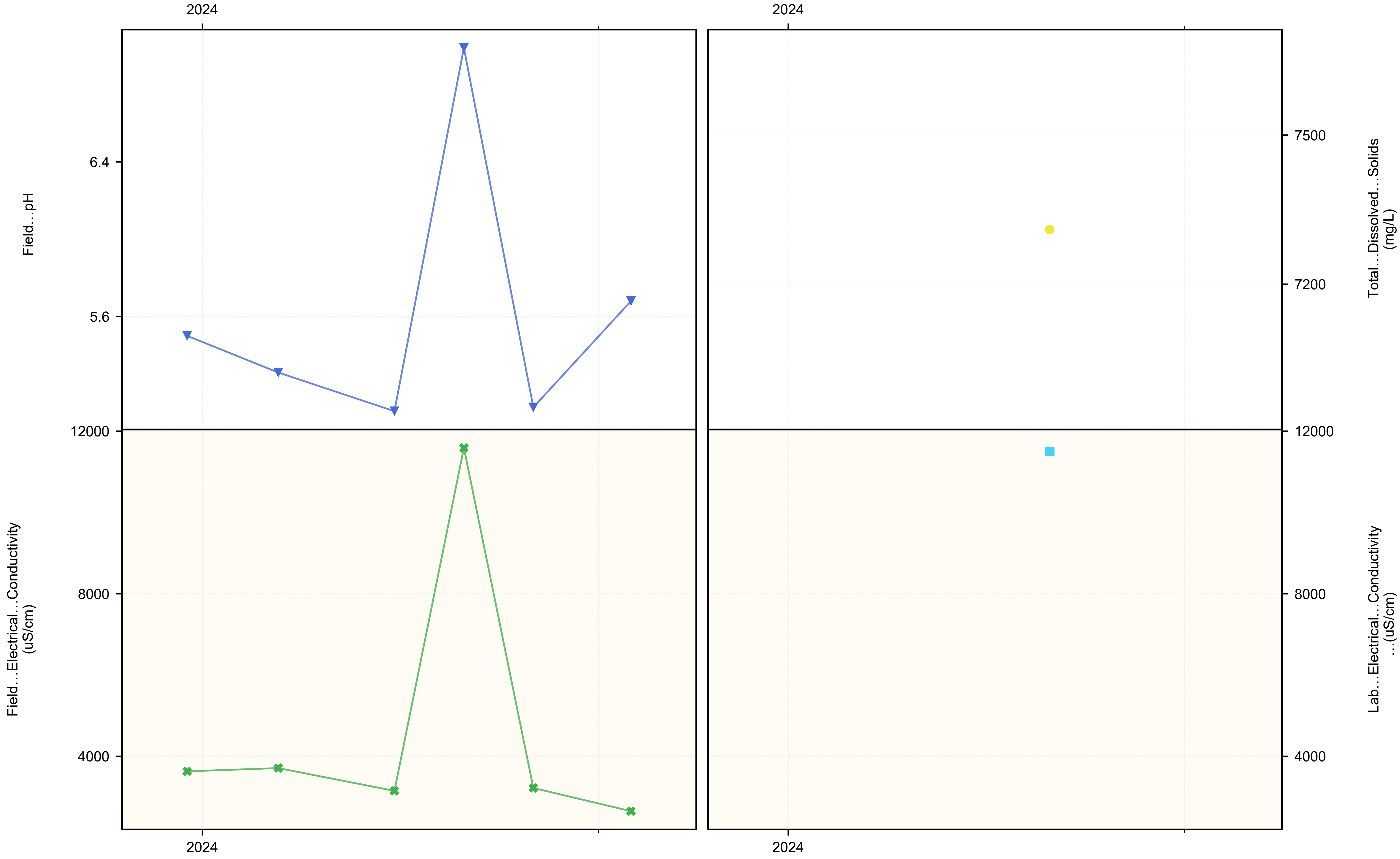
Filled markers indicate above limit of reporting, empty markers indicate below limit of reporting

P91…(Mayfield…Spring;…No…structure…info)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

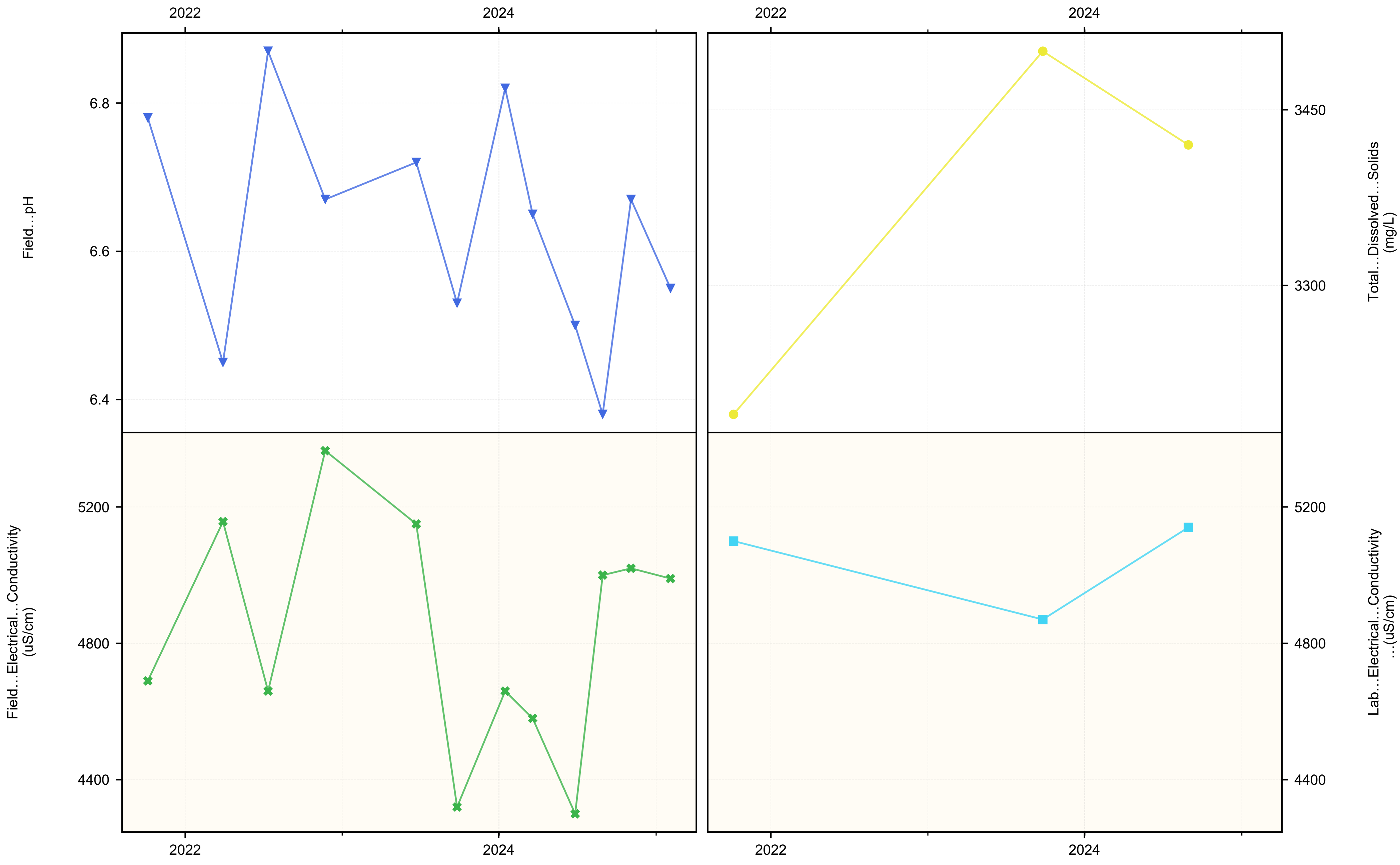
P92…(Mayfield…Spring;…No…structure…info)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

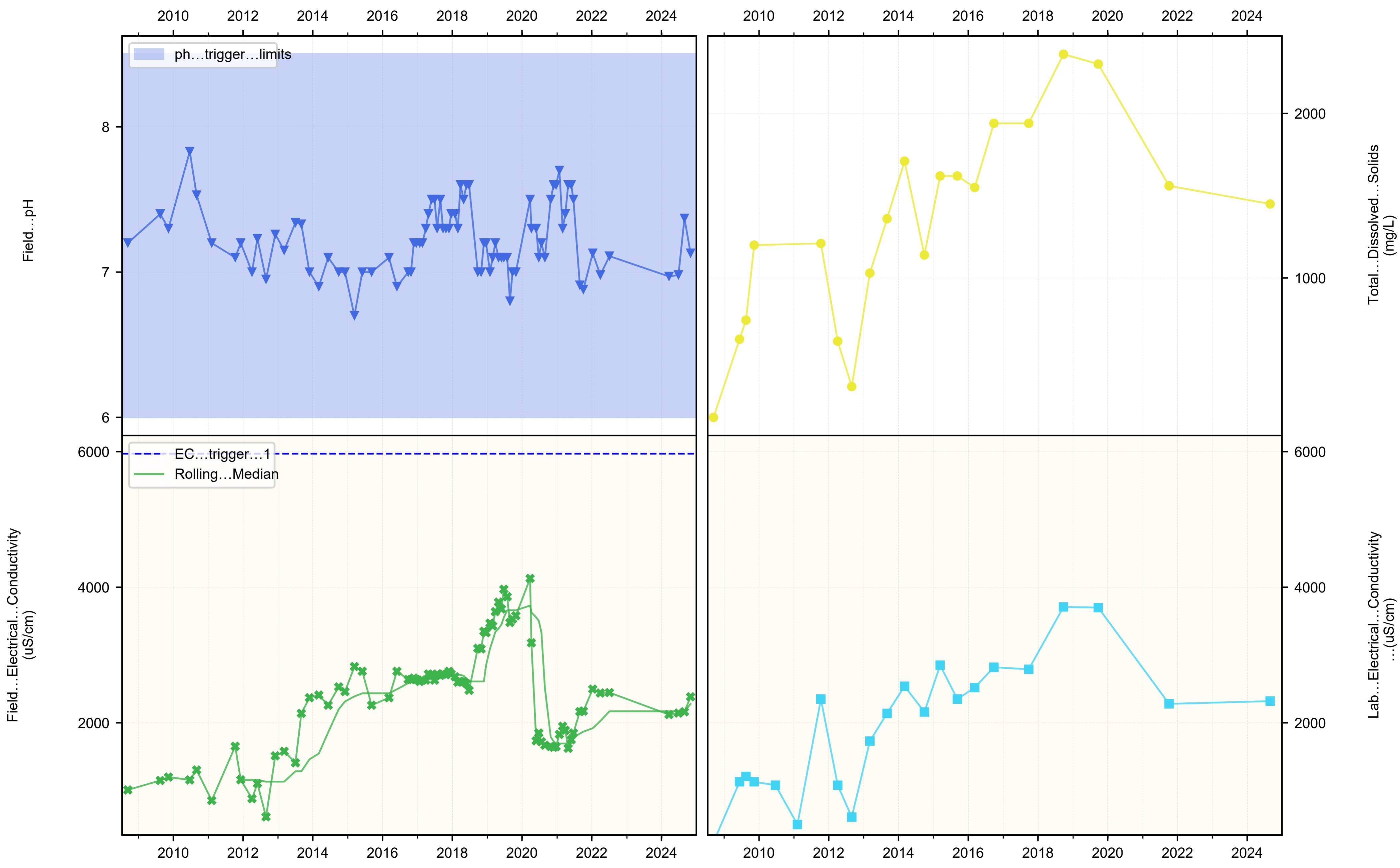
Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

WB10…(Unknown;…No…structure…info)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

WB2…(Garrawilla…Volcanics…-…old;…Outcrop)



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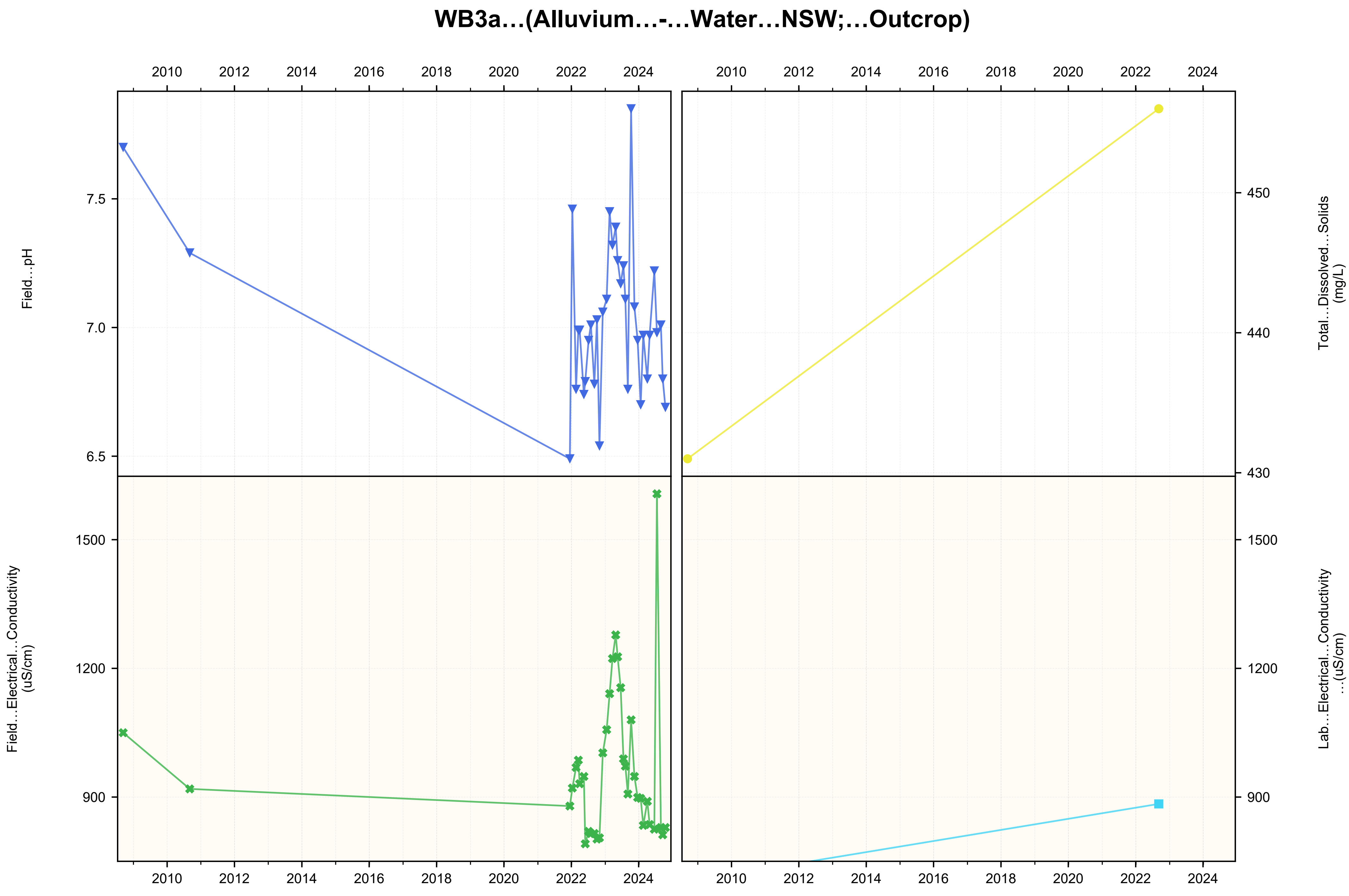
ANZG…(stock)…used…for…triggers

Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters



Filled markers indicate above limit of reporting, empty markers indicate below limit of reporting

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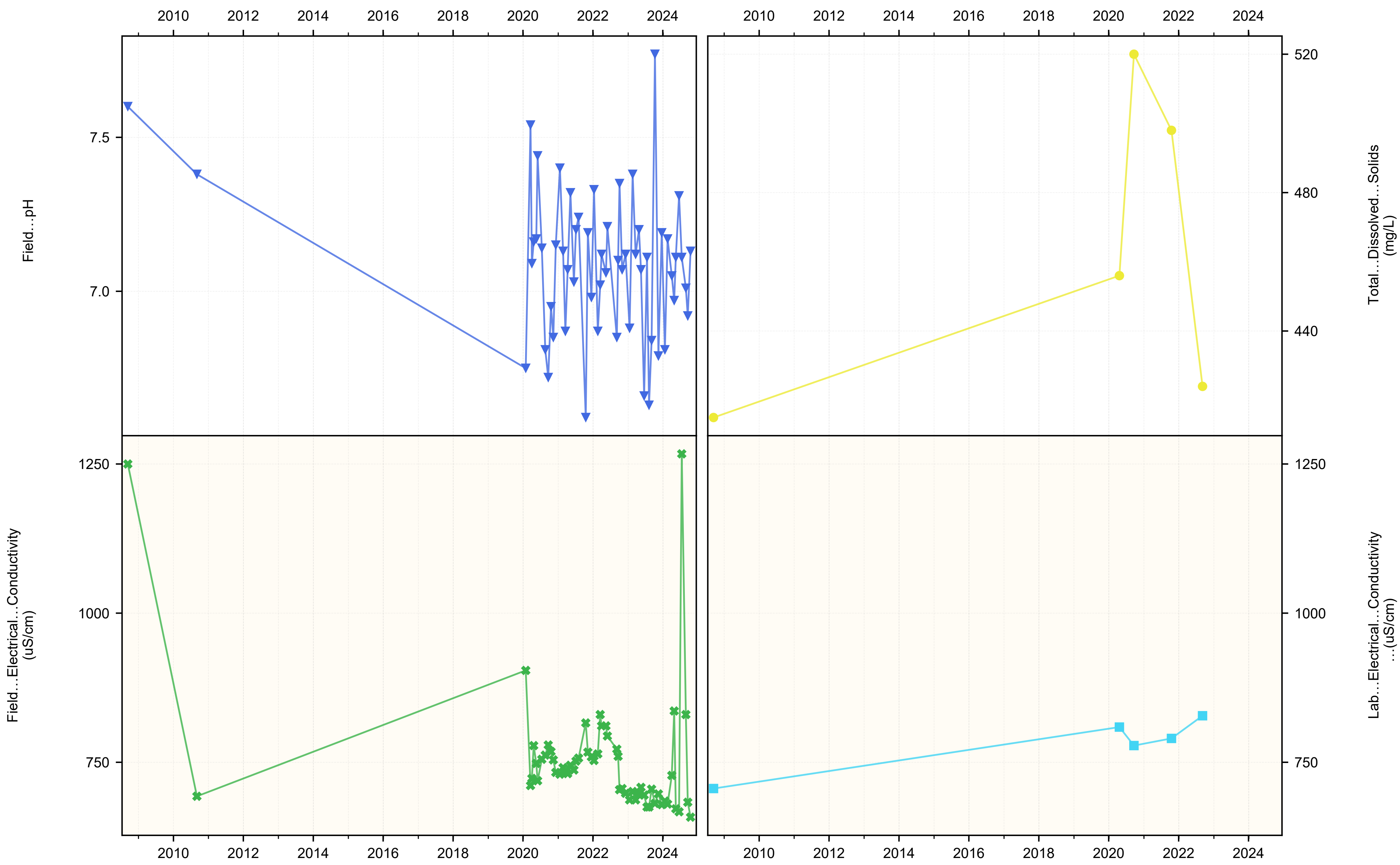
Water Quality Plots - General Parameters

WB3b…(Alluvium…-…Water…NSW;…Outcrop)



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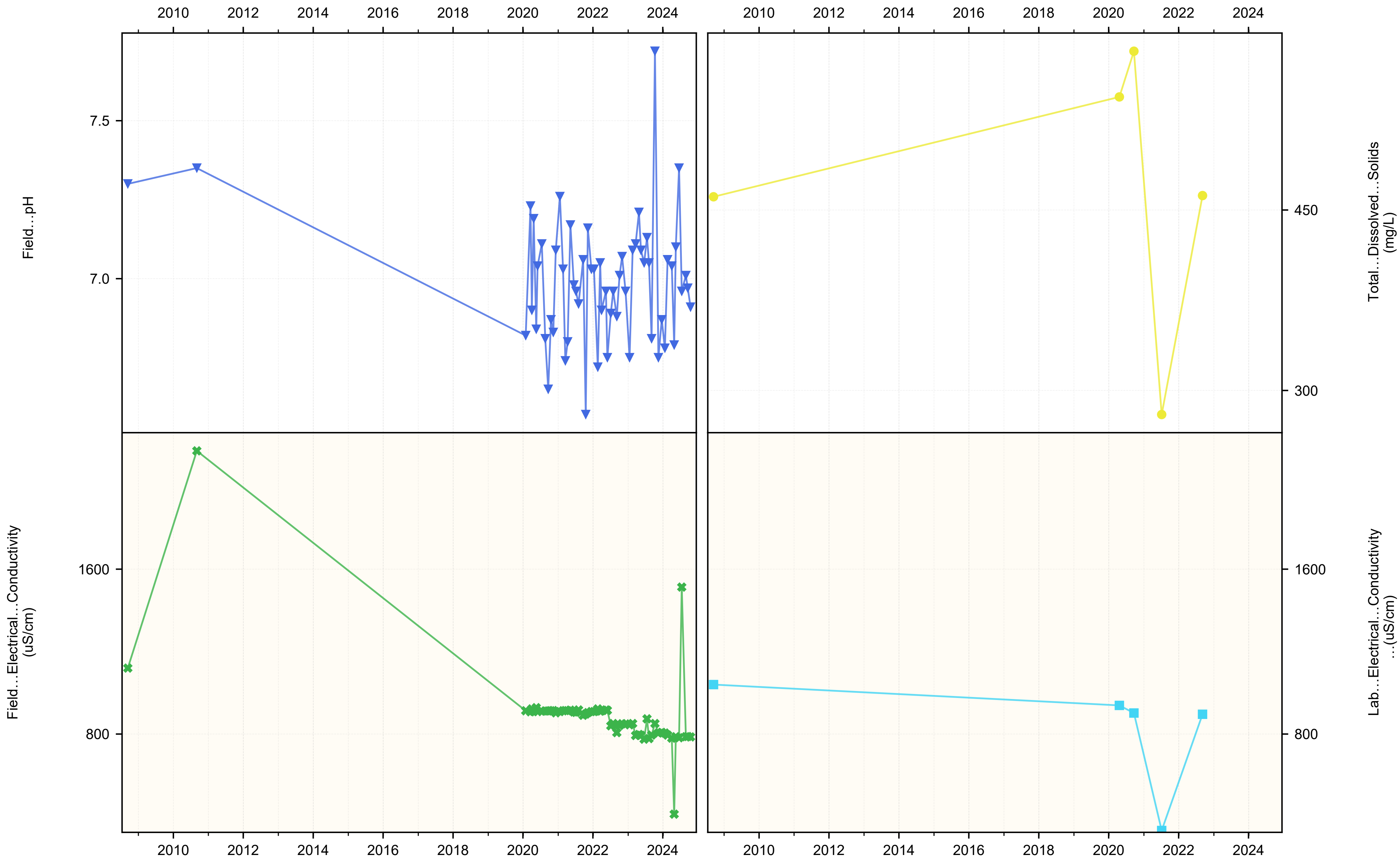
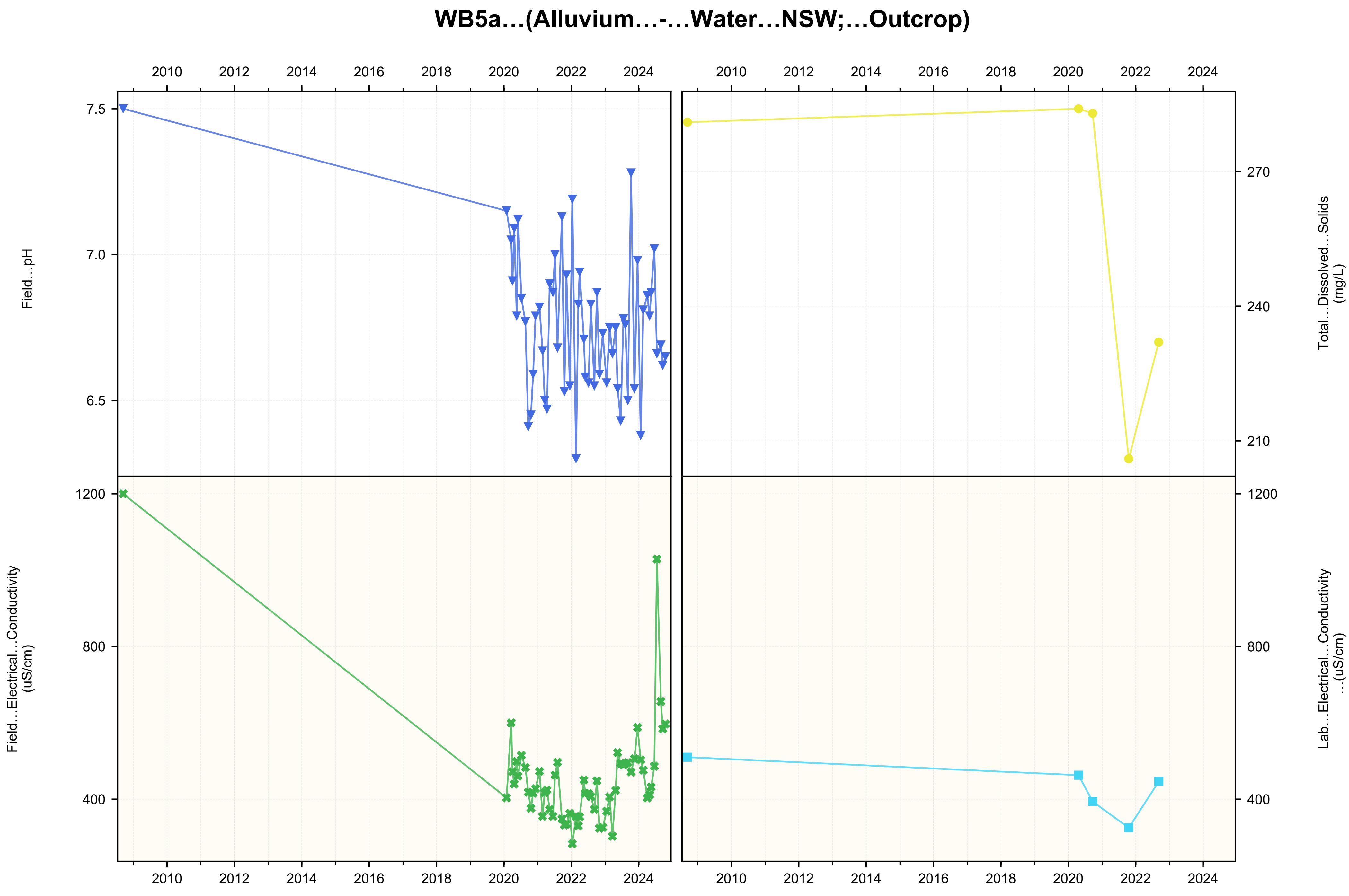
WB4…(Alluvium…-…Water…NSW;…Outcrop)



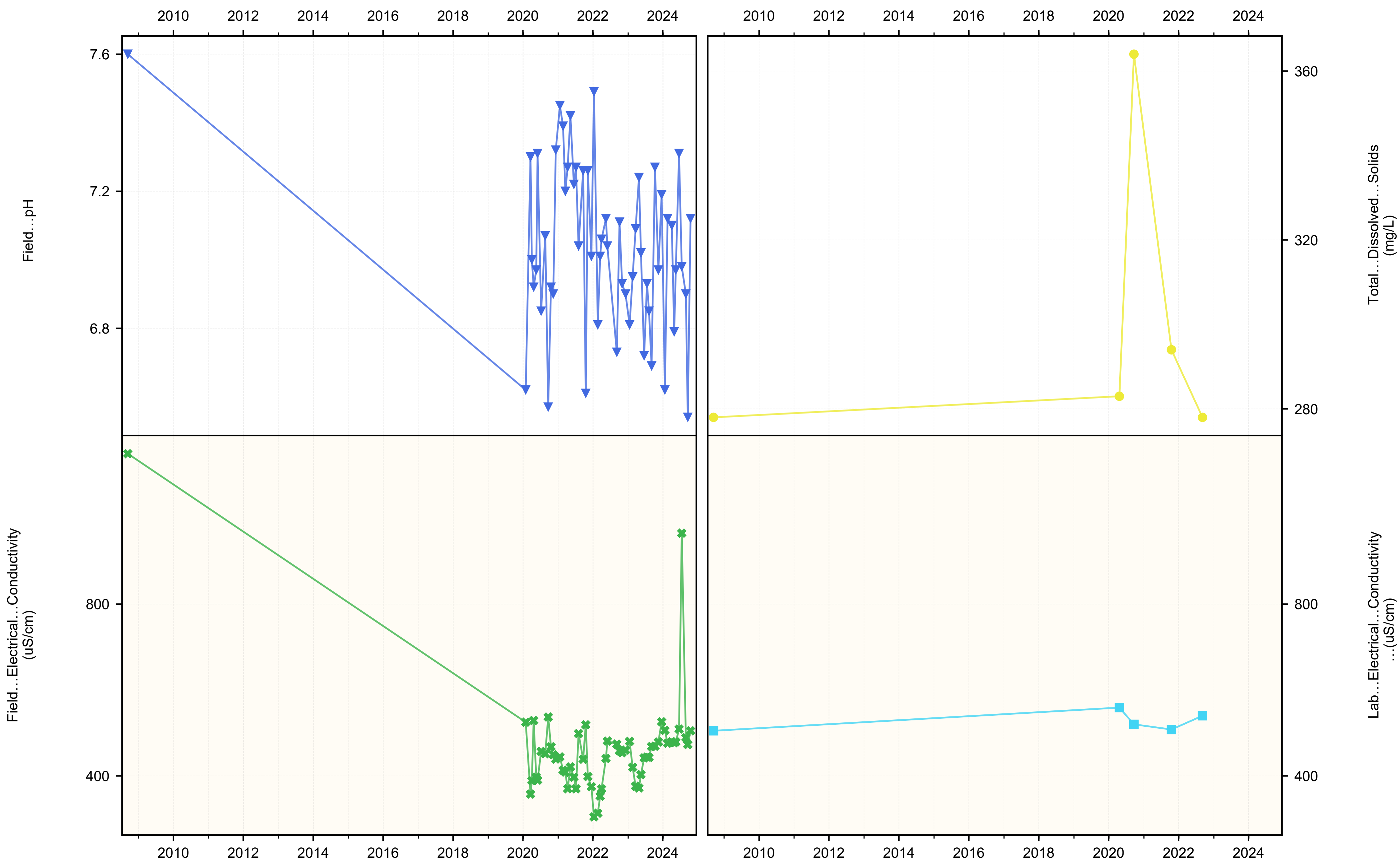
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters



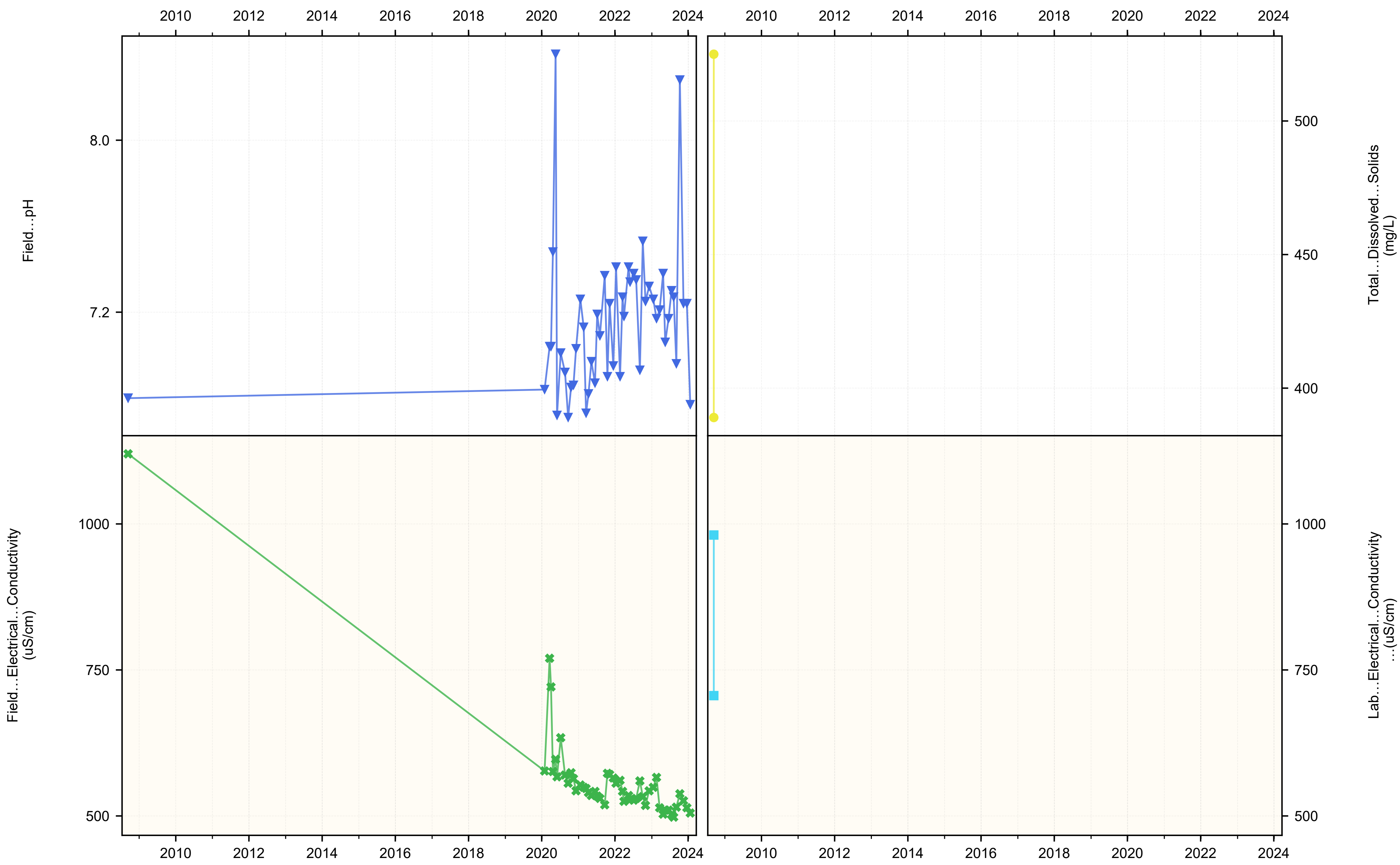
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

WB5b…(Alluvium…-…Water…NSW;…Outcrop)



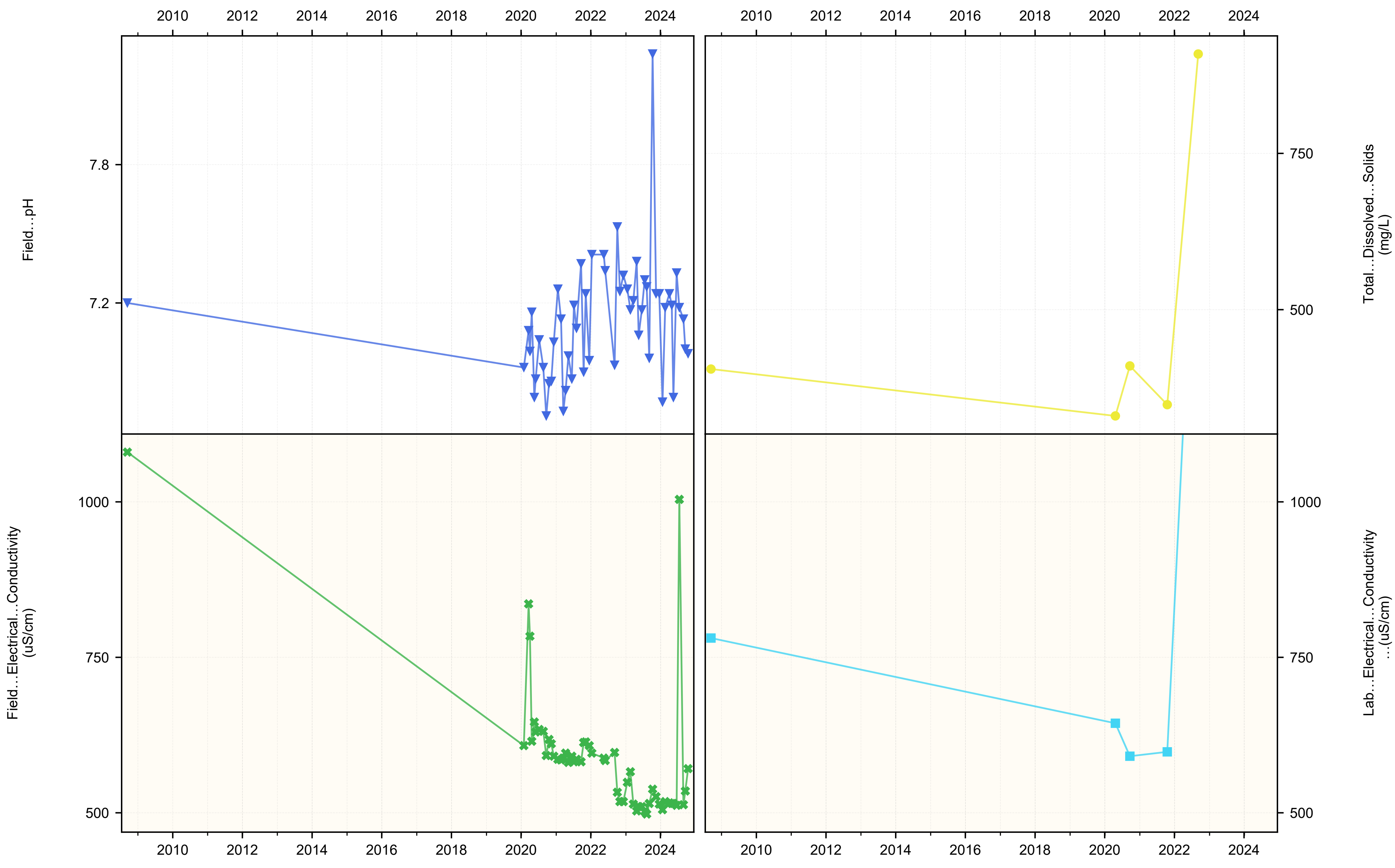
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

WB6a…(Alluvium…-…Water…NSW;…Outcrop)



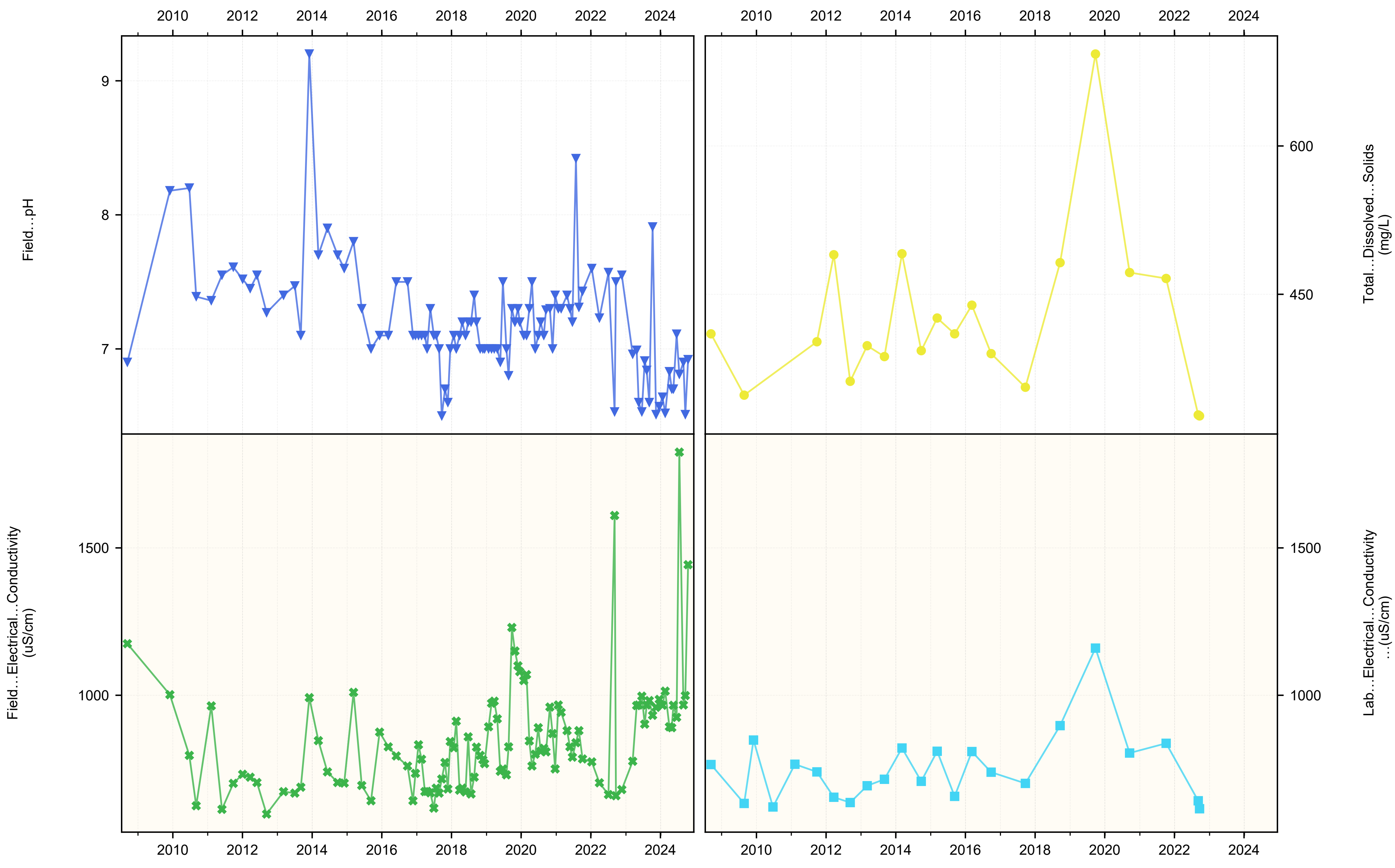
Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

WB6b (Alluvium - Water NSW; Outcrop)



Filled markers indicate above limit of reporting, empty markers indicate below limit of reporting

WB7…(Alluvium…-…Water…NSW;…Outcrop)



Filled…markers…indicate…above…limit…of…reporting,…empty…markers…indicate…below…limit…of…reporting

Australasian…Groundwater…and…Environmental…Consultants…Pty…Ltd
Water…Quality…Plots…-…General…Parameters

Appendix E

Bore census

E 1 Bore census locations

BORE ID	EASTING*	NORTHING*	PROPERTY	STATUS	COMMENTS
GW000014	774787	6619753	Mayfield- ML	Do not exist	-
GW000018	778504	6617994	Oakleigh	Do not exist	-
GW005023	775642	6614554	Longsight	Do not exist	-
GW005892	775863	6613839	Longsight	Do not exist	-
GW022595	774975	6619810	Claremont	Do not exist	-
GW034989	778260	6617846	Oakleigh	Do not exist	-
GW060976	776762	6617358	Haylen Views	Not in use	The bore is situated in alluvium, 13 meters from the creek. It has not been in use for the past 14 years. The SWL on 13/11/2024 was recorded at 2.34 mbgl.
GW060977	774351	6617299	Mayfield- ML	Do not exist	-
GW060978	777651	6616999	Haylin Views	Do not exist	-
GW966836	776382	6619701	??	Do not exist	This bore is monitored as WB2 in groundwater monitoring program.
GW966839	776449	6619822	Claremont	Domestic bore	Currently monitored as WB2. SWL was measured at 12.82 mbgl on 27/06/2024. The bore supplies water to a series of tanks at the farm shed, which are used to fill a spray rig for farming activities. The tank capacity is approximately 50,000 litters. The paddocks are sprayed 5-6 times per year, requiring the tanks to be refilled for each event. This results in an estimated extraction of 250,000-300,000 liters per year, with additional minor use for livestock water.
House Bore	776105	6614120	Longsight	Not in use	Bore has not been in use for at least the past 5 years. Bore has approximately 27 to 28 meters and it was dry on 13/11/2024.
Longsight Dam #1	774353	6613824	Longsight	Stock use	Not a groundwater feature. The water is turbid with algae present. The primary composition is sand with a small amount of gravel. No odor or seepage was observed.

BORE ID	EASTING*	NORTHING*	PROPERTY	STATUS	COMMENTS
Longsight Dam #2	774916	6614015	Longsight	Stock use	Not a groundwater feature. The water is turbid with algae present. The primary composition is clay and silt. No odor or seepage was observed.
Mayfield Feature 1	774630	6613917	Longsight	NA	Not a groundwater feature. It is a small natural drainage channel that is dammed at both ends by Longsight Dam #1 and #2. No water flow observed.
Merrilong Seep	775670	6615617	Merrilong	NA	Not a groundwater feature. A square wooden "well head" was constructed to harness the seep. The primary composition observed was silt and sand. The water level was recorded at the surface on 13/14/2024.
Yarranabee Dam #1	774935	6612839	Yarranabee	Stock use	Not a groundwater feature. The water is turbid with minimal algae present. The primary composition is silt, sand and gravel. No odor or seepage was observed.
Yarranabee Dam #2	776014	6613131	Yarranabee	Stock use	Not a groundwater feature. The water is turbid with minimal algae present. The primary composition is silt, sand and minimal gravel. No odor or seepage was observed.

Notes:
* Coordinates system: GDA 94/MGA Zone 55
NA: Not applicable
SWL: Static Water Level
mbgl: Meters below ground level

GW060976	IMAGE
Property Name: Haylen Views	
Lease: Billy Harris	
NGIS/NSW Registered Number: 90BL132595	
Bore Status: Existing	
Easting: 776762	
Northing: 6617358	
Coordinate system: EPSG:28355 - GDA94/MGA ZONE 55	
Collar Height (cm): 23	
Ground level elevation (mAHD): 267	
Year Drilled: 1985	
Total Drilled Depth (m): 26.5	
Casing Type: Stell	
Water Depth (mTOC): 2.57 on 13/11/2024	
Bore in Use: Not in use	
Pumping Equipment: NA	
Power Supply: NA	
Pumping Rate: NA	
Primary Use of Bore: Domestic, stock	
Stock on Bore: No	
Field notes: The bore is situated in alluvium, 13 meters from the creek. It has not been in use for the past 14 years. The SWL on 13/11/2024 was recorded at 2.34 mbgl.	

GW966839 (WB2)	IMAGE
Property Name: Claremont	
Lease: Mark Foster	
NGIS/NSW Registered Number: -	
Bore Status: Existing	
Easting: 776449	
Northing: 6619822	
Coordinate system: EPSG:28355 - GDA94/MGA ZONE 55	
Collar Height (cm): 51	
Ground level elevation (mAHD): 279	
Year Drilled: 1994	
Total Drilled Depth (m): 30	
Casing Type: PVC	
Water Depth (mTOC): Measurement not possible.	
Bore in Use: Yes	
Pumping Equipment: Suction	
Power Supply: Petrol	
Pumping Rate: 250,000-300,000 litters per year	
Primary Use of Bore: Domestic, stock	
Stock on Bore: No	
Field notes: Currently monitored as WB2. SWL was measured at 12.82 mbgl on 27/06/2024. The bore supplies water to a series of tanks at the farm shed, which are used to fill a spray rig for farming activities. The tank capacity is approximately 50,000 litters. The paddocks are sprayed 5-6 times per year, requiring the tanks to be refilled for each	

event. This results in an estimated extraction of 250,000-300,000 litters per year, with additional minor use for livestock water.	

House Bore	IMAGE
Property Name: Longsight	
Lease: Graham Clarke	
NGIS/NSW Registered Number: -	
Bore Status: Existing	
Easting: 776105	
Northing: 6614120	
Coordinate system: EPSG:28355 - GDA94/MGA ZONE 55	
Collar Height (cm): 32	
Ground level elevation (mAHD): 326	
Year Drilled: -	
Total Drilled Depth (m): 27 to 28 m	
Casing Type: Stell	
Water Depth (mTOC): Dry	
Bore in Use: Not in use	
Pumping Equipment: NA	
Power Supply: Solar – Not in use	
Pumping Rate: NA	
Primary Use of Bore: Domestic, stock	
Stock on Bore: No	

Field notes: Bore has not been in use for at least the past 5 years. Bore has approximately 27 to 28 meters and it was dry on 13/11/2024.	

Longsight Dam #1	IMAGE
Property Name: Longsight	
Lease: Graham Clarke	
NGIS/NSW Registered Number: NA	
Bore Status: Not a groundwater feature	
Easting: 774353	
Northing: 6613824	
Coordinate system: EPSG:28355 - GDA94/MGA ZONE 55	
Collar Height (cm): NA	
Ground level elevation (mAHD): 323	
Year Drilled: NA	
Total Drilled Depth (m): NA	
Casing Type: NA	
Water Depth (mTOC): NA	
Bore in Use: Not a groundwater feature	
Pumping Equipment: NA	
Power Supply: NA	
Pumping Rate: NA	
Primary Use: Stock	
Stock Present: Yes	

Field notes: Not a groundwater feature. The water is turbid with algae present. The primary composition is sand with a small amount of gravel. No odor or seepage was observed.	

Longsight Dam #2	IMAGE
Property Name: Longsight	
Lease: Graham Clarke	
NGIS/NSW Registered Number: NA	
Bore Status: Not a groundwater feature	
Easting: 774916	
Northing: 6614015	
Coordinate system: EPSG:28355 - GDA94/MGA ZONE 55	
Collar Height (cm): NA	
Ground level elevation (mAHD): 309	
Year Drilled: NA	
Total Drilled Depth (m): NA	
Casing Type: NA	
Water Depth (mTOC): NA	
Bore in Use: Not a groundwater feature	
Pumping Equipment: NA	
Power Supply: NA	
Pumping Rate: NA	
Primary Use: Stock	
Stock Present: Yes	

Field notes: Not a groundwater feature. The water is turbid with algae present. The primary composition is clay and silt. No odor or seepage was observed.	

Mayfield Feature 1	IMAGE
Property Name: Longsight	
Lease: Graham Clarke	
NGIS/NSW Registered Number: NA	
Bore Status: Not a groundwater feature	
Easting: 774630	
Northing: 6613917	
Coordinate system: EPSG:28355 - GDA94/MGA ZONE 55	
Collar Height (cm): NA	
Ground level elevation (mAHD): ?	
Year Drilled: NA	
Total Drilled Depth (m): NA	
Casing Type: NA	
Water Depth (mTOC): NA	
Bore in Use: Not a groundwater feature	
Pumping Equipment: NA	
Power Supply: NA	
Pumping Rate: NA	
Primary Use: NA	
Stock Present: Yes	

Field notes: Not a groundwater feature. It is a small natural drainage channel that is dammed at both ends by Longsight Dam #1 and #2. No water flow observed.	

Merrilong Seep	IMAGE
Property Name: Merrilong	
Lease: None	
NGIS/NSW Registered Number: NA	
Bore Status: Not a groundwater feature	
Easting: 775670	
Northing: 6615617	
Coordinate system: EPSG:28355 - GDA94/MGA ZONE 55	
Collar Height (cm): NA	
Ground level elevation (mAHD): 292	
Year Drilled: NA	
Total Drilled Depth (m): NA	
Casing Type: NA	
Water Depth (mTOC): NA	
Bore in Use: Not a groundwater feature	
Pumping Equipment: NA	
Power Supply: NA	
Pumping Rate: NA	
Primary Use: Stock	

Stock Present: No	
Field notes: Not a groundwater feature. A square wooden "well head" was constructed to harness the seep. The primary composition observed was silt and sand. The water level was recorded at the surface on 13/14/2024.	

Yarranabee Dam #1	IMAGE
Property Name: Yarranabee	
Lease: David Hudson	
NGIS/NSW Registered Number: NA	
Bore Status: Not a groundwater feature	
Easting: 774935	
Northing: 6612839	
Coordinate system: EPSG:28355 - GDA94/MGA ZONE 55	
Collar Height (cm): NA	
Ground level elevation (mAHD): ?	
Year Drilled: NA	
Total Drilled Depth (m): NA	
Casing Type: NA	
Water Depth (mTOC): NA	
Bore in Use: Not a groundwater feature	
Pumping Equipment: NA	
Power Supply: NA	
Pumping Rate: NA	
Primary Use: Stock	

Stock Present: No

Field notes: Not a groundwater feature. The water is turbid with minimal algae present. The primary composition is silt, sand and gravel. No odor or seepage was observed.

Yarranabee Dam #2	IMAGE
Property Name: Yarranabee	
Lease: David Hudson	
NGIS/NSW Registered Number: NA	
Bore Status: Not a groundwater feature	
Easting: 776014	
Northing: 6613131	
Coordinate system: EPSG:28355 - GDA94/MGA ZONE 55	
Collar Height (cm): NA	
Ground level elevation (mAHD): 291	
Year Drilled: NA	
Total Drilled Depth (m): NA	
Casing Type: NA	
Water Depth (mTOC): NA	
Bore in Use: Not a groundwater feature	
Pumping Equipment: NA	
Power Supply: NA	
Pumping Rate: NA	
Primary Use: Stock	

Stock Present: No	
Field Notes: Not a groundwater feature. The water is turbid with minimal algae present. The primary composition is silt, sand and minimal gravel. No odor or seepage was observed.	

Appendix G – *Ambient Flow Monitoring*

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
KC1DS	20.03.2024	–	–	–	–	–	Quarterly Flow Event - Too Low to sample
	05.04.2024	–	–	–	–	–	Rain Event - Too Low to Sample
	02.06.2024	–	–	–	–	–	Rain Event – Too Low to sample
	06.08.2024	85	9	7.39	19	120	Quarterly Flow Event
	02.12.2024	419	<5	7.59	22	30	Rain Event
KC1US	20.03.2024	–	–	–	–	–	Quarterly Flow Event - Too Low to sample
	05.04.2024	–	–	–	–	–	Rain Event - Too Low to Sample
	02.06.2024	103	<5	6.92	13	169	Rain Event
	06.08.2024	72	12	7.16	13	111	Quarterly Flow Event
	02.12.2024	–	–	–	–	–	Rain Event – Too Low to Sample
KC2DS	20.03.2024	–	–	–	–	–	Quarterly Flow Event - Too Low to sample
	05.04.2024	–	–	–	–	–	Rain Event - Too Low to Sample
	02.06.2024	124	<5	7.87	14	53	Rain Event
	06.08.2024	55	11	6.81	14	34	Quarterly Flow Event
	02.12.2024	168	<5	7.11	13	28	Rain Event
KC2US	20.03.2024	–	–	–	–	–	Quarterly Flow Event - Too Low to sample
	05.04.2024	–	–	–	–	–	Rain Event - Too Low to Sample
	02.06.2024	64	<5	6.52	14	18	Rain Event
	06.08.2024	61	9	6.76	14	54	Quarterly Flow Event
	02.12.2024	–	–	–	–	–	Rain Event - Too Low to Sample
KCDS	20.03.2024	–	–	–	–	–	Quarterly Flow Event - Too Low to sample
	05.04.2024	–	–	–	–	–	Rain Event - Too Low to Sample
	06.04.2024	–	–	–	–	–	Discharge Sample – No Flow

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
	07.04.2024	–	–	–	–	–	Discharge Sample – No Flow
	08.04.2024	–	–	–	–	–	Discharge Sample – No Flow
	09.04.2024	–	–	–	–	–	Discharge Sample – No Flow
	01.06.2024	92	<5	7.35	10	482	Discharge Sample – Wet Weather
	02.06.2024	158	<5	6.7	14	100	Discharge Sample – Wet Weather
	03.06.2024	259	<5	7.12	14	29	Discharge Sample – Wet Weather
	04.06.2024	305	<5	7.17	12	60	Discharge Sample – Wet Weather
	06.08.2024	136	<5	6.62	12	59	Quarterly Flow Event
	30.11.2024	474	<5	7.4	22	29	Discharge Sample – Wet Weather
	02.12.2024	235	<5	6.99	22	11	Rain Event
	03.12.2024	–	–	–	–	–	Rain Event – Too Low to Sample
	04.12.2024	256	<5	7.15	18	12	Discharge Sample – Wet Weather
	05.12.2024	–	–	–	–	–	Rain Event – Too Low to Sample
KCUS	20.03.2024	–	–	–	–	–	Quarterly Flow Event - Too Low to sample
	05.04.2024	–	–	–	–	–	Rain Event - Too Low to Sample
	06.04.2024	–	–	–	–	–	Discharge Sample – No Flow
	07.04.2024	–	–	–	–	–	Discharge Sample – No Flow
	08.04.2024	–	–	–	–	–	Discharge Sample – No Flow
	09.04.2024	–	–	–	–	–	Discharge Sample – No Flow
	01.06.2024	64	<5	7.37	13	1090	Discharge Sample – Wet Weather
	02.06.2024	249	<5	6.59	14	75	Discharge Sample – Wet Weather
	03.06.2024	387	<5	7.05	10	102	Discharge Sample – Wet Weather
	04.06.2024	381	<5	7.16	8	120	Discharge Sample – Wet Weather
	06.08.2024	152	12	6.88	13	62	Quarterly Flow Event
	30.11.2024	660	<5	7.82	23	39	Discharge Sample – Wet Weather

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
	02.12.2024	415	27	7.2	17	14	Rain Event
	03.12.2024	466	<5	7.5	17	8	Discharge Sample – Wet Weather
	04.12.2024	466	<5	6.87	14	31	Discharge Sample – Wet Weather
	05.12.2024	414	<5	7.4	15	13	Discharge Sample – Wet Weather
PC1	20.03.2024	–	–	–	–	–	Quarterly Flow Event - Too Low to sample
	05.04.2024	–	–	–	–	–	Rain Event - Too Low to Sample
	02.06.2024	136	<5	6.94	15	96	Rain Event
	06.08.2024	115	9	7.2	11	22	Quarterly Flow Event
	02.12.2024	227	<5	7.23	20	43	Rain Event
PCa	20.03.2024	–	–	–	–	–	Quarterly Flow Event - Too Low to sample
	05.04.2024	–	–	–	–	–	Rain Event - Too Low to Sample
	02.06.2024	–	–	–	–	–	Rain Event - Too Low to Sample
	06.08.2024	–	–	–	–	–	Quarterly Flow Event - Too Low to sample
	02.12.2024	123	8	7.45	25	84	Rain Event

Appendix H – *Subsidence Pond Monitoring*

	EC (µS/cm)												
SAMPLE DATE	LW101 Ponding	LW104 North	LW105 North	LW105 South	LW106 North	LW107 North	LW108 North	LW108 South	LW109 North	LW109 North A	LW109 South	LW110 North	LW110 South
31/01/2024													
29/02/2024													
21/03/2024													
08/04/2024													
28/05/2024									407				
03/06/2024	115	104	76	92						68	227		
30/07/2024	128	96	92								241		
29/08/2024	236	144	97		86						297		
30/09/2024	260	136	119		135						366		
31/10/2024	432	320	166		212						709		
30/11/2024	No access due to wet weather, sample collected as soon as possible (5/12/2024)												
05/12/2024	150	96	101	92	72	101				98	219	106	

Note: Grey cells indicate sampling point either 'Dry' or 'Too Low to Sample'. Orange cells indicate elevated reading.

1. *Level 2 TARP exceedance of ANZECC water quality guideline limit (EC - 350 µS/cm) for three consecutive monitoring results.*