

Reporting date: 30 June 2026
Submitted via email to epbcmonitoring@dcceew.gov.au

Environmental Event Report

Narrabri Underground Mine Stage 3 Extension Project

Application number:	EPBC 2019/8427
Licensee/Proponent:	Narrabri Coal Operations Pty Ltd Locked Bag 1002 Narrabri NSW 2390
Licensed Premises/Land:	Narrabri Coal Operations (NCO) 10 Kurrajong Creek Road Baan Baa NSW 2390

a) Summary of the incident;

Quarterly groundwater monitoring was completed in accordance with the Water Management Plan¹ (**the plan**); monitoring results for several locations (Table 1) have exceeded the groundwater impact assessment criteria listed in the plan. NCO have complied with the plan requirements and enacted the Trigger Action Response Plan (**TARP**). The TARP lists the following response when monitoring indicates an exceedance of water level and/or quality triggers:

- *Implement incident notification measures.*
 - Notification to NSW Department of Planning, Housing and Infrastructure (DPHI), and the Australian Government DCCEEW was completed on 21 May 2026.
- *Engage a suitably qualified hydrogeologist to undertake an assessment and report on any identified changes/likely causes and recommendations.*
 - Results from monitoring bores with reported exceedance of trigger levels were provided to Australasian Groundwater & Environmental Consultants Pty Ltd (**AGE**) to undertake a hydrogeological review. The investigation report is provided as Attachment A.

¹ [Narrabri Mine- Water Management Plan LW203-206](#)

Table 1: Summary of groundwater monitoring trigger value exceedances

Sample Date	Bore ID	Coordinates (MGA55)	Formation	Trigger Type	Trigger Value	Q2 2026 Monitoring Result
15/5/2026	P10	774066; 6616447	Napperby	Water Level	270.9mAHD ³	261.27mAHD
				Water Quality- EC	9426 µS/cm ³	15040 µS/cm
18/5/2026	P29	778541; 6619978	Napperby	Water Quality- EC	11337 µS/cm ³	19080 µS/cm
18/5/2026	P32	778993; 6620335	Napperby	Water Quality- EC	2938 µS/cm ³	4160 µS/cm
13/5/2026	P39A	782024; 6620076	Watermark	Water Quality- EC	5970 µS/cm ¹	7860 µS/cm
13/5/2026	P39B	782018; 6620077	Tullamullen Alluvium	Water Quality- EC	6546 µS/cm ³	12560 µS/cm
13/5/2026	P53	776995; 6620655	Garrawilla	Water Quality- EC	1169 µS/cm ³	1543 µS/cm
14/5/2026	P7	768998; 6624338	Pilliga Sandstone	Water Quality- pH	pH minimum - 6.0	5.32 pH

¹ ANZG (2018) livestock drinking water (beef cattle); ² Tier 1- bore specific 80th percentile; ³ Tier 2- bore specific 95th percentile

b) Outcomes of an investigation, including identification of the cause of the incident

AGE was requested to undertake an assessment of the exceedances and report on any identified changes/likely causes and recommendations. The investigation report is attached:

- *Narrabri Coal Mine- Hydrogeological Review of Monitoring Bore Exceedances Q2 2026*

Conclusions and recommendations for individual exceedances are contained within the attached report. A summary of findings and recommendations for further work are included in Table 2. This includes recommendations from the 2024 Annual Review that states that bores with repeated exceedances should consider the following:

- does the conclusion that changes are associated with 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.
 - New trigger levels have been recommended for several bores (Table 2). The Water Management Plan (for Stage 3 SSD-10269) has been revised to include the new trigger levels; the plan has been reviewed by DCCEEW Water Group (letter dated 04 June 2026) and NCO are currently revising the plan to address the DCCEEW recommendations prior to submitting to the NSW Planning Secretary for approval.

For bores with no current recommendation for further work monitoring should continue with data reviewed quarterly to determine if bore has reached equilibrium or any other changes are noticeable.

Overall, the review indicated that the GWMP was followed and that the exceedances have not resulted in potential risk of environmental impacts to sensitive receptors.

Table 2: Summary of exceedances and recommendations for further work (Table 8.1 in attached AGE report)

Bore ID	Formation	Exceedance	Likely cause	New baseline / triggers established	Further work required
P7	Pilliga	pH	Inconclusive: Natural variability of formation, possibly post-drought wet period response	No	Consider aquifer specific trigger for pH
P10	Napperby	Water level	Drawdown related to mining (as modelled)	No	Remove P10 trigger
P10	Napperby	EC	Inconclusive: possible natural variations / mixing within Napperby Fm	No	No
P29	Napperby	EC	Inconclusive: possible saturation of unsaturated zone / seepage	N/A	Further investigations required
P32	Napperby	EC	Inconclusive: possible natural variations / major climate event / saturation of unsaturated zone	N/A	Further investigations required
P39A	Watermark	EC	Inconclusive: Natural variations / major climate event / seepage from nearby dams	Tier 1 7,710 $\mu\text{S/cm}$ Tier 2 8,031 $\mu\text{S/cm}$	Update triggers and sample groundwater quality from nearby bores
P39B	Alluvium	EC	Inconclusive: Natural variations / major climate event / seepage from nearby dams	Tier 1 13,662 $\mu\text{S/cm}$ Tier 2 14,198 $\mu\text{S/cm}$	Update triggers and sample groundwater quality from nearby bores
P53	Garrawilla	EC	Inconclusive: Mixing with other groundwater and/or infiltration from SB3 or evaporator fans	N/A	Review major ions and groundwater types against nearby SB3

c) Details of the corrective actions that have been, or will be, implemented to address the incident and prevent recurrence;

- New trigger levels have been recommended for several bores (Table 2). The Water Management Plan (for Stage 3 SSD-10269) has been revised to include the new trigger levels; the plan has been reviewed by DCCEEW Water Group (letter dated 04 June 2026) and NCO are currently revising the plan to address the DCCEEW recommendations prior to submitting to the NSW Planning Secretary for approval.
- The recommendation associated with monitoring bore P53 requires additional sampling and data interpretation to better constrain and determine the cause of the observed changes at the bore.

The outcomes of these actions will be summarised within the 2026 Annual Review to be submitted no later than 31 March 2027 (required under condition E11 of SSD-10269) and in the annual report detailing the outcomes of the water monitoring program (required under Condition 13 of EPBC 2019/8427).

d) Details of compliance with requirements of the relevant management plan pertinent to the incident

Water Management Plan- Groundwater Monitoring Program		
Section / Requirement	Comments	Compliant
4.2 Groundwater monitoring program Monitoring type- Standpipes Quarterly field EC and pH	All required groundwater monitoring wells are sampled quarterly in accordance with groundwater monitoring program.	Yes
5. Trigger Action Response Plan Level 2- Routine monitoring indicates water quality exceeds the EC trigger value over three consecutive monitoring events.	NCO have initiated the required response for a Level 2 TARP trigger.	Yes
6. Incidents and non-compliance As soon as practicable after becoming aware of an exceedance of performance criteria notify DPHI and provide a detailed report within 7 days.	As per table 5.1 TARP - Engage a suitably qualified hydrogeologist to undertake an assessment and report on any identified changes/likely causes and recommendations. - Implement reasonable and feasible remediation measures in accordance with hydrogeologist recommendations and in consultation with DPHI. NCO became aware of the exceedance of performance criteria on 20 May 2026 and provided incident notification on 21 May 2026. A hydrogeologist was engaged to undertake an assessment. There are no remediation measures recommended by the hydrogeologist. Recommendations have been provided in Table 2.	Yes

e) Details of any communication with other stakeholders regarding the incident.

Due to the generally high naturally occurring groundwater salinity in the area, there is limited existing groundwater abstraction in the immediate mining area other than for coal mine dewatering. No vulnerable receptors or active stock/irrigation bores are in the immediate area and therefore no immediate action is required outside of further investigation and monitoring.

The outcomes of the investigation and attached report have been provided to NSW DPHI.

Reported by:

Brent Baker
Environmental Manager

ATTACHMENT A

Narrabri Coal Mine - Hydrogeological Review of Monitoring Bore Exceedances Q2 2026, Australasian Groundwater & Environmental Consultants



29 June 2026

Narrabri Coal Mine
Kamilaroi Highway
Narrabri NSW 2390

Attention: Brent Baker
via email: BrentBaker@whitehavencoal.com.au

Dear Brent,

Narrabri Coal Mine – Hydrogeological Review of Monitoring Bore Exceedances Q2 2026

1 Introduction

Narrabri Coal Operations Pty Ltd (NCOPL) routinely monitor groundwater levels and quality above and surrounding the Narrabri Coal Mine. Groundwater monitoring campaigns are conducted in accordance with the site Water Management Plan (WMP)¹. Monitoring results have been reviewed against the 2024 revision of the WMP, which has been updated with water level and quality trigger criteria that align with the approved Extraction Plan for Long Wall (LW) 203-206 WMP². Groundwater drawdown trigger levels are based on the latest revision of the site groundwater model³. As shown in Figure 2.1 water levels and quality are monitored by a network of standpipe monitoring bores and vibrating wire piezometers (VWPs). Data collected at these monitoring locations is reviewed quarterly by Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) on behalf of NCOPL.

The Narrabri WMP includes Trigger Action Response Plans (TARP) for managing changes in groundwater levels and quality, and defines groundwater level and quality triggers. For water levels and bores where water is unsuitable for stock and irrigation, a two-tiered trigger system is used:

- Tier 1 trigger provides a method for assessing a gradual change in groundwater quality over the medium term; and
- Tier 2 trigger is intended to detect an event related change over the short term.

As outlined in Sections 2 and 3, bores P10, P29, P32, P39A, P39B, P53 were identified as exceeding their Tier 2 water quality electrical conductivity (EC) trigger for three consecutive recordings, while P7 exceeded pH trigger lower level and P10 also exceeded water level trigger. As per the TARP, further review was required. AGE was commissioned by NCOPL to undertake this review of exceedances for Q2 2026 (reporting period).

¹ Narrabri Coal Operations (2022) Stage 3 Groundwater Management Plan, revision date 01 December 2022.

² Narrabri Coal Operations (2025) Narrabri Mine Extraction plan water management plan LW203 – LW206, revision date 24 January 2025.

³ AGE Consultants (2024) Narrabri Coal Mine Groundwater Model – Re-calibration Stage 2 MOD 7 v 01.01.

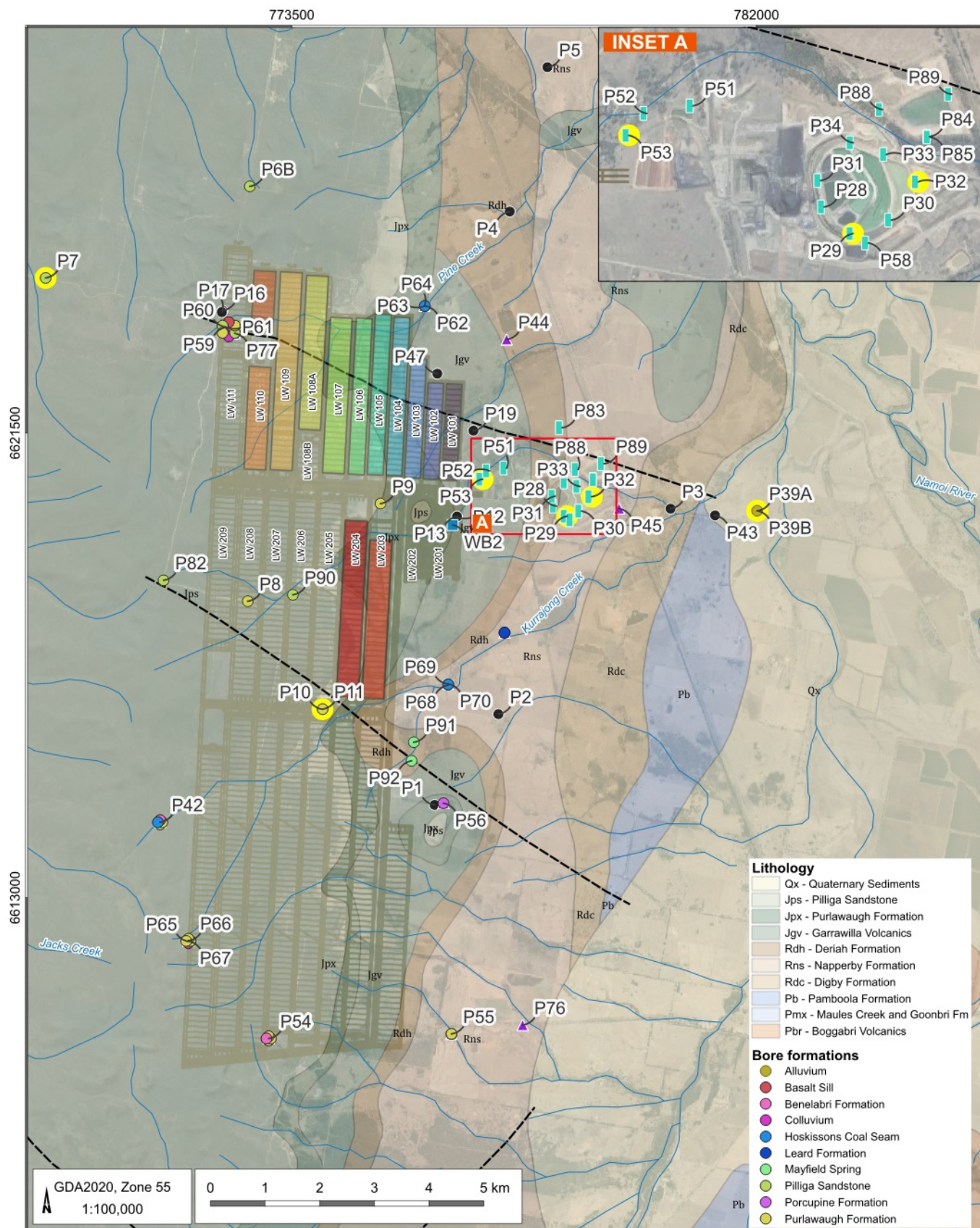
2 Reporting period exceedance bore descriptions

Details of bores with recorded exceedances for the reporting period (RP), including locations, installation depths, screened intervals and formations are listed in Table 2.1, bore locations are shown in Figure 2.1 and Figure 2.2. Further information on the trigger levels and exceedances is listed in Table 3.1, Table 3.2 and Table 3.3.

Table 2.1 Reporting period exceedance bore descriptions

Bore ID	Easting (GDA2020)	Northing (GDA2020)	Total depth (m bgl)	Screen interval (m bgl)	Target formation	Exceedance
P7	768998	6624340	90	78-90	Pilliga Sandstone	Water quality - pH
P10	774064	6616445	130	118-130	Napperby Formation	Water quality - EC Water level
P29*	778542	6619979	25	19-25	Napperby Formation	Water quality - EC
P32*	778993	6620335	15	9-14	Napperby Formation	Water quality - EC
P39A	782024	6620078	80	72-80	Watermark Formation	Water quality - EC
P39B	782019	6620079	32	15-30	Tulla Mullen Alluvium	Water quality - EC
P53*	776995	6620657	24	18-21	Garrawilla Volcanics	Water quality - EC

Notes: Coordinates are in GDA2020.
m bgl - metres below ground level.
*seepage monitoring bore.



Narrabri Mine Quarterly and Annual Reporting 2025 - 2026 (NAR5027.001)

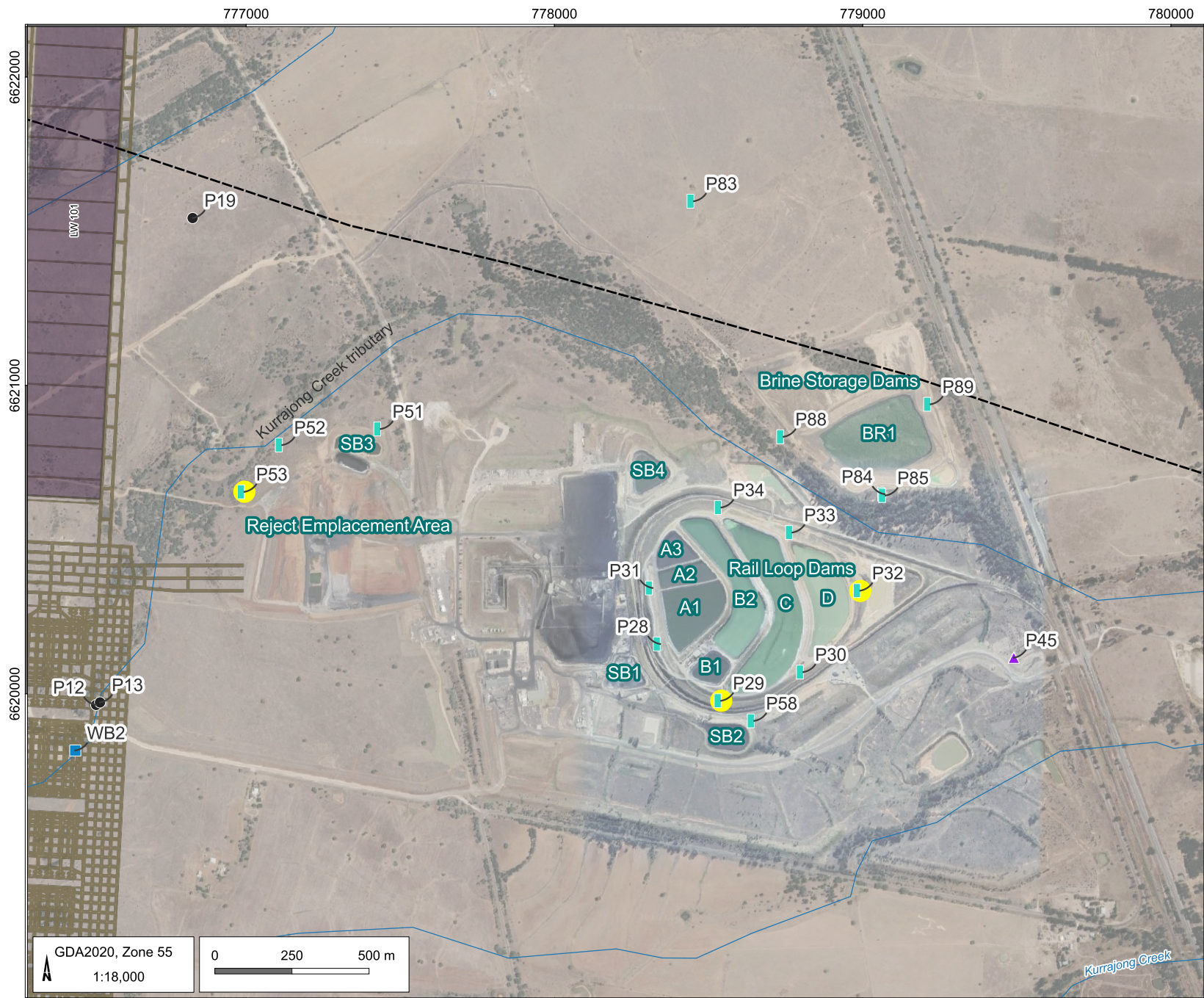
Groundwater Monitoring Network



AGE

DATE
19/06/2026

FIGURE No:
2.1



LEGEND

- Underground mine workings
- Fault
- Major Creek

Monitoring Bores

- Standpipe
- Standpipe - seepage detection
- Production - stock and domestic
- VWP
- Bores with exceedances

Narrabri Mine Quarterly and Annual Reporting
2025-2026 (NAR5027.001)

Surface water storage and monitoring network

DATE
19/06/2026



FIGURE No:
2.2

GDA2020, Zone 55
1:18,000

0 250 500 m

3 Reporting period trigger exceedances

Water quality triggers are defined in the WMP and extraction plans. The water quality triggers relevant to this quarterly review are for electrical conductivity (EC) and pH. For datasets with non-normal distribution such as EC, a rolling median is calculated from the eight most recent data points and plotted on a time series chart (control chart) and a two-tiered trigger approach is used. Two triggers are then identified as follows:

- Tier 1 – where the rolling EC median⁴ exceeds the 80th percentile of long-term data; and
- Tier 2 – where three consecutive EC exceedances of the 95th percentile of the long-term data occur. If this occurs, the TARP (Level 2) will be initiated.

Bores with three consecutive exceedances of their listed EC trigger level are outlined in Table 3.1, pH exceedances in Table 3.2 and water level exceedances in Table 3.3.

Table 3.1 Bores with reportable EC exceedances

Bore ID	Formation	EC trigger (µS/cm)		Three consecutive exceedances (µS/cm)	EC Trend (previous 12 months – between Q2 2025 and Q2 2026)
		Tier 1	Tier 2		
P10	Napperby	8,894	9,426	14,680 (Nov 2025) 13,450 (Feb 2026) 15,040 (May 2026)	Short term fluctuations around 15,000 µS/cm to 13,450 µS/cm
P29*	Napperby	9,732	11,337	19,590 (Nov 2025) 19,260 (Feb 2026) 19,080 (May 2026)	Short term increasing trend. (from ~13,000 µS/cm to ~19,000 µS/cm) within a long-term pattern of dilution and concentration
P32*	Napperby	2,170	2,938	3,640 (Nov 2025) 3,920 (Feb 2026) 4,160 (May 2026)	Increasing trend with EC increasing from 1,902 µS/cm to over 4,000 µS/cm
P39A	Watermark	5,970		7,020 (Nov 2025) 6,890 (Feb 2026) 7,860 (May 2026)	Decreasing from 7,700 µS/cm to about 6,700 µS/cm
P39B	Tulla Mullen Alluvium	6,546		12,090 (Nov 2025) 11,360 (Feb 2026) 12,560 (May 2026)	Overall decreasing trend with short term fluctuations 14,360 µS/cm and 11,360 µS/cm. Slight increase since Q1, but still less concentrated than peak in 2024/2025.
P53*	Garrawilla	1,107	1,169	2,041 (Nov 2025) 1,154 (Feb 2026) 1,543 (May 2026)	Fluctuations in salinity, with total EC ranging between approximately 1,000 µS/cm and 2,000 µS/cm

Note: *Seepage monitoring bores.

Table 3.2 Bores with reportable pH exceedances

Bore ID	Formation	pH (lower) (pH units)	pH (upper) (pH units)	Three consecutive exceedances (pH)	pH Trend – field data (previous 12 months)
P7	Pilliga	6.0	8.5	5.08 (Nov 2025) 5.14 (Feb 2026) 5.32 (May 2026)	Increasing from about 5.00 to 5.32

⁴ For datasets with non-normal distribution, a rolling median is calculated from the eight most recent data points and plotted on a time series chart.

Table 3.3 Bores with reportable water level exceedances

Bore ID	Formation	Tier 1 (m AHD)	Tier 2 (m AHD)	Three consecutive exceedances (m AHD)	Water level trend (previous 12 months)
P10	Napperby	275.2	270.9	265.1 (Nov 2025) 262.7 (Feb 2026) 261.3 (May 2026)	Steady decrease from about 270 mAHD to 261 mAHD

4 Climate

Monthly rainfall and evaporation totals obtained from Scientific Information for Landowners (SILO) (DES, 2025)⁵ are plotted in Figure 4.1 from 2008 to 2026 to capture climate variations prior to the onset of baseline data. Rainfall and evaporation trends show seasonal fluctuations, with rainfall generally highest from November to March. A period of reduced rainfall occurred between 2017 and the end of 2019, coinciding with increased evaporation. This was followed by a wetter period from 2020 to 2023, characterised by increased rainfall and reduced evaporation. From 2023 to the present, rainfall has generally declined, while evaporation shows an increasing trend. Rainfall in May 2026 had a total of 126.4 mm, exceeding evaporation of 91.7 mm.

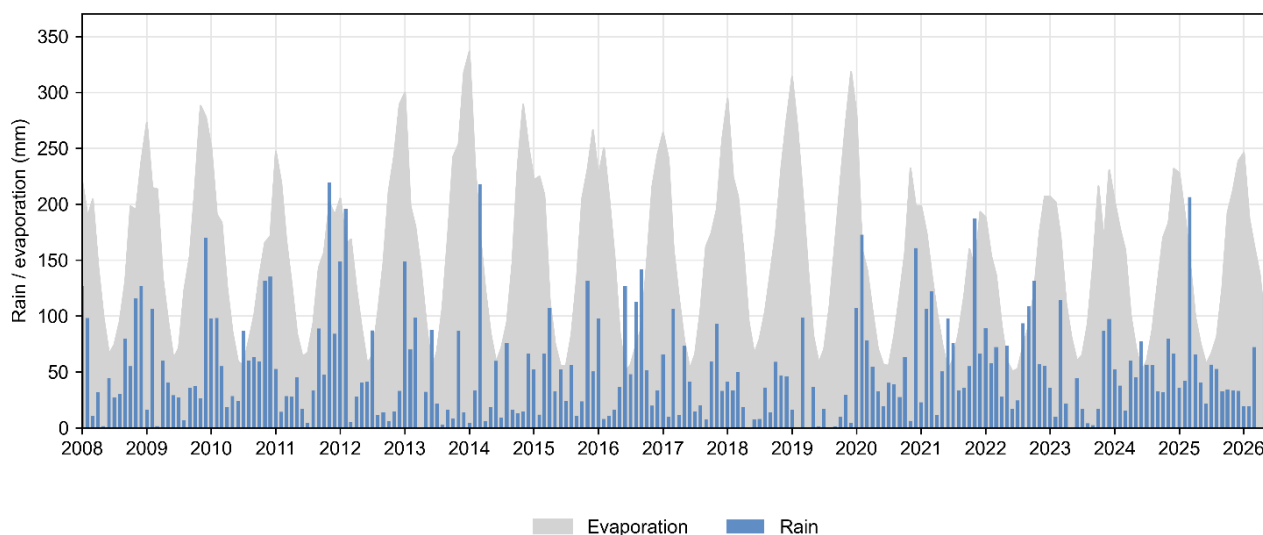


Figure 4.1 Monthly rainfall and evaporation 2008 to 2026

Cumulative rainfall departure (CRD) is calculated to place recent rainfall years into an historical context. The CRD is calculated by subtracting the long-term average monthly rainfall from the actual monthly rainfall, providing a monthly departure from the average. A rising slope in the CRD indicates periods of above-average rainfall, and a falling slope indicates below-average rainfall. CRD for the site is shown in Figure 4.2 using historical rainfall data obtained from the SILO website.

From 2017 to the end of 2019 a falling slope is recorded which coincides with the Tinderbox Drought, the driest three-year period on record for the region. Following this drought, the region experienced a period of above average rainfall from early 2020 to 2023. Since then, rainfall fluctuations show similar trends to those experienced before the tinderbox drought (2008 to 2017).

⁵ Department of Environment and Science. 2025. SILO Australian climate data from 1889 to yesterday, Downloaded from <https://www.longpaddock.qld.gov.au/silo/> on 11 March 2026.

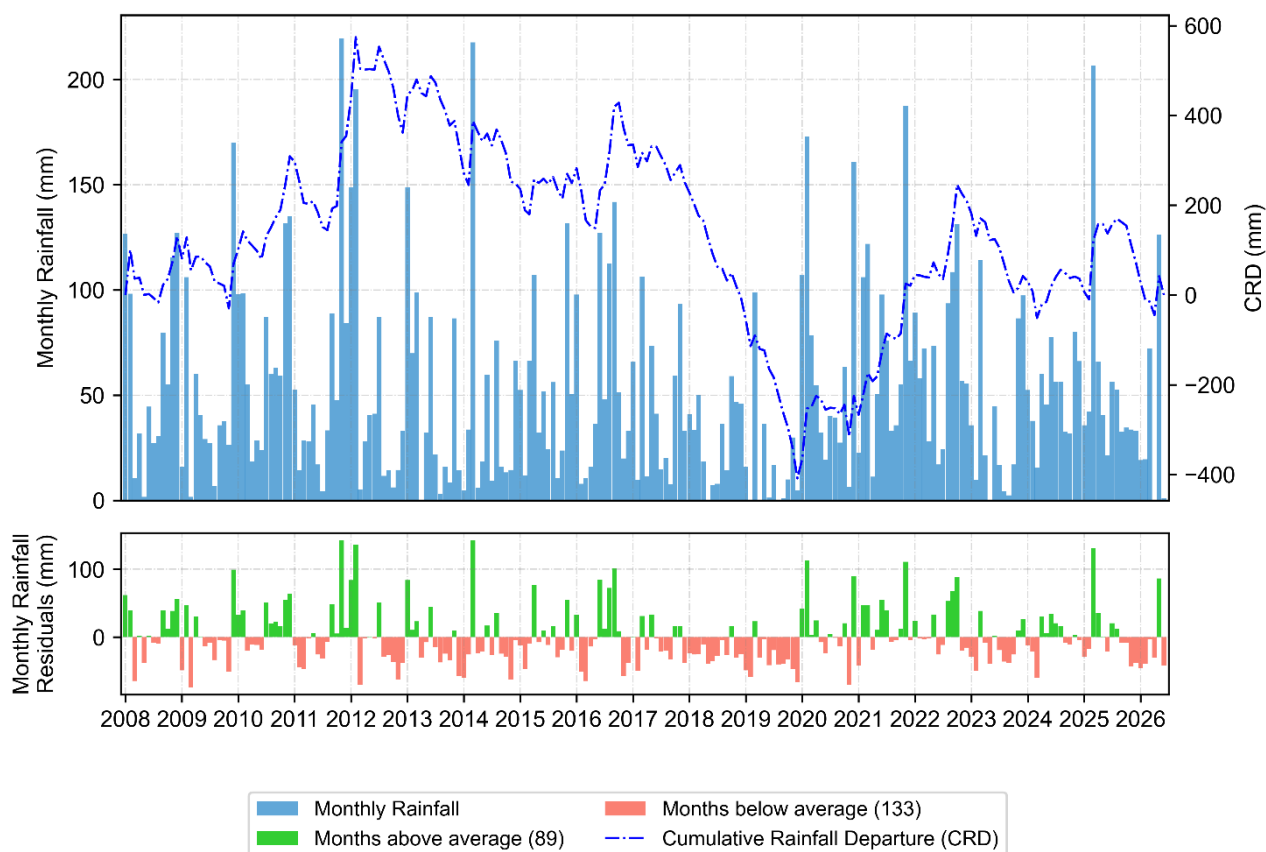


Figure 4.2 Cumulative rainfall departure and monthly rainfall from January 2008 to June 2026

5 Hydrogeological conceptual model

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 illustrated in Figure 5.1 and include the following:

- 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 Formation and Digby Formation; and
 - Permian Hoskissons Coal Seam, Arkarula Formation, Watermark Formation and Pamboola Formation.

Bores with recorded exceedances reviewed in this report are located within the Tulla Mullen alluvium (tributary of the Namoi River), Pilliga Sandstone, Garrawilla Volcanics, Watermark Formation, and Napperby Formation.

The Pilliga Sandstone is the youngest consolidated formation in the project area, and ranges in thickness from 0 to 120 m at the far western reach of the project area. The sandstone is predominantly a well sorted, fine to coarse grained quartz sandstone with medium cross beds (AGE, 2020).

The Garrawilla Volcanics is a layer of alkali basalt rocks, trachytes and interbedded pyroclastics. The volcanics form the basal unit of the Surat Basin in the area and unconformably overlie the Triassic formations of the Gunnedah Basin.

The Napperby Formation is comprised of an upwards coarsening sequence of siltstone and sandstone laminate, interbedded with quartzose sandstone beds. The upper part of the Napperby Formation, above the Napperby Sill, has a higher proportion of sandstone. The Napperby Formation is generally unweathered rock with low permeability and is not a productive aquifer.

The Watermark formation consists of a fining-up sequence of intensely bioturbated silty sandstone to siltstone/claystone laminate with marine fossils, overlain by finely laminated siltstone/claystone, then a coarsening-up sequence (Australian Stratigraphic Units Database, 2023).

Recharge to the hydrostratigraphic units occurs through diffuse rainfall recharge as well as limited seepage through the non-perennial Kurralong Creek and its tributaries when flowing. No aquifer discharge related to baseflow occurs near the mining area as groundwater levels are generally deep and well below the channels of the highly ephemeral creeks. Accordingly, the creeks are either entirely disconnected (or possibly only very occasionally connected) to the Namoi Alluvium.

Two water sources dominate the mine region, the Gunnedah-Oxley Basin (GOB) Murray Darling Basin (MDB) Groundwater Source and the Great Artesian Basin (GAB) Southern Recharge Groundwater Source. The GOB MDB groundwater source covers an outcrop area of 1,128,000 hectares and comprises the Permian and Triassic rocks associated with the Gunnedah Basin and the younger Jurassic and Cretaceous rocks associated with the Oxley Basin. The GAB Southern Recharge Groundwater Source includes Cretaceous, Jurassic and Tertiary aged rocks including alluvial sediments and the outcropping Pilliga Sandstone.

Two high-productivity aquifers are located within the region: the Namoi River alluvium to the east (also a MDB groundwater source) and the Pilliga Sandstone to the west (Figure 5.1). All other formations are either considered aquitards or non-productive aquifers.

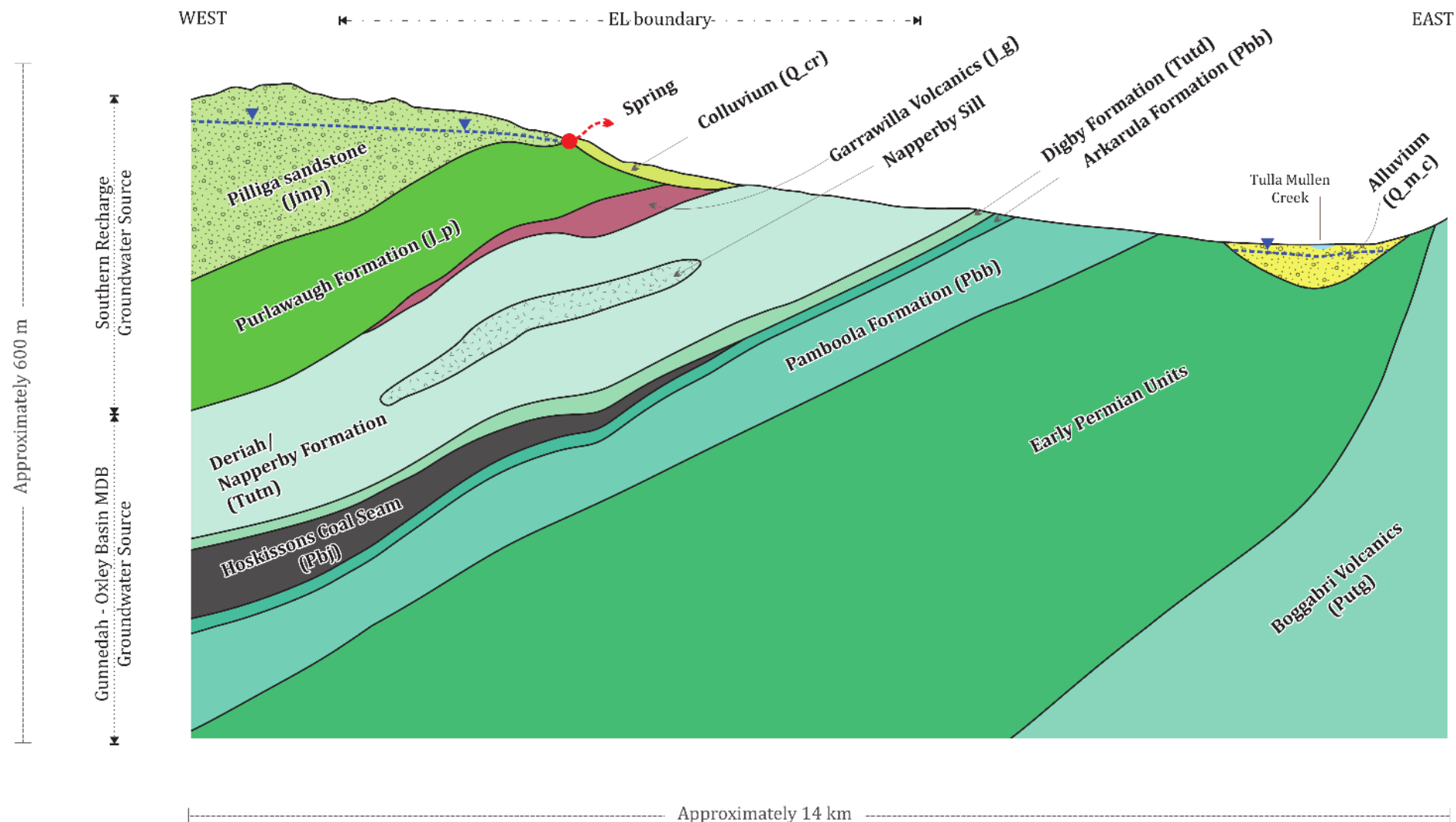


Figure 5.1 Conceptual geological cross section (AGE, 2020)⁶

⁶ Australasian Groundwater & Environmental Consultants (AGE) (October 2020). Groundwater Assessment Narrabri Mine Stage 3 Extension Project. Prepared for Narrabri Coal Operations Pty Ltd.

6 Mining progression and infrastructure

Mining at NCO commenced in June 2012 with longwall (LW) 101 (Figure 2.1) and progressed west, in April 2023 the 100 series longwalls were completed. The 200 series commenced in June 2023 with LW 203. Mining progression is outlined in Table 6.1.

A set of water storage dams, the Rail Loop dams (RLDs) are located next to the Coal Handling and Processing Plant (CHPP) (inset Figure 2.1 and Figure 2.2). Typically, water stored in dams D and B1 is fresh (low salinity), water in dams A1, A2, A3, SB1, SB2, SB3 and SB4 are brackish while water quality in dams B2, C and BR1 are saline. Dam D receives water from the Namoi River pump station and the water supply bore.

Table 6.1 Progression of longwall mining

Longwall	Start Date	Completion Date
Longwall 101	6 June 2012	1 June 2013
Longwall 102	22 July 2013	20 January 2014
Longwall 103	3 March 2014	20 October 2014
Longwall 104	1 December 2014	4 August 2015
Longwall 105	10 September 2015	16 May 2016
Longwall 106	20 June 2016	10 March 2017
Longwall 107	19 April 2017	22 July 2018
Longwall 108	16 September 2018	17 November 2019
Longwall 109	6 January 2020	7 November 2021
Longwall 110A	22 December 2020	15 June 2022
Longwall 110B	21 July 2022	17 April 2023
Longwall 203	05 June 2023	12 April 2025
Longwall 204	14 June 2025	22 March 2027*
Longwall 205	26 May 2027*	10 August 2028*
Longwall 206	24 September 2028*	3 September 2029*

Note: *planned extraction.

7 Review of monitoring data

Potential causes of changes in groundwater quality at and around coal mines are both natural and anthropogenic, and typically include:

1. **natural:** a reduction in recharge (causing less dilution) or an increase in evaporation (causing more concentration) or increase in recharge (causing mobilisation of salts) due to climate factors; and/or
2. **anthropogenic/natural:** seepage from surface sources of water that have salinity elevated above groundwater levels and likely connected to aquifer systems directly or indirectly through lagged recharge; and/or
3. **anthropogenic:** groundwater mixing with groundwater from adjacent areas of hydrostratigraphic units due to permitted mine dewatering and/or third-party groundwater users (e.g. irrigation) that may cause changes or reversals in hydraulic gradient; and/or
4. **anthropogenic:** geochemical solute release due to oxidation and acid-rock drainage.

To determine the possible causes of water quality and level exceedances for the reporting period, this review encompasses the following tasks:

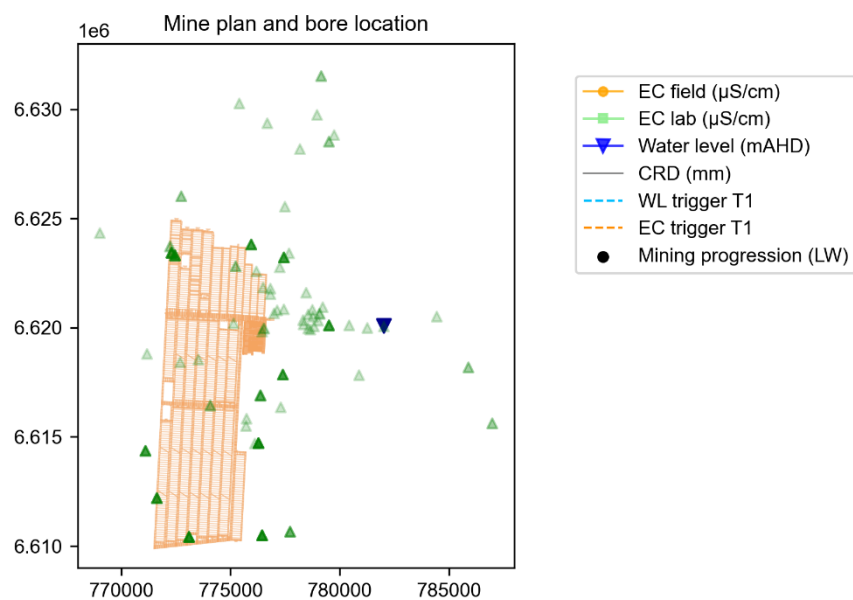
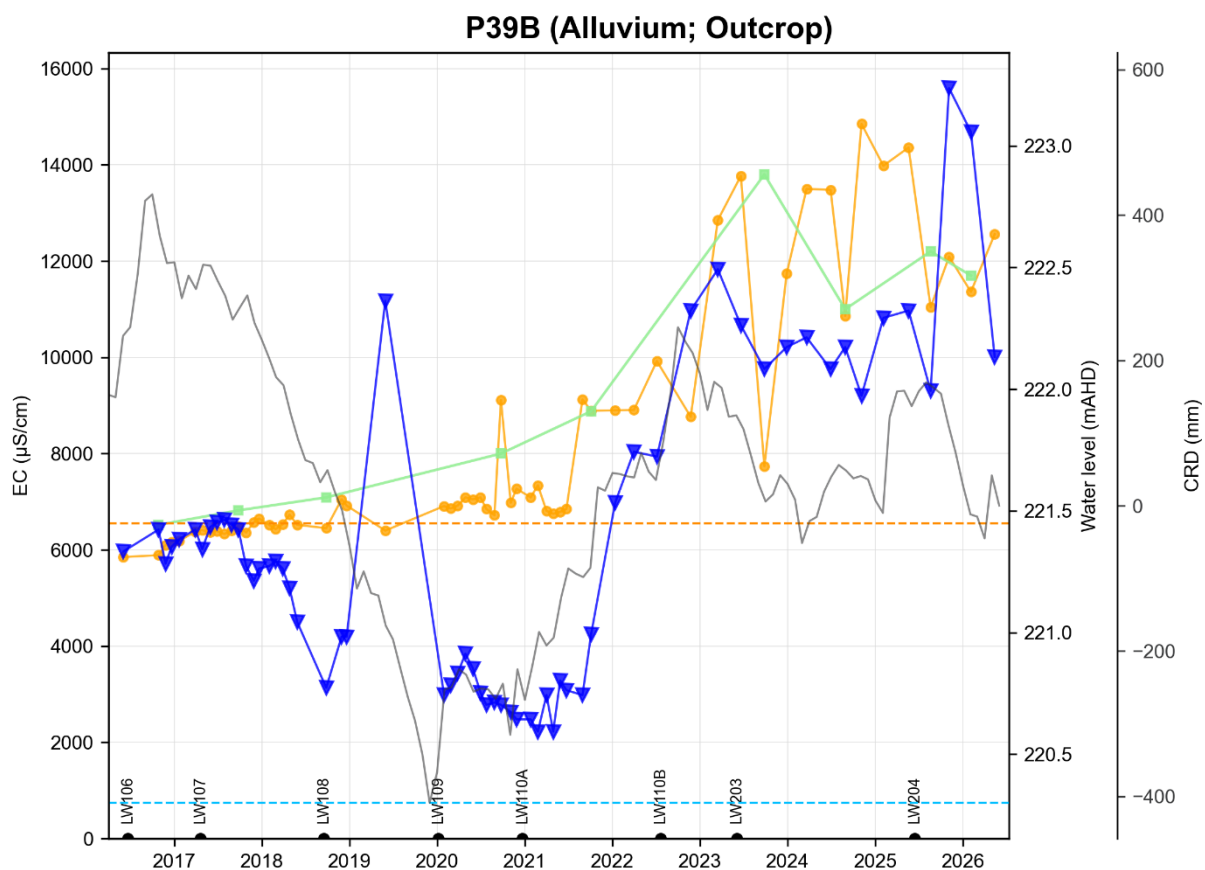
- undertake a first-order data review to identify any unexpected outliers or data errors;
- review results against baseline monitoring for the bore and against historical trends (if available);
- compare with trends in nearby bores within the same aquifer;
- investigate links to operational activities and external influences (e.g. climatic data) including:
 - natural climate factors;
 - from surface sources;
 - mining induced seepage or mixing; and
 - solute release.
- assess potential risk of environmental impacts to sensitive receptors; and
- review the current monitoring regime and assess if further work or monitoring is required.

7.1 Tulla Mullen alluvium

7.1.1 P39B - water quality - EC exceedance

Bore P39B is located approximately 6 kilometres (km) east of mining between Tulla Mullen and Kurrajong creeks and is screened from 15 to 30 meters (m) below ground level (bgl). The bore is co-located with bore P39A installed in the Watermark formation from 72 to 78 m bgl. P39B was installed in mid-2016, just prior to the onset of the Tinderbox Drought. From installation to 2021, water levels decreased (about 0.5 to 1 m) while EC increased with some fluctuations (Figure 7.1). From 2021 to 2026, groundwater levels increased by approximately 2.25 m. Over the same period, EC values also increased, although with marked temporal fluctuations. Figure 7.1 presents the EC values measured both in the field and in the laboratory. The most recent measurements, recorded in May 2026 (12,560 $\mu\text{S}/\text{cm}$ for field EC), have increased in comparison to the EC of 11,360 $\mu\text{S}/\text{cm}$ recorded in February 2026, continuing the fluctuating EC trend.

Groundwater levels recorded at P39A (Watermark) and P39B (Alluvium) (Figure 7.2) have historically remained at similar levels with a slight upwards gradient from the Watermark Formation to the alluvium being recorded prior to 2022. From 2022 onwards, during which groundwater levels were recovering, the hydraulic gradient changed to typically be a downwards gradient from the alluvial bore to the Watermark Formation bore.



* mAHD - metres Australian Height Datum

Australasian Groundwater and Environmental Consultants Pty Ltd
Water Level plots

Figure 7.1 P39B EC field and laboratory measurements plotted with water levels

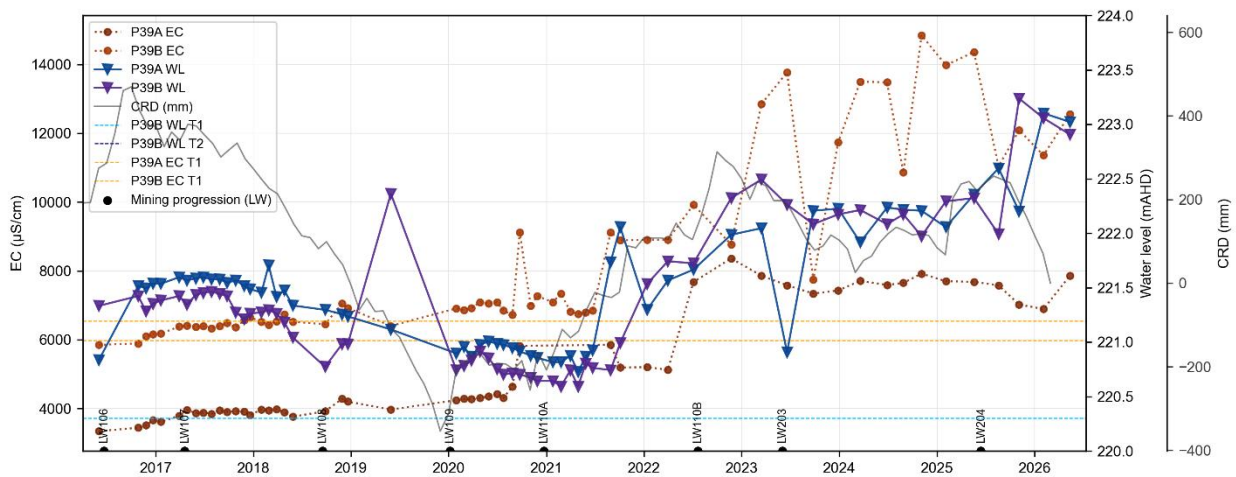


Figure 7.2 P39A and P39B groundwater elevations and EC

Major and minor ion chemistry indicates that water sampled at bore P39B from the Tulla Mullen Alluvium, plots as sodium–chloride (Na–Cl) type groundwater, with variable abundance of sulfate (Figure 7.3). This composition is similar to groundwater samples from the Watermark Formation (bores P43 and P39A) and the Pamboola Formation (bore P3). The most recent sample from P39B plots towards the top of the anion distribution for that bore, indicating the greatest proportion of sulfate (about 27%) compared to past samples at P39B.

In contrast, other Namoi Alluvium groundwater monitoring bores located further to the east (WB7) and southeast (WB5a and WB5b) of P39B exhibit different hydrochemical characteristics. The major ion composition at these locations is characterised by a greater relative contribution of calcium (Ca) and magnesium (Mg) compared to sodium and potassium (Na/K). Accordingly, groundwater samples from the Namoi Alluvium predominantly display a calcium–bicarbonate (Ca-HCO_3) or mixed hydrochemical facies (Figure 7.3).

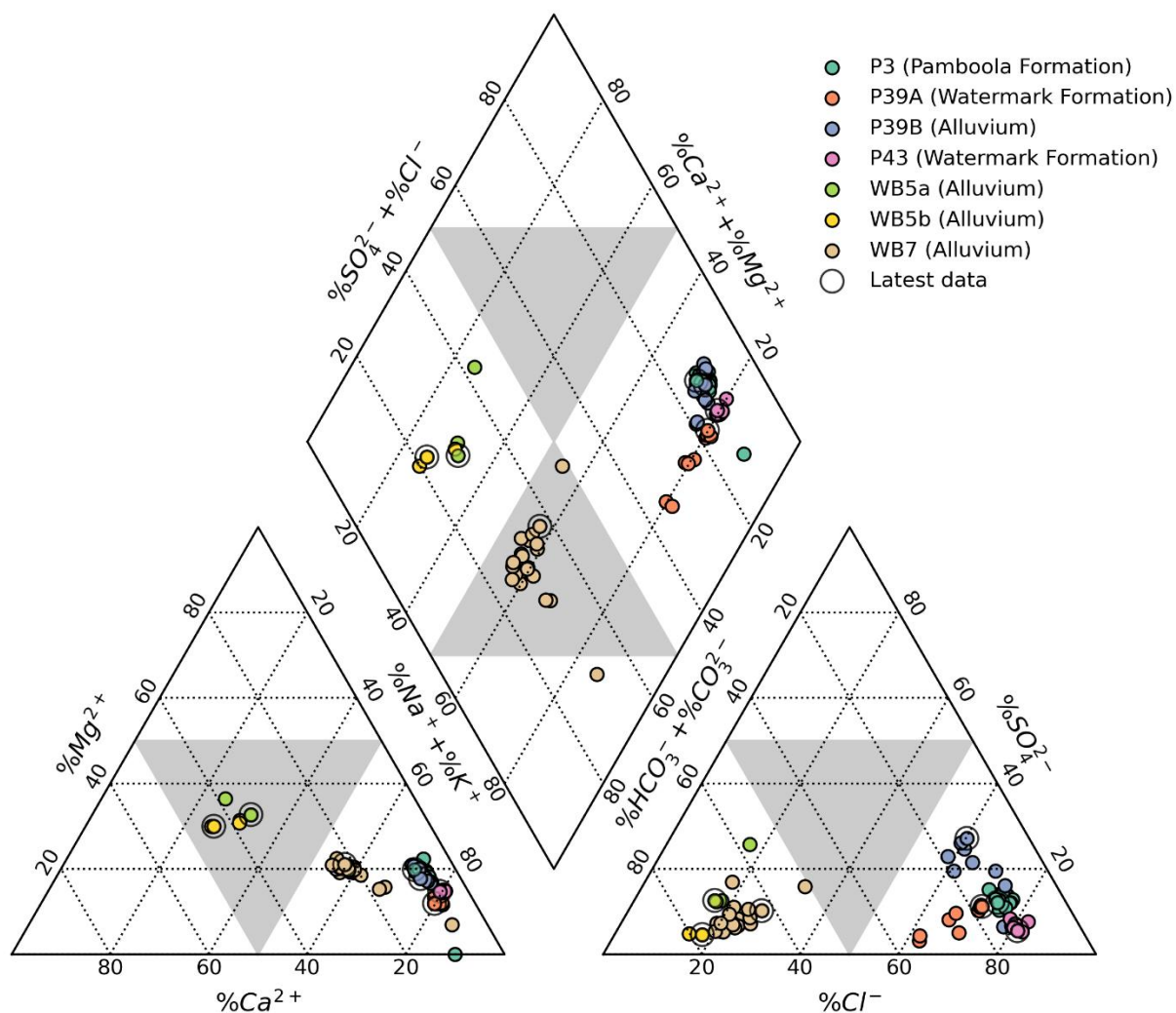


Figure 7.3 Piper Diagram of P39B and proximal bores

7.1.1.1 Natural climate factors

P39B is installed within sediments associated with Tulla Mullen Creek, which comprises a laterally unconfined, continuous channel characterised by low sinuosity (relatively straight planform) and a predominantly fine-grained channel bed. Groundwater levels at the bore range from approximately 4.9 m bgl to 7.6 m bgl.

Although rainfall conditions remained above average from the end of the Tinderbox Drought through to mid-2022, as shown on the hydrograph in Figure 7.1, groundwater levels did not begin to recover until early 2021. The approximately two-year lag between the cessation of drought conditions and the onset of groundwater recovery is interpreted to reflect slow recharge and infiltration processes associated with the fine-grained sediments of the Tulla Mullen Creek alluvium.

The most pronounced groundwater level response occurred between mid-2021 and 2023, when water levels rose from approximately 7.5 m bgl to 5.7 m bgl over a period of approximately 23 months. This interval also corresponds to the most rapid change in EC, increasing from 6,790 $\mu\text{S}/\text{cm}$ to 12,850 $\mu\text{S}/\text{cm}$ over the same period. This is one of two distinct periods of increasing EC evident in the monitoring record. The other comprises a gradual increase in EC coinciding with declining groundwater levels during the drought period, likely reflecting reduced recharge and dilution, resulting in concentration of dissolved salts.

During the recovery phase after the drought, the rate of increase in EC has been higher. This response is interpreted to reflect mobilisation of salts that accumulated in the soil profile and shallow subsurface during the prolonged hot and dry conditions of the drought, which were subsequently flushed into the groundwater system as recharge increased and water levels recovered.

7.1.1.2 Seepage from surface sources

A review of Digital Earth Australia (DEA) water observations⁷ for the area surrounding the P39 bores (Figure 7.4) shows little to no surface water present during the Tinderbox drought (2019). In 2020 and 2021 surface water was observed in 20 to 30% of observations. DEA images show an increase in persistent surface water post-drought with several surface water bodies present that were not present during the drought.

No surface water quality data are available for Tulla Mullen Creek; therefore, the potential contribution of seepage from the creek as a source of elevated EC cannot be confirmed. Nevertheless, the presence of persistent surface water features following the drought suggests that seepage from surface water sources is likely to contribute to recharge of the shallow groundwater system. The dam located approximately 220 m to the northwest and upgradient of the P39 has been sampled for field parameters in May 2026. This dam recorded an ED of 365 $\mu\text{S}/\text{cm}$ and pH of 8.69, although the dam may contribute to recharge of groundwater the low EC relative to water measured in bores P39A and B does not account for the elevated salinity.

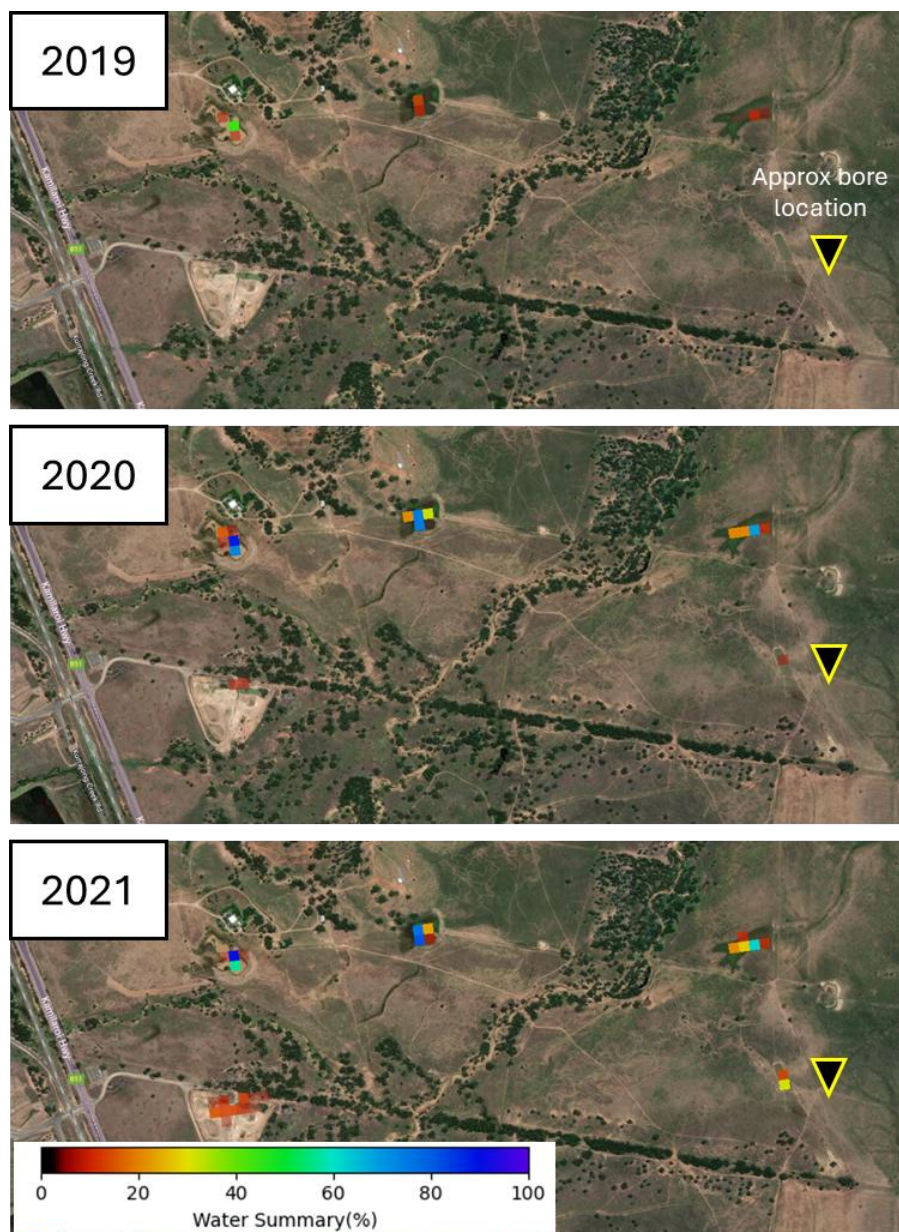


Figure 7.4 DEA water observations

⁷ The DEA Annual Water Observation Statistic is a set of calendar year statistical summaries of the DEA Water Observations product that combines satellite observations, that occur within each calendar year from 1986 to present, into summary products that help the understanding of surface water across Australia.

7.1.1.3 Mining-induced mixing

Groundwater levels recorded at bores P3 (Pamboola), P43 (Watermark), P39A (Watermark) and P39B (Alluvium) either remain stable (P3 and P43) or fluctuate with changes in rainfall (P39A and B). The lack of mining-induced depressurisation indicates that there is likely limited interconnectivity between the alluvium and the deeper coal seams and that mining-induced mixing is not a likely cause of elevated EC at P39B.

7.1.1.4 Solute release

The bores are located approximately 3 km to the east of the rail loop dams and 7 km from active underground mining; lateral migration of solutes through the westerly dipping formations from the dam complex is considered unlikely. Bores located between the dam complex and bore P39B do not show a similar increasing EC trend.

7.1.2 Potential impacts

Increases in EC are a likely result of long-term natural conditions, with mining-induced impacts not considered likely. Before the increase in EC in 2021, background EC measurements ranged from 6,000 to 7,000 $\mu\text{S}/\text{cm}$ with values now ranging from 8,000 $\mu\text{S}/\text{cm}$ to 14,000 $\mu\text{S}/\text{cm}$. Background salinity indicates saline water; however, within the acceptable ranges for most livestock e.g. TDS of 4,000 to 5,000 mg/L (2,680 $\mu\text{S}/\text{cm}$ to 3,350 $\mu\text{S}/\text{cm}$) for cattle and 4,000 to 10,000 mg/L (2,680 $\mu\text{S}/\text{cm}$ to 6,700 $\mu\text{S}/\text{cm}$) for sheep⁸. If this groundwater is used for livestock watering, the increase in salinity may result in loss of production and a decline in livestock condition and health.

7.1.3 Conclusion and recommendations

Trends observed in the EC and groundwater level data indicate that the likely cause of EC increases is due to two significant climate events: the Tinderbox Drought from 2017 to 2020 and the subsequent period of increased rainfall from 2020 to late 2022. The steady increase in EC observed during the Tinderbox Drought is likely due to reduced recharge from rainfall and diminished contributions from the Kurrajong and Tulla Mullen Creeks. Following the drought, as groundwater levels began to recover, EC values rose more sharply and exhibited greater fluctuations. This post-drought increase in salinity is potentially attributed to accumulation and concentration of salts (as a result of preceding dry spells and associated high evaporation) re-entering solution from near-surface strata in the unsaturated zone to deeper strata within the saturated zone, driven by increased recharge. Although recent groundwater EC remains elevated, it is within the expected range since changes to groundwater occurred post-drought. Given the natural causes of these mechanisms, no immediate action is required.

7.2 Pilliga Sandstone

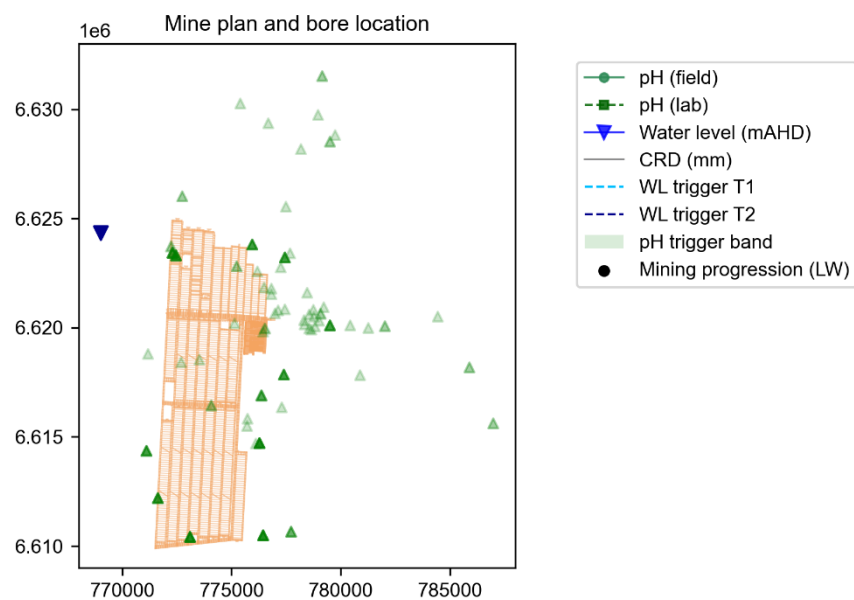
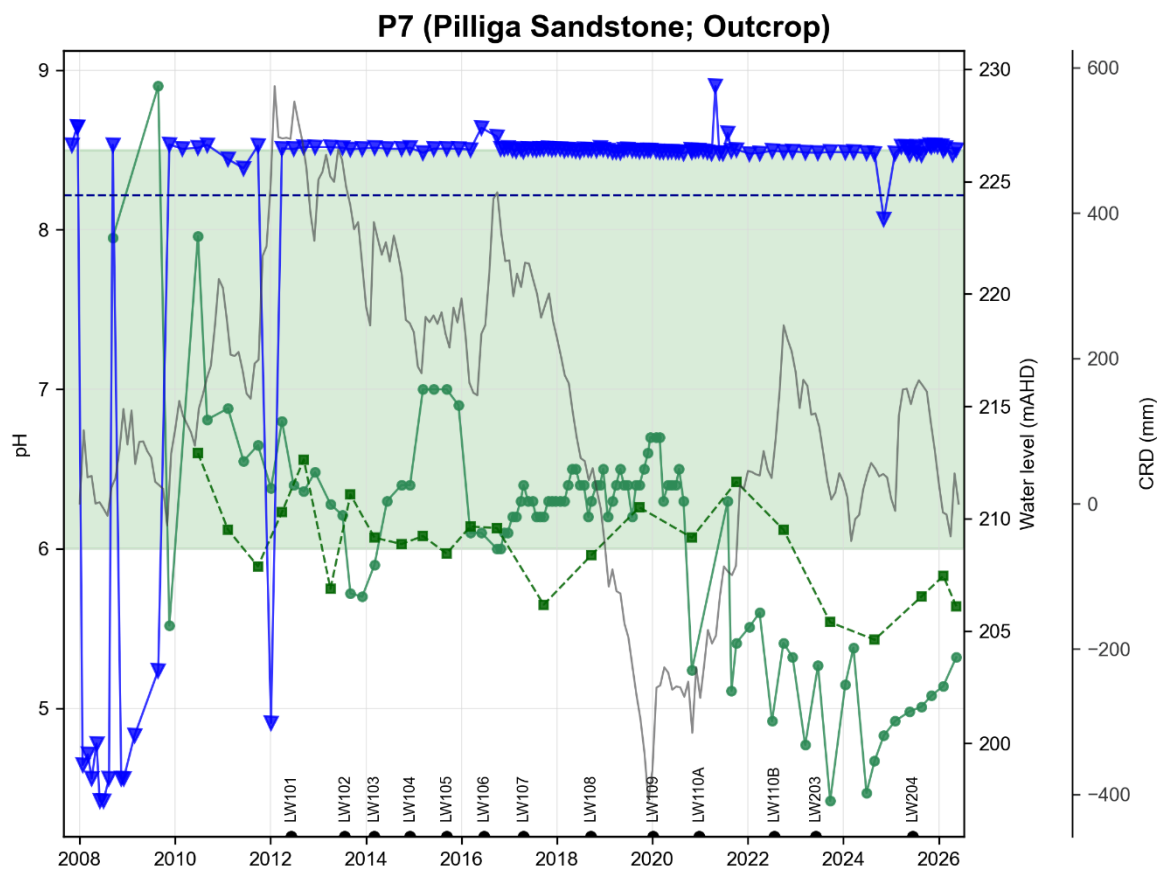
The Pilliga Sandstone monitoring bores at NCOPL are all situated on the eastern edge of the western dipping formation. The existence and thickness of the formation may differ from what has been inferred, and saturated conditions within the Pilliga have been found to be highly localised and not specifically related to depth.

⁸ ANZG. 2023. Livestock drinking water guidelines. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra.

7.2.1 P7 - water quality - pH exceedance

Bore P7, screened from 78 m bgl 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 (Figure 7.5). Laboratory (lab) pH measurements declined between 2022 and 2024. From 2024 to 2026, pH shows an increasing trend, although values persist to remain below the minimum pH threshold of 6; however, they are more consistent with historical trends. A report prepared by CSIRO for the Gas Industry Social and Environmental Research Alliance (GISERA) discusses distinct spatial zonation within the Pilliga Sandstone (Raiber *et al.*, 2022⁹). Based on the work of Raiber *et al.* (2022) the 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.

⁹ Raiber, M., Martinez, J., Suckow, A., Deslandes, A., and Gerber, G. 2022. Assessment of the influence of geological structures on aquifer connectivity in the Pilliga Forest area, NSW – an integrated hydrogeological, geophysical, hydrochemical and environmental tracer approach. CSIRO Land and Water.



* mAHd - metres Australian Height Datum

Australasian Groundwater and Environmental Consultants Pty Ltd
Water Level plots

Figure 7.5 P7 pH field and laboratory measurements plotted with water levels

7.2.1.1 Natural 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 from 2020 provides a possible source of acidity. With increased precipitation and rainfall, interaction of recharge water with soil CO₂ can result in CO₂ dissolution, and a decrease in recharge water pH. This is a potential source of lower pH, especially if the Pilliga Sandstone is deficient in buffering minerals (e.g. carbonates).

Changes in pH are likely due to natural fluctuations; however, further monitoring is required to confirm this. There appears to be fluctuations and some drift in the field measurements, and laboratory measurements do not record similar fluctuations or drift with the lowest recorded pH 5.32 for field and 5.64 for laboratory tested. Given that pH buffering can occur after sampling and prior to laboratory testing, it is usually more reliable to use the field pH as an indication of in situ conditions. The fact that there are differences in laboratory and field pH readings for P7 groundwater could support the idea that soil CO₂ is contributing to the low pH. Once the sample is obtained, the partial pressure of CO₂ in the water decreases, making the laboratory reading higher. This process can have a material effect on the sample pH, especially if alkalinity concentration is low.

7.2.1.2 Seepage from surface sources

No surface water is located near this bore; therefore, seepage from surface sources is unlikely.

7.2.1.3 Mining-induced mixing

Groundwater chemistry recorded at bore P7 plots as a sodium-chloride (Na-Cl) type water, with variable proportions of bicarbonate (Figure 7.6). A linear mixing trend in the anions is visible, with a relative increase in bicarbonate over chloride. The mixing trend does not coincide with the decreasing field pH trend.

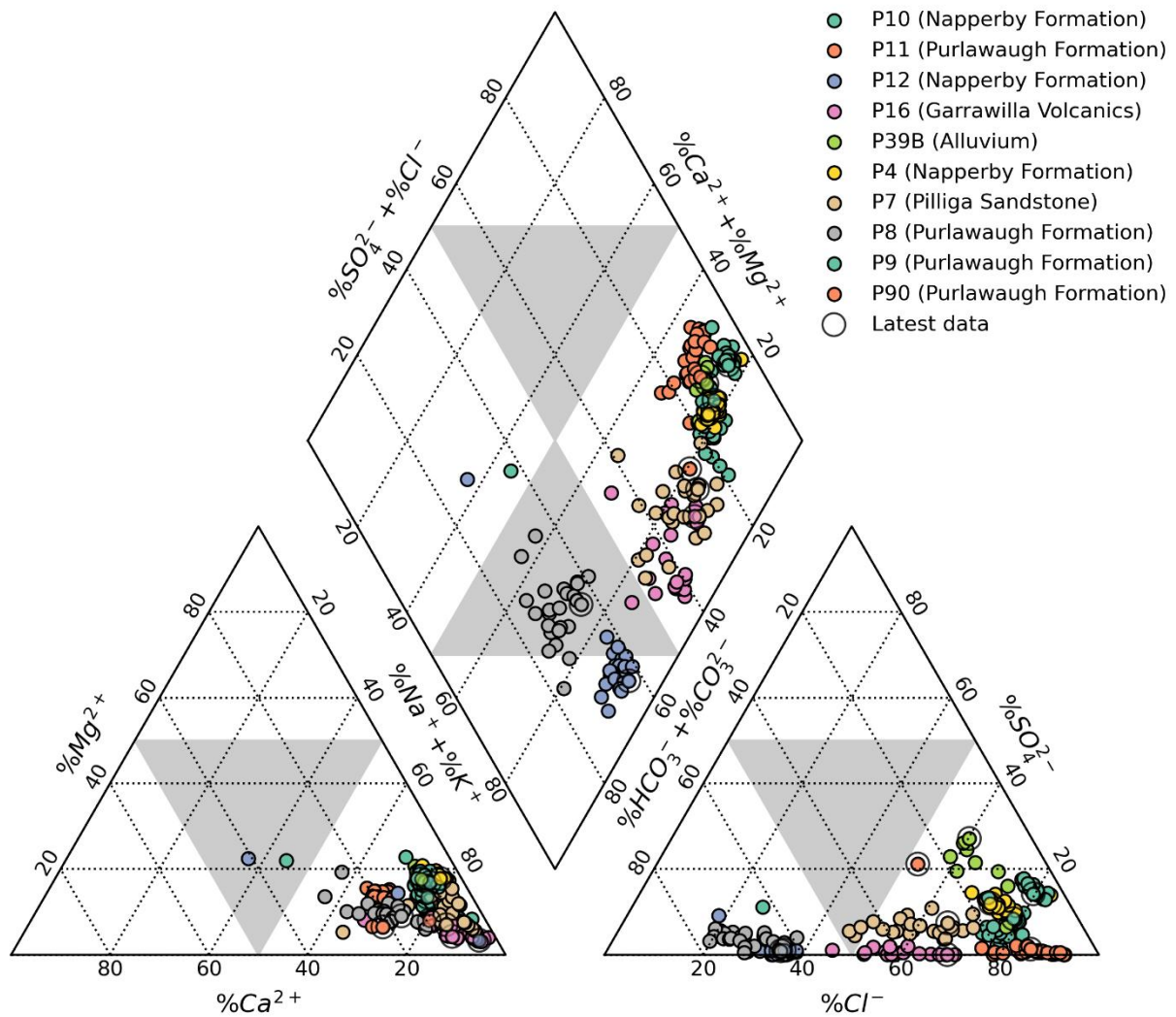


Figure 7.6 P7 and surrounding bores Piper Plot

7.2.1.4 Solute release

Pilliga Sandstone is not predicted to show significant impacts from mining in part due to the presence of multiple formations between the Hoskissons Coal Seam and the Pilliga Sandstone including the Digby Conglomerate, Napperby Formation (low permeability), Garrawilla Volcanics and Purlawaugh Formation (aquitard) (AGE, 2020)¹⁰. Groundwater samples collected underground from LW203 (located approximately 7.6 km southeast of P7) records pH from 5.3 to 7.7 while pH recorded in the underlying Purlawaugh formation generally ranges from 6.5 to 8.

¹⁰ AGE. (2020). Groundwater Assessment Narrabri Mine Stage 3 Extension Project, project No. G1973. Narrabri Coal Operations Pty Ltd.

7.2.2 Potential impacts

Hydrochemical studies conducted by Raiber *et al*¹¹ found that water of the Pilliga Sandstone often records pH lower than 6. Hierarchical cluster analysis (HCA) identified a cluster predominantly comprising bores sampled within the Pilliga region, exhibiting an average pH of 5.9. Considering the naturally low pH and baseline conditions, current reductions in pH are not anticipated to exert a significant impact on the groundwater system and would likely be driven by natural causes.

7.2.3 Conclusion and recommendations

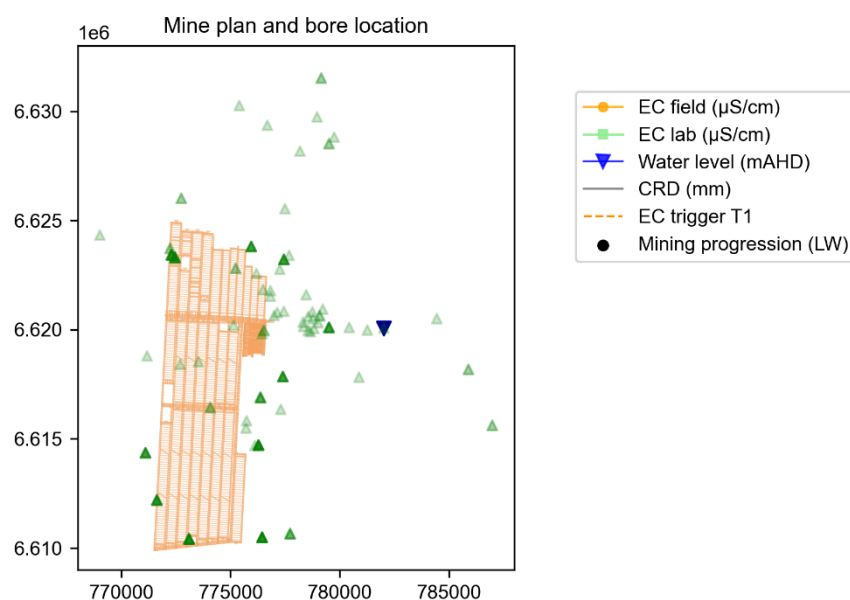
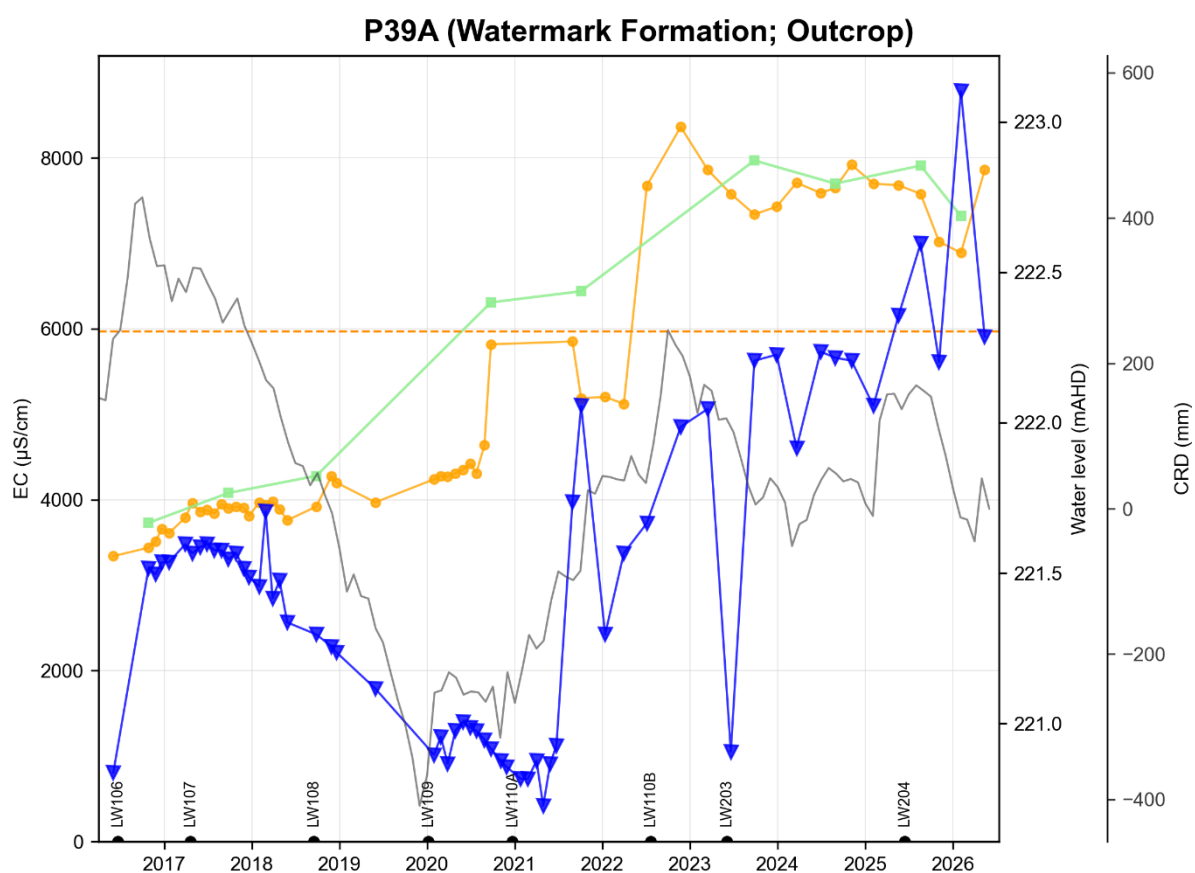
Groundwater within the Pilliga at P7 has a low baseline pH, and subsequent decreases in pH trigger the lower trigger level (pH 6.0). Multiple monitoring bores within the mining area have also recorded a decreasing pH trend with associated variable fluctuations. Sensor drift for field equipment is a possible means for the decreasing field trend; however, in most cases, the bores 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 increased recharge. Historical pH of the Pilliga Sandstone is variable across the formation and is often lower than 6 and as such the recently recorded low pH are within this range. Work completed by (Raiber *et al*, 2022) support the low pH range identified in this area. Given the naturally low pH it is recommended to update the WMP with an aquifer specific trigger.

7.3 Watermark Formation

7.3.1 P39A - water quality - EC exceedance

Bore P39A is installed approximately 7 km east of mining between Tulla Mullen and Kurrajong Creeks from 72 to 78 m bgl. The bore was installed just prior to the Tinderbox Drought and, as with bore P39B, demonstrates a lag from the end of the Tinderbox Drought to groundwater level recovery. As groundwater levels commenced recovering, the EC values show a sharp increase with large (~3,000 $\mu\text{S}/\text{cm}$) fluctuations (Figure 7.7).

¹¹ Raiber, M., Martinez, J., Suckow, A., Deslandes, A., & Gerber, C. 2022. Assessment of the influence of geological structures on aquifer connectivity in the Pilliga Forest, NSW – an integrated hydrogeological, geophysical, hydrochemical and environmental tracer approach. A technical report from GSIRO to GISERA.



* mAHD - metres Australian Height Datum

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Water Level plots

Figure 7.7 P39A EC field and laboratory measurements plotted with water levels

7.3.1.1 Natural climate factors

As with bore P39B (Tulla Mullen alluvium) changes in EC are marked by two distinct periods. The first is a steady increase in EC observed during the Tinderbox Drought, which is likely due to reduced recharge from rainfall and diminished contributions from the Kurrajong and Tulla Mullen Creeks. As with P39B, following the drought, as groundwater levels began to recover, EC values rose more sharply and exhibited greater fluctuations. This post-drought increase is attributed to the mobilisation of salts that had accumulated in the unsaturated zone during the dry period.

As water levels recorded at P39B (Tulla Mullen Alluvium) and P39A (Watermark Formation) are similar, have similar fluctuations in EC trends and similar water types (Na-Cl), the natural climate factors influencing P39B appear to also be influencing groundwater quality and level recorded at P39A.

7.3.1.2 Seepage from surface sources

The recent field measurements at the end of a very dry April show that the surface water dam, upgradient and close by, has fresh water, and although this may fluctuate, it is not considered likely that it will fluctuate sufficiently high to account for EC recorded in the bore.

7.3.1.3 Mining-induced mixing

No mixing trends are identified with other nearby formations; water type plots as Na-Cl type (Figure 7.3), similar to that of P39B.

7.3.1.4 Solute release

The bore is located approximately 7 km east of active mining and 3 km east of rail loop dams; as such, solute release from these sources is unlikely without observable trends in bores located nearby.

7.3.2 Potential impacts

Baseline EC measurements at bore P39A indicate the presence of naturally saline groundwater. As such, further increases in salinity are unlikely to result in significant impacts to the system.

7.3.3 Conclusion and recommendations

Mechanisms for change with the Watermark bore appear to be the same as with other formations experiencing EC exceedances. Groundwater EC trends are similar to those recorded in other bores, as such, recommendations are the same, which include continued monitoring followed by a review of EC baseline once bores have reached a new equilibrium and further sampling of surface water quality in nearby farm dams.

7.4 Napperby Formation

Bore P10 is located south of the planned LW 205 and north of Kurrajong Creek; the bore is installed in the Napperby Formation from 118 m bgl to 130 m bgl and is immediately adjacent to bore P11, which is installed in the shallower Purlawaugh Formation at 44 m bgl to 50 m bgl.

7.4.1 P10 – water level

The current water level in bore P10 is recorded as 261.3 mAHD (May 2026), making it the third consecutive exceedance below the Tier 2 level of 270.9 m AHD (prior readings: 265.1 mAHD (Nov 2025) and 262.7 mAHD (Feb 2026)). The water level trend in this bore in the last 12 months is a steady decrease from about 278 mAHD to 261 mAHD (Figure 7.8).

7.4.1.1 Natural climate factors

A slow reduction in groundwater levels at P10 is initially observed from 2017 (after the commencement of the Tinderbox Drought) until 2021, around this time the vertical hydraulic gradient between P10 (deep) and P11 (shallow) switched from downward to upward. From November 2020 to late 2023 groundwater levels fluctuated, after which, they commenced declining with the most rapid decline recorded from June 2025 until May 2026, whereby groundwater levels declined at an approximate rate of 1.49 m per month. As the direction and rate of groundwater level change at P10 is not commensurate with the CRD patterns (Figure 7.8), it is not likely that the water level exceedance is climate related.

7.4.1.2 Seepage from surface

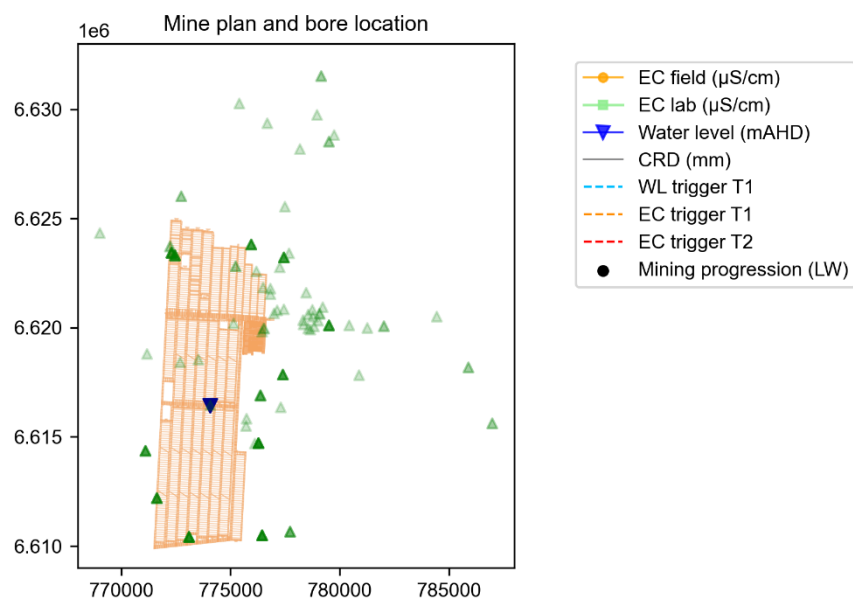
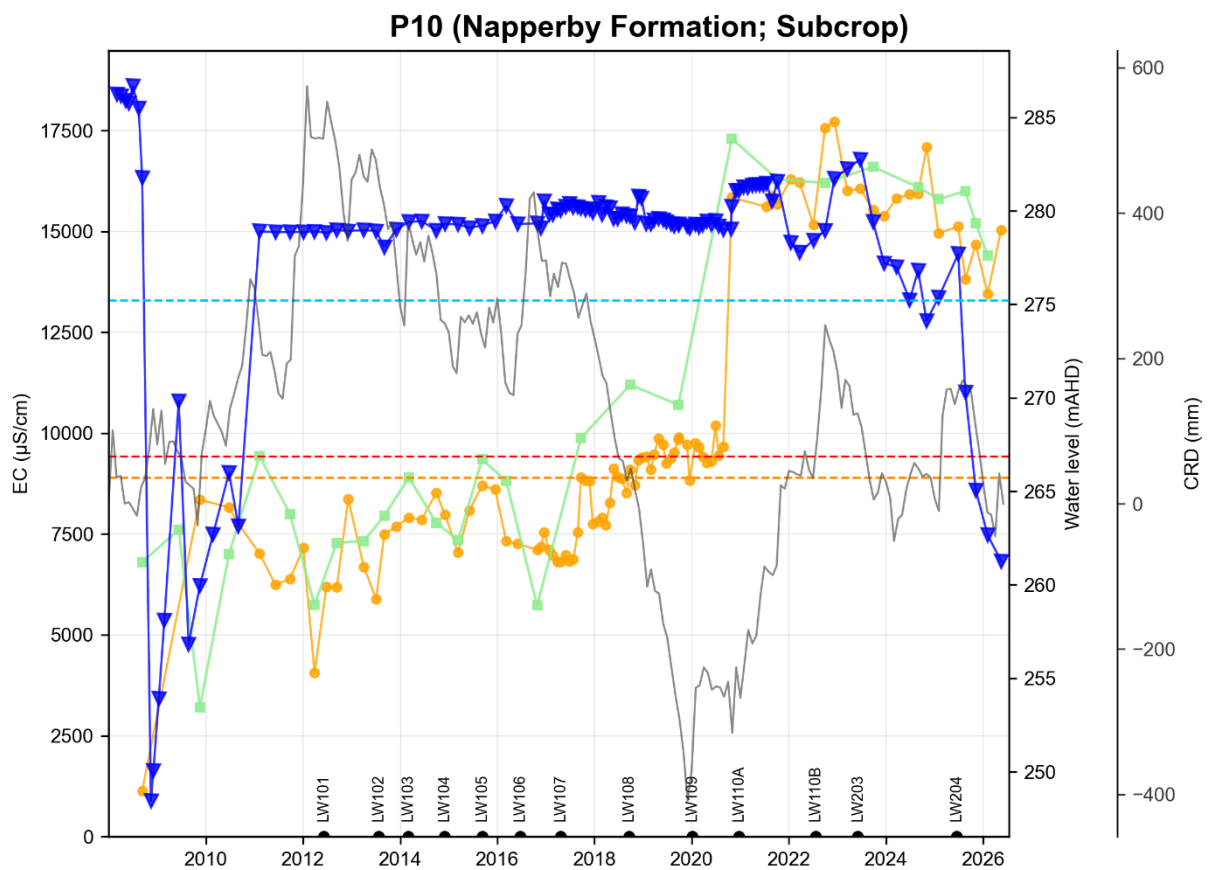
As the water level change is a reduction and not mounding, seepage is dismissed as a potential cause.

7.4.1.3 Mining-induced drawdown

Mining of LW204 commenced in June 2025, and the decreasing groundwater trend commenced at this time as expected based on groundwater modelling (Figure 7.9). In October 2024, drilling of the Western Shaft commenced; at this point in time, drawdown appears to have occurred at a faster rate than modelled. The drilling and installation of the Western Shaft was not included in the numerical modelling, and may account for the underprediction. Groundwater decline at P10 is mainly associated with mining LW204 with the faster than expected decline likely due to the installation of the Western Shaft.

7.4.2 P10 - water quality - EC exceedance

Groundwater EC values are naturally high in the Napperby Formation at P10 (Figure 7.8), having fluctuated between 4,000 $\mu\text{S/cm}$ and 8,000 $\mu\text{S/cm}$ from 2010 (installation pre-mining) to 2017. In 2017, P10 groundwater EC values began to steadily increase from 7,000 $\mu\text{S/cm}$ to 10,000 $\mu\text{S/cm}$. In late 2021, EC values increased more rapidly, reaching a maximum of 17,715 $\mu\text{S/cm}$ in 2024. Since then, EC has remained elevated, although a decreasing trend is evident from 2024 to early 2026 (Figure 7.8). The most recent measurement, recorded in May 2026, was 15,040 $\mu\text{S/cm}$.



* mAHD - metres Australian Height Datum

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Water Level plots

Figure 7.8 P10 EC field and laboratory measurements plotted with water levels

7.4.2.1 Natural climate factors

The gradual EC increase recorded between 2017 and 2020 is possibly associated with a reduction in recharge from precipitation and freshwater recharge from Kurrajong Creek during the Tinderbox Drought. However, with P10 being a deep bore, and the groundwater being naturally saline, immediate responses to a reduction in current recharge are only one possibility for the change in EC. In October 2020, just prior to the commencement of mining LW110A (December 2020) the groundwater levels recorded at P10 increased by 1.2 m from 279.0 m AHD to 280.2 m AHD at the same time EC increased from 9,670 $\mu\text{S}/\text{cm}$ to 15,841 $\mu\text{S}/\text{cm}$. As such, saturation of previously unsaturated rock and dissolution of salts is the likely cause of the rapid increase in salinity.

7.4.2.2 Seepage from surface sources

Nearby surface water testing at Kurrajong Creek shows no increases in salinity or possible contribution to changes in the underlying groundwater. In addition, there are no other surface sources adjacent to P10; therefore, this potential cause is dismissed.

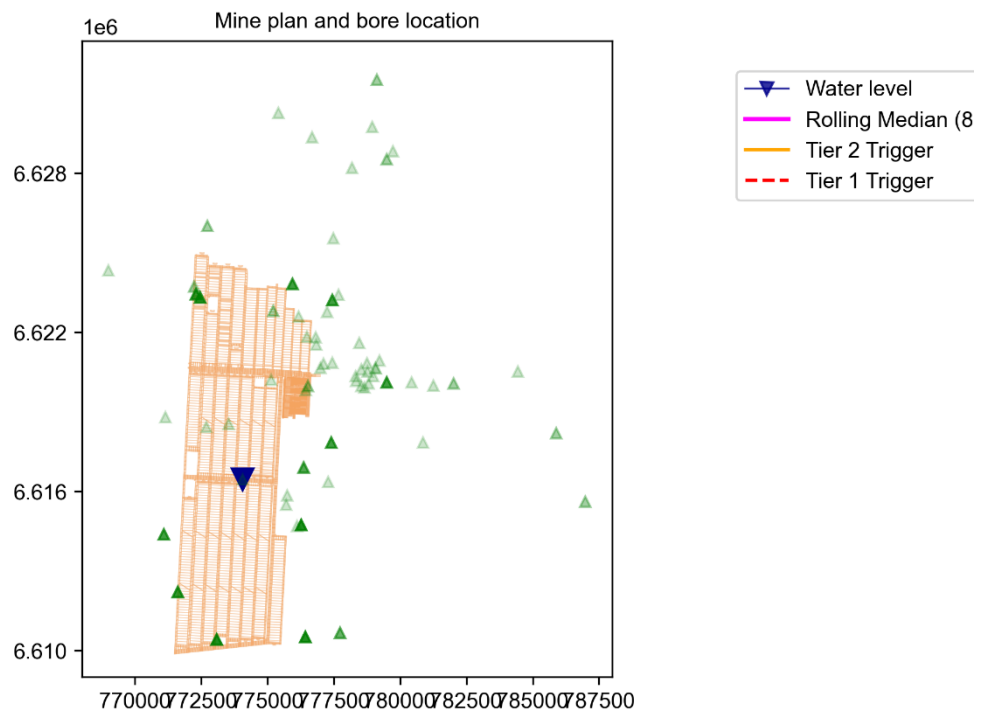
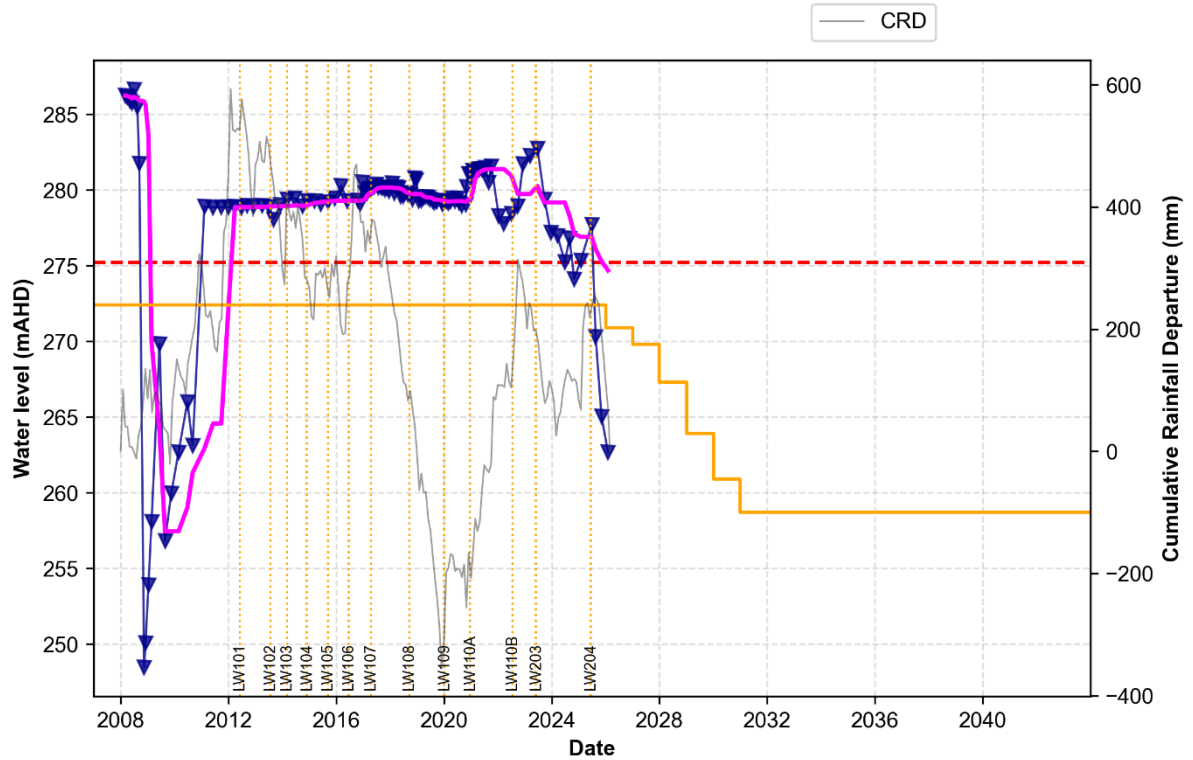
7.4.2.3 Mining-induced mixing

Increases in EC may be attributed to a reduction in dilution from seepage from overlying units, which is plausible based on the change in vertical gradients between P10 and P11 discussed above. Bore P11, screened in the Purlawaugh Formation, records EC ranging from approximately 5,500 to 6,500 $\mu\text{S}/\text{cm}$; during the same time period EC recorded at P10 ranged from approximately 7,500 to 10,000 $\mu\text{S}/\text{cm}$.

Chemical analysis of water from P10 indicates a Na-Cl type water chemistry (Figure 7.6) throughout its record. Changes in chemistry over time could provide insight into the source of the higher EC water at P10. Ion-ion ratio plots indicate a decrease in the bicarbonate (HCO_3) to chloride (Cl) mass ratio (Figure 7.10), with a concurrent increase in the calcium (Ca) + magnesium (mg) to sodium (Na) mass ratio (Figure 7.11). This indicates that the water at P10 is becoming more Na-Cl dominated with time.

Bore P2, located 3.2 km to the east of P10, also plots as a Na-Cl type, indicating that this is a typical water composition for that formation. In addition, the EC at P2 is $\sim 20,000$ $\mu\text{S}/\text{cm}$, which means there is naturally saline water in the formation that is greater than the Tier 2 value at P10. Therefore, the exceedance at P10 could be the result of groundwater mixing within the Napperby Formation.

P10 (Napperby Formation; Subcrop)



* mAHD - metres Australian Height Datum

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Water Level plots

Figure 7.9 Groundwater drawdown at P10 with triggers

7.4.2.4 Solute release

Mine rock drainage in coal mine settings is typically associated with an increase in sulfate (SO_4) concentration, as reduced forms of sulfur (e.g. sulfide minerals) become oxidised because of oxygenation related to dewatering. However, SO_4 concentration can also increase due to evaporation or other natural causes. One metric of SO_4 release that distinguishes oxidation from evaporative concentration is the SO_4 -Cl mass ratio. If this ratio does not increase above background concentrations, it indicates that sulfide oxidation is less likely to be the cause of groundwater quality changes. This is the case at P10, where the SO_4 -Cl mass ratio has increased from about 0.10 in 2010 to about 0.18 in 2023 (Figure 7.12), but has remained well below the baseline value, which is approximately 0.23 to 0.43 in bore P8, and approximately 0.21 to 0.32 in bore P9. In addition, the hydraulic gradient at P10 indicates flow toward the mining zone, indicating that there is no viable pathway for solutes to reach P10, if they were being produced.

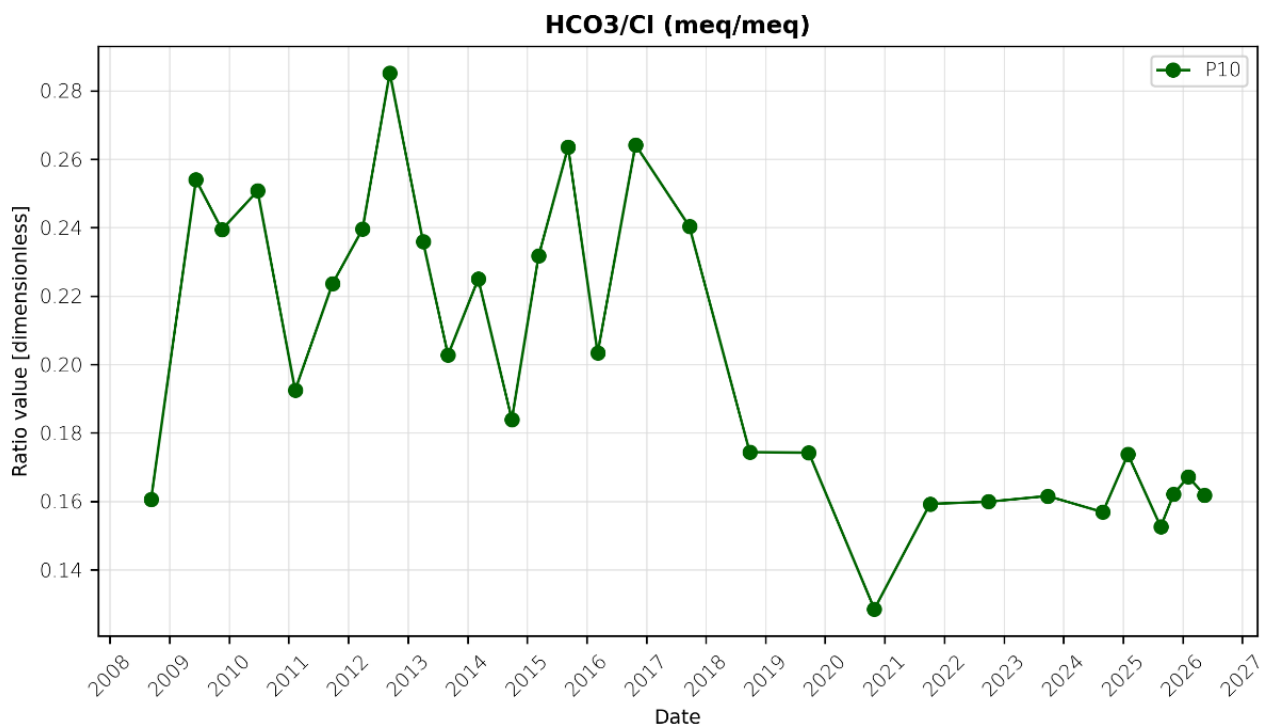


Figure 7.10 P10 HCO_3/Cl ratio

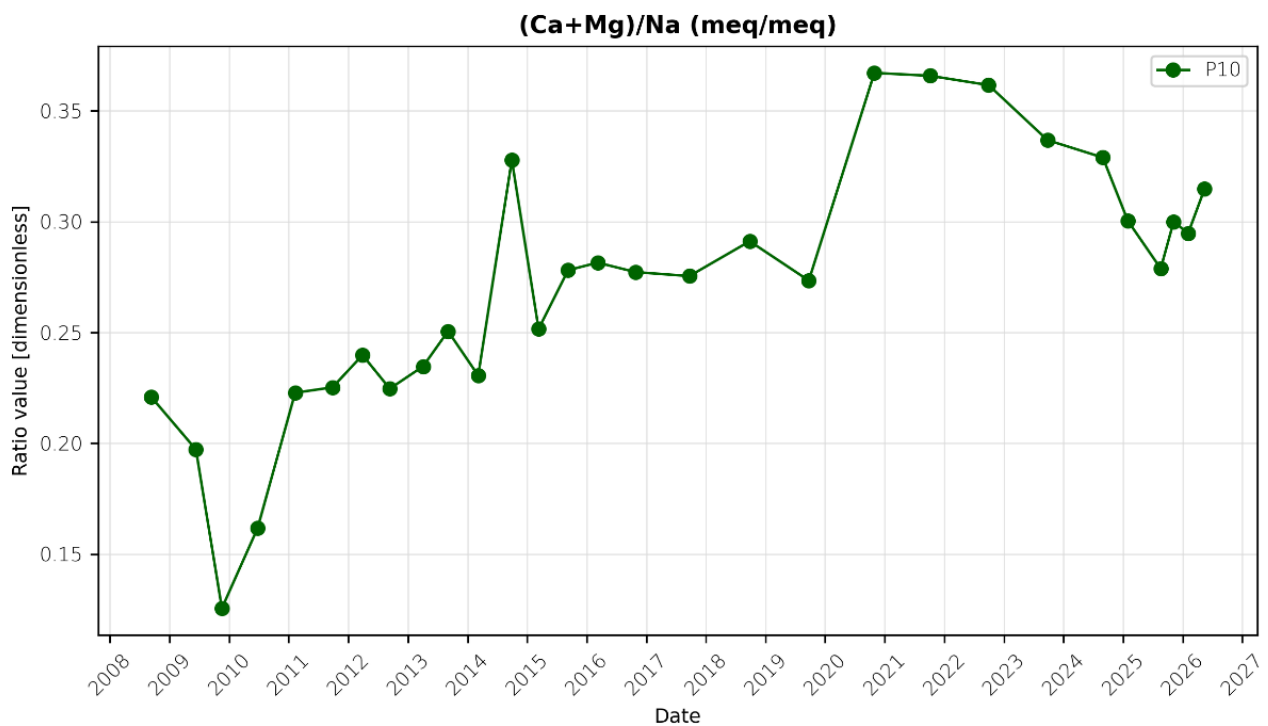


Figure 7.11 P10 Ca+Mg/Na ratios

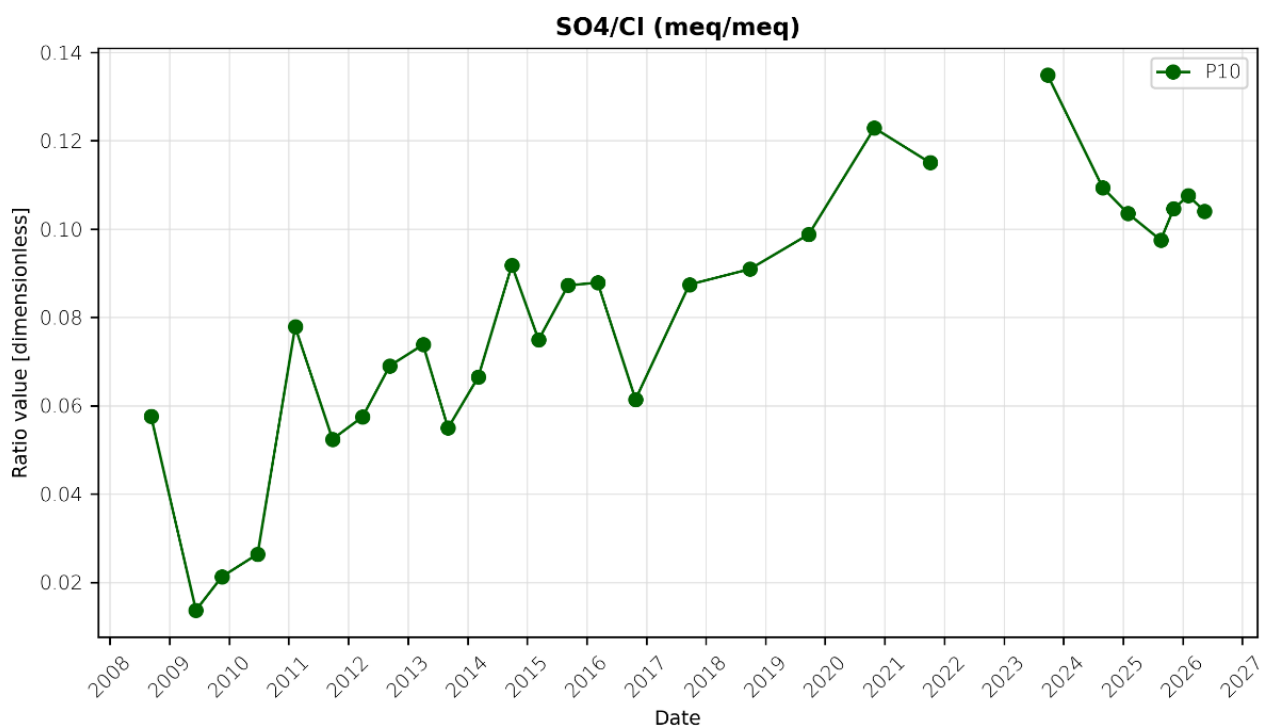


Figure 7.12 P10 and P11 SO4/Cl ratios

7.4.3 Potential impacts

Groundwater drawdown at P10 was predicted in modelling that supported the application for the mine's EIS. Salinity in groundwater within the Napperby Formation is naturally high; therefore, values resulting in EC exceedances are unlikely to cause impacts to any sensitive environmental receptors or groundwater users.

7.4.4 Conclusion and recommendations

The recent groundwater declining trend in P10 indicates that the bore is connected with mining, and drawdown is associated with mining LW204 and construction of the western shaft.

Groundwater EC observed within Napperby Formation bore P10 have been historically high. EC increases, as response to the Tinderbox Drought, in P10 (118 m bgl to 130 m bgl) indicates that changes in salinity are a natural response to the mobilisation of salts after the end of the drought. The delayed response is associated with the tight Napperby Formation and depths for recharge to reach the bore depths. In contrast, the recent change in EC (Q2 exceedance) could be the result of groundwater mixing within the Napperby Formation and appear unlikely to be seepage or solute release from mining-related sources.

The proximity of the bore to active mining and a recently installed ventilation shaft indicate that the bore is no longer suitable as a trigger and can be removed from the list of triggers. Additionally, several new bores have been installed closer to sensitive receptors.

7.5 Seepage Monitoring

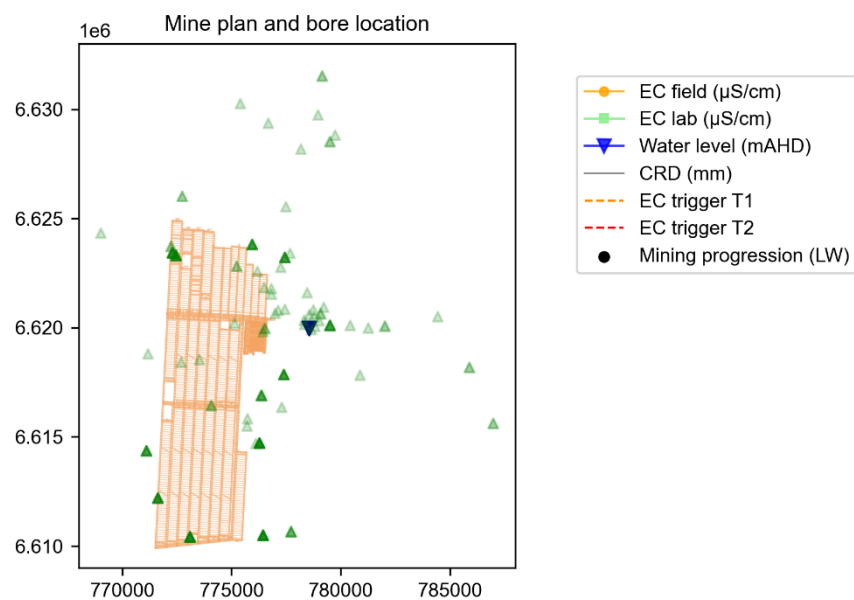
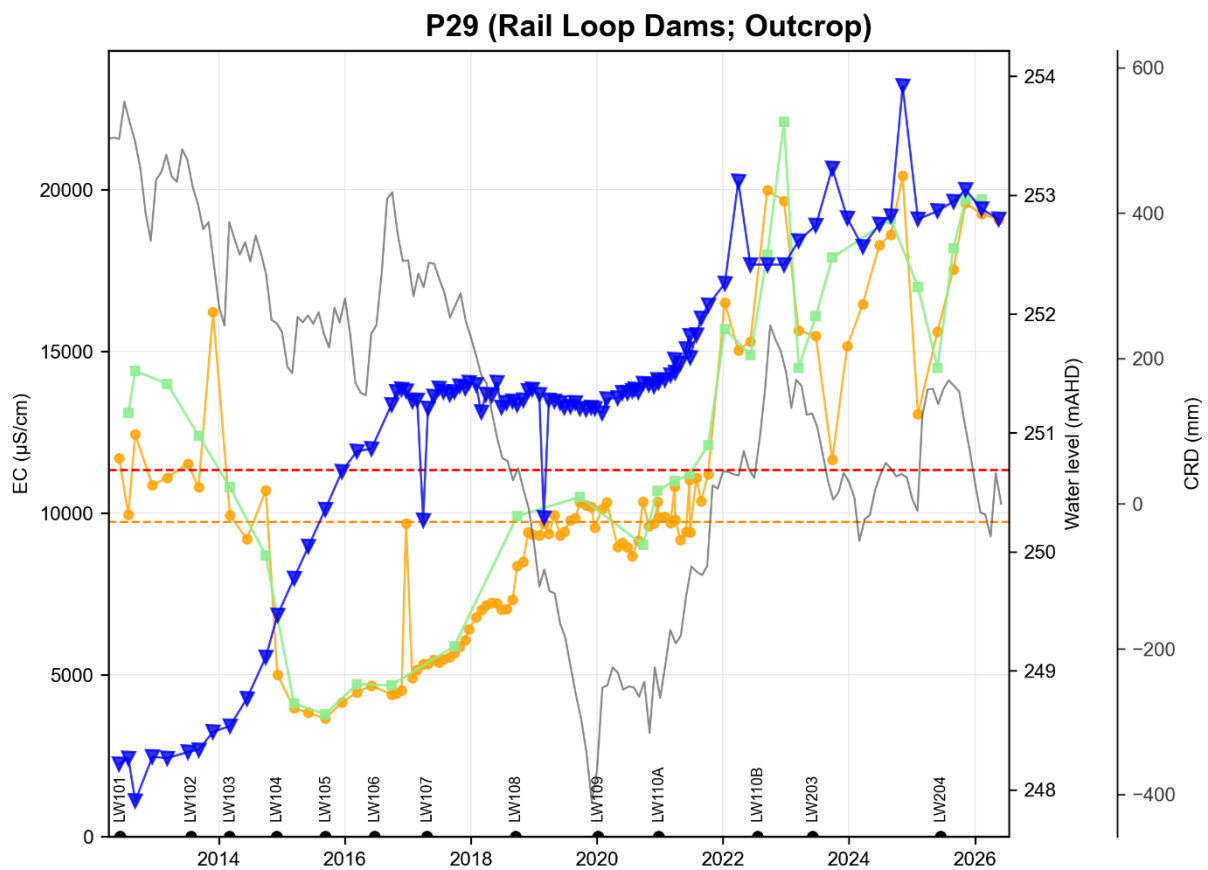
7.5.1 P29 - water quality - EC exceedance

Bore P29 is a seepage monitoring bore located south of the Rail Loop Dams (RLD) (Figure 2.2), the bore is screened in the Napperby Formation from 19 m bgl to 25 m bgl. The monitoring bore was installed in 2012 when the dams were constructed.

7.5.1.1 Natural climate factors

Two major temporal patterns are observed: the first period of change is from installation up to 2015, and the next period extends from 2015 to 2026, with an inflection in the trends around 2022 (Figure 7.13).

During the Tinderbox Drought groundwater levels at P29 remained stable with a slight decline observed late in the drought. During this time, EC increased from approximately 5,000 $\mu\text{S}/\text{cm}$ to 10,000 $\mu\text{S}/\text{cm}$, consistent with initial EC values. After the end of the drought the region experienced higher average rainfall from 2020 to 2023, during this time groundwater level measured at P29 increased by approximately 1.6 m. Over the same period, EC increased up to a maximum of 20,000 $\mu\text{S}/\text{cm}$. Since 2023, water levels have continued to increase contrary to fluctuations in rainfall.

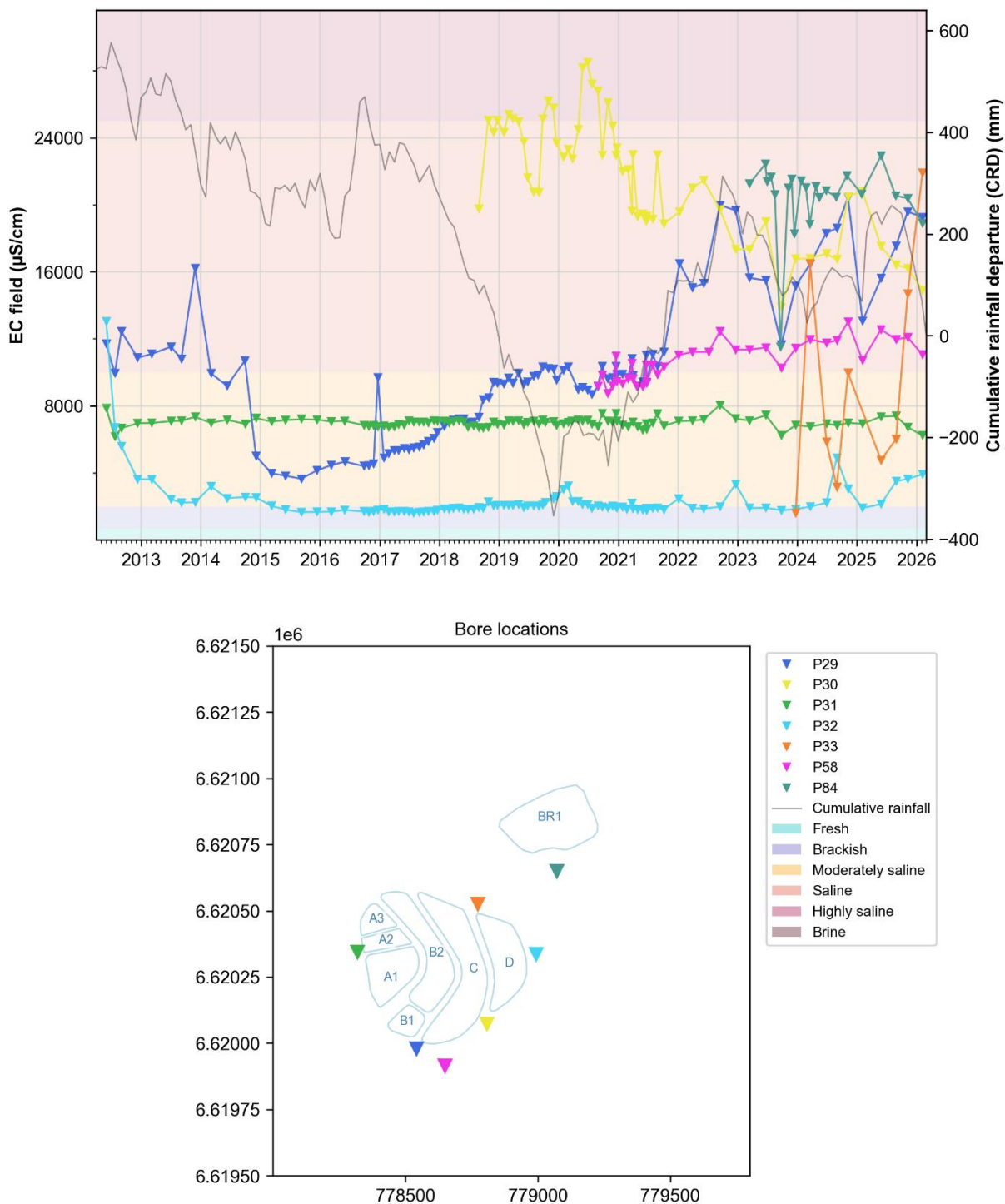


* mAHD - metres Australian Height Datum

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Water Level plots

Figure 7.13 P29 EC field and laboratory measurements plotted with water levels

Other RLD seepage monitoring bores installed in the Napperby Formation (Figure 7.14) do not follow similar EC trends of P29. Bore P30, located about 280 m to the east of P29 and adjacent to storage Dams D and C shows increasing water level trends with a declining EC trend. EC at this bore decreases from 20,800 $\mu\text{S}/\text{cm}$ in February 2025 to 16,340 $\mu\text{S}/\text{cm}$ in May 2026 with EC becoming more similar to that of P29.



Filled markers indicate values above limit of reporting; and Empty markers indicate values below limit of reporting.

Australasian Groundwater and Environmental Consultants Pty Ltd
Water Quality Plots

Figure 7.14 Seepage monitoring bore EC and locations

7.5.1.2 Seepage from surface sources

The high EC values at P29 and the changes over time may indicate a potential influence from the RLDs; however, the available data do not conclusively identify seepage as the sole source of salinity. Dams B2 and C have average EC values exceeding 20,000 $\mu\text{S}/\text{cm}$ and are a viable source of the increased EC at P29; however, the differences in water chemistry indicate that they are unlikely to represent the sole or direct source.

The major ion water quality data from bore P29 and other seepage monitoring bores are plotted in Figure 7.15. Major ions of recent P29 samples plot as a Na-Cl type water; whereas water from the dams B1, A1 and C plot as a Na-HCO₃ type indicating that the current groundwater chemistry cannot be explained by direct seepage from a single dam source. A linear mixing trend towards Na-HCO₃ type water at P29 has been identified in historical data from 2015 to 2016, the reasons for this is unknown.

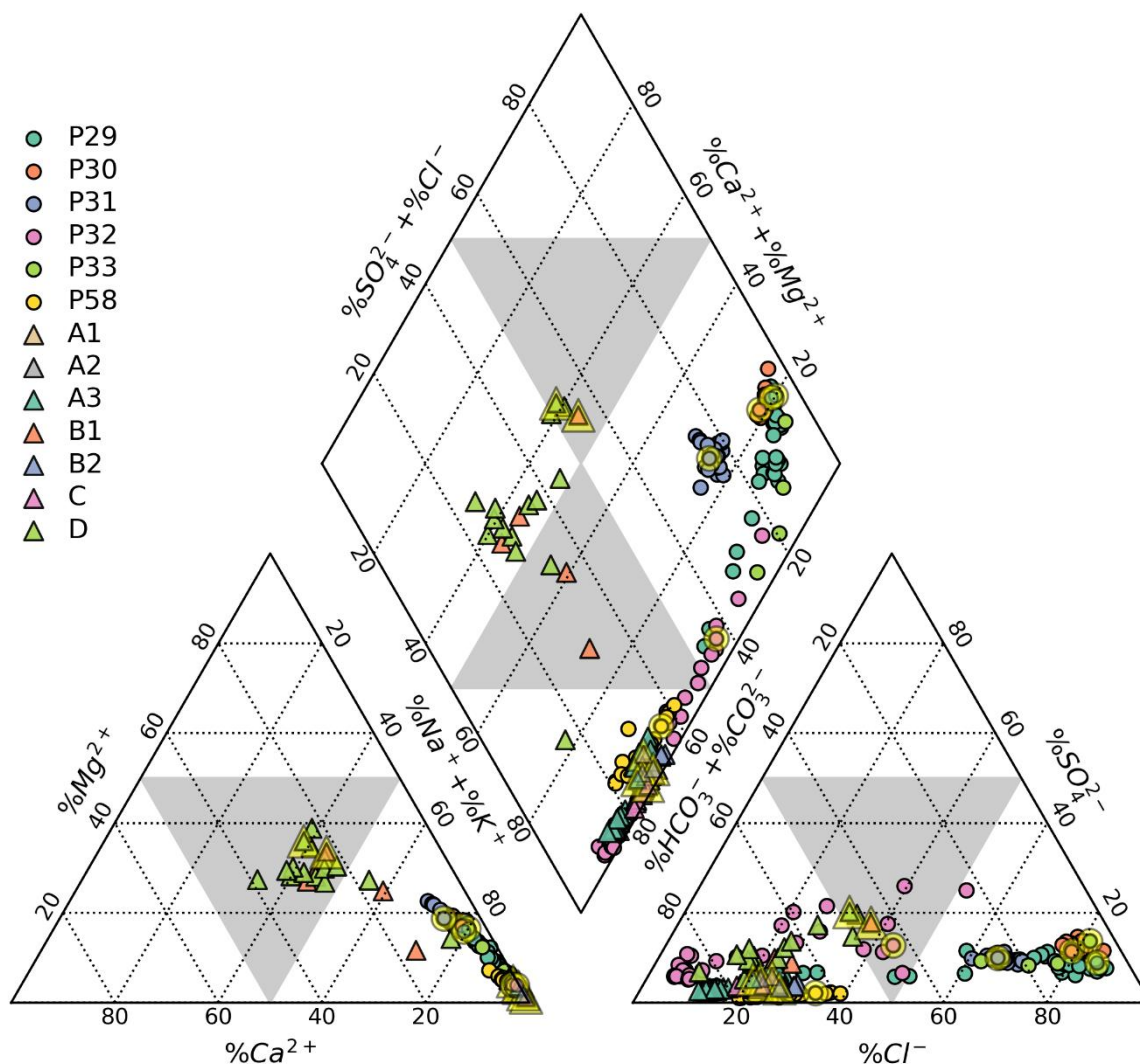


Figure 7.15 Piper diagram for monitoring bores P29 and surrounding sites, including rail loop dams B1, A1 and C

Post 2022, other changes in the ionic ratios of P29 water continued to occur. Of note are the increases in Mg^{2+} relative to K^+ (Figure 7.16) and Ca^{2+} relative to HCO_3^- (Figure 7.17). The major ion concentrations over time for P29 revealed that magnesium and calcium were increasing over this time commensurate with sodium and chloride concentrations, whereas the concentrations for potassium and bicarbonate were relatively static over this time. As the loss of potassium and bicarbonate is highly unlikely though precipitation, it is more likely that the data show a real addition of major ion salts, including sodium, calcium, magnesium, chloride, and sulfate.

Overall, the observed increases in water levels and EC indicate that groundwater at P29 is influenced by one or more sources; while some influence from the RLD complex is possible, the available data suggest that additional processes are also contributing. Some influence of Dam C is possible, due to the similarity of the EC with recent P29 observations; however, addition of sodium-chloride (and all major ions except bicarbonate and potassium) to P29 has occurred from a source other than Dam C, which is bicarbonate dominated. These salts could be from the subsurface, but other sources cannot yet be ruled out.

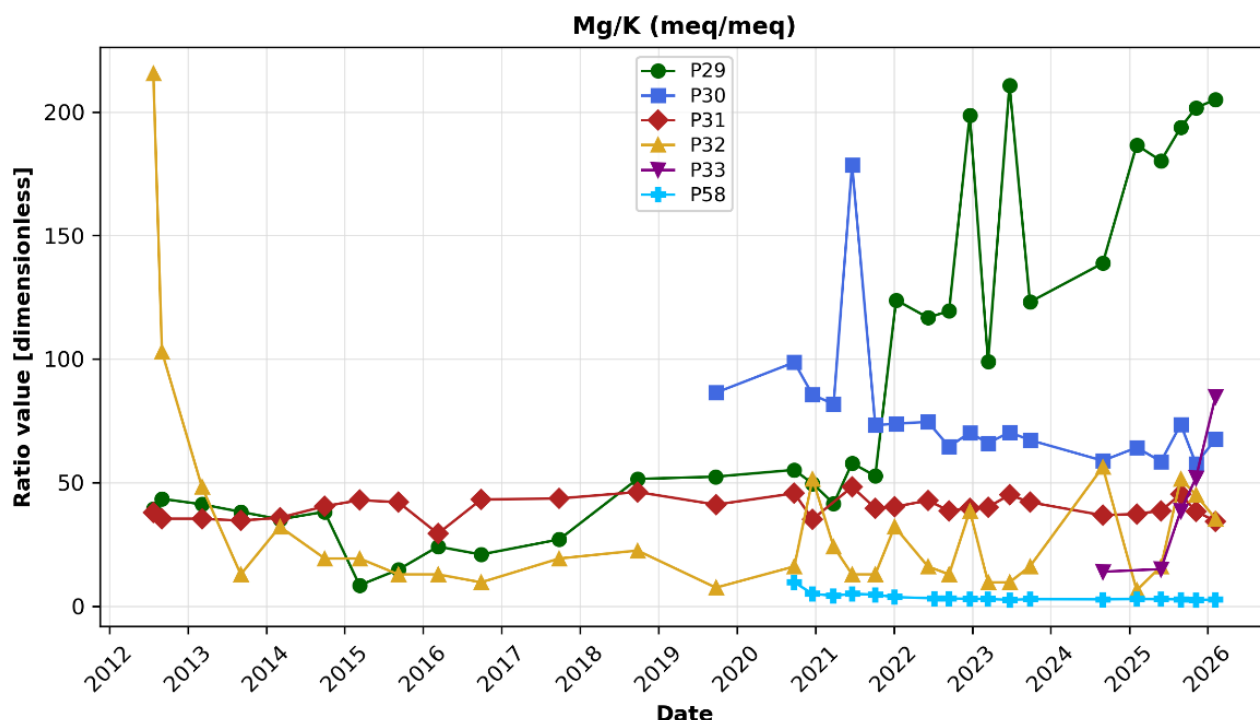


Figure 7.16 Mg/K ratio plot (meq/meq)

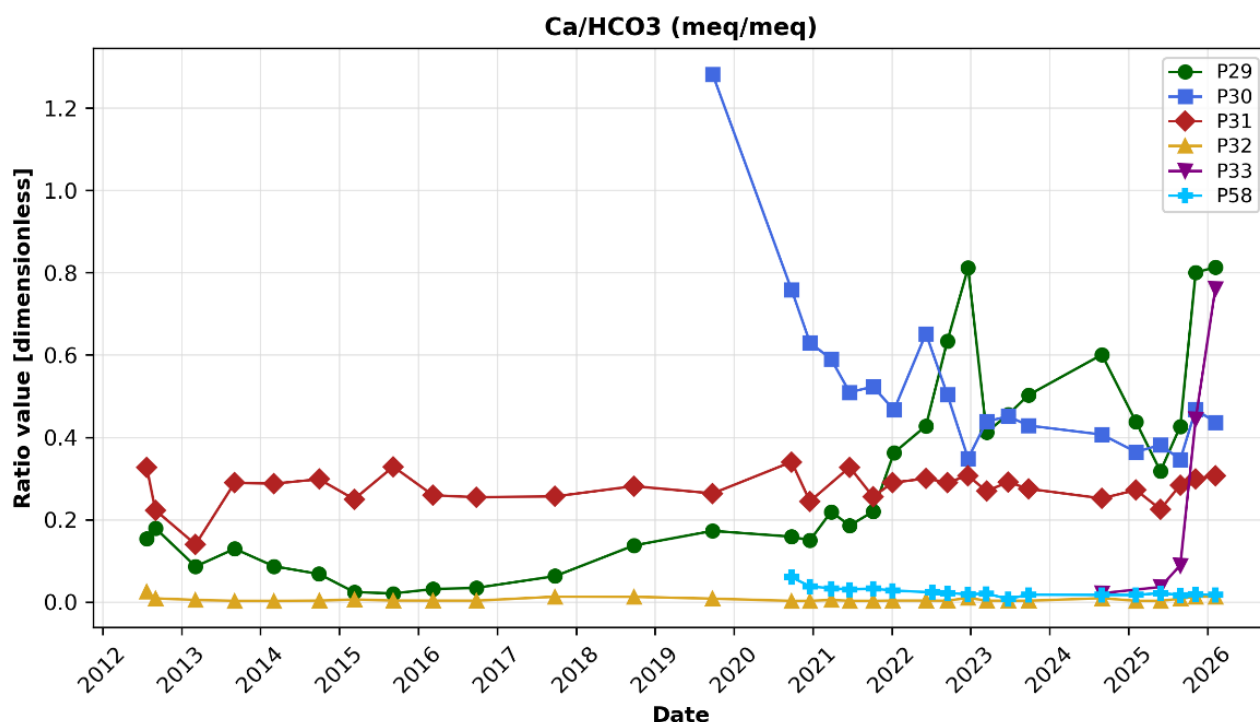


Figure 7.17 Ca/HCO₃ ratio plot (meq/meq)

7.5.1.3 Mining-induced mixing

Mixing with groundwater from adjacent hydrostratigraphic units as a result of changes in hydraulic gradients is not considered a plausible cause of the increased EC observed at P29. This is supported by recorded increases in groundwater levels, which indicate that depressurisation associated with nearby mining activities has not occurred at P29.

7.5.1.4 Solute release

The proximity of P29 to the RLDs and the comparative distance to mining indicates solute release from mining as the lesser likely source.

7.5.2 Potential impacts

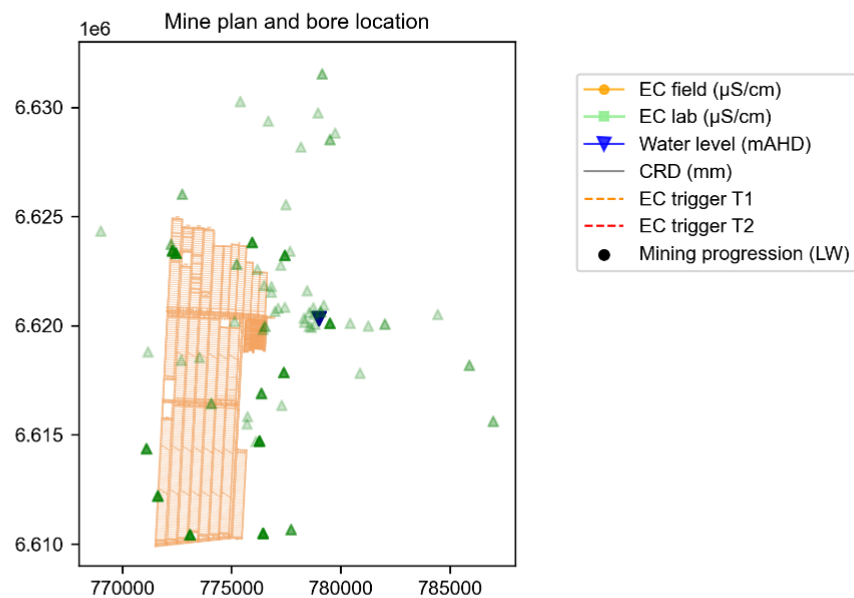
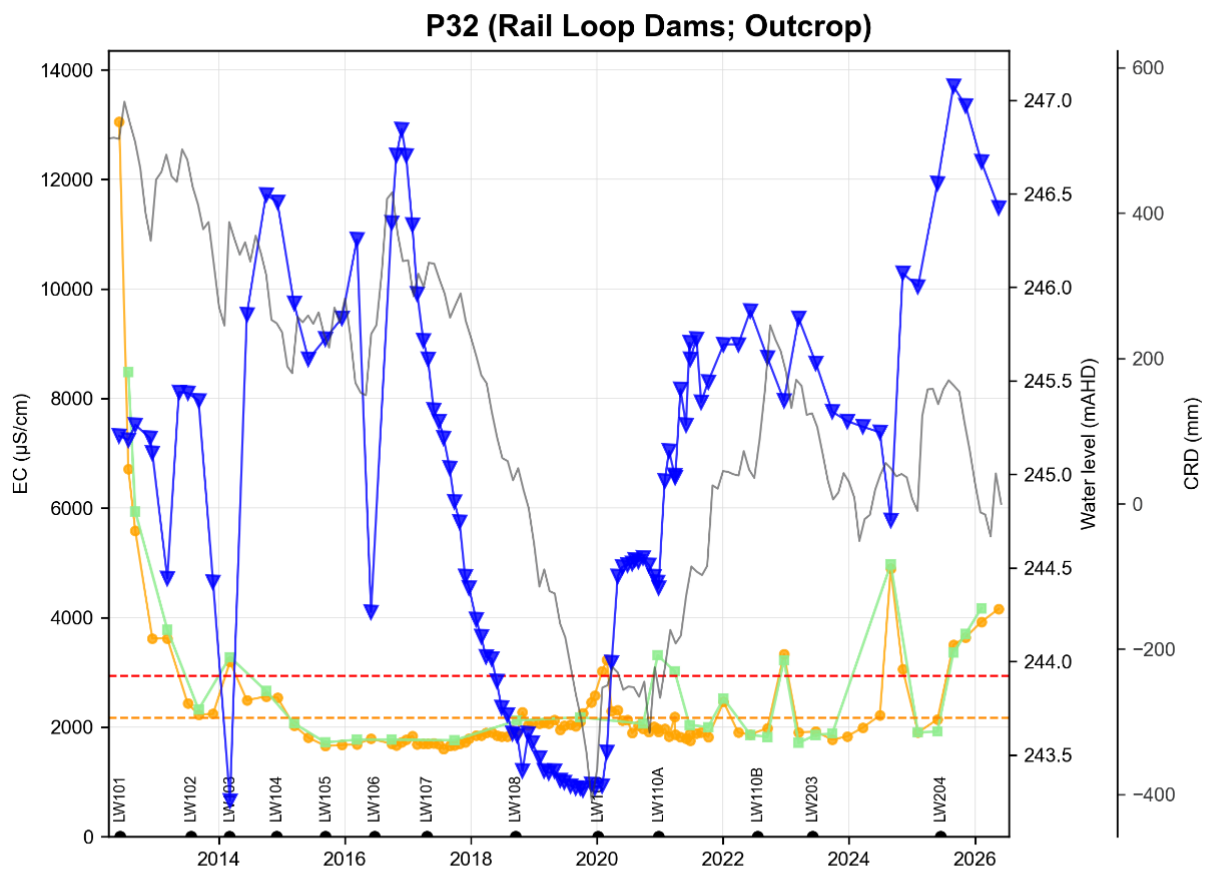
Increasing water levels and salinity recorded at P29 are isolated around the southern area of the RLD, nearby bore P58 which is screened deeper in the Napperby Formation and is demonstrating a downward EC trend since the end of 2025.

7.5.3 Conclusion and recommendations

Groundwater trends at P29 indicate that rising water levels and salinity are not solely attributable to rainfall or seepage from a single source. While seepage from nearby dams potentially contributes to hydraulic loading, the Na-Cl dominated chemistry and increasing major ion concentrations suggest additional processes, particularly mobilisation of salts from previously unsaturated soils as groundwater levels rise. The observed changes are most consistent with a combination of processes, including potential seepage from surface water storages and mobilisation of salts within the unsaturated zone; however, the relative contribution of each process remains uncertain. Further investigations are planned to clarify the causes of change at P29.

7.5.4 P32 - water quality - EC exceedance

Bore P32 is a seepage monitoring bore located east of Dam D (Figure 2.2). Dam D receives water from the Namoi River and occasionally Namoi alluvial groundwater system and west of a containment bund. The bore is screened in the Napperby Formation from 9 m bgl to 15 m bgl and was installed in 2012 when the dams were constructed. EC values initially declined after installation to mid-2015. Since 2015 values have fluctuated with an overall increase concurrent with a recent increase in water levels (Figure 7.18).



* mAHD - metres Australian Height Datum

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Water Level plots

Figure 7.18 P32 EC field and laboratory measurements plotted with water levels

7.5.4.1 Natural climate factors

Groundwater levels recorded at P32 fluctuate in very similar fashion to variations in rainfall with periods of higher rainfall showing elevated groundwater levels. The recent increase in EC occurs together with an increase in groundwater levels recording a near all-time high groundwater level in late 2025. The connected nature of the bore patterns to CRD, and the water level relationship to groundwater EC, indicate that the recent changes could be related to climate factors.

7.5.4.2 Seepage from surface sources

Bore P32 is installed to the east of Dam D between the dam and a containment bund capturing surface water runoff from dam walls and surrounding tracks. The recent increase in water levels is likely associated with increases in rainfall, and potentially seepage from Dam D and the containment bund. Bore P32 generally has a Na-HCO₃ type water, but with significant variation in composition in the anions, whereby some proportion of anions can be chloride (up to 55%) and sulfate (up to 28%). Ratios of major ions HCO₃-to-Cl (Figure 7.19) and Na-to-Cl (Figure 7.20) show fluctuating ratios indicating variable recharge or solute sources. Water stored in Dam D is primarily from Namoi River; however, it can be used to store water from the Namoi Bore. Variations in groundwater composition over time possibly indicate that bore P32 could be impacted by seepage from Dam D and nearby surface water containment bunding.

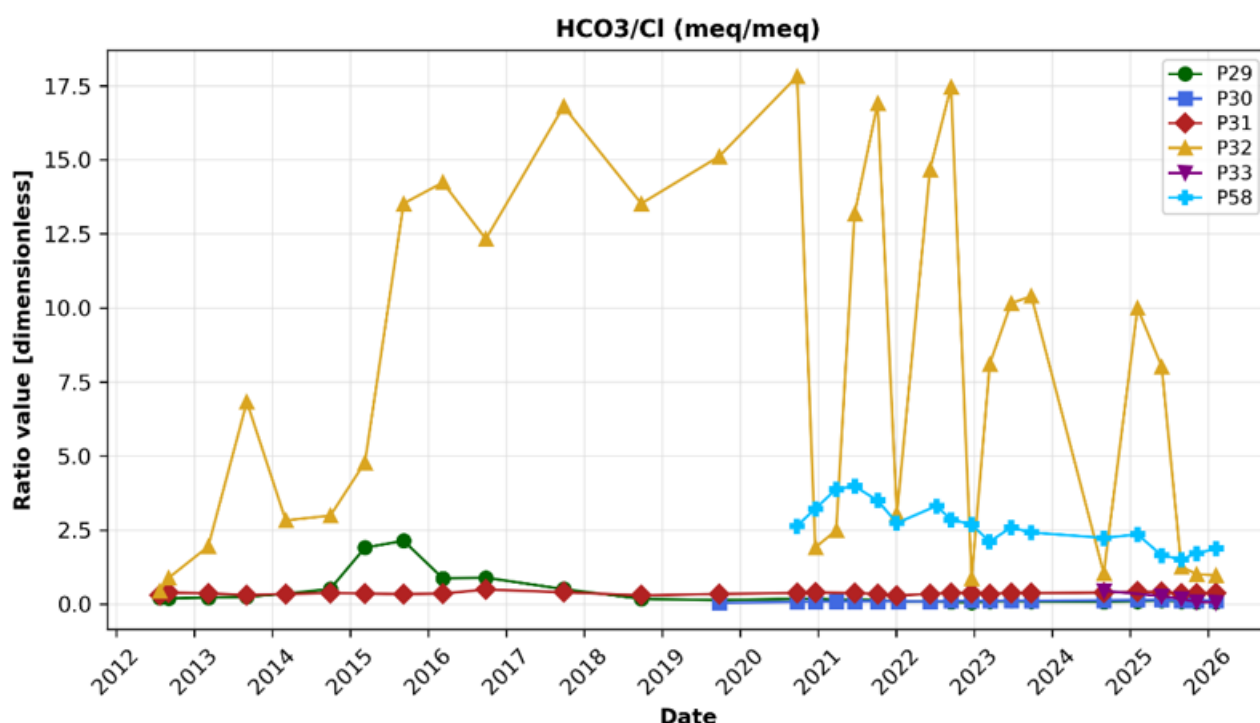


Figure 7.19 HCO₃/Cl ratio plot (meq/meq)

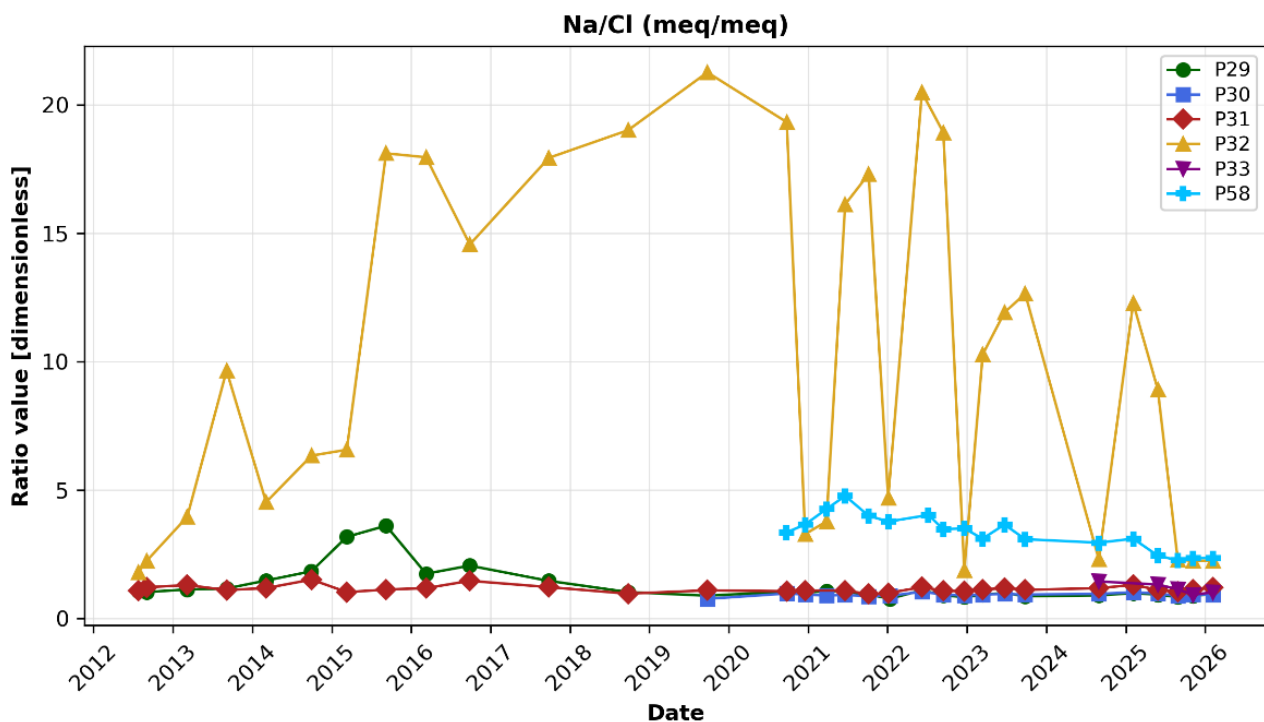


Figure 7.20 Na/Cl ratio plot (meq/meq)

7.5.4.3 Mining-induced mixing

Mixing with groundwater from adjacent hydrostratigraphic units driven by changes in hydraulic gradients is not considered a plausible cause of the increased EC observed at P32. This interpretation is supported by recorded rises in groundwater levels, which indicate that no depressurisation related to nearby mining activities is occurring.

7.5.4.4 Solute release

The proximity of P32 to the RLD and distance from mining indicates solute release from mining as an unlikely source.

7.5.5 Potential impacts

Given that surface water from Dam D is sourced predominantly from the Namoi River, which is considered to be better quality than the groundwater typical of the surrounding area, no negative impact to the groundwater system is expected if Dam D is indeed the source of solutes.

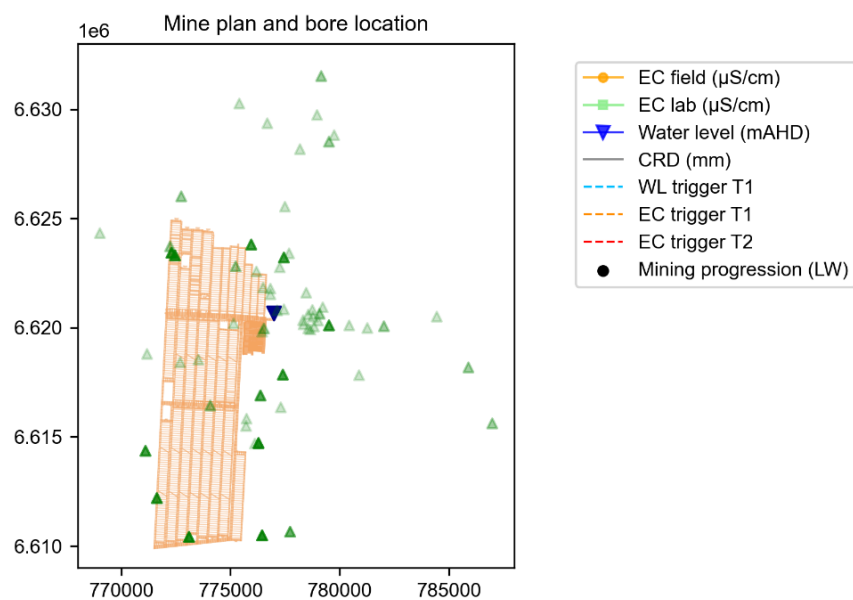
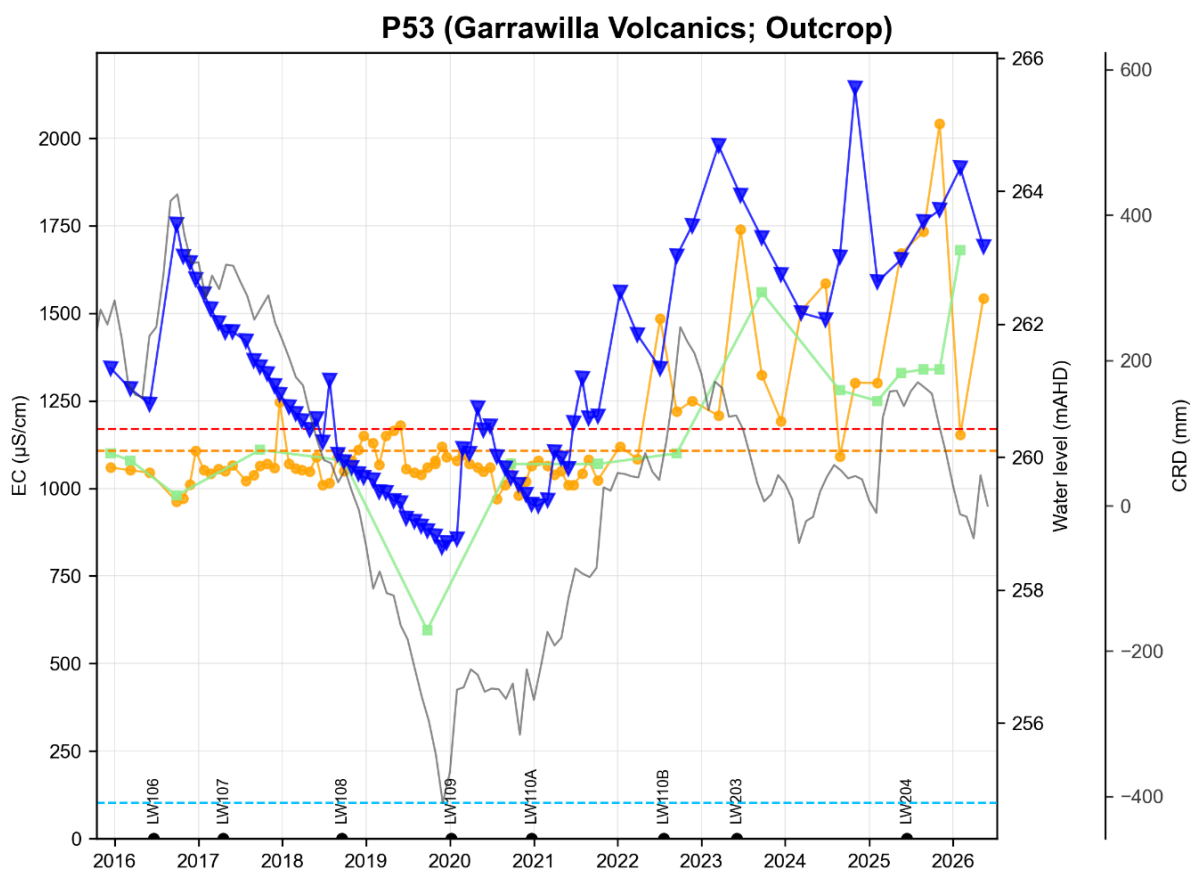
7.5.6 Conclusion and recommendations

Recent increases in EC are likely attributed to increases in water level. Although Dam D may contribute recharge to the area surrounding the RLDs it is not considered the main source of elevated salinity at P32, as EC measured at Dam D is just 793 $\mu\text{S}/\text{cm}$. Seepage from Dam D may influence the water levels; however, is not directly attributable to increases in EC. Instead, this water could act as a medium to mobilise salts that are accumulated in the shallow subsurface, as seen in 2020 and end of 2025 when there has been a notable increase in the rate of groundwater rise. The increase in EC is possibly due to saturation of previously unsaturated ground due to increasing water levels. In addition, the connected nature of the bore patterns to CRD indicates that the recent changes could be related to climate factors as well. Further monitoring of water levels and salinity will be required to further validate concepts around bore P32.

7.5.7 P53 - water quality - EC exceedance

Bore P53 is one of three REA monitoring bores which is located between the REA and a tributary of Kurrajong Creek. The bore was installed in 2016 and is screened from 18 m bgl to 21 m bgl in the Garrawilla Volcanics which outcrop in this area. Groundwater levels show a correlation with rainfall (Figure 7.21), which is consistent with other bores installed in the Garrawilla Volcanics in this area.

From 2016 to early 2022 EC measured in the field remained around 1,060 $\mu\text{S}/\text{cm}$, with fluctuations generally no larger than 200 $\mu\text{S}/\text{cm}$. In mid-2022 EC values began to increase, a trend that is also seen in the laboratory measurements, with larger fluctuations in field measurements up to ~ 700 $\mu\text{S}/\text{cm}$. The EC records at P53 exceeded the Tier 2 trigger levels on 19th July 2025 and TARP level 2 response was enacted.



* mAHD - metres Australian Height Datum

Australasian Groundwater and Environmental Consultants Pty Ltd
Water Level plots

Figure 7.21 P53 EC field and laboratory measurements plotted with water levels

7.5.7.1 Natural 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 $\mu\text{S}/\text{cm}$) would be expected due to the water level increase. In addition, given the shallow depth of P53, and the decrease in salinity at P52, this scenario is also considered unlikely.

Although several bores around the site have shown increasing EC trends that have been attributed to changing conditions post Tinderbox Drought (2017 to end-2019), this is unlikely to be the cause of increasing salinity recorded at P53. The reason is that, during the drought and the post-drought recovery, EC remained stable and water levels varied consistent with rainfall trends (Figure 7.21).

7.5.7.2 Seepage from surface sources

The nearest surface water monitoring locations to P53 are KC1US, located on the Kurrajong Creek tributary approximately 1 km upstream of P53, and KC1DS located approximately 2.8 km downstream near where the creek crosses the Kamilaroi Highway. The EC records for KC1DS range from 46 $\mu\text{S}/\text{cm}$ to 1,270 $\mu\text{S}/\text{cm}$ (Figure 7.22). No apparent correlation exists in the temporal patterns (e.g., between increasing salinity in the creek and the groundwater), and the groundwater at P53 consistently has a higher EC than the observed levels in the creek.

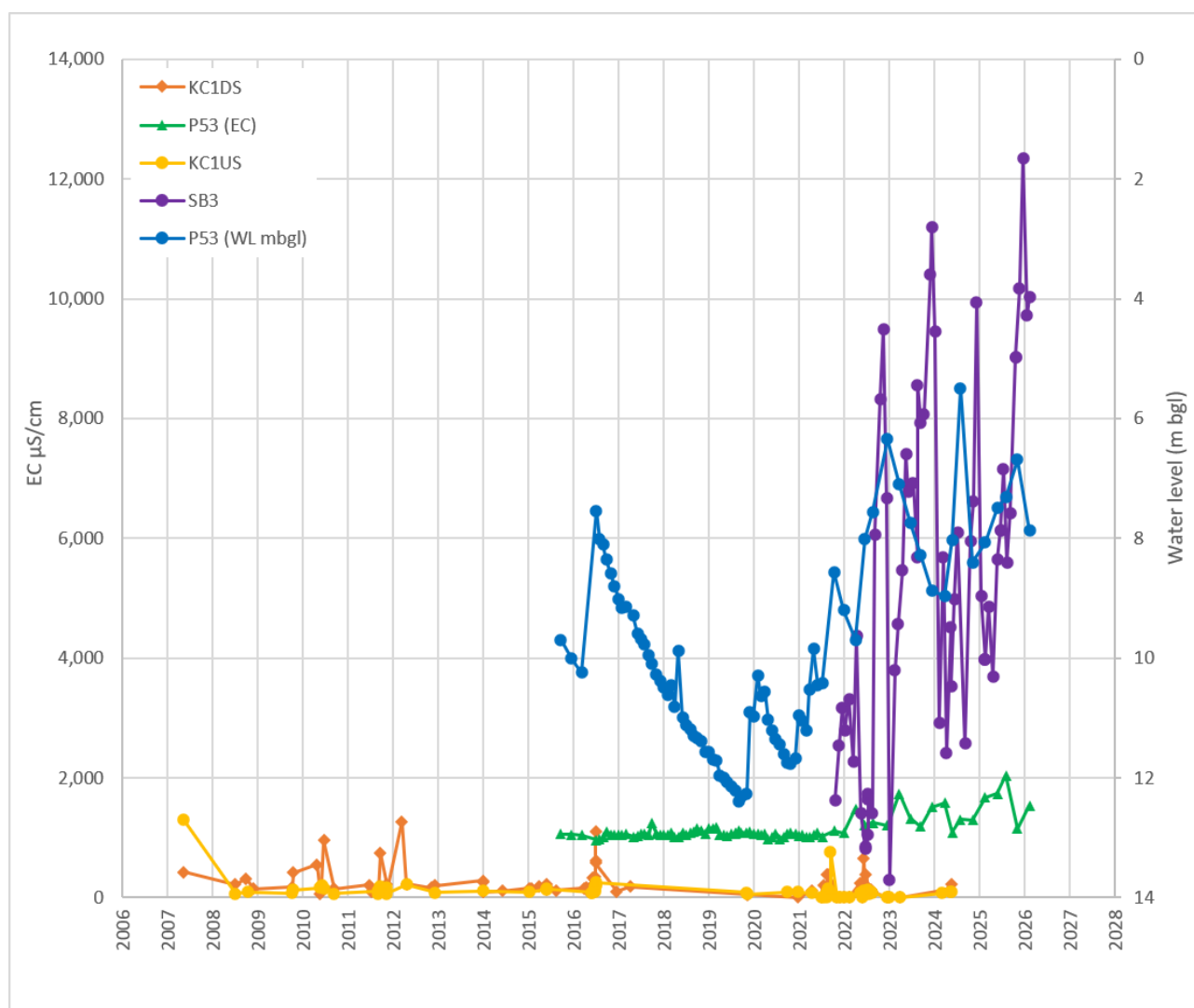


Figure 7.22 Kurrajong Creek tributary EC measured at KC1DS and water level and EC for bore P53

Sediment dam SB3 is located immediately south of P51 and 300 m northeast of P53. Sampling throughout 2025 recorded a field EC in the SB3 dam ranging from 4,860 $\mu\text{S}/\text{cm}$ to 9,930 $\mu\text{S}/\text{cm}$. Recent groundwater levels recorded at P51 and P53 indicate a groundwater flow direction from P53 to P51 (P53 water level higher). Therefore, seepage directly from SB3 is an unlikely cause of elevated salinity at P53, as a physical pathway is either absent or less likely since EC changed in 2022. Two evaporator fans sourced with water from SB3 are located south of the SB3, approximately 250 m east of P53. The evaporator fans potentially provide a more direct source of water from SB3 to P53; and further examination of water quality of SB3 compared with P53 is required to assess this dam and the evaporator fans as a potential source.

HCO_3/Cl ratios for P53 groundwater (Figure 7.23) show the ratio of HCO_3 to Cl decreases from 2022, indicating more relative chloride present (or a depletion of bicarbonate) during the period of higher EC. This indicates that the water is becoming a more chloride type water, whereas water from mine inflows and Hoskissons Coal is more dominated by bicarbonate (Figure 7.24). If changes in water quality at P53 were due to water contamination from the REA, it would be expected that the water at P53 would become more bicarbonate-dominated with time and increasing EC, and this is not the case.

Groundwater major ions for bore P52 show an increasing ratio of HCO_3 to Cl indicating that P52 is becoming more bicarbonate dominate (depletion of chloride), during this time EC at P52 decreased to become less saline. EC (Figure 7.23) and major ions (Figure 7.25) indicate mixing of the water types at the two bores (P53 and P52) to become similar to each other. Since 2022, both bores have EC approaching $\sim 2,000$ $\mu\text{S}/\text{cm}$, and a HCO_3/Cl mass ratio approaching 1.5 (Figure 7.23). Both bores show similar water level trends consistent with variations in rainfall. This could indicate that a source of water with that composition is influencing the groundwater at both sites via mixing.

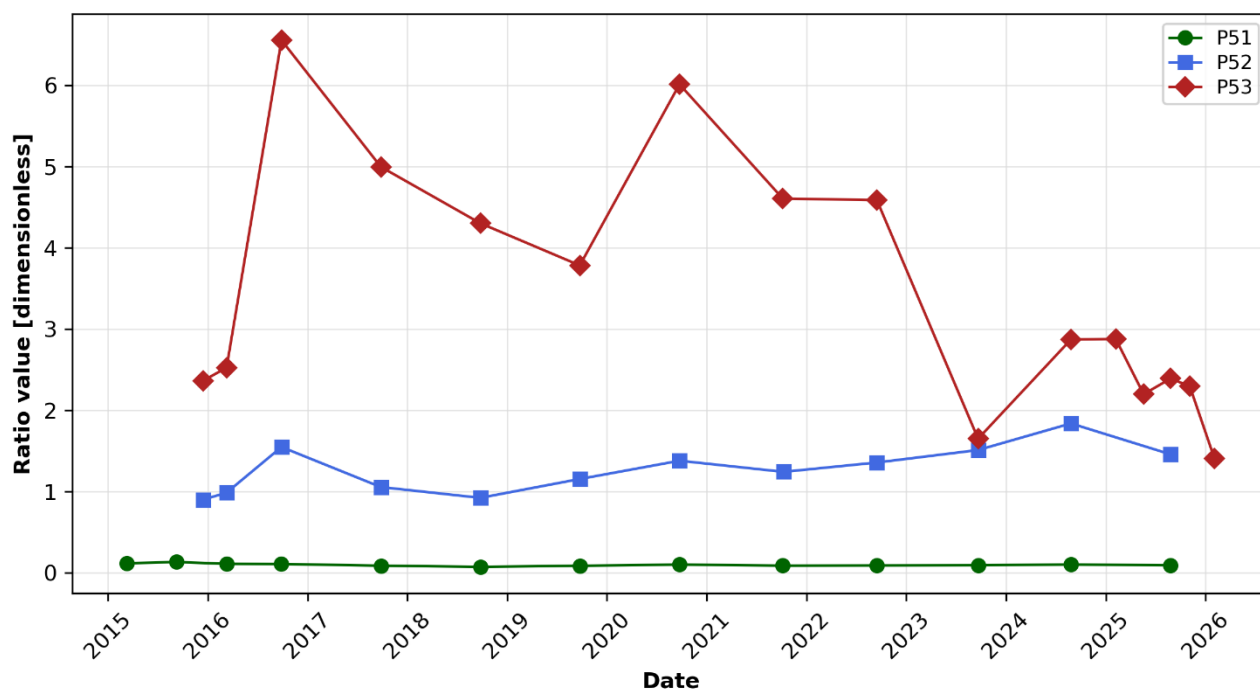


Figure 7.23 P51, P52 and P53 HCO_3/Cl ratios

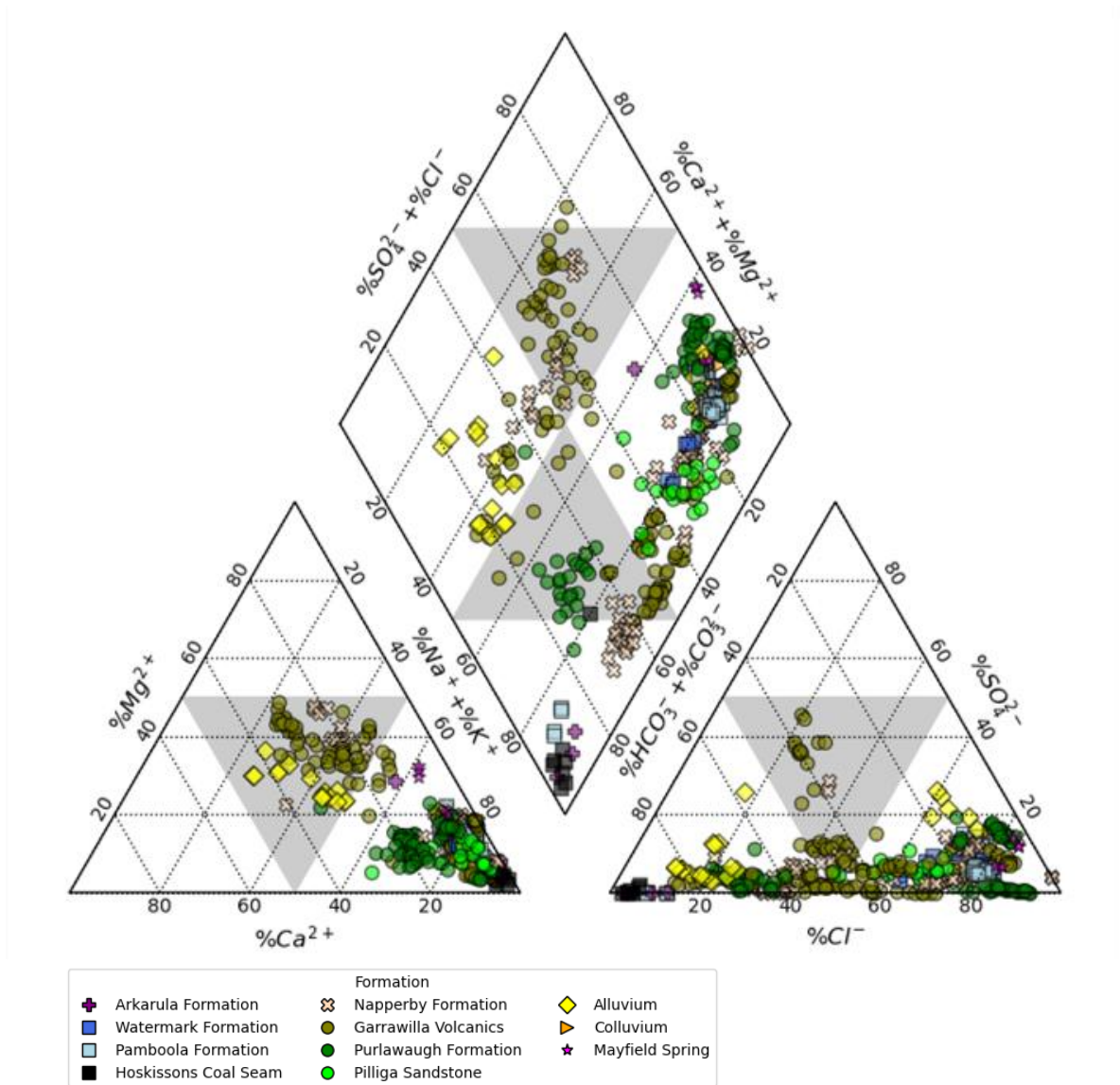


Figure 7.24 Piper plot grouped by formation

7.5.7.3 Mining-induced mixing

Water chemistry recorded at P53 is mixed type for cations, and bicarbonate-dominated for anions (Figure 7.25). P53 groundwater is similar to that of P52, although P52 has higher relative portions of chloride. A linear mixing trend in the anions is visible with an increase in relative chloride in both P53 and P52. This trend, coupled with the higher EC recorded in P52 (2,000-2,400 $\mu\text{S}/\text{cm}$) indicates possible mixing with P52, possibly caused by changing water flow paths, or mixing with a third, similar source (refer to Section 7.5.7.2). However, for this mixing to be mining-induced it would need to be driven by depressurisation in one or more locations. As this is not the case (Figure 7.21), mining-induced mixing is dismissed as a potential cause.

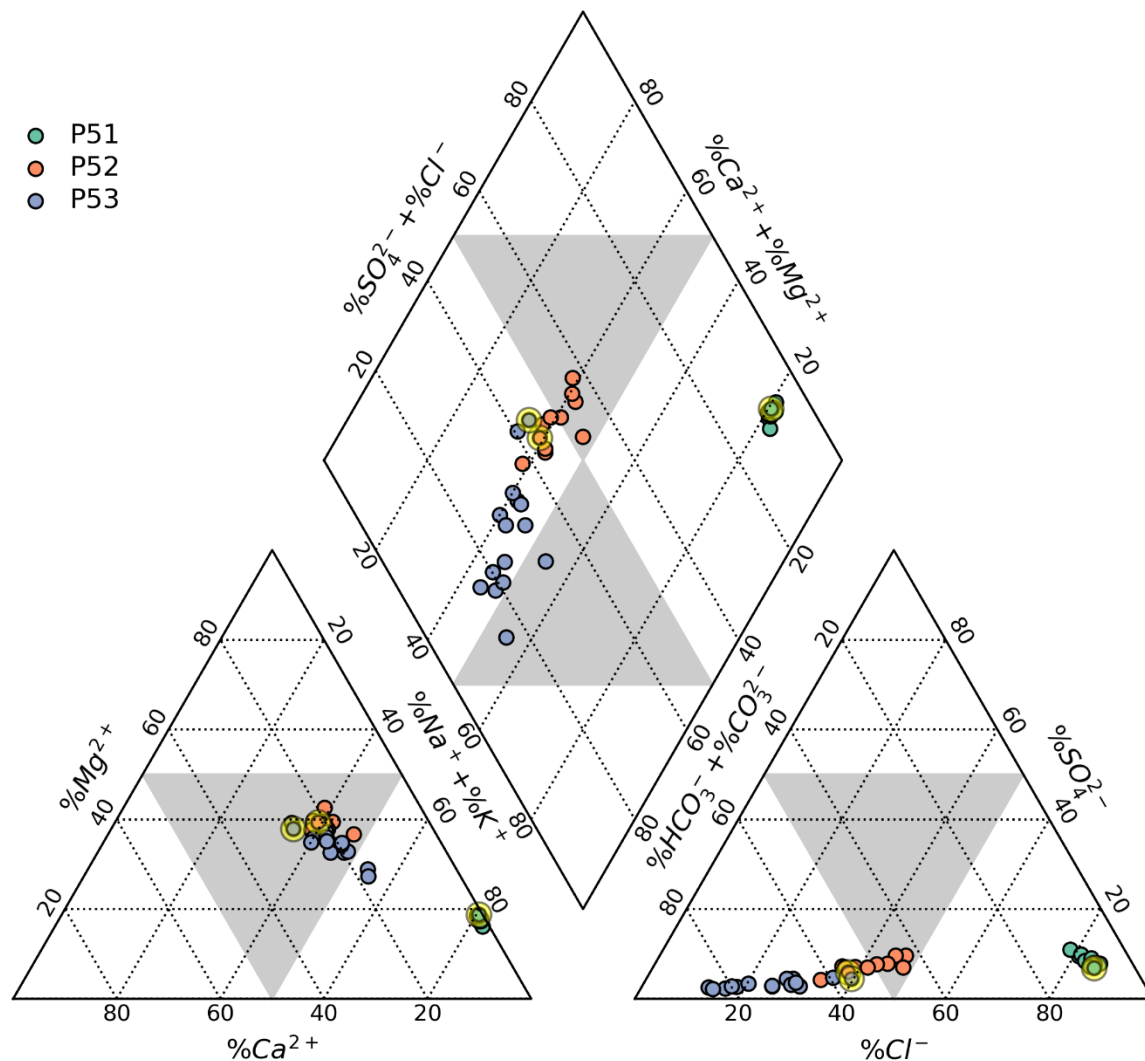


Figure 7.25 Piper plot REA bores P51, P52 and P53

7.5.7.4 Solute release

Differences in major ion compositions of mine inflow and coal seam water (sodium-dominated) with that of P53 (mixed cation composition) indicate solute release from mining is not a likely cause of elevated EC. Further, the anion distribution of P53 groundwater (Figure 7.25) shows no material enrichment of sulfate.

7.5.8 Potential impacts

No sensitive environmental receptors are located nearby. Therefore, no significant environmental impacts are expected from the marginally elevated EC measurements at P53.

7.5.9 Conclusion and recommendations

The potential sources of increases in EC recorded at P53 (which may also be linked to major ion mixing trends apparent in the Piper plots) are either: groundwater mixing is occurring between bores P53 and P52 (but not induced by mining drawdown); or the same source of water (such as that from SB3, or the evaporator fans located near bores P53 and P52) is acting on both bores. Further sampling and interpretation is needed to constrain the source of change in P53 EC in future.

8 Conclusions

Conclusions and recommendations for individual exceedances are included in each section. A summary of findings, comparison with previous findings, and recommendations for further work are included in Table 8.1. This table also includes responses to the recommendations from annual reporting around two critical questions for bores with recorded exceedances:

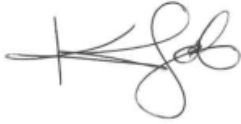
- are the groundwater changes associated with climatic events; and
- has a new adjusted baseline been established? If so, a review of the baseline data and trigger levels is recommended.

For bores with no current recommendation for further work, monitoring should continue as per the WMP, with data reviewed quarterly to determine if a bore has reached equilibrium or any other changes are noticeable.

Table 8.1 Summary of exceedances and further work

Bore ID	Formation	Exceedance	Likely cause	New baseline / triggers established	Further work required
P7	Pilliga	pH	Inconclusive: Natural variability of formation, possibly post-drought wet period response	No	Consider aquifer specific trigger for pH
P10	Napperby	Water level	Drawdown related to mining (as modelled)	No	Remove P10 trigger
P10	Napperby	EC	Inconclusive: possible natural variations / mixing within Napperby Fm	No	No
P29	Napperby	EC	Inconclusive: possible saturation of unsaturated zone / seepage	N/A	Further investigations required
P32	Napperby	EC	Inconclusive: possible natural variations / major climate event / saturation of unsaturated zone	N/A	Further investigations required
P39A	Watermark	EC	Inconclusive: Natural variations / major climate event / seepage from nearby dams	Tier 1 7,710 $\mu\text{S}/\text{cm}$ Tier 2 8,031 $\mu\text{S}/\text{cm}$	Update triggers and sample groundwater quality from nearby bores
P39B	Alluvium	EC	Inconclusive: Natural variations / major climate event / seepage from nearby dams	Tier 1 13,662 $\mu\text{S}/\text{cm}$ Tier 2 14,198 $\mu\text{S}/\text{cm}$	Update triggers and sample groundwater quality from nearby bores
P53	Garrawilla	EC	Inconclusive: Mixing with other groundwater and/or infiltration from SB3 or evaporator fans	N/A	Review major ions and groundwater types against nearby SB3

Yours faithfully,



Kathryn Job

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